ADVANTEST CORPORATION

R3752H/53H/54 Series

Network Analyzer

Programming Manual

MANUAL NUMBER FFE-8324151G00

Applicable
R3752AH/BH/EH
R3753AH/BH/EH
R3754A/B/C

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Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

- **Warning Labels**

Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

Symbols of those warning labels are shown below together with their meaning.

DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

- **Basic Precautions**

Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

- Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas.
- When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.
- When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
- Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the instrument.
- Connect the power cable to a power outlet that is connected to a protected ground terminal. Grounding will be defeated if you use an extension cord which does not include a protected ground terminal.
- Be sure to use fuses rated for the voltage in question.
- Do not use this instrument with the case open.
- Do not place anything on the product and do not apply excessive pressure to the product. Also, do not place flower pots or other containers containing liquid such as chemicals near this

product.

- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this manual are shown below together with their meaning.

DANGER: Indicates an item where there is a danger of serious personal injury (death or serious injury).

WARNING: Indicates an item relating to personal safety or health.

CAUTION: Indicates an item relating to possible damage to the product or instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

⚠ : ATTENTION - Refer to manual.

⏚ : Protective ground (earth) terminal.

ϟ : DANGER - High voltage.

⚠ : CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.
Replace the parts listed below before their expected lifespan has expired to maintain the performance and function of the instrument.
Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used.
The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

Each product may use parts with limited life.
For more information, refer to the section in this document where the parts with limited life are described.

Main Parts with Limited Life

Part name	Life
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
LCD display	6 years
LCD backlight	2.5 years
Floppy disk drive	5 years
Memory backup battery	5 years

- **Hard Disk Mounted Products**

The operational warnings are listed below.

- Do not move, shock and vibrate the product while the power is turned on.
  Reading or writing data in the hard disk unit is performed with the memory disk turning at a high speed. It is a very delicate process.

- Store and operate the products under the following environmental conditions.
  An area with no sudden temperature changes.
  An area away from shock or vibrations.
  An area free from moisture, dirt, or dust.
  An area away from magnets or an instrument which generates a magnetic field.

- Make back-ups of important data.
  The data stored in the disk may become damaged if the product is mishandled. The hard disc has a limited life span which depends on the operational conditions. Note that there is no guarantee for any loss of data.

- **Precautions when Disposing of this Instrument**

When disposing of harmful substances, be sure dispose of them properly with abiding by the state-provided law.

Harmful substances: (1) PCB (polycarbon biphenyl)
(2) Mercury
(3) Ni-Cd (nickel cadmium)
(4) Other
Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in solder).

Example: fluorescent tubes, batteries

Environmental Conditions

This instrument should be only be used in an area which satisfies the following conditions:

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- Altitude of up to 2000 m

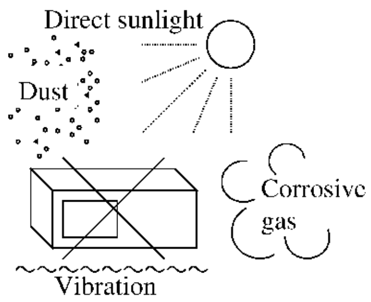
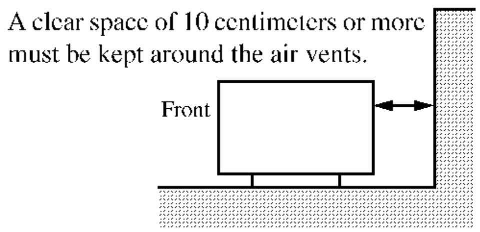


Figure-1 Environmental Conditions

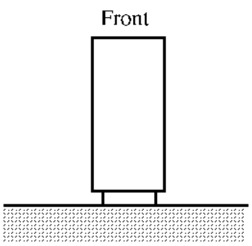
- Operating position



The instrument must be used in a horizontal position.
A cooling fan, which prevents the internal temperature from rising, is equipped with the instrument.
The air vents on the case must be unblocked.

Figure-2 Operating Position

- Storage position



This instrument should be stored in a horizontal position.
When placed in a vertical (upright) position for storage or transportation, ensure the instrument is stable and secure.

-Ensure the instrument is stable.
-Pay special attention not to fall.

Figure-3 Storage Position

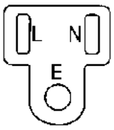
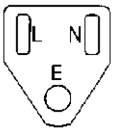
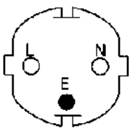
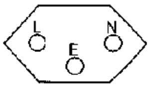
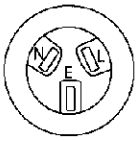
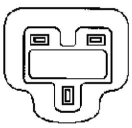
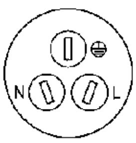
- The classification of the transient over-voltage, which exists typically in the main power supply, and the pollution degree is defined by IEC61010-1 and described below.

  Impulse withstand voltage (over-voltage) category II defined by IEC60364-4-443

  Pollution Degree 2

Types of Power Cable

Replace any references to the power cable type, according to the following table, with the appropriate power cable type for your country.

Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413
	CEE: Europe DEMKO: Denmark NEMKO: Norway VDE: Germany KEMA: The Netherlands CEBEC: Belgium OVE: Austria FIMKO: Finland SEMKO: Sweden	250 V at 6 A Gray 2 m (6 ft)	Straight: A01404 (Option 96) Angled: A01414
	SEV: Switzerland	250 V at 6 A Gray 2 m (6 ft)	Straight: A01405 (Option 97) Angled: A01415
	SAA: Australia, New Zealand	250 V at 6 A Gray 2 m (6 ft)	Straight: A01406 (Option 98) Angled: ---------
	BS: United Kingdom	250 V at 6 A Black 2 m (6 ft)	Straight: A01407 (Option 99) Angled: A01417
	CCC:China	250 V at 10 A Black 2 m (6 ft)	Straight: A114009 (Option 94) Angled: A114109

Part 1

PREFACE

How to Use This Manual

1. The following describes the structure of this manual.

   • Part 1: Built-in BASIC

   • Part 2: GPIB

   Reference: For details of the network analyzer section names functions and key operations, refer to the pertinent instruction manual.

   • R3752H Series Network Analyzer Operation Manual
   • R3753H Series Network Analyzer Operation Manual
   • R3754 Series Network Analyzer User Manual

2. Please be understood that the left product name described below is applied to the right product name.

   R3752A → R3752AH

   R3752B → R3752BH

   R3752E → R3752EH

   R3753A → R3753AH

   R3753B → R3753BH

   R3753E → R3753EH

3. For customers who use the R3754 Series

   Descriptions for the R3752H or R3753H are also applicable to the R3754 except in the following cases:

   • When applicable models are clearly listed.

   • When the R3754 Series is the only applicable model.

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1. INTRODUCTION

The BASIC language built into the network analyzer is equipped with general-purpose BASIC commands, GPIB control purpose commands, and exclusive built-in functions, enabling the network analyzer to be used for simple configuration of small GPIB systems.

1.1 Command and statement syntax

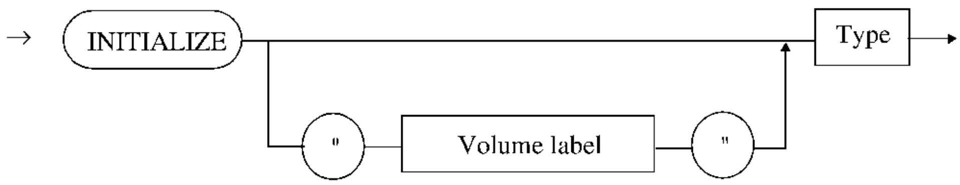
The syntax for the commands and statements used for this analyzer is explained in Chapters 3 and 4 of this manual with both schematic and descriptive representations for intuitive understanding.

1. Schematic representation

   To represent a syntax, the analyzer disassembles it into its elements and connects them with straight lines.

   Statements should always be read in the direction of the arrows. If a statement jumps to multiple branches on the way, the analyzer will go to one of them. If a loop is formed in the representation, the loop can be passed any number of times.

   Description example:



2. Meanings of symbols used for descriptive representation

   - Part enclosed with symbols [ ]

     Indicates that the enclosed item is an option (omissible).

   - Part enclosed with symbols < >

     Indicates that the enclosed item is not an option (un-omissible).

   - Part enclosed with symbols { }

     Indicates that the enclosed item is repeatable 0 times or more.

   - Symbol |

     Indicates "or". (ex. A | B - A or B is selectable.)

   Example of representation: INITIALIZE ["volume label"] <type>

3. Meanings of words used for schematic and descriptive representations

   - Numerical value representation expression:

     Any one of numeric value constant, numeric value variable, and expression

   - Character string representation expression:

     Expression consisting of character string constant, character string variable, character string function, and sub-string

   - Equipment address

     Address of device connected to GPIB

1.2 GPIB mode

The analyzer operates in either of two modes: ADDRESSABLE or CONTROL. The switching between the modes is performed using the CONTROL command or from the front panel.

For the use of the CONTROL command, refer to "3. BASIC COMMANDS". For the use of the front panel, refer to the instruction manual for the pertinent unit.

1. ADDRESSABLE mode

   The ADDRESSABLE mode is a normal mode. In this mode, the analyzer is controlled by an external controller.

   If the built-in BASIC program of the analyzer is run in this mode, the analyzer will operate as follows:

   - If "CONTROL 7;4" of the BASIC command has not been set:

     Data can be transmitted/received between the built-in BASIC of the analyzer and an external controller.

     However, since the ENTER and OUTPUT instructions of the built-in BASIC have higher priority, setting cannot be performed using a GPIB command from the external controller.

     Perform setting using a GPIB command from the external controller, stop the built-in BASIC program or set "CONTROL 7;4".

   - If "CONTROL 7;4" of the BASIC command has been set:

     In contrast with "CONTROL 7;4" of the BASIC command has not been set, setting can be performed using a GPIB command from an external controller.

     In other words, the system operates in the same manner as when the built-in BASIC is stopped. However, no data can be transmitted/received between the built-in BASIC and the external controller.

2. SYSTEM CONTROLLER mode

   The built-in BASIC program enables the analyzer to control the measurement function and the externally connected units.

2. BASIC OPERATIONS

2.1 Outline of Operations

Front panel keys are used for loading, executing, and stopping a program.

The program can be entered and executed by an external computer through the GPIB.

2.2 Panel Operations

For panel operations concerning the built-in BASIC, refer to the instruction manual of the pertinent unit together with the explanation below, since operations differ in part according to the unit being used.

2.2.1 Entering, Executing, and Stopping a Program

To create a program, a personal computer (or a unit that can access files on an MS-DOS-formatted floppy disk) should be used for entering/editing data and saving them on a floppy disk in ASCII format.

Use the following procedure to load, execute, and stop the program:

Operations (R3752)

1. Insert the floppy disk containing the program to be executed into the floppy disk drive of the analyzer.
2. Press the **[LOAD]** to display the files on the floppy disk.
3. Use the up **[↑]** and down **[↓]** to move the cursor to the file name to be loaded.
4. Press the **[ENT]** to start program loading.
5. Press the **[RUN]** to execute the program.
6. Press the **[STOP]** to stop the execution of the program.

2.2.2 Data Entry Keys

To enter the INPUT statement, use the numeric keys (0 to 9), the **[-]** and **[.]**, then press the **[ENT]**.

Before pressing the **[ENT]**, the **[BS]** can be used to delete the input data character by character.

2.2.3 Function Keys

To interrupt the operation of the **[ON]**, use interrupt keys K1 to K6.

2.3 Floppy Disk

The floppy disk is used for storing/reading the setting condition and the measured data or a BASIC program and the files from the BASIC program.

The floppy disk format complies with MS-DOS, enabling programs to be created or data to be analyzed using a personal computer corresponding to MS-DOS.

In the analyzer, the disks initialized with the following formats can be used:

- 2DD (Double-sided double-density)
  720 Kbytes (512 bytes, 9 sectors)
- 2HD (Double-sided high-density)
  1.2 Mbytes (1024 bytes, 8 sectors)
  1.2 Mbytes (512 bytes, 15 sectors)
  1.4 Mbytes (512 bytes, 18 sectors)

CAUTION: ***The analyzer automatically discriminates between 2DD and 2HD disks. 2DD floppy disks formatted to hold 1.2 Mbytes or 1.4 Mbytes and 2HD floppy disks formatted to hold 720 Kbytes cannot be used.***

1. External appearance and names of micro-floppy disk

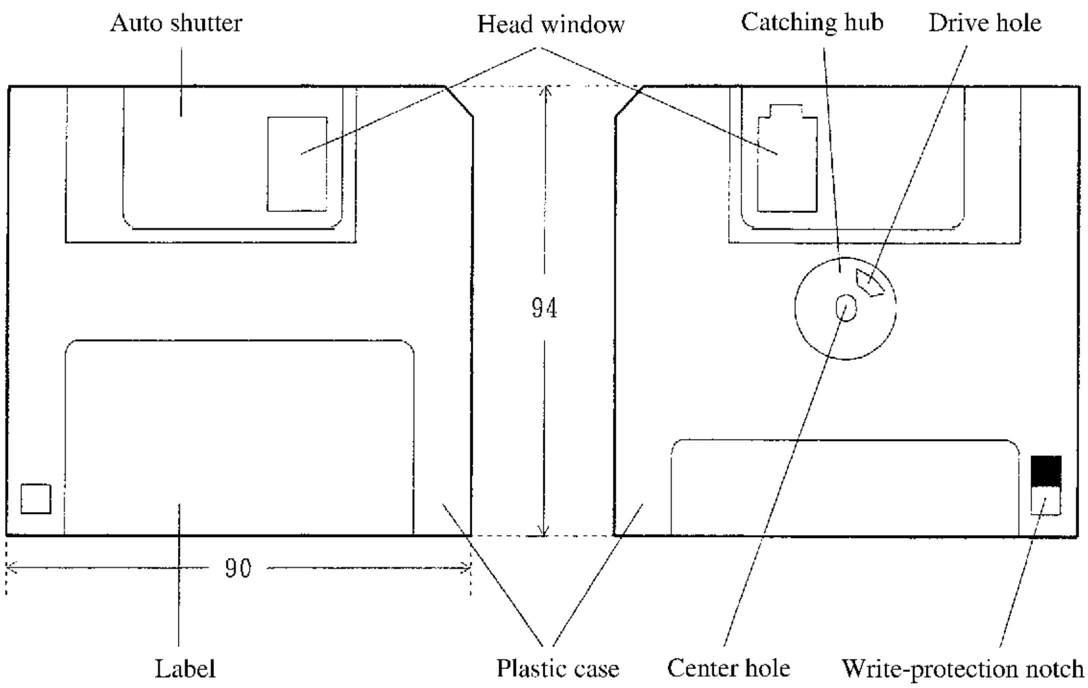


Figure 2-1 External Appearance and Names of Parts of Micro-Floppy Disk

- Label

  Adhesive label for floppy disk
- Head window

  The READ/WRITE head is positioned at the corresponding opening on the back of the floppy disk. The head is aligned with this slot.
  When the floppy disk is pulled out from the drive slot, the auto shutter closes to protect the disk.
- Catching hub (drive hole, center hole)

  When the floppy disk is inserted into the drive slot, a spindle which uses a catching magnet on the drive side fixes and rotates the floppy disk.
- Write-protect window

  Writing can be prohibited to prevent important data from being erased by mistake.

2. Insertion and handling of floppy disks

   Insert the floppy into the disk drive with the label facing upwards, as shown in Figure 2-2.

   Check that the disk is fully inserted in the drive by pushing it in with a finger. The disk is ejected automatically when the eject button is pressed.

CAUTION: ***Never press the eject button while the floppy drive lamp is blinking, since this could result in incorrect operation or data loss.***

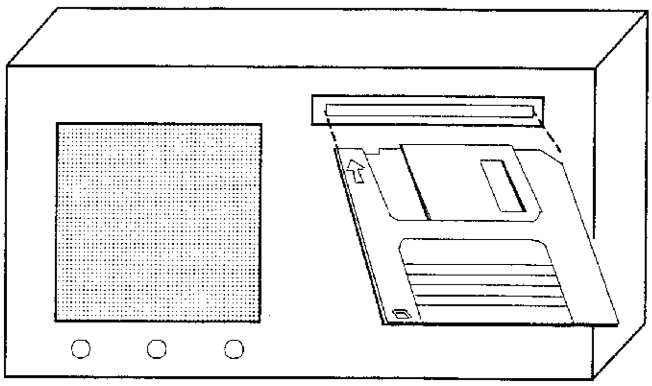


Figure 2-2 Inserting Floppy Disk (for R3753)

When handling floppy disks, pay attention to the following items.

- Keep away from materials which generate a strong magnetic field.
- Do not expose to extreme heat or direct sunlight.
- Take care to avoid cigarette ash and other contaminants.
- Do not touch the magnetic surface.
- Do not place heavy objects on disks.
- Damaged disks (wet, dripped, bent, etc.) or those which have been contaminated with foreign particles should be changed.

3. Write protect

   Important data should be protected from accidental erasure by using the write-protect shutter.

   To protect data, slide the write-protect tub (Figure 2-3).

   Writing is possible when the tub is closed to the center hole and not possible when furthest from the center hole.

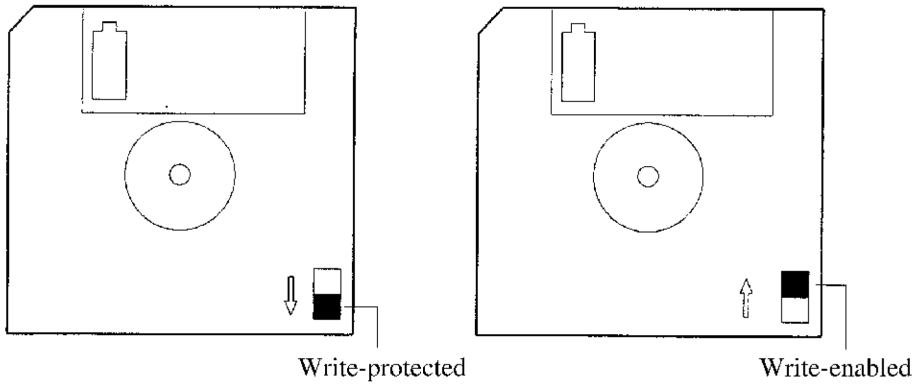


Figure 2-3   Write-Protect Tab Position

2.4 File Management

2.4.1 Outline

The management of disk files for the analyzer is the same as for disk files created by MS-DOS. In other words, the analyzer can use MS-DOS-formatted floppy disks itself, and files created by the analyzer can be referenced from MS-DOS.

1. File

   Generally, a group of data is called a "file". BASIC programs edited on personal computers (PCs) and data created by BASIC are all stored as files.

2. Drive

   Files are stored on disks such as floppy disks and memory disks. A unit which reads and writes files is called a "drive". Each drive manages one disk. The following four drives are provided for the analyzer:

   A: Floppy disks
   Same as floppy disks created using MS-DOS

   B: Memory disks which cannot be backed up
   These disks are automatically formatted when the analyzer is switched on. When the analyzer is switched off, the contents of the disk are lost.
   BASIC cannot use these memory disks.

   C: Memory disks which can be backed up
   The contents of the disk can be maintained when the analyzer is switched off.
   BASIC can use up to 128 Kbytes of the disk capacity.

   D: Read-only memory disks
   These disks maintain the system program of the analyzer.
   BASIC cannot use these memory disks.

   To select the current drive, refer to the instruction manual for each model of analyzer.

3. Storing and calling files

   When BASIC stores or calls a file, the drive and file name must be specified as follows:

   "[<drive name>:] <file name>"

   To specify the drive, alphabetic characters of the drive name must be followed by a colon. The drive name is omissible. If the drive name is omitted, the analyzer will automatically select the current drive.

   For information on how to store/call files, refer to the description of BASIC commands OPEN and CLOSE.

4. Initializing floppy disks

   When a new floppy disk is to be used, it must first be initialized (formatted).

   The following three initialization methods are possible:

   - Execute the FORMAT command contained in MS-DOS by using the personal computer and use the formatted disk in the analyzer.
   - Analyzer panel operation (Refer to the description of the panel operation.)
   - Execute the INITIALIZE command contained in the BASIC program of the analyzer.

   Generally, floppy disks can be formatted to have any one of the following capacities:

   - 1.44 Mbytes (2HD)
   - 1.2 Mbytes (2HD)
   - 720 Kbytes (2DD)
   - 640 Kbytes (2DD)

   The analyzer can use floppy disks formatted to have any of the above capacities except for "640 Kbytes (2DD)".

2.4.2 File Management

```
CAT
```

The CAT command is used to display the names of the files and directories in the current drive. The registered number, the file name, the number of bytes used, and the file attribute are displayed in that order from the left.

2.4.3 File Saving

```
SAVE "file name"
```

The SAVE command is used to name the program created and save it on the drive. Take care when naming the program, since if the name of an existing file is specified, the contents of the specified file will be updated.

2.4.4 File Loading

```
LOAD "file name"
```

The LOAD command is used to load the file from the drive into the memory.

2.4.5 File Deletion

```
PURGE "file name"
```

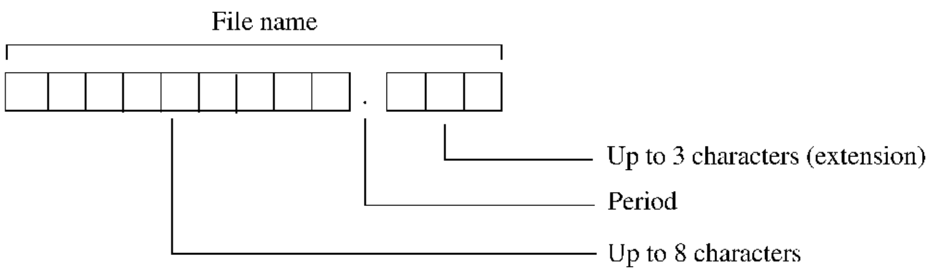
The PURGE command is used to purge unnecessary files.

2.4.6 File Name Changing

```
RENAME "current file name", "new file name"
```

The RENAME command is used to rename an existing file without changing its contents.

Numbers, letters, and symbols (except for double quotation marks) are used to specify the file name as follows:



3. BASIC COMMANDS

3.1 Various Commands

In the built-in BASIC, various commands are used to edit/execute programs and to operate files.

The following shows the hierarchical structure of the built-in BASIC commands:

.

- Built-in BASIC commands
  - Direct commands
    - Program input
    - DEL
    - GLIST
    - GLISTN
    - LIST
    - LISTN
    - LLIST
    - LLISTN
    - PRINTER
    - REN
    - SCRATCH
  - Execution commands
    - CONT
    - CONTROL
    - PAUSE
    - STEP
    - STOP
    - RUN
  - File commands
    - CAT
    - COPY
    - INITIALIZE
    - LOAD
    - MERGE
    - PURGE
    - SAVE
    - RENAME

Note: A capital letter is used for command.

3.1.1 List of Command Function

Command		Function
EDIT commands	Program input	Stores the statement as a program.
	DEL	Deletes the specified line number.
	GLIST	Outputs the program list to the GPIB.
	GLISTN	Outputs the program list to the GPIB.
	LIST	Displays the program list on the screen.
	LISTN	Displays the program list on the screen.
	LLIST	Outputs the program list to the serial port.
	LLISTN	Outputs the program list to the serial port.
	PRINTER	Sets the GPIB address of the printer.
	REN	Changes the line number.
	SCRATCH	Deletes the already input program.
EXECUTION commands	CONT	Runs the program again.
	CONTROL	Sets the BASIC control variables. (Environment setup)
	PAUSE	Suspends the program. (Enables CONT command)
	STEP	Runs the program one line.
	STOP	Stops the program. (Disables CONT command)
	RUN	Runs the program.
FILE commands	CAT	Displays the file name of the floppy disk on the screen.
	COPY	Copies the file to other disks or directories.
	INITIALIZE	Formats the disk.
	LOAD	Loads the program from a floppy disk.
	MERGE	Loads the program from a floppy disk to merge it into the already input program.
	PURGE	Purges the file stored in a floppy disk.
	SAVE	Saves (Stores) the program into a floppy disk.
	RENAME	Renames the file name stored in a floppy disk.

3.1.2 List of Command Syntax

Command		Syntax
EDIT	Program input	Line number Statement
commands	DEL	DEL Start line [, End line]
	GLIST	GLIST [Start line] [, [End line]]
	GLISTN	GLISTN [Start line] [, [Number of line]]
	LIST	LIST [Start line] [, [End line]]
	LISTN	LISTN [Start line] [, [Number of line]]
	LLIST	LLIST [Start line] [, [End line]]
	LLISTN	LLISTN [Start line] [, [Number of line]]
	PRINTER	PRINTER Device address
	REN	REN [[Current line number] [, <New line number> [, <Increment>]]]
	SCRATCH	SCRATCH [1 | 2]
EXECUTION	CONT	CONT [Line number]
commands	CONTROL	CONTROL <Resistor number>;<Value>
	PAUSE	PAUSE
	STEP	STEP [Line number]
	STOP	STOP
	RUN	RUN [Line number]
FILE	CAT	CAT ["DATE"]
commands	COPY	COPY "Current file name", "New file name"
	INITIALIZE	INITIALIZE ["Volume label"] <Type>
	LOAD	LOAD "File name"
	MERGE	MERGE "File name"
	PURGE	PURGE "File name"
	SAVE	SAVE "File name"
	RENAME	RENAME "Current file name", "New file name"

3.1.3 Precautions Common to All Commands

The following precautions are common to all of the built-in BASIC commands:

1. Parameters

   The character string representation expression and numeric value representation expression can be used to specify command parameters. In other words, variables used in the BASIC command can be used. If the number used is a real number, digits to the right of the decimal point will be omitted.

   The description of each command uses representations such as integers and character strings for easy understanding.

2. Boundary of expression

   In principle, when the BASIC command uses multiple expressions continuously, a space can be used instead of a comma, as long as the boundary of the expressions can be interpreted in the syntax.

3. Line number

   The line number setting range is 1 to 65535.

   If 0 or any value below the first line number of the program is specified, the analyzer will interpret that the first line of the program has been specified.

   If 65535 or any value over the last line number of the program is specified, the analyzer will interpret that the last line of the program has been specified.

3.2 Command Grammar and Application

This index is used to easily find in Section 3.2.

GPIB Command	Pages	GPIB Command	Pages
CAT	3-6		
CONT	3-7		
CONTROL	3-7		
COPY	3-9		
DEL	3-10		
GLIST	3-11		
GLISTN	3-12		
INITIALIZE (INIT)	3-13		
LIST	3-14		
LISTN	3-15		
LLIST	3-16		
LLISTN	3-17		
LOAD	3-18		
MERGE	3-18		
PAUSE	3-19		
PRINTER	3-19		
PURGE	3-19		
REN	3-20		
RENAME	3-21		
RUN	3-21		
SAVE	3-22		
SCRATCH	3-23		
STEP	3-23		
STOP	3-24		

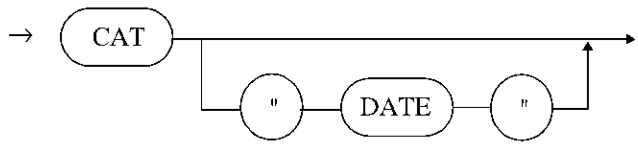
1. Program Input

   The commands and statements described in Chapters 3 and 4 can be entered as a program if line numbers are added to them.

   If the same line number exists in a program which has already been input, the newly entered number will replace it. If the same line number does not exist, the new number will be added or inserted.

2. CAT

   - Outline — The CAT command is used to list the names of the files stored on the current drive.
   - Syntax — (1)-1



(1)-2

CAT ["DATE"]

   - Description — The CAT command lists the names of the files and directories stored on the current drive.

     CAT: Displays the registered number, the file name, the number of bytes used, and the file attribute in that order from the left.

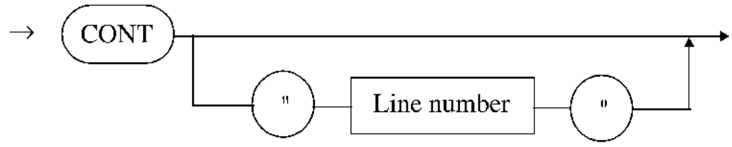
     CAT "DATE": Displays the registered number, the file name, and the date the file was created in that order from the left.

NOTE: For the information how to handle files, refer to "2.4 File Management".

---

3. CONT

- Outline: The CONT command is used to restart the BASIC program.
- Syntax: (1)-1



(1)-2

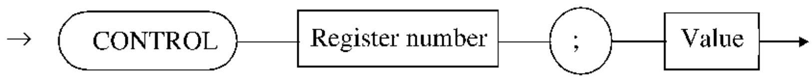
CONT [Line number]

- Description:
  - The CONT command restarts the BASIC program which is paused by the PAUSE command at the next of the line where the program pauses.
  - The CONT command restarts the BASIC program at the desired (specified) line. Cannot be used to initialize variables.
- Example: CONT

  CONT 200

4. CONTROL

- Outline: The CONTROL command is used to set the detailed values concerning the BASIC control (environment setup).
- Syntax: (1)-1



(1)-2

CONTROL register number; value

- Description:
  - The CONTROL command specifies the items to be controlled by the register number. The value followed by a semicolon is the actual value.
  - The value 1 to 9 can be set to the register number. The contents of each register are as follows. (However, the register 4 has not been used by means of internal structure.)

<Register 1> Initial value: 79

Sets a serial I/O port. The total of values added up is used to specify the serial I/O port. The following underlined-value is each default value which has been already set when the analyzer is turned on.

1.Baud rate:	0;	1200 baud	3.Parity:	0;	None
	1;	2400 baud		16;	Odd
	2;	4800 baud		48;	Even
	3;	9600 baud			

2.Character length:	0;	5 bits	
	4;	6 bits	
	8;	7 bits	
	12;	8 bits	

4.Stop-bit number:	0;	None
	64;	bit
	128;	1 1/2 bits
	192;	2 bits

Example:

When 9600 bps for baud rate, 8 bits for character length, even parity for parity, and 2 bits for stop-bit number are used:

CONTROL 1;3+12+48+192

or

CONTROL 1;255

<Register 2> Initial value: 0

With the command LLIST or GLIST, specifies the print position from the left side by entering the number of spaces.

Example:

When the list output is moved to the right by five characters

Execute the CONTROL 2;5 first and the LLIST or GLIST, five spaces will be inserted immediately before the line number, then the list will be displayed after that.

<Register 3> Initial value: 0

Specifies whether the BASIC program will be displayed in full name or short name.

0: Full name

1: Short name

For the relationship between the full and short names, refer to Table 4-2.

<Register 5> Initial value: 0

Specifies whether the maintenance command POKE is available or not.

0: Not available

1: Available

<Register 6> Initial value: 0

Specifies the stop condition of INPUT statement.

0: Stops the statement only when the ENT key is pressed.

1: Stops the statement when the ENT key or the function key is pressed.

<Register 7> Initial value: 0

Used for GPIB setting. Each value must be set as follows:

0: Sets GPIB mode to ADDRESSABLE.

1: Sets GPIB mode to SYSTEM CONTROLLER.

2: Transits REQUEST CONTROL (request for control privilege).

4: Enables GPIB command setting from the external controller during BASIC operation.

<Register 8> Initial value: 0

Sets ON/OFF of DMA transfer mode.

0: OFF

1: ON

<Register 9> Initial value: 1

Specifies a desired output instrument for PRINT. The total of values added up is used to set up.

1: Default output (front panel indicator of each model)

2: Output to maintenance port (terminal)

4: Output to external monitor or R3753 LCD

8: Output to R3752 fluorescent character display tube

Example 1:Output to default and maintenance port

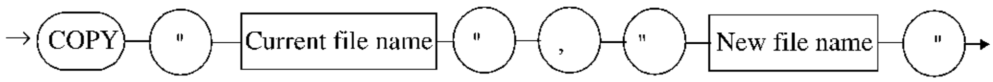
CONTROL 9;3

Example 2:Output to default, maintenance port and external monitor

CONTROL 9;7

5. COPY

- Outline: The COPY command is used to copy the files stored on the drive to floppy disks or directories, etc.
- Syntax: (1)-1



(1)-2

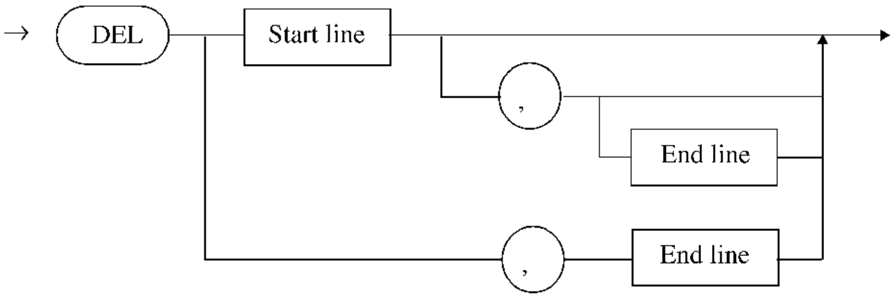
COPY "current file name", "new file name"

- Description
  - The COPY command copies the contents of the current file name to a new file name.
  - When a new file name has already existed, the contents of the current file is overwritten.
  - If the new file name is the same as the current file name, then the error will be occurred.
  - Both of two file names can be specified by using a character-string expression.

NOTE: For the information how to handle files, refer to "2.4 File Management".

6. DEL

- Outline — The DEL command is used to delete lines in the program.
- Syntax — (1)-1



(1)-2

DEL <Start line [, [end line] >|<, end line>

NOTE: ***A space may be used instead of a comma. The line number setting range is 1 through 65535.***

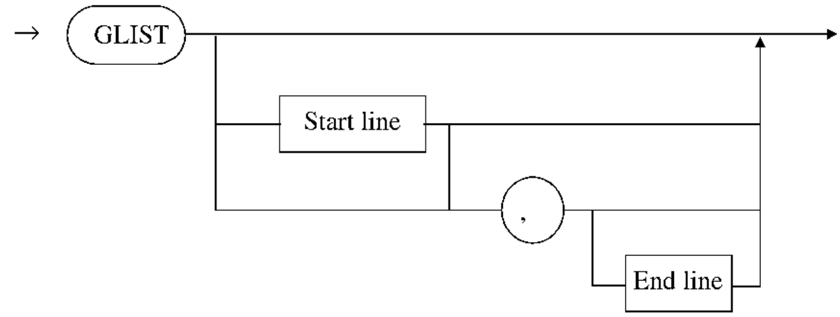
- Description
  - The DEL command deletes the program from the start line to the last line.
  - If the line number is omitted, the no operation will be performed.
- Example

DEL 10	Deletes the 10th line only of the program.
DEL 10,	Deletes the program from line 10 to the last line.
DEL 10,100	Deletes the program from line 10 to line 100.
DEL, 100	Deletes the program from the start line to line 100.

7. GLIST

- Outline: The GLIST command is used to output a program list to peripheral devices such as a printer, etc. through the GPIB.

- Syntax: (1)-1



(1)-2

GLIST [Start line [, [last line]]] | [, [last line]]

NOTE: ***A space may be used instead of a comma.***
The line number setting range is 1 through 65535.

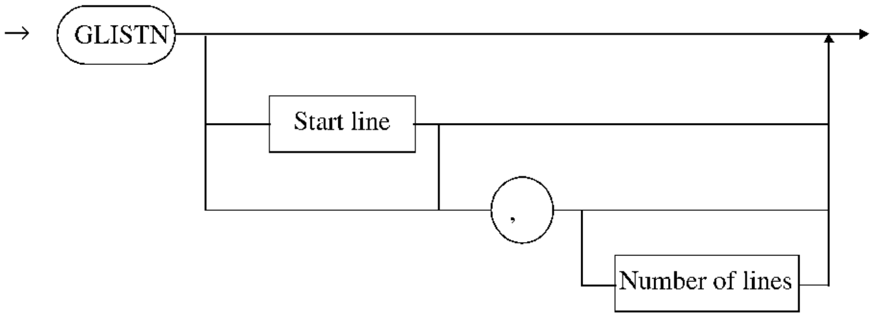
- Description
  - The GLIST command outputs the BASIC programs list to peripheral devices such as a printer, etc. connected with the GPIB.
  - The printer GPIB address can be define by the PRINTER statement or the panel key operation of R3752/53.

- Example

GLIST	Outputs all lines of the program list.
GLIST 100	Outputs the 100th line only of the program list.
GLIST 100,	Outputs the program list from line 100 to the last line.
GLIST 100, 200	Outputs the program list from line 100 to line 200.
GLIST,	Outputs all lines of the program list. (Same as GLIST)
GLIST, 200	Outputs the program list from the start line to line 200.

8. GLISTN

- Outline: The GLISTN command is used to output a program list to peripheral devices such as a printer, etc. through the GPIB.
- Syntax: (1)-1



(1)-2

GLISTN [Start line [, [number of lines]]] | [, [number of lines]]

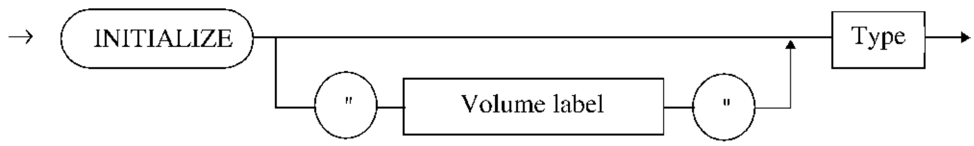
NOTE: ***A space may be used instead of a comma.***
The line number setting range is 1 through 65535.

- Description
  - The GLISTN command outputs the BASIC programs list to peripheral devices such as a printer, etc. connected with the GPIB.
  - The printer GPIB address can be define by the PRINTER statement or the panel key operation of R3752/53.
  - The GLISTN command outputs specified lines of the program list from the start line number specified at the start line.
  - When the line number is a negative value, this command outputs the program list toward the lower order numbers.
- Example

GLISTN	Outputs all lines of the program list.
GLISTN 100	Outputs the 100th line only of the program list.
GLISTN 100,	Outputs the program list from line 100 to the last line.
GLISTN 100, 20	Outputs 20 lines of the program list from line 100.
GLISTN,	Outputs all lines of the program list. (Same as GLISTN)
GLISTN, 20	Outputs 20 lines of the program list from the start line.

9. INITIALIZE (INIT)

- Outline: The INITIALIZE command is used to initialize a floppy disk.
- Syntax: (1)-1



(1)-2

INITIALIZE ["Volume label"] type

- Description
  - The INITIALIZE command initializes a new floppy disk or the floppy disk to be copied with the format specified by the floppy type setting.
  - The volume label can be specified at the initialization.
    If omitted, there is no volume label
  - Specify the types of floppy disks as follows:

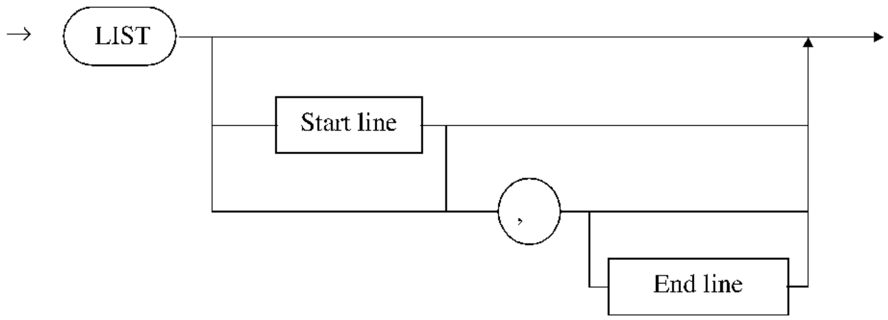
    Floppy type: 0; 720 KB (512 bytes, 9 sectors) 2DD
    1; 1.2 MB (1024 bytes, 8 sectors) 2HD
    2; 1.4 MB (512 bytes, 18 sectors) 2HD
    3; 1.2 MB (512 bytes, 15 sectors) 2HD

CAUTION: ***The analyzer automatically discriminates between 2DD and 2HD disks. If the different type (floppy disk) is inserted in the floppy disk drive, make sure to initialize it with the following default setting:***
Default setting: 720 KB for 2DD (type 0)
1.2 MB for 2HD (type 1)

NOTE: ***For the information how to handle files, refer to "2.4 File Management".***

10. LIST

- Outline — The LIST command is used to display a program list on the display.
- Syntax — (1)-1



(1)-2

LIST [Start line [, [end line]]] | [, [end line]]

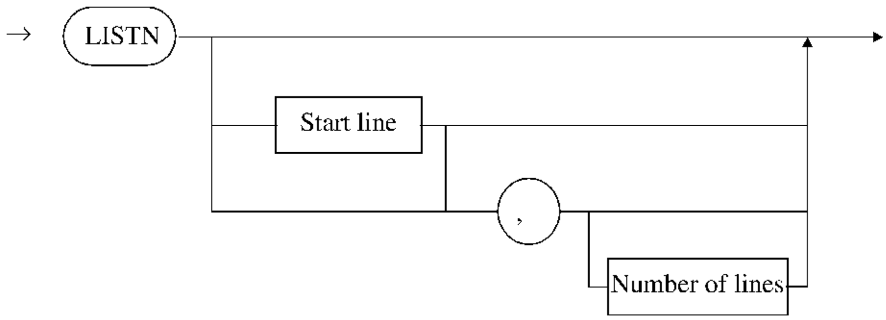
NOTE: ***A space may be used instead of a comma.***
The line number setting range is 1 through 65535.

- Description
  - The LIST command displays the BASIC program list specified by the parameters on the display.
  - The display of the program list can be aborted using the STOP key. However, since the stop operation differs from the program operation, the program list cannot be re-displayed from the aborted line.
- Example

LIST	Outputs all lines of the program list.
LIST 100	Outputs the 100th line only of the program list.
LIST 100,	Outputs the program list from line 100 to the end line.
LIST 100, 200	Outputs the program list from line 100 to line 200.
LIST,	Outputs all lines of the program list. (Same as LIST)
LIST, 200	Outputs the program list from the start line to line 200.

11. LISTN

- Outline — The LISTN command is used to display a program list on the display.
- Syntax — (1)-1



(1)-2

LISTN [Start line [, [number of lines]]] | [, [number of lines]]

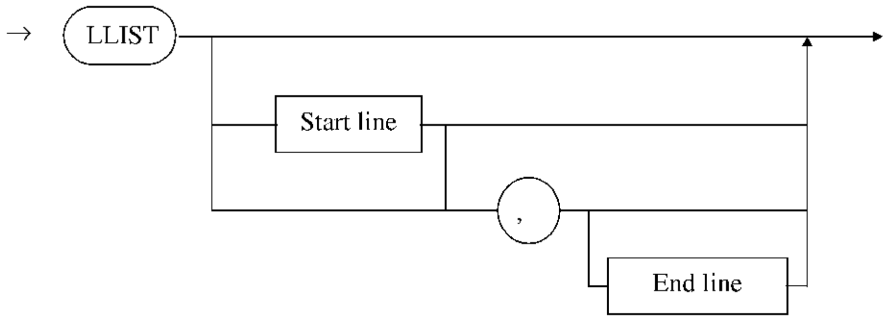
NOTE: A space may be used instead of a comma.
The line number setting range is 1 through 65535.

- Description — The LISTN command displays the BASIC program list specified by the parameters on the display.
- Example

LISTN	Outputs all lines of the program list.
LISTN 100	Outputs the 100th line only of the program list.
LISTN 100,	Outputs the program list from line 100 to the end line.
LISTN 100, 20	Outputs 20 lines of the program list from line 100.
LISTN,	Outputs all lines of the program list. (Same as LISTN)
LISTN, 20	Outputs 20 lines of the program list from the start line.

12. LLIST

- Outline — The LLISTN command is used to output a program list to peripheral devices such as a printer, etc. through the serial port.
- Syntax — (1)-1



(1)-2

LLIST [Start line [, [end line]]] | [, [end line]]

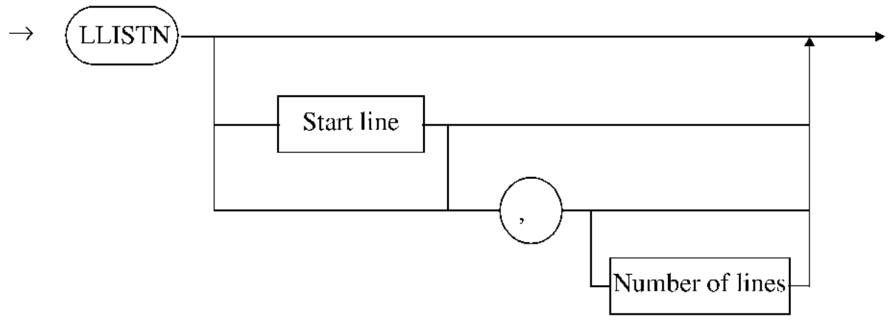
NOTE: ***A space may be used instead of a comma.***
The line number setting range is 1 through 65535.

- Description — The LLIST command outputs the BASIC program list to peripheral devices such as a printer, etc. connected with the serial port.
- Example

LLIST	Outputs all lines of the program list.
LLIST 100	Outputs the 100th line only of the program list.
LLIST 100,	Outputs the program list from line 100 to the end line.
LLIST 100, 200	Outputs the program list from line 100 to line 200.
LLIST,	Outputs all lines of the program list. (Same as LLIST)
LLIST, 20	Outputs the program list from the start line to line 200.

13. LLISTN

- Outline: The LLISTN command is used to output a program list to peripheral devices such as a printer, etc through the serial port.
- Syntax: (1)-1



(1)-2

LLISTN [Start line [, [number of lines]]] | [, [number of lines]]

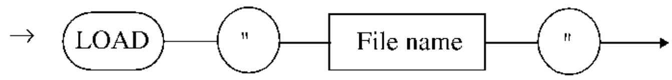
NOTE: The line number setting range is 1 through 65535.

- Description:
  - The LLISTN command outputs the BASIC program list to peripheral device such as a printer, etc. connected with the serial port.
  - The LLISTN command outputs specified lines of the program list from the start line number specified at the start line.
  - When the line number is a negative value, this command outputs the program list toward the lower order line numbers.
- Example:

LLISTN	Outputs all lines of the program list.
LLISTN 100	Outputs the 100th line only of the program list.
LLISTN 100,	Outputs the program list from line 100 to the end line.
LLISTN 100, 20	Outputs 20 lines of the program list from line 100.
LLISTN,	Outputs all lines of the program list. (Same as LLISTN)
LLISTN, 20	Outputs 20 lines of the program list from the start line.

14. LOAD

- Outline — The LOAD command is used to load the file stored in a drive.
- Syntax — (1)-1



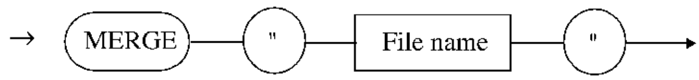
(1)-2
LOAD "file name"

- Description — The LOAD command loads the file specified. Only BASIC files can be loaded (except for another files such as system files).

NOTE: For the information how to handle files, refer to "2.4 File Management".

15. MERGE

- Outline — The MERGE command is used to load the file stored in a drive.
- Syntax — (1)-1



(1)-2
MERGE "file name"

- Description
  - The MERGE command differs from the LOAD command, since the BASIC buffer is not initialized before loading.
  - The program already existed in the BASIC buffer cannot be deleted unless the same line number exists in the program newly loaded.
  - The combination of the SCRATCH and MERGE commands represents the same function as the LOAD command.

NOTE: For the information how to handle files, refer to "2.4 File Management".

16. PAUSE

- Outline: The PAUSE command is used to pause (suspend) a program operation.
- Syntax: (1)-1

(1)-2
PAUSE

- Description:
  - The PAUSE command suspends the BASIC program temporally, or the BASIC program itself stops the program temporally.
  - The program is restarted again at the next line of the suspended line by the CONT command.
- Example:

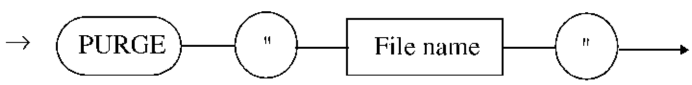
```
10  FOR I=1 TO 9
20      GOTO 60
30      GOTO *PRT
40  NEXT
50  PAUSE
60  !
70  X = I * I
80  GOTO 30
90  *PRT
100 PRINT I; "*" ;I; "=" ;X
110 GOTO 40
```

17. PRINTER

Refer to "44.PRINTER" in section 4.3.

18. PURGE

- Outline: The PURGE command is used to purge the file stored in a drive.
- Syntax: (1)-1



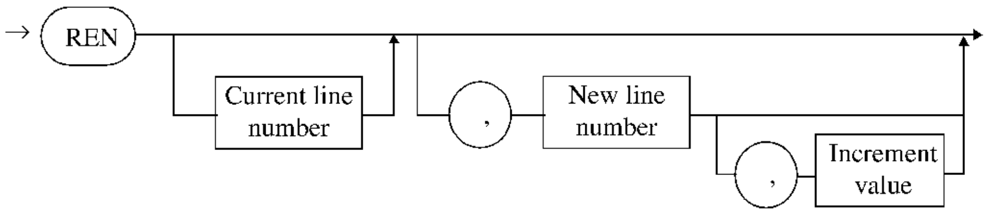
(1)-2
PURGE "file name"

- Description: The PURGE command purges unnecessary file in the existed files.

NOTE: For the information how to handle files, refer to "2.4 File Management".

19. REN

- Outline — The REN command is used to renew the line numbers of program.
- Syntax — (1)-1



(1)-2

REN [[Current line number] [, New line number [, Increment value]]]

NOTE: ***A space may be used instead of a comma.***
The setting range of the current line number, the new line number and the increment value is 1 through 65535.

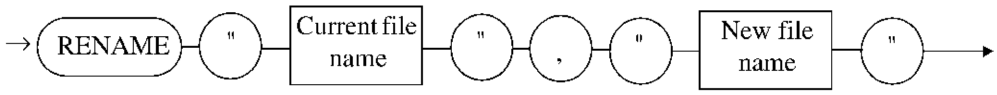
- Description
    - The current line number specifies the head of the line number to be renewed in the current program.
    - The new line number specifies the start of the renewed line number.
    - The increment value specifies the step of the renewed line number.
    - The REN command renews the line number used in the GOTO and GOSUB statements corresponding to the new line number.
    - The REN command cannot be used to specify the line number exceeds 65535. Do not specify the program line with changing/modifying the order.
- Example

REN: Renews the start line to 10, and changes the line number by 10 steps till the end line.

REN 30, 50, 3: Renews the line number 30 to 50, and changes the line number by 3 steps till the end line.

20. RENAME

- Outline — The RENAME command is used to rename the file name stored on a drive.
- Syntax — (1)-1



(1)-2

RENAME "Current file name", "New file name"

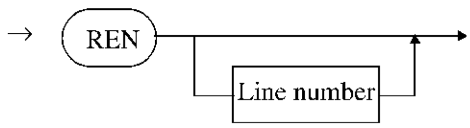
- Description
  - The RENAME command renames only the file name stored without changing its contents.
  - If the same file exists in a floppy which has already been created, then no operation will be performed.

NOTE: For the information how to handle files, refer to "2.4 File Management".

---

21. RUN

- Outline — The RUN command is used to execute the BASIC program.
- Syntax — (1)-1



(1)-2

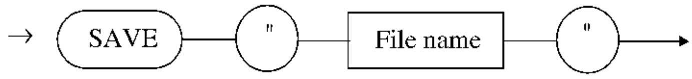
RUN [line number]

- Description
  - The RUN command executes the BASIC program from the specified line.
  - If no line number is specified, the program will be executed from the start line.
  - When the RUN command is executed, all the variables are cleared and also the array declarations are forcibly cleared before program execution.
- Example

```
RUN
RUN 200
```

22. SAVE

- Outline — The SAVE command is used to save (store) files onto a drive.
- Syntax — (1)-1



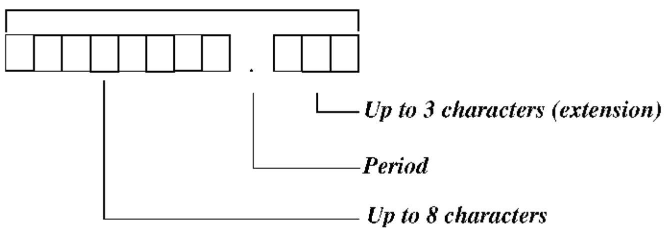
(1)-2

SAVE "file name"

- Description
  - The SAVE command stores the program (stored in the memory) into the file specified in the statement.
  - If the already existed file name is specified, the specified file is assumed to update, then the file is overwritten.

CAUTION: ***The file name uses numerics, alphabets and symbols (except for double quotations), and specify the file name as follows:***

File name

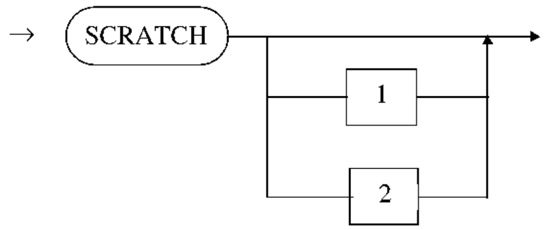


NOTE: ***For the information how to handle files, refer to "2.4 File Management".***

---

23. SCRATCH

- Outline — The SCRATCH command is used to scratch (erase) the BASIC program stored in the memory.
- Syntax — (1)-1



(1)-2

SCRATCH [1 | 2]

- Example

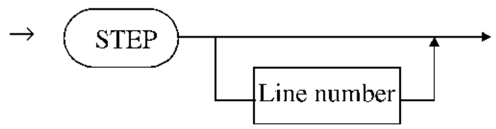
SCRATCH: Erases all the programs stored in the BASIC buffer.

SCRATCH 1: Initializes the program data only stored in the BASIC buffer.

SCRATCH 2: Initializes the program procedure only stored in the BASIC buffer.

24. STEP

- Outline — The STEP command is used to execute the only one line of the BASIC program.
- Syntax — (1)-1



(1)-2

STEP [line number]

- Description
  - The STEP command executes the only one line of the BASIC program, however, no operation will be performed in the FOR statement.
  - If the line number is omitted, the next line of currently suspended line is performed.
- Example

STEP
STEP 100

25. STOP

- Outline — The STOP command is used to stop the BASIC program.
- Syntax — (1)-1

(1)-2

STOP

- Description — The STOP command stops the BASIC program execution or the BASIC program itself stops the program execution.

4. BASIC STATEMENT

4.1 Programming Rules

4.1.1 Program Structure

1. Statement

   The BASIC program consists of various statements.
   The statements are grouped into two types; control statement and executable statement (command).
   Each statement consists of key words and expressions. The decision of the construction is the syntax rule for grammar.

   - Statement
     - Control statement
       - Declaration statement
       - Loop/branch statement
       - Instruction interrupt processing instruction
     - Executable statement
       - Program execution control command
       - Program editing command
       - I/O command
       - File control command
       - GPIB related command

2. Key word

   The term whose meaning and application are predetermined with BASIC is called a "key word". The same name as the key word cannot be used for any other purpose.
   The key word that is frequently used and whose full name is long has a short name.
   To change the appearance from the full name to the short name, CONTROL command should be used to set the control register 3 should be set to "0".
   For information of key word list, refer to Table 4-1.
   The relationship between the full and short names is shown in Table 4-2.

Table 4-1 Key Word List

AND	APPEND	AS	ASCII	BAND	BASIC
BINARY	BNOT	BOR	BREAK	BUZZER	BXOR
CASE	CAT	CHKDSK	CIRCLE	CLEAR	CLOSE
CLS	CMD	COLOR	CONSOLE	CONT	CONTINUE
CONTROL	COPY	COPYFILES	COUNT	CSR	CURSOR
DATA	DEL	DELAY	DELIMITER	DIM	DISABLE
DSTAT	DUMP	ELSE	ENABLE	END	ENT
ENTER	ENTERF	ERROR	EVENT	FOR	FORMAT
GLIST	GLISTN	GOSUB	GOTO	GPRINT	IF
INIT	INITIALIZE	INP	INPUT	INTEGER	INTERFACE
INTR	ISRQ	KEY	LABEL	LINE	LINETYPE
LIST	LISTEN	LISTN	LLIST	LLISTN	LOCAL
LOCKOUT	LPRINT	LOAD	MERGE	MOVE	NEXT
NEWVERSION	NOT	OFF	ON	OPEN	OR
OUTPUT	OUT	OUTPUTF	PAUSE	PEEK	POKE
PRINT	PRINTER	PRF	PRINTF	READ	RECTANGLE
RESTORE	PURGE	RENAME	REM	REMOTE	REN
REQUEST	RETURN	RUN	SAVE	SCRATCH	SELECT
SEND	SPRINTF	SRQ	STEP	STOP	SYSTEM
TALK	TEXT	THEN	TIME	TO	TRIGGER
UNL	UNT	UNTIL	USE	USING	VIEWPORT
WAIT	XOR				

Note: A capital letter is used for keyword.

Table 4-2 Correspondence Table between Full Name and Short Name

Full Name	Short Name
CURSOR	CSR
ENTER	ENT
INITIALIZE	INIT
INPUT	INP
OUTPUT	OUT
PRINTF	PRF
USING	USE
PRINT	?

3. Expression

   The expression consists of the object and operator and can be placed anywhere it can be grammatically specified to. (However, since the condition expression of 1F statement interpret the symbol "-" as equal sign because of the compatibility with the conventional BASIC, the assignment expression cannot be written.)

   There are four kinds of expressions, depending on which kinds of data type is used for the final value as a result of computation.

   <arithmetic expression> <character string expression><logical expression> <label>

Arithmetic expression:	Results in an integer value or real value,
logical expression:	Is determined by the syntax regardless of whether the expression includes the logical operator within itself and estimates the final value as logical value, i.e., "0" is false and "1" is true.

4.1.2 Object

The item to be processed by BASIC is called "object". The object may be a constant, variable, and function and each object type consists of:

- Object
  - constant
    - integer number constant
    - real number constant
    - character string constant
    - Label
  - variable
    - scalar variable
      - integer number variable
      - real number variable
      - character string variable
    - system variable
      - current line variable
      - built-in variable
    - array
      - integer number
      - real number
  - function

1. Constant

   - Integer number constant

     The constant which has no decimal point within a program is considered as an integer number. Since the constant is represented using four bytes inside, it can range from -2,147,483,648 to +2,147,483,647.

- Real number constant

  The constant which has a decimal point or is represented using a floating decimal point such as 1E+20 is considered as a real number. Since the constant is represented using eight bytes (1EEE) inside, it can range from approx. -1E+308 to approx. 1E+308 and has an accuracy of 15 digits.

- Character string constant

  To represent a character string, it must be enclosed with double quotation marks ("). It is possible to specify any character string between the empty string "" and a maximum of 128 character string. The unit of the included character is 8 bits and it is possible to represent up to 256 kinds of character units of 0 to 255. ASCII codes are used as character codes, which register special symbols to codes from 128 to 255.

  For the program to represent the codes which are not assigned to the keyboard or to enter the INPUT statement, the form field (\f) method is prepared using "\". Similarly, "\" can be written to include the double quotation mark " into the character string.

  To represent the ASCII control characters, escape sequences are prepared, as follows:

Table 4-3 Escape sequences

Escape sequences	Meanings	total number	Decimal number
\b	Back space	010	8
\t	Horizontal TAB	011	9
\n	Line field (new line)	012	10
\v	Vertical TAB	013	11
\f	Form field (clear screen)	014	12
\r	Carriage return	015	13

- Label constant

  Is used instead of the statement number. For declaration, an asterisk "*" should be added to the beginning of the program.

  The label constant uses the same characters as the variable. However, since it is not a variable, any character cannot be substituted. In addition, the syntax rule limits the position at which the table can be written. The positions are the table line number part described in "4.3 Statement Grammar and Application" and the part where "jump to" is written.

2. Variable

The name of variable consists of up to 20 alphanumeric characters, starting with an alphabetic character.

If the last character of the variable name is $:	Character string variable
If the last character is (integer):	Array type variable If INTEGER statement does not declare the variable type, the variable is used as a real number type.

Table 4-4 Alphanumeric Characters

1,2,3,4,5,6,7,8,9,0
a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z
A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P,Q,R,S,T,U,V,W,X,Y,Z
-

Example: Variable types

value, v123:	Real number variable
string$, s123$:	Character string variable
array(3):	Array type real number variable
INTEGER code:	Integer variable
INTEGER week(7):	Array type integer number variable

- Scalar variable
  - Integer number variable
  - Real number variable
  - Character string variable

  As long as the variable is not initialize, "0" is assigned to the numeric type variable. Therefore, if the variable is to be initialized to a specific value, it is necessary to specifically substitute a value in the program.

  The value which can be stored each data type has the same amplitude as for the constant. The character string variable does not have the array. The character string has the length attribute similarly to the character string constant. To declare the length, DIM statement should be used.

  DIM string$[100]

  If the reference is made without the declaration, the variable is considered as 18 character string. A part of the character string can be handled using the sub-string operator ([ ]).

  Refer to "(7) Sub-string operator" in section 4.1.3.

```
string$ = "ADVANTEST CORPORATION"
PRINT string$[1,14] ; "."
```

Result

```
ADVANTEST CORP.
```

- System variable
  - Current line variable @

    Stores the line number of the program which is currently performed. Any value cannot be substituted.

    LIST @: Displays the line currently performed.
  - Built-in variable

    Is the variable which is automatically registered when the BASIC starts. The variable is initialized to a specific value and can be changed by substituting a specific value. To return it to the value when the BASIC starts, substitute that value specifically or initialize the BASIC with SCRATCH 1,SCRATCH.

    PI: 3.14159.....

    EXP: 2.71828.....

- Array

  For declaration of the array, use DIM, INTEGER statement.
  - Numeric value type array

    If the reference is made without any declaration, the amplitude of that array (number of elements) is 10 as shown in the declaration below. The attached character is always assigned starting at 1.

    DIM array(10)
    INTEGER array(10)

    Real number type array DIM real(20)

    Integer number type array INTEGER int(30, 40)
- File descriptor

  The BASIC reads and writes files by using the file descriptor. Declaration is not necessary, but OPEN connects to the real file name. After OPENed, specify the file descriptor by using ENTER or OUTPUT to refer to the file. Since the file descriptor is a special variable, it cannot perform operations or print like other variables can.

3. Functions

   All the functions are built-in type and grouped into the integer number type, real number type, and character string type, depending on its return value. In addition, since the function call can be written in an operation expression, it can be handled similarly to the variable.

```
string$ = "ADVANTEST"
PRINT string$
A = NUM("A")
a = NUM("a")
FOR idx = 1 TO LEN(string$);
      b = NUM(string$[idx;1]) - A + a
       string$[idx;1]=CHR$(b)
NEXT idx
PRINT STRING$
```

Result

```
ADVANTEST
advantest
```

- Built-in functions

Functions	Descriptions
SIN (Arithmetic expression) COS (Arithmetic expression) TAN (Arithmetic expression) ATN (Arithmetic expression)	Sine (sin) Cosine (cos) Tangent (tan) Reverse tangent ($\tan^{-1}$) Unit of angle = radian
LOG (Arithmetic expression)	Natural logarithm
SQR (Arithmetic expression)	Square root
ABS (Arithmetic expression)	Absolute value
NUM (Character string expression)	Returns ASCII code for the first one character of the character string expression. Example: NUM ("A")---> 65
CHR$ (Arithmetic expression)	Returns the character string of the ASCII code one character corresponding to the value of the arithmetic expression. Example: CHR$ (65)---> "A"
LEN (Character string expression)	Returns the length of the character string expression. Example: LEN ("ADVANTEST")---> 9
POS (Arithmetic expression 1, Arithmetic expression 2)	Returns the digit of the head character of the character string corresponding to the character string expression 2 in the character string expression 1. Example: POS ("ADVANTEST", "AN")---> 4
Built-in functions	Functions to handle the measurement value For details, refer to "4.4 Built-in Function".

4.1.3 Operators

Operator are used to operate the object operand. An expression is coded by combining operators and objects.

Operators
- Assignment operators
- Unary arithmetic operators
- Dyadic arithmetic operators
- Logic operators
- Bit processing operators
- Relational operators
- Sub-string operators

1. Assignment operators

   The key word existed in the standard BASIC, which is called "LET" is not provided for the assignment operator. Assignment expression contains has its values and and makes up an expression.

```
PRINT a=1                 ---> 1.0
PRINT a$="ADVANTEST"  ---> "ADVANTEST"
PRINT (a=1)+a             ---> 2.0
```

   The assignment operators are shown below:

   =: Normal assignment

   In the assignment for character-string variables, transmits the only effective value of right part.

   Example:
```
DIM string$ [20]
PRINT LEN (string$ = "12345")
Result
  5
```

   =: Converts the value depending on the data type of left part, then assigns it to variable.

   Example:
```
string$ = 123.456--->"123.456"
numeric = "123"--->123
integer = 123.456--->123
```

```
+=:  a += 10    ---> a = a + 10
-=:  a -= 10    ---> a = a - 10
*=:  a *= 10    ---> a = a * 10
/=:  a /= 10    ---> a = a / 10
%=:  a %= 10    ---> a = a % 10
```

   =<: Assigns the character strings left-justify to variables.

   =>: Assigns the character strings right-justify to variables.

2. Unary arithmetic operators

   -: Minus sign

   +: Plus sign

++: Front/Back Increment
  Front b = ++a ... Adds 1 to a, then assigns ++a to b.
  Back b = a++ ... Assigns a++ to b, then adds 1 to a.
--: Front/Back Decrement
  Front b = --a ..... Subtracts 1 from a, then assigns --a to b.
  Back b = a-- ..... Assigns a-- to b, then subtracts 1 from a.

Example: a = 10: PRINT a++: PRINT a: PRINT --a: PRINT --a: print a

```
Result
10.0
11.0
10.0
9.0
9.0
```

3. Dyadic arithmetic operators
   +: Addition
   -: Subtraction
   *: Multiplication
   /: Division
   %: Modulo calculation (remainder)
   ^: Involution
   &: Coupling characters

4. Logic operators
   NOT
   AND
   OR
   XOR

5. Bit processing operators
   In numeric expressions, only the integer type is available. Real type may result in an error.
   BNOT
   BAND
   BOR
   BXOR

6. Relational operators

   The following operators are provided, and the result of applying these operators is a boolean value, either TRUE or FALSE. At this case, TRUE is 1, and FALSE is 0. When the relational operation is resulted based on the BASIC syntax, if the value calculated finally resulted in 0, the result is determined as FALSE. All the values other than calculated values become TRUE.

   =: Equal

   <>: Not equal (or !=)

   <

   >

   <=

   >=

   Since the relational operations always perform the arithmetic operation according to the IF statement condition, the operator "=" is determined unconditionally as relational operator. Therefore, the assignment expression cannot be included in the IF statement conditional expression.

7. Sub-string operators

   Enables to specify the character-string expression in part as character string.

   Character-string expression [arithmetic expression 1, arithmetic expression 2]:

   The sub-string operator is considered (defined) as from.

   "ADVANTEST" [1,5] ---> "ADVAN"

   Character-string expression [arithmetic expression 1, arithmetic expression 2]:

   The sub-string operator is considered (defined) as from.

   "ADVANTEST" [6;4] ---> "TEST"

4.2 Various Statements

4.2.1 Statement Function List

1. Basic (fundamental) statement

(1 of 2)

Statement	Function
BUZZER	Sounds the buzzer.
CLS	Clears the screen.
CONSOLE	Specifies the scroll area.
CURSOR	Moves the cursor.
DATA	Defines the numeric value or character string to be read out by READ statement.
DATE$	Reads out the date of timer (RTC) built into the analyzer.
DIM	Defines the array variable or character-string variable.
DISABLE INTR	Disables the acceptance of the interruption.
ENABLE INTR	Enables the acceptance of the interruption.
ERRM$	Returns the error message.
ERRN	Returns the error number.
FOR-TO-STEP, NEXT, BREAK, CONTINUE	Executes the loop processing.
FRE	Returns the BASIC program buffer remaining capacity.
GOSUB,RETURN	Branches or returns to the subroutine.
GOTO	Branches to the specified line.
GPRINT	Outputs to the numeric value or character string to the GPIB.
IF-THEN, ELSE, END IF	Conditional branch
INPUT	Inputs from the panel key.
INTEGER	Defines the variable as an integer type.
KEY$	Returns the panel key code of the analyzer.
LPRINT	Outputs the numeric value or character string to the serial port.
LET	Substitutes the expression for variable.
OFF ERROR	Cancels the branch when detecting the BASIC error.
OFF ISRQ	Cancels the interruption branch by ISRQ.
OFF KEY	Cancels the interruption branch by key input.
OFF SRQ	Cancels the interruption branch by SRQ.
ON DELAY	Branches after the specified time elapses.
ON ERROR	Defines the branch when detecting the BASIC error.
ON ISRQ	Defines the interruption branch by the internal request.
ON KEY	Defines the interruption branch by key input.
ON SRQ	Defines the interruption branch by externally GPIB SRQ.
PRINT [USING]	Displays the numeric value or character string.
PRINTER	Sets the printer GPIB address.

(2 of 2)

Statement	Function
PRINTF	Displays the numeric value or character string.
READ	Assigns the constant of DATA statement to the variable.
REM	Annotation
RESTORE	Specifies the data line to be read in next READ statement.
SELECT, CASE, END SELECT	Executes the multi branches with condition of expression value.
SPRINTF	Assigns the result according to PRINTF format to the character string.
TIME$	Returns the value of timer (RTC) built into the analyzer.
TIMER	Reads out and resets the value of the built-in system timer.
WAIT	Waits for the specified time.
WAIT EVENT	Waits for the occurrence of the specified event.

2. GPIB control statement

Statement	Function
CLEAR	Clears the device.
DELIMITER	Specifies the block delimiter.
ENTER	Inputs from the GPIB.
INTERFACE CLEAR	Clears the GPIB interface.
LOCAL	Cancels the remote control.
LOCAL LOCKOUT	Local lockout
OUTPUT	Outputs to the GPIB.
REMOTE	Remote control
REQUEST	Sets the status byte.
SEND	Outputs (sends) the command, data, and others to the GPIB.
SPOLL	Reads out the status byte.
TRIGGER	Outputs the group-execute trigger.

3. File control statement

Statement	Function
CLOSE	Closes the file.
DSTAT	Obtains the directory contents of floppy disk for the BASIC variable.
ENTER [USING]	Reads out the data from the file.
OFF END	Cancels the processing specified by ON END statement.
ON END	Defines the processing at the end of file.
OPEN	Opens the file.
OUTPUT [USING]	Outputs (writes) the data to the file.

4.2.2 Statement Syntax List

1. Basic statement

(1 of 2)

Statement	Syntax
BUZZER	BUZZER <tone><time>
CLS	CLS
CONSOLE	CONSOLE <start line><end line>
CURSOR	CURSOR <X axis><Y axis>
DATA	DATA numeric constant | character-string constant {, numeric constant | character-string constant}
DATE$	(1) DATE$ (2) DATE$ = "YY/MM/DD"
DIM	DIM <B> | <C> {, <B> | <C>}
DISABLE INTR	DISABLE INTR
ENABLE INTR	ENABLE INTR
ERRM$	ERRM$ (error number)
ERRN	ERRN
FOR-TO-STEP, NEXT, BREAK, CONTINUE	FOR numeric variable = numeric expression TO numeric expression [STEP numeric expression] [BREAK] [CONTINUE] NEXT [numeric variable]
FRE	FRE (numeric)
GOSUB,RETURN	GOSUB integer | label expression RETURN
GOTO	GOTO integer | label expression
GPRINT	GPRINT [A {, | ;A}]
IF-THEN, ELSE, END IF	(1) IF<conditional expression> THEN <statement> (2) IF<conditional expression> THEN [ELSE IF <conditional expression> THEN] [multi statements] [ELSE] [multi statements] END IF
INPUT	INPUT ["<character-string>",] A {, A}
INTEGER	INTEGER <B> {, <B>}
KEY$	KEY$
LPRINT	LPRINT [A {, | ;A}]
LET	LET <D> | <E> {:<D> | <E>}
OFF ERROR	OFF ERROR
OFF ISRQ	OFF ISRQ
OFF KEY	OFF KEY [key code]

(2 of 2)

<table>
<tr><th>Statement</th><th>Syntax</th></tr>
<tr><td>OFF SRQ</td><td>OFF SRQ</td></tr>
<tr><td>ON DELAY</td><td>ON DELAY time GOTO | GOSUB integer | label expression</td></tr>
<tr><td>ON ERROR</td><td>ON ERROR GOTO | GOSUB integer | label expression</td></tr>
<tr><td>ON ISRQ</td><td>ON ISRQ GOTO | GOSUB integer | label expression</td></tr>
<tr><td>ON KEY</td><td>ON KEY key code GOTO | GOSUB integer | label expression</td></tr>
<tr><td>ON SRQ</td><td>ON SRQ GOTO | GOSUB integer | label expression</td></tr>
<tr><td>PRINT [USING]</td><td>(1) PRINT [A {, | ;A}]
(2) PRINT USING format setup expression ; {, A}</td></tr>
<tr><td>PRINTER</td><td>PRINTER numeric expression</td></tr>
<tr><td>PRINTF</td><td>PRINTF format expression {, A}</td></tr>
<tr><td>READ</td><td>READ input item {, input item}</td></tr>
<tr><td>REM</td><td>REM [character string] or ![character string]</td></tr>
<tr><td>RESTORE</td><td>RESTORE integer | label expression</td></tr>
<tr><td>SELECT, CASE, END SELECT</td><td>SELECT <numeric expression | character-string expression>
CASE <numeric expression | character-string expression>
multi statements
[CASE ELSE]
[multi statements]
END SELECT</td></tr>
<tr><td>SPRINTF</td><td>SPRINTF character-string variable format specification {, A}</td></tr>
<tr><td>TIME$</td><td>TIMER (0 | 1)</td></tr>
<tr><td>TIMER</td><td>(1) TIME$
(2) TIME$ = "HH:MM:SS"</td></tr>
<tr><td>WAIT</td><td>WAIT time</td></tr>
<tr><td>WAIT EVENT</td><td>WAIT EVENT <event number></td></tr>
</table>

A: numeric expression | character-string expression
B: numeric variable name [(numeric expression {, numeric expression})]
C: character-string variable [numeric expression]
D: numeric variable = Numeric expression
E: character-string variable = | =< | =>character-string expression

- In PRINT USING format specification, specify the following image specifications by using a comma among images.

  image specifications

  D: Specifies the output digits with No. of D. A space is used to fill up the remaining blank in the specified field.

  Z: Specifies the output digits with No. of Z. A zero is used to fill up the remaining blank in the specified field.

  K: Displays the expression as it is.

  S: Displays the PRINT USING format with a + or - sign flag at the position of S.

  M: Displays the PRINT USING format with a - for negative and a space for positive at the position of M.

  .: Displays the PRINT USING format to match the position "." with coming the decimal point.

  E: Displays PRINT USING format with the exponent format (e, sign, exponent).

  H: Same as K. However, use a comma for a decimal point.

  R: Same as ".". However, use a comma for a decimal point.

  *: Specifies the output digits with the number of *. A space is used to fill up the remaining blank in the specified field.

  A: Displays one character.

  k: Displays the character-string expression as it is.

  X: Displays the character of one space.

  Literal: Encloses a literal with \" when writing it to the format expression.

  B: Displays the expression result using an ASCII code.

  @: Form lead

  +: Moves the display position to the top of the same line.

  -: Line feed

  #: Does not line feed.

  n: Specifies the number of repetition of each image by using numerics.

- In PRINTF format specification, specify the parameter immediately followed after % by using the following image.

  %[-] [0] [m] [. n] character

  -: Justifies the character with no space from left (if no specification, then from right).

  0: Sets the character, which is justified for the remaining blank in the specified field, to be 0.

  m: Reserves the field for the character "m".

  .n: Outputs the PRINT USING format with n-digit accuracy. In character string, this setup value is used for an actual character-string length.

  Character: d; decimal with sign s; character string

  o; octal e; floating-point expression (exponent format)

  x; hexadecimal f; floating-point expression

2. GPIB statement

Statement	Syntax
CLEAR	CLEAR [device address {, device address}]
DELIMITER	DELIMITER numeric expression
ENTER	ENTER device address ; B {, B}
INTERFACE CLEAR	INTERFACE CLEAR
LOCAL	LOCAL [device address {, device address}]
LOCAL LOCKOUT	LOCAL LOCKOUT
OUTPUT	OUTPUT device address {, device address} ;A {, A}
REMOTE	REMOTE [device address {, device address}]
REQUEST	REQUEST integer
SEND	SEND <C> I <D> {, <C> I <D>}
SPOLL	SPOLL (Device address)
TRIGGER	TRIGGER [device address {, device address}]

A: numeric expression I character-string expression
B: numeric variable [character-string expression]
C: <CMD I DATA I LISTEN I TALK> [numeric expression {, numeric expression}]
D: UNL I UNT

3. File control statement

Statement	Syntax
CLOSE	CLOSE #FD I *
DSTAT	(1) DSTAT 0 <number of file> (2) DSTAT<index> <file name> <attribute> <size><number of sector> <year> <month> <date> <time> <minute> <start sector> (3) DSTAT ;SELECT <character string> COUNT <variable>
ENTER [USING]	(1) ENTER #FD ; input item {, input item} (2) ENTER #FD USING "image specification" ; input item {, input item} }
OFF END	OFF END #FD
ON END	ON END #FD GOTO I GOSUB integer I label expression
OPEN	OPEN "file name" FOR processing mode AS #FD [; type]
OUTPUT [USING]	(1) OUTPUT #FD ; output item {, output item} (2) OUTPUT #FD USING "image specification" ; output item {, output item} }

FD: file descriptor
Processing mode: INPUT I OUTPUT
Type: BINARY I TEXT I ASCII

- ENTER USING image specification

  image specification

  D: Interprets the numeric of D as an input digit and reads out it, then assigns it to the variable of the input item.

  Z: Same as D.

  K: Reads one line and converts it to the numeric data, then assigns it to the variable of the input item.

  S: Same as D.

  M: Same as D.

  .: Same as D.

  E: Same as K

  H: Same as K. However, use a comma for a decimal point.

  *: Same as D.

  A: Reads the number of A and assigns it to the character-string variable.

  k: Reads one line and assigns it to the character-string variable.

  X: Skips one character.

  Literal: Skips the the character-string numeric data enclosed with \".

  B: Reads one character and assigns it to the input item using an ASCII code.

  @: Skips one-byte data.

  +: Same as @.

  -: Same as @.

#:	Ignored in ENTER statement.
n:	Specifies the number of repetition of each image by using numerics.

- OUTPUT USING image specification

image specification

D:	Specifies the output digits with No. of D. A space is used to fill up the remaining blank in the specified field.
Z:	Specifies the output digits with No. of Z. A zero is used to fill up the remaining blank in the specified field.
K:	Displays the expression as it is.
S:	Displays the OUTPUT USING with a + or - sign flag at the position of S.
M:	Displays the OUTPUT USING with a - for negative and a space for positive at the position of M.
.:	Displays the OUTPUT USING to match the position "." with coming the decimal point.
E:	Displays OUTPUT USING with the exponent format (e, sign, exponent).
H:	Same as K. However, use a comma for a decimal point.
R:	Same as ".". However, use a comma for a decimal point.
*:	Specifies the output digit with the number of *. A space is used to fill up the remaining blank in the specified field.
A:	Displays one character.
k:	Displays the character-string expression as it is.
X:	Displays the character of one space.
Literal:	Encloses the literal with \" when writing it in the format expression.
B:	Displays the expression result using an ASCII code.
@:	Outputs the form lead.
+:	Outputs the carriage return.
-:	Outputs the line feed.
#:	Does not hang the line feed immediately followed after the last item.
n:	Specifies the number of repetition of each image by using numerics.

4.3 Statement Syntax and Use

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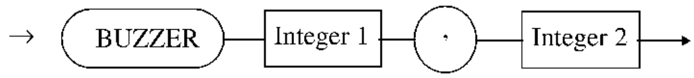
1. BUZZER
   - Outline: The BUZZER statement is used to sound alarm.
   - Syntax: (1)-1



(1)-2
BUZZER integer 1, integer 2

NOTE: ***An integer 1 is used to specify the tone at the range of 0 (high tone) to 65535 (low tone).***
An integer 2 is used to specify the duration (unit: ms)

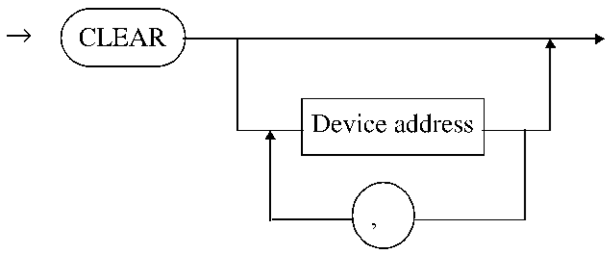
   - Description: The BUZZER statement sounds the buzzer built into the analyzer in accordance with the specified range
   - Example:

```
10  FOR I=0 TO 255
20      BUZZER I, 10
30  NEXT I
40  STOP
```

2. CLEAR

• Outline — The CLEAR statement is used to set the all devices connected to a GPIB or the selected particular devices to an initial state. In other word, this statement clears the all setup values for devices.

• Syntax — (1)-1



(1)-2

CLEAR [device address {, device address}]

• Description
  • If only the CLEAR statement is performed without specifying the device address, the universal Device Clear (DCL) command will be sent. By the DCL command, all the devices, which is connected to a GPIB, could be set to the initial state.
  • When the device address is specified followed after the CLEAR statement, only the devices which are specified by the device address are addressed, then the Select Device Clear (SDC) command is sent. By the SDC command, only the particular devices is set to the initial state. Multiple unit-address can be specified.
  • The initial state that is defined for each unit in the CLEAR statement depends on each unit.

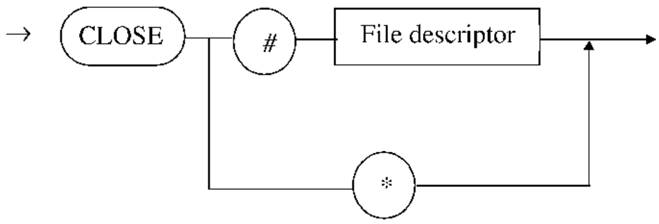
• Example

```
10 CLEAR
20 CLEAR 2
30 CLEAR 1, 3, 5, 7
```

• Note — The CLEAR statement is not available in ADDRESSABLE mode.

3. CLOSE

- Outline — The CLOSE statement is used to close files assigned to a file descriptor.
- Syntax — (1)-1



(1)-2

CLOSE <#file descriptor | *>

- Description
  - All files opened by the OPEN command must be closed before removing a floppy disk or turning off the power of devices. If not, the files may be damaged.
  - In BASIC program, when operation is suspended using the PAUSE or STOP key, files are not closed automatically. In other cases, all files are closed automatically after programming, also after termination with an error. However, if ON ERROR is set in instrument, the files will not be closed.
    By reasons above, be sure to perform the close operation certainly by using the following method (specification method for closing all files using the command) at the error termination.

    CLOSE *
  - The files are closed automatically when command such as SCRATCH or LOAD is executed.

NOTE: For the information how to handle files, refer to "2.4 File Management".

4. CLS

- Outline: The CLS statement is used to clear the display on the screen.
- Syntax: (1)-1

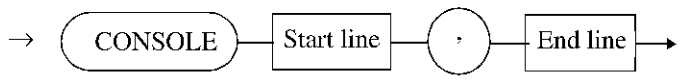
(1)-2

CLS

- Description:
  - The CLS statement clears the characters displayed on the screen and immediately returns the cursor to the original position.
  - The CLS statement clears the scroll range specified by CONSOLE.
- Example: 10 CLS

5. CONSOLE

- Outline: The CONSOLE statement is used to specify the scroll range.
- Syntax: (1)-1



(1)-2

CONSOLE start line , end line

NOTE: ***If any value below the start line is specified as the end line, the start line is assigned to the end line***

- Description:
  - The CONSOLE statement sets the scroll range of the text screen.
  - The range of start line and end line is specified as follows:
    R3752 (fluorescent character display tube); 0 to 7
    R3752 (external monitor); 0 to 29
    R3753; 0 to 29
- Example:

```
10 CONSOLE 0,5
20 PRINT "This is Network Analyzer"
30 PRINT "....Sweep Check Program...."
40 STOP
```

6. CURSOR

- Outline: The CURSOR statement is used to move the cursor to the specified coordinate position.
- Syntax: (1)-1

(1)-2

CURSOR numeric expression 1, numeric expression 2

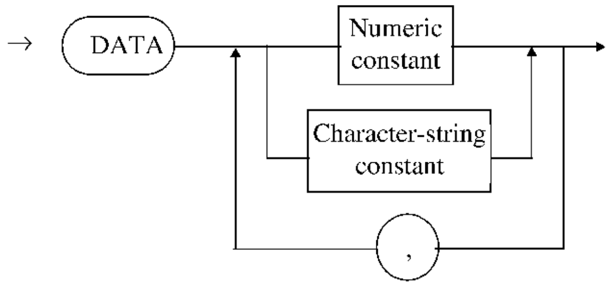
NOTE: ***Numeric expression 1:X-axis specification (column direction)***
Numeric expression 2:Y-axis specification (line direction)
A space may be used instead of a comma.

- Description
  - The CURSOR statement moves the cursor to the specified position on the screen.
  - The numeric expression 1 is used to specify X-axis coordinate, and the numeric expression 2 is used to specify Y-axis coordinate.
  - The range of X-axis coordinate and Y-axis coordinate is specified as follows:
    R3752 (fluorescent character display tube); $0 \le X \le 31$ $0 \le Y \le 7$
    R3752 (external monitor); $0 \le X \le 79$ $0 \le Y \le 29$
    R3753; $0 \le X \le 66$ $0 \le Y \le 29$
- Example

```
10  CLS
20  X=4:Y=4:X1=1:Y1=1
30  CURSOR X, Y:PRINT "";
40  X=X+X1:Y=Y+Y1
50  CURSOR X, Y:PRINT "*";
60  IF X<=0 OR 67<=X THEN X1 *=-1
70  IF Y<=0 OR 29<=Y THEN Y1 *=-1
80  GOTO 30
90  STOP
```

7. DATA

- Outline — The DATA statement is used to define the numeric and the character string to be read out by the READ statement.
- Syntax — (1)-1



(1)-2

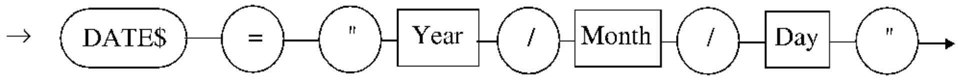
DATA <numeric constant | character-string constant> {, <numeric constant | character-string constant> }

- Description
  - Since the DATA statement does not become the object to be executed, so it can be placed in any statement number. Generally, the DATA statement is necessary based on the order read out by the READ statement.
  - The READ statement searches the DATA statement in the program and retrieves the data to be read.
  - To change this order, use the RESTORE statement.
  - In DATA statement, multiple constants can be defined, by using commas or spaces for separating the constants. The character string is enclosed with double quotation as character-string constant.
  - After the DATA statement, multi-statement separated by a colon cannot be used.
- Note — In DATA statement, the parameters (expressions) which include variables cannot be used.

8. DATE$

- Outline — The DATE$ statement is used to read out date and to change the date.
- Syntax — (1)-1

(1)-2
DATE$ = "
(2)-1



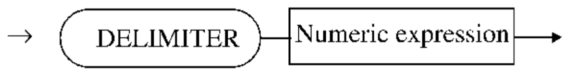
(2)-2
DATE$ = "year/month/day"

- Description
  - The DATE$ statement reads out the date of the system built-in timer (RTC).
  - The read out date can be changed.
    Input as follows:
    DATE$="93/1/1"
    or
    DATE$="93/1/01"
- Example

```
10  DIM D$[10]
20  D$=DATE$
30  PRINT "Date is ":D$
40  PRINT "Date Reset"
50  DATE$="93/1/1"
60  STOP
```

9. DELIMITER

- Outline: Used to set the delimiters for GPIB output.
- Syntax: (1)-1



(1)-2

DELIMITER numeric expression

- Description
  - The delimiters in numeric representation (used for outputting data to GPIB using the OUTPUT statement and so on) are selected.

Selection No.	Type of delimiter
0	Outputs 2-byte code of CR and LF. Also outputs single signal EOI immediately with LF.
1	Outputs 1-byte code of LF.
2	Outputs single signal EOI immediately with end of data byte.
3	Outputs 2-byte code of CR and LF.

(Note) CR: Carriage return (Hexadecimal 0D)
LF: Line feed (Hexadecimal 0A)
EOI: Single-wire message (End Or Identity)

  - If the result of numeric expression exceeds the range of 0 to 3, an error may occur.
    Numeric digits that follow after a decimal point are ignored and recognized as an integer.
  - "DELIMITER = 0" is automatically set as a default value when the power is turned on.

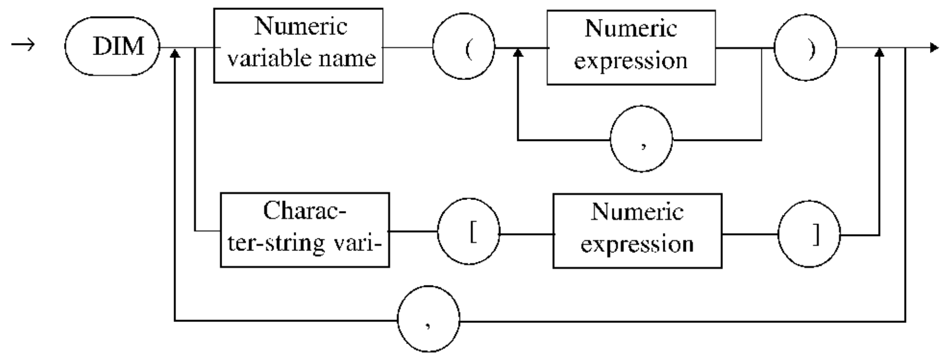
NOTE: The termination code used when outputting the data to GPIB is specified by the DELIMITER statement.
Any data entered from GPIB is always terminated with LF or EOI.

- Example

```
10  DELIMITER 0
20  DELIMITER 1
30  DELIMITER A*10
```

10. DIM

- Outline — The DIM statement is used to define the array variable or character-string variable.
- Syntax — (1)-1



(1)-2

DIM <A | B> {, <A | B>}

NOTE: ***A: numeric variable name [(numeric expression {, numeric expression})]***
B: character-string variable [numeric expression]

- Description
  - When the array variable and character-string variable are used, the array variable name and the character length of array variable must be defined by DIM statement. If the array variable is used with no definition, the array variable will become 10 prime numbers in one dimension, and the character string will be the length of 18 characters.
  - When the array declaration is performed by the DIM statement, the specified size array variable is reserved into memory. If more array declaration is performed, the remaining capacity (space) of BASIC program will be decreased and then the program may stop and will be resulted in an error (memory space full).
  - The numeric expression that indicates an array variable size recognizes the real number as an integer by omitting the digit followed after a decimal point, even if the calculation has resulted in a real expression. A zero cannot be used for an array variable.
  - Numeric expression is used to declare the length of character string for character-srting variable.
- Example

```
10  DIM N(5)            <Result>
20  FOR I = 1 TO 5        0.5
30      N(I) = I*I/2      2.0
40  NEXT I                4.5
50  FOR I = 1 TO 5        8.0
60      PRINT N(I)        12.5
70  NEXT I
```

11. DISABLE INTR

- Outline: The DISABLE INTR statement is used to prohibit the interruption reception.
- Syntax: (1)-1

→ (DISABLE INTR) →

(1)-2

DISABLE INTR

- Description:
  - The DISABLE INTR statement prohibits the interruption by ENABLE INTR statement.
  - When the interruption is permitted again after the DISABLE INTR statement performs, the ENABLE INTR statement must be performed. At this case, the branch condition set by ON XXX statement is kept as the previous condition. However, if the condition of interruption branch is changed, it can be set using ON XX or OFF XXX statement before the ENABLE INTR performs.
  - After immediately executing (running) the program, the interruption is prohibited until the ENABLE INTR is executed.
- Example:

```
10  ON KEY 1 GOTO 60
20  ENABLE INTR
30  ! LOOP
40  GOTO 30
50  !
60  DISABLE INTR
70  PRINT "KEY 1 INTERRUPT"
80  STOP
```

12. DSTAT

- Outline

The DSTAT statement is used to obtain the contents of directory for BASIC variable.

- Syntax

(1)

DSTAT <index> <variable>

(2)

DATAT <index> <fileattribute> <size> <sectors>
<year> <month> <day> <hour> <minutes> <start-sector>

(3)

DSTAT ; SELECT <string> COUNT <variable>

- Description

- Syntax of (1)
The DSTAT statement checks the number of files stored in the directory of file system. A zero is specified for 1st parameter <index>, and numeric variable for 2nd parameter. The result is assigned to the 2nd parameter.
- Syntax of (2)
The DSTAT statement obtains the directory information of file system for BASIC variable. The index of the directory is specified by 1st parameter <index>. The settable values are between 1 to the number of stored files (the number of stored file is the value obtained by syntax of (1)).
For 2nd parameter, character-string variable is specified. The file name of result is stored for the 2nd parameter.
For 3rd parameter and after, all of the parameters are specified with numeric variables. In these parameters, the following contentsare assigned:

fileattribute	File attribute (when file has multiple attributes, the parameter is output by adding each number.) 1. READ ONLY 8. VOLUME LABEL 2. HIDDEN FILE 16. DIRECTORY 4. SYSTEM FILE 32. ARCHIVE FILE
size	File size (number of byte)
sectors	Number of sector
year, month, day	Date of file created
hour, minutes	Time of file created
start-sector	Start sector of file

- Syntax of (3)
The DSTAT statement assigns the number of file specified by parameter <character string> to the parameter <variable>.
This syntax is used for searching files whether the specified file is existed in the directory or not.
? : Same as one character
* : Same as one character or more
[ ] : Same as any one character of character string enclosed with [ ].
If parameter is specified with [character 1 - character 2], then it is the same as the character between character 1 and character 2.

13. ENABLE INTR

- Outline: The ENABLE ENTER statement is used to permit the interruption reception.
- Syntax: (1)-1

→ (ENABLE INTR)→

(1)-2

ENABLE INTR

- Description:
  - The ENABLE ENTR statement permits the interruption reception, and enables the interruption branch defined by ON XXX statement.
  - If the interruption is permitted again after performing the DISABLE INTR, then the ENABLE INTER statement must be executed.
  - After immediately executing the program, the interruption cannot be performed until the ENABLE INTR statement is performed.
- Example:

```
10  ON KEY 1 GOTO 60
20  ENABLE INTR
30  ! LOOP
40  GOTO 30
50  !
60  PRINT "KEY 1"
70  GOTO 20
```

CAUTION: ***If the interruption defined by ON XXX statement occurs, then the interruption cannot be used after immediately the program branches, even if the ENABLE INTER statement is executed (same as DISABLE INTR statement). That is to prevent the Nest for the interruption processing, if the next interruption occurred during interruption.***
To enable the interruption branch continuously, the ENABLE INTR statement is required again to permit the interruption.

14. ENTER

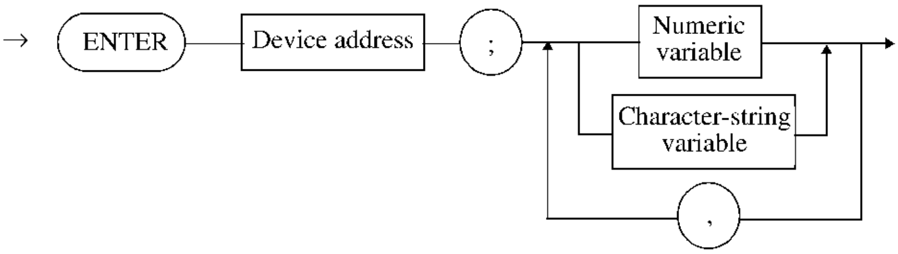
- Outline

(1) The ENTER statement obtains data from a GPIB and a parallel I/O.

(2) The ENTER statement read data from file and assigns the data to an input item.

- Syntax

(1)-1

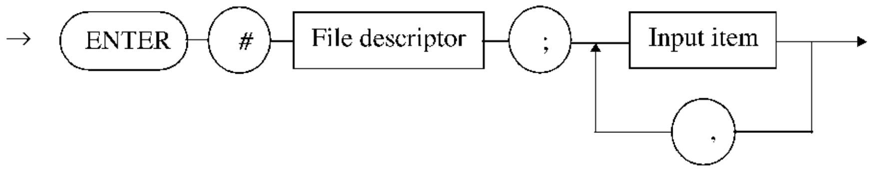


(1)-2

ENTER device address; <numeric variable | character-string variable>
{, <numeric variable | character-string variable>}

Device address:0 to 30;Device address connected to an external GPIB.
31; Data input from measurement section of the analyzer.
34; Read out of parallel port Flip/Flop condition.
35; Data read out of parallel port C.
36; Data read out of parallel port D.
37; Data read out of parallel port CD.

(2)-1



(2)-2

ENTER # file descriptor ; input item {, input item}

- Description

Syntax of (1)

- The ENTR statement inputs data from the unit specified by device address through a GPIB and stores the data into BASIC variable as numeric variable or character string. Pay attention that the controller will stop the operation without completing handshake if talker function is not provided for the unit specified by the device address.
  When character-string variable is used, it must be defined by DIM statement.
- In character staring input, pay attention that the input data will overflow and the overflowed data will be ignored, if the length of character string variable used for destination is not enough.

- Any data entered from GPIB is always terminated with LF or EOI.
  Also refer to "9. DELIMITER" in Section 4.3.

Example

```
10  ENTER 1;A
20  DIM A$(100), B$(20)
30  ENTER 2;A$
40  ENTER 3;B$
```

NOTE: When SYSTEM CONTROLLER mode is selected, the device specified by the address is set as talker and the data are obtained.

Syntax of (2)

The ENTER statement reads data as data-type format corresponding input item from the file assigned to the file descriptor, and assigns the data to the input item.

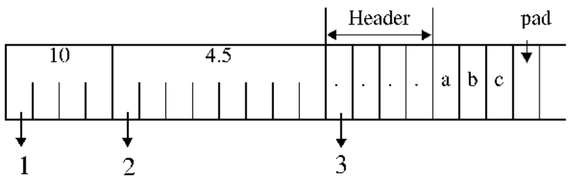
NOTE: For the information how to handle files, refer to "2.4 File Management".

Example 1: BINARY file

The ENTER statement assigns an internal data as it is. It also enables to read the data of the number of byte indicated by the header contents after reading each header such as integer of 4 byte, real number of 8 byte, and character string of 4 byte.
Since the number of byte to be read is decided by the type of input item, the same type as OUTPUT is required for preventing the data difference

```
10  INTEGER I
20  DIM R
30  OPEN "FILE" FOR INPUT AS #FD
40  ENTER #FD;I,R,S$
```

Number of byte to be read differs according to the variable type to be assigned



1 : When the variable is an integer, 4-byte data is read and assigned to the variable.

2 : When the variable is a real number, 8-byte data is read and assigned to the variable.

3 : When the variable is a character string, 4-byte header and header length are read and assigned to the variable.

Example 2: TEXT file

Regardless of the number of input items, the TEXT file is read out until the line field. The TEXT file is recognized as one data until a comma and converted into the input-item type, then it is assigned. If the number of input items is more, it cannot be assigned to the variables. Therefore, these values stored in advance are remaining. In reverse, if the number of variables is less than the number of actual data, the data are omitted.

```
10  INTEGER I
20  DIM R
30  OPEN "FILE" FOR INPUT AS #FD;TEXT
40  ENTER #FD;I,R,S$
```

	1	0	.		4	.	5	.	a	b	c	yn	.	.	.	
	I		↓			R		↓		S$			↓			
			1					1					2			

1 : Each item is delimited with a string of commas.

2 : LF followed after the final item is used.

Example 3: ASCII file

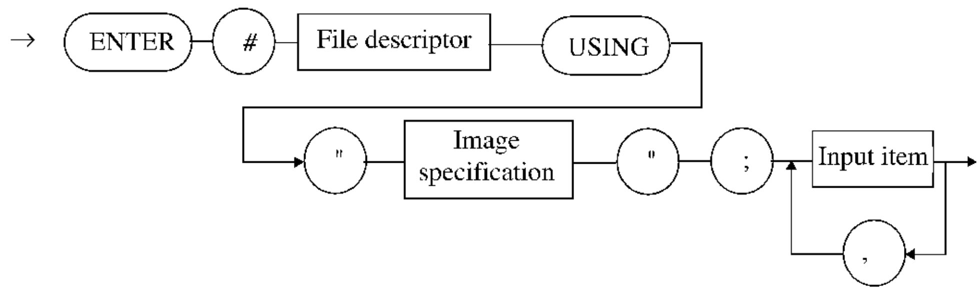
The 2-byte header and its data according to the header length are read out. The ASCII file is converted into the variable type and assigned.

```
10  INTEGER I
20  DIM R
30  OPEN "FILE" FOR INPUT #FD;ASCII
40  ENTER #FD;I,R,S$
```

.	.		1	0		.	.		4	.	5	.	.	a	b	c
Header		Data				Header		Data								

15. ENTER USING

- Outline — The ENTER USING statement is used to enter data to the input item from the file by using the image specification format.
- Syntax — (1)-1



(1)-2

ENTER # file descriptor USING "image specification" ; input item {, input item}

NOTE: ENT can be used instead of the ENTER, and USE for the USING.

- Description — The ENTER USING statement enters the data to the input item from the file assigned to the file descriptor by using the image specification format.

image specification

D: Recognizes the numeric of D as a numeric digit and reads out it, then assigns it to the variable of the input item.

Z: Same as D.

K: Reads out one line and converts it into the numeric data, then assigns it to the variable of the input item.

S: Same as D.

M: Same as D.

.: Same as D.

E: Same as K.

H: Same as K. However, use a comma for a decimal point.

*: Same as D.

A: Reads the number of A and assigns it to the character-string variable.

k: Reads one line and assigns it to the character-string variable.

X: Skips one-character data.

Literal:Skips the the character-string numeric data enclosed with \".

B: Reads one character and assigns it to the input item using an ASCII code.

@: Skips one-byte data.

+: Same as @

-: Same as @

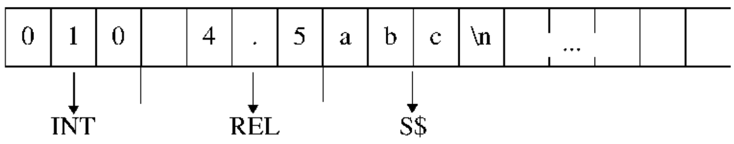
#: Ignored in ENTER statement.

n: Specifies the number of repetition of each image by using numerics.
For example, 3D.2D is the same as for DDD.DD, and 4A for AAAA.

NOTE: ***For the information how to handle files, refer to "2.4 File Management".***

- Example

```
10 INTEGER  INT
20 DIM      REL
30 ENTER #FD USING "ZZZ,DD.D,3A";INT,REL,S$
```

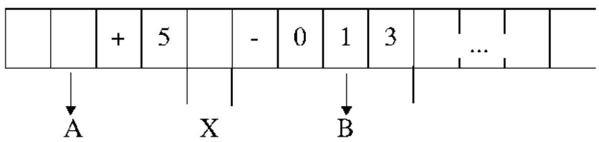


INT: Reads out 3-byte data and converts it into an integer-type data, then assigns it to the variable INT.

REL: The DD.D of image specification corresponds to the REL of the input item. Reads out 4-byte data and converts it into a real-type data, then assigns it to the variable REL. After the execution, the REL becomes 4.5.

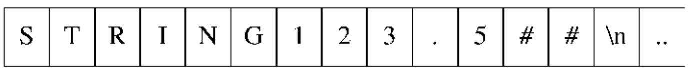
S$: Reads out 3-byte data and assigns it to the variable S$. After the execution, the A$ becomes "abc".

```
10 DIM A,B
20 ENTER #FD USING "SDDD,X,MZZZ";A,B
```



A,B: Reads out 4-byte data and converts it into a real-type data, then assigns it to the variables A and B.
After the execution, the A = 5.0, and the B = -13.0.
The image specification X can read 1-byte data, however, cannot assign it to the variable. Converts the data, which is input using an SDDD format, into a real-type data, and assigns it to the variable A. The image specification X is not required for variable, it skips one character.
The MZZZZ corresponds to the variable B and enters 4-byte data to convert it into a real-type data, then assigns it to the variable B.

```
10 DIM A
20 ENTER #FD USING "K";A
```



Execution result: A=123.5

The STRING123.5## is read out and converted into the real-type data of input variable A. When the input item is a real-type data, the preceding character strings other than numerics, signs (+, -), and exponents (E, e) are ignored and only the numerics are obtained. Only the numerics can be detected. If the character other than numerics is detected, the conversion is terminated.
For the image specifications such as K, E, k, and H, since LF represents terminator, the data from the current file pointer to the LF as one data are assigned to the variables.

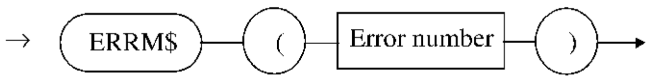
16. ERRM$

- Outline

The ERRM$ statement is the system function which is used to return an error message of the number specified.

- Syntax

(1)-1



(1)2

ERRM$ (error number)

- Description

- The ERRM$ statement returns the error message specified by parameters. Particularly, if 0 as a parameter is specified, the ERRM$ returns the error message immediately displayed.
- The error numbers are constructed from as follows:
  Error classes * 256 + error message number

  Error classes: 1; Data input
  2; Data calculation processing
  3; Built-in function
  4; BASIC syntax
  5; Others
- If the numbers which include the error classes are specified, only the error message numbers will be displayed. Therefore, the ERRN can be specified for the error numbers.

17. ERRN

- Outline — The ERRN statement is the system variable which holds an error number.
- Syntax — (1)-1

  → (ERRN) →

  (1)-2

  ERRN
- Description
  - The ERRN statement is the system variable, which holds the error number occurred when the BASIC program is being executed.
  - The ERRN is initialized to 0 when the BASIC program starts, and if an error occurs, its number will be assigned to the ERRN. To initialize this assigned value to 0, forcibly assign 0 to the ERRN or re-start the BASIC program.
  - The error numbers are constructed from as follows:

    Error classes * 256 + error message number

    Error classes: 1; Data input

    2; Data calculation processing

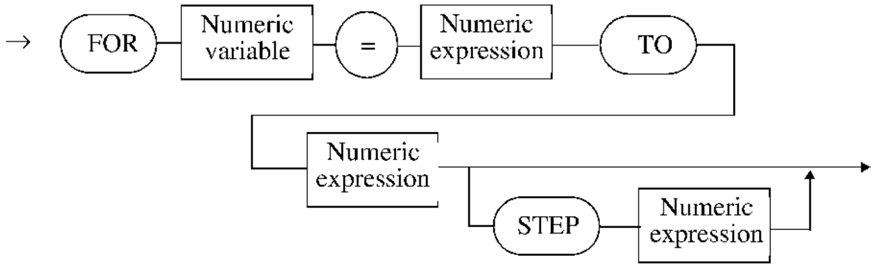
    3; Built-in function

    4; BASIC syntax

    5; Others

18. FOR-TO-STEP, NEXT, BREAK, CONTINUE

- Outline: This statement consists of the program loop (loop processing) by combining with FOR statement and NEXT statement.
- Syntax: (1)-1



(1)-2

FOR numeric variable = numeric expression TO numeric expression
[STEP numeric expression]

(2)-1

(2)-2

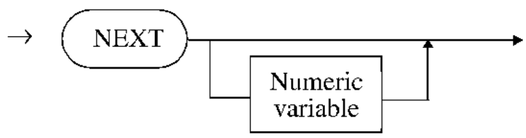
BREAK

(3)-1

(3)-2

CONTINUE

(4)-1



(4)-2

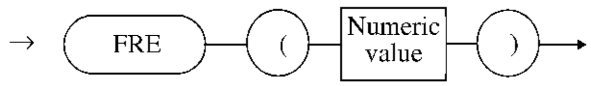
NEXT [numeric variable]

- Description
  - This statement uses the numeric variable specified as a loop counter (repetition) and enables to increase the value from the initial value to the final value by the increased step. If the counter value exceeds the final value, then the loop will terminate. The counter increment/decrement is performed by the NEXT statement. Therefore, the program created between FOR statement and NEXT statement is looped repeatedly.
  - The values of the initial, final, step are as follows:
    FOR A=(initial value) TO (final value) STEP (increment)
  - If STEP (increment) value is omitted, the value is automatically incremented by 1.
  - Nest is available between FOR statement and NEXT statement.
  - The numeric variable name of the loop counter used for a pair of FOR statement and NEXT statement, be sure to use the same name. If the numeric variable name is different, an error may occur.
  - If the value of numeric variable used for the loop counter is changed when the loop processing is executed between FOR statement and NEXT statement, the normal loop processing could not be performed.
  - If the numeric variable followed after NEXT statement is omitted, the NEXT statement will automatically correspond to immediately FOR statement.
  - BREAK statement can be used to exit in FOR-NEXT loop.
  - CONTINUE statement branches to the next step loop in FOR-NEXT loop.
- Example

```
10  FOR R=11 TO 0 STEP -5
20     FOR I=0 TO PI STEP PI/180
30        X=SIN(I)*R+23
40        Y=COS(I)*R+15
50        CURSOR X,Y:PRINT "*"
60     NEXT I
70  NEXT R
80  STOP
```

19. FRE

- Outline: The FRE statement is the system function which returns the memory space of BASIC buffer.
- Syntax: (1)-1



(1)-2

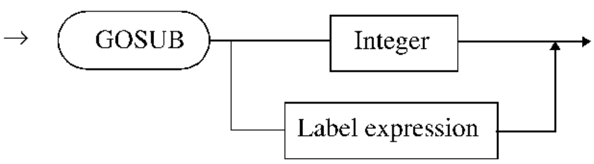
FRE (numeric value)

NOTE: ***Any value can be used to specify the numeric. However, the cannot be omitted.***

- Description:
  - The FRE statement is the system function which returns the memory space roughly to be used by the BASIC.
  - This statement checks the memory space roughly and performs no re-structure strictly. Therefore, saving and re-loading the data may result in more memory capacity.
- Example: PRINT FRE(0)

20. GOSUB, RETURN

- Outline: This statement is used to branch/return to the specified subroutine.
- Syntax: (1)-1



(1)-2

GOSUB <integer | label expression>

(2)-1

(2)-2

RETURN

- Description:
  - This statement moves the processing control to the subroutine which starts from the line number specified by the integer or label expression, and returns to the next statement of the GOSUB statement by the RETURN statement.
  - Be sure to input the RETURN statement at the end of subroutine and return the processing control to the main program.

- If the RETURN statement is executed without the branch to subroutine, an error may occur.
- Since Nest is available between the GOSUB statement and RETURN statement, the processing can branch to the other subroutine. If more Nest is performed, the remaining capacity (space) of BASIC program will be decreased and then an error may occur.
- When a label expression is written using the GOTO/GOSUB statement, if the target line defined in the label expression is not existed or if the line of the label expression is deleted by mistake, then the value of label expression in the GOTO/GOSUB statement will become 0. At this case, if this statement is executed, the following message will be displayed.

  Undefined line

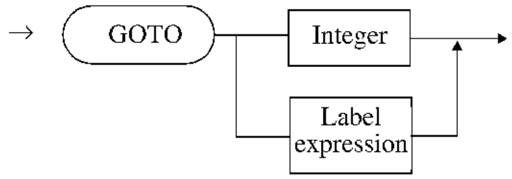
  The statement cannot be executed as it is. The line of the GOTO/GOSUB statement must be edited correctly.

- Example

```
10  FOR I=1 TO 9
20     GOSUB 60
30     GOSUB *PRT
40  NEXT I
50  STOP
60  ! SUB ROUTINE
70  X = I * I
80  RETURN
90  *PRT ! SUB ROUTINE
100 PRINT I; " * " ;I; " = " ;X
110 RETURN
```

21. GOTO

- Outline: The GOTO statement is used to branch to the specified line.
- Syntax: (1)-1



(1)-2

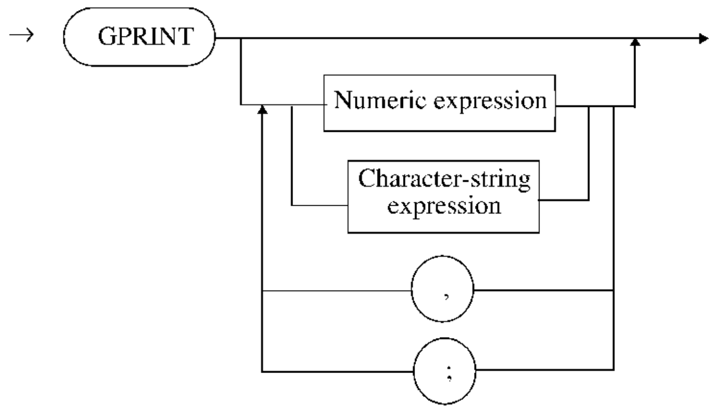
GOTO <integer | label expression>

- Description: The GOTO statement branches to the specified line number unconditionally.
- Example:

```
10  FOR I=1 TO 9
20      GOTO 60
30      GOTO *PRT
40  NEXT I
50  STOP
60  !
70  X = I * I
80  GOTO 30
90  *PRT
100 PRINT I; " * " ;I; " = " ;X
110 GOTO 40
```

22. GPRINT, LPRINT

- Outline
  This statement is used to output numerics or character strings.
  GPRINT: GPIB output
  LPRINT: Serial output
- Syntax
  (1)-1



(1)-2

GPRINT [<numeric expression | character-string expression> {, | <numeric expression | character-string expression>}

(2)

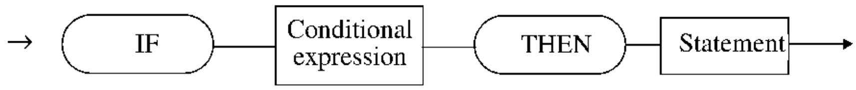
The LPRINT is the same as the GPRINT

- Description
  - This statement displays the numerics or character strings specified by the GPRINT or LPRINT.
  - When the multiple numerics or character strings are delimited with a comma and specified, they are continuously output without LF.
  - If a semicolon is used at the end of the GPRINT/LPRINT statement, LF could not be performed after the termination of print out. Therefore, if the next GPRINT/LPRINT statement is executed, the line followed after the previous output line will be output continuously.
- Example

```
100 PRINTER 1
110 FOR I=0 TO 20
120     GPRINT I
130     LPRINT I
140 NEXT I
150 STOP
```

23. IF-THEN, ELSE, END IF

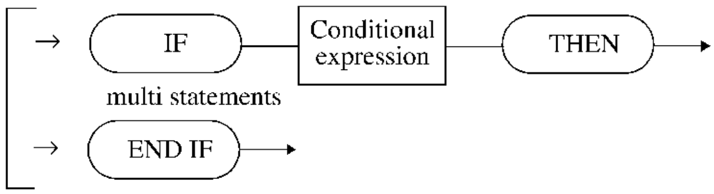
- Outline — This statement is used to perform the branch based on the condition branch and the specified statement.
- Syntax — (1)-1



(1)-2

IF conditional expression THEN statement

(2)-1



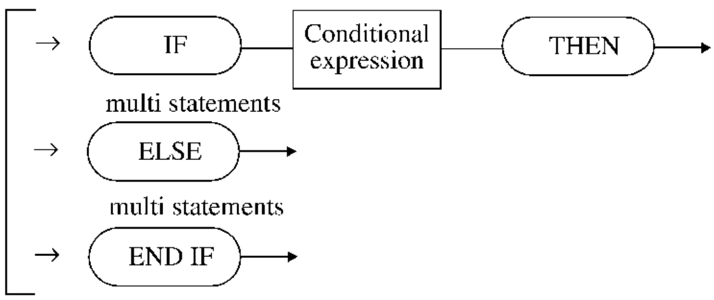
(2)-2

IF conditional expression THEN

    multi statements

END IF

(3)-1



(3)-2

IF conditional expression THEN

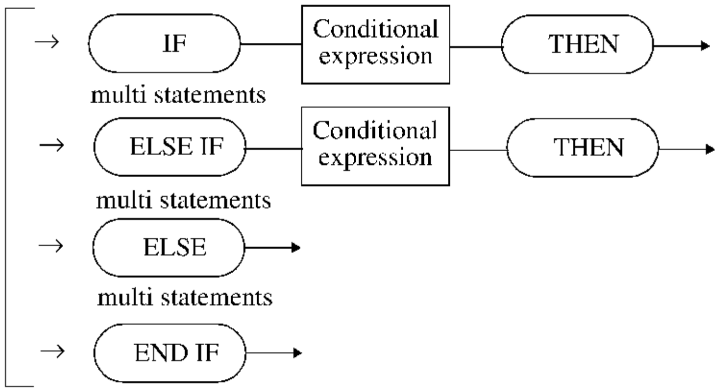
    multi statements

ELSE

    multi statements

END IF

(4)-1



(4)-2

IF conditional expression THEN
    multi statements
ELSE IF conditional expression THEN
    multi statements
ELSE
    multi statements
END IF

- Description
  - Generally, the condition expression represents a logical expression, however, numeric expression can be used in this statement other than the logical expression used relational operators. In this case, when the calculation result becomes 0 only, the value is determined as FALSE, and the values other 0 is estimated as TRUE.
  - Depending on the condition of logical expression, branching and processing the program can be performed.
  - When the logical expression is defined, the THEN statement can be executed. The other statements can be followed after the THEN statement and the next statement can be executed.
  - If the logical expression cannot be concluded, the next line is performed.
  - The following six types of relational operators are provided:

A=B	Returns true if A equal to B; false otherwise.
A>B	Returns true if A is greater than B; false otherwise.
A<B	Returns true if A is less than B; false otherwise.
A>=B	Returns true if A is greater than or equal to B; false otherwise
A<=B	Returns true if A is less than or equal to B; false otherwise.
A<>B	Returns true if A does not equal to B; false otherwise.

In the logical expression above, both values A and B consist of numeric expression. The comparison between numeric expression and character-string expression can be performed.

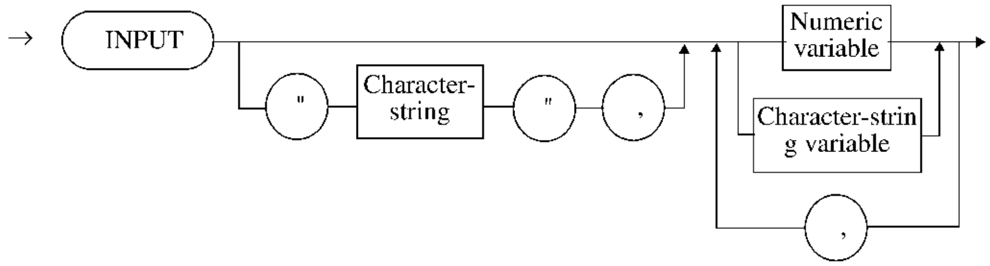
- Example

```
10  FLG = 0
20  FOR I=0 TO 10
30      PRINT I;
40      IF (I % 2) =0 THEN FLG = 1
50      IF FLG = 1 THEN
60          PRINT "  EVEN" ;
70          FLG = 0
80          END IF
90  PRINT
100 NEXT I
110 STOP
```

24. INPUT

- Outline — The INPUT statement is used to assign the data entered by keys to numeric variables.

- Syntax — (1)-1



(1)-2

INPUT ["character-string",] <numeric variable | character-string variable> {,<numeric variable | character-string variable>}

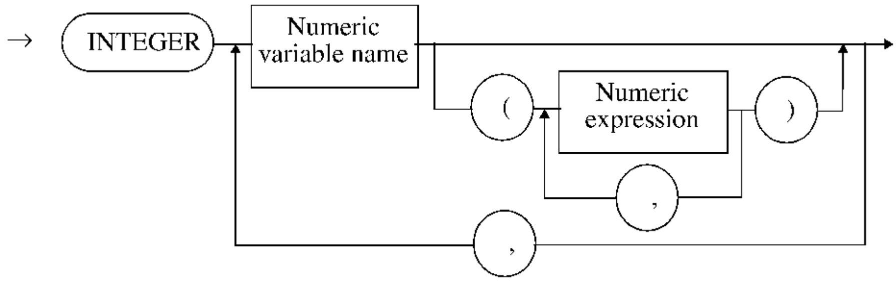
- Description
  - When the INPUT statement is executed, then the program is temporarily suspended and waits for next key to be input. The waiting state for the key input is continued until the ENTER key is pressed. If the ENTER key is pressed after data input, the data will be assigned to variables.
  - Both numeric variable and character-string variable can be handled in the INPUT statement. In case of numeric variable input, if the characters other than numeric (such as alphabets, symbols, and others) are entered, then they will be ignored. If no numeric is existed, then 0 will be assigned to the variable. If only the ENTER key is pressed, no assignment can be performed. In other words, the value immediately before the INPUT statement has been remaining.
  - To enter a character constant, it is not required to be enclosed with double quotation marks. If the register 6 of the CONTROL command is set to the register 1, then the input of function keys will be available during the input waiting state. (R3752 is not available due to the front panel key configuration.)

- Example

```
10  OUTPUT 31; "OLDC OFF"
20  OUTPUT 31; "INIT:CONT OFF"
30  INPUT "CENTER FREQUENCY(MHz) ?" ,CF
40  INPUT "SPAN FREQUENCY(KHz)?" ,SF
50  OUTPUT 31; "FREQ:CENT " ,CF, "MHz"
60  OUTPUT 31; "FREQ:SPAN " ,SF, "KHz"
70  OUTPUT 31; "INIT"
80  PRINT "MAX = " ,MAX(0,1200,0)
90  STOP
```

25. INTEGER

- Outline: The INTEGER statement is used to declare that the variable or array variable is an integer type.
- Syntax: (1)-1



(1)-2

INTEGER A[B] {, A[B] }

A: Numeric variable name

B: (Numeric expression {, Numeric expression})

- Description:
  - When a numeric variable or an array variable is specified in the INTEGER statement, the variable is determined as an integer type after the specification.
  - The numeric handled in the integer-type variable, it is the same as the range of an integer constant.
    -2147483648 to +2147483647
  - In the variables which handle only the integers, the declaration in the INTEGER statement is recommended to shorten the processing time.
  - When the array declaration is used in the INTEGER statement, the specified-size array variable is reserved on the memory. If larger array declaration is performed, an error may occur due to the rack of memory space (memory space full) and then the program execution will be forcibly terminated.
    (memory space full)
  - When multiple subscripts are specified, the array variables are also specified according to the number of dimension. (Number of dimension is specified as long as the memory space is permitted.)
- Example

```
10  INTEGER ARRAY(2,3)
20  PRINT "J/I " ;
30  PRINT USING "X,3D,3D,3D" ;1,2,3
40  PRINT " " ;
50  FOR I = 1 TO 2
60      FOR J = 1 TO 3
70          ARRAY(I,J) = I*10 + J
80      NEXT J
90  NEXT I
100 FOR I = I TO 2
110 PRINT
```

```
120 PRINT USING " 2D,2X,# " ;I
130     FOR J = 1 TO 3
140         PRINT USING "3D,#" ;ARRAY(I,J)
150     NEXT J
160 NEXT I
```

<Result>

```
J/I  1  2  3
1  11 12 13
2  21 22 23
```

CAUTION:

1. ***The variable which is once specified as an integer type by the INTEGER statement, if the instruction is deleted by the DEL or comment statement, the specified variable (integer type) is not changed.***
2. ***To change the specified integer-type variable into a real-type variable again, add the DIM instruction or execute the SAVE/LOAD command once and then perform the RUN command.***

26. INTERFACE CLEAR

- Outline: The INTERFACE CLEAR statement is used to initialize the all GPIB interfaces connected with the analyzer.
- Syntax: (1)-1

  → (INTERFACE CLEAR) →

  (1)-2

  INTERFACE CLEAR
- Description: When the INTERFACE CLEAR statement is executed, the GPIB single signal IFC is output approximately 100μs.
  If the all GPIB interface devices connected with the analyzer receive the IFC signal, then the setting state of talker or listener will be canceled.
- Example: 10 INTERFACE CLEAR
- Note: The INTERFACE CLEAR statement is not available in the ADDRESSABLE mode.

27. KEY$

- Outline — The KEY$ statement is used to return the code of panel key.
- Syntax — (1)-1

(1)-2

KEY$

- Description — The KEY$ statement returns the code pressed at the last operation. When this code is referred once, the contents of this variable is cleared.
- Example

```
10  A$=KEY$
20  IF A$="1" THEN
30      GOSUB *TEST1
40  ELSE IF A$="2" THEN
50      GOSUB *TEST2
60  END IF
70  GOTO 10
80  STOP
100 *TEST1
110     PRINT "Check1 Start !!"
120     ......
130     RETURN
200 *TEST2
210     PRINT "Check2 Start !!"
220     ......
230     RETURN
```

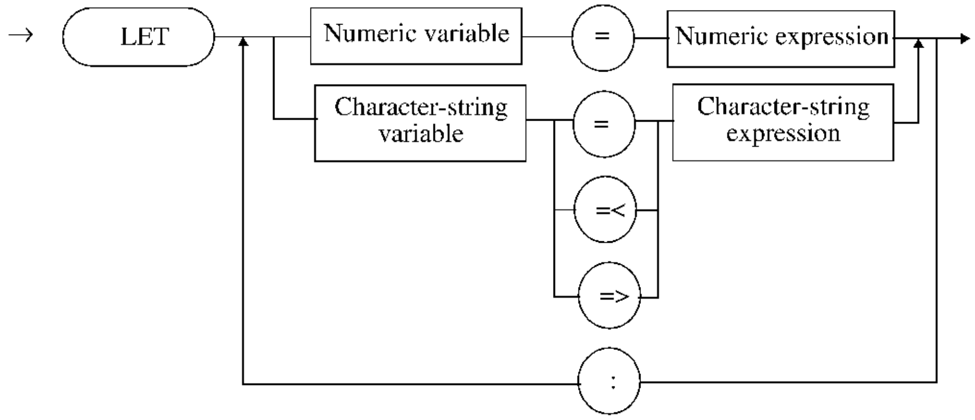
28. LET

- Outline

  (The LET statement is not used in the program, the assignment statement can be used directly.)
  The LET statement is used to assign to the variable.

- Syntax

  (1)-1



  (1)-2

  LET <A | B> {: <A | B> }

  A: numeric variable = numeric expression

  B: character-string variable = | =< | => character-string expression

- Description

  - The signs used in this statement indicate an assignment and differ from the sign used in arithmetic operation.
  - If th left part of sign is a numeric, the numeric part of character string is converted and then assigned.
    Especially, when character string is assigned:
    when =: Only the length of right part is assigned.
    when =>: If the character string of the right part is shorter than the left one, spaces is used to assign the different values from the top of the left part.
    when =<: Spaces are used to fill up to the blank.

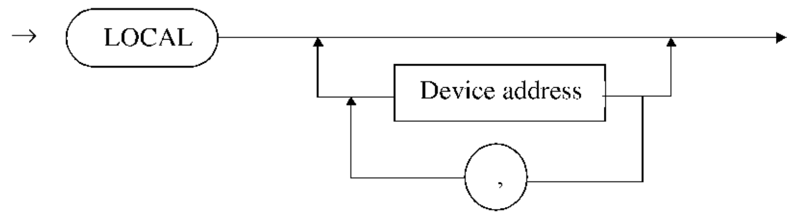
    Therefore, the signs => and =< are assignment operators which are available only for character strings.

- Example

10 DIM STR$	<After the execution>
20 PRINT "123456789012345678"	123456789012345678
30 STR$ = "ABC" :PRINT STR$	ABC
40 STR$ =< "OPQ" :PRINT STR$	OPQ
50 STR$ => "XYZ" :PRINT STR	XYZ

29. LOCAL

- Outline — The LOCAL statement is used to cancel the specified device from the remote state or to set the remote-enable (REN) line to FALSE.
- Syntax — (1)-1



(1)-2

LOCAL [device address {, device address}]

- Description
  - If only the LOCAL statement is executed without specifying the device address, then the GPIB remote-enable line will become FALSE (High level) and all the devices on the GPIB will be a local state.
    If the REN is FALSE, pay attention that the setting of GPIB device could not be performed (cannot be controlled by GPIB).
  - To set the REN to TRUE (Low level) again, execute the REMOTE.
  - If the device address is specified followed after the LOCAL, only the device specified by the device address could be addressed, and the remote state will be canceled.
- Example

```
10 LOCAL
20 LOCAL 1
30 LOCAL 1,2,3
```

- Note — The LOCAL state is not be available in the ADDRESS mode.

30. LOCAL LOCKOUT

- Outline

  The LOCAL LOCKOUT statement is used to prohibit the function which controls the local/remote state from the panel key of the device connected to the GPIB.

- Syntax

  (1)-1

  → LOCAL LOCKOUT →

  (1)-2

  LOCAL LOCKOUT

- Description

  - When each device is remote state (controlled by GPIB), the panel key of each device is locked except for the LOCAL key and the data setting cannot be performed from each panel.
    When the LOCAL key is pressed during the remote state, the data setting is available since each device become local state. Therefore, various errors occur during the remote control and the control cannot be performed correctly.
    In this case, if the LOCAL LOCOUT statement is executed, its function enables to lock the all devices on the GPIB and the setting from each device panel can be completely prohibited.
  - When the LOCAL LOCKOUT statement is executed, the local lockout (LLO) of universal command is sent to the GPIB.
  - To cancel the local lockout state, use the LOCAL command to set the REN line to FALSE (High level).

- Example

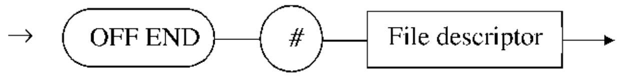
  ```
  10 LOCAL LOCKOUT
  ```

- Note

  The LOCAL LOCKOUT statement is not available in the ADDRESSABLE mode.

31. OFF END

- Outline — The OFF END statement is used to cancel the processing of the end of file specified by the ON END statement.
- Syntax — (1)-1



(1)-2

OFF END # file descriptor

- Description — After canceling the branch defined into file descriptor, if the end of file occurs, the following error message will be displayed and the program will be terminated.

end of "DATAFILE" file

NOTE: For the information how to handle files, refer to "2.4 File Management".

---

32. OFF ERROR

- Outline — The OFF ERROR statement is used to cancel the branch function when an error occurs.
- Syntax — (1)-1

(1)-2

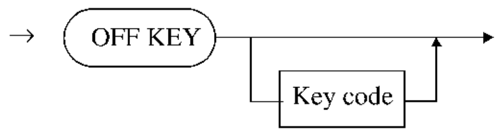
OFF ERROR

- Description — The OFF ERROR statement prohibits the error branch defined by the ON ERROR statement.
- Example

```
10   ON ERROR GOTO 100
          :
100 OFF ERROR
110 PRINT "Error Code", ERRN
120 STOP
```

33. OFF KEY

- Outline — The OFF KEY statement is used to cancel the branch function by interruption of KEY input.
- Syntax — (1)-1



(1)-2

OFF KEY [key code]

- Description — The OFF KEY statement prohibits the branch by the interruption of the analyzer KEY input, which is permitted by the ON KEY statement.
- Example

```
10  ON KEY 2 GOTO 100
20  ENABLE INTR
30  ! LOOP
40  GOTO 30
100 OFF KEY
110 PRINT "OFF KEY"
120 STOP
```

34. OFF SRQ, OFF ISRQ

- Outline
  This statement is used to cancel the function and definition by the interruption of SRQ or ISRQ.

- Syntax
  (1)-1

  → (OFF SRQ) →

  (1)-2
  OFF SRQ
  (2)
  The OFF ISRQ is the same as the OFF SRQ

- Description
  - OFF SRQ
    This statement prohibits the branch by the interruption, which is permitted by the ON SRQ.
  - OFF ISRQ
    This statement prohibits the branch by the interruption, which is permitted by the ON ISRQ.

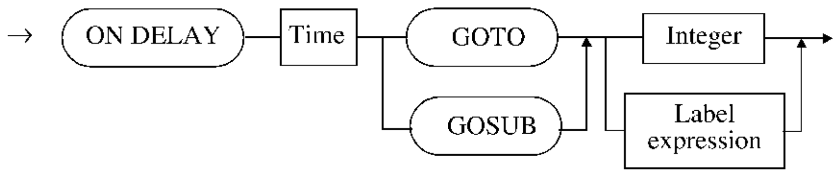
- Example

```
100 OUTPUT 31; "OLDC OFF"
110 OUTPUT 31; "START:OPER:ENAB 8;*SRE 128":SPOLL(31)
120 ON ISRQ GOTO *MAX
130 OUTPUT 31; "INIT:CONT OFF;:ABOR;:INIT"
140 ENABLE INTR
150 ! LOOP
160 GOTO 150
170 *MAX
180 DISABLE INTR
190 OFF ISRQ
200 PRINT MAX(0,1200,0)
210 STOP
```

Address	Contents
110	Enables the SRQ.
120	Sets the interruption branch of the internal SRQ.
130	Single sweep.
140	Interruption reception.
180	Interruption prohibition.
190	Cancels the interruption branch of the internal SRQ.
200	Displays the maximum level.

35. ON DELAY

- Outline — The ON DELAY statement is used to branch after the specified time elapsed.
- Syntax — (1)-1



(1)-2

ON DELAY time <GOTO | GOSUB> <integer | label expression>

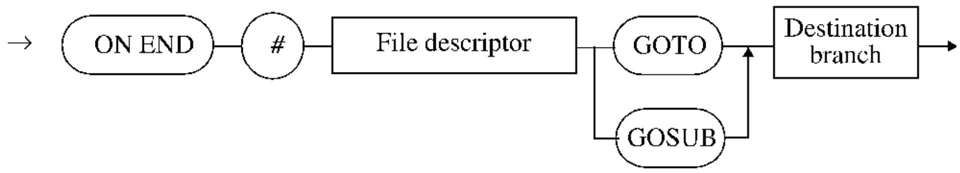
NOTE: The unit of time is msec, and the setting range is between 0 to 65535.

- Description
  - The ON DELAY statement branches according to the statement after the specified time elapsed.
  - Acceptance of the interruption should be permitted by the ENABLE INTR statement.
- Example

```
10  INTEGER T
20  T=50
30  ENABLE INTR
40  ON DELAY T GOSUB *TEST
50  STOP
100 *TEST
110     PRINT T;"[msec] Delay"
120 RETURN
```

36. ON END

- Outline — The ON END statement is used to define the processing (destination branch) at the end of file.
- Syntax — (1)-1



(1)-2

ON END #file descriptor <GOTO | GOSUB>

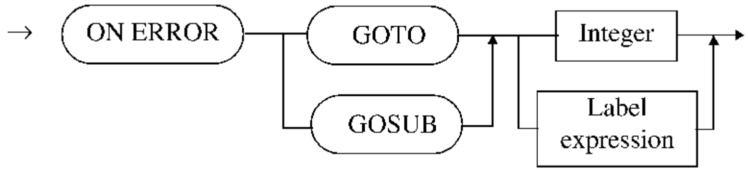
- Description
  - The ON END statement reads out the data from the file by the ENTER command, if the data to be entered is not existed with reading out the end of file, the result will be the end of file.
    If the processing declaration is omitted in the ON END statement, after closing the file, an error message will be displayed and the program will terminate.
  - The destination branch is specified by numeric variables, numeric constant, or labels.

NOTE: ***For the information how to handle files, refer to "2.4 File Management".***

---

37. ON ERROR

- Outline: The ON ERROR statement is used to permit the branch when an error occurs.
- Syntax: (1)-1



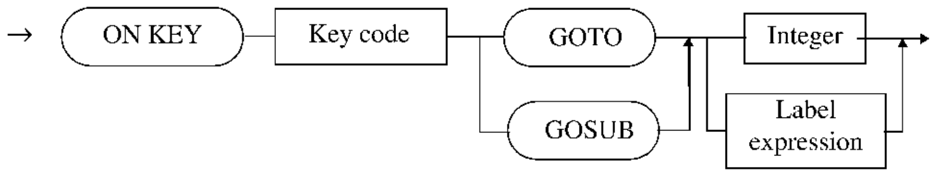
(1)-2

ON ERROR <GOTO I GOSUB> <integer I label expression>

- Description:
  - If an error occurs during the BASIC program, the statement number and error message of the program will be displayed and the program will terminate.
    Especially, if the built-in function error which demands the service request of the measuring device, only the error message will be displayed and the program will continue the operation. To detect the error to branch, use the ON ERROR statement is used.
  - The destination branch is specified by numeric variables, numeric constant, or labels. To categorize the generated error, the ERRN system variable which stores the error number is provided.
  - After generating the error, if the error is not recovered by the error processing, then the endless loop will be performed. To prevent this trouble, the OFF ERROR statement must be used (written).
- Example: ON ERROR GOTO 1000

38. ON KEY

- Outline: The ON KEY statement is used to permit the branch by the interruption of KEY input.
- Syntax: (1)-1



(1)-2

ON KEY key code <GOTO | GOSUB> <integer | label expression>

- Description
  - The ON KEY statement branches by the interruption of KEY input during the program execution.
  - The branch is executed after completing the processing of the statement being executed when the interruption is generated.
  - The return position of the statement when the program branches to the subroutine is the next statement of the statement being executed when the interruption is generated.
  - The key codes are constructed from the numerics of 1 to 6. They correspond to the function key on the front panel and the F1 to F6 on the key board.
  - Acceptance of the interruption should be permitted by the ENABLE INTR statement.
- Example

```
10    CLS
20    ON KEY 1 GOTO 1000
30    ON KEY 2 GOTO 1100
40    ON KEY 3 GOTO 1200
50    ON KEY 4 GOTO 1300
60    ON KEY 5 GOTO 1400
70    ON KEY 6 GOTO 1500
75     CNT = 10
80    *HERE:
85    I = 0: PRINT " "
90    IF I=CNT THEN FOTO *HERE
100   ++I: PRINT ">" ;
110   ENABLE INTR
120   GOTO 90
1000  PRINT "FIRST KEY"
1001  CNT = 1
1010  GOTO *HERE
1100  PRINT "SECOND KEY"
1101  CNT = 10
1110  GOTO *HERE
1200  PRINT "THIRD KEY"
1201  CNT = 20
1210  GOTO *HERE
1300  PRINT "FOURTH KEY"
1301  CNT = 30
1310  GOTO *HERE
1400  PRINT "FIFTH KEY"
1401  CNT = 40
1410  GOTO *HERE
1500  PRINT "SIXTH KEY"
1501  CNT = 50
1510  GOTO *HERE
```

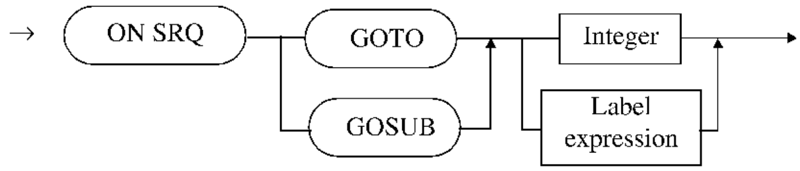
39. ON SRQ, ON ISRQ

- Outline

The ON SRQ statement is used to permit the interruption branch by the GPIB external SRQ signal. (It is available in ON SRQ controller mode only.)
The ON ISRQ statement is used to permit the interruption branch when the internal interruption factor is generated.

- Syntax

(1)-1



(1)-2

ON SRQ <GOTO | GOSUB> <integer | label expression>

(2)

The ON ISRQ is the same as the ON SRQ

- Description

  - This statement branches by the interruption during the program execution.
  - The branch is executed after completing the processing of the statement being executed when the interruption is generated.
  - The return position of the statement when the program branches to the subroutine is the next statement of the statement being executed when the interruption is generated.
  - The ON SRQ statement performs the interruption branch by the SRQ signal from the GPIB external during the controller mode in progress.
  - Acceptance of the interruption should be permitted by the ENABLE INTR statement.

- Example

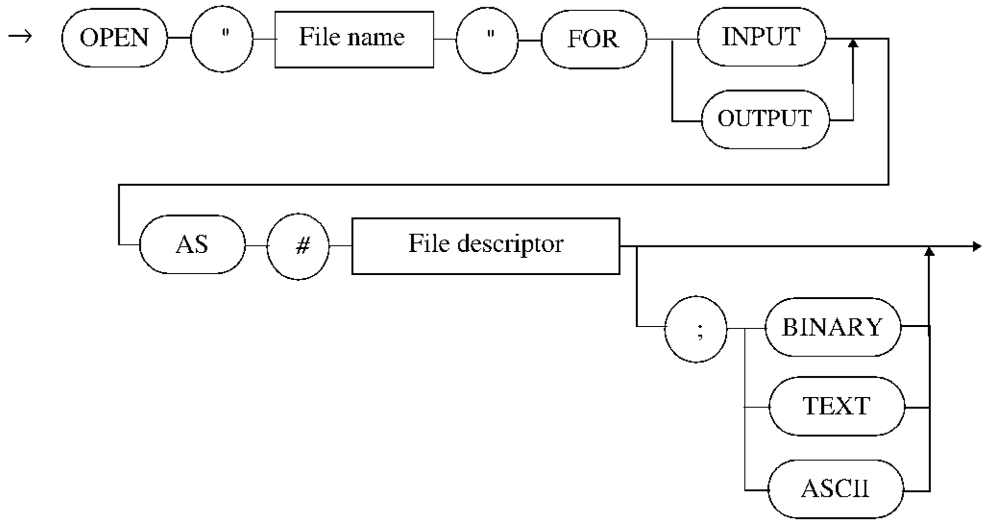
Sample program which searches the MAX every single sweep.

```
100 OUTPUT 31;"OLDC OFF"
110 ON ISRQ GOTO *MAX
120 OUTPUT 31; "STAT:OPER;ENAB 8;*SRE 128" :SPOLL(31)
130 ENABLE INTR
135 OUTPUT 31; "INIT:CONT OFF;:ABOR;:INIT"
140 ! LOOP
150 GOTO 140
160 *MAX
170 DISABLE INTR:SPOLL(31)
180 PRINT MAX(0,1200,0)
190 GOTO 130
```

Address	Contents
110	Sets the interruption branch of the internal SRQ.
120	Enables the SRQ.
130	Interruption reception.
135	Single sweep.
170	Interruption prohibition.
180	Displays the maximum level.

40. OPEN

- Outline: The OPEN statement is used to assign the file descriptor to the file and to open the by with the specified processing mode.
- Syntax: (1)-1



(1)-2

OPEN "file name" FOR processing mode AS #file descriptor [; file type]

Processing mode: INPUT | OUTPUT
File type: BINARY | TEXT | ASCII

- Description
  - To recognize the file for the program, the OPEN statement assigns the file descriptor to the file and to open the by with the specified processing mode.

    Processing mode
    Two processing modes are provided.
    OUTPUT:Used for writing the data to files.
    INPUT:Used for reading out the data from files.

File descriptor

Generally, writing/reading files uses the ENTER or OUTPUT mode.
For these commands, the file descriptor is used to recognize the target files.
To name the file descriptor, use alphanumerics followed after #.

File type

Three file types (BINARY, TEXT and ASCII) are provided.
If the file type is not specified, BINARY type is automatically set.

BINARY: Stores the data without changes. An integer type is 4-byte data, a real type for 8-byte data, and a character-string type for header 4-byte. In case of the character-string type, ASCII data is followed after the header 4-byte. If the number of character data is an odd, then one space of 1-byte will be followed after the data.

TEXT: Converts data into ASCII codes and outputs the data, and "-" or space is followed before the numeric. The USING specification can be used for the TEXT file.

ASCII: Represents the input/output item using ASCII codes followed after 2-byte header. "-" or space is followed before the numeric. If the number of the character data is an even, then one space will be followed after the data.

- When the file descriptor already assigned the file to the other file is opened, the previous assigned file is closed and the specified file is newly opened.
- The same files cannot be opened using the multiple file-descriptor at the same time.

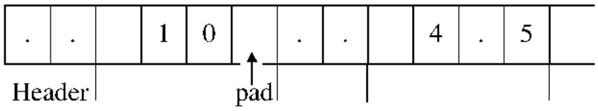
NOTE: For the information how to handle files, refer to "2.4 File Management".

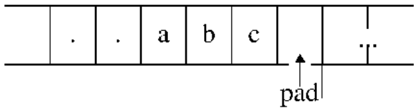
- Example

10 OPEN "DATA.BAS" FOR OUTPUT AS #FD; TEXT
20 OUTPUT #FD;10,4.5,"abc"

	1	0	,		4	.	5	,	a	b	c	\n	

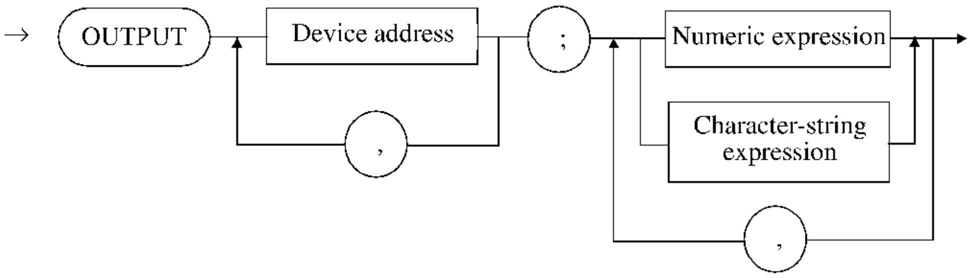
10 OPEN "DATA.BAS" FOR OUTPUT AS #FD; ASCII
20 OUTPUT #FD;10,4.5,"abc"


. . 1 0 . . 4 . 5
Header
pad


. . a b c
pad

41. OUTPUT

- Outline
  (1) The OUTPUT statement is used to output the data to a GPIB.
  (2) The OUTPUT statement is used to output (write) the data to files.
- Syntax
  (1)-1

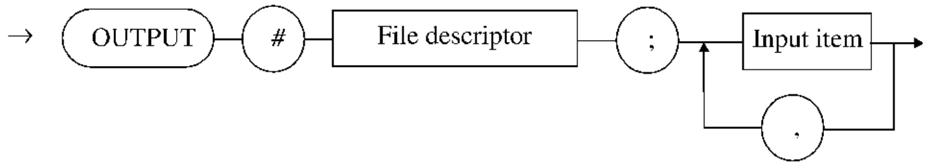


(1)-2

OUTPUT device address {, device address} ; <numeric expression | character-string expression> {, <numeric expression | character-string expression>}

Device address:0 to 30;Address of the external GPIB device.
31; Output to the measurement section of the analyzer.
33; Output to the A port of parallel port.
34; Output to the B port of parallel port.
35; Output to the C port of parallel port and set/reset of Flip/Flop.
36; Output to the D port of parallel port and set of port mode.
37; Output to the CD port of parallel port.

(2)-1



(2)-2

OUTPUT #file descriptor ; input item {, input item}

- Description

Syntax of (1)

- The OUTPUT statement sends numeric and character string as an ASCII data to the specified device by the device address.
  Multiple device address can be specified by delimiting with a string of commas. The numeric expression and the character-string expression are used together by delimiting with a string of commas.
- If the OUTPUT statement is executed when the REN line is TRUE (Low level), the unit specified by the device address will be automatically remote state. To cancel the remote state by the program, execute the LOCAL statement.
- The termination code used when outputting data to GPIB is specified by the DELIMITER statement.
  Also refer to "9. DELIMITER" in Section 4.3.
- Example
  10 A=5
  20 B=10
  30 OUTPUT A;"STARTF", B,"MHz"
- Note
  In the SYSTEM CONTROLLER mode, the specified address device is set as the listener and the data is output.
  When the external listener is not existed, this command cannot be executed.

Syntax of (2)

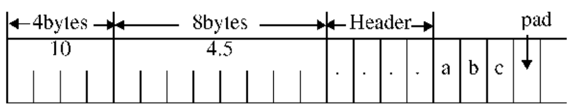
The OUTPUT statement converts the data into the BASIC format and then outputs the file assigned to the file descriptor.
The OUTPUT statement reads out the converted BASIC-format data and assigns it to its input item.

Example 1: BINARY file

Outputs data without changes. A character string is output with the header which indicates the length of 4-byte character string. If the number of character data is an odd, then one space of 1-byte will be followed after the data.

10 OPEN "FILE" FOR OUTPUT AS #FD
20 OUTPUT #FD;10,4.5,"abc"

NOTE:* *For the information how to handle files, refer to "2.4 File Management".



Header has each data length.

Example 2: TEXT file

Converts data into into ASCII codes and outputs the data.
The signs (space or minus) for numeric data is placed to the top of the field.

10 OPEN "FILE" FOR OUTPUT AS #FD;TEXT

20 OUTPUT #FD;10,4.5,"abc"

	1	0	.		4	.	5	.	a	b	c	Yn	.	.	.	
	I		↓ 1			R		↓ 1		S$		↓ 2				

1 : Each item is delimited with a string of commas.

2 : LF followed after the final item is output.

Example 3: ASCII file

Converts data into ASCII codes and outputs the data.
The signs (space or minus) for numeric data is placed to the top of the field. If the number of character data is an odd, then one space of 1-byte will be followed after the data.

10 OPEN "FILE" FOR INPUT #FD;ASCII

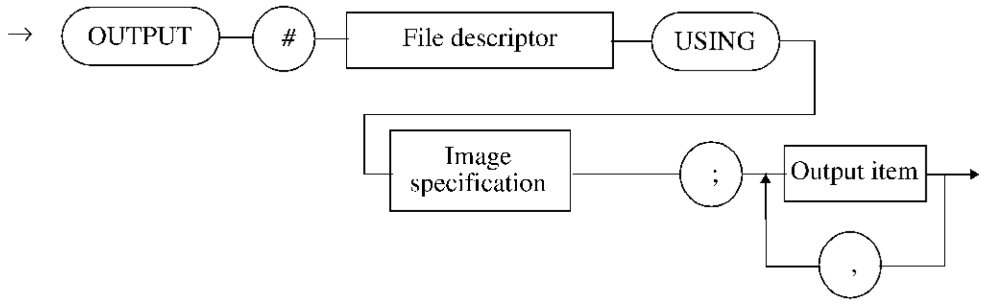
20 OUTPUT #FD;10,4.5,"abc"

.	.		1	0		.	.		4	.	5	.	.	a	b	c
Header		Data				Header		Data								

Header has each data length.

42. OUTPUT USING

- Outline: The OUTPUT USING statement is used to output data with the specified data-type to the file assigned to the #file descriptor.
- Syntax: (1)-1



(1)-2

OUTPUT # file descriptor USING image specification ; output item {, output item}

NOTE: OUT can be used instead of the OUTPUT, and USE for the USING.

- Description
  - When the USING and the image specification are specified, the format is converted and output. The image specification must be specified by character-string expression.
  - The specified file descriptor when the file is opened is used. The file descriptor is assigned for the file to be objected at the file open. After that, the processing for the file can be performed through this file descriptor.

image specification

D: Specifies the output digits with No. of D. A space is used to fill up the remaining blank in the specified field.

Z: Specifies the output digits with No. of Z. A zero is used to fill up the remaining blank in the specified field.

K: Displays the expression as it is.

S: Displays the OUTPUT USING with a + or - sign flag at the position of S.

M: Displays the OUTPUT USING with a - for negative and a space for positive at the position of M.

.: Displays the OUTPUT USING to match the position "." with coming the decimal point.

E: Displays OUTPUT USING with the exponent format (e, sign, exponent).

H: Same as K. However, use a comma for a decimal point.

R: Same as ".". However, use a comma for a decimal point.

*: Specifies the output digit with the number of *. A space is used to fill up the remaining blank in the specified field.

A: Displays one character.

k: Displays the character-string expression as it is.

Literal:Encloses the literal with \" when writing it in the format expression.

X: Displays the character of one space.

B: Displays the expression result using an ASCII code.

@: Outputs the form lead.

+: Outputs the carriage return.

-: Outputs the line feed.

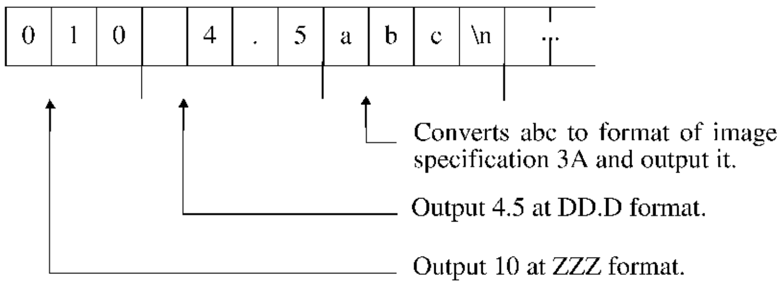
#: Does not hang the line feed immediately followed after the last item.

n: Specifies the number of repetition of each image by using numerics.
For example, 3D.2D is the same as for DDD.DD, and 4A for AAAA.

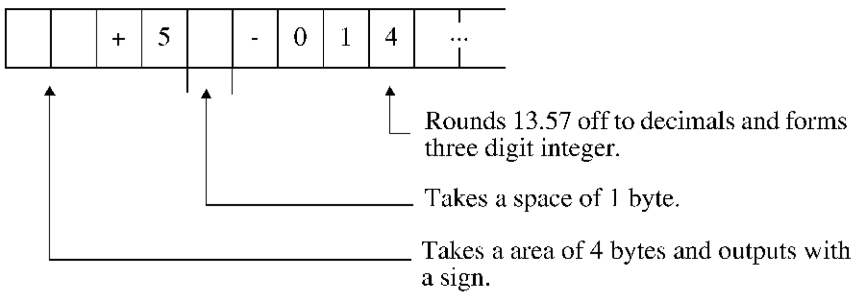
NOTE: ***For the information how to handle files, refer to "2.4 File Management".***

- Example

OUTPUT #FD USING "ZZZ,DD.D,3A";10,4.5,"abc"

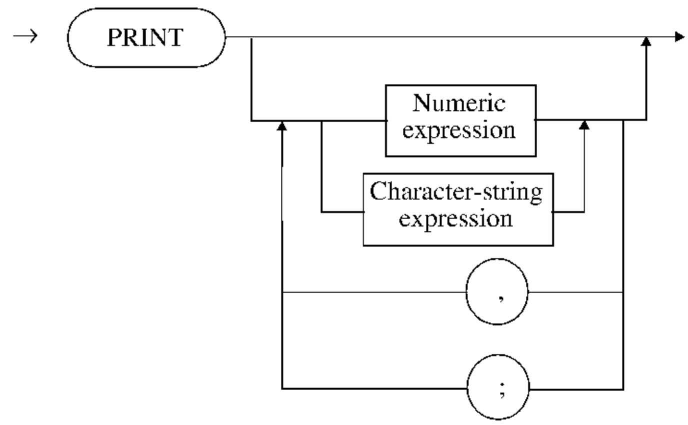


OUTPUT #FD USING "SDDD,X,MZZZ";+5,-13.57



43. PRINT [USING]

- Outline: The PRINT [USING] statement is used to display numerics or character strings.
- Syntax: (1)-1



(1)-2

PRINT [numeric expression | character-string expression {, | ; numeric expression | character-string expression}]

- Description
  - The PRINT [USING] statement displays the specified numeric or character string.
  - When the multiple numerics or character strings are delimited with a comma and specified, they are continuously output without LF.
  - If a semicolon is used at the end of the PRINT statement, LF could not be performed after the termination of print out. Therefore, if the next PRINT statement is executed, the line followed after the previous output line will be output continuously.
- Example

```
10  PRINT 123*456
20  PRINT "ABC"
30  PRINT "Freq.=",A, "Hz"
40  PRINT I,
```

- In PRINT USING format specification expression ; [[expression [...]]

The format specification expression (character-string expression), specify the image specification by using a comma among image. The end of the format specification expression is automatically returned with line feed.

image specifications

D: Specifies the output digits with No. of D. A space is used to fill up the remaining blank in the specified field.

Z: Specifies the output digits with No. of Z. A zero is used to fill up the remaining blank in the specified field.

K: Displays the expression as it is.

S: Displays the PRINT USING format with a + or - sign flag at the position of S.

M: Displays the PRINT USING format with a - for negative and a space for positive at the position of M.

.: Displays the PRINT USING format to match the position "." with coming the decimal point.

E: Displays PRINT USING format with the exponent format (e, sign, exponent).

H: Same as K. However, use a comma for a decimal point.

R: Same as ".". However, use a comma for a decimal point.

*: Specifies the output digits with the number of *. A space is used to fill up the remaining blank in the specified field.

A: Displays one character.

k: Displays the character-string expression as it is.

X: Displays the character of one space.

Literal:Encloses a literal with \" when writing it to the format expression.

B: Displays the expression result using an ASCII code.

@: Form lead

+: Moves the display position to the top of the same line.

-: Line feed

#: Does not line feed.

n: Specifies the number of repetition of each image by using numerics. For example, 3D.2D is the same as for DDD.DD, and 4A for AAAA.

- Example 1

```
10 PRINT USING "4Z,2X,5D,2X,5*" ;123,-444,567
```

<After the execution>

```
0123  -444  **567
```

- Example 2

```
10 PRINT USING "S3D,X,S3D" ;-4.5,465
20 PRINT USING "M3Z.Z,X,M3ZR3Z" ;1.26,-5.452
```

<After the execution>

```
-5 +456
001.3 -005.452
```

- Example 3

```
10 PRINT USING "K,X,H" ;5.03884e+22,4.5563
```

<After the execution>

```
5.03884e+22 4.5563
```

- Example 4

```
10 PRINT USING "k,#" ;"character:"
20 PRINT USING "B" ;69
```

<After the execution>

```
character:E
```

- Example 5

```
10  PRINT USING "\" ............ \" ,+,A" ; "*"
20  PRINT USING "k,-, \" .END. \" " ;  "string"
```

<After the execution>

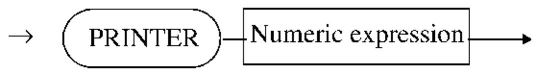
```
*............
string
.END.
```

- Example 6

	<After the execution>
100 PRINT USING "DDD.DD" ;1.2	1.20
110 PRINT USING "ZZZ.ZZ" ;1.2	001.20
120 PRINT USING "K" ;1.2	1.2
130 PRINT USING "SDDD.DD" ;1.2	+1.20
140 PRINT USING "MDDD.DD" ;1.2	1.20
150 PRINT USING "MDDD.DD" ;-1.2	-1.20
160 PRINT USING "H" ; 1.2	1,2
170 PRINT USING "DDDRDD" ; 1.2	1,20
180 PRINT USING "***.**" ; 1.2	**1.20
190 PRINT USING "A" ; "a"	a
200 PRINT USING "k" ; "string"	string
210 PRINT USING "B" ; 42	*
220 PRINT USING "3D.2D" ;1.2	1.20

44. PRINTER

- Outline: The PRINTER statement is used to specify the device address for sending the data to the printer.
- Syntax: (1)-1



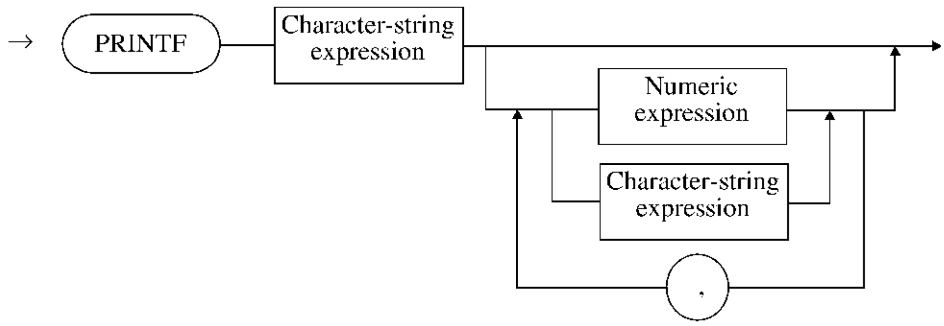
(1)-2

PRINTER numeric expression

- Description:
  - The PRINTER statement sets the printer device address connected to the GPIB.
  - Be sure to specify the printer device address to the analyzer by the PRINTER statement before executing the GPRINT, GLIST and GLISTN statement.
  - The device address is the integers from 0 to 30.
- Example: 10 PRINTER 1

45. PRINTF

- Outline — The PRINTF statement is used to display numerics or character strings.
- Syntax — (1)-1



(1)-2

PRINTF character-string expression [numeric expression | character-string expression {, numeric expression | character-string expression}]

- Description
  - The PRINTF statement displays the specified numeric or character string.
  - When the multiple numerics or character strings are delimited with a comma and specified, they are continuously output without LF. To line feed, use a "*n" in the format specification expression.
  - The first parameter character-string expression is used to specify the preceding parameter format.
  - The following format specification are provided.
- PRINTF format specification expression ; [[expression [expression [...]]]

The method of format specification is similarly to the Printf function of C language. The format specification expression is a character-string type and the output format is defined by the following method. The character string other than this format is normally output. If "%" is necessary, add "%" immediately followed after the "%".

%[-] [0] [m] [. n] character

-: Justifies the character with no space from left (if no specification, then from right).

0: Sets the character, which is justified for the remaining blank in the specified field, to be 0.

m: Reserves the field for the character "m".

.n: Outputs the PRINT USING format with n-digit accuracy. In character string, this setup value is used for an actual character-string length.

Character:	d; decimal with sign	s; character string
	o; octal	e; floating-point expression (exponent format)
	x; hexadecimal	f; floating-point expression

- Example

```
10  N = 500000
20  U = LOG(1+1/N)
30  V = U - 1 / N
40  PRINTF  "%7d %16.5e %16.5e \n" ,N,U,V
50  PRINTF  "%s\n" , "end"
```

<After the execution>
500000 2.00000e-06 -1.99994e-12
end

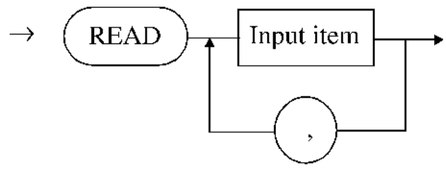
46. READ

- Outline

  The READ statement is used to assign the constant in the DATA statement to the variable.

- Syntax

  (1)-1



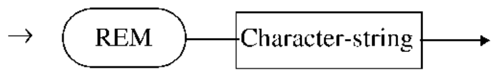
  (1)-2

  READ input item {, input item}

- Description
  - The READ statement reads the numeric or character string defined in the DATA statement to the variable specified by the argument.
  - The READ statement catches the READ statement and searches the DATA statement in the program.
  - In the first READ statement, basically (it must be changed by RESTORE statement), the READ searches the constant value from top line to final line in order, and the first searched value is assigned to the variable. After that, the constant corresponding to the DATA statement is searched and assigned to the variable.
  - If the constant value specified the DATA statement is less, an error will occur.
  - The objects are the value to be read out by the READ statement and the constant value corresponding to the DATA statement. (The number of line of the DATA/READ statement is meaningless.)

47. REM

- Outline — The REM statement is an annotation for program.
- Syntax — (1)-1



(1)-2

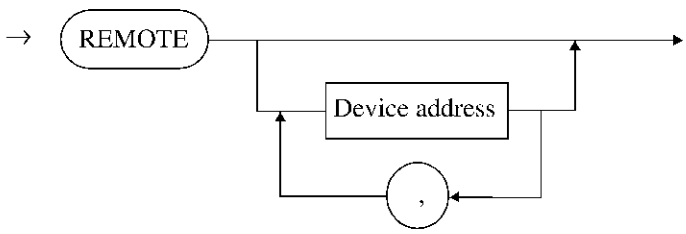
REM character-string

- Description
  - The REM statement is used to add the annotation to the program.
  - Since the REM statement is no execution statement, any character string can be used followed after the REM statement. All the characters, numerics, and symbols can be used.
  - An exclamation mark may be used instead of the REM statement.
  - Multi statements using colons followed after the REM statement cannot be used. All the statements are determined as annotation statement.
- Example

```
10  REM "PROGRAM 1"
20  ! 1983-JUN-02
30  A=A+1:! INCREMENT A
```

48. REMOTE

- Outline: The REMOTE statement is used to set the specified device to the remote state or to set the remote enable (REN) line to TRUE.
- Syntax: (1)-1



(1)-2

REMOTE [device address {, device address }]

- Description:
  - If only the REMOTE statement is executed without specifying the device address, the remote enable (REN) line of the GPIB will become TRUE (Low level) and the device connected on the GPIB will be set to the remote-controlled state. To set the REN line to FALSE (High level), execute the LOCAL statement.
  - If the device address followed after the REMOTE statement is specified, only the device address specified by its device address will be set to the remote-controlled state (only when the REN line is TRUE).
    Multiple device addresses can be specified.
    To cancel the remote-controlled state, execute the LOCAL statement.
  - The REMOTE statement is used to set the selected device to the remote-controlled state, however, if the following statements are executed, then the specified device will be automatically set to the remote-controlled state without executing the REMOTE statement.

CLEAR	[device address {, device address}]
OUTPUT	device address {, device address} ; <output data> {,<output data>}
REMOTE	[device address {, device address}]
SEND LISTEN	device address {, device address}
TRIGGER	device address {, device address}

- Example:

```
10  REMOTE 1
20  REMOTE 5
30  REMOTE 1,2,3
```

- Note: The REMOTE statement is not available in the ADDRESSABLE mode.

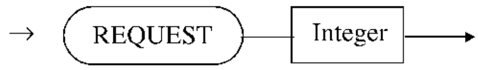
49. REQUEST

- Outline

The REQUEST statement is used to set the status byte which is sent to the external GPIB controller in the ADDRESSABLE mode.

- Syntax

(1)-1



(1)-2

REQUEST integer

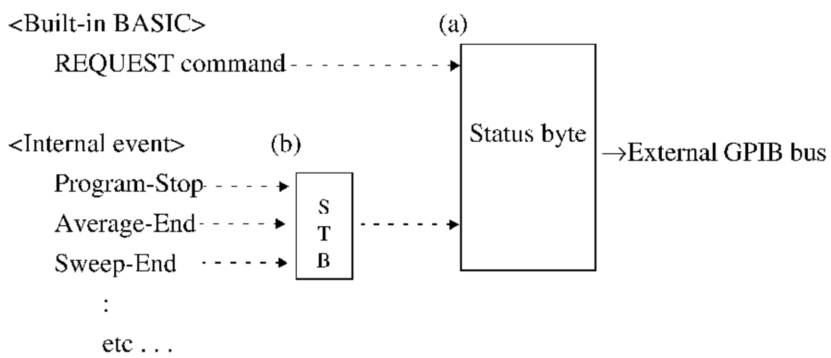
NOTE: The integer can be set to a value between 0 and 255.

- Description
  - The REQUEST statement sets the status byte which is sent to the external GPIB controller in the ADDRESSABLE mode.
  - To transmit the service request (SRQ), the values of 64 to 127 or 192 to 255 (bit 6 indicates "1") must be set.

- Example

10 REQUEST 65

- Note
  - The REQUEST statement is not available in the SYSTEM CONTROLLER mode.
  - Note that the serial poll is used to read the status byte from an external controller. The *STB? of the GPIB command cannot be used.
  - When the SRQD of the GPIB command is executed, the bit 6 of the status byte is always transmitted as "0". This means that the SRQ is not transmitted.
  - Notice on the status byte
    There are two output paths for a status byte as shown below:



(a) This is a status byte which is output through the external GPIB bus. This byte can be read out by using the serial poll (bit 6 of RQS is set to 0 (zero) when read out).

(b) Corresponds to the status register for the internal event. This register's contents can be read out by executing the " * STB?"(Bit 6 (MSS) will not change when this is done).

NOTE: ***The output of (a) is the one most recently stored (by either <Built-in BASIC> or the <Internal event>).***

When executing the REQUEST command under <Built-in BASIC>, the specified value is immediately saved to (a).
When executing a command under <Internal event>, the specified value is saved to (a) if any changes in (b) are detected.

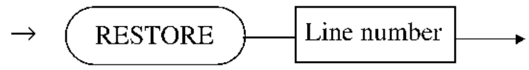
Bit change in (b) can be masked (except the MAV bit (Bit = 4)) by setting enable registers for each registers up to (b).
The MAV bit is set to "1" when receiving a query command; "0" when outputting a query data (including executions of the <Built-in BASIC>). In other words, there is a bit change each time a query command is executed.
The contents of (b) have precedence over the REQUEST command when a query command is executed before sending the contents of (a) (which has already been set by the REQUEST command) via a serial poll.

The status byte is always cleared by executing "* CLS" followed by "REQUEST 0".
"* CLS" is effective for register groups up to (b). However the bit status of (a) cannot be changed if (b) is already "0" (zero) (because there are no changes in (b), (a) stays unchanged).

50. RESTORE

- Outline — The RESTORE statement is used to specify the DATA line which is read out in the next READ statement.

- Syntax — (1)-1



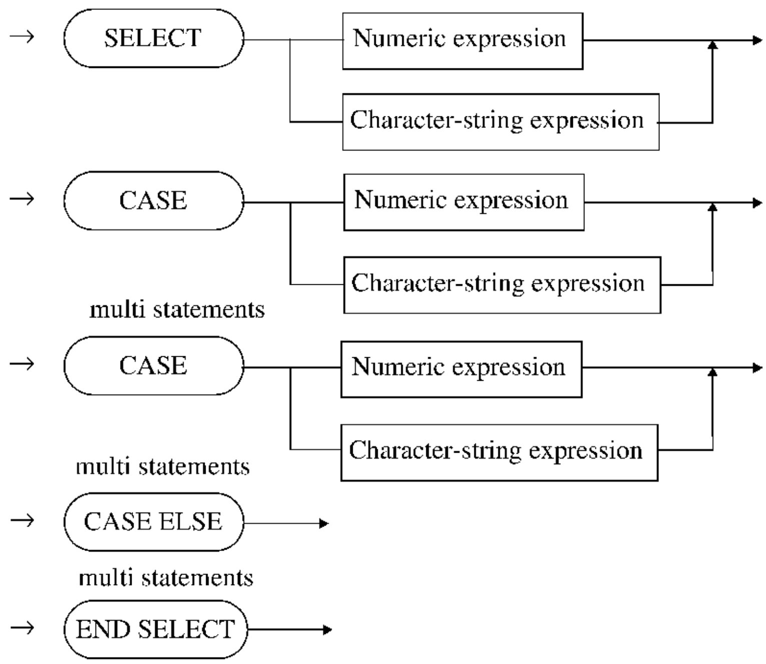
(1)-2

RESTORE line number

- Description
  - The line number is specified by the line number or label.
    Unless otherwise specified, the constant of the DATA statement is read out from the first line of the program in order, and the DATA statement which is objected for the next READ statement in the RESTORE statement.
  - The line number of the argument is the first line number from which the DATA statement search is to start. Therefore, the DATA statement to be specified may be written on the line from which the DATA statement search is to start or any subsequent line.

51. SELECT, CASE, ENS SELECT

- Outline: This statement is used to perform the multiple brunches on condition of the one expression value.
- Syntax: (1)-1



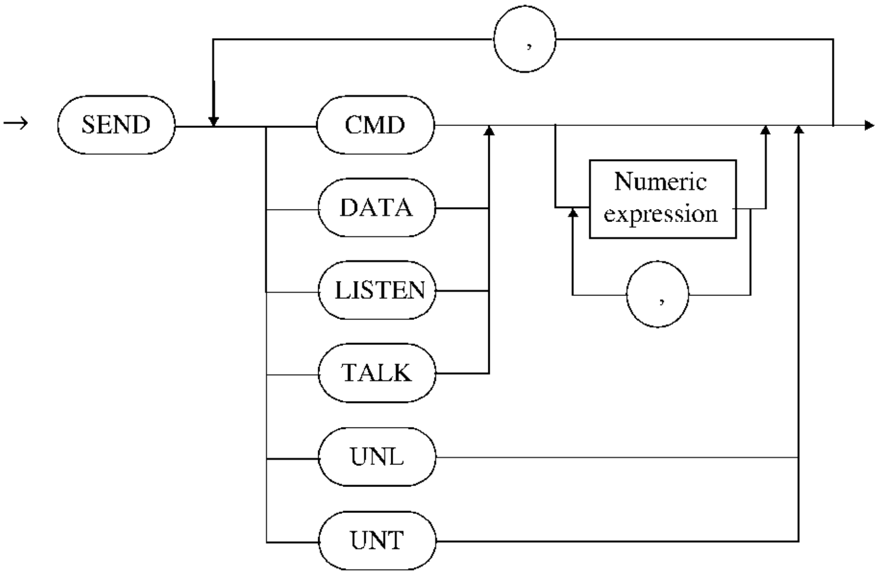
(1)-2

SELECT <numeric expression | character-string expression>
CASE <numeric expression | character-string expression>
    multi statements
CASE <numeric expression | character-string expression>
    multi statements
CASE ELSE
    multi statements
END SELECT

- Description:
  - This statement executes the multiple statements which are agreed with the expression value specified by the SELECT statement followed after the CASE statement.
    The next statements such as CASE, CASE ELSE, or END SELECT can be objected for the execution.
  - Nesting can be preformed in the SELECT statement. In this case, an internal SELECT statement includes the other statements.

52. SEND

- Outline — The SEND statement is used to output the command and data to a GPIB.
- Syntax — (1)-1



(1)-2

SEND <A | B> { , <A | B> }

A : <CMD | DATA | LISTEN | TALK> [numeric expression {, numeric expression}]

B : UNL | UNT

- Description — The SEND statement sends (transmits) the universal command, the address command, and the data independently to the GPIB.

CMD: Sets the ATN line to TRUE (Low level) and sends the numerics given to the GPIB. The numeric is converted into an 8-bit binary data and output to the GPIB. Therefore, the numerics to be used are the range of 0 to 255 and the numerics of decimal point expression are automatically converted into integers.

DATA:Sets the ANT line to FALSE (High level) and sends the numerics given to the GPIB. The numerics to be used are the same as CMD.

LISTEN:Sends the numerics given to the GPIB as listener address group (LAG). Multiple numerics can be specified.

TALK:Sends the numerics given to the GPIB as talker address group (TAG). Multiple numerics cannot be specified.

UNL: Sends the UNL command to the GPIB. The listener (device specified as listener before executing this command) can be canceled.

UNT: Sends the UNT command to the GPIB. The talker (device specified as talker before executing this command) can be canceled.

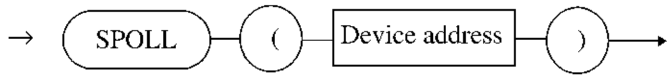
- Example

```
10  SEND UNT UNL LISTEN 1, 2, 3 TALK 4
20  SEND UNT CMD 63, 33 DATA 30,54
```

- Note — The SEND statement is not available in the ADDRESSABLE mode.

53. SPOLL

- Outline: The SPOLL statement is used to perform the serial polling of the specified device and to read out the status byte.
- Syntax: (1)-1



(1)-2

SPOLL (device address)

- Description:
  - When the analyzer is set to the SYSTEM CONTROLLER mode, the SPOLL statement executes the serial polling for the other GPIB devices.
  - When the device address is 0 to 30, the SPOLL statement executes the serial polling for the devices corresponding to each address.
  - When the device address is 31, the SPOOL statement retrieves the status byte for the analyzer regardless of whether ?>the analyzer<? is set to the SYSTEM CONTROLLER mode or the ADDRESSABLE mode.
- Example:

```
10  OUTPUT 31;"OLDC ON"
20  ON ISRQ GOTO 70
30  ENABLE INTR
40  OUTPUT 31;"SRQE"
50  OUTPUT 31;"SINGLE"
60  GOTO 60
70  PRINT SPOLL(31)
80  STOP
```

- Note: In the ADDRESSABLE mode, if the device address between 0 to 30 is specified and the SPOLL is executed, the value "0" will be returned.

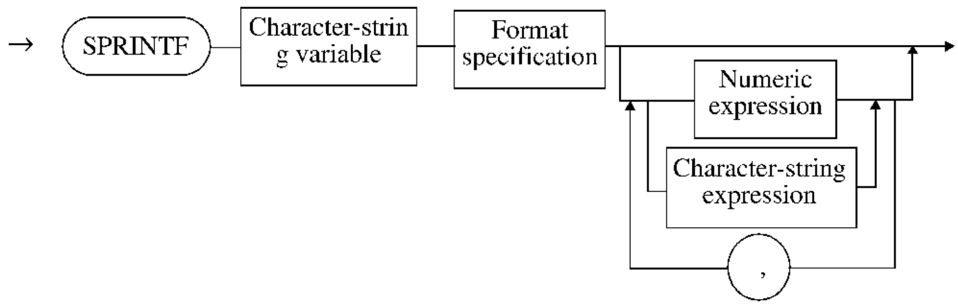
54. SPRINTF

- Outline

  The SPRINTF statement is used to convert the format in accordance with the format conversion of the PRINTF command and to assign the result to the character-string variable.

- Syntax

  (1)-1



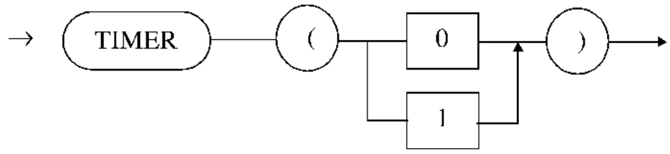
(1)-2

SPRINTF character-string variable format specification [numeric expression | character-string expression {, numeric expression | character-string expression}]

- Description
  - The SPRINTF statement converts the expression value in accordance with the format conversion of the PRINTF command, and assigns the result to the character-string variable of first parameter.
  - Pay attention to the format specification, the number of expression, and the character-string variable size for storing the result.
    If the character string for storing the result does not have enough capacity (free space), the BASIC buffer may be damaged.
    The method of format specification is refer to "45. PRINTF" of section 4.3.

55. TIMER

- Outline: The TIMER statement is used to read/reset the internal system time.
- Syntax: (1)-1



(1)-2
TIMER (0 | 1)

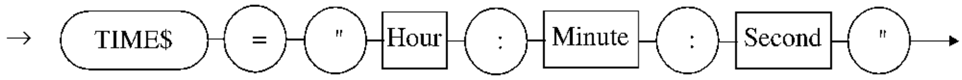
- Description:
  - The TIMER statement is the built-in function, which returns the internal system time with the device of sec. This function is mainly used to check the measurement operation time.
    When the argument 0 is specified: Reads out the internal system time.
    When the argument 1 is specified: Resets the internal system time.
  - The read out value with the resolution of 10msec includes an error of ±10msec.
- Example

```
10  INTEGER I
20  TIMER(1)
30  FOR I=0 TO 10000
40  NEXT I
50  T1=TIMER(0)
60  !
70  TIMER(1)
80  FOR I=0 TO 10000
90      PRINT I
100 NEXT I
110 T2=TIMER(0)
120 !
130 PRINT "PRINT Command execute time is " ;T2-T1
140 STOP
```

56. TIME$

- Outline — The TIME$ statement is used to read/set the time of the built-in timer.
- Syntax — (1)-1

(1)-2
TIME$
(2)-1



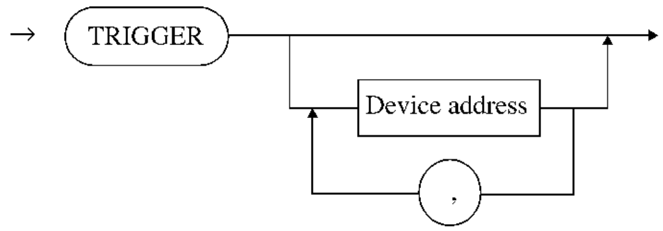
(2)-2
TIME$="hour : minute : second"

- Description
  - The TIME$ statement reads out the time of the built-in timer (RTC).
  - The TIME$ statement can change the time which is read out.
    Input as follows:
    TIME$="23:43:12"
    TIME$="11:5:6"
- Example

```
10  DIM T$[10]
20  T$=TIME$
30  PRINT "Time is "; T$
40  PRINT "Time Reset"
50  TIME$="0:0:0"
60  STOP
```

57. TRIGGER

- Outline: The TRIGGER statement is used to send the group execute trigger (GET) of address command group (ACG) to the all devices connected to the GPIB or to the particular device selected.
- Syntax: (1)-1



(1)-2

TRIGGER [device address {, device address }]

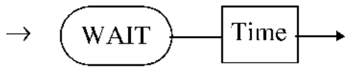
- Description:
  - If only the TRIGGER statement is executed without specifying the device address, only the the group execute trigger (GET) of address command will be transmitted. In this case, the device to be triggered must be set as listener in advance.
  - If the device address followed after the TRIGGER statement is specified, the GET command will be transmitted to only the device address specified by its device address.
- Example:

```
10  TRIGGER 1
20  TRIGGER
```

- Note: The TRIGGER statement is not available in the ADDRESSABLE mode.

58. WAIT

- Outline: The WAIT statement is used to wait for the specified time.
- Syntax: (1)-1



(1)-2

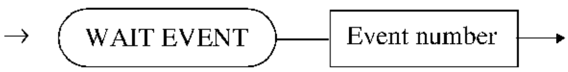
WAIT time

- Description: The WAIT statement waits for the specified time. The unit of time is msec. The setting range of time between 0 to 65535.
- Example:

```
10 INTEGER T
20 T=30
30 PRINT T;"[msec] Wait !!"
40 WAIT T
50 STOP
```

59. WAIT EVENT

- Outline: The WAIT EVENT statement is used to wait the event until the specified event is generated.
- Syntax: (1)-1



(1)-2

WAIT EVENT event number

- Description: The WAIT EVENT statement waits the event until the specified event number is generated.

  Event number:1;sweep end
- Example:

```
10 INTEGER EV
20 EV=1
25 OUTPUT 31;"OLDC OFF"
30 OUTPUT 31;"INIT:CONT OFF;:ABOR;INIT"
40 WAIT EVENT EV
50 PRINT "SWEEP FINISHED"
60 STOP
```

4.4 Built-in Function

4.4.1 Outline

The Built-in function is a function which is built into the analyzer and can perform a high-speed processing. The data measured with a network analyzer by using the built-in function.

The built-in function is available for analyzing or judging the measured data. The basic function is used similarly as the existing network analyzer R3751, however, care is taken to partially added or deleted functions. Also the processing speed is improved.

The numeric values in the built-in function cannot specify the device. Any value is managed as a standard device.

Example: When calculating 10KHz address point

P = POINT2(1E+8, 0)

Also the response data from the built-in function is similarly processed as the numeric value of the standard unit.

1. Measurement data and address point

   Use the address point for specifying the analysis range of the measurement data or the position in the measurement data. The address point specifies the measurement data by using the value of 0 through 1200. The measurement point is corresponded as follows:

   - When the measurement point number is 1201

     Address point value is incremented by one for the next data.

First data	Address point 0
2nd data	Address point 1
3rd data	Address point 2
:	
n-th data	Address point n-1
:	
1201st data	Address point 1200

   - When the measurement point number is 801

     The data for address points 801 through 1201 is invalid.

   - When the measurement point number is 601

     Address point value is incremented by two for the next data.

First data	Address point 0
2nd data	Address point 2
3rd data	Address point 4
:	
n-th data	Address point 2(n-1)
:	
601st data	Address point 1200

- When the measurement point number is 301

  Address point value is incremented by four for the next data.

  First data Address point 0

  2nd data Address point 4

  3rd data Address point 8

  :

  n-th data Address point 4(n-1)

  :

  301st data Address point 1200

  Relation between measurement point number and addition value of address point is as follows:

Table 4-5 Relation between measurement point number and addition value of address point

Measurement point number	Addition value of address point	Measurement point number	Addition value of address point
1201	1	101	12
801*	1	51	24
601	2	21	60
401	3	11	120
301	4	6	240
201	6	3	600

The above definition is also applicable for the user or program sweep. When the number of measurement points is 1201 and sweep mode is the user sweep, the next address point is always incremented by one. The data is packed starting with address point 0. If the total number of points within the segment does not exceed 601, the address point is incremented by 2 and the data is arranged every other point. Using the above rules, any specifications change to a built-in function is not required even if the number of measurement points is changed.

When the user or program sweep is performed using the total number of segment points (which is less than the number of measurement points), the data for the excess points is invalid (same as the case, which consists of 801 measurement points, as described above). On the contrary, if the total number of segment points exceeds the number of measurement points, the latter are automatically changed. For example, if the measurement points are 201 and the total number of segment points are 250 (which has exceeded 201), the measurement points is automatically becomes 301, and the data for address points 1000 through 1200 is invalid.

The number of measurement points will not be restored to the original number even though you set the total number of points to a number less than 201.

The relationships between measurement point numbers and address points are the same as for the R3751.

2. Analysis channel

Analysis channel specification is as follows:

Table 4-6 Each measurement channel and analysis channel

Channel	Description
0	Display data of CH1
1	Display data of CH2
2	Memory data of CH1
3	Memory data of CH2
8	Display data of CH1 (Phase data of LOGMAG&PHASE, etc.)
9	Display data of CH2 (Phase data of LOGMAG&PHASE, etc.)
10	Memory data of CH1 (Phase data of LOGMAG&PHASE, etc.)
11	Memory data of CH2 (Phase data of LOGMAG&PHASE, etc.)
32	LOGMAG data of CH1
33	Phase data of CH1
34	Real part data of CH1
35	Imaginary part data of CH1
36	LOGMAG data of CH2
37	Phase data of CH2
38	Real part data of CH2
39	Imaginary part data of CH2
40	LOGMAG data of CH1 memory
41	Phase data of CH1 memory
42	Real part data of CH1 memory
43	Imaginary part data of CH1 memory
44	LOGMAG data of CH2 memory
45	Phase data of CH2 memory
46	Real part data of CH2 memory
47	Imaginary part data of CH2 memory

3. Response formats for built-in function

Response formats for built-in function are provided for three types.

- Measurement point

  Address point including measurement data.

  Example; MAX function

- Address point

  At other than measurement point, interpolate to set the value of address point.

  Example; VALUE function

- Compensate

  Interpolate to set a value.

  Example; CVALUE function

4.4.2 List of Built-In Function

- Address point relation

POINT1(F,C):	meas point;	Measurement point closed to specified frequency
POINT2(F,C):	address point;	Address point closed to specified frequency
DPOINT(F0,F1,C):	address point;	Address point width corresponding to specified frequency width
POINT1L(F,C):	meas point;	Max. measurement point less than specified frequency
POINT1H(F,C):	meas point;	Min. measurement point more than specified frequency
POINT2L(F,C):	address point;	Max. address point less than specified frequency
POINT2H(F,C):	address point;	Min. address point more than specified frequency
SWPOINT(C):	meas point;	Latest measurement point

- Frequency relation

FREQ(P,C):	address point;	Frequency corresponding to specified address point
DFREQ(P0,P1,C):	address point;	Frequency width corresponding to specified address point width
SWFREQ(C):	meas point;	Latest measurement frequency

- Response relation

VALUE(P,C):	address point;	Response value in specified address point
DVALUE(P0,P1,C):	address point;	Difference of response values between specified address points
CVALUE(F,C):	compensate;	Response value in specified frequency
DCVALUE(F0,F1,C):	compensate;	Difference of response values between specified frequencies
SWVALUE(C):	meas point;	Latest response value

- Max. value/Min. value relation

MAX(P0,P1,C):	meas point;	Max. response value between specified address points
FMAX(P0,P1,C):	meas point;	Max. response frequency between specified address points
PMAX(P0,P1,C):	meas point;	Measurement point in max. response between specified address points
MIN(P0,P1,C):	meas point;	Min. response value between specified address points
FMIN(P0,P1,C):	meas point;	Min. response frequency between specified address points
PMIN(P0,P1,C):	meas point;	Measurement point in min. response between specified address points

- Bandwidth relation

BND(P,X,C):	compensate;	Bandwidth attenuating specified data from specified address point
BNDL(P,X,C):	compensate;	Frequency in low frequency side attenuating specified data from specified address point
BNDH(P,X,C):	compensate;	Frequency in high frequency side attenuating specified data from specified address point
CBND(F,X,C):	compensate;	Bandwidth attenuating specified data from specified address point
CBNDL(F,X,C):	compensate;	Frequency in low frequency side attenuating specified data from specified frequency
CBNDH(F,X,C):	compensate;	Frequency in high frequency side attenuating specified data from specified frequency
MBNDI(P0,P1,P,N,La,Fa,C):		
	compensate;	Frequency in low frequency side, frequency in high frequency side, center frequency and bandwidth attenuating specified data from specified address point between specified address points
MBNSO(P0,P1,P,N,La,Fa,C):		
	compensate;	Frequency in low frequency side, frequency in high frequency side, center frequency and bandwidth attenuating specified data from specified address point between specified address points

- Ripple relation-1

RPL1(P0,P1,dX,dY,C):		
	meas point;	Difference in max. value and min. value between specified address points
RPL2(P0,P1,dX,dY,C):		
	meas point;	Max. value of difference in max. value and min. value adjoining between specified address points
RPL3(P0,P1,dX,dY,C):		
	meas point;	Max. value adding difference in max. value and min. value adjoining between specified address points
RPL4(P0,P1,dX,dY,C):		
	meas point;	Max. point of difference in max. value and min. value adjoining between specified address points
RPL5(P0,P1,dX,dY,C):		
	meas point;	Largest value of max. value between specified address points
RPL6(P0,P1,dX,dY,C):		
	meas point;	Smallest value of max. value between specified address points
RPLF(P0,P1,dX,dY,C):		
	meas point;	Frequency difference in first max. value and min. value between specified points

RPLR(P0,P1,dX,dY,C):		
	meas point;	Response difference in first max. value and min. value between specified points
RPLH(P0,P1,dX,dY,C):		
	meas point;	Response value in first max. value between specified address points
FRPLH(P0,P1,dX,dY,C):		
	meas point;	Frequency in first max. value between specified address points
PRPLH(P0,P1,dX,dY,C):		
	meas point;	Measured point in first max. value between specified address points
RPLL(P0,P1,dX,dY,C):		
	meas point;	Response value in first min. value between specified address points
FRPLL(P0,P1,dX,dY,C):		
	meas point;	Frequency in first min. value between specified address points
FRPLL(P0,P1,dX,dY,C):		
	meas point;	Measured point in first min. value between specified address points

- Ripple relation-2

NRPLH(P0,P1,dX,dY,C):		
	meas point;	Nos. of max. point between specified address points
NRPLL(P0,P1,dX,dY,C):		
	meas point;	Nos. of min. point between specified address points
PRPLHN(N,C):	meas point;	Measured point in N-th max. value with NRPLH
PRPLLN(N,C):	meas point;	Measured point in N-th min. value with NRPLL
FRPLHN(N,C):	meas point;	Frequency in N-th max. value with NRPLH
FRPLLN(N,C):	meas point;	Frequency in N-th min. value with NRPLL
VRPLHN(N,C):	meas point;	Response value in N-th max. value with NRPLH
VRPLLN(N,C):	meas point;	Response value in N-th min. value with NRPLL
PRPLHM(Pa,C):	meas point;	Measured point array in max. value with NRPLH
PRPLLM(Pa,C):	meas point;	Measured point array in min. value with NRPLL
FRPLHM(Xa,C):	meas point;	Frequency array in max. value with NRPLH
FRPLLM(Xa,C):	meas point;	Frequency array in min. value with NRPLL
VRPLHM(Xa,C):	meas point;	Response value array in max. value with NRPLH
VRPLLM(Xa,C):	meas point;	Response value array in min. value with NRPLL

- Direct search relation

DIRECT(P0,P1,X,C):	address point;	Address point closed to first detected data between specified address points
DIRECTL(P0,P1,X,C):		
	meas point;	Measured point in first detected data by search of low frequency side between specified address points
DIRECTH(P0,P1,X,C):		
	meas point;	Measured point in first detected data by search of high frequency side between specified address points
CDIRECT(F0,F1,X,C):		
	compensate;	Frequency in first detected data between specified frequencies
CDIRECTL(F0,F1,X,C):		
	compensate;	Frequency in first detected data by search of low frequency side
CDIRECTH(F0,F1,X,C):		
	compensate;	Frequency in first detected data by search of high frequency side between specified frequencies
DDIRECT(P0,P1,X,C):		
	address point;	Address point width in specified data between specified address points
CDDIRECT(F0,F1,X,C):		
	compensate;	Bandwidth in specified data between specified frequencies
ZEROPHS(P0,P1,C):	compensate;	Frequency in zero (0) phase between specified address points

- Data transfer relation

TRANSR(P0,P1,Xa,C):		
	meas point;	Transfer of measured data between specified address points to array
TRANSW(P0,P1,Xa,C):		
	meas point;	Transfer from array to specified address point

P,P0,P1:	Address point specification
F,F0,F1:	Frequency specification
C:	Analysis channel specification
dX:	Gradient horizontal axis specification
dY:	Gradient vertical axis specification
X:	Level specification
N:	Number(s) and N-th specification
Xa,La,Fa:	Array specification
Pa:	Integer array specification

4.4.3 Function Obtaining Address Point

1. Functions which obtains measurement point POINT1, POINT1L, POINTIH

```
POINT1     (frequency, analysis channel)
POINT1L    (frequency, analysis channel)
POINT1H    (frequency, analysis channel)
```

Explanation: Obtain a measurement point in specified frequency.

POINT1 function: Obtains the measurement point closed to specified frequency. Round to the nearest whole number by conversion to measured point.

POINT1L function: Obtains the largest measurement point less than specified frequency. Omit the figures by conversion to measured point.

POINT1H function: Obtains the smallest measurement point more than specified frequency. Raise to a unit by conversion to measured point.

Usage: Most built-in functions have set an address point to an argument. For using other built-in functions, convert a frequency to a measurement point. When analysis range is specified, raising to a unit or omitting is accurate for specifying the range.

Example: P0=POINT1L(F0,0)

P1=POINT1H(F1,0)

X=MAX(P0,P1,0) Search the max. value in the range including the frequency, F0, F1.

P=POINT1(F,0)

Y=VALUE(P,0) Read out the measured data closed to the frequency, F.

2. Functions which obtains address point POINT2, POINT2L, POINT2H

```
POINT2     (frequency, analysis channel)
POINT2L    (frequency, analysis channel)
POINT2H    (frequency, analysis channel)
```

Explanation: Obtain an address point in specified frequency.

POINT2 function: Obtains the address point closed to specified frequency. Round to the nearest whole number by conversion to address point.

POINT2L function: Obtains the largest address point less than specified frequency. Omit the figures by conversion to address point.

POINT2H function: Obtains the smallest address point more than specified frequency. Raise to a unit by conversion to address point.

Usage: Most built-in functions have set an address point to an argument. For using other built-in functions, convert a frequency to an address point.

Example: P=POINT2(F,0)

Y=VALUE(P,0)

Read out the measured data closed to the frequency, F, measured data at measurement point and at other cases interpolate to read out.

3. Function which obtains address point width DPOINT

DPOINT (frequency1, frequency2, analysis channel

Explanation : Obtain an address point width corresponding to frequency width.

4. Function which obtains the latest measurement point SWPOINT

SWPOINT (analysis channel)

Explanation: Calculate the latest measurement point during sweep.

Usage: Sweep condition is shown by using SWPOINT (analysis channel).
As the following example, the data swept during the sweep can be analyzed.

Example:
```
*SWEEPING1
 IF SWPOINT(0)<P1 THEN GOTO *SWEEPING1
 X=MAX(P0,P1,0)
```

CAUTION: ***When the analyzer is sweeping at high speed, the measured point is intermittently read out.***

4.4.4 Function Obtaining Frequency

1. Function which obtains frequency FREQ

FREQ (address point, analysis channel)

Explanation: Convert address point to frequency.

Usage: Convert the function value which returns address point to frequency

Example:
```
P=PMAX(0,1200,0)
F=FREQ(P,0)
X=VALUE(P,0)
```

Obtain the max. frequency and response value. Calculate at the higher speed since the search is once executed without using MAX, FMAX.

2. Function which obtains frequency width DFREQ

DFREQ (address point1, address point2, analysis channel)

Explanation: Convert from specified address point to frequency width.

3. Function which obtains latest width SWFREQ

SWFREQ (analysis channel)

Explanation: Obtain the latest measurement frequency during measurement.
Usage: Sweeping frequency are shown by using SWFREQ(analysis channel).
Example:
```
*SWEEPING1
IF SWFREQ(0)<F1 THEN GOTO *SWEEPING1
X=CVALUE(F1)
```

CAUTION: ***When the analyzer is sweeping at high speed, the measured point is intermittently read out.***

4.4.5 Function Obtaining Response

1. Function which obtains response VALUE

VALUE (address point, analysis channel)

Explanation: Read out response in specified address point. When address point is not measurement point, interpolate to obtain.
Usage: Convert the function value which returns address point to response value.
Example:
```
P=PMAX(0,1200,0)
F=FREQ(P,0)
X=VALUE(P,0)
```

Obtain the max. frequency and response value. Calculate at the higher speed since the search is once executed without using MAX, FMAX.

2. Function which obtains response difference DVALUE

DVALUE (address point1, address point2, analysis channel)

Explanation: Obtain each difference of response value in specified address point.

3. Function which obtains response value CVALUE

CVALUE (frequency, analysis channel)

Explanation: Obtain response value corresponding to specified frequency.

4. Function which obtains response difference DCVALUE

DCVALUE (frequency1, frequency2, analysis channel)

Explanation: Calculate each difference of response values in specified frequency.

5. Function which obtains latest response value SWVALUE

SWVALUE (analysis channel)

Explanation: Obtain the latest measured response value during measurement.

Usage: Available for adjustment by monitoring a response value.

Example:
```
*ADJUST
IF SWVALUE(33)<=PHASE1 THEN GOTO *ADJUST_END
OUTPUT 33;C
GOTO *ADJUST
*ADJUST_END
```

Output to parallel I/O till a phase value drops less than a designated value.

CAUTION: ***When the analyzer is sweeping at high speed, the measured point is intermittently read out.***

4.4.6 Function calculating Max. value, Min. value

1. Function which calculates max. response value MAX

MAX (start address point, end address point, analysis channel)

Explanation: Searches max. response value between specified address points.

Usage: Used when the response value of resonance point is calculated.

Example: X=MAX(0,1200,0)

2. Function which obtains the frequency of max. response FMAX

FMAX (start address point, end address point, analysis channel)

Explanation: Calculates the frequency of max. response between specified address points.

Usage: Used when the frequency of resonance point is calculated.

Example: F=FMAX(0,1200,0)

3. Function which obtains the measurement point of max. response PMAX

PMAX (start address point, end address point, analysis channel)

Explanation: Calculates the measurement point of max. response between specified address points.

Usage: Used when the frequency of resonance point, response value or also address point in another analysis is obtained.

Example 1:
```
P=PMAX(0,1200,0)
F=FREQ(P,0)
X=VALUE(P,0)
```

Obtain the frequency and response value from the measured point in the max. value. Calculate at the higher speed since the search is once executed, compared with the use of MAX, FMAX.

Example 2:
```
P=PMAX(0,1200,0)
FB=BND(P,3,0)
```

Obtain the bandwidth of -3dB from peak value.

4. Function which obtains min. response value MIN

MIN (start address point, end address point, analysis channel)

Explanation: Search the min. response value between specified address points.

Usage: Used when the response value of anti-resonance point is obtained.

Example: X=MIN(0,1200,0)

5. Function which obtains the frequency of min. response FMIN

FMIN (start address point, end address point, analysis channel)

Explanation: Calculates the frequency of min. response between specified address points.

Usage: Used when the frequency of anti-resonance point is obtained.

Example: F=FMIN(0,1200,0)

6. Function which obtains the measurement point of min. response PMIN

PMIN (start address point, end address point, analysis channel)

Explanation: Calculates the measurement point of minx. response between specified address points.

Usage: Used when the frequency of anti-resonance point and response value are obtained.

Example:
```
P=PMIN(0,1200,0)
F=FREQ(P,0)
X=VALUE(P,0)
```

Obtain the frequency and response value from the measured point in the min. value. Calculate at the higher speed since the search is once executed, compared with the use of FMIN, MIN.

4.4.7 Function Obtaining Bandwidth, etc.

1. Function which obtains bandwidth BND

BND (address point, attenuation level, analysis channel)

Explanation: Obtain the bandwidth by searching the point which attenuated the specified attenuation level value from the specified address point.

The search is executed outside the specified address point.

Usage: Obtain 3dB less bandwidth, etc.

Example:
```
P=PMAX(0,1200,0)
F=BND(P,3,0)
```

Obtain 3dB less bandwidth.

2. Function which obtains frequency of low frequency side in bandwidth BNDL

BNDL (address point, attenuation level, analysis channel)

Explanation: Obtain the frequency by searching the point to the low frequency side, which attenuated the specified attenuation level value from the specified address point. The search is executed outside the specified address point.

Usage: Obtain center frequency, combined with BNDH.

3. Function which obtains frequency of high frequency side in bandwidth BNDH

BNDH (address point, attenuation level, analysis channel)

Explanation: Obtain the frequency by searching the point to the high frequency side, which attenuated the specified attenuation level value from the specified address point. The search is executed outside the specified address point.

Usage: Obtain center frequency, combined with BNDL.

Example:
```
P=PMAX(0,1200,0)
FH=BNDH(P,3,0)
FL=BNDL(P,3,0)
FB=FH-FL
FC=(FL+FH)*0.5
```

4. Function which obtains bandwidth CBND

CBND (frequency, attenuation level, analysis channel)

Explanation: Obtain the bandwidth by searching the point which attenuated the specified attenuation level value from the specified frequency.

The search is executed outside the specified address point.

Usage: Obtain 3dB less bandwidth, etc.

Example: F=BND(F,3,0)

Obtain 3dB less bandwidth.

5. Function which obtains frequency of low frequency side in bandwidth CBNDL

CBNDL (frequency, attenuation level, analysis channel)

Explanation: Obtain the frequency by searching the point to the low frequency side, which attenuated the specified attenuation level value from the specified frequency.

Usage: Obtain center frequency, combined with CBNDH.

6. Function which obtains frequency of high frequency side in bandwidth CBNDH

CBNDH (frequency, attenuation level, analysis channel)

Explanation: Obtain the frequency by searching the point to the low frequency side, which attenuated the specified attenuation level value from the specified frequency.

Usage: Obtain center frequency, combined with CBNDL.

Example:
```
FH=CBNDH(F,3,0)
FL=CBNDL(F,3,0)
FB=FH-FL
FC=(FL+FH)*0.5
```

7. Function which obtains bandwidth analysis for multiple attenuation levels MBNDI

MBNDI	(start address point, end address point, standard address point, nos, of attenuation level, attenuation level array, array storing analysis result such as bandwidth, analysis channel)

Explanation: Multiple attenuation levels are once analyzed. Outputs four types of frequency in low frequency side, frequency in high frequency side, center frequency and bandwidth to one attenuation level.

The attenuation level is specified in array and the analysis result is stored in array. The search is executed outside the specified address point. The array for attenuation level should be in order of low level.

Usage: Calculate at high speed when multiple attenuation levels are analyzed.

Available when four frequencies are required to one attenuation level.

Example:

```
DIM L(3), F(3,4)
L(1)=1.0
L(2)=3.0
L(3)=10.0
P=PMAX(0,1200,0)
N=MBNDI(0,1200,P,3,L(1),F(1,1),0)
```

In this case, the followings are stored in the array F.

F(1,1)	Frequency in low frequency side at attenuation level of 1.0
F(1,2)	Frequency in high frequency side at attenuation level of 1.0
F(1,3)	Center frequency at attenuation level of 1.0
F(1,4)	Bandwidth at attenuation level of 1.0
F(2,1)	Frequency in low frequency side at attenuation level of 3.0
F(2,2)	Frequency in high frequency side at attenuation level of 3.0
F(2,3)	Center frequency at attenuation level of 3.0
F(2,4)	Bandwidth at attenuation level of 3.0
F(3,1)	Frequency in low frequency side at attenuation level of 10.0
F(3,2)	Frequency in high frequency side at attenuation level of 10.0
F(3,3)	Center frequency at attenuation level of 10.0
F(3,4)	Bandwidth at attenuation level of 10.0

When the search ca not be executed, (0.0) is entered. To N, the nos. of attenuation level is entered.

8. Function which obtains bandwidth analysis for multi attenuation levels MBNDO

MBNDO	(start address point, end address point, standard address point, nos, of attenuation level, attenuation level array, array storing analysis result such as bandwidth, analysis channel)

Explanation: The function is the same as MBNDI, however, the search is executed from outside to inside.

Usage: Used when the search is executed from outside to inside.

Example:
```
DIM L(3), F(3,4)
L(1)=1.0
L(2)=3.0
L(3)=10.0
P  =PMAX(0,1200,0)
N  =MBNDO(0,1200,P,3,L(1),F(1,1),0)
```

In this case, the array F is stored similarly at MBNDI.

4.4.8 Ripple Analysis Function-1

1. Function which obtains the difference between the max. value and min. value RPL1

RPL1	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Calculates the difference between the max. value and min. value by detecting the highest or lowest value between the specified address points in accordance with the gradient coefficient for horizontal or vertical axis.

Usage: Analyzes the ripple to be measured.

Example: X=RPL1(0,1200,1,0.5,0)

Calculates the difference between the max. value and min. value in the ripple which drops or raise 0.5dB a point.

2. Function which calculates the difference between the max. value and min. value RPL2

RPL2	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detects the max. value or min. by detecting the max. or min value between specified address points according to the gradient coefficient for horizontal or vertical axis. Calculate the max. value in the difference between the closed max. value and min. value.

The max. value is low frequency side to the closed max. and min. value.

Usage: Analyzes the ripple to be measured.

Example: P=PMAX(0,1200,0)
X=RPL2(0,P,1,0.5,0)

Calculates the difference between the max. value and min. value closed to the left to the peak point in the ripple which drops or raise 0.5dB a point.

3. Function which calculates the max. for the value adding the difference between the max. value and min. value RPL3

RPL3	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. and min. value between the specified points in accordance with the gradient coefficient in the vertical and horizontal axis. Calculate the max. value by adding the difference between the max. and min. value or the difference between the min. and max. value.

Usage: Analyzes the ripple to be measured.

Example: X=RPL3(0,1200,1,0.5,0)

Analyzes the ripple which drops or raise 0.5dB a point.

4. Function which calculates the difference between the max. value and min. value RPL4

RPL4	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value or min. by detecting the max. or min value between specified address points according to the indent coefficient for horizontal or vertical axis. Calculate the max. value in the difference between the closed max. value and min. value.

The max. value is low frequency side to the closed max. and min. value.

The pair of the max. and min. is conversed to RPL2.

Usage: Analyze the ripple to be measured.

Example: P=PMAX(0,1200,0)
X=RPL4(P,1200,1,0.5,0)

Calculates the difference between the max. value and min. value closed to the left to the peak point in the ripple which drops or raise 0.5dB a point.

5. Function which obtains the max. value in the highest mark. RPL5

RPL5	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points according to the indent coefficient for horizontal or vertical axis to calculate the max. value.

Usage: Analyze the ripple spurious to be measured.

Example: X=RPL5(P0,P1,1,0.5,0)

Obtain the max. value in the ripple which drops or raise 0.5dB a point.

6. Function which obtains the min. value in the max. value RPL6

RPL6	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the max. value in the min.

Usage: Analyze the ripple spurious to be measured.

Example: X=RPL6(P0,P1,1,0.5,0)

Obtain the max. value in the min. in the ripple which drops or raise 0.5dB a point.

7. Function which calculates the frequency difference between the min. value and max. value RPLF

RPLF	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to calculate the frequency difference between the first max. value and next min. value.

Usage: Analyze the ripple to be measured.

Example: X=RPLF(P0,P1,1,0.5,0)

Calculate the frequency difference between the max. value and min. value in the ripple which drops or raise 0.5dB a point.

8. Function which calculates the response difference between the max. value and min. value RPLR

RPLR	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to calculate the response difference between the first max. value and the next min. value.

Usage: Analyzes the ripple to be measured.

Example: X=RPLR(P0,P1,1,0.5,0)

Calculates the response difference between the max. value and min. in the ripple which drops or raise 0.5dB a point.

9. Function which obtains the response value in the max. value RPLH

RPLH	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the response value in the first max. value.

Usage: Analyze the ripple to be measured.

Example: X=RPLH(P0,P1,1,0.5,0)

Obtain the max. response value in the ripple which drops or raise 0.5dB a point.

10. Function which obtains frequency in max. value FRPLH

FRPLH	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the frequency in the first max. value.

Usage: Analyze the ripple to be measured.

Example: X=FRPLH(P0,P1,1,0.5,0)

Obtain the frequency in max. in the ripple which drops or raise 0.5dB a point.

11. Function which obtains measurement point in the max. value PRPLH

PRPLH	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the measurement point in the first max. value.

Usage: Analyze the ripple to be measured.

Example: X=PRPLH(P0,P1,1,0.5,0)

Obtain the max. measurement value in the ripple which drops or raise 0.5dB a point.

12. Function which obtains response value in min. value RPLL

RPLL	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the min. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the frequency in the first min. value.

Usage: Analyze the ripple to be measured.

Example: X=RPLL(P0,P1,1,0.5,0)

Obtain the response value in min. in the ripple which drops or raise 0.5dB a point.

13. Function which obtains frequency in the min. value FRPLL

FRPLL	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the min. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the frequency in the first min. value.

Usage: Analyze the ripple to be measured.

Example: X=FRPLL(P0,P1,1,0.5,0)

Obtain the min. frequency in the ripple which drops or raise 0.5dB a point.

14. Function which obtains measurement point in the min. value PRPLL

PRPLL	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the min. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to obtain the measurement point in the first min. value.

Usage: Analyze the ripple to be measured.

Example: X=PRPLL(P0,P1,1,0.5,0)

Obtain the min. measurement point in the ripple which drops or raise 0.5dB a point.

4.4.9 Ripple Analysis Function-2

1. Function which obtains the number of the max. value NRPLH

NRPLH	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the max. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to calculate the number of the max. value by storing the max. value information inside.

Usage: Analyze the ripple to be measured.

Example: NH=NRPLH(0,1200,1,0.5,0)

Obtain the number of the max. value in the ripple which drops or raise 0.5dB a point.

2. Function which obtain the number of the min. value NRPLL

NRPLL	(start address point, end address point, gradient coefficient for horizontal axis, gradient coefficient for vertical axis, analysis channel)

Explanation: Detect the min. value between the specified points in accordance with the gradient coefficient for horizontal or vertical axis to calculate the number of the max. value by storing the min. value information inside.

Usage: Analyze the ripple to be measured.

Example: NL=NRPLL(0,1200,1,0.5,0)

Obtain the number of the min. value in the ripple which drops or raise 0.5dB a point.

3. Function which obtains measurement point for the max. or min. value PRPLHN, PRPLLN

PRPLHN	(number specification of ripple, analysis channel)
PRPLLN	(number specification of ripple, analysis channel)

Explanation: PRPLHN; Calculate the measurement point for the N-th max. value in NRPLH.
PRPLLN; Calculate the measurement point for the N-th min. value in NRPLL.

Example:
```
NH =NRPLH(0,1200,1,0.5,0)
NL =NRPLL(0,1200,1,0.5,0)
PH2=PRPLHN(2,0)
PL2=PRPLLN(2,0)
```

Execute the NRPLH, NRPLL to calculate the measurement point for the second max. or min value.

4. Function which obtains frequency for the max. or min. value FRPLHN, FRPLLN

FRPLHN	(number specification of ripple, analysis channel)
FRPLLN	(number specification of ripple, analysis channel)

Explanation: FRPLHN; Obtain the frequency for the N-th max. value in NRPLH.
FRPLLN; Obtain the frequency for the N-th min. value in NRPLL.

Usage: Analyze the ripple to be measured.

Example:
```
NH =NRPLH(0,1200,1,0.5,0)
NL =NRPLL(0,1200,1,0.5,0)
FH2=FRPLHN(2,0)
FL2=FRPLLN(2,0)
```

Execute the NRPLH, NRPLL to obtain the frequency for the second max. or min value.

5. Function which obtains response value for the max. or min. value VRPLHN, VRPLLN

VRPLHN	(number specification of ripple, analysis channel)
VRPLLN	(number specification of ripple, analysis channel)

Explanation: VRPLHN; Obtain the response value for the N-th max. value in NRPLH.
VRPLLN; Obtain the response value for the N-th min. value in NRPLL.

Usage: Analyze the ripple to be measured.

Example:
```
NH =NRPLH(0,1200,1,0.5,0)
NL =NRPLL(0,1200,1,0.5,0)
XH2=VRPLHN(2,0)
XL2=VRPLLN(2,0)
```

Execute the NRPLH, NRPLL to obtain the response value for the second max. or min value.

6. Function which batches process of calculating measurement point for the max. or min. value PRPLHM, PRPLLM

PRPLHM	(integer array, analysis channel)
PRPLLM	(integer array, analysis channel)

Explanation: PRPLHM; Calculate the measurement point in the max. value in NRPLH.

PRPLLM; Calculate the measurement point in the min. value in NRPLL.

Usage: Analyzes the ripple to be measured.

Example:

```
INTEGER PH(600),PL(600)
NH =NRPLH(0,1200,1,0.5,0)
NL =NRPLL(0,1200,1,0.5,0)
NH =PRPLHM(PH(1),0)
NL =PRPLLM(PL(1),0)
```

Execute the NRPLH, NRPLL to enter the measurement point in the max. and min value in the array.

7. Function which batches process of obtaining frequency for the max. or min. value FRPLHM, FRPLLM

FRPLHM	(real array, analysis channel)
FRPLLM	(real array, analysis channel)

Explanation: FRPLHM; Obtain the frequency in the max. value in NRPLH.

FRPLLM; Obtain the frequency in the min. value in NRPLL.

Usage: Analyze the ripple to be measured.

Example:

```
DIM FH(600),FL(600)
NH =NRPLH(0,1200,1,0.5,0)
NL =NRPLL(0,1200,1,0.5,0)
NH =FRPLHM(FH(1),0)
NL =FRPLLM(FL(1),0)
```

Execute the NRPLH, NRPLL to enter the frequency in the max. and min value in the array.

8. Function which batches process of obtaining response value for the max. or min. value
   VRPLHM, VRPLLM

VRPLHM	(real array, analysis channel)
VRPLLM	(real array, analysis channel)

Explanation: VRPLHM;Obtain the response value in the max. value in NRPLH.

VRPLLM; Obtain the response value in the min. value in NRPLL.

Usage: Analyze the ripple to be measured.

Example:
```
DIM XH(600),XL(600)
NH  =NRPLH(0,1200,1,0.5,0)
NL  =NRPLL(0,1200,1,0.5,0)
NH  =VRPLHM(XH(1),0)
NL  =VRPLLM(XL(1),0)
```

Execute the NRPLH, NRPLL to enter the response value in the max. and min value in the array.

4.4.10 Direct Search

1. Function which obtains address point corresponding to specified response DIRECT

DIRECT (start address point, end address point, response value, analysis channel)

Explanation: Search the specified response value between specified address points to set the corresponded address point. The search direction is from low frequency to high frequency.

Example: P=DIRECT(0,1200,-10.0,0)

Search the data position of -10dB.

2. Function which calculates measurement point corresponding to specified response DIRECTL, DIRECTH

DIRECTL	(start address point, end address point, response value, analysis channel)
DIRECTH	(start address point, end address point, response value, analysis channel)

Explanation: Search the specified response value between specified address points to set the corresponded measurement point. The search direction of DIRECTL is from low frequency to high frequency and of DIRECTH is from high frequency to low frequency. when a response corresponds to the specified response, the measurement point is returned. When it not corresponded, the measurement point more than the specified response value is returned. Therefore, The continuous search is easy to execute.

Example:
```
P0=DIRECTL(0,1200,-3.0,0)
P1=DIRECTH(0,1200,-3.0,0)
F =DFREQ(P0,P1,0)
```

Search from outside to calculate the bandwidth.

3. Function which obtains frequency corresponding to specified response CDIRECT

CDIRECT (start frequency, end frequency, response value,analysis channel)

Explanation: Search the specified response value between specified responses to calculate the corresponded address point. The search direction is from low frequency to high frequency.

Example: F=CDIRECT(F0,F1,-10.0,0)

Obtain the data position of -10dB.

4. Function which obtains frequency corresponding to specified response CDIRECTL, CDIRECTH

```
CDIRECTL (start frequency, end frequency, response value,analysis channel)
CDIRECTH (start frequency, end frequency, response value,analysis channel)
```

Explanation: Search the specified response value between specified address points to obtain the corresponded frequency. The search direction of CDIRECTL is from low frequency to high frequency and of CDIRECTH is from high frequency to low frequency.

Example:
```
F0=CDIRECTL(F0,F1,-3.0,0)
F1=CDIRECTH(F0,F1,-3.0,0)
F  =F1-F0
```

Search from outside to calculate the bandwidth.

5. Function which obtains address point width in specified response DDIRECT

```
DDIRECT (start address point, end address point, response value,analysis channel)
```

Explanation: Search the specified response value between the specified address points to the high frequency side to obtain the address point width from two detected measured points.

6. Function which obtains bandwidth in specified response CDDIRECT

```
CDDIRECT (start address point, end address point, response value,analysis channel)
```

Explanation: Search the specified response value between the specified frequencies to the high frequency side to calculate the bandwidth from two detected measured points.

7. Function which obtains frequency in zero phase ZEROPHS

```
ZEROPHS (start frequency, end frequency, response value,analysis channel)
```

Explanation: Detect the phase zero between the specified address points to obtain the frequency.

4.4.11 Data Transfer

1. Function which reads data of specified analysis channel to array TRANSR

TRANSR (start address point, end address point, real array, analysis channel)

Explanation: Read the measured data in the specified analysis channel by specifying the address point to the BASIC array to return the number of data.

Usage: Used when the measured data is secondary processed.

Example:
```
DIM X(1201)
N =TRANSR(0,1200,X(1),0)
```

2. Function which writes description of array to specified analysis channel TRANSW

TRANSW (start address point, end address point, real array, analysis channel)

Explanation: Write the description of the BASIC array to the specified analysis channel.

Usage: Used when the measured data is secondary processed.

Example:
```
DIM X(1201)
N =TRANSW(0,1200,X(1),0)
```

5. COMMUNICATION WITH PERIPHERAL DEVICES

As standard, the R3754 Series is equipped with the parallel I/O interface and RS-232 interface as well as the GPIB interface. With these interfaces, it can communicate with peripherals.

- Parallel I/O: Used for communication with peripheral devices such as the handler.
- RS-232: Used for printed output of internal BASIC.

5.1 Parallel I/O Port (R3752H/53H Series: standard, R3754 Series: Option 01)

1. Outline

The parallel I/O port is the input/output port to communicate with the handler or peripherals.

Use always the shield cable for the connection.

The parallel I/O connector on the back panel is used for communication. Figure 5-2 show the internal pin assignment and signals of the connector. These I/O port is controlled with ENTER and OUTPUT commands.

- Input/output port

  There are two output ports and two input/output ports, as follows:

  - Port only for output : A port: 8-bit width
    B port: 8-bit width
  - Input/output port: C port: 4-bit width
    D port: 4-bit width

- Port C status output, port D status output

  Shows the settings of the input of the input/output ports C and D. It is low when C or D port is set to input, it is high when it is set to output.

- Write strobe output for output port

  By generating a negative pulse on the write strobe output, it shows a data is output to some port.

  Figure below shows the timing chart of the write strobe output and data output.

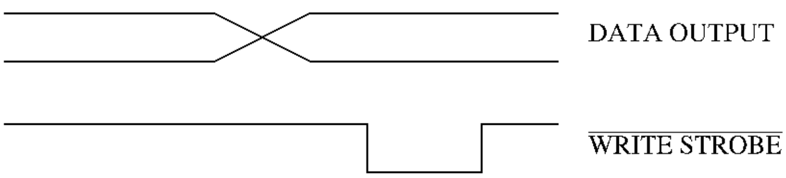


Figure 5-1 Timing Chart of WRITE STROBE

- INPUT 1

  By entering a negative pulse on the INPUT 1, the OUTPUT 1 and 2 are set to LOW. The pulse width of the input signal to be entered in the INPUT 1 should be more than 1µs.

- OUTPUT 1 and 2

  These two signal lines are the latch output terminals set to LOW when a negative pulse is entered on the INPUT 1. It can be set to LOW or HIGH with the BASIC command (OUTPUT).

- PASS/FAIL output

  Generates LOW when the result of the limit test is PASS and HIGH when the result is FAIL. This function is available only when the limit test function is ON.

- Write strobe output for PASS/FAIL output

  When the limit test result is output to the PASS/FAIL output line, generates a negative pulse.

- SWEEP END

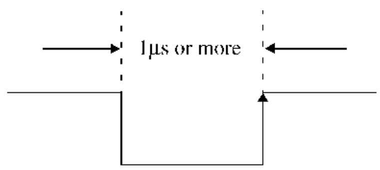
  When the R3754 Series finishes the sweeping, generates a negative pulse with a width of 10μs.

- +5V output

  +5V output is provided for the external device. The maximum current to be supplied is 100mA. This line has a fuse which will be blown when overcurrent flows for circuit protection. The blown fuse needs to be replaced.

- EXT TRIG input

  By entering a negative pulse on this line, it is possible to trigger the sweep of measurement. The pulse width should be at least 1μs. The sweeping starts at the trailing edge of the pulse. When this signal line is used, the trigger mode should be set to external source.



2. Connector Internal Pin Assigned and Signal Standard

The table below lists signal names and their functions.

Pin No.	Signal name	Function
1	GND	Ground
2	INPUT 1	Negative logic pulse input of TTL level (width: 1μs or more)
3	OUTPUT 1	Negative logic latch output of TTL level
4	OUTPUT 2	Negative logic latch output of TTL level
5	Output port A0	Negative logic latch output of TTL level
6	Output port A1	Negative logic latch output of TTL level
7	Output port A2	Negative logic latch output of TTL level
8	Output port A3	Negative logic latch output of TTL level
9	Output port A4	Negative logic latch output of TTL level
10	Output port A5	Negative logic latch output of TTL level
11	Output port A6	Negative logic latch output of TTL level
12	Output port A7	Negative logic latch output of TTL level
13	Output port B0	Negative logic latch output of TTL level
14	Output port B1	Negative logic latch output of TTL level
15	Output port B2	Negative logic latch output of TTL level
16	Output port B3	Negative logic latch output of TTL level
17	Output port B4	Negative logic latch output of TTL level
18	EXT TRIG	EXTERNAL TRIGGER input (width: 1μs or more),negative logic
19	Output port B5	Negative logic latch output of TTL level
20	Output port B6	Negative logic latch output of TTL level
21	Output port B7	Negative logic latch output of TTL level
22	Input/output port C0	Negative logic state input/latch output of TTL level
23	Input/output port C1	Negative logic state input/latch output of TTL level
24	Input/output port C2	Negative logic state input/latch output of TTL level
25	Input/output port C3	Negative logic state input/latch output of TTL level
26	Input/output port D0	Negative logic state input/latch output of TTL level
27	Input/output port D1	Negative logic state input/latch output of TTL level
28	Input/output port D2	Negative logic state input/latch output of TTL level
29	Input/output port D3	Negative logic state input/latch output of TTL level
30	Port C status	TTL level, Input mode: LOW, Output mode: HIGH
31	Port D status	TTL level, Input mode: LOW, Output mode: HIGH
32	Write strobe signal	TTL level, Negative logic, Pulse output
33	PASS/FAIL signal	TTL level, PASS: LOW, FAIL: HIGH, latch output
34	SWEEP END signal	TTL level, Negative logic, Pulse output (width: 10μs or more)
35	+5V	+5V±10%, 100mA MAX
36	Write strobe signal (PASS/FAIL)	TTL level, Negative logic, Pulse output

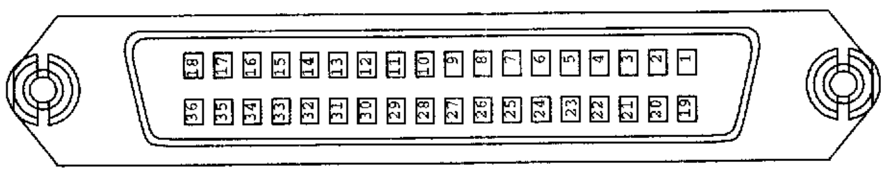


Figure 5-2 36-pin Connector Internal Pin Assignment and Signal

3. Internal circuit

   Figure below shows input and output ports and the interface section of INPUT/OUTPUT.

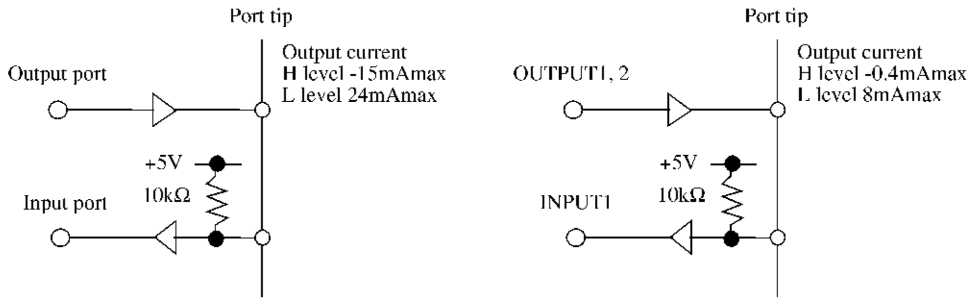


Figure 5-3 Internal Circuit

4. Mode setting of port

   To use a parallel I/O port, first set the mode setting of port. The relationships between commands, output ports and input ports are as listed in the table below.

Command	Output port	Input port
OUTPUT 36 ;16	A, B, C, D	
OUTPUT 36 ;17	A, B, D	C
OUTPUT 36 ;18	A, B, C	D
OUTPUT 36 ;19	A, B	C, D

Example: Set the output mode to Ports A and B, and set the input ports to Ports C and D.

```
10  OUTPUT   36;19
20  OUTPUT   33;255
30  ENTER    37;A
      :
```

Description

10 Output ports are set to Ports A and B and input ports are set to Ports C and D.

20 Set Port A to 255.

30 Read the data from Ports C and D and save it into Variable A.

5. Each port operation method

Describes the operation method by built-in BASIC.

OUTPUT statement (for output) and ENTER statement (for input) are used for data input/output.

In the BASIC command (OUTPUT and ENTER statements), each port is distinguished by the address used in the statement.

- BASIC format

  OUTPUT (address); (output data)

  ENTER (address); [variable] (Input data are assigned to specified variable.)

- Address and data range

Address	Port to be used
33	Port A (Output only: OUTPUT statement only)
34	Port B (Output only: OUTPUT statement only)
35	Port C (Input/output: ENTER, OUTPUT)
36	Port D (Input/output: ENTER, OUTPUT)
37	Port C, D (Input/output: ENTER, OUTPUT)

- OUTPUT 33, 34, 37
  OUTPUT × × ; 0 to 255 (8bit)
- OUTPUT 35, 36
  OUTPUT × × ; 0 to 15 (4bit)

NOTE: The OUTPUT 35 concerns with the Set/Reset of Flip Flop.

- ENTER 35, 36
  ENTER × × ; numeric variable (4bit) (Data from 0 to 15 are assigned.)
- ENTER 37
  ENTER 37 ; numeric variable (8bit) (Data from 0 to 255 are assigned.)

6. INPUT 1, OUTPUT 1 and OUTPUT 2 Terminals

   By combining with the signal lines of INPUT 1, OUTPUT 1 and OUTPUT 2, convenient functions are provided to easily control external devices.

   The functions are; function which sets two latch outputs of OUTPUTs 1 and 2 to LOW by pulse input to INPUT 1, and function which detects the state of OUTPUT 1 by INPUT 1. Also, the state of OUTPUTs 1 and 2 can be controlled by OUTPUT command.

   - Setting and Resetting of OUTPUT 1 and OUTPUT 2

     The following four types are provided for set/reset as follows:

     - Setting OUTPUT 1: OUTPUT 35 ; 16
     - Setting OUTPUT 2: OUTPUT 35 ; 48
     - Resetting OUTPUT 1: OUTPUT 35 ; 80
     - Resetting OUTPUT 2: OUTPUT 35 ; 112

   - INPUT 1 (external input)

     The state of OUTPUT 1 can be observed by INPUT 1 using ENTER statement.

     ENTER 34; (numeric variable)

     If 1 is assigned to the numeric variable, OUTPUT 1 is ON (Low level: negative logic), if 0, OUTPUT 1 is OFF (High level).

     Example : By observing the state of OUTPUT 1, if OUTPUT 1 is set to ON, then 1 is output to the port A.

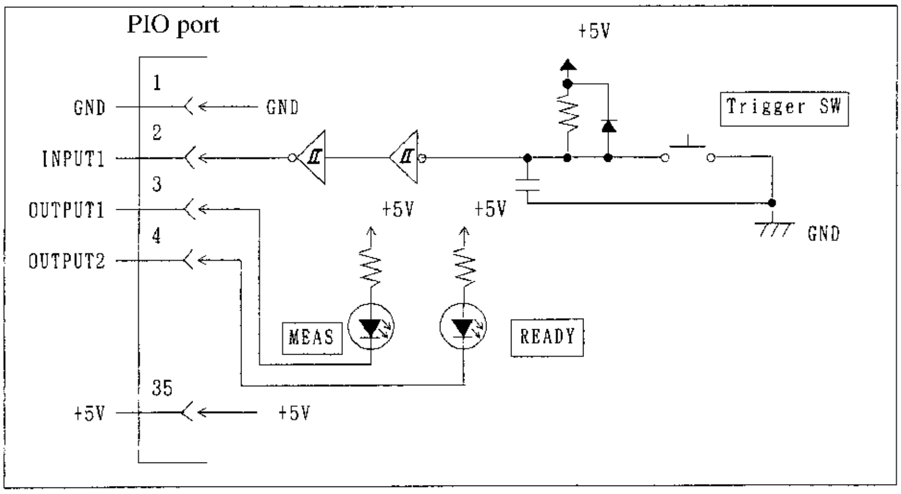
```
10    OUTPUT 36 ; 16
20    ENTER 34 ; A
30    IF A<> 1 THEN GOTO 20
40    OUTPUT 33 ; 1
      :
```

7. Usage sample of the ports

- INPUT 1, OUTPUT 1 and OUTPUT 2

  This sample program shows how to execute a program using the trigger switch.

  - Circuit example



- Program example

  Waiting time for measurement: Represents **[READY]**.

  During measurement operation: Represents **[MEAS]**.

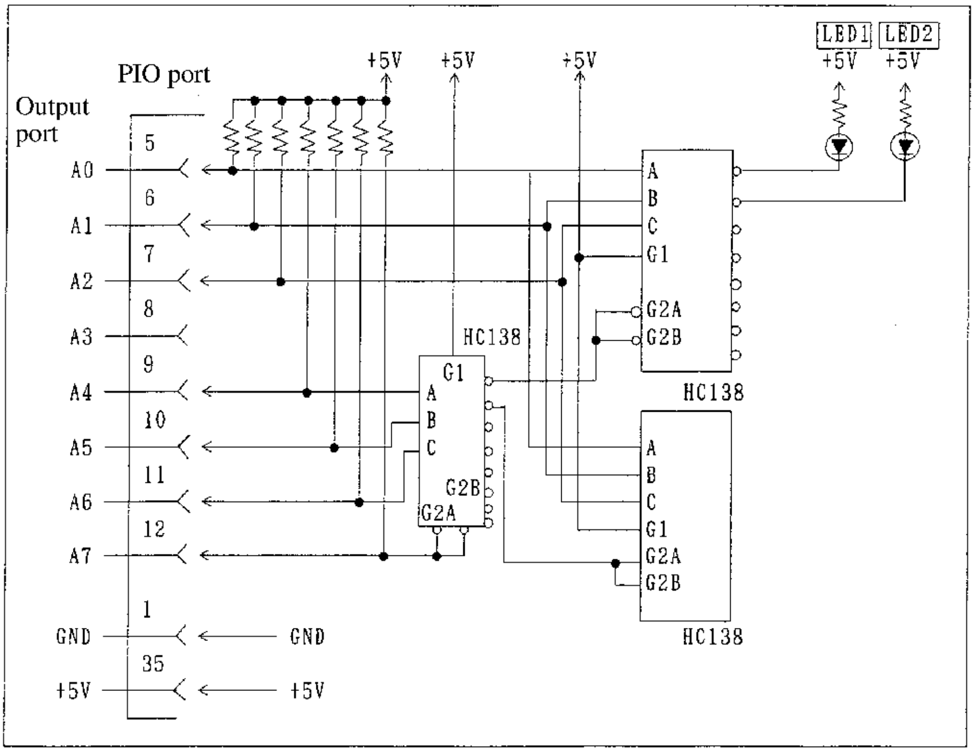
10	OUTPUT 35 ; 80	
20	OUTPUT 35 ; 112	**[READY]**, **[MEAS]** turns OFF.
:		Network analyzer initial setup
100	OUTPUT 35 ; 48	**[READY]** turns ON.
110	ENTER 34 ; A	
120	IF A<>1 THEN GOTO 110	Recognition of Trigger SW
130	OUTPUT 35 ; 112	**[READY]** turns OFF.
:		
:		Measurement routine
500	OUTPUT 35 ; 80	**[MEAS]** turns OFF.
510	GOTO 100	When repeating the measurement
520	STOP	

- Output port A (or B)

  This sample program shows how to select a device using one of the LEDs.

NOTE: When setting the output port to Port B, you can use this sample program in the same manner as for Port A.

- Circuit example



- Program example

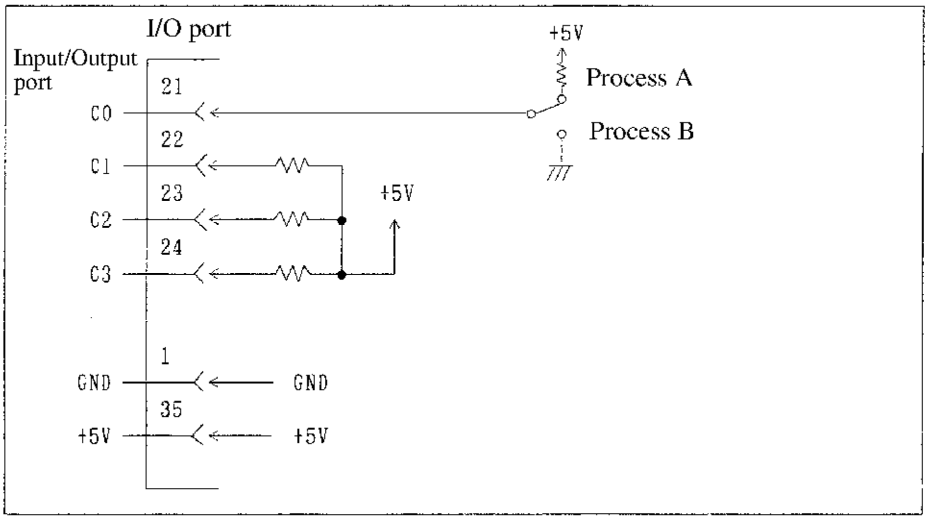
```
10      OUTPUT 36 ; 16          Defines ports A, B, C, and D as output port.
20      OUTPUT 33 ; 0           Initializes LED.
30
 :                              Measurement and judgment
 :                              ( measurement variable:  A                              )
 :                              ( judgment area: JED0 to JED1, JED1 to JED2...)
500     IF A>=JED0 AND A<JED1 THEN OUTPUT 33 ; 0XFF
                                (when JED0 to JED1, lights up LED 1.)
510     IF A>=JED1 AND A<JED2 THEN OUTPUT 33 ; 0XFF
                                (when JED1 to JED2, lights up LED 2.)
 :
800     GOTO 30
810     STOP
```

- Input/Output port C (or D)

  The following sample shows how to switch the process depending on the value of C0 (1 or 0).

NOTE: ***When setting the input/output port to Port D, you can use this sample program in the same manner as for Port C.***

- Circuit example



- Program example

  Check the port C by pressing **[Trigger SW]** in example (a).

10	OUTPUT 36 ; 19	Defines ports A and B as output port.
20	OUTPUT 35 ; 80	Defines ports C and D as input port.
30	OUTPUT 35 ; 112	
:		Network analyzer initial setup
100	*TRIG	
110	ENTER 34 ; A	
120	IF A<>1 THEN GOTO *TRIG	
130	ENTER 35 ; B	Obtains value of port C.
140	IF B=1 THEN GOTO *ROUT-B	
150	*ROUT_A	
:		Process A
490	GOTO *TRIG	
500	*ROUT_B	
:		Process B
900	GOTO *TRIG	
910	STOP	

5.2 Parallel I/O Port (R3754 Series only:Option 02)

1. Outline

The parallel I/O port is the input/output port to communicate with the handler or peripherals.

Use always the shield cable for the connection.

The parallel I/O connector on the back panel is used for communication. Figure 5-5 show the internal pin assignment and signals of the connector. These I/O port is controlled with ENTER and OUTPUT commands.

- Input/output port

  There are two output ports and two input/output ports, as follows:

  - Port only for output : A port: 8-bit width
    B port: 8-bit width
  - Input/output port: C port: 4-bit width
    D port: 4-bit width

- Port C status output, port D status output

  Shows the settings of the input of the input/output ports C and D. It is low when C or D port is set to input, it is high when it is set to output.

- Write strobe output for output port

  By generating a negative pulse on the write strobe output, it shows a data is output to some port.

  Figure below shows the timing chart of the write strobe output and data output.

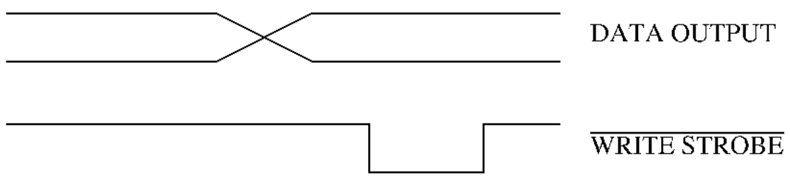


Figure 5-4 Timing Chart of WRITE STROBE

- INPUT 1

  By entering a negative pulse on the INPUT 1, the OUTPUT 1 and 2 are set to LOW. The pulse width of the input signal to be entered in the INPUT 1 should be more than 1μs.

- OUTPUT 1 and 2

  These two signal lines are the latch output terminals set to LOW when a negative pulse is entered on the INPUT 1. It can be set to LOW or HIGH with the BASIC command (OUTPUT).

- PASS/FAIL output

  Generates LOW when the result of the limit test is PASS and HIGH when the result is FAIL. This function is available only when the limit test function is ON.

- Write strobe output for PASS/FAIL output

  When the limit test result is output to the PASS/FAIL output line, generates a negative pulse.

- SWEEP END

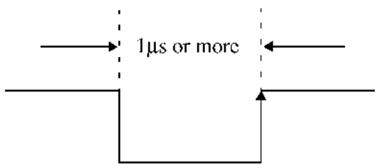
  When the R3754 Series finishes the sweeping, generates a negative pulse with a width of 10μs.

- +5V output

  +5V output is provided for the external device. The maximum current to be supplied is 100mA. This line has a fuse which will be blown when overcurrent flows for circuit protection. The blown fuse needs to be replaced.

- EXT TRIG input

  By entering a negative pulse on this line, it is possible to trigger the sweep of measurement. The pulse width should be at least 1μs. The sweeping starts at the trailing edge of the pulse. When this signal line is used, the trigger mode should be set to external source.



2. Connector Internal Pin Assigned and Signal Standard

   The table below lists signal names and their functions.

Pin No.	Signal name	Function
1	GND	Ground
2	INPUT 1	Negative logic pulse input of TTL level (width: 1μs or more)
3	OUTPUT 1	Negative logic latch output of TTL level
4	OUTPUT 2	Negative logic latch output of TTL level
5	Output port A0	Negative logic latch output of TTL level
6	Output port A1	Negative logic latch output of TTL level
7	Output port A2	Negative logic latch output of TTL level
8	Output port A3	Negative logic latch output of TTL level
9	Output port A4	Negative logic latch output of TTL level
10	Output port A5	Negative logic latch output of TTL level
11	Output port A6	Negative logic latch output of TTL level
12	Output port A7	Negative logic latch output of TTL level
13	Output port B0	Negative logic latch output of TTL level
14	Output port B1	Negative logic latch output of TTL level
15	Output port B2	Negative logic latch output of TTL level
16	Output port B3	Negative logic latch output of TTL level
17	Output port B4	Negative logic latch output of TTL level
18	Output port B5	Negative logic latch output of TTL level
19	Output port B6	Negative logic latch output of TTL level
20	Output port B7	Negative logic latch output of TTL level
21	Input/output port C0	Negative logic state input/latch output of TTL level
22	Input/output port C1	Negative logic state input/latch output of TTL level
23	Input/output port C2	Negative logic state input/latch output of TTL level
24	Input/output port C3	Negative logic state input/latch output of TTL level
25	Input/output port D0	Negative logic state input/latch output of TTL level
26	Input/output port D1	Negative logic state input/latch output of TTL level
27	Input/output port D2	Negative logic state input/latch output of TTL level
28	Input/output port D3	Negative logic state input/latch output of TTL level
29	Port C status	TTL level, Input mode: LOW, Output mode: HIGH
30	Port D status	TTL level, Input mode: LOW, Output mode: HIGH
31	Write strobe signal	TTL level, Negative logic, Pulse output
32		
33	SWEEP END signal	TTL level, Negative logic, Pulse output (width: 10μs or more)
34	+5V	+5V±10%, 100mA MAX
35	PASS/FAIL signal	TTL level, PASS: LOW, FAIL: HIGH, latch output
36	Write strobe signal (PASS/FAIL)	TTL level, Negative logic, Pulse output

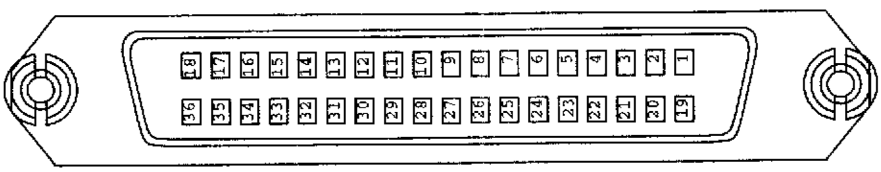


Figure 5-5 36-pin Connector Internal Pin Assignment and Signal

3. Internal circuit

   Figure below shows input and output ports and the interface section of INPUT/OUTPUT.

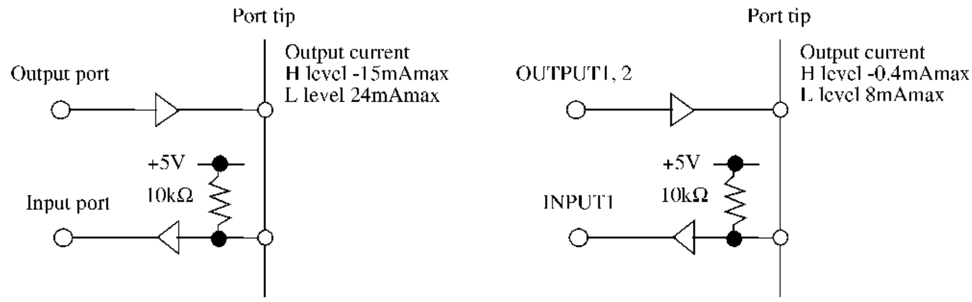


Figure 5-6 Internal Circuit

4. Mode setting of port

   To use a parallel I/O port, first set the mode setting of port. The relationships between commands, output ports and input ports are as listed in the table below.

Command	Output port	Input port
OUTPUT 36 ;16	A, B, C, D	
OUTPUT 36 ;17	A, B, D	C
OUTPUT 36 ;18	A, B, C	D
OUTPUT 36 ;19	A, B	C, D

Example: Set the output mode to Ports A and B, and set the input ports to Ports C and D.

```
10  OUTPUT   36;19
20  OUTPUT   33;255
30  ENTER    37;A
        :
```

Description

10 Output ports are set to Ports A and B and input ports are set to Ports C and D.

20 Set Port A to 255.

30 Read the data from Ports C and D and save it into Variable A.

5. Each port operation method

   Describes the operation method by built-in BASIC.

   OUTPUT statement (for output) and ENTER statement (for input) are used for data input/output.

   In the BASIC command (OUTPUT and ENTER statements), each port is distinguished by the address used in the statement.

   - BASIC format

     OUTPUT (address);   (output data)

     ENTER (address);   [variable] (Input data are assigned to specified variable.)

   - Address and data range

Address	Port to be used
33	Port A (Output only: OUTPUT statement only)
34	Port B (Output only: OUTPUT statement only)
35	Port C (Input/output: ENTER, OUTPUT)
36	Port D (Input/output: ENTER, OUTPUT)
37	Port C, D (Input/output: ENTER, OUTPUT)

- OUTPUT 33, 34, 37
  OUTPUT × × ; 0 to 255 (8bit)
- OUTPUT 35, 36
  OUTPUT × × ; 0 to 15 (4bit)

NOTE: The OUTPUT 35 concerns with the Set/Reset of Flip Flop.

- ENTER 35, 36
  ENTER × × ; numeric variable (4bit) (Data from 0 to 15 are assigned.)
- ENTER 37
  ENTER 37 ; numeric variable (8bit) (Data from 0 to 255 are assigned.)

6. INPUT 1, OUTPUT 1 and OUTPUT 2 Terminals

   By combining with the signal lines of INPUT 1, OUTPUT 1 and OUTPUT 2, convenient functions are provided to easily control external devices.

   The functions are; function which sets two latch outputs of OUTPUTs 1 and 2 to LOW by pulse input to INPUT 1, and function which detects the state of OUTPUT 1 by INPUT 1. Also, the state of OUTPUTs 1 and 2 can be controlled by OUTPUT command.

   - Setting and Resetting of OUTPUT 1 and OUTPUT 2

     The following four types are provided for set/reset as follows:

     - Setting OUTPUT 1: OUTPUT 35 ; 16
     - Setting OUTPUT 2: OUTPUT 35 ; 48
     - Resetting OUTPUT 1: OUTPUT 35 ; 80
     - Resetting OUTPUT 2: OUTPUT 35 ; 112

   - INPUT 1 (external input)

     The state of OUTPUT 1 can be observed by INPUT 1 using ENTER statement.

     ENTER 34; (numeric variable)

     If 1 is assigned to the numeric variable, OUTPUT 1 is ON (Low level: negative logic), if 0, OUTPUT 1 is OFF (High level).

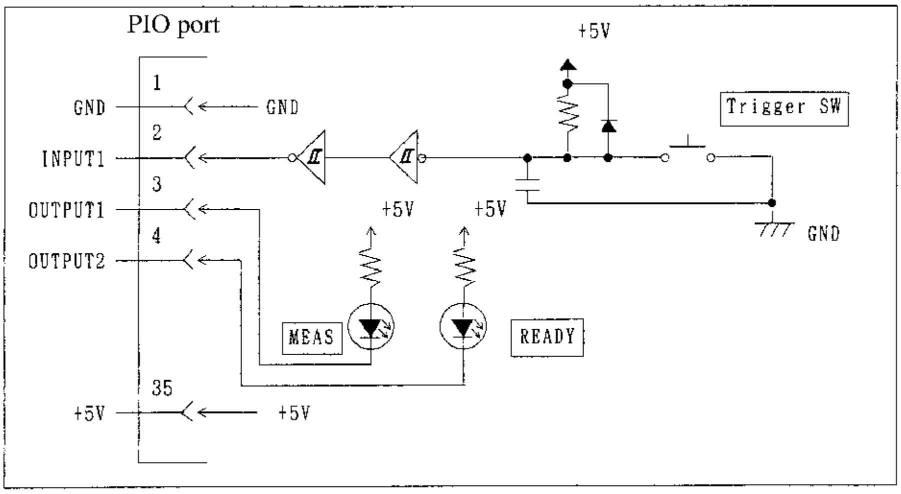
     Example : By observing the state of OUTPUT 1, if OUTPUT 1 is set to ON, then 1 is output to the port A.

```
10    OUTPUT 36 ; 16
20    ENTER 34 ; A
30    IF A<> 1 THEN GOTO 20
40    OUTPUT 33 ; 1
      :
```

7. Usage sample of the ports
   - INPUT 1, OUTPUT 1 and OUTPUT 2

     This sample program shows how to execute a program using the trigger switch.

     - Circuit example



- Program example

  Waiting time for measurement: Represents **[READY]**.

  During measurement operation: Represents **[MEAS]**.

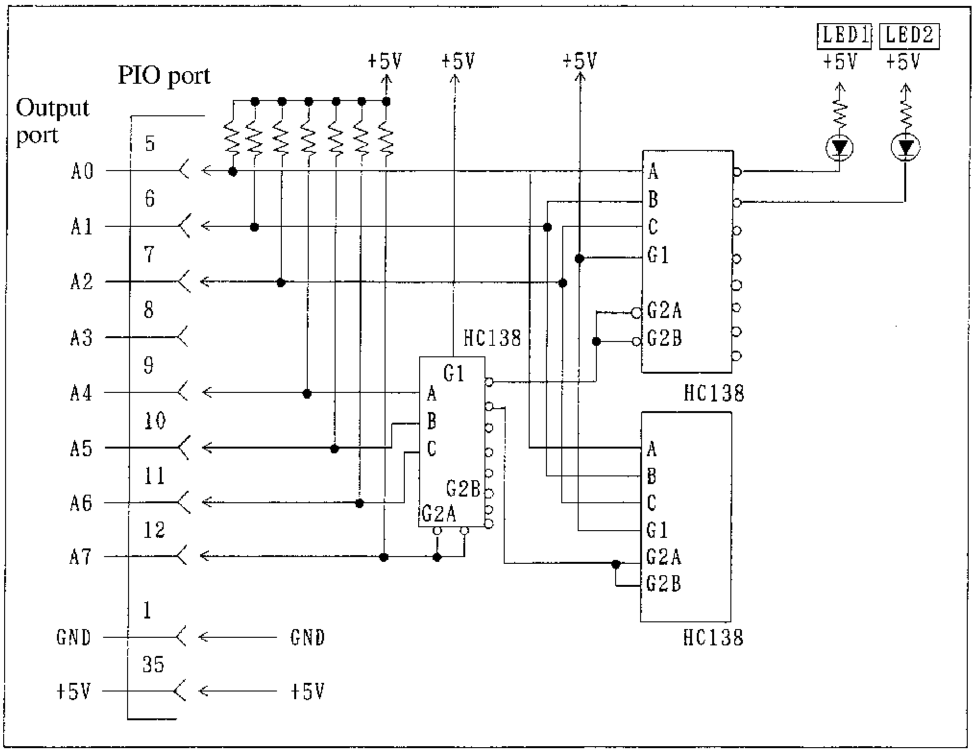
10	OUTPUT 35 ; 80	
20	OUTPUT 35 ; 112	**[READY]**, **[MEAS]** turns OFF.
:		Network analyzer initial setup
100	OUTPUT 35 ; 48	**[READY]** turns ON.
110	ENTER 34 ; A	
120	IF A<>1 THEN GOTO 110	Recognition of Trigger SW
130	OUTPUT 35 ; 112	**[READY]** turns OFF.
:		
:		Measurement routine
500	OUTPUT 35 ; 80	**[MEAS]** turns OFF.
510	GOTO 100	When repeating the measurement
520	STOP	

- Output port A (or B)

  This sample program shows how to select a device using one of the LEDs.

NOTE: ***When setting the output port to Port B, you can use this sample program in the same manner as for Port A.***

- Circuit example



- Program example

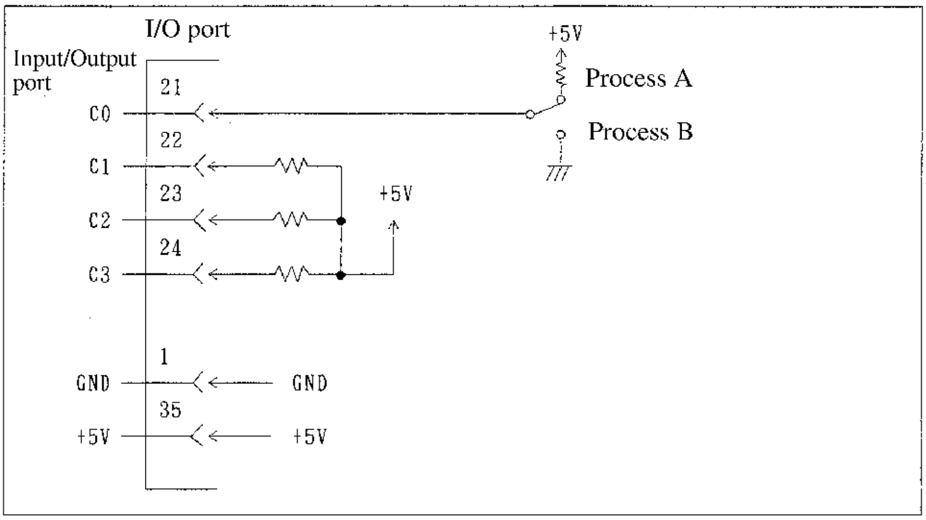
10	OUTPUT 36 ; 16	Defines ports A, B, C, and D as output port.
20	OUTPUT 33 ; 0	Initializes LED.
30		
:		Measurement and judgment
:		(measurement variable: A
:		judgment area: JED0 to JED1, JED1 to JED2...)
500	IF A>=JED0 AND A<JED1 THEN OUTPUT 33 ; 0_XFF	
		(when JED0 to JED1, lights up LED 1.)
510	IF A>=JED1 AND A<JED2 THEN OUTPUT 33 ; 0_XFF	
		(when JED1 to JED2, lights up LED 2.)
:		
800	GOTO 30	
810	STOP	

- Input/Output port C (or D)

  The following sample shows how to switch the process depending on the value of C0 (1 or 0).

NOTE: ***When setting the input/output port to Port D, you can use this sample program in the same manner as for Port C.***

- Circuit example



- Program example

  Check the port C by pressing **[Trigger SW]** in example (a).

10	OUTPUT 36 ; 19	Defines ports A and B as output port.
20	OUTPUT 35 ; 80	Defines ports C and D as input port.
30	OUTPUT 35 ; 112	
:		Network analyzer initial setup
100	*TRIG	
110	ENTER 34 ; A	
120	IF A<>1 THEN GOTO *TRIG	
130	ENTER 35 ; B	Obtains value of port C.
140	IF B=1 THEN GOTO *ROUT_B	
150	*ROUT_A	
:		Process A
490	GOTO *TRIG	
500	*ROUT_B	
:		Process B
900	GOTO *TRIG	
910	STOP	

5.3 OPT Isolation Parallel I/O Port (R3754 Series only:Option 03)

1. Outline

The OPT isolation parallel port is the input/output port to communicate with the handler or peripherals.

Use always the shield cable for the connection.

The parallel I/O connector on the back panel is used for communication. Figure 5-8 show the internal pin assignment and signals of the connector. These I/O port is controlled with ENTER and OUTPUT commands.

- Input/output port

  There are two sets of output ports and two sets of input ports:

  - Port only for output: A port: 8-bit width
    B port: 8-bit width
  - Port only for input: C port: 4-bit width
    D port: 4-bit width

- Write strobe output for output port

  By generating a negative pulse on the write strobe output, it shows a data is output to some port.

  Figure below shows the timing chart of the write strobe output and data output.

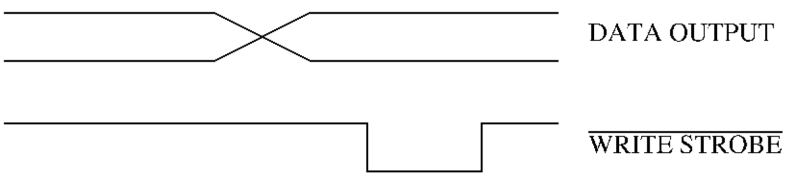


Figure 5-7 Timing Chart of WRITE STROBE

- OUTPUT 1 and 2

  Each of these two signal lines can be set to LOW or HIGH with the BASIC command (OUTPUT).

- PASS/FAIL output

  Generates LOW when the result of the limit test is PASS and HIGH when the result is FAIL. This function is available only when the limit test function is ON.

- Write strobe output for PASS/FAIL output

  When the limit test result is output to the PASS/FAIL output line, generates a negative pulse.

- SWEEP END

  When the R3754 Series finishes the sweeping, generates a negative pulse with a width of 10μs or more.

- +5V output

  +5V output is provided for the external device. The maximum current to be supplied is 100mA. The reference ground (GND) is defined as the ground (GND) of the network analyzer.

- GND

  The potential of this pin is equivalent to the GND potential of the network analyzer.

- External VCC

  Connect the wire from this pin to External VCC.
- External GND

  Connect the wire from this pin to External GND.
- NC

  Do not connect any wire to this pin (Always leave this pin electrically open).

2. Connector Internal Pin Assigned and Signal Standard

   The table below lists signal names and their functions.

Pin No.	Signal name	Function
1	GND	Ground (GND potential of the network analyzer)
2	OUTPUT 1	Negative logic latch output of OPT isolation
3	Output port A0	Negative logic latch output of OPT isolation
4	Output port A2	Negative logic latch output of OPT isolation
5	Output port A4	Negative logic latch output of OPT isolation
6	Output port A6	Negative logic latch output of OPT isolation
7	Output port B0	Negative logic latch output of OPT isolation
8	Output port B2	Negative logic latch output of OPT isolation
9	Output port B4	Negative logic latch output of OPT isolation
10	Output port B6	Negative logic latch output of OPT isolation
11	Input port C0	Negative logic state input of OPT isolation
12	Input port C2	Negative logic state input of OPT isolation
13	Input port D0	Negative logic state input of OPT isolation
14	Input port D2	Negative logic state input of OPT isolation
15	Data write strobe signal	Negative logic state pulse output of OPT isolation (width : 10μs or more)
16	SWEEP END signal	Negative logic state pulse output of OPT isolation (width : 10μs or more)
17	NC	Leave this terminal electrically open
18	External VCC (Vx)	External power supply
19	+5V	+5V ± 10%, 100mA MAX
20	OUTPUT 2	Negative logic latch output of OPT isolation
21	Output port A1	Negative logic latch output of OPT isolation
22	Output port A3	Negative logic latch output of OPT isolation
23	Output port A5	Negative logic latch output of OPT isolation
24	Output port A7	Negative logic latch output of OPT isolation
25	Output port B1	Negative logic latch output of OPT isolation
26	Output port B3	Negative logic latch output of OPT isolation
27	Output port B5	Negative logic latch output of OPT isolation
28	Output port B7	Negative logic latch output of OPT isolation
29	Input port C1	Negative logic state input of OPT isolation
30	Input port C3	Negative logic state input of OPT isolation
31	Input port D1	Negative logic state input of OPT isolation
32	Input port D3	Negative logic state input of OPT isolation
33	PASS/FAIL strobe signal	Negative logic state pulse output of OPT isolation (width : 10μs or more)
34	PASS/FAIL signal	Negative logic state pulse output of OPT isolation (width : 10μs or more)
35	NC	Leave this terminal electrically open
36	External GND	External GND

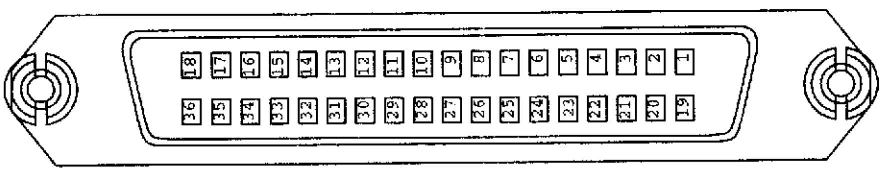


Figure 5-8 36-pin Connector Internal Pin Assignment and Signal

3. Internal circuits of the input/output port
   The explanation of the output circuit is shown in Figure 5-9.
   The explanation of the Input circuit is shown in Figure 5-10.

Output circuit	Signal name
Output Port	Port A0 to A7 and Port B0 to B7
Output signals	OUTPUT 1, OUTPUT2 Data write strobe SWEEP END PASS/FAIL, PASS/FAIL strobe

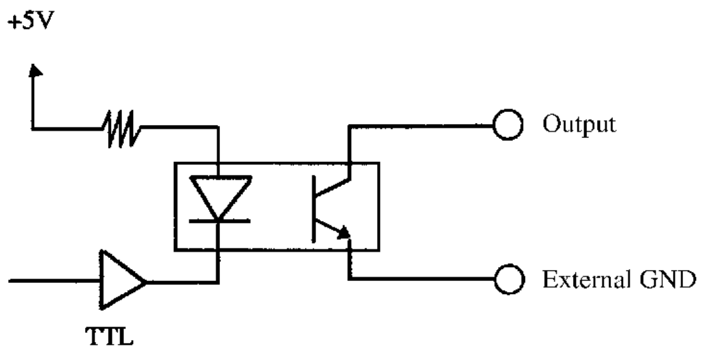


Figure 5-9 Output Circuit

Output circuit	Signal name
Input Port	Port C0 to C3 and Port D0 to D3

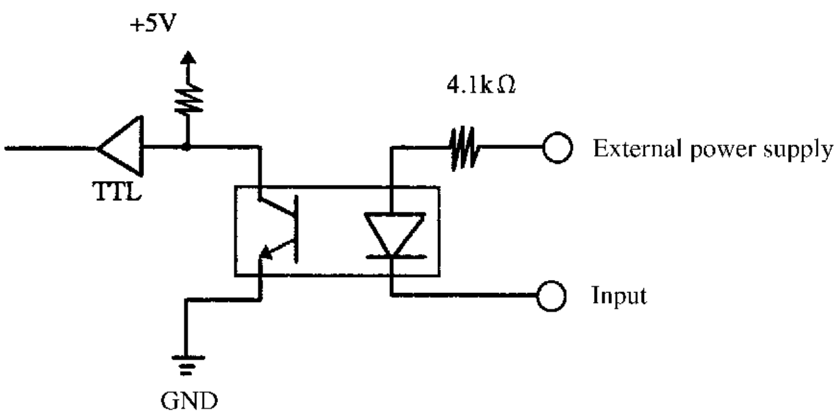


Figure 5-10 Input Circuit

4. Control method recommended

- Output port and output signal

  Connect the output port and output signal to the external power supply using an external pull-up resistor since the output port and output signal are the open-collector type.

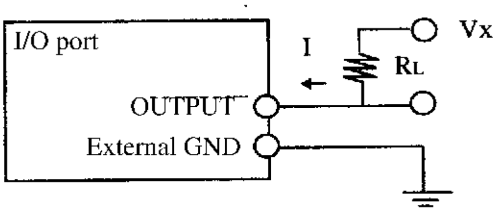


Figure 5-11 OUTPUT

The values of external resistor RL and external power supply voltage Vx must meet the following equation.

$(Vx/2)^2 / RL < 75mW$

Table 5-1 Rated Values of the Signals

Signal Name	Variable Name	Rated Value
External power supply voltage	Vx	25V
Maximum current 12 mA or less	Imax	12mA or less
Saturation voltage	VCE (SAT)	0.8 V for I = 12 mA

- Input port

  Input port is internally connected to the cathode side (-) of the LED. In addition, the anode side (+) of the LED is connected to external power supply through a resistor.

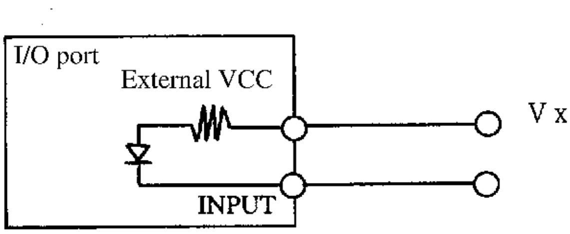


Figure 5-12 INPUT

The voltage range of the external power supply must be between 10 V and 25 V.

Table 5-2 Rated Values of the Signals

Signal Name	Variable Name	Rated Value
External power supply voltage	Vx	Between 10 V and 25 V

5. Mode setting of port

   To use a parallel I/O port, first set the mode setting of port. The relationships between commands, output ports and input ports are as listed in the table below.

Command	Output port	Input port
OUTPUT 36 ; 19	A, B	C, D

Example : Set the output mode to Ports A and B, and set the input ports to Ports C and D.

```
10  OUTPUT   36;19
20  OUTPUT   33;255
30  ENTER    37;A
      :
```

Description

10 Output ports are set to Ports A and B and input ports are set to Ports C and D.

20 Set Port A to 255.

30 Read the data from Ports C and D and save it into Variable A.

6. Each port operation method

   Describes the operation method by built-in BASIC.

   OUTPUT statement (for output) and ENTER statement (for input) are used for data input/output.

   In the BASIC command (OUTPUT and ENTER statements), each port is distinguished by the address used in the statement.

   - BASIC format

     OUTPUT (address); (output data)

     ENTER (address); [variable] (Input data are assigned to specified variable.)

   - Address and data range

Address	Port to be used
33	Port A (Output only: OUTPUT statement only)
34	Port B (Output only: OUTPUT statement only)
35	Port C (Input only: ENTER statement only)
36	Port D (Input only: ENTER statement only)
37	Port C, D (Input only: ENTER statement only)

   - OUTPUT 33, 34
     OUTPUT ; 0 to 255 (8-bit)
   - ENTER 35, 36
     ENTER ; numeric variable (4-bit) (Data from 0 to 15 are assigned.)
   - ENTER 37
     ENTER 37 ; numeric variable (8-bit) (Data from 0 to 255 are assigned.)

7. OUTPUT 1 and OUTPUT 2 Terminals

   The state of OUTPUTs 1 and 2 can be controlled by OUTPUT command.

   - Setting and Resetting of OUTPUT 1 and OUTPUT 2

     The following four types are provided for set/reset as follows:

     - Setting OUTPUT 1: OUTPUT 35 ; 16
     - Setting OUTPUT 2: OUTPUT 35 ; 48
     - Resetting OUTPUT 1: OUTPUT 35 ; 80
     - Resetting OUTPUT 2: OUTPUT 35 ; 112

6. ERROR MESSAGES

6.1 How to Check Error Message Line Number

When the PRINT ERRM$(0) statement is executed, the line number of suspended position and the last error message will be displayed.

6.2 How to Check Program Current Position

The symbol "@" is a system variable, which stores the line number of the program being executed. The current line number, program position and suspended position of the program can be checked by using the @ system variable.

Example: PRINT @ (Displays the paused position of the program.)

6.3 Error Message List

NOTE:

1. ***The error messages are described in the following table in the order of error class (error number).***
   (After the table, correspondence table in alphabetical order is also provided.)
   Character strings are explained as XXX.
   Numerics are described as YYY.
2. ***Error class*** ***1: Data input***
   2: Data calculation processing
   3: Built-in function
   4: BASIC syntax
   5: Others

(1 of 3)

Error class (Error number)	Error message	Description
1(22)	xxx1(xxx2) error	xxx1 command is not available for xxx2 file.
1(23)	xxx1(xxx2, xxx3) error	xxx1 command is not available for xxx2 file and xxx3 file.
1(64)	"xxx" file cannot be opened.	The file could not be opened or dose not exist.
1(65)	xxx: "xxx" file was opened with xxx mode.	The file was accessed with different mode from it was opened.
1(66)	cannot read data from "xxx" file.	The specified character number could not be read from xxx file.
1(67)	cannot write data into "xxx" file.	Data can not be written to xxx file.
1(69)	"xxx" file is already opened with another PATH.	The file already opened was tried to open again.
1(72)	file is NOT open.	File is not registered in the specified descriptor. (File has not been opened).
1(74)	end of "xxx" file.	Data was read to EOF(End Of File).
1(75)	"xxx" file already exists.	The existing file was tried to open with OUTPUT mode.
1(76)	Only one OUTPUT file can be opened	More than two modes were tried to open in read mode.
1(79)	CANNOT assigned into this token	Cannot be assigned into the character variable.
1(81)	Only one INPUT file can be opened	More than two modes were tried to open in read mode.
1(95)	GPIB SYNTAX ERROR	The GPIB command is incorrect.
1(96)	Abort	The GPIB control statement was aborted in the execution, or an error occurred on the GPIB bus.
2(1)	0 divide	0 division (n/0) was executed.
2(10)	xxx: CANNOT convert into string	Conversion into character string is not available.
2(32)	string length is too long	Declaration of character string variable exceeded the maximum value (128).
2(33)	Array's range error	Subscript of the array variable is out of declaration range.
2(41)	yyy: UNIT addr error in xxx	GPIB address is incorrectly specified.
2(43)	yyy is invalid value in xxx	yyy is invalid in xxx instruction.
2(48)	CANNOT move line.	The last line was specified exceeding 65535 in the REN command.
2(51)	Overflow value	The value of operation exceeded the allowable range

(2 of 3)

Error class (Error number)	Error message	Description
2(60)	yyy: Undefined Control Register	The register number of CONTROL instruction is not correct.
2(63)	Unmatched DATA's value-sand READ variable	Data read in READ statement does not exist.
2(85)	file format error	A terminator that should be within 256 characters is not.
3(11)	xxx function error	An parameter error was detected the built-in function.
3(94)	xxx function error. message	An error was detected the built-in function.
4(2)	xxx: invalid type in xxx	xxx contains an invalid type.
4(3)	NO operand in xxx	Operation format for xxx was set incorrectly.
4(5)	Program does NOT exist	Executed the program not exist.
4(6)	xxx: Syntax error	The syntax is not correct.
4(7)	undefined ON condition	ON state was incorrectly defined.
4(9)	xxx: Invalid TARGET operand in xxx	The operand syntax in xxx contains an error.
4(12)	Unbalanced NEXT statement	NEXT statement does not exist even the existence of FOR statement.
4(13)	FOR's nest is abnormal.	Nesting to FOR statement could not execute properly.
4(14)	FOR variable does NOT exist.	The counter variable of FOR statement does not exit.
4(15)	FOR <init value> does NOT exist.	The initial value of FOR statement does not exist.
4(16)	Unbalanced FOR variable in NEXT	Relation between For statement and NEXT statement is not normal.
4(17)	Unbalanced BREAK	BREAK statement does not exist between FOR statement and NEXT statement.
4(18)	Uninstalled type (xxx)	Variable was incorrectly formatted.
4(19)	Label xxx already exists.	Label for xxx is already exist.
4(20)	Unbalanced xxx	Statement construction is not balanced.
4(21)	Not available ASCII char(yyy)	ASCII code is not available.
4(24)	xxx: invalid first type in xxx	The first part of command syntax is incorrect.
4(25)	xxx: invalid second type in xxx	The second part of command syntax is incorrect.
4(26)	xxx: invalid source type in xxx	The type of source side is invalid for assignment of expression.

(3 of 3)

Error class (Error number)	Error message	Description
4(27)	xxx: invalid target type in xxx	The type of target variable is invalid for assignment.
4(29)	Invalid dimension parameter	Parameter of an array variable is not correct.
4(31)	string declaration error	[ ] was used in numeric variable.
4(34)	Unbalanced line No.	Specified line does not exist.
4(37)	Undefined label	Specified label does not exist.
4(38)	label not found	Specified label does not exist.
4(39)	Unknown line No.	Specifying line does not exist.
4(40)	expression format error	Expression is formatted incorrectly.
4(43)	yyy is invalid value in xxx	yyy is invalid in xxx instruction.
4(44)	Unbalanced xxx block	xxx block is not matched (FOR statement, IF statement, etc.).
4(45)	Not found THEN in xxx	THEN was not found after IF statement.
4(47)	Not found line No. yyy	Line No. yyy is not found.
4(49)	Substring error	Substring is incorrectly specified.
4(50)	parameter error	Parameter is not set correctly.
4(52)	Unmatched IMAGE-spec in USING	Specification of IMAGE in USING is unmatched.
4(54)	yyy error(s) appeared.	The label line number is not correct.
4(55)	Program CANNOT be continued.	The terminated program was tried to restart again.
4(56)	Line No.yyy is out of range.	Specification of line number exceeded the program range.
4(68)	cannot specify "USING"	USING can not be specified by the specified file type.
4(70)	Not found DATA statement	DATA statement was not found in the direction of RESTORE.
4(71)	xxx nest overflow	The nesting exceeded the capacity.
4(78)	SELECT nesting overflow	Nesting to SELECT statement exceeded the capacity.
4(93)	Program cannot changed	Program change was tried in the execution of program.

Correspondence table in alphabetical order

(1 of 3)

Error message	Error class (Error number)
Abort	1(96)
Array's range error	2(33)
CANNOT assigned into this token	1(79)
CANNOT move line.	2(48)
cannot read data from "xxx" file.	1(66)
cannot specify "USING"	4(68)
cannot write data into "xxx" file.	1(67)
end of "xxx" file	1(74)
expression format error	4(40)
file format error	2(85)
file is NOT open.	1(72)
FOR <init value> does NOT exist.	4(15)
FOR variable does NOT exist.	4(14)
FOR's nest is abnormal.	4(13)
GPIB SYNTAX ERROR	1(95)
Invalid dimension parameter	4(29)
label not found	4(38)
Label xxx is already exists.	4(19)
Line No.yyy is out of range.	4(56)
NO operand in xxx	4(3)
Not available ASCII char(yyy)	4(21)
Not found DATA statement	4(70)
Not found line No. yyy	4(47)
Not found THEN in xxx	4(45)
Only one INPUT file can be opened.	1(81)
Onlu one OUTPUT file can be opened.	1(76)
Overflow value	2(51)
parameter error	4(50)
Program CANNOT be continued.	4(55)
Program cannot changed	4(93)
Program does NOT exist	4(5)

(2 of 3)

Error message	Error class (Error number)
SELECT nesting overflow	4(78)
string declaration error	4(31)
string length is too long	2(32)
Substring error	4(49)
Unbalanced BREAK	4(17)
Unbalanced FOR variable in NEXT	4(16)
Unbalanced line No.	4(34)
Unbalanced NEXT statement	4(12)
Unbalanced xxx	4(20)
Unbalanced xxx block	4(44)
Undefined label	4(37)
undefined ON condition	4(7)
Uninstalled type (xxx)	4(18)
Unknown line No.	4(39)
Unmatched DATA's values and READ variable	2(63)
Unmatched IMAGE-spec in USING	4(52)
xxx function error	3(11)
xxx function error message	3(94)
xxx nest overflow	4(71)
xxx1(xxx2) error	1(22)
xxx1(xxx2, xxx3) error	1(23)
xxx: CANNOT convert into string	2(10)
xxx: invalid first type in xxx	4(24)
xxx: invalid second type in xxx	4(25)
xxx: invalid source type in xxx	4(26)
xxx: Invalid TARGET operand in xxx	4(9)
xxx: invalid target type in xxx	4(27)
xxx: invalid type in xxx	4(2)
xxx: Syntax error	4(6)
xxx: "xxx" file was opened with xxx mode.	1(65)
"xxx" file cannot be opened.	1(64)
"xxx" file already exist.	1(75)
"xxx" file is already opened with another PATH.	1(69)

(3 of 3)

Error message	Error class (Error number)
yyy error(s) appeared.	4(54)
yyy is invalid value in xxx	2(43),4(43)
yyy: Undefined Control Register	2(60)
yyy: UNIT addr error in xxx	2(41)
0 divide	2(1)

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1. INTRODUCTON

The network analyzer is equipped with a GPIB (General-Purpose Interface Bus) as standard, which complies with IEEE standards 488.1-1987 and 488.2-1987 and can be remotely controlled by means of an external controller. The analyzer also has a built-in control function, enabling easy configuration of small GPIB systems.

The following describes the method of control using the GPIB remote control functions.

1.1 GPIB

The GPIB is a high-performance interface bus used to connect the measuring instruments to the computer.

The operations of the GPIB are defined by IEEE standard 488.1-1987. Since the GPIB has a bus-configured interface, it can specify a device by assigning a specific address to each device. Up to 15 devices can be connected in parallel to a single bus. GPIB devices have one or more of the following functions:

- Talker

  The talker is a device which is specified to send data to the bus. Only one active talker can exist on the GPIB bus.

- Listener

  The listener is a device which is specified to receive data from the bus. Multiple active listeners can exist on the GPIB bus.

- Controller

  The controller is a device which specifies the talker and listener. Only one active controller can operate on the GPIB bus. Controllers which control IFC and REN messages are called “system controllers”.

  The GPIB bus can have only one system controller on it. If there are multiple controllers on the bus, the system controller becomes the active controller, while other devices which have a control function operate as addressable devices when the system is started up.

  The TCT (Take Control) interface message is used to set a controller other than the system controller as the active controller. After setting, the system controller will become the non-active controller.

  The controller controls the entire system by sending interface messages or device messages to each measuring instrument. The functions of the messages are:

  • Interface message: Control of the GPIB bus

  • Device message: Control of the measuring instrument

  To use the built-in BASIC, refer to Part 1 of this manual.

1.2 Command Modes

1.2.1 IEEE488.2-1987 Command Mode

IEEE488.2-1987 command mode is a command system based on IEEE standard 488.2-1987. The 488.2-1987 is defined by extending 488.1-1987 to include the items listed below. In IEEE488.2-1987 command mode, the analyzer operates in accordance with the 488.2-1987 standard.

- Syntax for programming the measuring instrument
- Communication protocol (procedure) of commands and data
- Common commands

CAUTION: ***The common commands refer to the commands that identically operate on all measuring instruments.***

- Status data structure
- System synchronization protocol

1.2.2 IEEE488.1-1987 Command Mode

Since the command syntax and the communication protocol used in IEEE488.1-1987 command mode are compatible with those of R3751/R3762/R3763 series, smooth transition from IEEE488.1-1987 command mode to R3752/53 series is possible. (However, because of changes in product specifications, some operations are performed using different commands.)

1.2.3 Switching of Command Mode

This instrument is set IEEE488.1-1987 command mode after activating (power on).

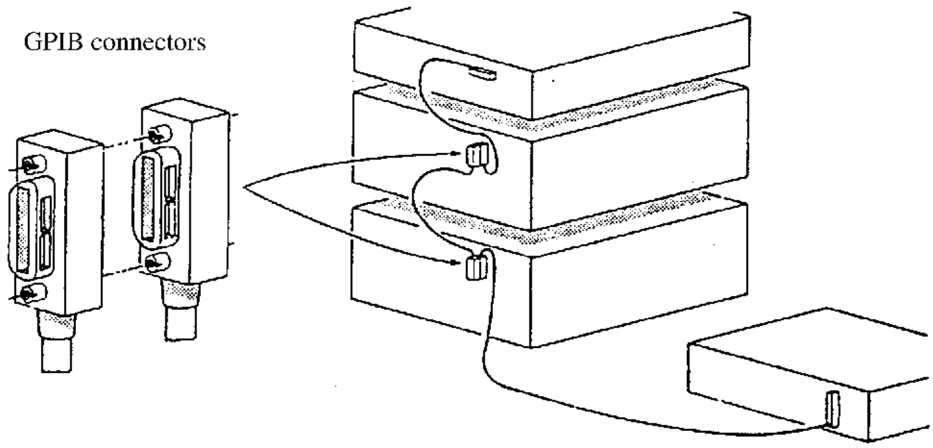
Execute switching of IEEE488.1-1987 command mode and IEEE488.2-1987 command mode is as follows:

- Send OLDC OFF → It enters IEEE488.2-1987 command mode.
- Send OLDC ON → It enters IEEE488.1-1987 command mode.

1.3 GPIB Setup

1. Connecting GPIB

   The following shows the standard GPIB connector. Secure the GPIB connector with the two screws to prevent it from coming loose during use.



The following precautions should be observed when using the GPIB interface:

- The total GPIB cable length in a single bus system should not exceed n × 2 meters, where n = the number of devices to be connected, including the GPIB controller. In no case should the cable length exceed 20 meters.
- Up to 15 devices can be connected to a single bus system.
- There are no restrictions concerning the method of connection between cables. However, no more than three GPIB connectors should be connected to a single device, since the use of excessive force could damage the connector mounting.

  For example, the total cable length in a system with five devices should be 10 meters or less (2 meters × 5 devices = 10 meters). The total cable length can be distributed freely within the range of the maximum allowed cable length. However, if more than ten devices are to be connected, some of them should be connected using cables of less than 2 meters so that the total cable length does not exceed 20 meters.

2. Setting GPIB address. The GPIB address is set using the keys on the front panel. The key operation depends on the model (R3752/53). For details, refer to the pertinent operation manual.

2. GPIB BUS FUNCTIONS

2.1 GPIB Interface Functions

Code	Description
SH1	With source handshake function
AH1	With acceptor handshake function
T6	Basic talker function, serial polling function, listener-specified talker cancel function
TE0	Without extended talker function
L4	Basic listener function, talker-specified listener cancel function
LE0	Without extended listener function
SR1	With service request function
RL1	Remote function, local function, local lockout function
PP0	Without parallel polling function
DC1	Device clear function
DT1	Device trigger function
C1	System controller function
C2	IFC transmission, controller in charge function
C3	REN transmission function
C4	SRQ response function
C12	Transmission of interface messages, control transfer function
E1	Using open-collector bus driver

2.2 Controller Functions

R3752/53 has a system controller mode and an addressable mode. The features of each mode are as follows:

	System Controller Mode	Addressable Mode
At startup	Active controller	Non-active controller
IFC	Controllable	Not controllable
REN	Controllable	Not controllable

To be active in the addressable mode, R3752/53 must have received the TCT interface message.

Only one system controller is allowed on the GPIB bus. When a system connected through the GPIB bus is started up, the system controller becomes the active controller. Only one active controller at a time is allowed on the GPIB bus. The controller controls the devices on the bus by sending interface messages and receiving service requests (SQR). Note that the IFC and REN interface messages are sent by the system controller only.

Interface messages are used to send indications of talker and listener, serial poll, device clear, trigger, local, and the other information to the measuring instrument. Service requests are used to receive interruptions from the instrument.

The active controller can transfer control to any non-active controller. After specifying the talker as the device to which control is to be transferred, the active controller sends a TCT interface message to transfer control to the talker. This operation is called "pass control".

When the system controller sends an IFC interface message, control is returned from the active controller to the system controller.

2.3 Responses to Interface Messages

The responses of the analyzer to interface messages are defined by IEEE standards 488.1-1987 and 488.2-1987 and are described in this section.

For information on how to send interface messages to the analyzer, refer to the instruction manual of the controller to be used.

2.3.1 Interface Clear (IFC)

The IFC message is transmitted directly to the analyzer through a signal line. The message allows the analyzer to stop the operation of the GPIB bus. Although all input/output operation is stopped, the input/output buffer is not cleared. Note that the DCL is used to clear the buffer. If the analyzer is specified as an active controller at that time, control of the GPIB bus will be removed from the analyzer and transferred to the system controller.

2.3.2 Remote Enable (REN)

The REN message is transmitted directly to the analyzer through a signal line. If the analyzer is specified as a listener when the message is true, the analyzer is in the remote mode. The analyzer remains in the remote mode until the GTL message is received, or the REN becomes false, or the LOCAL key is pressed.

When the analyzer is in the local mode, it ignores all the received data. When the analyzer is in the remote mode, it ignores all key inputting other than LOCAL key inputting. When the analyzer is in the LOCAL LOCKOUT mode (LLO; see section 2.3.8), it ignores all key inputting.

2.3.3 Serial Polling Enable (SPE)

When the analyzer receives a message from external devices, it is in the serial polling mode. If the analyzer is specified as a talker in this mode, it sends status bytes instead of normal messages. The analyzer remains in the serial polling mode until the SPD (Serial Polling Disable) message or the IFC message is received.

When the analyzer sends an SRQ (Service Request) message to the controller, bit 6 (RQS bit) of the response data is set to 1 (true). When the analyzer has finished sending this message, the RQS bit reverts to 0 (false). The SRQ (Service Request) message is sent directly through a signal line.

2.3.4 Group Execute Trigger (GET)

If the following conditions are satisfied when this message triggers the analyzer, the analyzer will start the measuring operation.

- The trigger source becomes the GPIB bus (TRIG: SOUR BUS).
- The analyzer is in the trigger waiting state (see "5. TRIGGER SYSTEM").

The GET operates in the same manner as the *TRG but differently from TRIG:IMM and TRIG:SIG. The GET, *TRG, TRIG:IMM and TRIG:SIG are stacked in the input buffer and executed in order of reception.

2.3.5 Device Clear (DCL)

When the analyzer receives the DCL message, it performs the following:

- Clearing of the input and output buffers
- Resetting of syntax (?>program<?) analysis, execution control and response data generation
- Cancellation of all commands that prevent the remote command from being executed next
- Cancellation of commands that are paused to wait for other parameters
- Cancellation of *OPC and *OPC?

It does not perform the following:

- Changing of data set or stored in the analyzer
- Interruption of the front panel operation
- Modification or interruption of analyzer operations being executed
- Changing of status bytes other than MAV. (MAV becomes 0 when the output buffer is cleared.)

2.3.6 Selected Device Clear (SDC)

The SDC message operates in the same manner as the DCL message. However, it is executed only when the analyzer is as a listener.In other cases, it is ignored.

2.3.7 Go To Local (GTL)

The GTL message places the analyzer in the local mode. In the local mode, all the operations on the front panel are available.

2.3.8 Local Lockout (LLO)

The LLO message places the analyzer in the local lockout mode. If the analyzer is set to the remote mode in this mode, all the operations on the front panel will be inhibited. (Note that in the normal remote mode, front panel operations can be performed using the LOCAL key.)

The following three methods can be used to set the analyzer to the local mode from the local lockout mode:

- Sending a GTL message to the analyzer
- Setting the REN message to false (In this case, the local lockout mode will be canceled.)
- Switching on the analyzer power again

2.3.9 Take Control (TCT)

If the analyzer receives the TCT message when it is specified as a talker, it becomes the active controller through "pass control". On receiving the IFC message, the analyzer returns to the addressable mode.

2.4 Message Exchange Protocol

The analyzer receives program messages from controllers or other devices through the GPIB bus and generates response data. The program messages include commands, queries (commands used to query response data) and data. The procedure used to exchange these commands, queries and data is explained in this section.

2.4.1 GPIB Buffers

The analyzer is equipped with the following three buffers:

1. Input buffer

   The input buffer is used to store data temporarily for command analysis (1024 bytes).

   Either of the following two methods can be used to clear the input buffer:

   - Switching on the analyzer power
   - Execution of the DCL or the SDC

2. Output buffer

   The output buffer is used to store data which are to be read from the controller (1024 bytes).

   Either of the following two methods can be used to clear the output buffer:

   - Switching on the analyzer power
   - Execution of the DCL or the SDC

3. Error queue

   The error queue is available only for IEEE488.2-1987 mode. It is used to store up to ten error messages for remote commands. Each time an error occurs during remote command analysis or in execution, an error message is stored in the queue. The SYST:ERR command is used to read out these messages. When a message is read out, it is removed from the queue.

   Either of the following two methods can be used to clear the error queue:

   - Switching on the analyzer power
   - Execution of the *CLS

2.4.2 IEEE488.2-1987 Command Mode

IEEE488.2-1987 command mode performs the sending and receiving of messages in accordance with the message exchange protocol in compliance with IEEE standard 488.2-1987.

The following are the most important events when another controller or device receives messages from the analyzer in this mode:

- Response data are generated when a query is received.
- Data are generated in the order of query execution.

1. Purser

   The purser receives command messages in the order of reception from the input buffer, analyzes the syntax and determines what the received command is to execute.

   The purser traces the tree structure of the commands when analyzing the command program. It memorizes which part of the tree structure is to be used to start analysis when analyzing the next command. This information is returned to the head of the structure when the purser is cleared.

   Any of the following four methods can be used to clear the purser:

   - Switching on the analyzer power
   - Reception of the DCL or the SDC
   - Reception of ":" following ";"
   - Reception of the terminator or the EOI signal

2. Generating response data

   When the purser executes a query, the analyzer generates data in the output buffer in response to it (that is, to output data a query must be sent immediately before the data). The procedure implies that unless the controller reads out the data generated through the query, the data will never be cleared.

   Apart from the controller read operation, there are two conditions under which the data are cleared. A query error will occur under the following conditions:

   - Unterminated condition

     When the controller has read the response data without terminating (LF code of ASCII or END message of GPIB) or sending the query

   - Interrupted condition

     When the controller has received the next program message before reading the response data

2.4.3 IEEE488.1-1987 Command Mode

In IEEE488.1-1987 mode, the analyzer uses the same protocol for message exchange as R3751. In this mode, the command stored in the input buffer can be analyzed, and no command string longer than the input buffer can be received (such commands are ignored).

When the analyzer is specified as a talker, the analyzer generates response data. It is necessary for the query to specify the items of the response data in advance. Each time the analyzer is specified as a talker, response data are generated and formatted on the output buffer. It is impossible to answer multiple queries simultaneously.

2.4.4 BASIC Mode

The analyzer supports a function enabling the analyzer to program itself or to be programmed by external devices with a built-in BASIC interpreter. When the BASIC interpreter is in operation, the GPIB interface of the analyzer enters a special mode and the interpreter controls the command messages from the external devices and data output from the analyzer.

For information on data input/output, refer to "ENTER and OUTPUT" in Part 1 of this manual. For information on how the BASIC interpreter does not control the GPIB, refer to "CONTROL Command" in Part 1 of this manual.

2.4.4 BASIC Mode

The analyzer enables the use of a special method whereby the addressable mode controls the built-in BASIC interpreter.

@BASIC statement

NOTE: ***The character "@" must be at the beginning of the input message.***

There are no restrictions concerning the BASIC statement to be executed using this method. Also, the BASIC statements described here are not confined to commands. That is, statements such as the following can be executed:

- @100 PRINT "Hello World"
- @VAR=1000

Using this method, it is possible to download the built-in BASIC program from the external controller through the GPIB bus.

The GPIB bus is controlled by the BASIC interpreter when the BASIC interpreter is in operation. Under these conditions, the external controller can execute the statements in the same manner as above. (However, there are some restrictions on BASIC command execution.)

In other words, no character string beginning with "@" can be received through the GPIB bus in the addressable mode. (This restriction does not apply in the system controller mode, and there is no way to avoid it in the addressable mode.)

3. COMMAND SYNTAX

3.1 IEEE488.2-1987 Command Mode

For characters input in IEEE488.2-1987 command mode other than character string data and block data, no distinction is made between upper case and lower case.

3.1.1 Command Syntax

The command program for IEEE488.2-1987 command mode is defined in the following format:

Header	→	Space (space character)	⇒	data

NOTE: " ⇒ " indicates repetition.

1. Header

   The header has a hierarchical structure consisting of multiple mnemonics separated by a colon. A four-character (or three-character) "short form" is provided for each mnemonic consisting of four characters or more. (Mnemonics which are not abbreviated are called "long forms".) It is possible to use any form in any combination.

   Any command with a header followed immediately by "?" becomes a query command.

2. Space (space character)

   One space or more is required in this field; otherwise, a syntax error will occur.

3. Data

   When the command requires multiple data, the data should be separated with commas. A space may be inserted before or after the each comma.

   For details of data types, refer to "3.1.2 Data Formats".

4. Writing multiple commands

   In IEEE488.2-1987 command mode, it is possible to write multiple commands by separating them with semicolons.If commands are written in this way, they should be executed while changing the current path in the hierarchical structure of the header.

5. Changing the current path

   The current path should be changed in accordance with the following rules:

   • Switching on: The current path is set to "root".

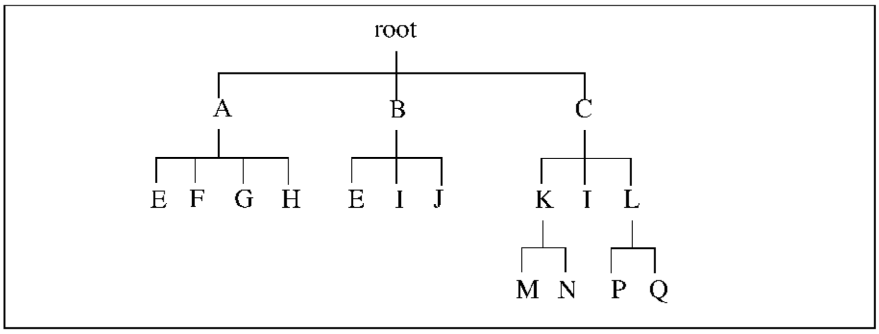
   • Terminator: The current path is set to "root".

   • Colon (:): The current path is changed to the layer immediately below in the command tree. If the colon is at the beginning of the command, the current path will be changed to "root".

   • Semicolon (;): The current path is not changed.

   • Common command:
   The command can be executed regardless of the current path position. When the *RST command is executed, the current path is set to "root". (See the example below.)

   The following header structure is given as an example:



In this example, the current path is changed as follows:

1. :A:E;:B:E

   Since the colon in the second command changes the current path to "root", commands "A:E" and "B:E" are both valid.

2. :A:E<END> B:E

   Since <END> (terminator) changes the current path to "root", commands "A:E" and "B:E" are both valid.

3. :A:E;F;G;H

   Since the semicolon does not change the current path, ":A:E;F;G;H" results in the four commands "A:E", "A:F", "A:G" and "A:H".

4. :C:I;K:N;M

   Since the colon changes the current path, "K:N" is viewed from the ":C:" layer. Therefore, "K:N" results in "C:K:N". At the same time, since "K:N" includes a colon, the current path is changed to ":C:K:" and the last "M" is interpreted as "C:K:M".

5. :A:E;*ESR 16

   Since the common command is independent of the current path, "*ESR 16" will be executed correctly.

6. :A:E;*ESR 16;F;G;H

   Since the common command does not change the current path, the third item, "F", will be searched for using the current path ":A:" set by the first item ":A:E". Therefore, "F", "G" and "H" result in "A:F", "A:G" and "A:H", respectively.

The following examples show syntax errors.

1. :A:E;B:E

   Since "A:E" changes the current path to ":A:", "B:E" will be searched for in the layer of ":A:". However, because the mnemonic "B" is not found, an error will occur.

2. :C:K:M;L:P

   Since ":C:K:M" changes the current path to ":C:K:", "L:P" will be searched for in the layer of ":C:K:". However, because the mnemonic "L" is not found, an error will occur.

3.1.2 Data Formats

In IEEE488.2-1987 command mode, the analyzer uses the data formats for data input/output shown in this section.

1. Numeric data

   There are three numeric data formats, any of which can be used for numeric data input. (The data are rounded up or down in accordance with the data format to be input.)

   Some commands add the units to the data at data inputting. For information on units, refer to 5. below.

   The following shows the format of the character data.

   - Integer type: NR1 format

     [Symbol] → Number ⇒

   - Fixed-point type: NR2 format

     [Symbol] → Number ⇒ . → Number ⇒

   - Floating-point type: NR3 format

     [Symbol] → Number ⇒ . → Number ⇒ E or e → Symbol → Number ⇒

NOTE: " ⇒ " indicates repetition. Symbols at the beginning may be omitted.

2. Character data

Alphabetic character	→	Alphanumeric character or _	⇒

NOTE: ***" ⇒ " indicates repetition.***

3. Character string data

There are two character string data formats.

"	→	Character/ " "	⇒	"
'	→	Character/ ' '	⇒	'

Each format can be used as an ASCII 7-bit code character in the character string data.

NOTE: ***In character string data starting with ["], ["] must be represented by [" "]. In character string data starting with ['], ['] must be represented by ['']. "⇒" indicates repetition.***

When the response data are character string data, character string data starting with ["] should be output.

4. Block data

There are two block data formats. Either can be used for inputting into the analyzer.

Fixed-length format:	#	→	Number	→	Number	⇒	DATA	⇒
Undefined-length format:	#	→	0	→	DATA	⇒	LF^EOI	

NOTE: ***" ⇒ " indicates repetition.***

In the fixed-length format, the one-digit number following "#" represents the number of digits for the bytes in the data following that number. "0" cannot be used, because it indicates the undefined-length format.

Example: Block data #3128 <data byte>

"3" following "#" represents the number of digits in the character string (128) following "3", while "128" represents the number of bytes in <data byte> following that number.

5. Units

Units are the suffix following a numeric value. The suffix can be used as a prefix for the unit. The table below lists the suffixes and the units which can be used.

Suffixes		Unit	Commands with which Usable
1E18	EX	HZ	[SENSe:]BANDwidth[:RESolution]
			[SOURce:]FREQuency:CENTer
1E125	PE		[SOURce:]FREQuency:CW
			[SOURce:]FREQuency:SPAN
1E12	T		[SOURce:]FREQuency:STARt
			[SOURce:]FREQuency:STOP
			[SOURce:]PSWeep:FREQuency
1E9	G	DEG	[SENSe:]CORRection:OFFSet:PHASe
1E6	MA		
		DB	INPut:ATTenuation
1E3	K		OUTPut:ATTenuation
1E-3	M *	DBM	[SOURce:]POWer[:LEVel][:AMPLitude]
			[SOURce:]POWer:STARt
1E-6	U		[SOURce:]POWer:STOP
1E-9	N	M	[SENSe:]CORRection:EDELay:DISTance
1E-12	P	S	[SENSe:]CORRection:EDELay[:TIME]
			[SENSe:]CORRection:PEXTension:TIME
1E-15	F		[SOURce:]SWEep:TIME
			TRIGger[:SEQuence]:DELay
1E-18	A	OHM	CALCulate:TRANsform:IMPedance:CIMPedance
			IMPut:IMPedance

Note: For commands not listed in the table, only the suffix can be used.

*: If HZ or OHM is used as the unit, the command will be executed using the suffix 1E6 (equivalent to MA).

3.2 IEEE488.1-1987 Command Mode

The following shows the program message structure for IEEE488.1-1987 command mode. For IEEE488.1-1987 command mode, a lower-case letter is used as the separator, except in character string data.

3.2.1 Command Syntax

The program for IEEE488.1-1987 command mode is defined in the following format.

Header → [Separato] ⇒ DATA

The separator can be a space of zero or more characters, a comma, or a semicolon. The following three data formats can be used:

- Numeric value data format:

  [Symbol] → Number ⇒ . → Number ⇒ EXP/E/e → Symbol → Number ⇒ [Unit]

- Binary data format:

  ON | OFF | 1 | 0

- Character string data format:

  Character ⇒ LF^EOI

NOTE: " ⇒ " indicates repetition.

The units below can be used for numeric value data:

GHZ	MHZ	KHZ	HZ
DEG			
DP	DM	DB	
METER	CM		
SEC	MSEC	USEC	NSEC
VOLT	MV	UV	NV
MOHM	KOHM	OHM	
UNIT			
DIV			
PER			

In character string data, the characters from the character immediately after the header to the last character of the input data are regarded as a character string. If "?" is added immediately after the header, the command will become a query command.

4. STATUS BYTES

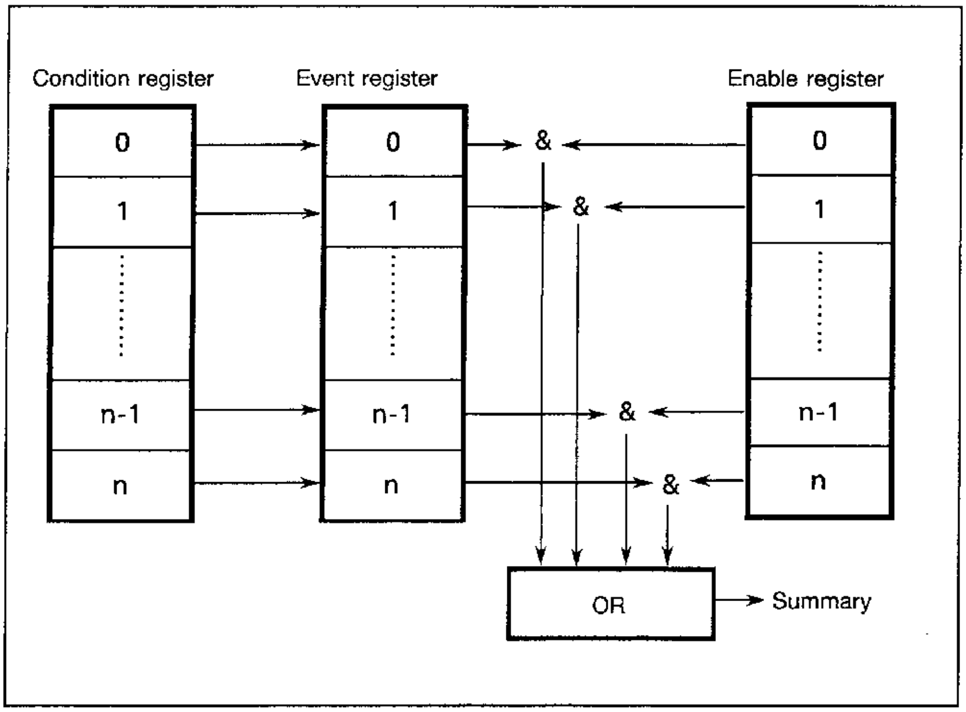
The analyzer has a hierarchical status register structure in compliance with IEEE standard 488.2-1987, which is used to send various device status information to the controller. This chapter explains the operational models of the status byte and event assignments.

NOTE: The status structure differs from that of R3751 series, irrespective of the command mode.

4.1 Status Register

4.1.1 Status Register Structure

The analyzer employs the status register model defined by IEEE standard 488.2-1987 and consists of a condition register, an event register and an enable register.



1. Condition register

   The condition register continuously monitors the status of devices, that is, retains the latest status of devices. No data can be written into this register.

2. Event register

   The event register latches and retains the status information from the condition register. (In some cases, it retains status changes.)

   Once the register is set, the condition is maintained until a query command reads out the information or the register is reset by means of the *CLS command. No data can be written into this register.

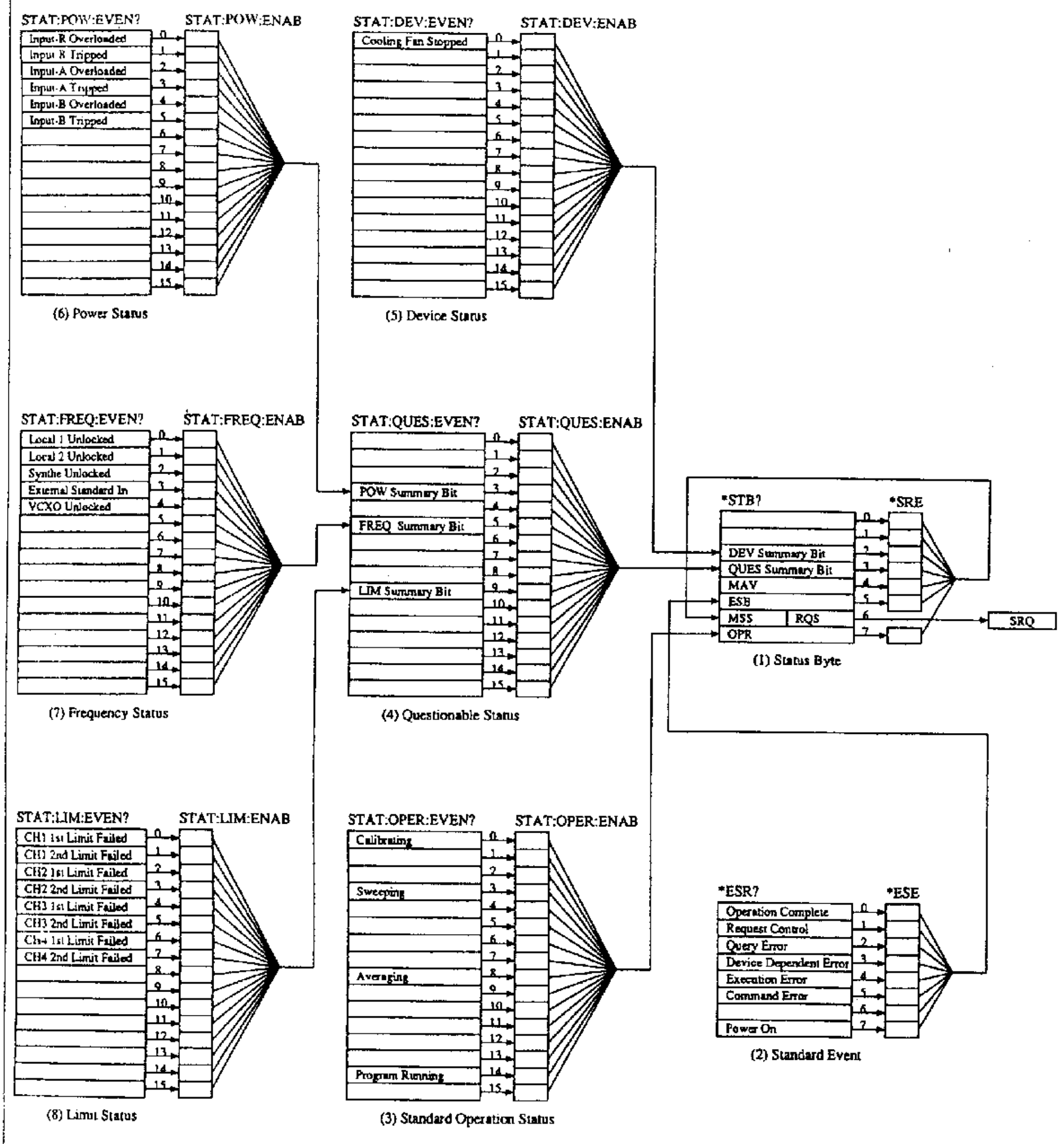
3. Enable register

   The enable register specifies which bit in the event register is to be used as the valid status to generate a summary. The enable register is ANDed with the event register. The OR of the result of the AND operation is generated as a summary. The summary is written into the following status registers. Any data can be written into these registers.

4.1.2 Status Register Types

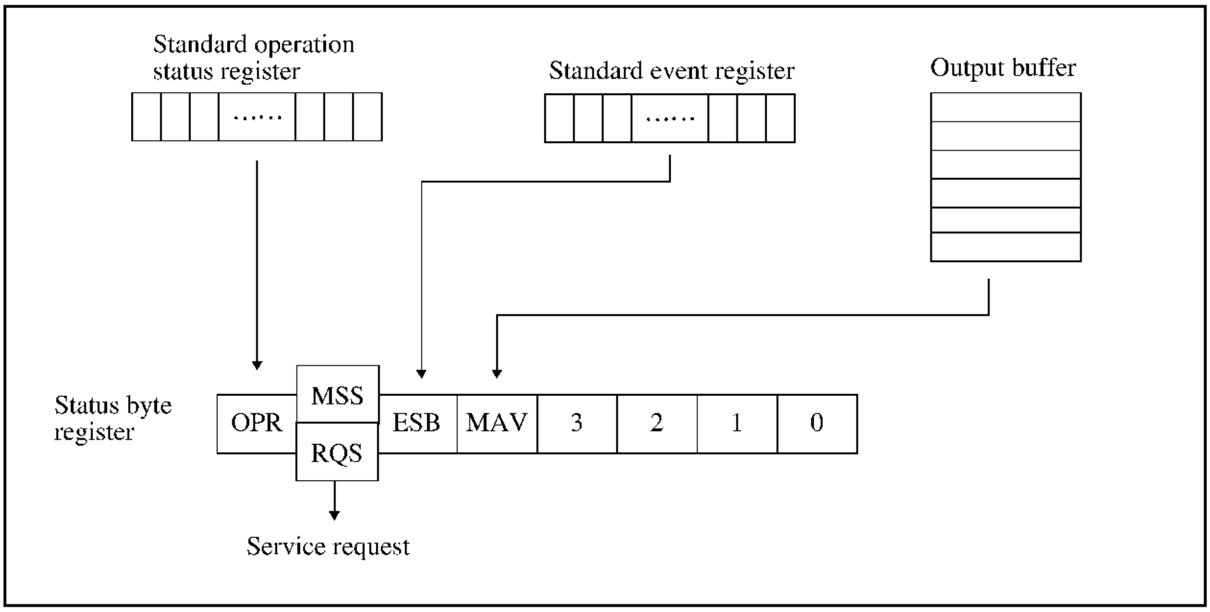
The following three types of status register are used in the analyzer:

1. Status byte register; See Section 4.2.
2. Standard event register; See Section 4.3.
3. Standard operation status register; See Section 4.4.
4. Questionable status register
5. Device status register; See Section 4.5.
6. Power status register; See Section 4.6.
7. Frequency status register; See Section 4.7.
8. Limit status register; See Section 4.8.


STAT:POW:EVEN?
STAT:POW:ENAB
Input-R Overloaded
Input-R Tripped
Input-A Overloaded
Input-A Tripped
Input-B Overloaded
Input-B Tripped
(6) Power Status
STAT:DEV:EVEN?
STAT:DEV:ENAB
Cooling Fan Stopped
(5) Device Status
STAT:FREQ:EVEN?
STAT:FREQ:ENAB
Local 1 Unlocked
Local 2 Unlocked
Synthe Unlocked
External Standard In
VCXO Unlocked
(7) Frequency Status
STAT:QUES:EVEN?
STAT:QUES:ENAB
POW Summary Bit
FREQ Summary Bit
LIM Summary Bit
(4) Questionable Status
*STB?
*SRE
DEV Summary Bit
QUES Summary Bit
MAV
ESB
MSS
RQS
OPR
SRQ
(1) Status Byte
STAT:LIM:EVEN?
STAT:LIM:ENAB
CH1 1st Limit Failed
CH1 2nd Limit Failed
CH2 1st Limit Failed
CH2 2nd Limit Failed
CH3 1st Limit Failed
CH3 2nd Limit Failed
CH4 1st Limit Failed
CH4 2nd Limit Failed
(8) Limit Status
STAT:OPER:EVEN?
STAT:OPER:ENAB
Calibrating
Sweeping
Averaging
Program Running
(3) Standard Operation Status
*ESR?
*ESE
Operation Complete
Request Control
Query Error
Device Dependent Error
Execution Error
Command Error
Power On
(2) Standard Event

4.1.2 Status Register Types

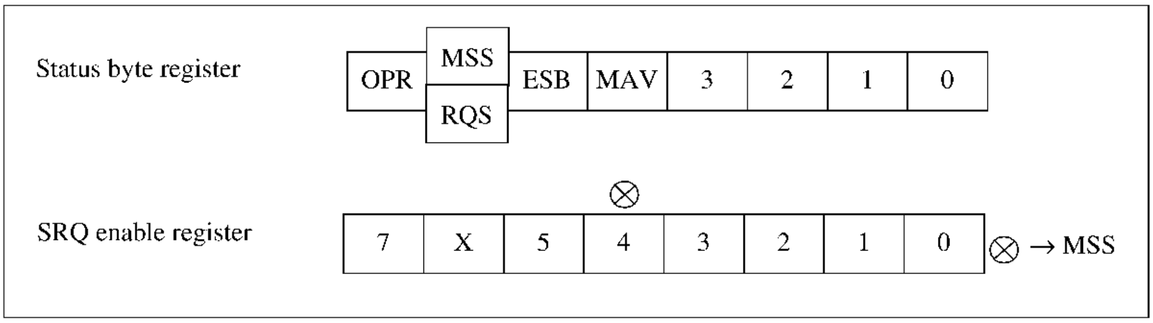
The figure below shows the arrangement of the status registers in the analyzer.



4.2 Status Byte Register

The status byte register summarizes the information from the status register (see section 4.1.1). In addition, a summary of the status byte register is sent to the controller as a service request. Therefore, the register operates slightly differently from the status register. This section explains the status byte register.

The figure below shows the structure of the status byte register.



The register has the same functions as the status register explained in section 4.1.1, except with regard to the following three points:

1. The summary of the status byte register is written in bit 6 of the status byte register.
2. Bit 6 of the enable register is always valid and cannot be changed.
3. Bit 6 (MSS) of the status byte register writes the RQS of the service request.

The register responds to the serial polling from the controller. On doing so, bits 0 to 5 and bit 7 of the status byte register and the RQS are read out, then the RQS is reset to 0. The other bits are not cleared until each factor has been reset to 0.

When the *CLS command is executed, the status byte register, the RQS bit and the MSS bit can be cleared.

The table below explains the meanings of the bits in the status byte register.

bit		Description
7	OPR	The OPR bit is a summary of the standard operation status register.
6	MSS	The RQS bit is true when the MSS bit of the status byte register is set to 1. The MSS bit is the summary bit for the entire status data structure.
		The service request cannot read out the MSS bit. (However, the MSS bit is understood to be 1 when the RQS bit is 1.)
		To read the MSS bit, use the common command *STB?.The *STB? command can read out bits 0 to 5 and bit 7 of the status byte register and the MSS bit. In this case, neither the status byte register nor the MSS bit can be cleared.
		The MSS bit cannot become 0 until all the unmasked factors in the status register structure have been cleared.
5	ESB	The ESB bit is a summary of the standard event register.
4	MAV	The MAV bit is a summary bit for the output buffer.
		When data exist in the buffer, this bit is set to 1. When the data are read out, it is set to 0.
3 to 0		Always 0

4.3 Standard Event Register

The table below shows the assignments of the standard event register.

bit		Description
7	Power on	Set to 1 when the analyzer is switched on
6		Always 0
5	Command Error	Set to 1 when the purser finds a syntax error.
4	Execution Error	Set to 1 when the system fails to execute the instruction received as a GPIB command for some reason (such as out-of-range parameter).
3	Device Dependent Error	Set to 1 when errors other than command errors, execution errors, or query errors occur.
2	Query Error	Set to 1 when no data exist or data have been deleted when the controller attempts to read out data from the analyzer.
1	Request Control	Set to 1 when the analyzer is required to be the active controller.
0	Operation Control	Set to 1 when the analyzer has no command to be executed after receiving an *OPC command.

4.4 Standard Operation Status Register

1. Condition register

   The table below shows the assignments of the condition register for the standard operation status.

bit		Description
15		Always 0
14	Program running	Set to 1 when the built-in BASIC language is running.
4 to 13		Always 0
3	Sweeping	Set to 1 when sweeping is being executed.
1 to 2		Always 0
0	Calibrating	Set to 1 when calibration data are being acquired.

Note: Unlike the event register, the bit 8 (Averaging) is always 0.

2. Event register

   The event register for the standard operation status is used to hold the change from 1 to 0 of the corresponding condition register. The table below shows the assignments of the event register for the standard operation status.

bit		Description
15		Always 0
14	Program running	Set to 1 when the built-in BASIC language stops.
13 to 9		Always 0
8	Averaging	Set to 1 when averaging finishes.
7 to 4		Always 0
3	Sweeping	Set to 1 when sweeping finishes.
2 to 1		Always 0
0	Calibrating	Set to 1 when calibration data acquisition finishes.

4.5 Device Status Register

The table below shows the assignments of the condition register.

bit		Description
0	Cooling Fan Stopped	Sets to 1 when the cooling fan stops.
1	Over temperature Detected	This is set to 1 when the internal temperature is outside of the specified temperature range.
Others		Always 0

4.6 Power Status Register

The table below shows the assignments of the condition register.

bit		Description
0	Input-R Overloaded	Sets to 1 when the input-R is overloaded.
1	Input-R Tripped	Sets to 1 when the protection circuit of the input-R is in operation.
2	Input-A Overloaded	Sets to 1 when the input-A is overloaded.
3	Input-A Tripped	Sets to 1 when the protection circuit of the input-A is in operation.
4	Input-B Overloaded	Sets to 1 when the input-B is overloaded.
5	Input-B Tripped	Sets to 1 when the protection circuit of the input-B is in operation.
Others		Always 0

Event register latches the change of the corresponding condition register $0 \rightarrow 1$. That is, 1 is set when the input is overloaded (or the protection circuit are put into operation).

4.7 Frequency Status Register

The table below shows the assignments of the condition register.

bit		Description
0	Local 1 Unlocked	Sets to 1 when the local 1 is unlocked.
1	Local 2 Unlocked	Sets to 1 when the local 2 is unlocked.
2	Synthe Unlocked	Sets to 1 when the synthesizer is unlocked.
3	External Standard In	Sets to 1 when the external standard frequency is input.
4	VCXO Unlocked	Sets to 1 when VCXO is unlocked.
Others		Always 0

Event register latches the change of the corresponding condition register 0 → 1. That is, 1 is set when the lock is unlocked.

4.8 Limit Status Register

The table below shows the assignments of the condition register.

bit		Description
0	CH1 1st Limit Failed	Sets to 1 when the first waveform of the channel 1 is FAIL.
1	CH1 2nd Limit Failed	Sets to 1 when the second waveform of the channel 1 is FAIL.
2	CH2 1st Limit Failed	Sets to 1 when the first waveform of the channel 2 is FAIL.
3	CH2 2nd Limit Failed	Sets to 1 when the second waveform of the channel 2 is FAIL.

Event register latches the change of the corresponding condition register $0 \rightarrow 1$. That is, 1 is set when the FAIL arose in each waveform.

4.9 SRQE/SRQD Operation

The analyzer incorporates an expansion which is not specified in IEEE standard 488.2-1987 in the service request system to support R3751 compatible mode. The items described here are not applicable to IEEE488.2-1987 command mode.

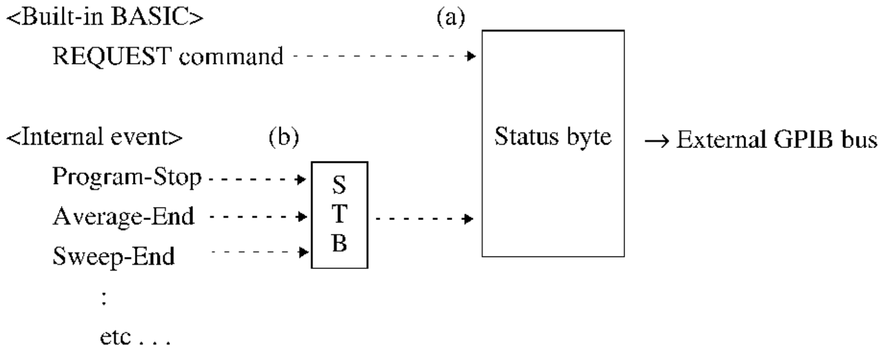
In R3751, the SRQE/SRQD command is used to permit or inhibit service requests. Since IEEE standard 488.2-1987 uses a status data structure, the enable register can be used to permit or inhibit the service requests. However, the enable register cannot perform exactly the same functions as the SRQE/SRQD command because of the nature of the register (that is, if the enable register is set to "enable" when its factor is 1, a request will be generated), IEEE standard 488.2-1987 has been expanded only for the SRQE/SRQD signal in IEEE488.1-1987 command mode.

The SRQE/SRQD command in IEEE488.1-1987 command mode operates as RQS enable/disable of the status data structure. The SRQE command ignores existing requests and does not issue a request. It sends an RQS message to the controller only when a new MSS occurs. The SRQD command always stops generating the RQS message.

If the SRQD command and the SRQE command are executed continuously when the RQS state is TRUE, the RQS state will be set to FALSE. Since the controller cannot read out the RQS state at that time, a serial poll must be performed on the analyzer before executing the SRQD command if it is necessary to use the RQS state.

4.10 Notice on the status byte

There are two output paths for a status byte as shown below:



(a) This is a status byte which is output through the external GPIB bus. This byte can be read out by using the serial pole (the bit 6 of RQS is set to 0 (zero) when read out).

(b) Corresponds to the status register for the internal event. This register's contents can be read out by executing " * STB?"(Bit 6 (MSS) will not change when this is done).

NOTE:

1. ***The output of (a) is the one most recently stored (by either the <Built-in BASIC> or the <Internal event>).***
2. ***When executing the REQUEST command under <Built-in BASIC>, the specified value is immediately saved to (a).***
   When executing a command under <Internal event>, the specified value is saved to (a) if any changes in (b) are detected.
3. ***Bit changes in (b) can be masked (except the MAV bit (Bit = 4)) by setting enable registers for each register up to (b).***
   The MAV bit is set to "1" when receiving a query command; "0" when outputting (including executions of the <Built-in BASIC>). In other words, there is a bit change each time a query command is executed.
   The contents of (b) have precedence over the REQUEST command when a query command is executed before sending the contents of (a) (which has already been set by the REQUEST command) via a serial pole.
4. ***The status byte is always cleared by executing "* CLS" followed by "REQUEST 0".***
   "* CLS" is effective for register groups up to (b). So the bit status of (a) cannot be changed if (b) is already "0" (zero) (because there are no changes in (b), (a) stays unchanged).

---

5. TRIGGER SYSTEM

This chapter describes the trigger system.

The trigger system is used to synchronize measurement with a specified event. The event may be a GET interface message, a GPIB command such as the *TRG command, or an external trigger signal. The delay time from an event to the start of measurement can also be specified using the trigger system.

5.1 Trigger Model

The following shows the model of the trigger system for the analyzer.

Switching on power

:ABORt → *RST → Idle state — See section 5.2.

↓ ↑

Trigger waiting state — See section 5.3.

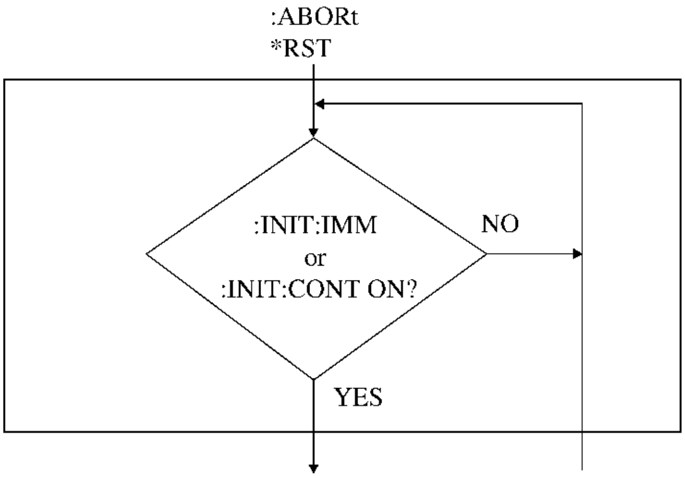
↓ ↑

Measuring state — See section 5.4.

When the analyzer is switched on or when the :ABORt command or the *RST command is executed, the trigger state changes to the idle state. The idle and trigger waiting states wait for conditions that are required for measurement.

5.2 Idle State

When the analyzer is switched on, the trigger system of the analyzerchanges to the idle state. Also, the execution of the :ABORt command or the *RST command forcibly changes the trigger system to the idle state. The state changes as follows:

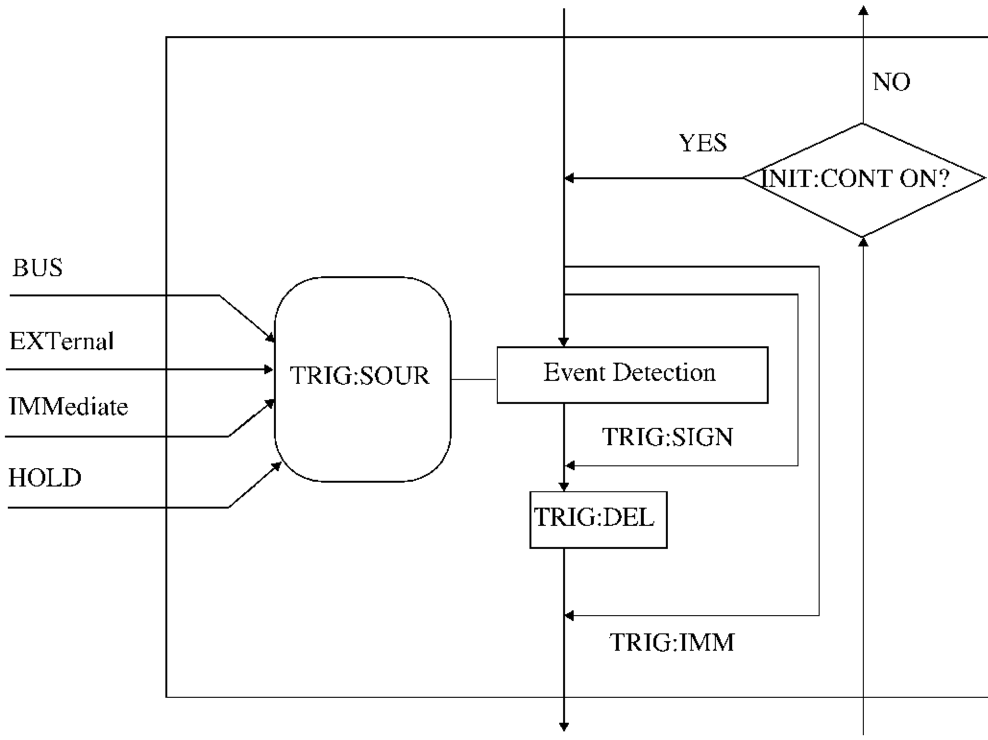


The trigger system does not leave this state until INITiate [:IMMediate] or INITiate:CONTinuous ON. Either of these conditions changes the trigger system to the trigger waiting state.

NOTE: ***Since the execution of the *RST command sets INITiate:CONTinuous to OFF, measurement stops.***

When the trigger system exits the idle state, the operation pending flag of the analyzer is always set. Also, when the analyzer enters in the idle state, the operation pending flag is cleared. *OPC, *OPC? and *WAI refer to the operation pending flag.

5.3 Trigger Waiting State

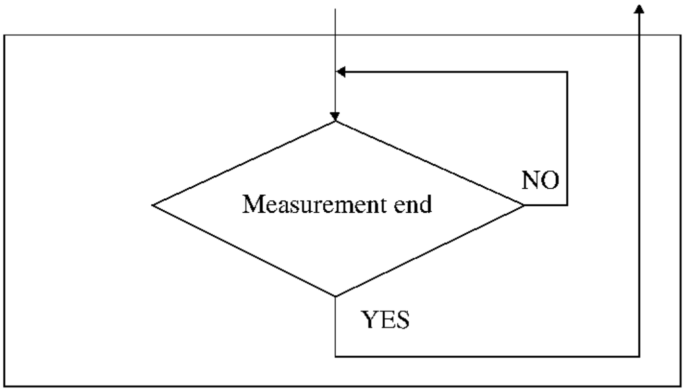


The above is a flowchart of the trigger waiting state of the analyzer. The TRIGger:SOURce command sets the trigger source, and the event detection detects a trigger factor. When the analyzer is triggered and leaves the event detection state, it enters the next state after the time specified by the TRIGger:DELay command has elapsed.

If the analyzer receives the TRIGger:SIGNal command in the trigger waiting state, it will enter the measuring state immediately without entering the event detection state. If it receives the TRIGger [:IMMediate] command in the trigger waiting state, it will enter the measuring state immediately without entering the TRIGger:DELay state.

If the INITiate:CONTinuous signal is set to OFF when the analyzer exits the measuring state, the analyzer will not return to the idle state but will directly enter the next trigger waiting state.

5.4 Measuring State



The analyzer performs measurement in this state. When the analyzer enters the measuring state, it performs sweeping and acquires measurement data.

5.5 IEEE488.1-1987 Command Mode

When the analyzer is in IEEE488.1-1987 command mode, it cannot utilize all of the functions for the trigger system described above. It can utilize only the following four macro commands for the trigger system.

The actual operations of each command in IEEE488.2-1987 command codes are shown on the right. They differ slightly from those used in the actual operation.

CONT	INITiate:CONTinuous ON
SINGLE	INITiate:CONTinuous OFF;:ABORt;INITiate
MEAS	ABORt;INITiate
SWPHLD	INITiate:CONTinuous OFF;:ABORt

6. SAMPLE PROGRAMS

The following are three sample programs:

- Program 1

  Inputs the center frequency and the span frequency, obtains in levels at all points of the waveform, and substitutes them for variables. After obtaining in all the levels, displays them in the order of 1 to 1201.

- Program 2

  This is a basic program which performs sweeping once, waits until it has received an SRQ signal indicating the sweeping end while forming a loop, and exits the loop and proceeds to the next loop on receiving the SRQ signal.

- Program 3

  Inputs the center frequency and the span frequency, searches for a maximum level of the waveform and the frequency at the maximum level, and displays the result.

- Program 1

```
100 !*************************
110 !*                       *
120 !* BINARY DATA TRANSFER  *
130 !*      TEST PROGRAM     *
140 !*                       *
150 !*************************
160 !
170 DIM DA(1201)
180 INTEGER N,LP
190 ADD=31
195 OUTPUT ADD;'OLDC OFF'
200 OUTPUT ADD;'DISP:ACT 1;:CALC:FORM MLOG"
210 OUTPUT ADD;'SWE:POIN 1201'
220 OUTPUT ADD;'INIT:CONT OFF'
230 CLS
240 INPUT 'CENTER FREQ ? [MHz] -',CF
250 INPUT 'SPAN   FREQ ? [KHz] -',SP
260 OUTPUT ADD;'FREQ:CENT ",CF,'MHz'
270 OUTPUT ADD;'FREQ:SPAN ",SP,'KHz'
280 OUTPUT ADD;'FREQ:STAR?"
290 ENTER ADD;STA
300 OUTPUT ADD;'FREQ:STOP?"
310 ENTER ADD;STP
320   P1=POINT1(STA,0)
330   P2=POINT1(STP,0)
340   N=TRANSR(P1,P2,DA(1),0)
350   FOR LP=1 TO 1201
360     PRINT "POINT ';(LP-1);" = ';DA(LP)
370   NEXT LP
380 PRINT 'DATA COUNT - ';N
390 STOP
```

Line	Description
100 to 160	Comment lines.
170	Declares the variable arrangement (waveform data are substituted).
180	Declares the variable to be an integer.
190	Substitutes the address of the network analyzer for the variable.
195	Sets the R3752/3753 mode.
200	Sets the format of channel 1 to LOGMAG.
210	Sets the measurement point to 1201.
220	Sets the sweeping to the single mode.
230	Deletes characters on the display.
240	Inputs the center frequency and substitutes it for the variable (unit: MHz).
250	Inputs the span frequency and substitutes it for the variable (unit: kHz).
260	Sets to the input center frequency.
270	Sets to the input span frequency.
280	Takes in the start frequency from the analyzer.
290	Substitutes the taken-in value for the variable.
300	Takes in the stop frequency from the analyzer.
310	Substitutes the taken-in value for the variable.
320	Converts the taken-in start frequency into an address point.
330	Converts the taken-in stop frequency into an address point.
340	Substitutes the waveform data (LOGMAG) for the variable.[Data at address point 0 = DA (1): up to 1200 below]
350	Displays data from 1 to 1201 in that order.
360	Displays the variable DA (1 to 1201) for which waveform data are substituted on the display.
370	Repeats until the LP reaches 1201.
380	Finally displays the number of times that data are transferred (1201 times).
390	Program ends.

- Program 2

```
100 !*****************
110 !*               *
120 !* SRQ SWEEP TEST *
130 !*               *
140 !*****************
150 !
160 CLS
162 OUTPUT 31;"OLDC OFF"
165 OUTPUT 31;"STAT:OPER:ENAB 8"
170 OUTPUT 31;"SWE:POIN 1201"
180 OUTPUT 31;"SWE:TIME 1S"
190 OUTPUT 31;"INIT:CONT OFF;:ABOR"
200 INPUT "HIT ENT KEY TO SWEEP START !",DUMMY$
210  GOSUB *SWP
220 PRINT "SWEEP TEST FINISHED !!!"
230 STOP
240 !
250 !****************
260 !
270 *SWP
280   ON ISRQ GOTO *PATH
290   OUTPUT 31;"*SRE 128":SPOLL(31)
300   ENABLE INTR
310   OUTPUT 31;"INIT"
320  *LOOP
330   GOTO *LOOP
340 !
350  *PATH
360   SPOLL(31):DISABLE INTR
370   OUTPUT 31;"*SRE 0"
380 RETURN
```

Line	Description
100 to 150	Comment lines.
160	Deletes characters on the display.
162	Sets the R3752/3753 mode.
165	Enables bit 3 (Sweep End) of OPER status.
170	Sets measurement point of network analyzer to 1201.
180	Sets the sweeping time to one second.
190	Sets the sweeping to the single mode.
200	Displays a comment on the CRT. (Go to next with ENTER key.)
210	Calls subroutine (*SWP).
220	Displays a comment on the CRT.
230	Program ends.
240	Comment line
250	Comment line
260	Comment line
270	Subroutine (*SWP)
280	On receiving ISRQ, go to *PATH.
290	Enables SRQ transmission of the standard operation status register.
300	Permits reception of interruption.
310	Sets the sweeping to the single mode. (In this case, performs sweeping once.)
320	*LOOP
330	Goes to *LOOP.(Forms a loop until an ISRQ is received.)
340	Comment line
350	*PATH (Jump destination name when an ISRQ is received.)
360	Inhibits reception of interruptions.
370	Inhibits transmission of all SRQ commands.
380	Returns to the point where the subroutine (*SWP) was called.

- Program 3

```
100 !****************************
110 !*                          *
120 !* MAX SEARCH SAMPLE PROGRAM *
130 !*                          *
140 !****************************
150 !
155 OUTPUT 31;"OLDC OFF"
160 OUTPUT 31;"DISP:ACT 1;:CALC:FORM MLOG"
170 OUTPUT 31;"SWE:POIN 1201"
180 OUTPUT 31;"SWE:TIME 1S"
190 CLS
200 INPUT "ENTER CENTER FREQ ? [MHz] =",CF
210 INPUT "ENTER SPAN   FREQ ? [KHz] =",SF
220 OUTPUT 31;"FREQ:CENT ",CF,"MHz"
230 OUTPUT 31;"FREQ:SPAN ",SF,"KHz"
240 OUTPUT 31;"FREQ:STAR?"
250 ENTER 31;S1
260 OUTPUT 31;"FREQ:STOP?"
270 ENTER 31;S2
280   PO1=POINT1(S1,0)
290   PO2=POINT1(S2,0)
300   FR=FMAX(PO1,PO2,0)
310   LV=MAX(PO1,PO2,0)
320   FR=FR/10^6
330 PRINT "***** PROGRAM RESULT *****"
340 PRINT "MAX FREQ  [MHz] = ";FR
350 PRINT "MAX LEVEL [dB]  = ";LV
360 STOP
```

Line	Description
100 to 150	Comment lines.
155	Sets the R3752/3753 mode.
160	Sets channel 1 of network analyzer to LOGMAG.
170	Sets the number of measurement points to 1201.
180	Sets the sweeping time to one second.
190	Deletes characters on the display.
200	Inputs the center frequency and substitutes it for the variable (unit: MHz).
210	Inputs the span frequency and substitutes it for the variable (unit: KHz).
220	Sets to the input center frequency.
230	Sets to the input span frequency.
240	Takes in the start frequency from the analyzer.
250	Substitutes the taken-in value for the variable.
260	Takes in the stop frequency from the analyzer.
270	Substitutes the taken-in value for the variable.
280	Converts the taken-in start frequency into an address point.
290	Converts the taken-in stop frequency into an address point.
300	Searches for the frequency with the maximum response (level) in the bandwidth.
310	Searches for the maximum response (level) in the bandwidth.
320	Converts the searched-for value into a value in MHz.
330	Displays a comment on the display.
340	Displays a comment and the frequency value of the maximum response.
350	Displays a comment and the maximum response value.
360	Program ends.

7. COMMAND REFERENCE

This chapter explains the program for all the remote commands of the analyzer (command syntax, or query syntax, or both), formats of response data (when there is a query), and other details.

NOTE:

1. ***When referring to a command, note that part of the command mnemonic can be omitted.***
   Example: ***Although the following two commands have different syntax, they function in the same way:***
   SOURCE:SWEEP:TIME 1S
   SWEEP:TIME 1S
2. ***If you were unable to find this command in the command references using a description of SWEEP:TIME, search for a complete description of the command using the attached command list, then refer to the references. If you have a complete description of the command, you can search for it in the table of contents.***

The commands are grouped in the following subsystems:

Common commands:	Commands used by all the instruments to perform a unique function.
ABORt subsystem:	Commands used for resetting the trigger system.
CALCulate subsystem:	A group of commands used to determine how measurement data received is processed. Commands for setting measurement formats, and so on are included.
DISPlay subsystem:	A group of commands related to various displays, including displays of measurement data. The commands used to switch channel displays, and so on are included.
FILE subsystem:	A group of commands related to saving measurement data or setup information to files, or to retrieving measurement data or setup information from those files. Commands such as Store file, Load file, and so on are included.
INITiate:	Command used to start the trigger system.
INPut subsystem:	A group of commands related to the input port. Commands for setting attenuators, and so on are included.
OUTPut subsystem:	A group of commands related to the output port.
REGister subsystem:	A group of commands related to saving measurement data or setup information to registers, or to reproducing measurement data or setup information from those registers.
SENSe subsystem:	A group of commands used with the measurement section, including commands for setting calibration data, and so on.
SOURce subsystem:	A group of commands used with the signal source, including commands for setting the sweep types, and so on.
STATus subsystem:	A group of commands related to the status register.
SYSTem subsystem:	Commands that do not affect the measurement system. Commands for system initialization, clock setting, and so on are included in this sub system.
TRACe subsystem:	Commands related to the internal data arrangement. Commands for arranging input and output data, and so on are included.
TRIGger subsystem:	Commands related to triggers. Commands for turning the trigger on and so on are included.

MARKer subsystem: Commands related to markers. Commands for turning the markers ON or OFF, and so on are included.

FETCh? subsystem: Commands used for obtaining analysis results. Commands for obtaining the measurement values at marker locations are also included.

LIMit subsystem: Commands related to the limit test. Commands for turning the limit test ON or OFF, and so on are included.

CDMA subsystem: Commands related to the CDMA IF filter analysis. Commands for turning the CDMA filter analysis gate ON or OFF, and so on are included.

WANalysis subsystem: Commands related to the direct analysis. (Only available for the R3754 Series)

DLDependency subsystem:
Commands related to the drive level measurement (DLD). (Only available for the R3754 Series and only when Option 71 is installed)

TRANsform subsystem: Commands related to the time domain transformation function.
Commands for turning the time domain display ON or OFF, etc. are included. (Only available for the R3754 Series and only when Option 70 is installed)

GATE subsystem: Commands related to the Gate function. Commands for turning the Gate function ON or OFF, etc. are included. (Only available for the R3754 Series and only when Option 70 is installed)

7.1 Command Description Format

The following are detailed descriptions used with IEEE488.2-1987 and IEEE488.1-1987 command modes. The following precautions should be taken:

1. ***The command and response data formats are described using the following symbols:***

   <>: ***Indicates an element of syntax. The contents are written after the symbol.***

   |: ***Indicates selection of one item from among multiple items.***

   Example: ***A | B | C Means that A, B, or C is selectable.***

   [ ]: ***Indicates that the enclosed item is an option (omissible).***

   {}: ***Indicates that the enclosed item is a group of selections separated by | and that you can select one of them.***

2. ***The headings mean the following:***

   Command/Query: ***Indicates that both a command and a query are available.***

   Command: ***Indicates that only a command is available.***

   Query: ***Indicates that only a query is available.***

3. ***A mnemonic with four characters or more has a short form. In this document, upper-case characters indicate the short form.***

   Example: *SOURce:SWEep:TIME*

   short form: *SOUR, SWE*

   long form: *SOURCE, SWEEP*

   Since the term "TIME" consists of four characters, there is no difference between its short form and its long form.

4. ***Query commands must have "?" as their header. For a query which requires parameters, the query format must be described.***

5. ***The parameter formats commonly used in this chapter are as follows:***

   <int>: ***This is numeric data and can be input in NR1, NR2, or NR3 format. When the analyzer has received the data, they are rounded to a whole number.***

   <real>: ***This is numeric data and can be entered in NR1, NR2, or NR3 format. When the analyzer has received the data, they are rounded to a real number with the valid number of digits.***

   <bool>: ***On/off switch (0: OFF; 1: ON)***

   <str>: ***Character string Indicates an alphanumeric symbol enclosed by " or '. (For IEEE488.1-1987 command mode, do not use " and '.)***

   <block>: ***Block data type***
   The contents of data are eight-bit binary data strings.

   For the format, refer to the description of IEEE488.2-1987 command mode.

6. ***The parameters to be added to a part of the parameter header are shown below. They are commonly used for each command.***

   <chno>: *0:* ***active channel***
   1: ***Channel 1***
   2: ***Channel 2***

   <trace>: ***Analysis channel***
   (For parameters in which this channel can be specified, specifications with <chno> are ignored.)

   <input>: *1:* ***R channel***
   2: ***A channel***
   3: ***B channel***

   <port>: *1:* ***PORT 1***
   2: ***PORT 2***

   <eport>: *1:* ***R channel***

	2:	***A channel***
	3:	***B channel***
	4:	***PORT 1***
	5:	***PORT 2***
<n>:	*n:*	***Integer value defined by each command***
	Example:	***To set the measurement format of channel 1 to MLOG using CALCulate[<chno>]:FORMat, input the following:***
		CALCulate1:FORMat MLOG
<parano>:	***When the display format is the rectangular coordinate system:***	
	1;	***Main trace***
	2;	***Sub trace***
	When the display format is the polar coordinate system:	
	1;	***Magnitude or real part***
	2;	***Phase or imaginary part***

7.2 Common Commands

1. | *CLS | IEEE488.1-1987 command mode |
|---|---|
| | *CLS |

- Function — Clearing status byte and related data
- Presence of command and query — Command
- Command — *CLS
- Description — The *CLS command clears the status data structure and forcibly cancels *OPC and *OPC?. It also clears the error queue. Since this command does not clear the output buffer, the MAV bit is not cleared when output data is present. If this command is executed at the beginning of the line, all the status bits, including the MAV status bit, are cleared.

  The *CLS command also clears the error queue.

  The status byte (which was set by the REQUEST command in the Built-in BASIC) cannot be cleared by "* CLS". "* CLS" can used to clear the status byte register whenever its contents are not zero. If you first execute "* CLS" and then execute "REQUEST 0" from BASIC when using the REQUEST command.

2. *DDT

- Function: Macro definition for GET
- Presence of command and query: Command / Query
- Command: *DDT <block>
- Parameter: <block>
- Response type: <block>
- Description: The *DDT command defines the command sequence which is to be executed when the *TRG interface message or the *GET interface message is received. That is, it replaces the *TRG operation with a series of commands which has been written into the <block> data. The length of the sequence to be defined must not exceed 255 characters.

  If the *DDT command defines block data (#10) with a length of 0, the *TRG interface message or the GET interface message will execute nothing. The macro can be canceled by executing the *RST command.

  Block data are used to respond a query. If the *DDT? command is executed with the macro not yet defined, block data (#10) with a length of 0 will be returned.
- Note: Do not use the *TRG interface message in this definition. If it is used in the definition with the *DDT command, the sequence set by the *DDT command will be called instead of the trigger, and thus an endless loop will be formed. (Actually, a macro error will occur because of nesting limitation.)
- Example: When the *DDT command is #214INIT;TRIG:SIGN, *TRG replaces INIT;TRIG:SIGN.

3. *DMC

- Function — Macro definition
- Presence of command and query — Command
- Command — *DMC <str>,<block>
- Parameter — <str>
  <block>
- Description — The *DMC command defines the command sequence in the macro label specified by <str>. When <str> is received, the definition allows the system to operate as if it has received <block> itself. (However, *EMC must be 1.)

  A hierarchical command can be used for this macro label. In addition, it is possible to overwrite the macro on IEEE488.2-1987 command mode command defined in advance. (However, it is not possible to overwrite on the common command.) Then, when the macro is enabled by *EMC 1, the system will perform the original operation by disabling a series of commands which has been replaced with the macro using *EMC 0. Use the *PMC command to delete the macro which has been defined by the *DMC command. Once registered, a macro cannot be re-registered until it has been cleared by the *PMC command.

  Follow the grammar of IEEE488.2-1987 command to write the macro body. Up to nine parameters ($1 to $9) can be given to the macro command. "1" must be given to the parameter following the macro command, "2" to the next parameter, and so on. Also, the macro definition can include the macro. Up to nine levels of nesting are supported. Up to 30 macros can be registered as new macros (depending on the condition).

  See *PMC, *GMC?, *LMC? and *EMC.
- Example — When the *DMC command is “SWPINIT”, #221FREQ:START $1;STOP $2, SWPINIT 100MHZ,500MHZ replaces
  FREQ:START 100MHZ:STOP 500MHZ.

4. *EMC

- Function — Permission for macro execution
- Presence of command and query — Command / Query
- Command — *EMC <int>
- Parameter — <int>
- Response type — 0 | 1
- Description — The *EMC command permits (1) or inhibits (0) the execution of the macro.

  This command does not affect the contents of the macro definition. It is used to execute an original command which has been overwritten by the macro.

  *RST inhibits the execution of the macro.

  See *DMC, *PMC, *GMC? and *LMC?.

5. *ESE — IEEE488.1-1987 command mode *ESE

- Function — Setting of standard event status enable register
- Presence of command and query — Command / Query
- Command — *ESE <int>
- Parameter — <int>
- Response type — NR1 (integer value)
- Description — The *ESE command sets the enable register in the standard event status register. The standard event status register corresponding to the bit set to 1 in this register is reflected in the status byte register as a valid bit.

  For details, see the description of the status data structure and *ESR?.
- Example — When the operation control bit (bit 3) and the device dependent error bit (bit 0) are set to "enable", calculate:

  $2^3 + 2^0 = 8 + 1 = 9$ and set *ESE 9.

6. *ESR? — IEEE488.1-1987 command mode: *ESR?

- Function — Readout of standard event status register
- Presence of command and query — Query
- Query — *ESR?
- Response type — NR1 (integer value)
- Description — The *ESR command reads out the standard event status register value. When the register is read out, it is cleared and the corresponding bit (bit 5) of the status byte is cleared.

  For details, see the description of the status data structure.

Standard Event Status Register Assignment

bit		Description
7	Power on	Set to 1 when the system is switched on
6		Always 0
5	Command Error	Set to 1 when the purser detects a grammar error
4	Execution Error	Set to 1 when the system fails to execute the instruction which has been received as a GPIB command for some reason (such as parameter out of range)
3	Device Dependent Error	Set to 1 when an error other than a command error, an execution error, or a query error occurs
2	Query Error	Set to 1 if there are no data or if data have been deleted when the controller attempts to read out data from the analyzer
1	Request Control	Set to 1 when the analyzer is required to be active controller
0	Operation Control	Set to 1 when the analyzer has no command to be executed after it has received the *OPC command

7. *GMC?

- Function: Query of macro definition
- Presence of command and query: Query
- Query: *GMC? <name>
- Parameter: <name>
- Response type: <block>
- Description: The *GMC? command reads out the macro definition specified by <name>.

  If the command reads out an undefined <name> macro, block data (#10) with a length of 0 will be returned.

  See *DMC, *PMC?, *LMC? and *EMC.

8. *IDN? — IEEE488.1-1987 command mode IDNT?

- Function: Query of devices
- Presence of command and query: Query
- Query: *IDN?

  IDNT?
- Response type: "<manufacturer>,<model>,<serial number>,<firmware level>"

  <manufacturer> = ADVANTEST

  <model> = Model name

  <serial number> = Serial number

  <firmware level> = System version
- Description: The *IDN? extracts system identification information. This command outputs four items in the character string format, as shown in the response format above.

9. *LMC?

- Function — Readout of all macros
- Presence of command and query — Query
- Query — *LMC?
- Response type — “<macro label>”[,”<macro label>”...]
  <macro label> = Macro header
- Description — Answers all the macro headers in the character string format. When multiple macros are defined, they are separated by ",". If there is no defined macro, the system responds with a character string with a length of 0 ("").
  See *DMC, *PMC, *GMC? and *EMC.

10. *OPC — IEEE488.1-1987 command mode *OPC

- Function — Notification of end of all operations in progress
- Presence of command and query — Command / Query
- Command — *OPC
- Response type — 1
- Description — The *OPC command sets the ’Operation Control’ bit of the standard event status register to 1 when all commands being executed have been completed. If the next command is received before the command being executed finishes, the *OPC command waits until the execution of that command has been completed. Therefore, if the analyzer does not execute a command after receiving the *OPC command, the status register will be set.
  The *OPC? writes 1 into the output buffer while the *OPC command above sets the ’Operation Control’ bit. Therefore, the *OPC? command allows the command to be finished when the controller receives the response from the analyzer.
  Both *OPC and *OPC? can be canceled by using a DCL interface message, the *CLS command, or the *RST command.
  See *WAI.

11. *PCB IEEE488.1-1987 command mode *PCB

- Function: Setting of the GPIB address used to return the right of control
- Presence of command and query: Command
- Command: *PCB <primary>[,<secondary>]
- Parameter: <primary>
  <secondary>

NOTE: In IEEE488.1-1987 command mode, <secondary> cannot be input and must always be omitted.

- Description: The *PCB command sets the address of the external controller to which the analyzer is connected.

12. *PMC

- Function: Deletion of all macro definitions
- Presence of command and query: Command
- Command: *PMC
- Description: The *PMC command deletes all the macro definitions. This command deletes all the macro headers and bodies from the memory of the analyzer, making it possible to register new macros.
  See *DDT *DMC *GMC?, *LMC? and *EMC.

13. *RCL　IEEE488.1-1987 command mode
RECLREG{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20}
RECLPOFF

- Function: Recalls the device settings
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  - Command: *RCL {<int> | POFF}
  - Parameter: <int> = register number
    POFF = Settings before the power-off
- IEEE488.1-1987 command mode
  - Command: RECLREG{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20}
    RECLPOFF
- Description: The *RCL command recalls the analyzer settings from the specified internal register. If the register number 0 or POFF (or RECLPOFF) is used, this command recalls the settings before the power-off.

14. | *RST | IEEE488.1-1987 command mode
*RST |
|---|---|

- Function — Resetting of devices
- Presence of command and query — Command
- Command — *RST
- Description — The *RST command resets the analyzer. The following operations are performed on the system:
  1. System initialization (See "A.4 Initial Settings".)
  2. Initialization of the macro defined by the *DDT command.
  3. Invalidation of the macro (Same as *EMC 0)
  4. Invalidation of the *OPC bit and the *OPC? bit
  5. Resetting of the trigger system

  The resetting does not affect:
  1. GPIB bus condition
  2. GPIB address
  3. Output buffer
  4. Status data structure
  5. Macro defined by the *DMC command
  6. Calibration data of the device

  See SYSTem:PRESet(IP).

15. | *SAV | IEEE488.1-1987 command mode
SAVEREG{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20} |
|---|---|---|

- Function — Saves the device settings
- Presence of command and query — Command
- IEEE488.2-1987 command mode
  - Command — *SAV <int>
  - Parameter — <int>
- IEEE488.1-1987 command mode
  - Command — SAVEREG{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20}
- Description

The *SAV command saves the analyzer settings in an internal register with a specified number.

The internal register is backed up with a built-in battery.

Using the save register function, a maximum of 20 sets of measurement conditions and measurement data can be saved in the built-in memory of this network analyzer (each save register function saves one set of measurement conditions and measurement data).

Each time a save register function is executed, the data is saved as a file in the built-in memory, which has a capacity of 1880 kB. The total data saved cannot exceed this limit (this memory is shared with the C drive). If the total data exceeds this capacity, new data will not be saved (even if there is a register which does not contain data). When this happens, the user must first erase the data provionsly saved, then try to save the current data again.

16. *SRE — IEEE488.1-1987 command mode: *SRE

- Function — Setting of service request enable register
- Presence of command and query — Command / Query
- Command — *SRE <int>
- Parameter — <int>
- Response type — NR1 (integer value)
- Description — The *SRE command sets the service request enable register. The status byte register corresponding to the bit in this register which is set to 1 is reflected in the MSS bit as a valid bit.

  Bit 6 of the response data for the query command is always 0.

  For details, see the description of the status data structure.

  See *STB?.
- Example — If the OPR bit (bit 7), the ESB bit (bit 5) and the MAV bit (bit 4) are set to "enable", calculate:

  $2^7 + 2^5 + 2^4 = 128 + 32 + 16 = 176$ and set *SRE 176.

17. *STB? IEEE488.1-1987 command mode
*STB?

- Function: Readout of status byte register
- Presence of command and query: Query
- Query: *STB?
- Response type: NR1 (integer value)
- Description: The *STB? command reads out the contents of the status byte register.
  The summary bit of the request to be read out here is the MSS bit.
  This register and the MSS bit are not cleared, even if the register is read out.
  For details, see the description of the status data structure.

Status Byte Register Assignments

bit		
7	OPR	OPR is a summary of the standard operation status register.
6	MSS	When the MSS bit of the status byte register is set to 1, the RQS bit is TRUE and the MSS bit is the summary bit for all of the status data structure.
		The service request cannot read out the MSS bit. (However, when the RQS bit is 1, it is understood that the MSS bit is 1.)
		To read the MSS bit, the common command *STB? should be used. The *STB? command can read out bits 0 to 5 and bit 7 of the status byte register and the MSS bit. In this case, the status byte register and the MSS bit are not cleared.
		The MSS bit does not become 0 until all the unmasked factors in the status register structure are cleared.
5	ESB	The ESB bit is a summary of the standard event register.
4	MAV	The MAV bit is a summary bit of the output buffer.
		The MAV bit is 1 when the output buffer has data to be output and it is 0 when the data are read out.
3 to 0		Always 0

18. *TRG IEEE488.1-1987 command mode
*TRG

- Function: Triggering device
- Presence of command and query: Command
- Command: *TRG
- Description: The *TRG command triggers devices. This command has exactly the same effect as the GET interface message. If the analyzer receives the *TRG interface message when TRIG:SOUR is set to BUS and the analyzer is in the trigger waiting state (see "5. TRIGGER SYSTEM"), it starts measurement. Under conditions other than above, this command is ignored.

  Both the *TRG interface message and the GET interface message are stored in the input buffer and they are processed in the order of inputting.

19. *TST? IEEE488.1-1987 command mode
*TST?

- Function: Query of self test result
- Presence of command and query: Query
- Query: *TST?
- Response type: 0 | error code
- Description: The *TST? command allows the analyzer to start the self test and return the result. Answering with 0 indicates that the test has been passed, while other answers indicate error codes.

  The following bits are logically ORed when errors occur.

  0x0001...Rch INPUT board is defective.

  0x0002...Ach INPUT board is defective.

  0x0004...Bch INPUT board is defective.

  0x0010...OUTPUT board is defective.

  0x0020...SYNTHE board is defective.

  The other values are assigned as reserved bits.

20.

*WAI	IEEE488.1-1987 command mode *WAI

- Function — Waiting for end of all operations being performed
- Presence of command and query — Command
- Command — *WAI
- Description — The *WAI command is used to wait for the completion of all the commands which are being executed. If this command is executed, all commands input after that time will be delayed until all the commands being executed have been completed.

  *WAI can be canceled by means of the DCL interface message.

7.3 ABORt Subsystem

1. ABORt

- Function: Resetting trigger module
- Presence of command and query: Command
- Command: ABORt
- Description: The ABORt command resets the trigger system and forcibly sets the trigger state to the idle state. At the same time, the measurement is stopped and the average count is reset. Also, the device operation pending flag is cleared.

  The use of this command does not change INITiate:CONTinuous. Therefore, when CONTinuous is set to ON, the system moves immediately to the next trigger waiting state.

  See INITiate Subsystem and TRIGger Subsystem.

7.4 CALCulate Subsystem

1. CALCulate[<chno>]:FORMat IEEE488.1-1987 command mode LOGMAG,PHASE,DELAY,LINMAG,SWR,REAL,IMAG, UNWRAP,LINMP,LOGMP,LOGMD,POLAR,SRJX,SGJB

- Function — Selection of measurement format
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:FORMat <format>
  - Parameter: <format> = {MLOGarithmic | PHASe | GDELay | MLINear | SWR | REAL | IMAGinaly | UPHase | MLIPhase | MLOPhase | MLODelay | POLar | SCHart | ISCHart}
  - Response type: MLOG | PHAS | GDEL | MLIN | SWR | REAL | IMAG | UPH | MLIP | MLOP | MLOD
- IEEE488.1-1987 command mode
  - Command: LOGMAG
    PHASE
    DELAY
    LINMAG
    SWR
    REAL
    IMAG
    UNWRAP
    LINMP
    LOGMP
    LOGMD
  - Response type: 0 | 1
- Description — Specifies measurement formats such as amplitude, phase and group delay.

  Initial value MLOPhase

  The input signal is measured as a complex number in the form X + jY, and the signal is calculated in accordance with the specified measurement format, as shown in the table below:

IEEE488.1-1987 Command	IEEE488.2-1987 Command parameter	Calculation expression: (unit. relative measurement/absolute value)	Contents
LOGMAG	MLOG	$10\log_{10}(X^2+Y^2)$:(dB/dBm)	Amplitude (logarithm)
PHASE	PHAS	arctan(Y/X):(deg/deg)	Phase
DELAY	GDEL	$\frac{-\Delta\text{ (phase)}}{360 \times \Delta\text{ (frequency)}}$: (sec/sec)	Group delay
LINMAG	MLIN	$\sqrt{X^2+Y^2}$: (Unit/Vrms)	Amplitude
SWR	SWR	$\frac{1+\Gamma}{1-\Gamma}$: (Unit/Unit) $\Gamma = \sqrt{X^2+Y^2}$	Reflection coefficient
REAL	REAL	X: (Unit/Unit)	Real part
IMAG	IMAG	Y: (Unit/Unit)	Imaginary part
UNWRAP	UPH	arctan(Y/X): (deg/deg)	Phase PHASE indicates a value within a range of ±180°. UNWRAP indicates a continuous value using the first measurement point as reference without turning back at ±180°.
LINMP	MLIP	pair (r1, r2) $\Gamma = \sqrt{X^2+Y^2}$: (Unit/Vrms) r2= arctan (Y/X): (deg/deg)	Amplitude and phase pair rectangular coordinate display
LOGMP	MLOP	pair (r1, r2) r1= $10\log_{10}(X^2+Y^2)$: (dB/dBm) r2= arctan (Y/X): (deg/deg)	Amplitude (logarithm) and phase pair rectangular coordinate display
LOGMD	MLOD	pair (r1, r2) r1= $10\log_{10}(X^2+Y^2)$: (dB/dBm) r2= $\frac{-\Delta\text{ (phase)}}{360 \times \Delta\text{ (frequency)}}$: (sec/sec)	Amplitude (logarithm) and group delay pair rectangular coordinate display
POLAR	POLar	X: (Unit/Unit) Y: (Unit/Unit)	Real part Imaginary part
SRJX	SCHart	X: (Unit/Unit) Y: (Unit/Unit)	Real part Imaginary part
SGJB	ISCHart	X: (Unit/Unit) Y: (Unit/Unit)	Real part Imaginary part

2. CALCulate[<chno>]:GDAPerture:APERture — IEEE488.1-1987 command mode APERTP

- Function: Group delay aperture setting
- Presence of command and query: Command / Query
- Command: CALCulate[<chno>]:GDAPerture:APERture <real>
  APERTP<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the aperture of the group delay.

  Initial value: 10%
  Setting range: 0.01% to 50%
  Setting resolution: 0.01%

  The group delay can be calculated using the expression below, in which Δ (frequency) is called "aperture".

$$\text{Group delay} = \frac{-\Delta\ (\text{phase})}{360 \times \Delta\ (\text{frequency})}$$

  The aperture (Δ (frequency)) is converted into the measurement point (horizontal axis) and determined for the setting value <real> as follows:

$$\Delta\ (\text{frequency}) = \Delta\ (\text{point})$$

$$= \frac{\text{number of measurement point-1}}{100} \times \text{<real>}$$

  That is, the setting value <real> is set as a percentage of the number of measurement points. The value is maintained even if the number of measurement points is changed. The Δ point is calculated internally again using the number of measurement points after the change.

- Example: Number of measurement points: 101 point

  Aperture: $2(\%) \rightarrow \Delta\ (\text{point}) = \frac{101-1}{100} \times 2 = 2$

  Measurement points: n-1 n n+1

  ○ ○ ○ ○ ○

  Δ (point) =2

3. CALCulate[<chno>]:MATH[:EXPRession]:NAME — IEEE488.1-1987 command mode DISPDDM

- Function — Data (+, -, ×, /) memory setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — CALCulate[<chno>]:MATH[:EXPRession]:NAME <type>
  - Parameter — <type> = {NONE | DDM | DMM | DAM | DSM}
  - Response type — NONE | DDM | DMM | DAM | DSM
- IEEE488.1-1987 command mode
  - Command — DISPDDM<bool>
  - Parameter — <bool> = {ON | OFF}
  - Response type — 0 | 1
- Description — Calculates the relationship between the measurement data and the memory data.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Calculation
DISPDDM ON	DDM	÷
	DMM	×
	DAM	+
	DSM	-
DISPDDM OFF	NONE	NONE

- Note — The calculation is valid only when the relationship between the data and the memory in the same channel is calculated. (It is not possible to calculate the relationship between the data and the memory in different channels.)

  DDM (÷) is used to normalize the data.

  The calculation is performed on the vector quantity (complex number data) before formatting.

4. CALCulate[<chno>]:PLINearity:PARTial <bool>   IEEE488.1-1987 command mode
PLINPART<bool>

- Function: Turning the section definition of the Phase linearity analysis ON or OFF
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:PLINearity:PARTial<bool>
  PLINPART<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Turns the section definition of the Phase linearity analysis ON or OFF. When ON, the Phase linearity is analyzed within the section specified by the partial search. When OFF, the Phase linearity is analyzed for the full measurement range.
  The section definition is performed by the
  "MARKer[<chno>:SEARch:PARTial:SRANge"
  (refer to the command 24 in the Section 7.19).

5.	CALCulate[<chno>]:PLINearity:STATe <bool>	IEEE488.1-1987 command mode PLINE<bool>

- Function — Turning the Phase linearity analysis ON or OFF
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:PLINearity:STATe<bool>
  PLINE<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Turns the Phase linearity analysis ON or OFF.

  When the section analysis is set to ON by the "CALCulate[<chno>]:PLINearuty:PARTial" command, the Phase linearity is analyzed within the section specified by the partial marker search range. When set to OFF, the Phase linearity is analyzed for the full measurement range.

  The analysis is obtained by the "FETCh[<chno>]:PLINearity?".

  This function cannot be set at the same time as the CDMA Phase Linearity function.

6.	CALCulate[<chno>]:SMOothing:APERture	IEEE488.1-1987 command mode SMOOAPER

- Function — Smoothing span setting
- Presence of command and query — Command / Query
- Command — CALCulate[<chno>]:SMOothing:APERture <real>
  SMOOAPER<real>
- Parameter — <real>
- Response type — NR3 (real number value)
- Description — Sets the smoothing aperture.

Initial value: 10%
Setting range: 0.01% to 50%
Setting resolution: 0.01%

The smoothing value is determined by the algorithm below. (2m) is referred to as "aperture".

Smoothing algorithm

$$\overline{D}_{(n)} = \frac{D_{(n-m)} + \ldots + D_{(n)} + \ldots + D_{(n+m)}}{2m+1}$$

$\overline{D}_{(n)}$: Smoothed nth data after formatting

$D_{(n)}$: nth data before smoothing

2m: Smoothing aperture

The aperture is obtained for the <real> setting using the expression below:

Aperture(2m)

$$= \frac{\text{(number of measurement point)-1}}{100} \times \text{<real>}$$

That is, <real> is set as a percentage of the number of measurement points. The setting value <real> is held even if the number of measurement points is changed, and the aperture (2m) is calculated internally again using the number of measurement points after the change.

- Example

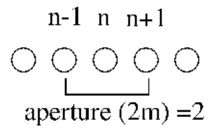
Number of measurement points: 101 point

Aperture: 2(%) → aperture (2m)

$$= \frac{101-1}{100} \times 2$$

$$= 2$$

Measurement points:



7. CALCulate[<chno>]:SMOothing:STATe — IEEE488.1-1987 command mode SMOO

- Function: ON/OFF of smoothing
- Presence of command and query: Command / Query
- Command: CALCulate[<chno>]:SMOothing:STATe <bool>
  SMOO<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Performs smoothing.

  Smoothing is used to obtain the moving average between adjacent formatted data.

  By smoothing the noise component, the average of the noise can be obtained.

  In contrast to this, since the averaging obtains the time average of the data before formatting (vector quantity), the noise is reduced rather than averaged.

  Smoothing algorithm

$$\overline{D}_{(n)} = \frac{D_{(n-m)} + \ldots + D_{(n)} + \ldots + D_{(n+m)}}{2m+1}$$

  $\overline{D}_{(n)}$: Smoothed nth data after formatting

  $D_{(n)}$: nth data before smoothing

  2m: Smoothing aperture

- Note: When the measurement format is set to 2 traces (MLOP, MLOD, MLIP) or the memory trace is set to ON, smoothing is performed for all the traces.
- Example: Number of measurement points: 101 point

  Aperture: 2(%) →Aperture (2m)

$$= \frac{101-1}{100} \times 2$$

$$= 2$$

  Measurement points: n-1 n n+1

  ○ ○ ○ ○ ○

  aperture (2m) =2

8. CALCulate[<chno>]:TRANsform:IMPedance:CIMPedance — IEEE488.1-1987 command mode: SETZ0, MKRZ0{50 | 75}

- Function: Z conversion characteristic impedance setting
- Presence of command and query: Command / Query
- Command: CALCulate[<chno>]:TRANsform:IMPedance:CIMPedance <real>
  SETZ0<real>
  MKRZ0{50 | 75}
- Parameter: <real>
- Response type: NR3 (real number value)
  0 | 1 (MKRZ0{50 | 75})
- Description: Sets the characteristic impedance for the impedance measurement.

  Initial value: 50Ω
  Setting range: 100pΩ to 1GΩ
  Setting resolution: 0.001pΩ

  The measurement value is obtained using the value normalized by the characteristic impedance of the measurement system (1Ω). Therefore, to obtain the absolute value, it is necessary to specify the characteristic impedance of the measurement system.
- Example: To obtain the impedance using the reflection coefficient.

  Normalizec impedance: $\dfrac{1+\Gamma}{1-\Gamma} \times 1(\Omega)$

  Absolute value impedance: $\dfrac{1+\Gamma}{1-\Gamma} \times Z_0$

  Γ : Reflection coefficient
  Z_0 : Characteristic impedance

9. CALCulate[<chno>]:TRANsform:IMPedance:TYPE   IEEE488.1-1987 command mode
CONV{OFF | RZ | RY | TZ | TY | 1DS}

- Function: Z conversion type setting
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:TRANsform:IMPedance:TYPE <type>
  - Parameter: <type>={ NONE | ZREFlection | YREFlection | ZTRansmit | YTRansmit | INVersion }
  - Response type: NONE | ZREF | YREF | ZTR | YTR | INV
- IEEE488.1-1987 command mode
  - Command: CONV{OFF|RZ|RY|TZ|TY|1DS}
  - Response type: 0 | 1
- Description: Obtains the impedance from the reflection coefficient and the transfer characteristics using the table below:

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Converted Value	Conversion expression
CONVOFF	NONE	No conversion	
CONVRZ	ZREF	Reflection impedance	$\frac{1+\Gamma}{1-\Gamma} \times Z_0$
CONVRY	YREF	Reflection admittance	$\frac{1-\Gamma}{1+\Gamma} \times \frac{1}{Z_0}$
CONVTZ	ZTR	Transfer impedance	$\frac{2(1-T)}{T} \times Z_0$
CONVTY	YTR	Transfer admittance	$\frac{T}{2(1-T)} \times \frac{1}{Z_0}$
CONV1DS	INV	Reverse S parameter	$\frac{1}{S}$

Γ: Reflection coefficient
T: Gain
S: Γ or T
Zo: Characteristic Impedance

- Note — The data processing flow is as follows:

  Data → Impedance conversion → Format
  ↑
  Calibration data

7.5 DISPlay Subsystem

1. DISPlay:ACTive   IEEE488.1-1987 command mode
CH{1 | 2}

- Function: Active channel specification
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
- Command: DISPlay:ACTive <int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command: CH{1 | 2}
  - Response type: 0 | 1
- Description: Selects the active channel

Initial setting: CH1

The analyzer is equipped with two measurement channels, which can be used independently for measurement and data display.

For the functions dependent on these channels, it is possible to specify <chno> as the header parameter of the command.

When 0 is specified in <chno> or when <chno> is omitted, all the other commands are applied to the active channel specified by this command.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
CH1	1	Channel 1 is active.
CH2	2	Channel 2 is active.

For cases where measurement is made with channels 1 and 2 set identically, see subsection 2 of section 7.13.

2.

DISPlay:DUAL	IEEE488.1-1987 command mode DUAL

- Function — ON/OFF of dual channel
- Presence of command and query — Command / Query
- Command — DISPlay:DUAL <bool>
  DUAL<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects whether two measurement channels are to be displayed simultaneously or only the active channel is to be displayed.
  Initial setting: DUAL OFF

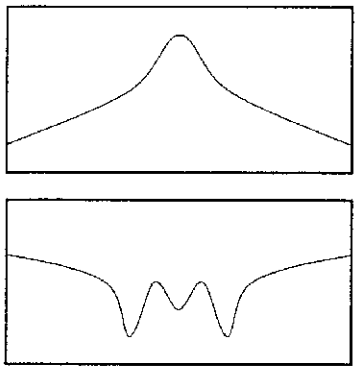
3. DISPlay:FORMat — IEEE488.1-1987 command mode: SPLIT

- Function — Split/overlap selection
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
    - Command — DISPlay:FORMat <type>
    - Parameter — <type>={ULOWer | FBACk}
    - Response type — ULOW | FBAC
- IEEE488.1-1987 command mode
    - Command — SPLIT<bool>
    - Parameter — <bool>={ON | OFF}
    - Response type — 0 | 1
- Description — Selects the split display or the overlap display.
  Initial setting: SPLIT OFF

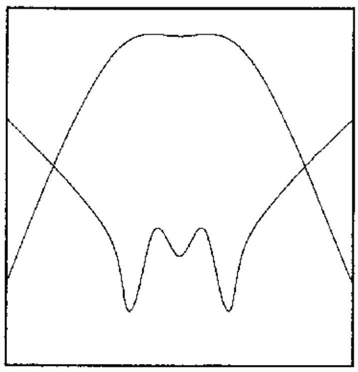
IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
SPLIT ON	ULOW	Split display
SPLIT OFF	FBAC	Overlap display

- Example

Split display



Overlap display



4. DISPlay[:WINDow[<chno>]]:TEXT[:DATA] — IEEE488.1-1987 command mode LABEL

- Function: Label setting
- Presence of command and query: Command / Query
- Command: DISPlay[:WINDow[<chno>]]:TEXT[:DATA] {<str> | <block>}
  LABEL<str>
- Parameter: {<str> | <block>}
- Response type: <str>=string
- Description: Sets the label.
  The label is set for the active channel.
  Number of characters to be set: 80

5. DISPlay[:WINDow[<chno>]]:TRACe:ASSign — IEEE488.1-1987 command mode DISP{DATA | MEM | DM}

- Function: ON/OFF of trace display
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPlay[:WINDow[<chno>]]:TRACe:ASSign <type>
  - Parameter: <type>={DATA | MEMory | DMEMory}
  - Response type: DATA | MEM | DMEM
- IEEE488.1-1987 command mode
  - Command: DISP{DATA | MEM | DM}
  - Response type: 0 | 1
- Description: Specifies the type of trace display.
  Initial setting: DISPDATA

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
DISPDATA	DATA	Displays the data trace only
DISPMEM	MEM	Displays the memory trace only
DISPDM	DMEM	Displays both the data trace and the memory trace

6. DISPlay[:WINDow[<chno>]]:TRACe:GRATicule[:STATe] | IEEE488.1-1987 command mode GRAT

- Function: ON/OFF of graticule
- Presence of command and query: Command / Query

  Command: DISPlay[:WINDow[<chno>]]:TRACe:GRATicule[:STATe] <bool>

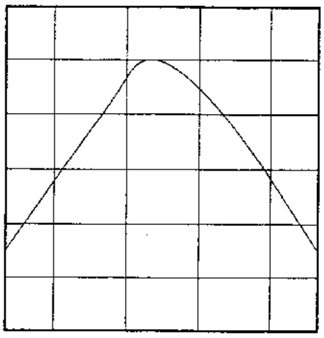
  GRAT<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects whether or not the graticule is displayed.

  Initial setting: GRAT ON

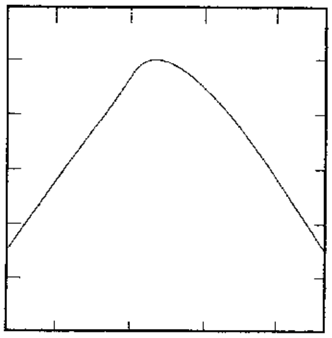
IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
GRAT ON	ON	Displays the graticule
GRAT OFF	OFF	Does not display the graticule

- Example

GRAT ON



GRAT OFF



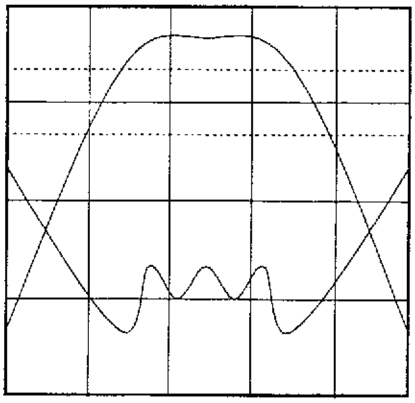
7.	DISPlay[:WINDow[<chno>]]:Y[<trace>]:RLINe	IEEE488.1-1987 command mode REFL

- Function: ON/OFF of Y-axis reference line display
- Presence of command and query: Command / Query
- Command: DISPlay[:WINDow[<chno>]]:Y[<trace>]:RLINe <bool>
  REFL<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects ON/OFF of the Y-axis reference line display.
  The Y-axis reference line indicates the reference value for the Y-axis graticule.
  Initial setting: REFL ON

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
REFL ON	ON	Displays the Y-axis reference line
REFL OFF	OFF	Does not display the Y-axis reference line

- Example

CH1
Reference line ⇒



⇐ CH2
Reference line

8.

DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:AUTO	IEEE488.1-1987 command mode AUTO SCALF{1ST I 2ND}

- Function — Y-axis automatic setting
- Presence of command and query — Command
- Command — DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:AUTO ONCE
  AUTO
  SCALF{1ST I 2ND}
- Parameter — ONCE
- Description — Automatically adjusts the Y-axis setting.

  The Y axis is set to an optimum value so that all the data which were displayed before the execution of this command fit into the scale screen. (Only the PDIV, RLEV setting is updated.)

  <trace> and SCALF{1ST I 2ND} of IEEE488.1-1987 command mode are used to specify the trace whose scale is to be changed when the measurement format is set to 2 traces (MLOP, MLOD, MLIP). If the measurement format is not set to 2 traces, the specification will be ignored.

<trace>	Waveform	
=0	First waveform of CH1	SCALF1ST
=1	First waveform of CH2	SCALF1ST
=8	Second waveform of CH1	SCALF2ND
=9	Second waveform of CH2	SCALF2ND

First waveform: MLOG for MLOP and MLOD
MLIN for MLIP

Second waveform: PHAS for MLOP and MLIP
GDEL for MLOD

9. DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:PDIVision

IEEE488.1-1987 command mode
SDIV
SCALF{1ST | 2ND}

- Function: Y-axis grid scale setting
- Presence of command and query: Command / Query
- Command: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:PDIVision <real>
  SDIV<real>
  SCALF{1ST | 2ND}
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the scale value of the Y-axis grid (scale per graticule).

  The command is ineffective in polar coordinate and Smith chart displays.

  <trace> and SCALF{1ST | 2ND} of IEEE488.1-1987 command mode are used to specify the trace whose scale is to be changed when the measurement format is set to 2 traces (MLOP, MLOD, MLIP).

  If the measurement format is not set to 2 traces, the specification will be ignored.

<trace>	=0 First waveform of CH1	SCALF1ST
	=1 First waveform of CH2	
	=8 Second waveform of CH1	SCALF2ND
	=9 Second waveform of CH2	

  First waveform: MLOG for MLOP and MLOD
  MLIN for MLIP

  Second waveform: PHAS for MLOP and MLIP
  GDEL for MLOD

  The initial value depends on the measurement format.

  See "A.4 Initial Settings".

10. DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:RLEVel | IEEE488.1-1987 command mode
REFV
SCALF{1ST | 2ND}

- Function: Y-axis reference level setting
- Presence of command and query: Command / Query
- Command: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:RLEVel <real>
  REFV<real>
  SCALF{1ST | 2ND}
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the level of the Y-axis reference line.

  The Y-axis reference line indicates the reference value for the Y-axis graticule.

  In polar coordinate and Smith chart displays, the value is set to the full-scale value on the outside circle.

  <trace> and SCALF{1ST | 2ND} of IEEE488.1-1987 command mode are used to specify the trace whose scale is to be changed when the measurement format is set to 2 traces (MLOP, MLOD, MLIP).

  If the measurement format is not set to 2 traces, the specification will be ignored.

  <trace> =0 First waveform of CH1
  =1 First waveform of CH2 } SCALF1ST
  =8 Second waveform of CH1
  =9 Second waveform of CH2 } SCALF2ND

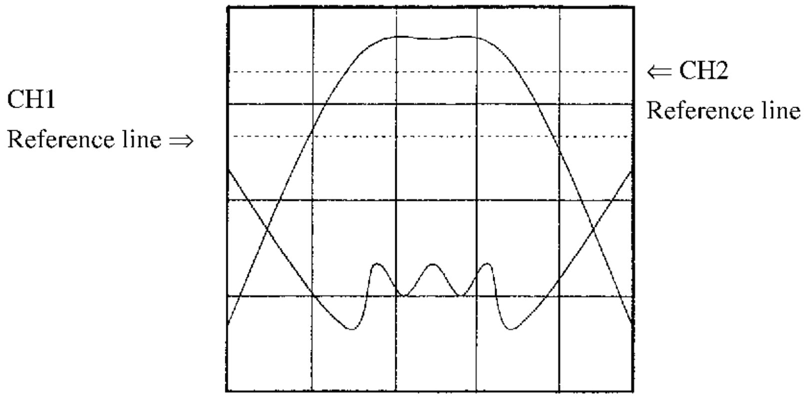
  First waveform: MLOG for MLOP and MLOD
  MLIN for MLIP

  Second waveform: PHAS for MLOP and MLIP
  GDEL for MLOD

  The initial value depends on the measurement format.

  See "A.4 Initial Settings".

- Example



11. DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:RPOSition   IEEE488.1-1987 command mode
REFP
SCALF{1ST | 2ND}

- Function: Y-axis reference line position specification
- Presence of command and query: Command / Query
- Command: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:RPOSition <real>

  REFP<real>

  SCALF{1ST | 2ND}
- Parameter: <real>=0 to 100
- Response type: NR3 (real value)
- Description: Specifies the position of the Y-axis reference line.

  <trace> and SCALF{1ST | 2ND} of IEEE488.1-1987 command mode are used to specify the trace whose scale is to be changed when the measurement format is set to 2 traces (MLOP, MLOD, MLIP).

  If the measurement format is not set to 2 traces, the specification will be ignored.

<trace>		
=0	First waveform of CH1	SCALF1ST
=1	First waveform of CH2	SCALF1ST
=8	Second waveform of CH1	SCALF2ND
=9	Second waveform of CH2	SCALF2ND

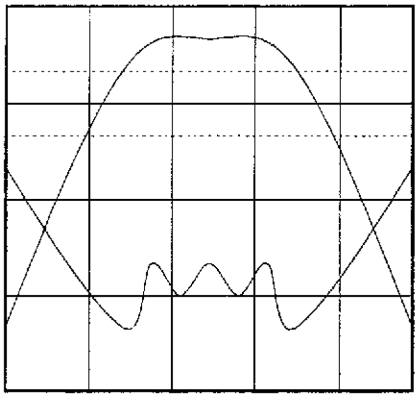
  First waveform: MLOG for MLOP and MLOD
  MLIN for MLIP

  Second waveform: PHAS for MLOP and MLIP
  GDEL for MLOD

  THE initial value depends on the measurement format. See "A.4 Initial Settings".

  The value should be specified as a percentage, with 100% at the top of the screen, 50% in the middle, and 0% at the bottom.

- Example



7.6 FILE Subsystem

1.

FILE:DELete	IEEE488.1-1987 command mode
	PURGE

- Function — Deletion of a stored file
- Presence of command and query — Command
- IEEE488.2-1987 command mode
  - Command — FILE:DELete <str>
  - Parameter — <str>=File name
- IEEE488.1-1987 command mode
  - Command — PURGE<str>
  - Response type — <str>=File name
- Description — Deletes a file stored by the FILE:STORe command or the STFILE command.

2.

FILE:LOAD	IEEE488.1-1987 command mode
	LDFILE

- Function — Loading of a stored file
- Presence of command and query — Command
- IEEE488.2-1987 command mode
  - Command — FILE:LOAD <str>
  - Parameter — <str>=File name
- IEEE488.1-1987 command mode
  - Command — LDFILE<str>
  - Response type — <str>=File name
- Description — Loads a file stored by the FILE:STORe command or the STFILE command.

  If the specified file is stored when the FILE:STATe:RAW or the FILE:STATe:DATA is ON, the sweeping is forcibly in the hold mode after loading because the measured waveform data are also loaded.

3.	FILE:STATe:CONDition	IEEE488.1-1987 command mode DSSTATE

- Function — Definition of the conditions for the file to store
- Presence of command and query — Command / Query
- Command — FILE:STATe:CONDition <bool>
DSSTATE <bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects whether or not to store the setting conditions of the file by the FILE:STORe command.

4.	FILE:STATe:CORRection	IEEE488.1-1987 command mode CORARY

- Function — Definition of the conditions for the file to store
- Presence of command and query — Command / Query
- Command — FILE:STATe:CORRection <bool>
CORARY <bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects whether or not to store the calibration data in the file by the FILE:STORe command.

5. FILE:STATe:DATA — IEEE488.1-1987 command mode: DATAARY

- Function: Definition of the conditions for the file to store
- Presence of command and query: Command / Query
- Command: FILE:STATe:DATA <bool>
  DATAARY <bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects whether or not to store the measured waveform data in the file by the FILE:STORe command.

6. FILE:STATe:MEMory — IEEE488.1-1987 command mode: MEMARY

- Function: Definition of the conditions for the file to store
- Presence of command and query: Command / Query
- Command: FILE:STATe:MEMory <bool>
  MEMARY <bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects whether or not to store the memory waveform data in the file by the FILE:STORe command.

7. FILE:STATe:RAW — IEEE488.1-1987 command mode: RAWARY

- Function: Definition of the conditions for the file to store
- Presence of command and query: Command / Query
- Command: FILE:STATe:RAW <bool>
  RAWARY <bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects whether or not to store the raw data of the measured waveform in the file by the FILE:STORe command.

8. FILE:STORe — IEEE488.1-1987 command mode: STFILE

- Function: Storing the file
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  - Command: FILE:STORe <str>
  - Parameter: <str>=File name
- IEEE488.1-1987 command mode
  - Command: STFILE<str>
  - Response type: <str>=File name
- Description: Setting conditions, calibration data, waveform data, etc. of this equipment can be stored to a floppy disk.
  The information to be stored is defined by the FILE:STATe command. For details, refer to FILE:STATe command.

7.7 FORMat Subsystem

1.	FORMat:BORDer	IEEE488.1-1987 command mode FORM{0 | 2 | 3 | 5 | 6 | 7 | 8}

- Function: Setting of byte order
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: FORMat:BORDer <border>
  - Parameter: <border> = {NORMal | SWAPped}
  - Response type: NORM | SWAP
- IEEE488.1-1987 command mode
  - Command: FORM{0 | 2 | 3 | 5 | 6 | 7 | 8}
  - Response type: None
- Description: The FORMat:BORDer(FORM{0 | 2 | 3 | 5 | 6 | 7 | 8}) command is used to set the data format to be input/output by the TRACe:DATA command. For detailed information on this command, see the description of the FORMat[:DATA] command.

  For details, see "2. FORMat[:DATA]".

2. FORMat[:DATA] — IEEE488.1-1987 command mode FORM{0 | 2 | 3 | 5 | 6 | 7 | 8}

- Function — Setting of data format
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — FORMat[:DATA] <format>,<len>
  - Parameter — <format>={ASCii | REAL | MBINary}
    <len>={32 | 64}
  - Response type — {ASC | REAL | MBIN},<int>
    <int>=NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — FORM{0 | 2 | 3 | 5 | 6 | 7 | 8}
  - Response type — None
- Description — The FORMat[:DATA] command is used in combination with the FORMat:BORDer command. Using these commands, the format of the trace data input/output using the TRACe:DATA command can be changed. (For IEEE488.1-1987 command mode, using the FORM {0 | 2 | 3 | 5 | 6 | 7 | 8} command, the input/output format of IN {1 | 2} etc or OT {1|2} etc can be changed.)

  The format for data transfer using a combination of these commands is shown in the table below. If BORDer is set to NORMal, the data will be transferred in descending order from the highest byte. If it is set to SWAPped, the data will be transferred in ascending order from the lowest byte.

  NOTE: ***If N88BASIC is used on an NEC personal computer, use the Microsoft floating-point format for the binary format.***

FORM:DATA	FORM:BORD	
	NORMal	SWAPped
ASCii	ASCII(FORM0)	
REAL,32	IEEE 32bit binary(FORM2)	IEEE 32-bit binary order exchange (FORM5)
REAL,64	IEEE 64bit binary(FORM3)	IEEE 64-bit binary order exchange (FORM6)
MBIN,32	Microsoft single precision floating point binary (FORM7)	
MBIN,64	Microsoft double precision floating point binary (FORM8)	

7.8 INITiate Subsystem

1. INITiate:CONTinuous

- Function: ON/OFF of trigger system state
- Presence of command and query: Command / Query
- Command: INITiate:CONTinuous <bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: The INITiate:CONTinuous command controls the start of the trigger system.

  If CONTinuous is set to ON, the system does not return to the idle state and changes to the trigger waiting state.

  If CONTinuous is set to OFF, it changes to the trigger waiting state through the idle state. In this case, use the INITiate[:IMMediate] command to go to the trigger waiting state.

  For details, see "5. TRIGGER SYSTEM".

2. INITiate[:IMMediate]

- Function: Trigger system start
- Presence of command and query: Command
- Command: INITiate[:IMMediate]
- Description: The INITiate[:IMMediate] command starts the trigger system.

  The trigger system changes from the idle state to the trigger waiting state to wait for the occurrence of an event.

  For details, see "5. TRIGGER SYSTEM".

7.9 INPut Subsystem

NOTE: When the R3754 series is used, see the section 7.9.1 for the command 1, 2 and 3.

1. INPut[<input>]:ATTenuation — IEEE488.1-1987 command mode
{RI | AI | BI}{50 | 1}A{20 | 0}
AATI{R | A | B}

- Function — Input attenuator setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — INPut[<input>]:ATTenuation <int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — {RI | AI | BI}{50 | 1}A{20 | 0}
    AATI{R | A | B} <int>
  - Parameter — <int>
  - Response type — NR1 (AATI{R | A | B} command)
    0 | 1 ({RI | AI | BI}{50 | 1}A{20 | 0} command)
- Description — Selects 0dB or 20dB as the input attenuator value.
  The relationship between the input attenuator value and the maximum input level is shown in the table below. It is possible to measure at the maximum dynamic range and at optimum accuracy by selecting the attenuator value in accordance with the input signal.

Attenuator	Maximum input level
0dB	-20dBm
20dB	0dBm

If automatic setting is to be selected, see section 2.

- Example — When A input attenuator is set to 20dB:
  IEEE488.1-1987 command mode: "A50IA20"
  *1
  "ATTIA 20 DB"

  IEEE488.2-1987 command mode: "INP2:ATT 20"

*1:For IEEE488.1-1987 command mode, it is necessary to specify the input impedance and ATT simultaneously. In this example, the input impedance required is 50Ω.For 1MΩ, 50Ω should be changed to 1.

2. INPut[<input>]:ATTenuation:AUTO — IEEE488.1-1987 command mode: AATI{R | A | B}AUTO

NOTE: When the R3754 series is used, see the command 2 in the section 7.9.1.

- Function: Input attenuator automatic switching function setting
- Presence of command and query: Command / Query
- Command: INPut[<input>]:ATTenuation:AUTO<bool>
  ATTI{R | A | B}AUTO
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects the automatic setting for the input attenuator. The command automatically sets the attenuator to the optimum value so that it can obtain the maximum dynamic range at each measurement point. Compared with the attenuator that is fixed, the dynamic range is extended to up to 20dB.

Attenuator	Maximum input level
0dB fixed	-20dBm
20dB fixed	0dBm
AUTO	0dBm

3.	INPut[<input>]:IMPedance	IEEE488.1-1987 command mode {RI | AI | BI}{50 | 1}A{20 | 0} IMPI{R | A | B}

NOTE: When the R3754 series is used, see the command 3 in the section 7.9.1.

- Function — Input impedance setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — INPut[<input>]:IMPedance <int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — {RI | AI | BI}{50 | 1}A{20 | 0}
    IMPI{R | A | B} <int>
  - Parameter — <int>
  - Response type — NR1 (IMPI{R | A | B} command)
    0 | 1 ({RI | AI | BI}{50 | 1}A{20 | 0} command)
- Description — Selects 50Ω or 1MΩ as the input impedance of the receiver.
- Example — When A input is set to 1MΩ:

  IEEE488.1-1987 command mode: "AI 1A20"
  *1
  "IMPIA 1MOHM"

  IEEE488.2-1987 command mode:"INP2:IMP 1MOHM"

  *1:For IEEE488.1-1987 command mode, it is necessary to set the attenuator and the input impedance simultaneously. In this example, the attenuator is set to 20dB. For 1dB, the setting should be A0.

7.9.1 INPut Subsystem (Only Available for the R3754 Series)

1. INPut[<input>]:ATTenuation — IEEE488.1-1987 command mode ATTI{R | A | B}

- Function: Input attenuator setting
- Presence of command and query: Command / Query
- Command: INPut[<input>]:ATTenuation <int[DB]>
  ATTI{R | A | B} <int[DB]>
  <input>={1 | 2 | 3} (1: Rch, 2: Ach, 3: Bch)
- Parameter: <int[DB]>
- Response type: NR1 (integer value)
- Description: Selects 0 dB or 25 dB as the input attenuator value.

  The relationship between the input attenuator or preamplifier (see Item 3) and the maximum input power is shown in the table below.

  It is possible to make measurements at the maximum dynamic range and at optimum accuracy, by selecting the attenuator value in accordance with the input power.

Attenuator	Preamplifier	Maximum input power
0dB	16dB	-36dB
0dB	0dB	-20dB
25dB	0dB	+5dB
AUTO	0dB	+5dB

If automatic setting is to be selected, see Item 2.

• Note

The following combinations are possible between the input attenuator and preamplifier values:

		Attenuator		
		AUTO (Note 2)	0dB	25dB
Preamplifier	0dB	○	○	○
	16dB	×(Note 1)	○	×(Note 1)

Note 1:In this combination, the value which was set earlier has priority over a new value between the attenuator and the preamplifier, and the lower priority value is forcibly set to 0 dB.

Note 2:To make the attenuator AUTO function operational, the following conditions must be met: an RBW setting lower than 15 kHz and a measurement frequency of 100 kHz or higher. If the RBW is 15 kHz or the measurement frequency is lower than 100 kHz, the attenuator setting is fixed internally to 25 dB.

2. INPut[<input>]:ATTenuation:AUTO — IEEE488.1-1987 command mode: AATI{R | A | B}AUTO

- Function: Input attenuator automatic switching function setting
- Presence of command and query: Command / Query
- Command: INPut[<input>]:ATTenuation:AUTO <bool>
  ATTI{R | A | B}AUTO
  <input>={1 | 2 | 3} (1: Rch, 2: Ach, 3: Bch)
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects the automatic setting for the input attenuator.
  The relationship between the input attenuator or preamplifier (see Item 3) and the maximum input power is shown in the table below.

Attenuator	Preamplifier	Maximum input power
0dB	16dB	-36dBm
0dB	0dB	-20dBm
25dB	0dB	+5dB
AUTO	0dB	+5dB

- Note: The following combinations are possible between the input attenuator and preamplifier values:

		Attenuator		
		AUTO (Note 2)	0dB	25dB
Preamplifier	0dB	○	○	○
	16dB	×(Note 1)	○	×(Note 1)

Note 1: In this combination, the value which was set earlier has priority over a new value between the attenuator and the preamplifier, and the lower priority value is forcibly set to 0 dB.

Note 2: To make the attenuator AUTO function operational, the following conditions must be met: an RBW setting lower than 15 kHz and a measurement frequency of 100 kHz or higher. If the RBW is 15 kHz or the measurement frequency is lower than 100 kHz, the attenuator setting is fixed internally to 25 dB.

3. INPut[<input>]:GAIN — IEEE488.1-1987 command mode AMPI{R | A | B}

- Function — Input preamplifier setting
- Presence of command and query — Command / Query
- Command — INPut[<input>]:GAIN<int[DB]>
  AMPI{R | A | B}<int[DB]>
  <input>={1 | 2 | 3} (1: Rch, 2: Ach, 3: Bch)
- Parameter — <int[DB]>
- Response type — NR1 (integer value)
- Description — Selects 0 dB or 16 dB as the input preamplifier value.

  The relationship between the input attenuator (see Item 1, 2) or preamplifier and the maximum input power is shown in the table below.

  It is possible to make measurements at the maximum dynamic range and at optimum accuracy, by selecting the attenuator value in accordance with the input power.

Attenuator	Preamplifier	Maximum input power
0dB	16dB	-36dB
0dB	0dB	-20dB
25dB	0dB	+5dB
AUTO	0dB	+5dB

- Note

The following combinations are possible between the input attenuator and preamplifier values:

		Attenuator		
		AUTO (Note 2)	0dB	25dB
Preamplifier	0dB	○	○	○
	16dB	×(Note 1)	○	×(Note 1)

Note 1:In this combination, the value which was set earlier has priority over a new value between the attenuator and the preamplifier, and the lower priority value is forcibly set to 0 dB.

Note 2:To make the attenuator AUTO function operational, the following conditions must be met: an RBW setting lower than 15 kHz and a measurement frequency of 100 kHz or higher. If the RBW is 15 kHz or the measurement frequency is lower than 100 kHz, the attenuator setting is fixed internally to 25 dB.

7.10 OUTPut Subsystem

1. OUTPut<port>[:STATe] — IEEE488.1-1987 command mode PORT{1 | 2}

NOTE: ***For the R3752H/53H series, this command will not function when used with E type.***
For the R3574 series, this command will not function without OPTION 10 or OPTION 11 installed.

- Function — Output port setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — OUTPut<port>[:STATe] <bool>
  - Parameter — <bool>
  - Response type — 0 | 1
- IEEE488.1-1987 command mode
  - Command — PORT{1 | 2}
  - Response type — 0 | 1
- Description — Sets the output port.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
PORT1	OUTP1 ON	Sets the single output port
PORT2	OUTP2 ON	Sets the power splitter output port

7.11 REGister Subsystem

1.

REGister:CLEar	IEEE488.1-1987 command mode
	CLRREG{1 I 2 I 3 I 4 I 5 I 6 I 7 I 8 I 9 I 10 I 11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20}

- Function — Clearing the register
- Presence of command and query — Command
- IEEE488.2-1987 command mode
  - Command — REGister:CLEar <int>
  - Parameter — <int>
- IEEE488.1-1987 command mode
  - Command — CLRREG{1 I 2 I 3 I 4 I 5 I 6 I 7 I 8 I 9 I 10 I 11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20}
- Description — Clears the register data stored by the *SAV, the REGister: SAVE <int> or the SAVEREG{1 I 2 I 3 I 4 I 5 I 6 I 7 I 8 I 9 I 10 I 11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20}command.

2.

REGister:RECall	IEEE488.1-1987 command mode
	RECLREG{1 I 2 I 3 I 4 I 5 I 6 I 7 I 8 I 9 I 10 I 11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20}

- Function — Recalling (reading) the register
- Presence of command and query — Command
- IEEE488.2-1987 command mode
  - Command — REGister:RECall {<int> I POFF}
  - Parameter — <int>=Register number
    POFF=Settings before power-off
- IEEE488.1-1987 command mode
  - Command — RECLREG{1 I 2 I 3 I 4 I 5 I 6 I 7 I 8 I 9 I 10 I 11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20}
- Description — Recalls the register data stored by *SAV, the REGister: SAVE <int> or the SAVEREG{1 I 2 I 3 I 4 I 5 I 6 I 7 I 8 I 9 I 10 I 11 I 12 I 13 I 14 I 15 I 16 I 17 I 18 I 19 I 20}command.
  This command has the same function as *RCL.

3. REGister:SAVE IEEE488.1-1987 command mode
SAVEREG{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20}

- Function: Saving data into the register
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  - Command: REGister:SAVE <int>
  - Parameter: <int>
- IEEE488.1-1987 command mode
  - Command: SAVEREG{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20}
- Description: Saves the analyzer settings and the calibration data into a register with the specified number.

  Using the save register function, a maximum of 20 sets of measurement conditions and measurement data can be saved in the built-in memory of this network analyzer (each save register function saves a set of measurement conditions and measurement data).

  Each time a save register function is executed, the data is saved as a file in the built-in memory which has a capacity of 1880 kB. The total data cannot exceed this limit (this memory is shared with the C drive). If the total data exceeds this limit, new data will not be saved (even if there is a register which does not contain data). When this happens, the user must first erase some data previously saved, and then try to save the current data again.

  This command has the same function as *SAV.

7.12 SENSe Subsystem

NOTE: ***When the R3754 series is used***
- ***See Section 7.12.1 and 7.12.2.***
- ***See the command 6 and 7 in Section 7.12.1 for the command 4 and 5.***
- ***See Section 7.12.2 for the commands on Option72.***

1. [SENSe:]AVERage[<chno>]:COUNt — IEEE488.1-1987 command mode: AVERFACT, AVR{2 | 4 | 8 | 16 | 32 | 64 | 128}

- Function: Setting of number of averaging times
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SENSe:]AVERage[<chno>]:COUNt <int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command: AVERFACT<int>
AVR{2 | 4 | 8 | 16 | 32 | 64 | 128}
  - Parameter: <int>
  - Response type: NR1 (AVERFACT command)
0 | 1 (AVR{2 | 4 | 8 | 16 | 32 | 64 | 128} command)
- Description: Sets the number of averaging times.

  The averaging averages the data by adding time weight to the measured data before formatting. Since this method averages the data in accordance with the vector quantity, the noise level can be reduced.

  The averaging process is as follows:

$$\overline{Y}_{(n)} = \frac{n-1}{n} \cdot \overline{Y}_{(n-1)} + \frac{1}{n} \cdot Y_{(n)} \quad (n \leq N)$$

$$\overline{Y}_{(n)} = \frac{N-1}{N} \cdot \overline{Y}_{(n-1)} + \frac{1}{N} \cdot Y_{(n)} \quad (n > N)$$

$\overline{Y}_{(n)}$: nth averaged data

$Y_{(n)}$: nth data

N: Number of averaging times

2. [SENSe:]AVERage[<chno>]:RESTart — IEEE488.1-1987 command mode AVERREST

- Function — Averaging restart
- Presence of command and query — Command
- Command — [SENSe:]AVERage[<chno>]:RESTart
  AVERREST
- Description — Clears the average counter and restarts the averaging.

  The averaging averages the data by adding time weight to the measured data before formatting. Since this method averages the data in accordance with the vector quantity, the noise level can be reduced.

  The averaging process is as follows:

$$\overline{Y}_{(n)} = \frac{n-1}{n} \cdot \overline{Y}_{(n-1)} + \frac{1}{n} \cdot Y_{(n)} \quad (n \leq N)$$

$$\overline{Y}_{(n)} = \frac{N-1}{N} \cdot \overline{Y}_{(n-1)} + \frac{1}{N} \cdot Y_{(n)} \quad (n > N)$$

  $\overline{Y}_{(n)}$: nth averaged data

  $Y_{(n)}$: nth data

  N: Number of averaging times

3. [SENSe:]AVERage[<chno>][:STATe]　　IEEE488.1-1987 command mode
AVERAGE
AVER

- Function: ON/OFF of averaging
- Presence of command and query: Command / Query
- Command: [SENSe:]AVERage[<chno>][:STATe] <bool>
  AVERAGE
  AVER<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Sets ON/OFF of the averaging.

  Initial setting: OFF

  The averaging averages the data by adding time weight to the measured data before formatted. Since this method averages the data in accordance with the vector quantity, the noise level can be reduced.

  The averaging process is as follows:

$$\overline{Y}_{(n)} = \frac{n-1}{n} \bullet \overline{Y}_{(n-1)} + \frac{1}{n} \bullet Y_{(n)} \quad (n \leq N)$$

$$\overline{Y}_{(n)} = \frac{N-1}{N} \bullet \overline{Y}_{(n-1)} + \frac{1}{N} \bullet Y_{(n)} \quad (n > N)$$

  $\overline{Y}_{(n)}$: nth averaged data

  $Y_{(n)}$: nth data

  N: Number of averaging times

  AVERAGE of IEEE488.1-1987 command is identical to AVER OFF.
- Note: Smoothing obtains the moving average between adjacent formatted data. Since the method averages the scalar quantity, it reduces the noise width but does not reduce the noise level.

4. [SENSe:]BANDwidth[:RESolution] IEEE488.1-1987 command mode
RBW
RBW{1K | 300 | 100 | 30 | 10}HZ

NOTE: When the R3754 series is used, see the command 7 in the section 7.12.1.

- Function: Bandwidth setting
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SENSe:]BANDwidth[:RESolution] <int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command: RBW<int>
    RBW{1K | 300 | 100 | 30 | 10}HZ
  - Parameter: <int>
  - Response type: NR1 (RBW command)
    0 | 1 (RBW{1K | 300 | 100 | 30 | 10}HZ command)
- Description: Sets the resolution bandwidth of the receiver.
  Initial setting: 10kHz
  The resolution bandwidth can be selected in the range 10kHz to 3Hz, as shown below. The maximum sweeping speed and noise level per point depend on the resolution bandwidth selected.

Resolution bandwidth	Maximum sweeping speed per point
10kHz	0.1ms/POINT
3kHz	0.35ms/POINT
1kHz	1.0ms/POINT
300Hz	3.5ms/POINT
100Hz	10ms/POINT
30Hz	35ms/POINT
10Hz	100ms/POINT
3Hz	350ms/POINT

- Note: If the resolution bandwidth is set to 10kHz, 3kHz, or 3Hz in IEEE488.1-1987 command mode, the setting must be performed and the query must be made by using an RBW command.

5. [SENSe:]BANDwidth[:RESolution]:AUTO — IEEE488.1-1987 command mode RBWAUTO

NOTE: When the R3754 series is used, see the command 5 in the section 7.12.1.

- Function — Automatic bandwidth setting
- Presence of command and query — Command / Query
- Command — [SENSe:]BANDwidth[:RESolution]:AUTO <bool>
  RBWAUTO
- Parameter — <bool>
- Response type — 0 | 1
- Description — Automatically sets the resolution bandwidth in accordance with the measurement frequency.
  The maximum sweeping speed and noise level per point depend on the resolution bandwidth selected.

Resolution bandwidth	Maximum sweeping speed per point
10kHz	0.1ms/POINT
3kHz	0.35ms/POINT
1kHz	1.0ms/POINT
300Hz	3.5ms/POINT
100Hz	10ms/POINT
30Hz	35ms/POINT
10Hz	100ms/POINT
3Hz	350ms/POINT

- Note — The maximum sweeping speed per point depends on the resolution bandwidth. Since at particularly low frequencies the resolution bandwidth is low and the sweeping speed is reduced, do not set the frequency too low.

6. [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] IEEE488.1-1987 command mode
NORM,NORMS
OPEN,SHORT,LOAD
IMPOPEN,IMPSHORT,IMPLD50

NOTE: When the R3754 series OPT72 is used, see the command 3 in Section 7.12.2.

- Function: Calibration data acquisition
- Presence of command and query: Command
- Command: [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] <standard>
  {NORM | NORMS} <bool>
  OPEN,SHORT,LOAD,
  IMPOPEN,IMPSHORT,IMPLD50
- Parameter: <standard>={NORMalize | SNORmalize | OPEN | SHORt |
- LOAD | IOPem | ISHort | ILOad 50}
- Description: Acquires the calibration data.

  This command restarts the sweeping and acquires the calibration data.

  If the averaging function is set to ON, the calibration data are acquired after the sweeping has been repeated the number of times specified.

  If the calibration data have already been acquired, the data will be updated. However, when one-port full calibration is in progress, the data cannot be updated. In this case, the data should be cleared then updated.

IEEE488.1-1987 Command	IEEE488.2-1987 Command parameter	Operation (acquired data)
NORM ON	NORM	Normalize: Acquired and finished simultaneously
NORMS ON	SNOR	Short normalize: Acquired and finished simultaneously
OPEN	OPEN	One-port full calibration Open data
SHORT	SHOR	One-port full calibration Short data
LOAD	LOAD	One-port full calibration Load data
IMPOPEN	IOP	Transmission full calibration Open data
IMPSHORT	ISH	Transmission full calibration Short data
IMPLD50	ILO 50	Transmission full calibration Load data

7. [SENSe:]CORRection[<chno>]:COLLect:DELete IEEE488.1-1987 command mode CLEAR

- Function: Calibration data clearing
- Presence of command and query: Command
- Command: [SENSe:]CORRection[<chno>]:COLLect:DELete
  CLEAR
- Description: Clears the calibration data.

  For one-port full calibration, once the calibration has finished, it is impossible to acquire the data again until the data have been cleared. Therefore, to acquire the calibration data again, the data should be cleared.

  Note that if the calibration data are to be cleared, the correction measurement should be set to OFF.

8. [SENSe:]CORRection[<chno>]:COLLect:SAVE IEEE488.1-1987 command mode DONE DONE1PORT

- Function: Calculation of error coefficient from calibration data
- Presence of command and query: Command
- Command: [SENSe:]CORRection[<chno>]:COLLect:SAVE
  DONE
  DONE1PORT
- Description: Calculates the error coefficient from the calibration data acquired and sets the correction measurement function to ON.

9. [SENSe:]CORRection[<chno>]:CSET:STATe — IEEE488.1-1987 command mode CORRECT

- Function — ON/OFF of correction measurement
- Presence of command and query — Command / Query
- Command — [SENSe:]CORRection[<chno>]:CSET:STATe <bool>
  CORRECT<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects ON/OFF of correction measurement using the calibration data.

  If the calibration data have already been gained, this command should be used to perform the correction measurement. Since the stored calibration data are not cleared when this command is set to OFF, it is possible to perform the correction measurement by setting the command to ON at any time.

10. [SENSe:]CORRection[<chno>]:CSET:INTerpolate <bool> — IEEE488.1-1987 command mode INTERPOL

- Function — Interpolation correction ON/OFF
- Presence of command and query — Command / Query
- Command — [SENSe:]CORRection[<chno>]:CSET: INTerpolate<bool>
  CORRECT<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects ON/OFF of interpolation error correction measurement.

  Changes the frequency range, the measurement points and so on without re-obtaining the correction data.

  When changing the frequency range or the number of measurement points with this function activated, the correction data is calculated from the previously obtained correction data.

  The following settings are enabled.

  1. Change of the Sweep range (Only in the corrective range)
  2. Change of the Sweep type (Linear sweep, Log sweep, Level sweep)
  3. Change of the number of Sweep points
- Note — When it is impossible to interpolate the data according to the setting conditions, the correction data previously obtained is used just as it is.

11. [SENSe:]CORRection[<chno>]:EDELay:DISTance   IEEE488.1-1987 command mode
LENGVAL

- Function: Electrical length (distance) setting
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:EDELay:DISTance <real>
  LENGVAL<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the value of the electrical length correction by inputting the distance.

$$\text{Correction value } \phi \text{ (deg)} = \frac{L}{c} \times \frac{1}{V_f} \times f \times 360$$

$$= S \times f \times 360$$

L : Electrical length (distance)
V_f : Velocity factor
c : Velocity of light
f : Frequency
S : Electrical length (time)

12. [SENSe:]CORRection[<chno>]:EDELay:STATe — IEEE488.1-1987 command mode LENGTH

- Function — ON/OFF of electrical length correction
- Presence of command and query — Command / Query
- Command — [SENSe:]CORRection[<chno>]:EDELay:STATe <bool>
  LENGTH<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects ON/OFF of the electrical length correction.

  Corrects the phase of the measurement data in accordance with the electrical length already set.

  This command is used to add or remove the phase of the connection cable so that only the phase of the object can be measured.

$$\text{Correction value } \phi \text{ (deg)} = \frac{L}{c} \times \frac{1}{V_f} \times f \times 360$$

$$= S \times f \times 360$$

L : Electrical length (distance)
V_f : Velocity factor
c : Velocity of light
f : Frequency
S : Electrical length (time)

13. [SENSe:]CORRection[<chno>]:EDELay[:TIME] IEEE488.1-1987 command mode ELED

- Function: Electrical length (time) setting
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:EDELay[:TIME] <real>
  ELED<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the value of the electrical length in time.

$$\text{Correction value } \phi \text{ (deg)} = \frac{L}{c} \times \frac{1}{V_f} \times f \times 360 = S \times f \times 360$$

L : Electrical length (distance)
V_f : Velocity factor
c : Velocity of light
f : Frequency
S : Electrical length (time)

14. [SENSe:]CORRection[<chno>]:OFFSet:PHASe IEEE488.1-1987 command mode PHAO

- Function: Phase offset value setting
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:OFFSet:PHASe <real>
  PHAO<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the value of the phase offset.
  A constant value is added to the phase data. Unlike the electrical length correction, the command always add a constant, regardless of the frequency.
- Note: If 0 is set, CORR:OFFS:STAT is automatically set to OFF.
  If the value other than 0 is set, CORR:OFFS:STAT is automatically set to ON.

15. [SENSe:]CORRection[<chno>]:OFFSet:STATe — IEEE488.1-1987 command mode PHAOFS

- Function: ON/OFF of phase offset function
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:OFFSet:STATe <bool>
  PHAOFS<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects ON/OFF of the phase offset function.
  A constant value is added to the phase data. Unlike the electrical length correction, the command always add a constant, regardless the frequency.
- Note: If OFF is set, CORR:OFFS:PHAS is automatically set to 0.

16. [SENSe:]CORRection[<chno>]:PEXTension:TIME[<eport>] — IEEE488.1-1987 command mode EPORT{R | A | B | 1 | 2}

- Function: Setting of correction value of reference plane extension
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:PEXTension:TIME[<eport>] <real>
  EPORT{R | A | B | 1 | 2} <real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the value of the reference plane extension.
  The command corrects the extension in accordance with the input port. While the electrical correction simply corrects the set value, this command corrects in accordance with the input port condition by setting the value corresponding to the input port.
  For example, this command automatically sets the correction value to two times the port extension value for reflection measurement and to one time the port extension value for transfer measurement.

17. [SENSe:]CORRection[<chno>]:PEXTension:STATe — IEEE488.1-1987 command mode PORE

- Function — ON/OFF of the function of reference plane extension
- Presence of command and query — Command / Query
- Command — [SENSe:]CORRection[<chno>]:PEXTension:STATe <bool>
  PORE<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Selects ON/OFF of the function of the reference plane extension.

  The command corrects the extension in accordance with the input port. While the electrical correction simply corrects the set value, this command corrects in accordance with the input port condition by setting the value corresponding to the input port.

  For example, this command automatically sets the correction value to two times the port extension value for reflection measurement and to one time the port extension value for transfer measurement.

18. [SENSe:]CORRection[<chno>]:RVELocity:COAX — IEEE488.1-1987 command mode VELOFACT

- Function: Cable transfer coefficient setting
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:RVELocity:COAX <real>
  VELOFACT<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the cable transfer coefficient value.

$$\text{Correction value } \phi \text{ (deg)} = \frac{L}{c} \times \frac{1}{V_f} \times f \times 360$$

$$= S \times f \times 360$$

$$V_f = \frac{1}{\sqrt{\varepsilon_R}}$$

l : Electrical length (distance)
V_f : Velocity factor
c : Velocity of light
f : Frequency
S : Electrical length (time)
ε_R : Relative permittivity

19.	[SENSe:]FUNCtion[<chno>][:ON]	IEEE488.1-1987 command mode {R | A | B | AR | BR | AB | BDC | BDCR}IN S11,S12,S21,S22

- Function — Input port specification
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SENSe:]FUNCtion[<chno>][:ON] <input>
  - Parameter — <input>={"POWer:{AC | DC} {1 | 2 | 3}" |
    "POWer:{AC | DC}:RATio {2,1 | 3,1 | 2,3}" |
    "POWer:{S11 | S12 | S22 | S21} "}
  - Response type — "POW:AC 1" | "POW:AC 2" | "POW:AC 3" | "POW:DC 3" |
    vPOW:AC:RAT 2,1" | "POW:AC:RAT 3,1" | "POW:AC:RAT 2,3" | "POW:DC:RAT 3,1" | "POW:S11" | "POW:S12" | "POW:S22" | "POW:S21"
- IEEE488.1-1987 command mode
  - Command — {R | A | B | AR | BR | AB | BDC | BDCR}IN
    S11,S12,S21,S22
  - Response type — 0 | 1
- Description — Specifies the input port to be measured/analyzed.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation (input port)
RIN	POW:AC 1	Sets R input
AIN	POW:AC 2	Sets A input
BIN	POW:AC 3	Sets B input
ARIN	POW:AC:RAT 2,1	Sets A/R input (ratio measurement)
BRIN	POW:AC:RAT 3,1	Sets B/R input (ratio measurement)
ABIN	POW:AC:RAT 2,3	Sets A/B input (ratio measurement)
BDCIN	POW:DC 3	Sets B (DC) input (DC measurement)
BDCRIN	POW:DC:RAT 3,1	Sets B (DC)/R input (ratio measurement)
S11	POW:S11	Sets S11 (forward direction, reflection)
S12	POW:S12	Sets S12 (reverse direction, transmission)
S21	POW:S21	Sets S21 (forward direction, transmission)
S22	POW:S22	Sets S22 (reverse direction, reflection)

20. [SENSe:]FUNCtion[<chno>]:POWer — IEEE488.1-1987 command mode {R | A | B | AR | BR | AB | BDC | BDCR}IN S11,S12,S21,S22

- Function — Input port specification
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SENSe:]FUNCtion[<chno>]:POWer <input>
  - Parameter — <input>={R | A | B | AR | BR | AB | BDC | BDCR | S11 | S12 | S21 | S22}
  - Response type — R | A | B | AR | BR | AB | BDC | BDCR | S11 | S12 | S21 | S22
- IEEE488.1-1987 command mode
  - Command — {R | A | B | AR | BR | AB | BDC | BDCR}IN S11,S12,S21,S22
  - Response type — 0 | 1
- Description — Specifies the input port to be measured/analyzed.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation (input port)
RIN	R	Sets R input
AIN	A	Sets A input
BIN	B	Sets B input
ARIN	AR	Sets A/R input (ratio measurement)
BRIN	BR	Sets B/R input (ratio measurement)
ABIN	AB	Sets A/B input (ratio measurement)
BDCIN	BDC	Sets B (DC) input (DC measurement)
BDCRIN	BDCR	Sets B (DC)/R input (ratio measurement)
S11	S11	Sets S11(forward direction, reflection)
S12	S12	Sets S12 (reverse direction, transmission)
S21	S21	Sets S21 (forward direction, transmission)
S22	S22	Sets S22 (reverse direction, reflection)

21. [SENSe:]POWer:AC:PROTection:CLEar — IEEE488.1-1987 command mode CLRTRIP

- Function — Input protection circuit clearing
- Presence of command and query — Command
- Command — [SENSe:]POWer:AC:PROTection:CLEar
  CLRTRIP
- Description — Clears the input protection circuit.

  The receiver has a function to protect against over-inputting. When the input impedance is 50Ω, the breakdown input range is 0 VDC, +24dBm. However, if a value greater than ±1.5 VDC, +14dBm is input, the receiver automatically switches the input impedance to 1MΩ. When the input impedance is 1MΩ, the breakdown input range is ±3 VDC.

22. [SENSe:]CORRection[<chno>]:SLOPe:PHASe

- Function — Sets the Phase slope
- Presence of command and query — Command / Query
- Command — [SENSe:]CORRection[<chno>] :SLOPe:PHASe <real>
  PHASLO<real>
- Parameter — <real>
- Response type — NR3 (real value)
- Description — Sets a Phase slope value (deg).

  Sloping phase value is added to the phase data: start point as 0 degree, and stop point as the value specified here.

  This slope varies linearly depending on the measurement point spacing, not on frequency.

7.12.1 SENSe Subsystem (Only Available for the R3754 Series)

1. [SENSe:]CORRection[<chno>]:CKIT:DEFine:SAVE — IEEE488.1-1987 command mode STDSAVE

• Function	Stores the calibration standard value (which has been already set) in the memory.
• Presence of command and query	Command
• Command	[SENSe:]CORRection[<chno>]:CKIT:DEFine:SAVE STDSAVE
• Parameter	None
• Description	Stores the open, short and load standard values for the transmission full calibration in the internal backup memory. Once this operation is performed, these input calibration standard values are stored in the backup memory even if the spectrum analyzer power is turned OFF.

2. [SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard:{O | S | L}IMPedance — IEEE488.1-1987 command mode STD{O | S | L}RS

• Function	Sets the calibration standard impedance (Rs).
• Presence of command and query	Command / Query
• Command	[SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard: {O	S	L}IMPedance<real[OHM]> STD{O	S	L}RS<real> O: Open standard S: Short standard L: Load standard
• Parameter	<real[OHM]>
• Response type	NR3 (real number)
• Description	Sets the calibration standard impedance (Rs) for the transmission full calibration.

3. [SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard:{O | S | L}INDuctance
IEEE488.1-1987 command mode
STD{O | S | L}LS

- Function: Sets the calibration standard inductance (Ls).
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard:{O | S | L}INDuctance<real[H]>
  STD{O | S | L}LS<real[H]>
  O: Open standard
  S: Short standard
  L: Load standard
- Parameter: <real[H]>
- Response type: NR3 (real number)
- Description: Sets the calibration standard inductance (Ls) for the transmission full calibration.

4. [SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard:{O | S | L}CAPacitance
IEEE488.1-1987 command mode
STD{O | S | L}CP

- Function: Sets the calibration standard capacitance (Cp).
- Presence of command and query: Command / Query
- Command: [SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard:{O | S | L}CAPacitance<real[F]>
  STD{O | S | L}CP<real[F]>
  O: Open standard
  S: Short standard
  L: Load standard
- Parameter: <real[F]>
- Response type: NR3 (real number)
- Description: Sets the calibration standard capacitance (Cp) for the transmission full calibration.

5. [SENSe:]BANDwidth[:RESolution]:AUTO IEEE488.1-1987 command mode RBWAUTO

- Function: Automatic bandwidth setting
- Presence of command and query: Command / Query
- Command: [SENSe:]BANDwidth[:RESolution]:AUTO <bool>
  RBWAUTO
- Parameter: <bool>
- Response type: 0 | 1
- Description: Automatically sets the resolution bandwidth in accordance with the measurement frequency.

  The resolution bandwidth is not defined uniquely by the range of sweeping frequency. This automatically switches the resolution bandwidth according to the frequency under sweeping.

  When AUTO is set, the resolution bandwidth as the figure below is selected and is measured automatically corresponding to the frequency of the measurement point.

Measurement frequency	Bandwidth of resolution
10kHz to 13.5kHz	400Hz
13.5kHz to 18kHz	500Hz
18kHz to 23kHz	700Hz
23kHz to 30kHz	1kHz
30kHz to 45kHz	1.5kHz
45kHz to 70kHz	2kHz
100kHz to 135kHz	3kHz
135kHz to 180kHz	4kHz
180kHz to 230kHz	5kHz
230kHz to 300kHz	7kHz
300kHz to 150kHz	10kHz

  When the auto function of bandwidth is selected, the bandwidth of resolution can not be set to 15kHz.
- Note: The maximum sweeping speed per point depends on the resolution bandwidth. Since at particularly low frequencies the resolution bandwidth is low and the sweeping speed is reduced, do not set the frequency too low.

6. [SENSe:]CORRection[n]:GPHase:STATe IEEE488.1-1987 command mode SRCCOR

- Function: ON/OFF of frequency characteristic correction in the receiver part
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SENSe:]CORRection[n]:GPHase:STATe <bool>
  - Parameter: <bool>
  - Response type: 0 | 1
- IEEE488.1-1987 command mode
  - Command: INPCOR<bool>
  - Parameter: <bool>
  - Response type: 0 | 1
- Description: Selects whether or not the frequency characteristics in the receiver part are to be corrected. (ON or OFF)

7. [SENSe:]BANDwidth[:RESolution] IEEE488.1-1987 command mode
RBW
RBW{1K | 300 | 100 | 30 | 10}HZ

NOTE: When the R3754 Series is used, see the command 7 in the section 7.12.1.

- Function: Bandwidth setting
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SENSe:]BANDwidth[:RESolution] <int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command: RBW<int>
    RBW{1K | 300 | 100 | 30 | 10}HZ
  - Parameter: <int>
  - Response type: NR1 (RBW command)
    0 | 1 (RBW{1K | 300 | 100 | 30 | 10}HZ command)
- Description: Sets the resolution bandwidth of the receiver.
  Initial setting: AUTO
  The resolution bandwidth can be selected in the range 15kHz to 3Hz, as shown below. The maximum sweeping speed and noise level per point depend on the resolution bandwidth selected.

Resolution bandwidth	Maximum sweeping speed per point
15kHz	0.05ms/POINT
10kHz	0.10ms/POINT
7kHz	0.15ms/POINT
5kHz	0.20ms/POINT
4kHz	0.25ms/POINT
3kHz	0.35ms/POINT
2kHz	0.50ms/POINT
1.5kHz	0.70ms/POINT
1kHz	1.0ms/POINT
700Hz	1.4ms/POINT
500Hz	1.9ms/POINT

Resolution bandwidth	Maximum sweeping speed per point
400Hz	2.7ms/POINT
300Hz	3.4ms/POINT
200Hz	5.0ms/POINT
150Hz	7.0ms/POINT
100Hz	10.0ms/POINT
70Hz	14.0ms/POINT
50Hz	19.0ms/POINT
40Hz	26.1ms/POINT
30Hz	34.9ms/POINT
20Hz	50.1ms/POINT
15Hz	70.1ms/POINT
10Hz	99.3ms/POINT
7Hz	160.1ms/POINT
5Hz	249.7ms/POINT
4Hz	480.1ms/POINT
3Hz	691.2ms/POINT

When the RBW is 15kHz, the attenuator AUTO Function does not operate.
The attenuator setting is fixed to 25dB.

- Note

If the resolution bandwidth is set to 10kHz, 3kHz, or 3Hz in IEEE488.1-1987 command mode, the setting must be performed and the query must be made by using an RBW command.

7.12.2 SENSe Subsystem (Only Available for the R3754 Series OPT72)

NOTE: ***The following commands can be used only when Option 72 is installed.***

1. [SENSe:]CORRection[<chno>]:CMEasure — IEEE 488.1-1987 command mode: CMEAS

- Function: Toggles the load capacitance measurement on or off.
- Presence of command and query: Command/Query
- Command: [SENSe:]CORRection[<chno>]:CMEasure <bool>
  CMEAS<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Toggles the load capacitance measurement on or off.
  ON: Used to measure three-terminal resonator's load capacitance.
  OFF: Used to measure two- or three-terminal resonators by entering the load capacitance.

2. [SENSe:]CORRection[<chno>]:CMFRequency — IEEE 488.1-1987 command mode: CMFREQ

- Function: Sets the measurement frequency for the load capacitance.
- Presence of command and query: Command/Query
- Command: [SENSe:]CORRection[<chno>]:CMFRequency <real>
  CMFREQ<real>
- Parameter: <real>
- Response type: NR3 (real number)
- Description: Sets the measurement frequency for the load capacitance.
  The measurement frequency can also be changed after the calibration. The error, however, becomes larger than before.

3.	[SENSe:]CORRection[<chno>]:COLLect[:ACQuire]	IEEE 488.1-1987 command mode NORM,NORMS IMPOPEN,IMPSHORT,IMPLD50 IMPLD100, IMPLD200

- Function: Calibration data acquisition
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  - Command: [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] <standard>
  - Parameter: <standard>={NORMalize | SNORmalize | IOPen | ISHort | ILOad50 | ILOad100 | ILOad200}
- IEEE488.1-1987 command mode
  - Command: {NORM | NORMS} <bool>
    IMPOPEN, IMPSHORT, IMPLD50
    IMPLD100, IMPLD200
- Description: Acquires the calibration data.

  When the IMPEDANCE CAL[ON/OFF] is set to ON, "1 Port Full Calibration" and "Trans Full Calibration" cannot be used simultaneously. As a result, the IMPEDANCE CAL must be set to OFF to use "1 Port Full Calibration" or "Trans Full Calibration."

  For more information, Section 5.3,"Three-terminal Resonator Measurement Function (Option 72)" in the R3754 Series USER MANUAL (Functional Description).

  This command restarts the sweeping and acquires the calibration data.

  If the averaging function is set to ON, the calibration data are acquired after the sweeping has been repeated the number of times specified.

  If the calibration data have already been acquired, the data will be updated. However, when one-port full calibration is in progress, the data cannot be updated. In this case, the data should be cleared then updated.

IEEE488.1-1987 command	IEEE488.2-1987 command mode	Center frequency
NORMON	NORM	Normalization
		Acquired and finished simultaneously
NORMSON	SNOR	Short normalization
		Acquired and finished simultaneously
IMPOPEN	IOPen	Impedance calibration
		Open data
IMPSHORT	ISHort	Impedance calibration
		Short data
IMPLD50	ILOad50	Impedance calibration
		Load data (50Ω standard)
IMPLD100	ILOad100	Impedance calibration
		Load data (100Ω standard)
IMPLD200	ILOad200	Impedance calibration
		Load data (200Ω standard)

For more information on the commands used with the "1 Port Full Calibration" and "Trans Full Calibration," refer to the command 6 in Section 7.12, "[SENSe:]CORRection[<chno>]:COLLect[:ACQuire]."

4. [SENSe:]CORRection[<chno>]:LCAPacitance:HIGH — IEEE 488.1-1987 command mode IMPCH

- Function: Sets the load capacitance (INPUT side).
- Presence of command and query: Command/Query
- Command: [SENSe:]CORRection[<chno>]:LCAPacitance:HIGH <real>
  IMPCH<real>
- Parameter: <real>
- Response type: NR3 (real number)
- Description: Sets the load capacitance of INPUT side.

  Enter the load capacitance for the INPUT side when obtaining data with the load capacitance measurement set to OFF.

  When the load capacitance measurement is set to ON, the measurement value for the INPUT side is displayed.

  The load capacitance value can be changed after measurement. Perform a SINGLE sweep to change the value.

5. [SENSe:]CORRection[<chno>]:LCAPacitance:LOW — IEEE 488.1-1987 command mode IMPCL

- Function: Sets the load capacitance (OUTPUT side).
- Presence of command and query: Command/Query
- Command: [SENSe:]CORRection[<chno>]:LCAPacitance:LOW <real>
  IMPCL<real>
- Parameter: <real>
- Response type: NR3 (real number)
- Description: Sets the load capacitance of OUTPUT side.

  Enter the load capacitance for the OUTPUT side when obtaining data with the load capacitance measurement set to OFF.

  When the load capacitance measurement is set to ON, the measurement value for the OUTPUT side is displayed.

  The load capacitance value can be changed after measurement. Perform a SINGLE sweep to change the value.

7.13 SOURce Subsystem

NOTE: ***When the R3754 series is used***
• See Section 7.13.1 and 7.13.2.
• See Section 7.13.1 for the command 16.
• See Section 7.13.2 for the commands on Option 70.

1. [SOURce:]COUPle — IEEE488.1-1987 command mode: COUPLE

- Function: ON/OFF of connecting channels for output signal
- Presence of command and query: Command / Query
- Command: [SOURce:]COUPle <bool>
  COUPLE<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects whether or not the same measurement conditions are to be used for measurement channels 1 and 2.
  Initial setting: COUPLE ON

  The measurement conditions include:
  • Sweeping type
  • Frequency
  • Output level
  • Sweeping time
  • Number of points for measurement
  • Resolution bandwidth

  If the command is set to COUPLE OFF, it measures measurement channel 1 first then measurement channel 2. In other words, it measures channel 1 and 2 alternately.

  If it is set to COUPLE ON, it measures measurement channel 1 and 2 simultaneously.

2. [SOURce:]FREQuency[<chno>]:CENTer IEEE488.1-1987 command mode CENTERF

- Function: Central frequency setting
- Presence of command and query: Command / Query
- Command: [SOURce:]FREQuency[<chno>]:CENTer <real>
  CENTERF<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the central frequency when the frequency is swept.

3. [SOURce:]FREQuency[<chno>]:CW IEEE488.1-1987 command mode CWFREQ

- Function: Fixed frequency setting
- Presence of command and query: Command / Query
- Command: [SOURce:]FREQuency[<chno>]:CW <real>
  CWFREQ<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the frequency for level sweeping.

4. [SOURce:]FREQuency[<chno>]:MODE   IEEE488.1-1987 command mode
LINFREQ
LOGFREQ

- Function   Sweeping type setting
- Presence of command and query   Command / Query
- IEEE488.2-1987 command mode
  - Command   [SOURce:]FREQuency[<chno>]:MODE <mode>
  - Parameter   <mode>=SWEep
  - Response type   CW | SWE | PSW
- IEEE488.1-1987 command mode
  - Command   LINFREQ
    LOGFREQ
  - Response type   0 | 1
- Description   This command must be set by combining each item as shown in the table below:
  Initial setting   Linear frequency sweeping

Command	PSW: MODE	FREQ: MODE	POW: MODE	SWE: SPAC	Sweeping type	Corresponding IEEE488.1-1987 command
Parameter	(NONE)	SWE	(FIX)	LIN	Linear frequency sweeping	LINFREQ
				LOG	Log frequency sweeping	LOGFREQ
		(CW)	SWE	(LIN)	Level sweeping	LEVEL
	FREQ	(PSW)	(FIX)	(LIN)	Program sweeping (frequency only)	USRFSWP
	ALL	(PSW)	(PSW)	(LIN)	Program sweeping	USRASWP

Note: The value in parentheses indicates the value which is returned for a query. Do not use this value for setting.

Sweeping type
- Linear frequency sweeping: Sweeps the frequency at a constant interval at a fixed level.
- Log frequency sweeping: Sweeps the frequency at a log interval at a fixed level.
- Level sweeping: Sweeps the output level at a fixed frequency.
- Program sweeping (frequency only): Arbitrarily sets the frequency only for each interval.
- Program sweeping: Arbitrarily sets the frequency, the output level, the resolution bandwidth, the input attenuator and the settling time for each interval.

However, the log frequency sweeping cannot be set for R3752.

5. [SOURce:]FREQuency[<chno>]:SPAN — IEEE488.1-1987 command mode: SPANF

- Function: Span frequency setting
- Presence of command and query: Command / Query
- Command: [SOURce:]FREQuency[<chno>]:SPAN <real>
  SPANF<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the span frequency for frequency sweeping.

6. [SOURce:]FREQuency[<chno>]:STARt — IEEE488.1-1987 command mode: STARTF

- Function: Start frequency setting
- Presence of command and query: Command / Query
- Command: [SOURce:]FREQuency[<chno>]:STARt <real>
  STARTF<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the start frequency for frequency sweeping.

7. [SOURce:]FREQuency[<chno>]:STOP — IEEE488.1-1987 command mode STOPF

- Function: Stop frequency setting
- Presence of command and query: Command / Query
- Command: [SOURce:]FREQuency[<chno>]:STOP <real>
  STOPF<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the stop frequency for frequency sweeping.

8. [SOURce:]POWer[<chno>][:LEVel][:AMPLitude] — IEEE488.1-1987 command mode OUTLEV

- Function: Output level setting
- Presence of command and query: Command / Query
- Command: [SOURce:]POWer[<chno>][:LEVel][:AMPLitude]<real>
  OUTLEV<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the output level for frequency sweeping.

9. [SOURce:]POWer[<chno>]:MODE　　IEEE488.1-1987 command mode
LEVEL

- Function　　Sweeping type setting
- Presence of command and query　　Command / Query
- IEEE488.2-1987 command mode
  - Command　　[SOURce:]POWer[<chno>]:MODE <mode>
  - Parameter　　<mode>={SWEep}
  - Response type　　FIX | SWE | PSW
- IEEE488.1-1987 command mode
  - Command　　LEVEL
  - Response type　　0 | 1
- Description　　This command must be set by combining each item as shown in the table below:

  Initial setting　Linear frequency sweeping

<table>
<tr><th>Command</th><th>PSW:
MODE</th><th>FREQ:
MODE</th><th>POW:
MODE</th><th>SWE:
SPAC</th><th>Sweeping type</th><th>Corresponding
IEEE488.1-1987
command</th></tr>
<tr><td rowspan="5">Parameter</td><td rowspan="3">(NONE)</td><td rowspan="2">SWE</td><td rowspan="2">(FIX)</td><td>LIN</td><td>Linear frequency sweeping</td><td>LINFREQ</td></tr>
<tr><td>LOG</td><td>Log frequency sweeping</td><td>LOGFREQ</td></tr>
<tr><td>(CW)</td><td>SWE</td><td>(LIN)</td><td>Level sweeping</td><td>LEVEL</td></tr>
<tr><td>FREQ</td><td>(PSW)</td><td>(FIX)</td><td>(LIN)</td><td>Program sweeping
(frequency only)</td><td>USRFSWP</td></tr>
<tr><td>ALL</td><td>(PSW)</td><td>(PSW)</td><td>(LIN)</td><td>Program sweeping</td><td>USRARWP</td></tr>
</table>

Note: The value in parentheses indicates the value which is returned for a query. Do not use this value for setting.

Sweeping type
Linear frequency sweeping: Sweeps the frequency at a constant interval at a fixed level.
Log frequency sweeping: Sweeps the frequency at a log interval at a fixed level.
Level sweeping: Sweeps the output level at a fixed frequency.
Program sweeping (frequency only): Arbitrarily sets the frequency only for each interval.
Program sweeping: Arbitrarily sets the frequency, the output level, the resolution bandwidth, the input attenuator and the settling time for each interval.
However, the log frequency sweeping cannot be set for R3752.

10. [SOURce:]POWer[<chno>]:STARt IEEE488.1-1987 command mode STLEVEL

- Function: Start level setting
- Presence of command and query: Command / Query
- Command: [SOURce:]POWer[<chno>]:STARt <real>
  STLEVEL<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the start level for level sweeping.

11. [SOURce:]POWer[<chno>]:STOP IEEE488.1-1987 command mode SPLEVEL

- Function: Stop level setting
- Presence of command and query: Command / Query
- Command: [SOURce:]POWer[<chno>]:STOP <real>
  SPLEVEL<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: Sets the stop level for level sweeping.

12. [SOURce:]PSWeep[<chno>]:BANDwidth[<n>] IEEE488.1-1987 command mode
USEG
URBW

- Function: Inputting of segment bandwidth for program sweeping
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]PSWeep[<chno>]:BANDwidth[<n>] <int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command: USEG<int>
    URBW<int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- Description: Sets the segment bandwidth for the program sweeping.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
USEG	<n>	Specifies the segment number
URBW	<int>	Sets the bandwidth

- Note: The bandwidth setting is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

13. [SOURce:]PSWeep[<chno>]:CLEar[<n>]

- Function: Clearing of specified segment for program sweeping
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  - Command: [SOURce:]PSWeep[<chno>]:CLEar[<n>]
- Description: Clears the setting condition of the nth segment for program sweeping.

14. [SOURce:]PSWeep[<chno>]:CLEar[<n>]:ALL   IEEE488.1-1987 command mode
USEGCL

- Function: Clearing of all segments for program sweeping
- Presence of command and query: Command
- Command: [SOURce:]PSWeep[<chno>]:CLEar[<n>]:ALL
  USEGCL
- Description: Clears the setting condition of all the segments for program sweeping.

15. [SOURce:]PSWeep[<chno>]:FREQuency[<n>] — IEEE488.1-1987 command mode: USEG, UFREQ, U{START | STOP}

- Function — Inputting of segment frequency for program sweeping
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SOURce:]PSWeep[<chno>]:FREQuency[<n>] <start>[,<stop>]
  - Parameter — <start>, <stop>
  - Response type — <start>,<stop>; <start>=<stop>=NR3 (real value)
- IEEE488.1-1987 command mode
  - Command — USEG<int>; UFREQ<real>; U{START | STOP}<real>
  - Response type — NR1 (USEG command); NR3 (UFREQ | USTART | USTOP command)
- Description — Sets the segment frequency for program sweeping.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
USEG	<n>	Specifies the segment number
UFREQ	*1	Sets the fixed frequency
USTART	<start>	Sets the start frequency
USTOP	<stop>	Sets the stop frequency

*1: Corresponds to <start> when <stop> is omitted. If <stop> is omitted, <stop> = <start> and the segment point number (PSWeep[<chno>]:POINts[<n>]) will automatically be set to 1.

16. [SOURce:]PSWeep[<chno>]:INPut[<input>]:ATTenuation[<n>] IEEE488.1-1987 command mode
USEG
UATTI{R | A | B}

NOTE: When the R3754 series is used, see the section 7.13.1.

- Function — Inputting of segment input attenuator for program sweeping
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SOURce:]PSWeep[<chno>]:INPut[<input>]:ATTenuation[<n>] <int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — USEG<int>
    UATTI{R | A | B}<int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- Description — Sets the segment input attenuator for program sweeping.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
USEG	<n>	Specifies the segment number
UATTIR	<input>=1, <int>	Sets the attenuator for R input
UATTIA	<input>=2, <int>	Sets the attenuator for A input
UATTIB	<input>=3, <int>	Sets the attenuator for B input

- Note — The setting value for the input attenuator is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is set to ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

17. [SOURce:]PSWeep[<chno>]:MODE   IEEE488.1-1987 command mode
USR{FSWP | ASWP}

- Function: Sweeping type setting
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]PSWeep[<chno>]:MODE <mode>
  - Parameter: <mode>={FREQuency | ALL}
  - Response type: NONE | FREQ | ALL
- IEEE488.1-1987 command mode
  - Command: USR{FSWP | ASWP}
  - Response type: 0 | 1
- Description: This command must be set by combining each item as shown in the table below:

  Initial setting   Linear frequency sweeping

  If PSW:MODE is set to FREQ or ALL, the segments already input are searched. And then, the segments are internally rearranged in the ascending order of the frequency and are executed.

  In this case, if the STOP frequency of a segment is larger than the START frequency of the following segment after the rearrangement, an error occurs.

Command	PSW: MODE	FREQ: MODE	POW: MODE	SWE: SPAC	Sweeping type	Corresponding IEEE488.1-1987 command
Parameter	(NONE)	SWE	(FIX)	LIN	Linear frequency sweeping	LINFREQ
				LOG	Log frequency sweeping	LOGFREQ
		(CW)	SWE	(LIN)	Level sweeping	LEVEL
	FREQ	(PSW)	(FIX)	(LIN)	Program sweeping (frequency only)	USRFSWP
	ALL	(PSW)	(PSW)	(LIN)	Program sweeping	USRASWP

Note: The value in parentheses indicates the value which is returned by a query. Do not use this value for setting.

Sweeping type

- Linear frequency sweeping: Sweeps the frequency at a constant interval at a fixed level.
- Log frequency sweeping: Sweeps the frequency at a log interval at a fixed level.
- Level sweeping: Sweeps the output level at a fixed frequency.
- Program sweeping (frequency only): Arbitrarily sets the frequency only for each interval.
- Program sweeping: Arbitrarily sets the frequency, the output level, the resolution bandwidth, the input attenuator and the settling time for each interval.

However, the log frequency sweeping cannot be set for R3752.

18. [SOURce:]PSWeep[<chno>]:POINts[<n>] — IEEE488.1-1987 command mode: USEG, UPOINT

- Function — Inputting of number of segment points for program sweeping
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SOURce:]PSWeep[<chno>]:POINts[<n>] <int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — USEG<int>
    UPOINT<int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- Description — Sets the number of segment points for program sweeping.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
USEG	<n>	Specifies the segment number
UPOINT	<int>	Sets the number of points

19. [SOURce:]PSWeep[<chno>]:POWer[<n>] IEEE488.1-1987 command mode
USEG
ULEVEL

- Function: Inputting of segment output level for program sweeping
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]PSWeep[<chno>]:POWer[<n>] <real>
  - Parameter: <real>
  - Response type: NR3 (real value)
- IEEE488.1-1987 command mode
  - Command: USEG<int>
    ULEVEL<real>
  - Parameter: <int>
    <real>
  - Response type: NR1 (USEG command)
    NR3 (ULEVEL command)
- Description: Sets the segment output level for program sweeping.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
USEG	<n>	Specifies the segment number
ULEVEL	<real>	Sets the output level

- Note: The setting value for the output level is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is set to ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

20. [SOURce:]PSWeep[<chno>]:SETTling[<n>] — IEEE488.1-1987 command mode: USEG, USETLT

- Function: Inputting of segment settling time for program sweeping
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]PSWeep[<chno>]:SETTling[<n>] <real>
  - Parameter: <real>
  - Response type: NR3 (real value)
- IEEE488.1-1987 command mode
  - Command: USEG<int>
    USETLT<real>
  - Parameter: <int>
    <real>
  - Response type: NR1 (USEG command)
    NR3 (USETLT command)
- Description: Sets the segment settling time for program sweeping.

IEEE488.1-1987 Command	IEEE488.2-1987 Command Parameter	Operation
USEG	<n>	Specifies the segment number
USETLT	<real>	Sets the settling time

- Note: The setting value for the settling time is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is set to ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

21. [SOURce:]SWEep[<chno>]:POINts IEEE488.1-1987 command mode
POIN
M{1201 | 601 | 301 | 201 | 101 | 51 | 21 | 11 | 6 | 3}P

- Function: Setting of numbers of points for sweeping
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]SWEep[<chno>]:POINts <int>
  - Parameter: <int>
  - Response type: NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command: POIN<int>
    M{1201 | 601 | 301 | 201 | 101 | 51 | 21 | 11 | 6 | 3}P
  - Parameter: <int>
  - Query: POIN?
    M{1201 | 601 | 301 | 201 | 101 | 51 | 21 | 11 | 6 | 3}P?
  - Response type: NR1 (POIN? command)
    0 | 1 (M{1201 | 601 | 301 | 201 | 101 | 51 | 21 | 11 | 6 | 3}P? command)
- Description: Sets the numbers of the points for sweeping.

  The numbers of the points to be set are:
  3,6,11,21,51,101,201,301,401,601,801,1201

22. [SOURce:]SWEep[<chno>]:SPACing — IEEE488.1-1987 command mode: LINFREQ, LOGFREQ

- Function: Sweeping type specification
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]SWEep[<chno>]:SPACing <mode>
  - Parameter: <mode>={LINear | LOGarithmic}
  - Response type: LIN | LOG
- IEEE488.1-1987 command mode
  - Command: LINFREQ
LOGFREQ
- Response type: 0 | 1
- Description: This command must be set by combining each item as shown in the table below:

  Initial setting: Linear frequency sweeping

<table>
<tr><th>Command</th><th>PSW: MODE</th><th>FREQ: MODE</th><th>POW: MODE</th><th>SWE: SPAC</th><th>Sweeping type</th><th>Corresponding IEEE488.1-1987 command</th></tr>
<tr><td rowspan="5">Parameter</td><td rowspan="3">(NONE)</td><td rowspan="2">SWE</td><td rowspan="2">(FIX)</td><td>LIN</td><td>Linear frequency sweeping</td><td>LINFREQ</td></tr>
<tr><td>LOG</td><td>Log frequency sweeping</td><td>LOGFREQ</td></tr>
<tr><td>(CW)</td><td>SWE</td><td>(LIN)</td><td>Level sweeping</td><td>LEVEL</td></tr>
<tr><td>FREQ</td><td>(PSW)</td><td>(FIX)</td><td>(LIN)</td><td>Program sweeping (frequency only)</td><td>USRFSWP</td></tr>
<tr><td>ALL</td><td>(PSW)</td><td>(PSW)</td><td>(LIN)</td><td>Program sweeping</td><td>USRASWP</td></tr>
</table>

Note: The value in parentheses indicates the value which is returned by a query. Do not use this value for setting.

Sweeping type
- Linear frequency sweeping: Sweeps the frequency at a constant interval at a fixed level.
- Log frequency sweeping: Sweeps the frequency at a log interval at a fixed level.
- Level sweeping: Sweeps the output level at a fixed frequency.
- Program sweeping (frequency only): Arbitrarily sets the frequency only for each interval.
- Program sweeping: Arbitrarily sets the frequency, the output level, the resolution bandwidth, the input attenuator and the settling time for each interval.

However, the log frequency sweeping cannot be set for R3752.

23. [SOURce:]SWEep[<chno>]:TIME — IEEE488.1-1987 command mode STIME

- Function — Sweeping time setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SOURce:]SWEep[<chno>]:TIME <real>
    STIME<real>
  - Parameter — <real>
  - Response type — NR3 (real value)
- Description — Sets the sweeping time. Setting of "0" indicates AUTO.

24. [SOURce:]SWEep[<chno>]:TIME:AUTO — IEEE488.1-1987 command mode STIMEAUTO

- Function — Automatic setting of sweeping time
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — [SOURce:]SWEep[<chno>]:TIME:AUTO <bool>
    STIMEAUTO
  - Parameter — <bool>
  - Response type — 0 | 1
- Description — Automatically sets the sweeping time to the minimum value which has been determined by the resolution bandwidth.
  If the sweeping time is set in the AUTO mode, the mode will be canceled.

7.13.1 SOURce Subsystem (Only Available for the R3754 Series)

1. [SOURce:]PSWeep[<chno>]:INPut[<input>]:ATTenuation[<n>] IEEE488.1-1987 command mode
USEG
UATTI{R | A | B}

- Function: Inputting of segment input attenuator for program sweeping
- Presence of command and query: Command / Query
- Command: [SOURce:]PSWeep[<chno>]:INPut[<input>]
  :ATTenuation[<n>]<int[DB]>
  USEG<n>
  UATTI{R | A | B}<int[DB]>

  <n>= segment number (0 to 29)
  <input>= {1 | 2 | 3}(1:Rch, 2:Ach, 3:Bch)
- Parameter: <int[DB]>
- Response type: NR1 (integer value)
- Description: Selects 0 dB or 25 dB as the segment input attenuator value for program sweeping.
- Note: The setting value for the input attenuator is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is set to ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

  The following combinations are possible between the input attenuator and preamplifier (see Item 3) values:

		Attenuator		
		AUTO(Note 2)	0dB	25dB
Preamplifier	0dB	○	○	○
	16dB	×(Note 1)	○	×(Note 1)

Note 1:In this combination, the value which was set earlier has priority over a new value between the attenuator and the preamplifier, and the lower priority value is forcibly set to 0 dB.

Note 2:To make the attenuator AUTO function operational, the following conditions must be met: an RBW setting lower than 15 kHz and a measurement frequency of 100 kHz or higher. If the RBW is 15 kHz or the measurement frequency is lower than 100 kHz, the attenuator setting is fixed internally to 25 dB.

2. [SOURce:]PSWeep[<chno>]:INPut[<input>]:ATTenuation[<n>]:AUTO

IEEE488.1-1987 command mode
USEG
UATTI{R | A | B}AUTO

- Function: Segment input attenuator automatic switching function setting
- Presence of command and query: Command / Query
- Command: [SOURce:]PSWeep[<chno>]:INPut[<input>]
  :ATTenuation[<n>]:AUTO<bool>

  USEG<n>
  UATTI{R | A | B}AUTO

  <n>= segment number (0 to 29)
  <input>= {1 | 2 | 3}(1:Rch, 2:Ach, 3:Bch)
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects the automatic setting for the segment input attenuator for program sweeping.
- Note: The automatic setting for the input attenuator is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is set to ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

  The following combinations are possible between the input attenuator and preamplifier (see Item 3) values:

		Attenuator		
		AUTO(Note 2)	0dB	25dB
Preamplifier	0dB	○	○	○
	16dB	×(Note 1)	○	×(Note 1)

Note 1: In this combination, the value which was set earlier has priority over a new value between the attenuator and the preamplifier, and the lower priority value is forcibly set to 0 dB.

Note 2: To make the attenuator AUTO function operational, the following conditions must be met: an RBW setting lower than 15 kHz and a measurement frequency of 100 kHz or higher. If the RBW is 15 kHz or the measurement frequency is lower than 100 kHz, the attenuator setting is fixed internally to 25 dB.

3. [SOURce:]PSWeep[<chno>]:INPut[<input>]:GAIN[<n>] IEEE488.1-1987 command mode
USEG
UATTI{R | A | B}

- Function — Setting of segment input preamplifier for program sweeping
- Presence of command and query — Command / Query
- Command — [SOURce:]PSWeep[<chno>]:INPut[<input>]:GAIN[<n>] <int[DB]>

  USEG<n>
  UAMPI{R | A | B}<int[DB]>

  <n>= segment number (0 to 29)
  <input>= {1 | 2 | 3}(1:Rch, 2:Ach, 3:Bch)
- Parameter — <int[DB]>
- Response type — NR1 (integer value)
- Description — Sets the segment input preamplifier for program sweeping
- Note — The setting value for the input preamplifier is reflected in (USRASWP) only when PSWeep[<chno>]:MODE is set to ALL. When the mode is FREQ, it is not reflected in (USRFSWP).

  The following combinations are possible between the input attenuator and preamplifier (see Item 1., 2.) values:

		Attenuator		
		AUTO(Note 2)	0dB	25dB
Preamplifier	0dB	○	○	○
	16dB	×(Note 1)	○	×(Note 1)

Note 1: In this combination, the value which was set earlier has priority over a new value between the attenuator and the preamplifier, and the lower priority value is forcibly set to 0 dB.

Note 2: To make the attenuator AUTO function operational, the following conditions must be met: an RBW setting lower than 15 kHz and a measurement frequency of 100 kHz or higher. If the RBW is 15 kHz or the measurement frequency is lower than 100 kHz, the attenuator setting is fixed internally to 25 dB.

7.13.2 SOURce Subsystem (Only Available for the R3754 Series OPT70)

NOTE: The following command can be used only when Option 70 is installed.

1. [SOURce:]FREQuency[<chno>]:LPASs — IEEE488.1-1987 command mode SETF

- Function: Automatically sets a low pass mode frequency
- Presence of command and query: Command
- Command: [SOURce:]FREQuency[<chno>]:LPASs
SETF
- Description: Sets a measurement frequency range as a prerequisite for using the low pass mode (Stop frequency = Start frequency x Number of measurement points).

7.14 STATus Subsystem

NOTE:* *When the R3754 series is used, and see the section 7.14.1.

1. STATus:OPERation:CONDition?

- Function — OPER status query (not clear)
- Presence of command and query — Query
- Query — STATus:OPERation:CONDition?
- Response type — NR1 (integer value)
- Description — STATus:OPERation:CONDition? returns the contents of the condition register in the standard operation status. When the register is read out, it is not cleared.

  For details, see "4. STATUS BYTES".

Condition Register Assignment of Standard Operation Status

bit		Description
15		Always 0
14	Program running	Set to 1 when the built-in BASIC program is being executed
13 to 4		Always 0
3	Sweeping	Set to 1 when the sweeping is being performed
2 to 1		Always 0
0	Calibrating	Set to 1 when the calibration is being performed

2. STATus:OPERation:ENABle

- Function — OPER status enable register settingtrigger source setting
- Presence of command and query — Command / Query
- Command — STATus:OPERation:ENABle <int>
- Parameter — <int>
- Response type — NR1 (integer value)
- Description — Sets the enable register of the standard operation status event register. The standard operation status event register which corresponds to the bit set to 1 in this register is reflected in the status byte register as a valid bit.

  For details, see "4. STATUS BYTES"

  For details, see STATus:OPERation[:EVENt]?,STATus:OPERation:CONDition?
- Example — If the program running bit (bit 14) and the sweeping bit (bit 13) are to be set to "enable", calculate:

  $2^{14}+2^{3}=16384+8=16392$

  then set STATus:OPERation:ENABle to 16392.

3. STATus:OPERation[:EVENt]?

- Function — OPER status query (with clear)
- Presence of command and query — Query
- Query — STATus:OPERation[:EVENt]?
- Response type — NR1 (integer value)
- Description — STATus:OPERation:[:EVENt]? returns the contents of event register in the standard operation status. When the register is read out, it is cleared, as is bit 7 of the corresponding status byte.

  For details, see "4. STATUS BYTES".

Standard Operation Status Event Register Assignments

bit		Description
15		Always 0
14	Program running	Set to 1 when the built-in BASIC program stops
13 to 9		Always 0
8	Averaging	Set to 1 when the averaging ends
7 to 4		Always 0
3	Sweeping	Set to 1 when the sweeping ends
2 to 1		Always 0
0	Calibrating	Set to 1 when the calibration ends

7.14.1 STATus Subsystem (Only Available for the R3754 Series)

1. STATus:DEVice:CONDition?

- Function: DEV status referring
- Presence of command and query: Query
- Query: STATus:DEVice:CONDition?
- Response type: NR1 (integer value)
- Description: Returns the contents of condition register of the device status register. This register is not cleared even though it is read out.
  For details, see "4. STATUS BYTES."

Condition register assignments

bit		Description
0	Cooling Fan Stopped	Sets to 1 when the cooling fan is stopped.
1	Overtemperature Detected	This is set to 1 when the internal temperature is outside of the specified temperature range.
Others		Always 0

2. STATus:DEVice:ENABle

- Function: DEV status referring
- Presence of command and query: Command/Query
- Command: STATus:DEVice:ENABle <int>
- Parameter: <int>
- Response type: NR1 (integer value)
- Description: Sets the contents of enable register of the device status register. The event register corresponding to the bit set to 1 in this register is reflected in 2 in the status byte register as a valid bit.
  For details, see "4. STATUS BYTES."
- Example: If the the Cooling Fan Stopped (bit 1) is to be set to 'enable', set STAT:DEV:ENAB 1.

3. STATus:DEVice[:EVENt]?

- Function: DEV status query (with clear)
- Presence of command and query: Query
- Query: STATus:DEVice:EVENt]?
- Response type: NR1 (integer value)
- Description: Returns the contents of event register of the device status register. When this register is read out, it's cleared and also bit 2 of the corresponding status byte register is cleared.
  For details, see "4. STATUS BYTES."

Event register assignments

bit		Description
0	Cooling Fan Stopped	Sets to 1 when the cooling fan stops.
1	Overtemperature Detected	This is set to 1 when the internal temperature is outside of the specified temperature range.
Others		Always 0

4. STATus:FREQuency:CONDition?

- Function: FREQ status referring
- Presence of command and query: Query
- Query: STATus:FREQuency:CONDition?
- Response type: NR1 (integer value)
- Description: Returns the contents of condition register of the frequency status register. Even though this register is read out, it's not cleared.
  For details, see "4. STATUS BYTES."

Condition register assignments

bit		Description
0	Local 1 Unlocked	Sets to 1 when local 1 is unlocked.
1	Local 2 Unlocked	Sets to 1 when local 2 is unlocked.
2	Synthe Unlocked	Sets to 1 when synthesizer is unlocked.
3	External Standard In	Sets to 1 when external standard frequency is input.
4	VCXO Unlocked	Sets to 1 when VCXO is unlocked.
Others		Always 0

5. STATus:FREQuency:ENABle?

- Function: FREQ status enable register setting
- Presence of command and query: Command/Query
- Command: STATus:FREQuency:ENABle <int>
- Parameter: <int>
- Response type: NR1 (integer value)
- Description: Sets the contents of enable register of the frequency status register. The event register corresponding to the bit set to 1 in this register is reflected in the bit 5 in the questionable status register as a valid bit.

  For details, see "4. STATUS BYTES."
- Example: If the the External Standard In (bit 3) is to be set to 'enable', calculate 2^3=8 and set STAT:FREQ:ENAB 8.

6. STATus:FREQuency[:EVENt]?

- Function — FREQ status reading
- Presence of command and query — Query
- Query — STATus:FREQuency[:EVENt]?
- Response type — NR1 (integer value)
- Description — Returns the contents of event register of the frequency status register. When this register is read out, it's cleared, as is bit 5 of the corresponding questionable status register.

  For details, see "4. STATUS BYTES."

Event register assignments

bit		Description
0	Local 1 Unlocked	Sets to 1 when local 1 is unlocked.
1	Local 2 Unlocked	Sets to 1 when local 2 is unlocked.
2	Synthe Unlocked	Sets to 1 when synthesizer is unlocked.
3	External Standard In	Sets to 1 when external standard frequency is input.
4	VCXO Unlocked	Sets to 1 when VCXO is unlocked.
Others		Always 0

7. STATus:LIMit:CONDition?

- Function — LIM status referring
- Presence of command and query — Query
- Query — STATus:LIMit:CONDition?
- Response type — NR1 (integer value)
- Description — Returns the contents of condition register of the limit status register. Even if this register is read out, it's not cleared.
  For details, see "4. STATUS BYTES."

Condition register assignments

bit		Description
0	CH1 1st Limit Failed	Sets to 1 when the first waveform of channel 1 is FAIL.
1	CH1 2nd Limit Failed	Sets to 1 when the second waveform of channel 1 is FAIL.
2	CH2 1st Limit Failed	Sets to 1 when the first waveform of channel 2 is FAIL.
3	CH2 2nd Limit Failed	Sets to 1 when the second waveform of channel 2 is FAIL.
Others		Always 0

8. STATus:LIMit:ENABle

• Function	LIM status enable register setting
• Presence of command and query	Command/Query
• Command	STATus:LIMit:ENABle <int>
• Parameter	<int>
• Response type	NR1 (integer value)
• Description	Sets the contents of enable register of the limit status register. The event register corresponding to the bit set to 1 in this register is reflected in the bit 9 in the questionable status register as a valid bit. For details, see "4. STATUS BYTES."
• Example	If the CH1 1st Limit Failed (bit 0) and the CH2 1st Limit Failed (bit 4) are to be set to 'enable', calculate $2^0 + 2^2 = 5$ and set STAT:LIN:ENAB 5.

9. STATus:LIMit[:EVENt]?

- Function: LIM status reading
- Presence of command and query: Query
- Query: STATus:LIMit[:EVENt]?
- Response type: NR1 (integer value)
- Description: Returns the contents of event register of the limit status register. When this register is read out, it's cleared, as is bit 9 of the corresponding questionable status register.
  For details, see "4. STATUS BYTES."

Event register assignments

bit		Description
0	CH1 1st Limit Failed	Sets to 1 when the first waveform of channel 1 is FAIL.
1	CH1 2nd Limit Failed	Sets to 1 when the second waveform of channel 1 is FAIL.
2	CH2 1st Limit Failed	Sets to 1 when the first waveform of channel 2 is FAIL.
3	CH2 2nd Limit Failed	Sets to 1 when the second waveform of channel 2 is FAIL.
Others		Always 0

10. STATus:POWer:CONDition?

- Function: POW status referring
- Presence of command and query: Query
- Query: STATus:POWer:CONDition?
- Response type: NR1 (integer value)
- Description: Returns the contents of condition register of the power status register. This register is not cleared even if it is read out.
  For details, see "4. STATUS BYTES."

Condition register assignments

bit		Description
0	Input-R Overloaded	Sets to 1 when the input-R is overloaded.
1	Input-R Tripped	Sets to 1 when the protection circuit of the input-R is in operation.
2	Input-A Overloaded	Sets to 1 when the input-A is overloaded.
3	Input-A Tripped	Sets to 1 when the protection circuit of the input-A is in operation.
4	Input-B Overloaded	Sets to 1 when the input-B is overloaded.
5	Input-B Tripped	Sets to 1 when the protection circuit of the input-B is in operation.
Others		Always 0

11. STATus:POWer:ENABle

• Function	POW status enable register setting
• Presence of command and query	Command/Query
• Command	STATus:OPERation:ENABle <int>
• Parameter	<int>
• Response type	NR1 (integer value)
• Description	Sets the contents of enable register of the power status register. The event register corresponding to the bit set to 1 in this register is reflected in the bit 3 in the questionable status register as a valid bit. For details, see "4. STATUS BYTES."
• Example	If the Input-A Overloaded (bit 2) is to be set to 'enable', calculate $2^2 = 4$ and set STAT:POW:ENAB 4.

12. STATus:POWer[:EVENt]?

- Function: POW status reading
- Presence of command and query: Query
- Query: STATus:POWer[:EVENt]?
- Response type: NR1 (integer value)
- Description: Returns the contents of event register of the power status register. When this register is read out, it's cleared, as is bit 3 of the corresponding questionable status register.

  For details, see "4. STATUS BYTES."

Event register assignments

bit		Description
0	Input-R Overloaded	Sets to 1 when the input-R is overloaded.
1	Input-R Tripped	Sets to 1 when the protection circuit of the input-R is in operation.
2	Input-A Overloaded	Sets to 1 when the input-A is overloaded.
3	Input-A Tripped	Sets to 1 when the protection circuit of the input-A is in operation.
4	Input-B Overloaded	Sets to 1 when the input-B is overloaded.
5	Input-B Tripped	Sets to 1 when the protection circuit of the input-B is in operation.
Others		Always 0

13. STATus:QUEStionable:ENABle

- Function — QUES status enable register setting
- Presence of command and query — Command/Query
- Command — STATus:QUEStionable:ENABle <int>
- Parameter — <int>
- Response type — NR1 (integer value)
- Description — Sets the contents of enable register of the questionable status register. The event register corresponding to the bit set to 1 in this register is reflected in the bit 3 in the status byte register as a valid bit.

  For details, see "4. STATUS BYTES."
- Example — If the POW (bit 3) and LIM (bit 9) summary bits are to be set to 'enable', calculate $2^3 + 2^9 = 520$ and set STAT:QUES:ENAB 520.

14. STATus:QUEStionable[:EVENt]?

- Function: QUES status reading
- Presence of command and query: Query
- Query: STATus:QUEStionable[:EVENt]?
- Response type: NR1 (integer value)
- Description: Returns the contents of event register of the questionable status register. When this register is read out, it's cleared, as is the corresponding status byte register.

  For details, see "4. STATUS BYTES."

Event register assignments

bit		Description
3	POW Summary Bit	Sets to 1 when the summary of power status register is 1.
5	FREQ Summary Bit	Sets to 1 when the summary of frequency status register is 1.
9	LIM Summary Bit	Sets to 1 when the summary of limit status register is 1.
Others		Always 0

7.15 SYSTem Subsystem

1. SYSTem:DATE	IEEE488.1-1987 command mode YEAR MONTH DAY

- Function — Date setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — SYSTem:DATE <year>,<month>,<day>
  - Parameter — <year>=Numeric data is 1900 to 2099
    <month>=Numeric data is 1 to 12
    <day>=Numeric data is 1 to 31
  - Response type — <year>,<month>,<day>
    <year>=<month>=<day>=NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — YEAR<int>
    MONTH<int>
    DAY<int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- Description — Sets the date on the timer built into the analyzer.
  Use the Christian calendar (four digits) to set the year (examples: 1990, 1993)

2. SYSTem:ERRor?

- Function: Query of error
- Presence of command and query: Query
- Query: SYSTem:ERRor?
- Response type: <errno>,<errmsg>

  <errno>=NR1 (integer value)

  <errmsg>=error messege
- Description: The system can store information on up to 10 errors in the error queue. If more than nine errors occur, the indication of 10th error will be replaced with:

  -350, "Queue overflow"

  The 10th and subsequent errors cannot be maintained. SYSTem:ERRor? removes the error information from the queue.

  Since the queue stores errors using the FIFO (First-In First-Out) method, the command removes error information in the order of occurrence of errors.

  When error information is removed from the queue, the information is deleted from the queue, and the queue is ready for the next error information.

  If there is no error, the system responds with:

  0, "No error"

  The *CLS command clears the error queue.

3. SYSTem:PRESet — IEEE488.1-1987 command mode: IP

- Function — System initialization
- Presence of command and query — Command
- Command — SYSTem:PRESet
  IP
- Description — The SYSTem:PRESet (IP) command initializes the setting of the analyzer and resets the trigger system.

  The initial values set using this command are different from those set using the *RST command.For actual setting values, see "A.4 Initial Settings".

  The items this command performs are the same as those performed using the PRESET key on the front panel.

4.

SYSTem:TIME	IEEE488.1-1987 command mode HOUR MINUTE RTC30ADJ

- Function — Time setting
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode

Command	SYSTem:TIME <hour>,<minute>,<second>
Parameter	<hour>=Numeric data is 0 to 23
	<minute>=Numeric data is 0 to 59
	<second>=Numeric data is 0 to 59
Response type	<hour>,<minute>,<second>
	<hour>=<minute>=<second>=NR1 (integer value)

- IEEE488.1-1987 command mode

Command	HOUR<int>
	MINUTE<int>
	RTC30ADJ
Parameter	<int>
Response type	NR1 (integer value)
	There is no query for the RTC30ADJ command.

- Description — Sets the time on the timer built into the analyzer. A 24-hour clock is used. The RTC30ADJ command of IEEE488.1-1987 command mode always sets the second to "0".

7.16 TRACe Subsystem

1. TRACe[<chno>]:COPY — IEEE488.1-1987 command mode: DTOM

- Function: Trace copying
- Presence of command and query: Command
- Command: TRACe[<chno>]:COPY <name>
  DTOM
- Parameter: <name>=DATA
- Description: The command copies the data waveform onto the memory waveform.

2. TRACe[<chno>][:DATA]? — IEEE488.1-1987 command mode:
   OT{1 | 2}{DRAT | CORED | MRAT | NORED | DFOR | MFOR}
   OT{1 | 2} {CORNR | CORED | CORSO | CORTR}

- Function: Query of trace (output)
- Presence of command and query: Query
- Command: TRACe[<chno>][:DATA]? {<name> | <trace>}
  [,{<name> | <trace>}...]
  OT{1 | 2}{DRAT | CORED | MRAT | NORED | DFOR | MFOR | CORNR | CORED | CORSO | CORTR}
- Parameter: <name>={NORM | EDIR | ESM | ERTR | EDF | ESF | ERF | ELF | ETF | EXF | EDR | ESR | ERR | ELR | ETR | EXR}
  <trace>=Analysis channel
- Description: Outputs the specified trace data.Multiple <names> or <trace> can be specified by separating them with a comma. In such cases, the data per trace are output in the specified order. (After the data corresponding to one trace are output, outputting of the data of next trace is begun.)
  For details, refer to Table 7-1.

3.	TRACe[<chno>][:DATA]	IEEE488.1-1987 command mode IN{1 | 2}{CORNR | CORDI | CORSO | CORTR}

- Function: Trace inputting
- Presence of command and query: Command
- Command: TRACe[<chno>][:DATA]{<name> | <trace>},
  {<block> | <real>[,<real>...]}
  IN{1 | 2}{CORNR | CORDI | CORSO | CORTR}
  {<block> | <real>[,<real>...]}
- Parameter: <name>={NORM | EDIR | ESM | ERTR | EDF | ESF | ERF |
  ELF | ETF | EXF | EDR | ESR | ERR | ELR | ETR | EXR}
  <trace>=Analysis channel
  {<name> | <trace>},{<block> | <real>[,<real>...]}
- Description: Inputs the data into the specified trace.
  Unlike trace outputting, multiple <name> or <trace> cannot be specified.
  For details, refer to Table 7-1.

Table 7-1 Trace input/output command parameters

<table>
<tr><th rowspan="2">IEEE488.1-1987
Command</th><th colspan="2">IEEE488.2-1987
Command Patameter</th><th rowspan="2">Object traces</th><th rowspan="2">Data format *2</th></tr>
<tr><th><name>*1</th><th><trace></th></tr>
<tr><td>OT{1 | 2}DRAT</td><td>RAW</td><td>{131 | 195}</td><td>Raw data array</td><td>Complex number</td></tr>
<tr><td>OT{1 | 2}CORED</td><td>DATA</td><td>{129 | 193}</td><td>Data array</td><td>Complex number</td></tr>
<tr><td>OT{1 | 2}MRAT</td><td>MEMory</td><td>{130 | 194}</td><td>Memory array</td><td>Complex number</td></tr>
<tr><td>OT{1 | 2}NORED</td><td>UDATa</td><td>{128 | 192}</td><td>Data array before formatting</td><td>Complex number</td></tr>
<tr><td>OT{1 | 2}DFOR</td><td>FDATa1</td><td>{0 | 1}</td><td>Data array after formatting 1</td><td>First waveform</td></tr>
<tr><td></td><td>FDATa2</td><td>{8 | 9}</td><td>Data array after formatting 2</td><td>Second waveform</td></tr>
<tr><td>OT{1 | 2}MFOR</td><td>FMEMory1</td><td>{2 | 3}</td><td>Memory array after formatting 1</td><td>First waveform</td></tr>
<tr><td></td><td>FMEMory2</td><td>{10 | 11}</td><td>Memory array after formatting 2</td><td>Second waveform</td></tr>
<tr><td>{OT | IN}{1 | 2}CORNR</td><td>NORMalize</td><td>{133 | 197}</td><td>Normalized reference data array</td><td>Complex number</td></tr>
<tr><td>{OT | IN}{1 | 2}CORDI</td><td>EDIRectivity</td><td>{134 | 198}</td><td>Direction error coefficient array</td><td>Complex number</td></tr>
<tr><td>{OT | IN}{1 | 2}CORSO</td><td>ESMatch</td><td>{135 | 199}</td><td>Source match error coefficient array</td><td>Complex number</td></tr>
<tr><td>{OT | IN}{1 | 2}CORTR</td><td>ERTRacking</td><td>{136 | 200}</td><td>Reflection tracking error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>EDForward</td><td>{137 | 201}</td><td>Forward direction: Direction error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ESForward</td><td>{138 | 202}</td><td>Forward direction: Source match error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ERForward</td><td>{139 | 203}</td><td>Forward direction: Reflection tracking error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ELForward</td><td>{140 | 204}</td><td>Forward direction: load match error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ETForward</td><td>{141 | 205}</td><td>Forward direction: Transfer tracking error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>EXForward</td><td>{142 | 206}</td><td>Forward direction: Isolation error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>EDReverse</td><td>{143 | 207}</td><td>Reverse direction: Direction error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ESReverse</td><td>{144 | 208}</td><td>Reverse direction: Source match error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ERReverse</td><td>{145 | 209}</td><td>Reverse direction: Reflection tracking error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ELReverse</td><td>{146 | 210}</td><td>Reverse direction: load match error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>ETReverse</td><td>{147 | 211}</td><td>Reverse direction: Transfer tracking error coefficient array</td><td>Complex number</td></tr>
<tr><td></td><td>EXReverse</td><td>{148 | 212}</td><td>Reverse direction: Isolation error coefficient array</td><td>Complex number</td></tr>
</table>

*1: If <name> is specified using IEEE488.2-1987 command, the channel should be specified using the parameter <chno>.

*2: The data type depends on the trace type (see below).

Complex number: Complex numbers are output in the order real, image, real, image, and so on. Therefore, the total number of data output is doubled.

First waveform: When the format is set to LOGMAG&PHASE or LOGMAG&DELAY, the first waveform is LOGMAG; when the format is set to LINMAG&PHASE, the first waveform is LINMAG; and when the format is set to SMITH or POLAR, the first waveform is real.

In other cases, the waveform depends on the data type for each format.

Second waveform: When the format is set to LOGMAG&PHASE or LINMAG&PHASE, the waveform is PHASE; when the format is set to LOGMAG&DELAY, the waveform is DELAY; and when the format is set to SMITH or POLAR, the waveform is image.

In other cases, the data are invalid.

7.17 TRIGger Subsystem

1. | TRIGger[:SEQuence]:DELay | IEEE488.1-1987 command mode SETLTIME |
|---|---|

- Function: Trigger delay setting
- Presence of command and query: Command / Query
- Command: TRIGger[:SEQuence]:DELay <real>
  SETLTIME<real>
- Parameter: <real>
- Response type: NR3 (real value)
- Description: This command sets the delay time between the detection of the trigger and the start of measurement.

  The delay time is available only when TRIGger[:SEQuence]:DELay:STATe is set to ON.

  See "TRIGger[:SEQuence]:DELay:STATe".
- Note: If 0 is set, TRIG:DEL:STAT is automatically set to OFF.
  If the value other than 0 is set, TRIG:DEL:STAT is automatically set to ON.

2. | TRIGger[:SEQuence]:DELay:STATe | IEEE488.1-1987 command mode SETLVARI |
|---|---|

- Function: ON/OFF of trigger delay
- Presence of command and query: Command / Query
- Command: TRIGger[:SEQuence]:DELay:STATe <bool>
  SETLVARI<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: This command enables/disables the trigger delay times set by the TRIGger[:SEQuence]:DELay (SETLTIME) command. Setting this command to OFF is identical to
  TRIGger[:SEQuence]:DELay 0 (SETLTIME 0).
- Note: If OFF is set, TRIG:DEL is automatically set to 0.

3. TRIGger[:SEQuence][:IMMediate]

- Function — Event detection path (not delay)
- Presence of command and query — Command
- Command — TRIGger[:SEQuence][:IMMediate]
- Description — This command bypasses the trigger waiting state. If the trigger system is in the trigger waiting state, the command starts the measurement immediately.

  In this case, the delay time set by the

  TRIGger[:SEQuence]:DELay (SETLTIME) command becomes invalid.

  For details, see "5. TRIGGER SYSTEM".

4. TRIGger[:SEQuence]:SIGNal

- Function — Event detection path (with delay)
- Presence of command and query — Command
- Command — TRIGger[:SEQuence]:SIGNal
- Description — This command bypasses the event detection of the trigger waiting state. If the trigger system is in the trigger waiting state, the command starts the measurement after the delay time set by TRIGger[:SEQuence]:DELay (SETLTIME) has elapsed.

  For details, see "5. TRIGGER SYSTEM".

5. TRIGger[:SEQuence]:SOURce — IEEE488.1-1987 command mode: FREE, EXTERN

- Function: Trigger source setting
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: TRIGger[:SEQuence]:SOURce <source>
  - Parameter: <source>={IMMediate | EXTernal | BUS | HOLD}
  - Response type: IMM | EXT | BUS | HOLD
- IEEE488.1-1987 command mode
  - Command: FREE
    EXTERN
  - Response type: 0 | 1
- Description: This command selects the trigger source. The event detection ends when all of the conditions below are satisfied.

  IMMediate: Has no event. This condition immediately ends the event detection of the trigger waiting state.

  EXTernal: Waits for the external signal.

  BUS: Waits for the *TRG interface message or the GET interface message.

  HOLD: Does not end the event detection of the trigger waiting state.

  If the analyzer receives TRIGger[:IMMediate] or TRIGger:SIGNal in the trigger waiting state, it starts the measurement regardless of the trigger source setting.

  For details, see "5. TRIGGER SYSTEM".

  FREE and EXTERN of IEEE488.1-1987 command mode select the same trigger sources as IMMediate and EXTernal of IEEE488.2-1987 command mode, respectively.

7.18 IEEE488.1-1987 Command

1. CONT

- Function — Sets the sweeping mode to CONT
- Presence of command and query — Command
- Command — CONT
- Description — Performs continuous sweeping and measurement.

2. MEAS

- Function — Performs measurement
- Presence of command and query — Command
- Command — MEAS
- Description — If the system is in the process of sweeping, it resets the sweeping and performs the sweeping and the measurement once.If the sweeping mode is set to CONT, it continuously performs the sweeping and the measurement.

3. SINGLE

- Function — Sets the sweeping mode to SINGLE
- Presence of command and query — Command
- Command — SINGLE
- Description — The system performs the sweeping and the measurement once.

4. SWPHLD

- Function — Holds the sweeping
- Presence of command and query — Command
- Command — SWPHLD
- Description — The system immediately stops the sweeping.

5. DL{0 | 1 | 2 | 3}

- Function: Specifies the delimiters.
- Presence of command and query: Command
- Command: DL{0 | 1 | 2 | 3}
- Description: Specifies the delimiters used with the query response in the IEEE488.1-1987 mode.

Command	Type of delimiter
DL0	Outputs 2-byte code of CR and LF. Also outputs single signal EOI immediately with LF.
DL1	Outputs 1-byte code of LF.
DL2	Outputs a single signal EOI immediately with the last data byte.
DL3	Outputs 2-byte code of CR and LF.

(Note)A termination code used with the query response in the IEEE488.1-1987 mode is changed using these commands. In the IEEE488.2-1987 command mode, EOI is always output concurrently with LF.

7.19 R3753 MARKer Subsystem

1.	MARKer[<chno>]:ACTivate[:NUMBer]	IEEE488.1-1987 command mode MKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}A

- Function — Setting of active marker
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:ACTivate[:NUMBer] <n>[,<real>]
  - Parameter: <n>=1 to 10 (marker number)
    <real>=Setting value (stimulus value)
  - Response type: NR1 (integer value): 0 to 10 (marker number)
    NR3 (real value): Setting value (stimulus value)
- IEEE488.1-1987 command mode
  - Command: MKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}A
  - Response type: NR3 (real value): Setting value (stimulus value)
    NR3 (real value): Measurement value (data A, B, C)
    NR1 (integer value): Status
- Description

  Specifies a number of the active marker. The specified marker will automatically be ON.

  In IEEE488.2-1987 command mode, the maker number and the setting value are returned by the query. If no marker is ON, 0 is set as the marker number.

  Setting value can be obtained by the FETch? query.

  In IEEE488.1-1987 command mode, setting value and measurement value are returned by the query.

  Refer to "7.20 FETCh? Subsystem" for details of data and format.

2. MARKer[<chno>]:ACTivate:STATe — IEEE488.1-1987 command mode: MKROFF

- Function: ON/OFF of marker
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:ACTivate:STATe <bool>
  MKROFF
- Parameter: <bool>
- Response type: 0 | 1
- Description: If the active marker is set to OFF and the other markers are set to ON, the marker having the smallest number is changed as an active marker.
  In IEEE488.2-1987 command mode, the marker 1 is set to ON only when the parameters are ON and the marker 1 is OFF.

3. MARKer[<chno>]:ACTivate:STIMulus — IEEE488.1-1987 command mode: MKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}A

- Function: Setting of marker stimulus value.
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:ACTivate:STIMulus <real>
  - Parameter: <real>=Stimulus value
  - Response type: NR3(real value): Stimulus value
- IEEE488.1-1987 command mode
  - Command: MKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}A <real>
  - Parameter: <real>=Stimulus value
  - Response type: NR3 (real value): Setting value (stimulus value)
    NR3 (real value): Measurement value (data A, B, C)
    NR1 (integer value): Status
- Description: Sets the stimulus value of the active marker.
  In IEEE488.2-1987 command mode, setting value is returned by the query.
  Measurement data can be obtained by the RETch? query.
  In IEEE488.1-1987 command mode, setting value and measurement value are returned by the query.

4. MARKer[<chno>]:AOFF — IEEE488.1-1987 command mode: MKRAOFF

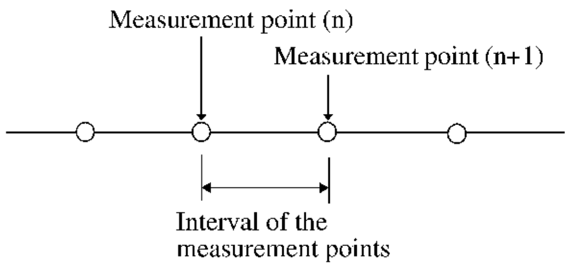
- Function: OFF of all markers
- Presence of command and query: Command
- Command: MARKer[<chno>]:AOFF
MKRAOFF
- Description: Sets all markers to OFF.

5. MARKer[<chno>]:COMPensate — IEEE488.1-1987 command mode: MKRCMP, MKRUCMP

- Function: ON/OFF of marker interpolation mode
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:COMPensate <bool>
  - Parameter: <bool>
  - Response type: 0 | 1
- IEEE488.1-1987 command mode
  - Command: MKRCMP → ON
MKRUCMP → OFF
  - Response type: 0 | 1
- Description: Marker interpolation mode is used to interpolate the data between measurement points in linear approximation.

  OFF: Marker can be set only to the measurement point. If you set the stimulus value to the point other than the measurement point, it is automatically changed to the nearest measurement point.

  ON: Marker between the measurement points can be set with interpolating.



6. MARKer[<chno>]:CONVert[:MODE] IEEE488.1-1987 command mode
ZYMK{DFLT | LIN | RI | LC}

- Function — Setting of marker conversion mode
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — MARKer[<chno>]:CONVert[:MODE] <format>
  - Parameter — <format>={DEFault | LINear | RIMaginary}
  - Response type — DEF | LIN | RIM
- IEEE488.1-1987 command mode
  - Command — ZYMK{DFLT | LIN | RI | LC}
  - Response type — 0 | 1
- Description — Sets the format of the measurement marker value irrespective of the measurement format. This command is effective when the parameter conversion of the measurement value is in execution.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Marker Format
ZYMKDFLT	DEFault	The same format as the measurement format
ZYMKLIN	LINear	Linear impedance
ZYMKRI	RIMaginary	Imaginary impedance

7. MARKer[<chno>]:COUPle — IEEE488.1-1987 command mode: MKRCOUP, MKRUCOUP

- Function — Setting of marker couple mode
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — MARKer[<chno>]:COUPle <bool>
  - Parameter — <bool>
  - Response type — 0 | 1
- IEEE488.1-1987 command mode
  - Command — MKRCOUP → ON
    MKRUCOUP → OFF
  - Response type — 0 | 1
- Description — Sets ON/OFF the marker coupling of the channel 1 and the channel 2.
  - ON: The marker set to the active channel is automatically set to another channel.
  - OFF: Marker is set to the channel 1 and the channel 2 each.

8. MARKer[<chno>]:DELTa[:MODE] — IEEE488.1-1987 command mode DMKR{C | A | F | OF}

- Function — Setting of delta marker
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — MARKer[<chno>]:DELTa[:MODE] <type>
  - Parameter — <type>={OFF | CHILd | COMPare | FIXed}
  - Response type — OFF | CHIL | COMP | FIX
- IEEE488.1-1987 command mode
  - Command — DMKRC
DMKRA
DMKRF
DMKROF
  - Response type — 0 | 1
- Description — Sets the mode of the delta marker.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Mode
DMKRC	CHIL	Sets the child marker to the point of the active marker and obtains the difference between the active marker and the child marker.
DMKRA	COMP	Obtains the difference between the active marker and the other marker.
DMKRF	FIX	Obtains the difference between the fixed marker (FIX MKR) and the active marker.
DMKROF	OFF	Sets the delta maker mode to OFF.

Note: Before setting the delta mode to COMP, specify the compare marker.
Delta stimulus cannot be set in IEEE488.1-1987 command mode.

9. MARKer[<chno>]:DELTa:COMPare IEEE488.1-1987 command mode
DMKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}O

- Function: Compare marker specification
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:DELTa:COMPare <n>[,<real>]
  - Parameter: <n>=1 to 10 (marker number)
    <real>=Stimulus value (relative value from the active marker)
  - Response type: <NR1> (integer value): 1 to 10 (marker number)
    <NR3> (real value): Stimulus value (relative value from the active marker)
- IEEE488.1-1987 command mode
  - Command: DMKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}O
  - Parameter: <real>=Stimulus value (relative value from the active marker)
  - Response type: 0 | 1
- Description: Specifies the marker to be compared when the delta marker is set to the COMPare mode. And, sets the position in the relative value from the active marker.

10.	MARKer[<chno>]:FANalysis:DIRection	IEEE488.1-1987 command mode TIN TOUT

- Function — Setting the direction for the filter analysis
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — MARKer[<chno>]:FANalysis:DIRection <type>
  - Parameter — <type>={IN | OUT}
  - Response type — IN | OUT
- IEEE488.1-1987 command mode
  - Command — TIN
TOUT
  - Response type — 0 | 1
- Description — Sets the direction for the filter analysis.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Direction
TIN	IN	Searching outward from the active marker.
TOUT	OUT	Searching toward the active marker.

11. MARKer[<chno>]:FANalysis:FORMat {ABSolute | RELative}

IEEE488.1-1987 command mode
FANAABS | FANAREL

- Function: Sets the display method of the bandwidth frequency when analyzing the filter
- Presence of command and query: Command/Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:FANalysis:FORMat <type>
  - Parameter: <type> = {ABSolute | RELative}
  - Response type: ABS|RELv
- IEEE488.1-1987 command mode
  - Command: FANAABS | FANAREL
  - Response type: 0 | 1
- Description: Sets the display method of the bandwidth frequency when analyzing the filter.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Operation
FANAABS	ABSolute	Absolute value display
FANAREL	RELative	Value display relative to the center frequency

12. MARKer[<chno>]:FANalysis:REFerence {ACTive | MAXimum | RLINe}

IEEE488.1-1987 command mode

TREFACT | TREFMAX | TREFREF

- Function — Sets the search reference used when analyzing the filter
- Presence of command and query — Command/Query
- IEEE488.2-1987 command mode
  - Command — MARKer[<chno>]:FANalysis:REFerence <type>
  - Parameter — <type> = {ACTive | MAXimum | RLINe}
  - Response type — ACT | MAX | RLIN
- IEEE488.1-1987 command mode
  - Command — TREFACT | TREFMAX | TREFREF
  - Response type — 0 | 1
- Description — Sets the search reference used when analyzing the filter.

IEEE488.1-1987 Command mode	IEEE488.2-1987 Command Parameter	Operation
TREFACT	ACTive	Active marker reference
TREFMAX	MAXimum	Minimum loss value reference
TREFREF	RLINe	Reference line reference

13. MARKer[<chno>]:FANalysis[:STATe] IEEE488.1-1987 command mode FLTANA

- Function: Turns the filter analysis ON or OFF
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:FANalysis[:STATe] <bool>
  FLTANA<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Used to set the filter analysis ON or OFF.
  The following items can be measured by the filter analysis.
  - Center frequency of the pass band specified with the analysis width (loss) from the active marker.
  - Pass bandwidth
  - The Left frequency of the pass band
  - The Right frequency of the pass band
  - Quality factor (Q factor)
  - Selectivity (shaping factor)

  Quality factor (Q factor) and selectivity (shaping factor) are obtained from the loss minimum value.

14.	MARKer[<chno>]:FANalysis:TYPE {BAND | NOTCh}	IEEE488.1-1987 command mode FANABAND | FANANOTCH

- Function — Sets the filter type used when analyzing the filter
- Presence of command and query — Command/Query
- IEEE488.2-1987 command mode
  - Command — MARKer[<chno>]:FANalysis:TYPE <type>
  - Parameter — <type> = {BAND | NOTCh}
  - Response type — BAND | NOTC
- IEEE488.1-1987 command mode
  - Command — FANABAND | FANANOTCH
  - Response type — 0 | 1
- Description — Sets the filter type used when analyzing the filter.

IEEE488.1-1987 Command mode	IEEE488.2-1987 Command Parameter	Operation
FANABAND	BAND	Band pass filter analysis
FANANOTCH	NOTCh	Notch filter analysi

15. MARKer[<chno>]:FANalysis:WIDTh

IEEE488.1-1987 command mode
T{3 | 6 | 60 | X}DB
T{3 | 6 | X}DEG

- Function: Sets the analysis band for the filter analysis
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:FANalysis:WIDTh <real>
  - Parameter: <real>=Analysis band (pass bandwidth)
  - Response type: NR3(real value):Analysis band (pass bandwidth)
- IEEE488.1-1987 command mode
  - Command:

T3DB	T3DEG
T6DB	T6DEG
T60DB	TXDEG<real>
TXDB<real>	

  - Parameter: <real>=Analysis band (pass bandwidth)
  - Response type:

NR3 (real value):	CENTER
NR3 (real value):	LEFT
NR3 (real value):	RIGHT
NR3 (real value):	BAND
NR3 (real value):	QUALITY FACTOR
NR3 (real value):	SHAPE FACTOR
NR1 (integer value):	Status

- Description: Used to set the analysis band (pass bandwidth) for the filter analysis.

  To set 3dB, 6dB or 60dB in IEEE488.1-1987 command mode, execute each of them by T3DB, T6DB, and T60DB command.

  Set a <real> value. (Only when the TXDB command is used)

  If 3deg or 6deg is set in phase, use T3DEG or T6DEG.

  Set a <real> value. (Only when the TXDEG command is used)

16. MARKer[<chno>]:FIXed:STIMulus — IEEE488.1-1987 command mode FMKRS

- Function: Sets the X axis value for the fixed marker (FIX MKR)
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:FIXed:STIMulus <real>
  FMKRS<real>
- Parameter: <real>=X axis value
- Response type: <NR3> real value:X axis value
- Description: Used to set the X axis value for the fixed marker (FIX MKR) shown in the rectangular coordinates display.
  The fixed marker (FIX MKR) is available only when the parameter conversion is set to OFF or 1/S.

17. MARKer[<chno>]:FIXed:VALue — IEEE488.1-1987 command mode FMKRV

- Function: Sets the Y axis value for the fixed marker (FIX MKR)
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:FIXed:VALue <real>
  FMKRV<real>
- Parameter: <real>=Y axis value
- Response type: <NR3> real value:Y axis value
- Description: Used to set the Y axis value for the fixed marker (FIX MKR) shown in the rectangular coordinates display.
  Also used to set real part of the value for the fixed marker shown in the Smith chart or the polar coordinates display.

18. MARKer[<chno>]:FIXed:AVALue

• Function	Sets the imaginary part of the fixed marker (FIX MKR)
• Presence of command and query	Command / Query
• Command	MARKer[<chno>]:FIXed:AVALue <real>
• Parameter	<real>=Imaginary part
• Response type	<NR3> real value:Imaginary part
• Description	Used to set imaginary part of the value for the fixed marker (FIX MKR) shown in the Smith chart or the polar coordinates display.

19. MARKer[<chno>]:LET   IEEE488.1-1987 command mode
MKR{REF | CENT | STAR | STOP | SPAN | FIX}

- Function: Marker assignment function.
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:LET <type>
  - Parameter: <type>={STARt | STOP | CENTer | SPAN | RLEVel | FIXed}
- IEEE488.1-1987 command mode
  - Command: MKR{REF | CENT | STAR | STOP | SPAN | FIX}
- Description: Assigns the set value and the measurement value of the active marker to each setting parameter.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Operation
MKRREF	RLEV	Assigns the Y axis value (measurement value) of the active marker to the reference value.
MKRCENT	CENT	Assigns the X axis value (setting value) of the active marker to the center value of the sweep. This command is available only in the frequency sweep.
MKRSTAR	STAR	Assigns the X axis value (setting value) of the active marker to the start value of the sweep.
MKRSTOP	STOP	Assigns the X axis value (setting value) of the active marker to the stop value of the sweep.
MKRSPAN	SPAN	Assigns the delta marker value (setting value) to the span value of the sweep. This command is available only in the frequency sweep.
MKRFIX	FIX	Assigns the position of the active marker to the fixed marker (FIX MKR).

20. MARKer[<chno>]:LIST

- Function: Turns the marker list display ON or OFF
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:LIST <bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Used to turn the marker list display ON or OFF.

21. MARKer[<chno>]:POLar — IEEE488.1-1987 command mode PMKR{LIN | LOG | RI}

- Function: Sets the marker mode for the polar display
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:POLar <type>
  - Parameter: <type>={MLINear | MLOGarithmic | RIMaginary}
  - Response type: MLIN | MLOG | RIM
- IEEE488.1-1987 command mode
  - Command: PMKR{LIN | LOG | RI}
  - Response type: 0 | 1
- Description: Sets the marker mode used with the polar display.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Mode
PMKRLIN	MLIN	Linear value
PMKRLOG	MLOG	Logarithmic value
PMKRRI	RIM	Complex value

22. MARKer[<chno>]:SMITh   IEEE488.1-1987 command mode
SMKR{LIN | LOG | RI | RX | GB}

- Function   Sets the marker mode used for the smith chart display
- Presence of command and query   Command / Query
- IEEE488.2-1987 command mode
  - Command   MARKer[<chno>]:SMITh <type>
  - Parameter   <type>={MLINear | MLOGarithmic | RIMaginary | IMPedance | ADMittance}
  - Response type   MLIN | MLOG|RIM | IMP | ADM
- IEEE488.1-1987 command mode
  - Command   SMKR{LIN | LOG|RI | RX | GB}
  - Response type   0 | 1
- Description   Sets the marker mode used for the smith chart display.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Mode
SMKRLIN	MLIN	Linear value
SMKRLOG	MLOG	Logarithmic value
SMKRRI	RIM	Complex value
SMKRRX	IMP	Impedance value
SMKRGB	ADM	Admittance value

23. MARKer[<chno>]:SEARch[:MODE] IEEE488.1-1987 command mode
SRCHOFF
{MAX | MIN}SRCH
ZRPSRCH
DRIPPL1

- Function: Marker search function
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:SEARch[:MODE] <type>
  - Parameter: <type>={OFF | MAX | MIN | TARGet | RIPPle}
  - Response type: OFF | MAX | MIN | TARG | RIPP
- IEEE488.1-1987 command mode
  - Command: SRCHOFF
    {MAX | MIN}SRCH
    ZRPSRCH
    DRIPPL1
  - Response type: SRCHOFF: 0 | 1
    {MAX | MIN}SRCH: NR3 (real value): Setting value
    ZRPSRCH (stimulus value)
    DRIPPL1 NR3 (real value): Measurement value
    (data A, B, C)
    NR1 (integer value): Status
- Description: Sets the marker search function.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Search Mode
SRCHOFF	OFF	OFF
MAXSRCH	MAX	Maximum value
MINSRCH	MIN	Minimum value
ZRPSRCH	TARG	Target value
DRIPPL1	RIPP	Ripple value

In IEEE488.2-1987 command mode, the search mode is returned by the query. The measurement value can be obtained by using the FETch? query.

In IEEE488.2-1987 command mode, a measurement value is returned by the query.

24. MARKer[<chno>]:SEARch:PARTial:SRANge

- Function — Specifes the Area used with partial marker searching
- Presence of command and query — Command
- Command — MARKer[<chno>]:SEARch:PARTial:SRANge
- Description — Used to specify the area between the delta markers that the partial marker search will take place in.

  This command is has no effect if the delta marker is set to OFF.

  This command is used only to specify the area to be searched. Use the MARK:SEAR:PART:STAT command to turn the partial search ON or OFF.

  NOTE: ***In IEEE488.1-1987 command mode, this function is automatically executed by MKRPART ON.***

25. MARKer[<chno>]:SEARch:PARTial[:STATe] — IEEE488.1-1987 command mode MKRPART

- Function — Turns of partial marker searching ON/OFF
- Presence of command and query — Command / Query
- Command — MARKer[<chno>]:SEARch:PARTial[:STATe] <bool>
  MKRPART <bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Turns the partial marker function ON or OFF.

26. MARKer[<chno>]:SEARch:RIPPle[:MODE]

- Function — Ripple search mode specification
- Presence of command and query — Command / Query
- Command — MARKer[<chno>]:SEARch:RIPPle[:MODE] <type>
- Parameter — <type>={MAX | MIN | BOTH | PPEak}
- Response type — MAX | MIN | BOTH | PPE
- Description — Specifies a mode when performing a ripple search.

  MAX: Obtains the maximum value of local maximum values.

  MIN: Obtains the minimum value of local minimum values.

  BOTH: Obtains the difference between the maximum value of local maximum values and the minimum value of local minimum values.

  PPEak: Obtains the difference between the maximum value and the minimum value.

  - In IEEE488.1-1987 command mode, the DRIPPL1 is applied to the BOTH.
  - The MAX and the MIN cannot be executed in IEEE488.1-1987 command mode.
  - In R3752/53 series, DRIPPL2 is not supported.
  - In IEEE488.1-1987 command mode, the DMAXMIN is applied to the DMAXMIN.

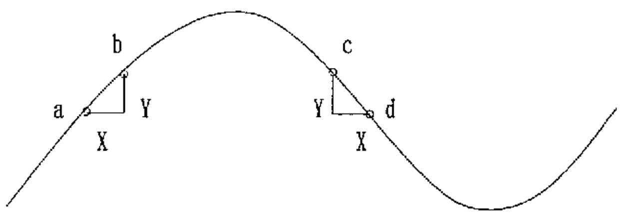
27. MARKer[<chno>]:SEARch:RIPPle{:DX | :DY}   IEEE488.1-1987 command mode
DLT{X | Y}

- Function: Setting the detectivity of the ripple search
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
- Command: MARKer[<chno>]:SEARch:RIPPle{:DX | :DY} <real>
  DLT{X | Y} <real>
- Parameter: <real>=Setting value
- Response type: <NR3> real value:Setting value
- Description: Sets the detectivity of the ripple search.

If the detectivity is set to ΔY/ΔX, first obtain the a point of which the gradient of the waveform (Y/X) is ΔY/ΔX or more, then obtain the d point of which the reverse gradient is ΔY/ΔX or more. And finally obtain a maximum value between the a point and the d point as the local maximum peak.

Obtain a minimum value in the same way of obtaining a maximum value with the reverse gradient.

IEEE488.2-1987 command mode; DX → Set the ΔX
DY → Set the ΔY
IEEE488.1-1987 command mode; DLTX → Set the ΔX
DLTY → Set the ΔY



28. MARKer[<chno>]:SEARch:TARGet[:MODE] IEEE488.1-1987 command mode ZRPSRCH

- Function: Specifies the mode used when doing a target search
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: MARKer[<chno>]:SEARch:TARGet[:MODE] <type>
  - Parameter: <type>={ZERO | PI | VALue}
  - Response type: ZERO | PI | VALue
- IEEE488.1-1987 command mode
  - Command: ZRPSRCH
  - Response type:
    - NR3 (real value): Setting value (stimulus value)
    - NR3 (real value): Measurement value (data A, B, C)
    - NR1 (integer value): Status
- Description: Specifies a mode of the target search.

IEEE488.1-1987 Command Mode	IEEE488.2-1987 Command Parameter	Mode
ZRPSRCH	ZERO	Searches the phase for 0deg.
	PI	Searches the phase for ±180deg.
	VAL	Searches for the specified value.

29. MARKer[<chno>]:SEARch:TARGet:VALue

- Function: Specifies a value for the forget search
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:SEARch:TARGet:VALue <real>
- Parameter: <real>
- Response type: <NR3> real value
- Description: Specifies the value used for a target search when target seach is set to specified value mode.

30. MARKer[<chno>]:SEARch:TARGet:LEFT

- Function: Searches for the left frequency
- Presence of command and query: Command
- Command: MARKer[<chno>]:SEARch:TARGet:LEFT
- Description: Used to search for the next frequency on the left when in target search mode.

31. MARKer[<chno>]:SEARch:TARGet:RIGHt

- Function: Searches for the right frequency
- Presence of command and query: Command
- Command: MARKer[<chno>]:SEARch:TARGet:RIGHt
- Description: Used to search for the next frequency on the right when in forget search mode.

32. MARKer[<chno>]:SEARch:TRACking IEEE488.1-1987 command mode
MKRTRAC

- Function: Turns the tracking mode ON or OFF
- Presence of command and query: Command / Query
- Command: MARKer[<chno>]:SEARch:TRACking <bool>
  MKRTRAC
- Parameter: <bool>
- Response type: 0 | 1
- Description: The tracking mode settings are as follows:
  ON: A marker search is executed every time a sweep ends.

  NOTE: Set the tracking mode to ON before specifying the marker search.

  OFF: Marker search is executed only once when a marker search is specified.

33. MARKer[<chno>]:STATistics <bool> IEEE488.1-1987 command mode
MKRSTAT

- Function: Turns the statistical analysis function ON or OFF
- Presence of command and query: Command/Query
- Command: MARKer[<chno>]:STATistics <bool>
  MKRSTAT<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Used to turn the statistical analysis function ON or OFF.

7.20 FETCh? Subsystem

1. FETCh[<chno>][:MARKer][:ACTivate]?

- Function: Active marker output
- Presence of command and query: Query
- Command: FETCh[<chno>][:MARKer][:ACTivate]?
  <data1>, <data2>, <data3>, <data4>, <data5>
  <data1>=<real> (Stimulus)
  <data2>=<real> (Data A)
  <data3>=<real> (Data B)
  <data4>=<real> (Data C)
  <data5>=<int> (Status)
- Description: Outputs the latest active marker data.
  The output data is transferred in ASCII format.

  <Stimulus>
  Shows the X axis value at the marker point.
  The following fixed length format of 22 characters is used.
  SN.NNNNNNNNNNNNNNNESNN
  (S:+/-, N:0 to 9, E:Exponential sign)
  If the active marker is disabled, the stimulus is +1.000000000000000E+38.
  If the delta marker is enabled, the stimulus is the difference between the markers.

  <Data A, B>
  Data A is the operation data of the first waveform. Data B is the operation data of the second waveform.
  The memory waveform is data B.
  When the polar coordinates or the smith chart display is set, data A is the value for the real part and the data B is the value for the imaginary part.
  The data format is the same as that of the stimulus.
  If there is no available data, data A and B are +1.000000000000000E+38.

  <Data C>
  Data C is available when the polar coordinates or the smith chart display is set. In this case, data c is the reactance value or the capac-

itance value.

The data format is the same as that of the stimulus.

If there is no available data, the data C is +1.000000000000000E+38.

<Status>

The status of the operation data is as follows.

-1: No data.

0: Data for the normal operation.

1: Measurement data cannot be operated.

2: Level 1 error in the filter analysis.

3: Level 2 error in the filter analysis.

4: Level 3 error in the filter analysis.

5: Level 4 error in the filter analysis.

The status is an integer value in the format of 1 or 2 character(s).

2. FETCh[<chno>][:MARKer]:FANalysis?

- Function — Filter analysis output
- Presence of command and query — Query
- Command — FETCh[<chno>][:MARKer]:FANalysis?

  <data1>, <data2>, <data3>, <data4>, <data5>, <data6>, <data7>

  <data1>=<real> (CENTER FREQ)
  <data2>=<real> (LEFT FREQ)
  <data3>=<real> (RIGHT FREQ)
  <data4>=<real> (BAND WIDTH)
  <data5>=<real> (QUALITY FACTOR)
  <data6>=<real> (SHAPE FACTOR)
  <data7>=<int> (Status)
- Description — Outputs the results for the filter analysis.

  The filter analysis is executed with the first waveform data. If the data waveform is OFF, however, the memory waveform data is used.

  The output data is transferred in the ASCII format.

  <CENTER FREQ>

  Center frequency of the filter

  The format is the following fixed length format of 22 characters.

  SN.NNNNNNNNNNNNNNNNESNN

  (S:+/-, N:0 to 9, E:Exponent characteristic)

  If the active marker is disabled, the CENTER FREQ is+1.000000000000000E+ 38.

  If the delta marker is enabled, the frequency difference between the markers cannot be transferred.

  <LEFT FREQ>

  Left frequency of the searched bandwidth

  The format is the same as that of the CENTER FREQ.

  If no available data, the LEFT FREQ is +1.000000000000000E+38.

  <LIGHT FREQ>

  Right frequency of the searched bandwidth

  The format is the same as that of the CENTER FREQ.

  If no available data, the RIGHT FREQ is +1.000000000000000E+38.

<BANDWIDTH>
Searched bandwidth
The format is the same as that of the CENTER FREQ.
If no available data, the BANDWIDTH is
+1.000000000000000E+38.

<QUALITYFACTOR>
Quality factor
The format is the same as that of the CENTER FREQ.
If no available data, the QUALITYFACTOR is
+1.000000000000000E+38.

<SHAPEFACTOR>
Selectivity
The format is the same as that of the CENTER FREQ.
If no available data, the SHAPEFACTOR is
+1.000000000000000E+38.

<Status>
The status of the operation data is as follows.
-1: No data.
0: Data for the normal operation.
1: Measurement data cannot be operated.
The status is in the format of 1 or 2 integers.

3. FETCh[<chno>][:MARKer]:NUMBer<n>?

- Function: Data output of the specified marker.
- Presence of command and query: Query
- Command: FETCh[<chno>][:MARKer]:NUMBer<n>?
- Parameter: <n>=0 to 10
- Description: Outputs the marker data of the specified number.
  Number 0 represents the active marker.
  The format is the same as that of the active marker output.

4. FETCh[<chno>]:CDMA:FANalysis? IEEE488.1-1987 command mode CDMAFREP?

- Function: Returns the CDMA filter analysis result.
- Presence of command and query: Command/Query
- Command: FETCh[<chno>]:CDMA:FANalysis?
  CDMAFREP?
- Response type: <data1>,<data2>,<data3>,<data4>,<data5>,<data6>
  <data1> = <real> (Center frequency of the passband)
  <data2> = <real> (Passband)
  <data3> = <real> (Insertion loss)
  <data4> = <real> (Difference between the lowest local minimum within the passband and the peak value)
  <data5> = <real> (Guaranteed attenuation (ATTN FREQ1)
  <data6> = <real> (Guaranteed attenuation (ATTN FREQ2)
  NR3(Real value)
  22-character fixed-length format
  SN.NNNNNNNNNNNNNNNNESNN
  (S:+/-, N:0 to 9, E: Exponential sign)
- Description: Outputs the result of the CDMA filter analysis. CDMA filter analyses are performed on LOG MAG data. If the format is either LOGMAG, LOGMAG&PHASE or LOGMAG&DELAY, the LOGMAG data on the displayed waveform is analyzed. If the format is other than the above, internal LOGMAG data which has not yet been displayed is analyzed (see the operation manual for more information).

  <data1>
  This is the center frequency of the filter passband. The data format uses a 22-character fixed-length format as shown below:
  SN.NNNNNNNNNNNNNNNNESNN
  (S:+/-, N:0 to 9, E: Exponential sign)
  When the data is invalid, the value is
  +1.000000000000000E+38.

  <data2>
  This is the filter passband. The same is used 22-character fixed-length format as in <data1>.
  When the data is invalid, the value is
  +1.000000000000000E+38.

<data3>

This is the filter insertion loss (the peak value). The same is used 22-character fixed-length format as in <data1>. When the data is invalid, the value is +1.000000000000000E+38.

<data4>

This is the difference between the lowest local minimum and the peak value. The same is used 22-character fixed-length format as in <data1>. When the data is invalid, the value is +1.000000000000000E+38.

<data5>

This is the guaranteed attenuation (ATTN FREQ1). The same is used 22-character fixed-length format as in <data1>. When the data is invalid, the value is +1.000000000000000E+38.

<data6>

This is the guaranteed attenuation (ATTN FREQ2). The same is used 22-character fixed-length format as in <data1>. When the data is invalid, the value is +1.000000000000000E+38.

5. FETCh[<chno>]:PLINearity? IEEE488.1-1987 command mode PLINREP?

- Function: Outputs the Phase Linearity analysis result
- Presence of command and query: Query
- Command: FETCh[<chno>]:PLINearity?
  PLINREP?
- Response type: <real>
  NR3(Real value)
  22-characters fixed-length format
  SN.NNNNNNNNNNNNNNNESNN
  (S:+/-, N:0 to 9, E: Exponential sign)
- Description: This mode allows the user to obtain the result of the Phase Linearity analysis.

  This function can be used for both Phase linearity and CDMA Phase linearity. When the Phase linearity function is set to ON, the analysis result of the Phase linearity is output; when the CDMA Phase linearity function is set to ON, the analysis result of the CDMA Phase linearity is output.

  A 22-character fixed-length format is used. When the data is invalid, the value is +1.000000000000000E+38.

6. FETCh[<chno>][:MARKer]:STATistics? — IEEE488.1-1987 command mode REPSTAT?

- Function — Outputs the statistical analysis result.
- Presence of command and query — Query
- Command — FETCh[<chno>][:MARKer]:STATistics?
  REPSTAT?
- Response type — <data1><data2><data3>
  <data1> = <real> (Median)
  <data2> = <real> (Standard deviation)
  <data3> = <real> (Peak to peak)
  NR3(Real value)
  22-characters fixed-length format
  SN.NNNNNNNNNNNNNNNNESNN
  (S:+/-, N:0 to 9, E: Exponential sign)
- Description — Used to output the result of the statistical analysis.

  <data1>
  This is the median. The data format uses a 22-character fixed-length format as shown below:
  SN.NNNNNNNNNNNNNNNNESNN
  (S:+/-, N:0 to 9, E: Exponential sign)
  When the data is invalid, the value is +1.000000000000000E+38.

  <data2>
  This is the standard deviation of the waveform data. The same is used 22-character fixed-length format as in <data1>. When the data is invalid, the value is +1.000000000000000E+38.

  <data3>
  This is the peak to peak of the waveform data. The same is used 22-character fixed-length format as in <data1>. When the data is invalid, the value is +1.000000000000000E+38.

7.21 LIMit Subsystem

1. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP — IEEE488.1-1987 command mode: FAILBEEP, PASSBEEP

- Function: ON/OFF of beep sound at the limit test
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP <bool>
  - Parameter: <bool>
  - Response type: 0 | 1
- IEEE488.1-1987 command mode
  - Command: FAILBEEP<bool>
    PASSBEEP<bool>
    Refer to "7.21 27 LPAR" too.
  - Parameter: <bool>
  - Response type: 0 | 1
- Description: Selects whether or not a beep sound at the limit test.

  In IEEE488.2 command mode, the beep is available by setting this command to ON when the limit test function (DISP:LIM) is ON.

  In IEEE488.1-1987 command mode, the beep is available by setting FAILBEEP or PASS BEEP to ON.

  Even if either one of FAILBEEP or PASSBEEP is set to OFF, the beep is disabled.

2. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP:FOR — IEEE488.1-1987 command mode: FAILBEEP, PASSBEEP

- Function: Sets the conditions under which a beep sound is played when performing a limit test.
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP:FOR <type>
  - Parameter: <type>={FAIL | PASS}
- IEEE488.1-1987 command mode
  - Command: FAILBEEP<bool>
    PASSBEEP<bool>
    Refer to "7.21 27 LPAR" too.
  - Parameter: <bool>
  - Response type: 0 | 1
- Description: Selects whether the beep sound is played when a FAIL or PASS occurs during the limit test.

  When this is set to ON under the IEEE488.2 command mode (DISP:LIM:BEEP ON), a beep sound is played according to the settings below.

  When FAILBEEP is set to ON, the beep sounds at a FAIL result.

  When PASSBEEP is set to ON, the beep sounds at a PASS result.

  When either FAILBEEP or PASSBEEP is set to OFF, the beep does not sound for those conditions.

3. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP:TONE   IEEE488.1-1987 command mode
BEEPTONE

- Function: Sets the beep tone
- Presence of command and query: Command / Query
- Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP:TONE <int>
  BEEPTONE<int>
  Refer to "7.21 27 LPAR" too.
- Parameter: <int>=0 to 7
- Response type: NR1 (integer value)
- Description: Sets the beep tone for the limit test.

4. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:CLEar   IEEE488.1-1987 command mode
LSEGCL

- Function: Clears all segments in the limit table
- Presence of command and query: Command
- IEEE488.2-1987 command mode
  Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:CLEar
- IEEE488.1-1987 command mode
  Command: LSEGCL
  Refer to "7.21 27 LPAR" too.
- Description: Clears the contents of all the segments in the limit table.
  Two limit tables exist in each channel. To clear the second table, specify 2 for <parano>.
  To clear the segment only partially, use DISP:LIM:SEGM:DEL.

5. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:DATA <block>

- Function: Information setting of all segments in the limit table.
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
- Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:DATA <block>
- Parameter:
  - <block> = #<byte><length><data>
  - <byte> = Describes byte of the next string <length> with ASCII numeral (1 character).
  - <length> = Describes byte of the next string <data> with ASCII numeral.
  - <data> = Describes each element of all the necessary segments in order of <stimulus>, <upper>, <lower>, <type>, <color>, <wcolor>, ...
  - <stimulus> = Stimulus value
  - <upper> = Upper limit value
  - <lower> = Lower limit value
  - <type> = Line type{SLINe | FLINe | SPOint}
  - <color> = Limit line display color {1-7}
  - <wcolor> = Display color of signal waveform {1-7}
- Response type: <block>
- Description: Sets all segment information of the limit table in perfect form. The previous segment information is lost.

  Sorts the segments in ascending order of stimulus value as they are received.

  If some description error is found in the data, the segments up to that point are valid, but subsequent segments are ignored.

  Refer to "3.1.2 Data Formats" for block data <block>.
- Example: LISP:LIM:DATA #2486MHz,5dB,-5dB,SLIN,2,6,400MHz,10dB, -10dB,SPO,2,6

6. | DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:LINE | IEEE488.1-1987 command mode
LIMILINE |
|---|---|

- Function — Turns the limit line screen display ON or OFF
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:LINE<bool>
  - Parameter — <bool>
  - Response type — 0 | 1
- IEEE488.1-1987 command mode
  - Command — LIMILINE<bool>

    Refer to "7.21 27 LPAR" too.
  - Parameter — <bool>
  - Response type — 0 | 1
- Description — Used to turn the limit line screen display ON or OFF.

  An ON setting displays the limit line on the display scale. Limit tests cannot be performed without setting DISP:LIM to ON.

7. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:OFFSet:AMPLitude
IEEE488.1-1987 command mode
LIMIAMPO

- Function: Adds or subtracts offset values to or from all segment limit values.
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:OFFSet:AMPLitude <real>
  - Parameter: <real>
  - Response type: NR3 (real value)
- IEEE488.1-1987 command mode
  - Command: LIMIAMPO<real>
    Refer to "7.21 27 LPAR" too.
  - Parameter: <real>
  - Response type: NR3 (real value)
- Description: Moves the limit line up or down according to the specified offset value.
  In order to add the offset value to the stimulus value, use the DISP:LIM:OFFS:STIM command.

8. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:OFFSet:STIMulus <real>
IEEE488.1-1987 command mode
LIMISTIO

- Function — Adds or subtracts offset values to or from all segment stimulus values.
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:OFFSet:STIMulus <real>
  - Parameter — <real>
  - Response type — NR3 (real value)
- IEEE488.1-1987 command mode
  - Command — LIMISTIO<real>
    Refer to "7.21 27 LPAR" too.
  - Parameter — <real>
  - Response type — NR3 (real value)
- Description — Moves the limit line up and down according to the specified offset value.
  In order to add the offset value to the response value, use DISP:LIM:OFFS:AMPL command.

9. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:ParallelIO IEEE488.1-1987 command mode LIMPIO

- Function: Controls the line limit result output.
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]
    :ParallelIO <bool>
  - Parameter: <bool>
  - Response type: 0 | 1
- IEEE488.1-1987 command mode
  - Command: LIMPIO<bool>
    Refer to "7.21 27 LPAR" too.
  - Parameter: <bool>
  - Response type: 0 | 1
- Description: Used to control whether the line limit test results are output to the parallel I/O (PIO).

  Setting this command to ON when the limit test (DISP:LIM) has been enabled outputs the results to PIO.

10. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:PARameter:PolarLIMit
IEEE488.1-1987 command mode
LIMPLIN | LIMPLOG

- Function — Selects which judgment parameter combination to use when using the Polar display format.
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:PARameter:PolarLIMit <select>
  - Parameter — <select> = {LINear | LOGarithmic}
  - Response type — LIN | LOG
- IEEE488.1-1987 command mode
  - Command — LIMPLIN | LIMPLOG
    Refer to "7.21 27 LPAR" too.
  - Response type — 0 | 1
- Description — When the Polar format (CALCulate[:FORMat]POLar) is selected for the display, a combination of magnitude and phase are used for the judgement parameter.
  This command selects whether a linear or log magnitude is used.

IEEE488.1-1987 command	IEEE488.2-1987 command parameter	Judgement parameter <parano>
LIMPLIN	LINear	1; Magnitude (Linear) 2; Phase
LIMPLOG	LOGarithmic	1; Magnitude (Log) 2; Phase

If the display format of the corresponding channel used rectangular coordinates, this setting has no effect.

11. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:PARameter:SmithLIMit

IEEE488.1-1987 command mode

LIMSLIN | LIMSLOG

- Function: Selects which judgment parameter combination to use when using the Smith chart format.
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:PARameter:SmithLIMit <select>
  - Parameter: <select> = {LINear | LOGarithmic}
  - Response type: LIN | LOG
- IEEE488.1-1987 command mode
  - Command: LIMSLIN | LIMSLOG
    Refer to "7.21 27 LPAR" too.
  - Response type: 0 | 1
- Description: When the Smith chart format (CALCulate[:FORMat] SCHart | ISCHart) is selected for the display, the combination of magnitude and phase are used for the judgement parameter.
  This command selects whether a linear or log magnitude is used.

IEEE488.1-1987 Command	IEEE488.2-1987 command parameter	Judgement parameter <parano>
LIMPLIN	LINear	1; Magnitude (Linear) 2; Phase
LIMPLOG	LOGarithmic	1; Magnitude (Log) 2; Phase

If the display format of the corresponding channel uses rectangular coordinates, this setting has no effect.

12. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:PARameter[:STATe]
IEEE488.1-1987 command mode
LIMPAR

- Function — Turns each judgment parameter setting ON or OFF.
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:PARameter[:STATe] <bool>
  - Parameter — <bool>
  - Response type — 0 | 1
- IEEE488.1-1987 command mode
  - Command — LIMPAR<bool>
    Refer to "7.21 27 LPAR" too.
  - Parameter — <bool>
  - Response type — 0 | 1
- Description — Used to turn each judgment parameter setting ON or OFF.

<parano>	Judgement parameter
1	Main trace/real part/magnitude
2	Sub trace/imaginary part/phase

To execute the limit test, use DISP:LIM ON after setting the limit. Even if the parameter is set to ON, if no segment has been set, this setting has is effect.

13. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:REPort?

- Function: Reports PASS and FAIL information for all segments
- Presence of command and query: Query
- IEEE488.2-1987 command mode
  - Query: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:REPort?
  - Response type: <block>

    The output format is related to the data format setting (FORMat[:DATA]).

    For ASCII format (FORMat[:DATA] ASCii).

    <block> = <segment>[,<segment>, ...]

    <segment> = 0 to 30 numeral (ASCII character string)

    For binary format (FORMat[:DATA] {REAL | MBIN}, {32 | 64}).

    <block> = #<byte>|<length>|<data>

    <byte> = Specifies byte of the next string <length> with 1 character of ASCII numeral.

    <length> = Specifies byte of the next string <data> with ASCII numeral.

    <data> = Numbers of FAIL segments (Order of 1 byte integer, ascending order)
- Description: Used to report PASS or FAIL information from all segments tested.

  To see the test results, use DISP:LIM:RES?.

  Refer to "3.1.2 Data Formats" for more in formation about the block data <block>.

  Refer to "7.7 2 FORMat[:DATA]" for more information on the data format.

14.	DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:RESult?	IEEE488.1-1987 command mode LIMRES?

- Function — Reports PASS and FAIL information for the test results
- Presence of command and query — Query
- IEEE488.2-1987 command mode
  - Query — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:RESult?
  - Response type — PASS | FAIL | OFF | UND
- IEEE488.1-1987 command mode
  - Query — LIMRES?
    Refer to "7.21 27 LPAR" too.
  - Response type — PASS | FAIL | OFF | UND
- Description — Used to show the test results as either PASS or FAIL.
  If the limit test is turned OFF, a result of "OFF" is returned, and if the limit value is undefined, "UNDefined" is returned.

15. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>

- Function — Sets all information for the specified segment together
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode

Query — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n> <block>

Parameter

<block> =	#<byte><length><data>
<byte> =	Describes byte of the next string <length> with ASCII numeral (1 character).
<length> =	Describes byte of the next string <data> with ASCII numeral.
<data> =	Describes each element of the segments in order of <stimulus>, <upper>, <lower>, <type>, <color>, <wcolor>.
<stimulus> =	Stimulus value
<upper> =	Upper limit value
<lower> =	Lower limit value
<type> =	Line type {SLINe lFLINe lSPOint}
<color> =	Limit line display color {1-7}
<wcolor> =	Display color of signal waveform {1-7}

Response type — <block>

- Description — Combines the necessary information for a single segment together in one setting. If the specified segment is not empty, old contents are overwritten.

  The segment number <n> can be between 0 and 30.

  When all the data has been received, the segments are ordered according to their stimulus values.

  If the specified segments are more than the segment number specified beforehand, the specification of segment is ignored and they are added to the first empty segment.
- Example — DISP:LIM:SEGM1 #2224MHz, 5dB,-5dB, SLIN, 2, 6

16. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:COLor
IEEE488.1-1987 command mode
LIMC

- Function — Sets the limit line display color for the specified segment
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:COLor <int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — LIMC<int>
    Refer to "7.21 27 LPAR" and "7.21.28 LSEG" too.
  - Parameter — <int>
  - Response type — NR1 (integer value)
- Description — Used to set the limit line display colors for the specified segments.

Parameter	Display color
1	Gray
2	Red
3	Purple
4	Green
5	Blue
6	Yellow
7	White

In IEEE488.2-1987 command mode, the segment number <n> range is 0 to 30. In IEEE488.1-1987 command mode, the segment number must be specified by the LSEG command in advance.

17. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:DELete

- Function — Deletes the specified segment
- Presence of command and query — Command
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:DELete
- Description — Used to delete the specified segment and shifts next segment up. To delete all segments, use DISP:LIM:CLEar.

18. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:COWor
IEEE488.1-1987 command mode
LIML

- Function — Sets the lower limit value for the specified segment
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:LOWer<real>
  - Parameter — <real>
  - Response type — NR3 (real value)
- IEEE488.1-1987 command mode
  - Command — LIML<real>
    Refer to "7.21 27 LPAR" and "7.21.28 LSEG" too.
  - Parameter — <real>
  - Response type — NR3 (real value)
- Description — Used to set the lower limit value for the specified segment.
  If the lower limit specified is larger than the upper limit, exchange these values.
  In IEEE488.2-1987 command mode, the segment number <n> range is 0 to 30. In IEEE488.1-1987 command mode, the segment number must be specified by the LSEG command in advance.

19. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:LOWer:REPort?

- Function: Reports the results for FAIL points at the lower limit of the specified segment
- Presence of command and query: Query
- Query: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:LOWer:REPort?
- Response type: <block>

  The output format is related to the data format setting (FORMat[:DATA]).

  In case of ASCII format (FORMat[:DATA] ASCii).

  <block> = <point>[,<point>,....]

  <point> = <stimulus>,<amplitude>,<failed> (ASCII character string)

  In case of binary format (FORMat[:DATA] {REAL | MBIN}, {32 | 64}).

  <block> = #<byte><length>[<point>...]

  <byte> = Specifies byte of the next string <length> with 1 character of ASCII numeral.

  <length> = Specifies byte of the next string <point>... with ASCII numeral.

  <point> = <stimulus><amplitude><failed> (binary format)

  <stimulus> = Stimulus value of FAIL point <real>

  <amplitude> = Response value of FAIL point <real>

  <failed> = The difference between the response value and the lower limit value <real>
- Description: Used to report the results for the FAIL point at the lower limit of the specified segment.

  The output data format follows the specifications set by the FORM[:DATA] command.

  The stimulus value and the response value units correspond to the current display format.

  Refer to "3.1.2 Data Formats" for the block data <block>.

  Refer to "7.7 2 FORMat[:DATA]" for the data format.

20. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:REPort?

- Function — Reports the result for a FAIL point in the specified segment
- Presence of command and query — Query
- Query — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:REPort?
- Response type — <block>

  The output format is related to the data format setting (FORMat[:DATA]).

  In case of ASCII format (FORMat[:DATA] ASCii).

  <block> = <point>[,<point>,....]

  <point> = <stimulus>,<amplitude>,<failed> (ASCII character string)

  In case of binary format (FORMat[:DATA] {REAL | MBIN}, {32 | 64}).

  <block> = #<byte><length>[<point>...]

  <byte> = Specifies byte of the next string <length> with 1 character of ASCII numeral.

  <length> = Specifies byte of the next string <point>... with ASCII numeral.

  <point> = <stimulus><amplitude><failed> (binary format)

  <stimulus> =Stimulus value of FAIL point <real>

  <amplitude> = Response value of FAIL point <real>

  <failed> = The difference between the response value and the lower limit value <real>
- Description — Used to report the results for the FAIL point in the specified segment.

  The output data format follows the specifications set by the FORM[:DATA] command.

  The stimulus value and the response value units correspond to the current display format.

  Refer to "3.1.2 Data Format" for the block data <block>.

  Refer to "7.7 2 FORMat[:DATA]" for the data format.

21. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:STIMulus
IEEE488.1-1987 command mode
LSTIM

- Function: Sets the stimulus value for the specified segment
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPLAY[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n> :STIMulus <real>
  - Parameter: <real>
  - Response type: NR3 (real value)
- IEEE488.1-1987 command mode
  - Command: LSTIM<real>
    Refer to "7.21 27 LPAR" and "7.21 28 LSEG" too.
  - Response type: NR3 (real value)
- Description: Used to set the stimulus value for the specified segment.
  In IEEE488.2-1987 command mode, the segment number <n> range is 0 to 30. In IEEE488.1-1987 command mode, the segment number must be specified by the LSEG command in advance.

22. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:TYPE

IEEE488.1-1987 command mode

LIMTFLT | LIMTSLP | LIMTSP

- Function — Sets the line type for the specified segment
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPLAY[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:TYPE <type>
  - Parameter — <type>=SLINe | FLINe | SPOint
  - Response type — SLIN | FLIN | SPO
- IEEE488.1-1987 command mode
  - Command — LIMTFLT | LIMTSLP | LIMTSP
    Refer to "7.21 27 LPAR" and "7.21 28 LSEG" too.
  - Response type — 0 | 1
- Description — Used to set the line type for the specified segment.

IEEE488.1-1987 command	IEEE488.2-1987 command parameter	Type
LIMTFLT	FLINe	Flat line
LIMTSLP	SLINe	Slope line
LIMTSP	SPOint	Single point

If a setting other than single point is selected in the polar coordinate display format, the same limit value is adapted for all measurement points in the segment.

In IEEE488.2-1987 command mode, the segment number <n> has a range of 0 to 30. In IEEE488.1-1987 command mode, the segment number must be specified by the LSEG command in advance.

23. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:UPPer
IEEE488.1-1987 command mode
LIMU

• Function	Sets the upper limit value for the specified segment
• Presence of command and query	Command / Query
• IEEE488.2-1987 command mode	
Command	DISPLAY[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:UPPer <real>
Parameter	<real>
Response type	NR3 (real value)
• IEEE488.1-1987 command mode	
Command	LIMU<real> Refer to "7.21 27 LPAR" and "7.21 28 LSEG" too.
Parameter	<real>
Response type	NR3 (real value)
• Description	Used to set the upper limit value for the specified segment. If the upper limit specified is smaller than the lower limit, exchange these values. In IEEE488.2-1987 command mode, segment number <n> has a range of 0 to 30. In IEEE488.1-1987 command mode, the segment number must be specified by LSEG command in advance.

24. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:UPPer:REPort?

- Function — Reports the result FAIL point at the upper limit of the specified segment
- Presence of command and query — Query
- IEEE488.2-1987 command mode

  Query — DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n> :UPPer:REPort?

  Response type — <block>

  The output format is related to the data format setting (FORMat[:DATA]).

  In case of ASCII format (FORMat[:DATA] ASCii).

  <block> = <point>[,<point>,....]

  <point> = <stimulus>,<amplitude>,<failed> (ASCII character string)

  In case of binary format (FORMat[:DATA] {REAL | MBIN}, {32 | 64}).

  <block> = #<byte><length>[<point>...]

  <byte> = Specifies byte of the next string <length> with 1 character of ASCII numeral.

  <length> = Specifies byte of the next string <point>... with ASCII numeral.

  <point> = <stimulus><amplitude><failed> (binary format)

  <stimulus> =Stimulus value of FAIL point <real>

  <amplitude> = Response value of FAIL point <real>

  <failed> = The difference between the response value and the upper limit value <real>

- Description — Used to report the results for the FAIL point at the upper limit of the specified segment.

  The output data format depends on the FORM[:DATA] command.

  The units of the stimulus value and the response value will be the same as the current display format.

  Refer to "3.1.2 Data Format" for the block data <block>.

  Refer to "7.7 2 FORMat[:DATA]" for the data format.

25. DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:WCOLor
IEEE488.1-1987 command mode
LIMWC

- Function — Sets the waveform color for the specified segment
- Presence of command and query — Command / Query
- IEEE488.2-1987 command mode
  - Command — DISPLAY[:WINDow[<chno>]]:LIMit[<parano>]:SEGMent<n>:WCOLor <int>
  - Parameter — <int>
  - Response type — NR1 (integer value)
- IEEE488.1-1987 command mode
  - Command — LIMWC<int>
    Refer to "7.21 27 LPAR" and "7.21 28 LSEG" too.
  - Parameter — <int>
  - Response type — NR1 (integer value)
- Description — Used to set the display color for the measurement waveform of the specified segment.

  Within the stimulus range of the segment, the measurement waveform of PASS range is displayed in the color specified. But the measurement waveform of FAIL range is displayed in red regardless of the setting here.

Parameter	Display color
1	Gray
2	Red
3	Purple
4	Green
5	Blue
6	Yellow
7	White

In IEEE488.2-1987 command mode, segment number <n> has a range of 0 to 30. In IEEE488.1-1987 command mode, the segment number must be specified by the LSEG command in advance.

26. DISPlay[:WINDow[<chno>]]:LIMit[<parano>][:STATe] IEEE488.1-1987 command mode LIMITEST

- Function: Turns the limit test function ON or OFF
- Presence of command and query: Command / Query
- IEEE488.2-1987 command mode
  - Command: DISPLAY[:WINDow[<chno>]]:LIMit[<parano>] [:STATe] <bool>
  - Parameter: <bool>
  - Response type: 0 | 1
- IEEE488.1-1987 command mode
  - Command: LIMITEST<bool>
    Refer to "7.21 27 LPAR" too.
  - Parameter: <bool>
  - Response type: 0 | 1
- Description: When the limit test is set to ON, the trace data judgment is executed using the set limit value.
  In order to display the limit line on the screen set, DISP:LIM:LINE to ON.
  The parameter <parano> specification is ignored.

27. IEEE488.1-1987 command mode
LPAR

- Function: Selects the parameter number.
- Presence of command and query: Command / Query
- IEEE488.1-1987 command mode
  - Command: LPAR<int>
  - Parameter: <int>=1 to 2
  - Response type: NR1 (integer value)
- Description: Specifies the parameter number used under IEEE488.1-1987 command mode.

  A selected parameter is allocated to the LIMIT command which requires the parameter number.

  As each command depends on the header parameter <parano> under IEEE488.2 command mode, the setting made by this command is ignored.

28. IEEE488.1-1987 command mode
LSEG

- Function: Selects the segment number
- Presence of command and query: Command / Query
- IEEE488.1-1987 command mode
  - Command: LSEG<int>
  - Parameter: <int> = 0 to 30
  - Response type: NR1 (integer value)
- Description: Specifies a segment number in IEEE488.1-1987 command mode.

  In the set commands of segment, LIMC, LIML, LSTIM, LIMIT, LIMU and LIMWC, the setting is performed for the segment numbers specified here.

  In IEEE488.2-1987 command mode, the setting by this command is ignored because the setting follows the segment by the header parameter <n> in each command.

7.22 CDMA Subsystem

1. CALCulate[<chno>]:CDMA:FANalysis:ATTenuation1 <real> IEEE488.1-1987 command mode
CDMAATT1<real>

- Function: Sets the offset frequency (ATTN FREQ1) used when calculating the guaranteed attenuation
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:CDMA:FANalysis:ATTenuation1 <real>
CDMAATTN1<real>
- Parameter: <real>
- Response type: NR3 (Real number)
- Description: Used to set the offset frequency (ATTN FREQ1) when calculating the guaranteed attenuation.
When <real> set to 0 (zero), no data is analyzed at this offset frequency (ATTN FREQ1).

2. CALCulate[<chno>]:CDMA:FANalysis:ATTenuation2 <real> IEEE488.1-1987 command mode
CDMAATT2<real>

- Function: Sets the offset frequency (ATTN FREQ2) used when calculating the guaranteed attenuation
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:CDMA:FANalysis:ATTenuation2 <real>
CDMAATTN2<real>
- Parameter: <real>
- Response type: NR3 (Real number)
- Description: Used to set the offset frequency (ATTN FREQ2) when calculating the guaranteed attenuation.
When <real> set to 0 (zero), no data is analyzed at this offset frequency (ATTN FREQ2).

3. CALCulate[<chno>]:CDMA:FANalysis:STATe <bool> IEEE488.1-1987 command mode CDMAFANA<bool>

- Function: Turns the CDMA filter analysis function ON or OFF
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:CDMA:FANanalysis:STATe <bool>
  CDMAFANA<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Used to turn the CDMA filter analysis function ON or OFF.
  The following items are measured during the CDMA filter analysis:
  - Central frequency of the passband specified by the analysis depth (loss) from the peak value.
  - Passband width
  - Insertion loss (the peak value)
  - Difference between the lowest local minimum and the peak value within the passband
  - Guaranteed attenuation at the points given by ATTN FREQ1 (whose center point is the center frequency)
  - Guaranteed attenuation at the points given by ATTN FREQ2 (whose center point is the center frequency)

  The analysis result is obtained using "FETCh[<chno>]:CDMA:FANalysis?".

4. CALCulate[<chno>]:CDMA:FANalysis:WIDTh <real> — IEEE488.1-1987 command mode CDMATXDB<real>

- Function — Sets the analysis depth of the CDMA filter analysis
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:CDMA:FANanalysis:WIDTh <real>
  CDMATXDB<real>
- Parameter — <real>
- Response type — NR3 (Real value)
- Description — Used to set the analysis depth (loss) for the CDMA filter analysis.

5. CALCulate[<chno>]:CDMA:GATE:STATe <bool> — IEEE488.1-1987 command mode CDMA<bool>

- Function — Turns the gate function for the CDMA filter analysis ON or OFF
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:CDMA:GATE:STATe <bool>
  CDMA<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Used to turn the gate function for the CDMA filter analysis ON or OFF.

6. CALCulate[<chno>]:CDMA:GATE:STARt <real> IEEE488.1-1987 command mode
CDMASTAR<real>

- Function: Sets a gate start time for the CDMA filter analysis
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:CDMA:GATE:STARTt <real>
  CDMASTAR<real>
- Parameter: <real>
- Response type: NR3 (Real value)
- Description: Used to set a gate start time for the CDMA filter analysis.

7. CALCulate[<chno>]:CDMA:GATE:STOP <real> IEEE488.1-1987 command mode
CDMASTOP<real>

- Function: Sets a gate stop time for the CDMA filter analysis
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:CDMA:GATE:STOP <real>
  CDMASTOP<real>
- Parameter: <real>
- Response type: NR3 (Real value)
- Description: Used to set a gate stop time for the CDMA filter analysis.

8. CALCulate[<chno>]:CDMA:GATE:WINDow {MINimum | NORMal | WIDE | MAXimum | CDMA}
IEEE488.1-1987 command mode
CDMSMINI | CDMSNORM | CDMSWIDE | CDMSMAXI | CDMSCDMA

- Function: Sets a gate type for the CDMA filter analysis
- Presence of command and query: Command/Query
- IEEE488.1-1987 command mode
  - Command: CDMSMINI | CDMSNORM | CDMSWIDE | CDMSMAXI | CDMSCDMA
  - Response type: 0 | 1
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:CDMA:GATE:WINDow <type>
  - Parameter: <type> = {MINimum | NORMal | WIDE | MAXimum | CDMA}
  - Response type: MIN | NORM | WID | MAX | CDMA
- Description: Used to set a gate type for the CDMA filter analysis.

IEEE488.1-1987 command	IEEE488.2-1987 command parameter	Operation
CDMSMINI	MINimum	Minimum
CDMSNORM	NORMal	Normal
CDMSWIDE	WIDE	Wide
CDMSMAXI	MAXimum	Maximum
CDMSCDMA	CDMA	Optimum value of the CDMA filter

9. CALCulate[<chno>]:CDMA:PLINearity:STATe <bool> IEEE488.1-1987 command mode
CDMAPLIN<bool>

- Function: Turns the CDMA phase linearity analysis function ON or OFF
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:CDMA:PLINearity:STATe <bool>
  CDMAPLIN<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Used to turn the CDMA phase linearity analysis function ON or OFF.
  The analysis result is obtained using the "FETCh[<chno>]:PLINearity?"
  This function cannot be set at the same time as the Phase linearity function.

7.23 WANalysis Subsystem (Only Available for the R3754 Series)

1. CALCulate[<chno>]:WANalysis:FILTer:MAXimum? — IEEE488.1-1987 command mode: OUTPXFIL?

- Function: Executes the Filter analysis (MAX) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query: Query
- Command: CALCulate[<chno>]:WANalysis:FILTer:MAXimum?
  OUTPXFIL?
- Response type: <data 1>, <data 2>, <data 3>, <data 4>, <data 5>
  <data 6>, <data 7>, <data 8>, <data 9>, <data 10>,
  <data 11>, <data 12>, <data 13>, <data 14>, <data 15>

  <data 1> to <data 15> = <NR 3> (real number)
  The following 22-character fixed-length format is used:
  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description: Executes the Filter analysis (MAX) in the Direct analysis mode and outputs the analysis result. Executing the Query outputs the analysis result in the format shown above. The maximum (peak) value of the measuring trace is used for this analysis.

  The analysis results are shown below:

  <data 1>
  Insertion loss

  <data 2>
  Bandwidth at 3 dB

  <data 3>
  Center frequency of the bandwidth

  <data 4>
  Q: quality factor

  <data 5>
  Difference between the left cutoff frequency and the center frequency of the bandwidth specified at 3 dB.

  <data 6>
  Difference between the right cutoff frequency and the center frequency of the bandwidth specified at 3 dB.

  <data 7>
  Difference between the left cutoff frequency and the center frequency of the bandwidth specified at X dB.

  <data 8>
  Difference between the right cutoff frequency and the center frequency of the bandwidth specified at X dB.

<data 9>
Passband ripple value

<data 10>
Cutoff leve

<data 11>
Spurious level

<data 12>
First negative peak level on the left side of the maximum value.

<data 13>
Frequency of the first negative peak level on the left side of the maximum value.

<data 14>
First negative peak level on the right side of the maximum value.

<data 15>
Frequency of the first negative peak level on the right side of the maximum value.

The following 22-character fixed-length format is used:

SN.NNNNNNNNNNNNNNNNESNN
(S: +/-, N: 0 to 9, E: Exponential sign)

If a cutoff point for 3 dB is not found, the values for <data 1>through <data 15> will be +1.000000000000000E+37.

If a negative peak is not found, the values for <data 12>, <data 13>, <data 14>, <data 15>, will be +1.000000000000000+37.

2. CALCulate[<chno>]:WANalysis:FILTer:CFRequency? IEEE488.1-1987 command mode OUTPCFIL?

- Function — Executes the Filter analysis (CFRequency) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query — Query
- Command — CALCulate[<chno>]:WANalysis:FILTer:CFRequency?
  OUTPCFIL?
- Response type — <data 1>, <data 2>, <data 3>, <data 4>, <data 5>,
  <data 6>, <data 7>, <data 8>, <data 9>, <data 10>,
  <data 11>, <data 12>, <data 13>, <data 14>, <data 15>, <data 16>

  <data 1> to <data 16> = <NR 3> (real number)

  The following 22-character fixed-length format is used:

  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description — Executes the Filter analysis (CFRequency) in the Direct analysis mode and outputs the analysis result. Executing the Query outputs the analysis result in the format shown above. This analysis is based on the nominal frequency.

  The analysis results are shown below:

  <data 1>
  Insertion loss

  <data 2>
  Constant loss

  <data 3>
  Bandwidth at 3 dB

  <data 4>
  Center frequency of the bandwidth

  <data 5>
  Q: quality factor

  <data 6>
  Difference between the left cutoff frequency and the center frequency of the bandwidth specified at 3 dB.

  <data 7>
  Difference between the right cutoff frequency and the center frequency of the bandwidth specified at 3 dB.

  <data 8>
  Difference between the left cutoff frequency and the center frequency of the bandwidth specified at X dB.

  <data 9>
  Difference between the right cutoff frequency and the center frequency of the bandwidth specified at X dB.

<data 10>
Passband ripple value

<data 11>
Cutoff leve

<data 12>
Spurious level

<data 13>
First negative peak level on the left side of the maximum value.

<data 14>
Frequency of the first negative peak level on the left side of the maximum value.

<data 15>
First negative peak level on the right side of the maximum value.

<data 16>
Frequency of the first negative peak level on the right side of the maximum value.

The data format for <data 1> to <data 16> uses the following 22-character fixed-length format:

SN.NNNNNNNNNNNNNNNNESNN
(S: +/-, N: 0 to 9, E: Exponential sign)

If the cutoff point at 3 dB is not found, the values for <data 1>through <data 16> will be +1.000000000000000E+38.

If a negative peak is not found, the values for <data 12>, <data 13>, <data 14>, <data 15>, will be +1.000000000000000+38.

3. | CALCulate[<chno>]:WANalysis:RESonantor:ZPHase? | IEEE488.1-1987 command mode
OUTPRESO? |
|---|---|

- Function: Executes the Filter analysis (0 PHASE) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query: Query
- Command: CALCulate[<chno>]:WANalysis:RESonantor:ZPHase?
  OUTPRESO?
- Response type: <data 1>, <data 2>, <data 3>, <data 4>
  <data 1> to <data 4> = <NR 3> (real number)
  The following 22-character fixed-length format is used:
  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description: Executes the Resonator analysis (0 PHASE) in the Direct analysis mode and outputs the analysis result. The analysis searches for the phase 0 (0 PHASE) point starting from the left side measurement range (low frequency side). The first point is used as the resonant point and the second is used as the anti-resonance point.
  The analysis results are shown below:
  <data 1>
  Resonance impedance
  <data 2>
  Resonance frequency
  <data 3>
  Anti-resonance impedance
  <data 4>
  Anti-resonance frequency

  The data format for <data 1> to <data 4> uses the following 22-character fixed-length format.
  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
  Invalid data will have a value of +1.000000000000000E+38.

4.	CALCulate[<chno>]:WANalysis:RESonantor:RIPPle?	IEEE488.1-1987 command mode OUTPRESR?

- Function — Executes the Resonator analysis (RIPPLE) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query — Query
- Command — CALCulate[<chno>]:WANalysis:RESonantor:RIPPle?
  OUTPRESR?
- Response type — <data 1>, <data 2>, <data 3>, <data 4>, <data 5>, <data 6>, <data 7>

  <data 1> to <data 7> = <NR 3> (real number)

  The following 22-character fixed-length format is used:

  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description — Executes the Resonator analysis (RIPPLE) in the Direct analysis mode and outputs the analysis result. The analysis searches for the phase 0 (0 PHASE) point beginning from the left side measurement range (low frequency side). The first found out point is the resonance point and the second found out point is the anti-resonance point.

  The analysis results are shown below:

  <data 1>
  Resonance impedance

  <data 2>
  Resonance frequency

  <data 3>
  Anti-resonance impedance

  <data 4>
  Anti-resonance frequency

  <data 5>
  The maximum ripple value on the left side (low frequency side) of the resonance point.

  <data 6>
  The maximum ripple value between the resonance point and the anti-resonance point.

  <data 7>
  The maximum ripple value on the right side (high frequency side) of the resonance point.

  The data format for <data 1> to <data 7> uses the following 22-character fixed-length format.

  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)

Invalid data will have a value of +1.00000000000000E+38.

5. CALCulate[<chno>]:WANalysis:RESonantor:MMINimum? IEEE488.1-1987 command mode OUTPRESF?

- Function: Executes the Resonator analysis (A dB, B dB) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query: Query
- Command: CALCulate[<chno>]:WANalysis:RESonantor:MMINimum?
  OUTPRESF?
- Response type: <data 1>, <data 2>, <data 3>, <data 4>, <data 5>, <data 6>
  <data 1> to <data 6> = <NR 3> (real number)
  The following 22-character fixed-length format is used:
  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description: Executes the Resonator analysis (A dB, B dB) in the Direct analysis mode and outputs the analysis result. The analysis searches for the maximum peak and the minimum negative peak within the measurement range.

  The analysis results are shown below:

  <data 1>
  Inter mediate frequency for the frequencies obtained from <data 3>, <data 4>

  <data 2>
  Inter mediate frequency for the frequencies obtained from <data 5>, <data 6>

  <data 3>
  Low frequency side frequency at the point where the value is A dB lower than the maximum peak

  <data 4>
  High frequency side frequency at the point where the value is A dB lower than the maximum peak

  <data 5>
  Low frequency side frequency at the point where the value is B dB higher than the minimum negative peak

  <data 6>
  High frequency side frequency at the point where the value is B dB higher than the minimum negative peak

  The data format for <data 1> to <data 6> uses the following 22-character fixed-length format.

  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)

Invalid data will have a value of +1.000000000000000E+38.

6.	CALCulate[<chno>]:WANalysis:EQUivalent:DEVice4?	IEEE488.1-1987 command mode EQUCPARS4?

- Function — Executes the Equivalent circuit analysis (four-element circuit) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query — Query
- Command — CALCulate[<chno>]:WANalysis:EQUivalent:DEVice4?
  EQUCPARS4?
- Response type — <data 1>, <data 2>, <data 3>, <data 4>, <data 5>, <data 6>, <data 7>, <data 8>, <data 9>

  <data 1> to <data 9> = <NR 3> (real number)

  The following 22-character fixed-length format is used:

  SN.NNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description — Executes the Equivalent circuit analysis (four-element circuit) in the Direct analysis mode and outputs the analysis result. The analysis searches for the maximum peak and the minimum negative peak within the measurement range.

  The analysis results are shown below:

  <data 1>
  Parallel capacitance

  <data 2>
  Motional capacitance

  <data 3>
  Motional inductance

  <data 4>
  Motional resistance

  <data 5>
  Motional (series) resonance frequency

  <data 6>
  Anti-resonance frequency

  <data 7>
  Resonance frequency

  <data 8>
  Frequency at the point where conductance is one-half the maximum.

  <data 9>
  Frequency at the point where conductance is one-half the maximum (however, <data 8> < <data 9>)

  The data format for <data 1> to <data 9> uses the following 22-

character fixed-length format.

SN.NNNNNNNNNNNNNNNESNN

(S: +/-, N: 0 to 9, E: Exponential sign)

Invalid data will have a value of +1.00000000000000E+38.

7. CALCulate[<chno>]:WANalysis:EQUivalent:DEVice6? IEEE488.1-1987 command mode EQUCPARA?

- Function: Executes the Equivalent circuit analysis (six-element circuit) in the Direct analysis mode and outputs the analysis result.
- Presence of command and query: Query
- Command: CALCulate[<chno>]:WANalysis:EQUivalent:DEVice6?
  EQUCPARA?
- Response type: <data 1>, <data 2>, <data 3>, <data 4>, <data 5>, <data 6>, <data 7>, <data 8>, <data 9>, <data 10>, <data 11>

  <data 1> to <data 11> = <NR 3> (real number)

  The following 22-character fixed-length format is used:

  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-, N: 0 to 9, E: Exponential sign)
- Description: Executes the Equivalent circuit analysis (six-element circuit) in the Direct analysis mode and outputs the analysis result.

  The analysis results are shown below:

  <data 1>
  Parallel capacitance

  <data 2>
  Motional capacitance

  <data 3>
  Motional inductance

  <data 4>
  Motional resistance

  <data 5>
  Electrode conductance

  <data 6>
  Electrode resistance

  <data 7>
  Motional (series) resonance frequency

  <data 8>
  Anti-resonance frequency

  <data 9>
  Resonance frequency

  <data 10>
  Frequency at the point where conductance is one-half the maximum

  <data 11>
  Frequency at the point where conductance is one-half the maximum (however, <data 10> < <data 11>)

The data format for <data 1> to <data 11> uses the following 22-character fixed-length format.

SN.NNNNNNNNNNNNNNNESNN
(S: +/-, N: 0 to 9, E: Exponential sign)

Invalid data will have a value of +1.000000000000000E+38.

8. | CALCulate[<chno>]:WANalysis:RIPPle{:DX | :DY} | IEEE488.1-1987 command mode
THR{X | Y} |
|---|---|

- Function — Sets the ripple search detection sensitivity for the Resonance analysis (RIPPLE) in the Direct analysis mode.
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:WANalysis:RIPPle{:DX | :DY}<real>
  THR{X | Y}<real>
- Parameter — <real> = Set value
- Response type — <NR 3> Real number: Set value
- Description — Sets the ripple search detection sensitivity for the Resonator analysis (RIPPLE) in the Direct analysis mode.

  If the detectivity is set to ΔY/ΔX, first obtain the a point of which the gradient of the waveform (Y/X) is ΔY/ΔX or more, then obtain the d point of which the reverse gradient is ΔY/ΔX or more. And finally obtain a maximum value between the a point and the d point as the local maximum peak.

  Obtain a minimum value in the same way of obtaining a maximum value with the reverse gradient.

  DX: Sets the ΔX (ratio (%) in the measurement range).

  DY: Sets the ΔY (level is directly input).

9. | CALCulate[<chno>]:WANalysis:FILTer:WIDth | IEEE488.1-1987 command mode
WAXDB |
|---|---|

- Function — Sets the analysis width for the Filter analysis in the Direct analysis mode.
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:WANalysis:FILTer:WIDth<real>
  WAXDB<real>
- Parameter — <real> = Analysis width (pass bandwidth)
- Response type — <NR 3> Real number: Analysis width (pass bandwidth)
- Description — Sets the Analysis width (pass bandwidth) for the Filter analysis (MAXimum/NFRequency) in the Direct analysis mode.

10. CALCulate[<chno>]:WANalysis:FILTer:DIFFerence — IEEE488.1-1987 command mode WAD

- Function: Sets the difference from the maximum value for the Filter analysis in the Direct analysis mode.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:WANalysis:FILTer:DIFFerence<real>
  WAD<real>
- Parameter: <real> = Difference from the maximum value
- Response type: <NR 3> Real number: Difference from the maximum value
- Description: Specifies the difference from the maximum value for the Filter analysis in the Direct analysis mode.
  When searching for the negative peak, the Filter analysis (MAXimum/NFRequency) searches for the negative peak equal to (the maximum value-the set value) or less.

11. CALCulate[<chno>]:WANalysis:FILTer:RERequency — IEEE488.1-1987 command mode WAF1

- Function: Sets the cutoff level analysis range for the Filter analysis in the Direct analysis mode.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:WANalysis:FILTer:RERequency<real>
  WAF1<real>
- Parameter: <real> = Cutoff level analysis range
- Response type: <NR 3> Real number: Cutoff level analysis range
- Description: Sets the cutoff level analysis range (frequency) for the Filter analysis in the Direct analysis mode.
  The Filter analysis (MAXimum/NFRequency) first obtains the maximum value from the set frequency to the left end of the analysis range. The difference between the insertion loss and the obtained maximum value is output as a cutoff level.

12. CALCulate[<chno>]:WANalysis:FILTer:SFRequency IEEE488.1-1987 command mode WAF2

- Function: Sets the spurious level analysis range for the Filter analysis in the Direct analysis mode.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:WANalysis:FILTer:SFRequency<real>
  WAF2<real>
- Parameter: <real> = Spurious level analysis range
- Response type: <NR 3>Real number: Spurious level analysis range
- Description: Sets the spurious level analysis range (frequency) for the Filter analysis in the Direct analysis mode.
  The Filter analysis (MAXimum/NFRequency) first obtains the maximum value from the set frequency to the right end of the analysis range. The difference between the insertion loss and the obtained maximum value is output as a spurious level.

13. CALCulate[<chno>]:WANalysis:FILTer:RESonator:BELow IEEE488.1-1987 command mode WAXA

- Function: Sets the Down width from the maximum peak value for the Resonator analysis (A dB, B dB) in the Direct analysis mode.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:WANalysis:FILTer:RESonator:
  BELow<real>
  WAXA<real>
- Parameter: <real> = Down width from the maximum peak value
- Response type: <NR 3> Real number: Down width from the maximum peak value
- Description: Sets the Down width form the maximum peak value for the Resonator analysis (A dB, B dB) in the Direct analysis mode.

14. CALCulate[<chno>]:WANalysis:FILTer:RESonator:ABOVe — IEEE488.1-1987 command mode WAXB

• Function	Sets the up width from the minimum negative peak value for the Resonator analysis (A dB, B dB) in the Direct analysis mode.
• Presence of command and query	Command/Query
• Command	CALCulate[<chno>]:WANalysis:FILTer:RESonator: ABOVe<real> WAXB<real>
• Parameter	<real> = Up width from the minimum negative peak value
• Response type	<NR 3> Real number: Up width from the minimum negative peak value
• Description	Sets the UP width form the minimum negative peak value for the Resonator analysis (A dB, B dB) in the Direct analysis mode.

15. CALCulate[<chno>]:WANalysis:FILTer:NFRequency — IEEE488.1-1987 command mode WAFC

• Function	Sets the nominal frequency in the direct or filter analysis mode.
• Presence of command and query	Command/Query
• Command	CALCulate[<chno>]:WANalysis:FILTer:NFRequency<real> WAFC<real>
• Parameter	<real> = Nominal frequency
• Response type	<NR 3> Real number: Nominal frequency
• Description	Sets the nominal frequency in the direct or filter analysis mode.

16.	CALCulate[<chno>]:WANalysis:RANGe:PARTial	IEEE488.1-1987 command mode ANARPART

- Function — Turns the partial definition in the direct analysis mode ON or OFF.
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:WANalysis:RANGe:PARTial<bool>
  ANARPART<bool>
- Parameter — <bool>
- Response type — 0 | 1
- Description — Turns the section definition in the direct analysis mode ON or OFF.

  When this function is set to ON, a direct analysis is executed for the section specified by the partial search.

  When set to OFF, the direct analysis is executed for the full measurement range.

  For the section definition, execute the MARKer[<chno>]:SEARch:PARTial:SRANge command (refer to the command 24 in the Section 7.19).

7.24 DLDependency Subsystem (Only Available for the R3754 Series OPT71)

NOTE: The following commands can be used only when Option 71 is installed.

1. CALCulate[<chno>]:DLDependency:FORMat — IEEE488.1-1987 command mode: DLCI | DLDF | DLCD

- Function: Selects the DLD display format.
- Presence of command and query: Command/Query
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:DLDependency:FORMat <type>
  - Parameter: <type> = {CIMPedance | DFRequency | BOTH}
  - Response type: CIMP | DFR | BOTH
- IEEE488.1-1987 command mode
  - Command: DLCI | DLDF | DLCD
  - Response type: 0 | 1
- Description: Selects the DLD display format.

IEEE488.1-1987 command	IEEE488.2-1987 command	Display format
DLCI	CIMPedance	Displays the crystal impedance.
DLDF	DFRequency	Displays ΔF.
DLCD	BOTH	Displays both crystal impedance and ΔF.

ΔF indicates the difference between the set DLD center frequency and measured resonance frequency.
The unit of ΔF is specified by CALCulate[<chno>]:DLDependency:FORMat:UNIT.

2. CALCulate[<chno>]:DLDependency:FORMat:UNIT IEEE488.1-1987 command mode
DLHZ | DLPPM

- Function Selects the unit ΔF.
- Presence of command and query Command/Query
- IEEE488.2-1987 command mode
  - Command CALCulate[<chno>]:DLDependency:FORMat:UNIT <type>
  - Parameter <type> = {HertZ | PPM}
  - Response type HZ | PPM
- IEEE488.1-1987 command mode
  - Command DLHZ | DLPPM
  - Response type 0 | 1
- Description Selects the unit of ΔF.

IEEE488.1-1987 command	IEEE488.2-1987 command	Unit
DLHZ	HertZ	Hz
DLPPM	PPM	ppm

ΔF will be a relative value to the DLD center frequency.

3. DISPlay:DLDependency[<chno>]:LIST IEEE488.1-1987 command mode
DLLIST

- Function Sets the display of measurement result lists to on or off.
- Presence of command and query Command/Query
- Command DISPlay:DLDependency[<chno>]:LIST <bool>
  DLLIST<bool>
- Parameter <bool>
- Response type 0 | 1
- Description Sets the display of measurement result lists to on or off.
  When this is on, the lists of levels, the first waveform data, and the second waveform data are displayed.
  When the DLD function is turned OFF, only levels are displayed.

4. [SENSe:]DLDependency[<chno>]:ATT:AUTO IEEE488.1-1987 command mode
DLATTAUTO

- Function: Performs the automatic control of the input attenuator and input pre-amplifier.
- Presence of command and query: Command/Query
- Command: [SENSe:]DLDependency[<chno>]:ATT:AUTO <bool>
  DLATTAUTO<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Turns the automatic control of the input attenuator(ATT) and input pre-amplifier(AMP) on or off.
  When on, the optimum combination of ATT and AMP is automatically selected for each level.

5. [SENSe:]DLDependency[<chno>]:BANDwidth[:RESolution] IEEE488.1-1987 command mode
DLRBW

- Function: Sets the resolution bandwidth of the DLD measurement.
- Presence of command and query: Command/Query
- Command: [SENSe:]DLDependency[<chno>]
  :BANDwidth[:RESolution] <real>
  DLRBW<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the resolution bandwidth(RBW) in the DLD measurement.

6. [SENSe:]DLDependency[<chno>]:BANDwidth[:RESolution]:AUTO
IEEE488.1-1987 command mode
DLRBWAUTO

- Function: Sets the resolution bandwidth of the DLD measurement automatically.
- Presence of command and query: Command/Query
- Command: [SENSe:]DLDependency[<chno>]:BANDwidth[:RESolution]:AUTO <bool>
  DLRBWAUTO<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Turns the automatic setting of the resolution bandwidth(RBW) in the DLD measurement on or off.
  When this is on, assuming the RBW value set by [SENSe:]DLDependency[<chno>]:BANDwidth[:RESolution] is the maximum value, the RBW value is automatically turned down if the level goes down.
  When OFF is set, the RBW value set by [SENSe:]DLDependency[<chno>]:BANDwidth[:RESolution] is fixed.

7. [SOURce:]DLDependency[<chno>]:FREQuency:CENTer
IEEE488.1-1987 command mode
DLCENTERF

- Function: Sets the DLD center frequency.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:FREQuency:CENTer <real>
  DLCENTERF<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the DLD center frequency.
  The value set is the DLD sweep center frequency and a base frequency (nominal frequency) for the ΔF calculation as well.
  If nothing has been set since the power was turned ON, this value becomes a center frequency for frequency setting conditions

8. [SOURce:]DLDependency[<chno>]:FREQuency:MODE IEEE488.1-1987 command mode
DLZPH | DLENT

- Function: Sets the DLD measurement center frequency.
- Presence of command and query: Command/Query
- IEEE488.2-1987 command mode
  - Command: [SOURce:]DLDependency[<chno>]:FREQuency:MODE <type>
  - Parameter: <type> = {ZPHase | ENTRy}
  - Response type: ZPH | ENTR
- IEEE488.1-1987 command mode
  - Command: DLZPH | DLENT
  - Response type: 0 | 1
- Description: Selects a method of determining the DLD measurement center frequency.

IEEE488.1-1987 command	IEEE488.2-1987 command	Display format
DLZPH	ZPHase	Turning DLD ON searches for phase 0 point and sets its frequency for the value of [SOURce:]DLDependency [<chno>]:FREQuency:CENTer.
DLENT	ENTRy	Even when the DLD is turned ON, [SOURce:]DLDependency [<chno>]:FREQuency:CENTer remains as the current set value.

In the following case, the value of [SOURce:]DLDependency [<chno>]:FREQuency:CENTer is also the DLD measurement center frequency.

9. [SOURce:]DLDependency[<chno>]:FREQuency:SPAN IEEE488.1-1987 command mode
DLSPANF

- Function: Sets the DLD sweep span.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:FREQuency:SPAN <real>
  DLSPANF<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the sweep span to measure drive levels with RLA method. Specifies, for each level, a ppm value which is a ratio of the frequency span (of two-point sweep) to the center frequency.

10. [SOURce:]DLDependency[<chno>]:LEVel:CIMPedance IEEE488.1-1987 command mode
DLIMP

- Function: Sets the typical value of the crystal impedance.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:LEVel:CIMPedance <real>
  DLIMP<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the typical value of the crystal impedance.
  It can be set within the range of 0.1Ω to 1kΩ
  This value is used for conversions between W←→dBm.

11. [SOURce:]DLDependency[<chno>]:LEVel:NUMBer IEEE488.1-1987 command mode DLNUM

- Function: Sets the number of levels.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:LEVel:NUMBer <int>
  DLNUM<int>
- Parameter: <int>
- Response type: NR1(Integer)
- Description: Sets the number of levels.
  When the setting of [SOURce:]DLDependency[<chno>]:SWEep:TYPE is UADown, it can be set within the range of 3 to 300.
  When the setting of [SOURce:]DLDependency[<chno>]:SWEep:TYPE is UODown, it can be set within the range of 3 to 600.

12. [SOURce:]DLDependency[<chno>]:LEVel:STARt IEEE488.1-1987 command mode DLSTARTL

- Function: Sets the DLD start level.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:LEVel:STARt <real>
  DLSTARTL<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the DLD start level.
  Sets the value according to the unit (dBm or W) specified by [SOURce:]DLDependency[<chno>]:LEVel:UNIT.
  When the start level is greater than stop level, the level decreases.
  When the start level is less than the stop level, the level increases.

13. [SOURce:]DLDependency[<chno>]:LEVel:STOP   IEEE488.1-1987 command mode
DLSTOP

- Function   Sets the DLD stop level.
- Presence of command and query   Command/Query
- Command   [SOURce:]DLDependency[<chno>]:LEVel:STOP <real>
  DLSTOP<real>
- Parameter   <real>
- Response type   NR3(real number)
- Description   Sets the DLD stop level.
  Sets the value according to the unit (dBm or W) specified by [SOURce:]DLDependency[<chno>]:LEVel:UNIT.
  When the sweep type is UP & DOWN, the level at the midpoint for [SOURce:]DLDependency[<chno>]:SWEep:TYPE UAD is set.

14. [SOURce:]DLDependency[<chno>]:LEVel:UNIT   IEEE488.1-1987 command mode
DLW | DLDBM

- Function   Selects the unit of level.
- Presence of command and query   Command/Query
- IEEE488.2-1987 command mode
  - Command   [SOURce:]DLDependency[<chno>]:LEVel:UNIT <type>
  - Parameter   <type> = {Watt | DBM}
  - Response type   W | DBM
- IEEE488.1-1987 command mode
  - Command   DLW | DLDBM
  - Response type   0 | 1
- Description   Selects the unit of level.

IEEE488.1-1987 command	IEEE488.2-1987 command	Display format
DLW	Watt	W
DLDBM	DBM	dBm

The level axis is an even-interval scale when dBm is selected and a log scale when W is selected.

15. [SOURce:]DLDependency[<chno>]:SEGMent<n>:CLEar | IEEE488.1-1987 command mode DLSEGCS

- Function — Deletes the specified segment for the DLD user level.
- Presence of command and query — Command
- Command — [SOURce:]DLDependency[<chno>]:SEGMent<n>:CLEar
  DLSEGCS
- Description — Deletes the specified segment for the DLD user level.
  In the IEEE488.2-1987 mode, the segment number as a header parameter <n> is specified.
  In the IEEE488.1-1987 mode, the segment number is specified using the DLSEG command in advance.

16. [SOURce:]DLDependency[<chno>]:SEGMent<n>:CLEar:ALL | IEEE488.1-1987 command mode DLSEGCL

- Function — Erases all segments for the DLD user levels.
- Presence of command and query — Command
- Command — [SOURce:]DLDependency[<chno>]:SEGMent<n>:CLEar:ALL
  DLSEGCL
- Description — Erases the contents of all segments for the DLD user levels.
  Specifying segment numbers is disabled.

17. [SOURce:]DLDependency[<chno>]:SEGMent<n>:LEVel   IEEE488.1-1987 command mode DLSEGL

- Function: Sets the segment level for the DLD user level.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:SEGMent<n>:LEVel <real>
  DLSEGL<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the level per segment for the DLD user level.
  The value is set according to the unit (dBm or W) specified by [SOURce:]DLDependency[<chno>]:LEVel:UNIT.
  In the IEEE488.2-1987 mode, the segment number as a header parameter <n> is specified.
  In the IEEE488.1-1987 mode, the segment number is specified using the DLSEG command in advance.

18. [SOURce:]DLDependency[<chno>]:SEGMent<n>:SETTling   IEEE488.1-1987 command mode DLSEGT

- Function: Sets the segment settling time for the DLD user level.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:
  SEGMent<n>:SETTling <real>
  DLSEGT<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the settling time per segment for the DLD user level.
  In the IEEE488.2-1987 mode, the segment number as a header parameter <n> is specified.
  In the IEEE488.1-1987 mode, the segment number is specified using the DLSEG command in advance.

19. [SOURce:]DLDependency[<chno>]:SETTling   IEEE488.1-1987 command mode
DLSETLT

- Function: Sets the DLD settling time.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:SETTling <real>
  DLSETLT<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Sets the measurement settling time per point.
  To enable the set settling time.
  [SOURce:]DLDependency[<chno>]:SETTling:STATe must be turned ON.

20. [SOURce:]DLDependency[<chno>]:SETTling:STATe   IEEE488.1-1987 command mode
DLSETL

- Function: Turns the DLD settling time on or off.
- Presence of command and query: Command/Query
- Command: [SOURce:]DLDependency[<chno>]:SETTling:STATe <bool>
  DLSETL<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Turns the measurement settling time per point on or off.
  When this is on, the settling time specified by [SOURce:]DLDependency[<chno>]:SETTling is enabled.
  However, the settling time set by the user level segment is enabled when the setting of [SOURce:]DLDependency[<chno>]:SWEep:TYPE is USER.

21. [SOURce:]DLDependency[<chno>]:STATe　　IEEE488.1-1987 command mode
DLD

- Function　　Turns the DLD function on or off.
- Presence of command and query　　Command/Query
- Command　　[SOURce:]DLDependency[<chno>]:STATe <bool>
  DLD<bool>
- Parameter　　<bool>
- Response type　　0 | 1
- Description　　Turns the DLD function on or off.
  See the following cautions when DLD is turned on.

CAUTION:

1. ***All conditions shown below must be met before using DLD:***
   - ***Calibration for either "Normalize" or TRANS-FULL-CAL must be performed.***
   - ***The linear sweep type must be selected when performing the calibration in Step1.***
   - ***{INTERPOLATE} must be set to {ON}.***
   - ***If {DLD CENTER} is {ENT}, the value in {CENTER ENTRY} must be within the frequency range used when the calibration is performed.***
   - ***When {DLD CENTER} is {ZERO}, search for phase 0° must be successful.***
2. ***The following conditions apply when DLD is ON. Failure to follow these conditions will result in an error:***
   - ***{COUPLE CH ON} is prohibited (COUPLE is turned off as soon as the DLD is turned on).***
   - ***{CORRECT OFF} is prohibited.***
   - ***{INTERPOLATE OFF} is prohibited.***
   - ***Calibration data cannot be obtained again.***
   - ***The smoothing function must be disable.***
   - ***Parameter conversion is fixed to {Z(TRANS)}.***
   - ***Trace operation functions (such as DATA divided by MEM) are prohibited.***
   - ***No standard measurement formats are allowed (such as LOGMAG and PHASE).***
   - ***DLD OFF must be used when changing the sweep type.***
   - ***Marker analysis functions (such as filter analysis) are partially prohibited.***

22. [SOURce:]DLDependency[<chno>]:SWEep:TYPE   IEEE488.1-1987 command mode
DLAND | DLOR | DLUSER

- Function   Selects the level sweep method.
- Presence of command and query   Command/Query
- IEEE488.2-1987 command mode
  - Command   [SOURce:]DLDependency[<chno>]:SWEep:TYPE <type>
  - Parameter   <type> = {UADown | UODown | USER}
  - Response type   UAD | UOD | USER
- IEEE488.1-1987 command mode
  - Command   DLAND | DLOR | DLUSER
  - Response type   0 | 1
- Description   Selects the level sweep method.

IEEE488.1-1987 command	IEEE488.2-1987 command	Operation
DLAND	UADown	UP & DOWN Performs a level sweep from the start level to the stop level while changing the level by (stop level -start level) / (number of levels -1) from the stop level to the start level while changing the level by (start level -stop level) / (number of levels -1), and stops sweeping at the start level.
DLOR	UODown	UP or DOWN Performs a level sweep from the start level while changing the level by (stop level -start level) / (number of levels -1) and stops sweeping at the stop level.
DLUSER	USER	Sweeps according to the user specified level.

TRANsform Subsystem (Only Available for the R3754 Series OPT70)

7.25 TRANsform Subsystem (Only Available for the R3754 Series OPT70)

NOTE: The following commands can be used only when Option 70 is installed.

1. CALCulate[<chno>]:TRANsform:TIME:CENTer <real> — IEEE488.1-1987 command mode: CENTERT<real>

- Function: Sets a center time.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:TRANsform:TIME:CENTer <real>
  CENTERT<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Used to set a center time for the time domain display.

2. CALCulate[<chno>]:TRANsform:TIME:SPAN? — IEEE488.1-1987 command mode: SPANT?

- Function: Outputs a time span.
- Presence of command and query: Query
- Command: CALCulate[<chno>]:TRANsform:TIME:SPAN?
  SPANT?
- Parameter: <real>
- Response type: NR3(real number)
  22-characters fixed-length format
  SN.NNNNNNNNNNNNNNNNESNN
  (S: +/-., N: 0 to 9, E: Exponential sign)
- Description: Used to set a time span for the time domain display.
- Caution: This command is only available when Option 70 has been installed.

3. CALCulate[<chno>]:TRANsform:TIME:STARt <real> IEEE488.1-1987 command mode
STARTT<real>

- Function: Sets a start time.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:TRANsform:TIME:STARt <real>
  STARTT<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Used to set a start time for the time domain display.
- Caution: This command is only available when Option 70 has been installed.

4. CALCulate[<chno>]:TRANsform:TIME:STATe <bool> IEEE488.1-1987 command mode
TIMDTRAN<bool>

- Function: Turns the time domain display ON or OFF.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:TRANsform:TIME:STATe <bool>
  TIMDTRAN<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Selects whether or not the time domain is displayed (if it's set to OFF, the frequency domain is displayed instead).
- Caution: This command is only available when Option 70 has been installed.

5. CALCulate[<chno>]:TRANsform:TIME:STIMulus{IMPulse | STEP}
IEEE488.1-1987 command mode
BANDPASS | LOWPIMPU | LOWPSTEP

- Function: Selects an input type when transforming in the time domain.
- Presence of command and query: Command/Query
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:TRANsform:TIME:STIMulus <type>
  - Parameter: <type> = {IMPulse | STEP}
  - Response type: IMP | STEP
- IEEE488.1-1987 command mode
  - Command: BANDPASS | LOWPIMPU | LOWPSTEP
  - Parameter: <bool>
  - Response type: 0 | 1
- Description: Used to set an input type for transformations between the frequency domain and the time domain.
  In the IEEE488.2-1987 mode, set the input type using the command shown below.
  CALCulate[<chno>]:TRANsform:TIME:TYPE{BPASs | LPASs}

IEEE488.2-1987 command mode

CALC:TRAN: TIME:TYPE	CALC:TRAN: TIME:STIM	Transformation mode
BPASs	(Not affected)	Bandpass
LPASs	IMPulse	Low pass impulse
LPASs	STEP	Low pass step

IEEE488.1-1987 command mode

Command	Transformation mode
BANDPASS	Bandpass
LOWPIMPU	Low pass impulse
LOWPSTEP	Low pass step

- Caution: This command is only available when Option 70 has been installed.

6. CALCulate[<chno>]:TRANsform:TIME:STOP <real> IEEE488.1-1987 command mode
STOPT<real>

- Function: Sets a stop time.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:TRANsform:TIME:STOP <real>
  STOPT<real>
- Parameter: <real>
- Response type: NR3(real number)
- Description: Used to set a stop time in the time domain display.
- Caution: This command is only available when Option 70 has been installed.

7. CALCulate[<chno>]:TRANsform:TIME:TYPE{BPASs | LPASs}
IEEE488.1-1987 command mode
BANDPASS | LOWPIMPU | LOWPSTEP

- Function: Selects a transformation mode for the time domain.
- Presence of command and query: Command/Query
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:TRANsform:TIME:TYPE <type>
  - Parameter: <type> = {BPASs | LPASs}
  - Response type: BPAS | LPAS
- IEEE488.1-1987 command mode
  - Command: BANDPASS | LOWPIMPU | LOWPSTEP
  - Response type: 0 | 1
- Description: Used to set a transformation mode to be used for the frequency domain and the time domain.
  In the IEEE488.2-1987 command mode, set the transformation mode using the command shown below:
  CALCulate[<chno>]:TRANsform:TIME:STIMulus{IMPulse | STEP}

IEEE488.2-1987 command mode

CALC:TRAN: TIME:TYPE	CALC:TRAN: TIME:STIM	Transformation mode
BPASs	(Not affected)	Bandpass
LPASs	IMPulse	Low pass impulse
LPASs	STEP	Low pass step

IEEE488.1-1987 command mode

Command	Transformation mode
BANDPASS	Bandpass
LOWPIMPU	Low pass impulse
LOWPSTEP	Low pass step

- Caution: This command is only available when Option 70 has been installed.

8. CALCulate[<chno>]:TRANsform:TIME:WINDow{MINimum | NORMal | MAXimum}
IEEE488.1-1987 command mode
WINDMINI | WINDNORM | WINDMAXI

- Function: Sets a window type.
- Presence of command and query: Command/Query
- IEEE488.2-1987 command mode
  - Command: CALCulate[<chno>]:TRANsform:TIME:WINDow <type>
  - Parameter: <type> = {MINimum | NORMal | MAXimum}
  - Response type: MIN | NORM | MAX
- IEEE488.1-1987 command mode
  - Command: WINDMINI | WINDNORM | WINDMAXI
  - Response type: 0 | 1
- Description: Used to set a window type for the time domain display.

Command parameter	Operation
MINimum	Minimum
NORMal	Normal
MAXimum	Maximum

- Caution: This command is only available when Option 70 has been installed.

7.26 GATE Subsystem (Only Available for the R3754 Series OPT70)

NOTE: The following commands can be used only when Option 70 is installed.

1. CALCulate[<chno>]:FILTer:GATE:TIME:CENTer <real> — IEEE488.1-1987 command mode GATECENT<real>

- Function — Sets a center time for the gate.
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:FILTer:GATE:TIME:CENTer <real>
  GATECENT<real>
- Parameter — <real>
- Response type — NR3(real number)
- Description — Used to set a center time for the gate.

2. CALCulate[<chno>]:FILTer:GATE:TIME:SPAN <real> — IEEE488.1-1987 command mode GATESPAN<real>

- Function — Sets a time span for the gate.
- Presence of command and query — Command/Query
- Command — CALCulate[<chno>]:FILTer:GATE:TIME:SPAN <real>
  GATESPAN<real>
- Parameter — <real>
- Response type — NR3(real number)
- Description — Used to set a time span for the gate.
- Caution — This command is only available when Option 70 has been installed.

3. CALCulate[<chno>]:FILTer:GATE:TIME:STATe <bool> IEEE488.1-1987 command mode GATE<bool>

- Function: Turns the gate function ON or OFF
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:FILTer:GATE:TIME:STATe <bool>
  GATE<bool>
- Parameter: <bool>
- Response type: 0 | 1
- Description: Used to turn the gate function ON or OFF.
- Caution: The CDMA filter analysis gate function. (CALC:GATE:CDMA:STAT) is automatically OFF when the gate function is ON.
  This command is only available when Option 70 has been installed.

4. CALCulate[<chno>]:FILTer:GATE:TIME:STARt <real> IEEE488.1-1987 command mode GATESTAR<real>

- Function: Sets a gate start time.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:FILTer:GATE:TIME:STARt <real>
  GATESTAR<real>
- Parameter: <real>
- Response type: NR3 (real number)
- Description: Used to set a gate start time.
- Caution: This command is only available when Option 70 has been installed.

5. CALCulate[<chno>]:FILTer:GATE:TIME:STOP <real> IEEE488.1-1987 command mode
GATESTOP<real>

- Function: Sets a gate stop time.
- Presence of command and query: Command/Query
- Command: CALCulate[<chno>]:FILTer:GATE:TIME:STOP <real>
  GATESTOP<real>
- Parameter: <real>
- Response type: NR3 (real number)
- Description: Used to set a gate stop time.
- Caution: This command is only available when Option 70 has been installed.

6. CALCulate[<chno>]:FILTer:GATE:TIME:WINDow{MINimum | NORMal | WIDE | MAXimum}
IEEE488.1-1987 command mode
GATSMINI | GATSNORM | GATSWIDE | GATSMAXI

- Function — Sets a gate type.
- Presence of command and query — Command/Query
- IEEE488.2-1987 command mode
  - Command — CALCulate[<chno>]:FILTer:GATE:TIME:WINDow <type>
  - Parameter — <type> = {MINimum | NORMal | WIDE | MAXimum}
  - Response type — MIN | NORM | WIDE | MAX
- IEEE488.1-1987 command mode
  - Command — GATSMINI | GATSNORM | GATSWIDE | GATSMAXI
  - Response type — 0 | 1
- Description — Used to select a gate type.

IEEE488.1-1987 command	IEEE488.2-1987 command	Operation
GATSMINI	MINimum	Minimum
GATSNORM	NORMal	Normal
GATSWIDE	WIDE	Wide
GATSMAXI	MAXimum	Maximum

- Caution — This command is only available when Option 70 has been installed.

APPENDIX

A.1 List of Command

A.1.1 Common Commands

*CLS

*DDT <blk>
*DMC <str>,<blk>

*EMC <num>
*ESE <num>
*ESR?

*GMC? <name>

*IDN?

*LMC?

*OPC

*PCB <primary>[,<secondary>]
*PMC

*RCL{<num> | POFF}
*RST

*SAV <num>
*SRE <num>
*STB?

*TRG
*TST?

*WAI

A.1.2 IEEE488.2-1987 Commands

ABORt

CALCulate[chno]:FORMat{MLOGarithmic | PHASe | GDELay | POLar | MLINear | SWR | REAL | IMAGinaly |UPHase | SCHart | ISCHart | MLIPhase | MLOPhase | MLODelay}
CALCulate[chno]:GDAPerture:APERture <real>
CALCulate[chno]:MATH[:EXPRession]:NAME{NONE | DDM | DMM | DAM | DSM}
CALCulate[chno]:SMOothing:APERture <real>
CALCulate[chno]:SMOothing:STAt <bool>
CALCulate[chno]:TRANsform:IMPedance:CIMPedance <real>
CALCulate[chno]:TRANsform:IMPedance:TYPE{NONE | ZREFlection | YREFlection | ZTRansmit | YTRansmit | INVersion}

DISPlay:ACTive <int>
DISPlay:DUAL <bool>
DISPlay:FORMat{ULOWer | FBACk}
DISPlay[:WINDow[chno]]:TEXT[:DATA]{<str> | <block>}
DISPlay[:WINDow[chno]]:TRACe:ASSign{DATA | MEMory | DMEMory}
DISPlay[:WINDow[chno]]:TRACe:GRATicule[:STATe] <bool>
DISPlay[:WINDow[chno]]:Y[trace]:RLINe <bool>
DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:AUTO ONCE
DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:PDIVision <real>
DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:RLEVel <real>
DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:RPOSition <real>

FETCh[<chno>][:MARKer][:ACTivate]?
FETCh[<chno>][:MARKer]:FANalysis?
FETCh[<chno>][:MARKer]:NUMBer<n>?
FILE:DELete <str>
FILE:LOAD <str>
FILE:STATe:CONDition <bool>
FILE:STATe:CORRection <bool>
FILE:STATe:DATA <bool>
FILE:STATe:MEMory <bool>
FILE:STATe:RAW <bool>
FILE:STORe <str>
FORMat:BORDer {NORMal | SWAPped}
FORMat[:DATA] {ASCii | REAL,32 | REAL,64 | MBINary,32 | MBINary,64}

INITiate:CONTinuous <bool>
INITiate[:IMMediate]

INPut[input]:ATTenuation <int>
INPut[input]:ATTenuation:AUTO <bool>
INPut[input]:IMPedance <int>

MARKer[<chno>]:ACTivate[:NUMBer]<n>[,<real>]
MARKer[<chno>]:ACTivate:STATe <bool>
MARKer[<chno>]:ACTivate:STIMulus <real>
MARKer[<chno>]:AOFF
MARKer[<chno>]:COMPensate <bool>
MARKer[<chno>]:CONVert[:MODE] <format>
MARKer[<chno>]:COUPle <bool>
MARKer[<chno>]:DELTa:COMPare <n>[,<real>]
MARKer[<chno>]:DELTa[:MODE]<type>
MARKer[<chno>]:FANalysis:DIRection <type>
MARKer[<chno>]:FANalysis[:STATe]<bool>
MARKer[<chno>]:FANalysis:WIDTh <real>
MARKer[<chno>]:FIXed:AVALue <real>
MARKer[<chno>]:FIXed:STIMulus <real>
MARKer[<chno>]:FIXed:VALue <real>
MARKer[<chno>]:LET <type>
MARKer[<chno>]:LIST <bool>
MARKer[<chno>]:POLar <type>
MARKer[<chno>]:SEARch[:MODE]<type>
MARKer[<chno>]:SEARch:PARTial:SRANge
MARKer[<chno>]:SEARch:PARTial[:STATe]<bool>
MARKer[<chno>]:SEARch:RIPPle:DX <real>
MARKer[<chno>]:SEARch:RIPPle:DY <real>
MARKer[<chno>]:SEARch:RIPPle[:MODE]<type>
MARKer[<chno>]:SEARch:TARGet[:MODE]<type>
MARKer[<chno>]:SEARch:TARGet:LEFT
MARKer[<chno>]:SEARch:TARGet:RIGHt
MARKer[<chno>]:SEARch:TARGet:VALue <real>
MARKer[<chno>]:SEARch:TRACking <bool>
MARKer[<chno>]:SMITh <type>

OUTPut[port]:STATe <bool>

REGister:CLEar <int>
REGister:RECall <int>
REGister:SAVE <int>

A.1.2 IEEE488.2-1987 Commands

[SENSe:]AVERage[chno]:COUNt <int>
[SENSe:]AVERage[chno]:RESTart
[SENSe:]AVERage[chno][:STATe] <bool>
[SENSe:]BANDwidth[:RESolution] <int>
[SENSe:]BANDwidth[:RESolution]:AUTO <bool>
[SENSe:]CORRection[chno]:COLLect[:ACQuire] <standard>
[SENSe:]CORRection[chno]:COLLect:DELete
[SENSe:]CORRection[chno]:COLLect:SAVE
[SENSe:]CORRection[chno]:CSET:STATe <bool>
[SENSe:]CORRection[chno]:EDELay:DISTance <real>
[SENSe:]CORRection[chno]:EDELay:STATe <bool>
[SENSe:]CORRection[chno]:EDELay[:TIME] <real>
[SENSe:]CORRection[chno]:OFFSet:PHASe <real>
[SENSe:]CORRection[chno]:OFFSet:STATe <bool>
[SENSe:]CORRection[chno]:PEXTension:TIME[eport] <real>
[SENSe:]CORRection[chno]:PEXTension:STATe <bool>
[SENSe:]CORRection[chno]:RVELocity:COAX <real>
[SENSe:]FUNCtion[chno][:ON] {"POWer:{AC | DC}{1 | 2 | 3}" |
"POWer:RATio:{AC | DC}{2,1 | 3,1 | 2,3}" |
"POWer:{S11 | S12 | S22 | S21}"}
[SENSe:]FUNCtion[<chno>]:POWer{R | A | B | AR | BR | AB | BDC | BDCR | S11 | S12 | S21 | S22}
[SENSe:]POWer:AC:PROTection:CLEar
[SOURce:]COUPle <bool>
[SOURce:]FREQuency[chno]:CENTer <real>
[SOURce:]FREQuency[chno]:CW <real>
[SOURce:]FREQuency[chno]:MODE SWEep
[SOURce:]FREQuency[chno]:SPAN <real>
[SOURce:]FREQuency[chno]:STARt <real>
[SOURce:]FREQuency[chno]:STOP <real>
[SOURce:]POWer[chno][:LEVel][:AMPLitude] <real>
[SOURce:]POWer[chno]:MODE SWEep
[SOURce:]POWer[chno]:STARt <real>
[SOURce:]POWer[chno]:STOP <real>
[SOURce:]PSWeep[chno]:BANDwidth[n] <int>
[SOURce:]PSWeep[chno]:CLEar
[SOURce:]PSWeep[chno]:CLEar:ALL
[SOURce:]PSWeep[chno]:FREQuency[n] <real> [,<real>]
[SOURce:]PSWeep[chno]:INPut[input]:ATTenuation[n] <int>
[SOURce:]PSWeep[chno]:MODE{FREQuency | ALL}
[SOURce:]PSWeep[chno]:POINts[n] <int>
[SOURce:]PSWeep[chno]:POWer[n] <real>

[SOURce:]PSWeep[chno]:SETTling[n] <real>
[SOURce:]SWEep[chno]:POINts <num>
[SOURce:]SWEep[chno]:SPACing{LINear | LOGarithmic}
[SOURce:]SWEep[chno]:TIME <real>
[SOURce:]SWEep[chno]:TIME:AUTO <bool>
STATus:OPERation:CONDition?
STATus:OPERation:ENABle <num>
STATus:OPERation[:EVENt]?
SYSTem:DATE <year>,<month>,<day>
SYSTem:ERRor?
SYSTem:PRESet
SYSTem:TIME <hour>,<minute>,<second>

TRACe[chno]:COPY <name>
TRACe[chno][:DATA]?{<name> | <trace>}[,{<name> | <trace>}...]
TRACe[chno][:DATA]{<name> | <trace>},{<block> | <real>[,<real>...]}
TRIGger[:SEQuence]:DELay <real>
TRIGger[:SEQuence]:DELay:STATe <bool>
TRIGger[:SEQuence][:IMMediate]
TRIGger[:SEQuence]:SIGNal
TRIGger[:SEQuence]:SOURce {IMMediate | EXTernal | BUS | HOLD}

A.1.3 IEEE488.1-1987 Commands

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
ABIN	[SENSe:]FUNCtion[chno][:ON] <function>
AI1A0	INPut[input]:IMPedance1MOHM
	INPut[input]:ATTenuation 0
AI1A20	INPut[input]:IMPedance 1MOHM
	INPut[input]:ATTenuation 20
AI50A0	INPut[input]:IMPedance 50
	INPut[input]:ATTenuation 0
AI50A20	INPut[input]:IMPedance 50
	INPut[input]:ATTenuation 20
AIN	[SENSe:]FUNCtion[chno][:ON] <function>
APERTP<real>	CALCulate[chno]:GDAPerture:APERture <real>
ARIN	[SENSe:]FUNCtion[chno][:ON] <function>
ATTIA<int>	INPut[input]:ATTenuation <int>
ATTIAAUTO	INPut[input]:ATTenuation:AUTO <bool>
ATTIB<int>	INPut[input]:ATTenuation <int>
ATTIBAUTO	INPut[input]:ATTenuation:AUTO <bool>
ATTIR<int>	INPut[input]:ATTenuation <int>
ATTIRAUTO	INPut[input]:ATTenuation:AUTO <bool>
AUTO	DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:AUTO ON
AVER<bool>	[SENSe:]AVERage[chno][:STATe] <bool>
AVERAGE	[SENSe:]AVERage[chno][:STATe] OFF
AVERFACT<int>	[SENSe:]AVERage[chno]:COUNt <int>
AVERREST	[SENSe:]AVERage[chno]:RESTart
AVR2	[SENSe:]AVERage[chno]:COUNt 2
AVR4	[SENSe:]AVERage[chno]:COUNt 4
AVR8	[SENSe:]AVERage[chno]:COUNt 8
AVR16	[SENSe:]AVERage[chno]:COUNt 16
AVR32	[SENSe:]AVERage[chno]:COUNt 32
AVR64	[SENSe:]AVERage[chno]:COUNt 64
AVR128	[SENSe:]AVERage[chno]:COUNt 128
BDCIN	[SENSe:]FUNCtion[chno][:ON] <function>
BDCRIN	[SENSe:]FUNCtion[chno][:ON] <function>
BI1A0	INPut[input]:IMPedance 1MOHM
	INPut[input]:ATTenuation 0
BI1A20	INPut[input]:IMPedance 1MOHM
	INPut[input]:ATTenuation 20

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
BI50A0	INPut[input]:IMPedance 50
	INPut[input]:ATTenuation 0
BI50A20	INPut[input]:IMPedance 50
	INPut[input]:ATTenuation 20
BIN	[SENSe:]FUNCtion[chno][:ON] <function>
BRIN	[SENSe:]FUNCtion[chno][:ON] <function>
CENTERF<real>	[SOURce:]FREQuency[chno]:CENTer <real>
CH1	DISPlay:ACTive 1
CH2	DISPlay:ACTive 2
CLEAR	[SENSe:]CORRection[chno]:COLLect:DELete
CLRREG1	REGister:CLEar 1
CLRREG2	REGister:CLEar 2
CLRREG3	REGister:CLEar 3
CLRREG4	REGister:CLEar 4
CLRREG5	REGister:CLEar 5
CLRREG6	REGister:CLEar 6
CLRREG7	REGister:CLEar 7
CLRREG8	REGister:CLEar 8
CLRREG9	REGister:CLEar 9
CLRREG10	REGister:CLEar 10
CLRTRIP	[SENSe:]POWer:AC:PROTection:CLEar
CONT	INITiate:CONTinuous ON
CONV1DS	CALCulate[chno]:TRANsform:IMPedance:TYPE INVersion
CONVOFF	CALCulate[chno]:TRANsform:IMPedance:TYPE NONE
CONVRY	CALCulate[chno]:TRANsform:IMPedance:TYPE YREFlection
CONVRZ	CALCulate[chno]:TRANsform:IMPedance:TYPE ZREFlection
CONVTY	CALCulate[chno]:TRANsform:IMPedance:TYPE YTRansmit
CONVTZ	CALCulate[chno]:TRANsform:IMPedance:TYPE ZTRansmit
CORARY<bool>	FILE:STATe:CORRection <bool>
CORRECT<bool>	[SENSe:]CORRection[chno]:CSET:STATe <bool>
COUPLE<bool>	[SOURce:]COUPle <bool>
CWFREQ<real>	[SOURce:]FREQuency[chno]:CW <real>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
DATAARY<bool>	FILE:STATe:DATA <bool>
DAY<int>	SYSTem:DATE <year>,<month>,<day>
DELAY	CALCulate[chno]:FORMat GDELay
DISPDATA	DISPlay[:WINDow[chno]]:TRACe:ASSign DATA
DISPDDM<bool>	CALCulate[chno]:MATH[:EXPRession]:NAME DDM
DISPDM	DISPlay[:WINDow[chno]]:TRACe:ASSign DMEMory
DISPMEM	DISPlay[:WINDow[chno]]:TRACe:ASSign MEMory
DL0	LF^ EOI fixed
DL1	LF^ EOI fixed
DL2	LF^ EOI fixed
DL3	LF^ EOI fixed
DLTX	MARKer[<chno>]:SEARch:RIPPle:DX <real>
DLTY	MARKer[<chno>]:SEARch:RIPPle:DY <real>
DMKR1O	MARKer[<chno>]:DELTa:COMPare 1[,<real>]
DMKR2O	MARKer[<chno>]:DELTa:COMPare 2[,<real>]
DMKR3O	MARKer[<chno>]:DELTa:COMPare 3[,<real>]
DMKR4O	MARKer[<chno>]:DELTa:COMPare 4[,<real>]
DMKR5O	MARKer[<chno>]:DELTa:COMPare 5[,<real>]
DMKR6O	MARKer[<chno>]:DELTa:COMPare 6[,<real>]
DMKR7O	MARKer[<chno>]:DELTa:COMPare 7[,<real>]
DMKR8O	MARKer[<chno>]:DELTa:COMPare 8[,<real>]
DMKR9O	MARKer[<chno>]:DELTa:COMPare 9[,<real>]
DMKR10O	MARKer[<chno>]:DELTa:COMPare 10[,<real>]
DMKRA	MARKer[<chno>]:DELTa[:MODE] COMPare
DMKRC	MARKer[<chno>]:DELTa[:MODE] CHILd
DMKRF	MARKer[<chno>]:DELTa[:MODE] FIXed
DMKROF	MARKer[<chno>]:DELTa[:MODE] OFF
DONE	[SENSe:]CORRection[chno]:COLLect:SAVE
DONE1PORT	[SENSe:]CORRection[chno]:COLLect:SAVE
DRIPPL1	MARKer[<chno>]:SEARch[:MODE] RIPPle
DSSTATE<bool>	FILE:STATe:CONDition <bool>
DTOM	TRACe[chno]:COPY <name>
DUAL<bool>	DISPlay:DUAL <bool>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
ELED<real>	[SENSe:]CORRection[chno]:EDELay[:TIME] <real>
EPORT1<real>	[SENSe:]CORRection[chno]:PEXTension:TIME[eport] <real>
EPORT2<real>	[SENSe:]CORRection[chno]:PEXTension:TIME[eport] <real>
EPORTA<real>	[SENSe:]CORRection[chno]:PEXTension:TIME[eport] <real>
EPORTB<real>	[SENSe:]CORRection[chno]:PEXTension:TIME[eport] <real>
EPORTR<real>	[SENSe:]CORRection[chno]:PEXTension:TIME[eport] <real>
EXTERN	TRIGger[:SEQuence]:SOURce EXTernal
FLTANA<bool>	MARKer[<chno>]:FANalysis[:STATe]<bool>
FMKRS<real>	MARKer[<chno>]:FIXed:STIMulus <real>
FMKRV<real>	MARKer[<chno>]:FIXed:VALue <real>
FORM0	FORMat[:DATA] ASCii
	FORMat:BORDer NORMal
FORM2	FORMat[:DATA] REAL,32
	FORMat:BORDer NORMal
FORM3	FORMat[:DATA] REAL,64
	FORMat:BORDer NORMal
FORM5	FORMat[:DATA] REAL,32
	FORMat:BORDer SWAPped
FORM6	FORMat[:DATA] REAL,64
	FORMat:BORDer SWAPped
FORM7	FORMat[:DATA] MBINary,32
	FORMat:BORDer NORMal
FORM8	FORMat[:DATA] MBINary,64
	FORMat:BORDer NORMal
FREE	TRIGger[:SEQuence]:SOURce IMMediate
GRAT<bool>	DISPlay[:WINDow[chno]]:TRACe:GRATicule[:STATe] <bool>
HOUR<int>	SYSTem:TIME <hour>,<minute>,<second>

A.1.3 IEEE488.1-1987 Commands

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
IDNT	*IDN?
IMAG	CALCulate[chno]:FORMat IMAGinaly
IMPIA<int>	INPut[input]:IMPedance <int>
IMPIB<int>	INPut[input]:IMPedance <int>
IMPIR<int>	INPut[input]:IMPedance <int>
IN1CORDI	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN1CORNR	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN1CORSO	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN1CORTR	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN2CORDI	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN2CORNR	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN2CORSO	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IN2CORTR	TRACe[chno][:DATA]{<name> | <trace>}, {<block> | <real>[,<real>...]}
IP	SYSTem:PRESet
LABEL<str>	DISPlay[:WINDow[chno]]:TEXT[:DATA]{<str> | <block>}
LDFILE<str>	FILE:LOAD <str>
LENGTH<bool>	[SENSe:]CORRection[chno]:EDELay:STATe <bool>
LENGVAL<real>	[SENSe:]CORRection[chno]:EDELay:DISTance <real>
LEVEL	[SOURce:]POWer[chno]:MODE SWEep
LINFREQ	[SOURce:]FREQuency[chno]:MODE SWEep
	[SOURce:]SWEep[chno]:SPACing LINear
LINMAG	CALCulate[chno]:FORMat MLINear
LINMP	CALCulate[chno]:FORMat MLIPhase
LOAD	[SENSe:]CORRection[chno]:COLLect[:ACQuire] <type>
LOGFREQ	[SOURce:]FREQuency[chno]:MODE SWEep
	[SOURce:]SWEep[chno]:SPACing LOGarithmic
LOGMAG	CALCulate[chno]:FORMat MLOGarithmic
LOGMD	CALCulate[chno]:FORMat MLODelay
LOGMP	CALCulate[chno]:FORMat MLOPhase
M3P	[SOURce:]SWEep[chno]:POINts 3
M6P	[SOURce:]SWEep[chno]:POINts 6
M11P	[SOURce:]SWEep[chno]:POINts 11
M21P	[SOURce:]SWEep[chno]:POINts 21
M51P	[SOURce:]SWEep[chno]:POINts 51
M101P	[SOURce:]SWEep[chno]:POINts 101
M201P	[SOURce:]SWEep[chno]:POINts 201

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
M301P	[SOURce:]SWEep[chno]:POINts 301
M601P	[SOURce:]SWEep[chno]:POINts 601
M1201P	[SOURce:]SWEep[chno]:POINts 1201
MAXSRCH	MARKer[<chno>]:SEARch[:MODE] MAX
MEAS	ABORt;INITiate[:IMMediate];
MEMARY<bool>	FILE:STATe:MEMory <bool>
MINSRCH	MARKer[<chno>]:SEARch[:MODE] MIN
MINUTE<int>	SYSTem:TIME <hour>,<minute>,<second>
MKR1A	MARKer[<chno>]:ACTivate[:NUMBer] 1[,<real>]
MKR2A	MARKer[<chno>]:ACTivate[:NUMBer] 2[,<real>]
MKR3A	MARKer[<chno>]:ACTivate[:NUMBer] 3[,<real>]
MKR4A	MARKer[<chno>]:ACTivate[:NUMBer] 4[,<real>]
MKR5A	MARKer[<chno>]:ACTivate[:NUMBer] 5[,<real>]
MKR6A	MARKer[<chno>]:ACTivate[:NUMBer] 6[,<real>]
MKR7A	MARKer[<chno>]:ACTivate[:NUMBer] 7[,<real>]
MKR8A	MARKer[<chno>]:ACTivate[:NUMBer] 8[,<real>]
MKR9A	MARKer[<chno>]:ACTivate[:NUMBer] 9[,<real>]
MKR10A	MARKer[<chno>]:ACTivate[:NUMBer] 10[,<real>]
MKRAOFF	MARKer[<chno>]:AOFF
MKRCENT	MARKer[<chno>]:LET CENTer
MKRCMP	MARKer[<chno>]:COMPensate ON
MKRCOUP	MARKer[<chno>]:COUPle ON
MKRFIX	MARKer[<chno>]:LET FIX
MKROFF	MARKer[<chno>]:ACTivate:STATe OFF
MKRPART<bool>	MARKer[<chno>]:SEARch:PARTial[:STATe] <bool>
MKRREF	MARKer[<chno>]:LET RLEVel
MKRSPAN	MARKer[<chno>]:LET SPAN
MKRSTAR	MARKer[<chno>]:LET STARt
MKRSTOP	MARKer[<chno>]:LET STOP
MKRTRAC<bool>	MARKer[<chno>]:SEARch:TRACking <bool>
MKRUCMP	MARKer[<chno>]:COMPensate OFF
MKRUCOUP	MARKer[<chno>]:COUPle OFF
MKRZO50	CALCulate[chno]:TRANsform:IMPedance:CIMPedance 50OHM
MKRZO75	CALCulate[chno]:TRANsform:IMPedance:CIMPedance 75OHM
MONTH<int>	SYSTem:DATE <year>,<month>,<day>
NORM<bool>	[SENSe:]CORRection[chno]:COLLect[:ACQuire] <type>
NORMS<bool>	[SENSe:]CORRection[chno]:COLLect[:ACQuire] <type>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
OPEN	[SENSe:]CORRection[chno]:COLLect[:ACQuire] <type>
OT1CORDI	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1CORED	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1CORNR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1CORSO	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1CORTR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1DFOR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1DRAT	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1MFOR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1MRAT	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT1NORED	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2CORDI	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2CORED	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2CORNR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2CORSO	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2CORTR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2DFOR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2DRAT	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2MFOR	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2MRAT	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OT2NORED	TRACe[chno][:DATA]? {<name> | <trace>} [,{<name> | <trace>}]
OUTLEV<real>	[SOURce:]POWer[chno][:LEVel][:AMPLitude] <real>
PHAO<real>	[SENSe:]CORRection[chno]:OFFSet:PHASe <real>
PHAOFS<bool>	[SENSe:]CORRection[chno]:OFFSet:STATe <bool>
PHASE	CALCulate[chno]:FORMat PHASe
PMKRLIN	MARKer[<chno>]:POLar MLINear
PMKRLOG	MARKer[<chno>]:POLar MLOGarithm
PMKRRI	MARKer[<chno>]:POLar RIMaginary
POIN<int>	[SOURce:]SWEep[chno]:POINts <int>
PORE<bool>	[SENSe:]CORRection[chno]:PEXTension:STATe <bool>
PORT1	OUTPut1[:STATe] ON
PORT2	OUTPut2[:STATe] ON
PURGE<str>	FILE:DELete <str>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
RAWARY<bool>	FILE:STATe:RAW <bool>
RBW10HZ	[SENSe:]BANDwidth[:RESolution] 10HZ
RBW30HZ	[SENSe:]BANDwidth[:RESolution] 30HZ
RBW100HZ	[SENSe:]BANDwidth[:RESolution] 100HZ
RBW300HZ	[SENSe:]BANDwidth[:RESolution] 300HZ
RBW1KHZ	[SENSe:]BANDwidth[:RESolution] 1KHZ
RBW<int>	[SENSe:]BANDwidth[:RESolution] <int>
RBWAUTO	[SENSe:]BANDwidth[:RESolution]:AUTO <bool>
REAL	CALCulate[chno]:FORMat REAL
RECLPOFF	*RCL{0 | POFF}
RECLREG1	*RCL 1
RECLREG2	*RCL 2
RECLREG3	*RCL 3
RECLREG4	*RCL 4
RECLREG5	*RCL 5
RECLREG6	*RCL 6
RECLREG7	*RCL 7
RECLREG8	*RCL 8
RECLREG9	*RCL 9
RECLREG10	*RCL 10
REFL<bool>	DISPlay[:WINDow[chno]]:Y[trace]:RLINe <bool>
REFP<real>	DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:RPOSition <real>
REFV<real>	DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:RLEVel <real>
RI1A0	INPut[input]:IMPedance 1MOHM
	INPut[input]:ATTenuation 0
RI1A20	INPut[input]:IMPedance 1MOHM
	INPut[input]:ATTenuation 20
RI50A0	INPut[input]:IMPedance 50
	INPut[input]:ATTenuation 0
RI50A20	INPut[input]:IMPedance 50
	INPut[input]:ATTenuation 20
RIN	[SENSe:]FUNCtion[chno][:ON] <function>
RTC30ADJ	SYSTem:TIME <hour>,<minute>,<second>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
S11	[SENSe:]FUNCtion[chno][:ON] <function>
S12	[SENSe:]FUNCtion[chno][:ON] <function>
S21	[SENSe:]FUNCtion[chno][:ON] <function>
S22	[SENSe:]FUNCtion[chno][:ON] <function>
SAVEREG1	*SAV 1
SAVEREG2	*SAV 2
SAVEREG3	*SAV 3
SAVEREG4	*SAV 4
SAVEREG5	*SAV 5
SAVEREG6	*SAV 6
SAVEREG7	*SAV 7
SAVEREG8	*SAV 8
SAVEREG9	*SAV 9
SAVEREG10	*SAV 10
SCALF1ST	DISPlay[:WINDow[chno]]:Y[trace]...
SCALF2ND	DISPlay[:WINDow[chno]]:Y[trace]...
SDIV<real>	DISPlay[:WINDow[chno]]:Y[trace][:SCALe]:PDIVision <real>
SETLTIME<real>	TRIGger[:SEQuence]:DELay <real>
SETLVARI<bool>	TRIGger[:SEQuence]:DELay:STATe <bool>
SETZ0<real>	CALCulate[chno]:TRANsform:IMPedance:CIMPedance <real>
SHORT	[SENSe:]CORRection[chno]:COLLect[:ACQuire] <type>
SINGLE	INITiate:CONTinuous OFF;:ABORt;INITiate[:IMMediate]
SMKRGB	MARKer[<chno>]:SMITh ADMittance
SMKRLIN	MARKer[<chno>]:SMITh MLINear
SMKRLOG	MARKer[<chno>]:SMITh MLOGarithm
SMKRRI	MARKer[<chno>]:SMITh RIMaginary
SMKRRX	MARKer[<chno>]:SMITh IMPedance
SMOO<bool>	CALCulate[chno]:SMOothing:STATe <bool>
SMOOAPER<real>	CALCulate[chno]:SMOothing:APERture <real>
SPANF<real>	[SOURce:]FREQuency[chno]:SPAN <real>
SPLEVEL<real>	[SOURce:]POWer[chno]:STOP <real>
SPLIT<bool>	DISPlay:FORMat {ULOWer | FBACk}
SRCHOFF	MARKer[<chno>]:SEARch[:MODE] OFF
SRQD	None (see the status data structure)
SRQE	None (see the status data structure)
STARTF<real>	[SOURce:]FREQuency[chno]:STARt <real>
STFILE<str>	FILE:STORe <str>
STIME<real>	[SOURce:]SWEep[chno]:TIME <real>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
STIMEAUTO	[SOURce:]SWEep[chno]:TIME:AUTO ON
STLEVEL<real>	[SOURce:]POWer[chno]:STARt <real>
STOPF<real>	[SOURce:]FREQuency[chno]:STOP <real>
SWPHLD	INITiate:CONTinuous OFF;:ABORt
SWR	CALCulate[chno]:FORMat SWR
T3DB	MARKer[<chno>]:FANalysis:WIDTh 3DB
T3DEG	MARKer[<chno>]:FANalysis:WIDTh 3DEG
T60DB	MARKer[<chno>]:FANalysis:WIDTh 60DB
T6DB	MARKer[<chno>]:FANalysis:WIDTh 6DB
T6DEG	MARKer[<chno>]:FANalysis:WIDTh 6DEG
TIN	MARKer[<chno>]:FANalysis:DIRection IN
TOUT	MARKer[<chno>]:FANalysis:DIRection OUT
TXDB<real>	MARKer[<chno>]:FANalysis:WIDTh <real>
TXDEG<real>	MARKer[<chno>]:FANalysis:WIDTh <real>
	MARKer[<chno>]:SEARch[:MODE] TARGet
UATTIA<int>	[SOURce:]PSWeep[chno]:INPut[input]:ATTenoation[n] <int>
UATTIB<int>	[SOURce:]PSWeep[chno]:INPut[input]:ATTenoation[n] <int>
UATTIR<int>	[SOURce:]PSWeep[chno]:INPut[input]:ATTenoation[n] <int>
UFREQ<real>	[SOURce:]PSWeep[chno]:FREQuency[n] <real>[,<real>]
UNWRAP	CALCulate[chno]:FORMat UPHase
ULEVEL<real>	[SOURce:]PSWeep[chno]:POWer[n] <real>
URBW<int>	[SOURce:]PSWeep[chno]:BANDwidth[n] <real>
UPOINT<int>	[SOURce:]PSWeep[chno]:POINts[n] <int>
USEG<int>	[SOURce:]PSWeep[chno]:FREQuency[n] <real>[,<real>]
USEGCL	[SOURce:]PSWeep[chno]:CLEar[n]:ALL
USETLT<real>	[SOURce:]PSWeep[chno]:SETTling[n] <real>
USRASWP	[SOURce:]PSWeep[chno]:MODE ALL
USRFSWP	[SOURce:]PSWeep[chno]:MODE FREQuency
USRSWP	[SOURce:]PSWeep[chno]:MODE FREQuency
USTART<real>	[SOURce:]PSWeep[chno]:FREQuency[n] <real>[,<real>]
USTOP<real>	[SOURce:]PSWeep[chno]:FREQuency[n] <real>[,<real>]
VELOFACT<real>	[SENSe:]CORRection[chno]:RVELocity:COAX <real>
YEAR<int>	SYSTem:DATE <year>,<month>,<day>

IEEE488.1-1987 Commands	Corresponding IEEE488.2-1987 commands
ZRPSRCH	MARKer[<chno>]:SEARch:TARGet[:MODE] ZERO
ZYMKDFLT	MARKer[<chno>]:CONVert[:MODE] DEFault
ZYMKLIN	MARKer[<chno>]:CONVert[:MODE] LINear
ZYMKRI	MARKer[<chno>]:CONVert[:MODE] RIMaginary

A.2 Invalid Commands

The following describes the invalid commands in the IEEE488.1-1987 commands. An error may not occur when these commands are received, however, no operation can be performed.

ADDRPLOT<int>
ATZMSPAN <real>
AUTOZOOM

BS

CCOPY
CD
CU
CWF <real>
CW

DMAXMIN
DMKRR
DRIPPL2

EDIT <bool>
EOFF

FD
FRQSTP <real>
FSTPA
FSTPM
FU

INITIAL
INTENS<int>

LINE
LMAXSRC
LMINSRC

MKR1TD
MKR1TM
MKR2TD
MKR2TM

MKR3TD
MKR3TM
MKR4TD
MKR4TM
MKR5TD
MKR5TM
MKR6TD
MKR6TM
MKR7TD
MKR7TM
MKR8TD
MKR8TM
MKR9TD
MKR9TM
MKR10TD
MKR10TM
MKRATOD
MKRATOM
MKRCSCL
MKRPOINT
MKRTOD
MKRTOM

PARTIAL <bool>
PLT1PICT
PLT2LEFT
PLT2PICT
PLT2RIGHT
PLT4LLOW
PLT4LUP
PLT4PICT
PLT4RLOW
PLT4RUP
PLTABORT
PLTAT
PLTD1PEN<int>
PLTD2PEN<int>
PLTDATA<bool>
PLTEXEC
PLTGRAT<bool>
PLTHP

PLTLABEL<bool>
PLTLBLPEN<int>
PLTM1PEN<int>
PLTM2PEN<int>
PLTMEM<bool>
PLTMKR<bool>
PLTREFLN<bool>
PLTSCALE<bool>
PLTSCLPEN<int>
PLTTEXT<bool>
PSEG <int>
PSEGCL
PSTART <real>
PSTOP <real>

STPDN
STPUP

TLEFT
TREFACT
TREFCNT
TREFMAX
TREFREF
TREFZRP
TREND
TRIGHT

UPSCAL <bool>

VARIABLE <bool>
VPRINT

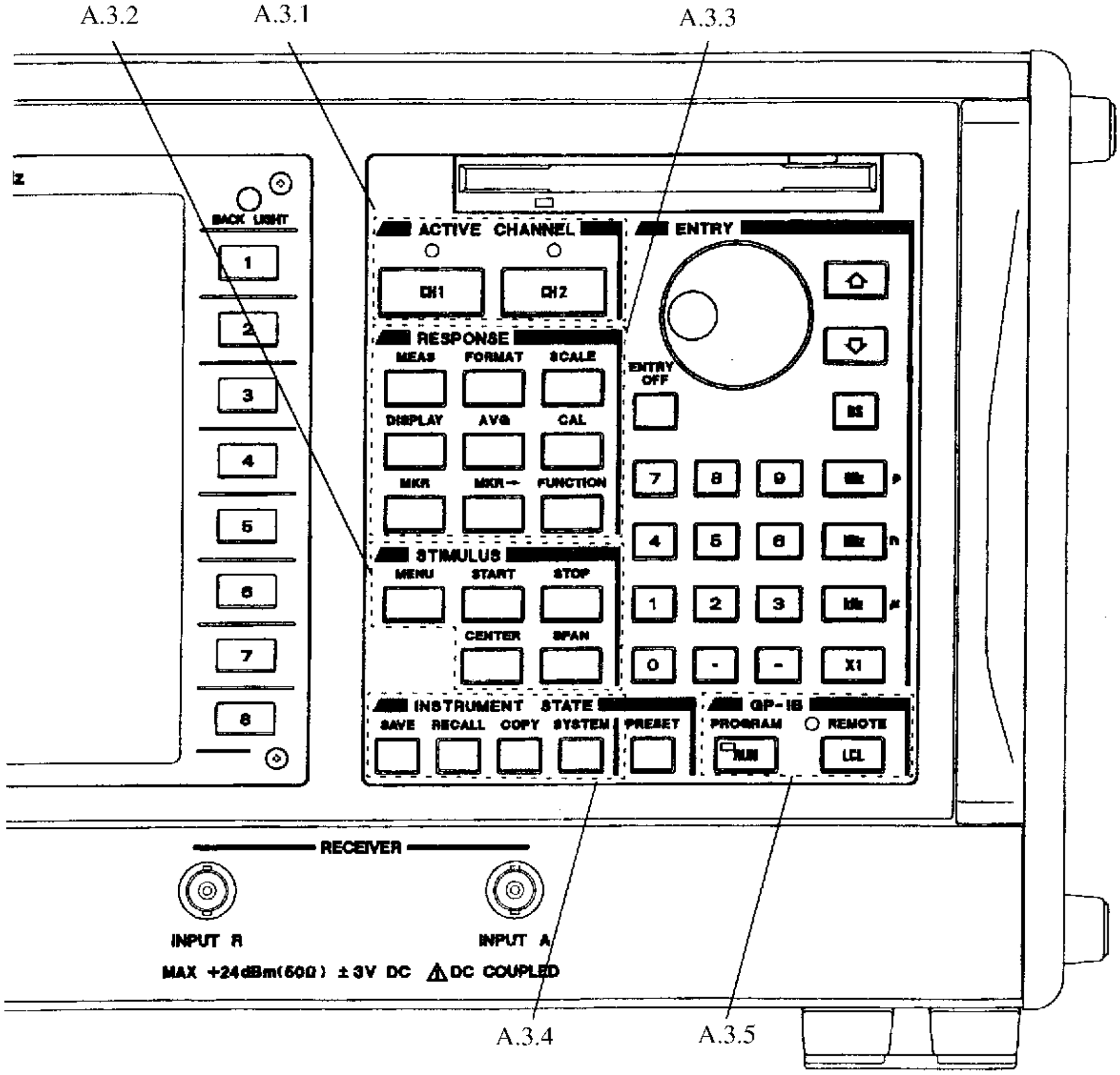
WEEK <int>

ZYMKLC

A.3 GPIB Command List Corresponding to Panel Key / Softkey

Shows the GPIB command corresponding to the panel key or the softkey. Refer to the separate volume "R3752/53 Programming Manual" for the details of each command.

- Describes depending on the item in the following panel.



- Explanation of "O" and "N"
  O:IEEE488.1-1987 command mode
  N:IEEE488.2-1987 command mode

A.3.1 ACTIVE CHANNEL Block

(1) CH1

[CH1]
O : CH1
N : DISPlay:ACTive 1

(2) CH2

[CH2]
O : CH2
N : DISPlay:ACTive 2

A.3.2 STIMULUS Block

(1) MENU

Signal source menu

{POWER} Calls the power menu (see step (1-1)).

{SWEEP TIME}
O : STIME<real>
STIMEAUTO
N : [SOURce:]SWEep[<chno>]:TIME <real>
[SOURce:]SWEep[<chno>]:TIME:AUTO <bool>

{SWEEP TYPE [ ]} Calls the sweep type menu (see step (1-3)).

{TRIGGER[ ]} Calls the trigger menu (see step (1-2)).

{POINTS}
O : M{1201 | 601 | 301 | 201 | 101 | b51 | b21 | 11 | 6 | 3}P /
POIN<int>
POIN<int>
N : [SOURce:]SWEep[<chno>]:POINts <int>

{COUPLED CH ON/OFF}
O : COUPLE<bool>
N : [SOURce:]COUPle <bool>

{CW FREQ}
O : CWFREQ<real>
N : [SOURce:]FREQuency[<chno>]:CW <real>

{RESTART}
O : MEAS
N : ABORt;INITiate[:IMMediate]

(1-1a) Power menu (Available for the R3752H/53H Series)

{OUTPUT 1}	O: PORT1
	N: OUTPut1[:STATe] ON
{OUTPUT 2}	O: PORT2
	N: OUTPut2[:STATe] ON
	NOTE: This is not displayed in R3753E.
{POWER}	O: OUTLEV <real>
	N: [SOURce:]POWer[<chno>][:LEVel][:AMPLitude] <real>
{ATTENUATOR PORT 1}	O: ATTP1
	N: OUTPutl:ATTenuation <real>
	NOTE: This can be set only the case with which S parameter test set is connected with R3753A.
{ATTENUATOR PORT 2}	O: ATTP2
	N: OUTPut2:ATTenuation <real>
	NOTE: This can be set only the case with which S parameter test set is connected with R3753A.
{Return}	Returns to the signa source menu (see step (1)).

(1-1b) Power menu (Available for the R3754 Series)

{OUTPUT 1}	O: PORT1
	N: OUTPut1[:STATe] ON
{OUTPUT 2}	O: PORT2
	N: OUTPut2[:STATe] ON
	NOTE: This menu is displayed only when Option 10 or 11 is installed.
{POWER}	O: OUTLEV <real>
	N: [SOURce:]POWer[<chno>][:LEVel][:AMPLitude] <real>
{Return}	Returns to the signa source menu (see step (1)).

(1-2) Trigger menu

{CONTINUOUS}	O : CONT
	N : INITiate:CONTinuous ON
{SINGLE}	O : SINGLE
	N : INITiate:CONTinuous OFF;:ABORt;INITiate
{HOLD}	O : SWPHLD
	N : INITiate:CONTinuous OFF;:ABORt
{INT TRIG}	O : FREE
	N : TRIGger[:SEQuence]:SOURce IMMediate
{EXT TRIG}	O : EXTERN
	N : TRIGger[:SEQuence]:SOURce EXTernal
{TRIGGER DELAY}	O : SETLTIME <real>
	N : TRIGger[:SEQuence]:DELay <real>
{Return}	Returns to the signal source menu (see step (1)).

(1-3) Sweep type menu

{LIN FREQ}	O : LINFREQ
	N : [SOURce:]SWEep[<chno>]:SPACing LINear [SOURce:]FREQuency[<chno>]:MODE SWEep
{LOG FREQ}	O : LOGFREQ
	N : [SOURce:]SWEep[<chno>]:SPACing LOGarithmic [SOURce:]FREQuency[<chno>]:MODE SWEep
{USER SWEEP}	O : USRFSWP
	N : [SOURce:]PSWeep[<chno>]:MODE FREQuency
{PROGRAM SWEEP}	O : USRARWP
	N : [SOURce:]PSWeep[<chno>]:MODE ALL
{POW SWEEP}	O : LEVEL
	N : [SOURce:]POWer[<chno>]:MODE SWEep
{EDIT USER SWEEP}	Calls the user frequency sweep segment editing menu (see step (1-3-1)).
{EDIT PROG SWEEP}	Calls the program sweep segment editing menu (see step (1-3-2)).
{Return}	Returns to the signal source menu (see step (1)).

Use these commands together.

(1-3-1) User frequency sweep segment editing menu

{SEGMENT:NUMBER}	O :	USEG<n>
	N :	See Note.
{START}	O :	USTART<start>
	N :	[SOURce:]PSWeep[<chno>]:FREQuency[<n>]<start> [,<stop>]
{STOP}	O :	USTOP<stop>
	N :	[SOURce:]PSWeep[<chno>]:FREQuency[<n>]<start> [,<stop>]
{FREQ}	O :	UFREQ<real>
	N :	[SOURce:]PSWeep[<chno>]:FREQuency[<n>] <start>
{POINT}	O :	UPOINT<int>
	N :	[SOURce:]PSWeep[<chno>]:POINts[<n>] <int>
{CLEAR SEG}	O :	There is no GPIB command to be applied.
	N :	[SOURce:]PSWeep[<chno>]:CLEar[<n>]
{CLEAR ALL SEG}	O :	USEGCL
	N :	[SOURce:]PSWeep[<chno>]:CLEar[<n>]:ALL
{Return}	Returns to the sweep type menu.	

<start> and <stop> are <real>.

NOTE: In IEEE488.2-1987 command mode, the segment number is specified by the parameter <n> in each GPIB command.

(1-3-2a)Program sweep segment editing menu (1 of 2) (Available for the R3752H/53H Series)

{SEGMENT: NUMBER}	O : USEG<n>
	N : See Note.
{START}	O : USTART<start> / UFREQ<real>
	N : [SOURce:]PSWeep[<chno>]:FREQuency[<n>] <start>[,<stop>]
{STOP}	O : USTOP<stop>
	N : [SOURce:]PSWeep[<chno>]:FREQuency[<n>] <start>[,<stop>]
{POINT}	O : UPOINT<int>
	N : [SOURce:]PSWeep[<chno>]:POINts[<n>] <int>
{CLEAR SEG}	O : There is no GPIB command to be applied.
	N : [SOURce:]PSWeep[<chno>]:CLEar[<n>]
{CLEAR ALL SEG}	O : USEGCL
	N : [SOURce:]PSWeep[<chno>]:CLEar[<n>]:ALL
{Return}	Returns to the sweep type menu (see step (1-3)).
{More 1/2}	Calls the program sweep segment editing menu (2 of 2).

<start> and <stop> are real.

Program sweep segment editing menu (2 of 2)

{SEGMENT: POWER}	O : ULEVEL <real>
	N : [SOURce:]PSWeep[<chno>]:POWer[<n>] <real>
{IF RBW}	O : URBW <int>
	N : [SOURce:]PSWeep[<chno>]:BANDwidth[<n>] <int>
{SETTLING TIME}	O : USETLT <real>
	N : [SOURce:]PSWeep[<chno>]:SETTling[<n>] <real>
{R ATT 0dB/20dB}	O: UATTIR <int>
	N: [SOURce:]PSWeep[<chno>]:INPut1:ATTenuation[<n>] <int>
	NOTE: This is not displayed in R3753E.
{A ATT 0dB/20dB}	O: UATTIA <int>
	N: [SOURce:]PSWeep[<chno>]:INPut2:ATTenuation[<n>] <int>

{B ATT 0dB/20dB}	O: UATTIB <int>
	N: [SOURce:]PSWeep[<chno>]:INPut3:ATTenuation[<n>] <int>

NOTE: This is not displayed in R3753B/E.

{Return}	Returns to the sweep type menu (see step (1-3)).
{More 2/2}	Calls the program sweep segment editing menu (1 of 2).

NOTE: In IEEE488.2-1987 command mode, the segment number is specified by the parameter <n> in each GPIB command

(1-3-2b)Program sweep segment editing menu (1 of 2) (Available for the R3754 Series)

{SEGMENT: NUMBER}	O: USEG <n>
	N: [SOURce:]PSWeep[<chno>]:POINts[<n>]
{START}	O: USTART<start> / UFREQ<real>
	N: [SOURce:]PSWeep[<chno>]:FREQuency[<n>] <start>[,<stop>]
{STOP}	O: USTOP<stop>
	N: [SOURce:]PSWeep[<chno>]:FREQuency[<n>] <start>[,<stop>]
{POIN}	O: UPOINT <int>
	N: [SOURce:]PSWeep[<chno>]:POINts[<n>] <int>
{CLEAR SEG}	O: There is no GPIB command to be applied.
	N: [SOURce:]PSWeep[<chno>]:CLEar[<n>]
{CLEAR ALL SEG}	O: USEGCL
	N: [SOURce:]PSWeep[<chno>]:CLEar[<n>]:ALL
{Return}	Returns to the sweep type menu (see step (1-3)).
{More 1/2}	Calls the program sweep segment editing menu (2 of 2).

<start> and <stop> are real.

Program sweep segment editing menu (2 of 2)

{SEGMENT: POWER}

O: ULEVEL <real>

N: [SOURce:]PSWeep[<chno>]:POWer[<n>] <real>

{IF RBW}

O: URBW <int>

N: [SOURce:]PSWeep[<chno>]:BANDwidth[<n>] <int>

{SETTLING TIME}

O: USETLT <real>

N: [SOURce:]PSWeep[<chno>]:SETTling[<n>] <int>

{Rch INPUT [ ]}

O: UATTIR{AUTO | 0 | 25}/UAMPIR{0 | 16}

N: [SOURce:]PSWeep[<chno>]:INPut1:ATTenuation[<n>]:AUTO ON/
[SOURce:]PSWeep[<chno>]:INPut1:ATTenuation[<n>] {0 | 25}/
[SOURce:]PSWeep[<chno>]:INPut1:GAIN[<n>] {0 | 16}

{Ach INPUT [ ]}

O: UATTIA{AUTO | 0 | 25}/UAMPIA{0 | 16}

N: [SOURce:]PSWeep[<chno>]:INPut2:ATTenuation[<n>]:AUTO ON/
[SOURce:]PSWeep[<chno>]:INPut2:ATTenuation[<n>] {0 | 25}/
[SOURce:]PSWeep[<chno>]:INPut2:GAIN[<n>] {0 | 16}

NOTE: This menu is displayed only when Option 10 or 11 is installed.

{Bch INPUT [ ]}

O: UATTIB{AUTO | 0 | 25}/UAMPIB{0 | 16}

N: [SOURce:]PSWeep[<chno>]:INPut3:ATTenuation[<n>]:AUTO ON/
[SOURce:]PSWeep[<chno>]:INPut3:ATTenuation[<n>] {0 | 25}/
[SOURce:]PSWeep[<chno>]:INPut3:GAIN[<n>] {0 | 16}

NOTE: This menu is displayed only when Option 11 is installed.

{Return} Returns to the sweep type menu (see step (1-3)).

{More 2/2} Calls the program sweep segment editing menu (1 of 2).

(2) START

[START]

O: STARTF <real>
STLEVEL <real>

N: [SOURce:]FREQuency[<chno>]:STARt <real>
[SOURce:]POWer[<chno>]:STARt <real>

(3) STOP

[STOP]

O: STOPF <real>
STLEVEL <real>

N: [SOURce:]FREQuency[<chno>]:STOP <real>
[SOURce:]POWer[<chno>]:STOP <real>

(4) CENTER

[CENTER]

O: CENTERF <real>

N: [SOURce:]FREQuency[<chno>]:CENTer <real>

(5) SPAN

[SPAN]

O: SPANF <real>

N: [SOURce:]FREQuency[<chno>]

A.3.3 RESPONSE Block

(1) MEAS

Measurement menu (Available for the R3752H/53H Series)

{A/R}

O: ARIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC:RATio 2,1'
[SENSe:]FUNCtion[<chno>]:POWer AR

NOTE: This is not displayed in R3753E.

{B/R}

O: BRIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC:RATio 3,1'
[SENSe:]FUNCtion[<chno>]:POWer BR

NOTE: This is not displayed in R3753B/E.

{A/B}

O: ABIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC:RATio 2,3'
[SENSe:]FUNCtion[<chno>]:POWer AB

NOTE: This is not displayed in R3753B/E.

{R}

O: RIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC 1'
[SENSe:]FUNCtion[<chno>]:POWer R

NOTE: This is not displayed in R3753E.

{A}

O: AIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC 2'
[SENSe:]FUNCtion[<chno>]:POWer A

{B}

O: BIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC 3'
[SENSe:]FUNCtion[<chno>]:POWer B

NOTE: This is not displayed in R3753B/E.

{CONVERSION[ ]} Calls the parameter conversion menu (see step (1-1)).

{S PARAMETERS} Calls S parameter menu (see step (1-2)).

Measurement menu (Available for the R3754 Series)

{A/R}

O: ARIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC:RATio 2, 1'

NOTE: This menu is displayed only when Option 10 or 11 is installed.

{B/R}

O: BRIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC:RATio 3, 1'

NOTE: This menu is displayed only when Option 11 is installed.

{A/B}

O: ABIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC:RATio 2, 3'
[SENSe:]FUNCtion[<chno>][:ON]:POWer AB

NOTE: This menu is displayed only when Option 11 is installed.

{A}

O: RIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC 1'

NOTE: This menu is displayed only when Option 10 or 11 is installed.

{B}

O: AIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC 2'

O: BIN

N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:AC 3'

NOTE: This menu is displayed only when Option 11 is installed.

{CONVERSION[ ]} Calls the parameter conversion menu. (See step (1-1).)

(1-1) Parameter conversion menu

{Z(REFL)	O: CONVRZ
	N: CALCulate[<chno>]:TRANsform:IMPedance:TYPE ZREFlection
{Z(TRANS)}	O: CONVTZ
	N: CALCulate[<chno>]:TRANsform:IMPedance:TYPE ZTRansmit
{Y(REFL)}	O: CONVRY
	N: CALCulate[<chno>]:TRANsform:IMPedance:TYPE YREFlection
{Y(TRANS)}	O: CONVTY
	N: CALCulate[<chno>]:TRANsform:IMPedance:TYPE YTRansmit
{1/S}	O: CONV1DS
	N: CALCulate[<chno>]:TRANsform:IMPedance:TYPE INVersion
{OFF}	O: CONVOFF
	N: CALCulate[<chno>]:TRANsform:IMPedance:TYPE NONE
{Z0 VALUE}	O: SETZ0 <real> / MKRZO{50Å°75}
	N: CALCulate[<chno>]:TRANsform:IMPedance:CIMPedance <real>
{Return}	Returns to the measurement menu (see step (1)).

(1-2) S parameter menu (Available for the R3752H/53H Series)

{S11(A/R) REFL FWD}
O: S11
N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:S11'
[SENSe:]FUNCtion[<chno>]:POWer S11

NOTE: This can be set only when S parameter test set is connected with R3753A.

{S21(B/R) TRANS FWD}
O: S21
N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:S21'
[SENSe:]FUNCtion[<chno>]:POWer S21

{S12 (A/R) TRANS REV}
O: S12
N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:S12'
[SENSe:]FUNCtion[<chno>]:POWer S12

{S22(A/R) REFL REV}
O: S22
N: [SENSe:]FUNCtion[<chno>][:ON] 'POWer:S22'
[SENSe:]FUNCtion[<chno>]:POWer S22

{CONVERSION[ ]} Calls the parameter conversion menu (see step (1-1)).

{INPUT PORTS} Calls the measurement menu (see step (1)).

(2) FORMAT

Format menu (1 of 2)

{LOG MAG}
O: LOGMAG
N: CALCulate[<chno>]:FORMat MLOGarithmic

{PHASE}
O: PHASE
N: CALCulate[<chno>]:FORMat PHASe

{DELAY}
O: DELAY
N: CALCulate[<chno>]:FORMat GDELay

{SMITH (R+jX)}
O: SRJX
N: CALCulate[<chno>]:FORMat SCHart

{SMITH (G+jB)}
O: SGJB
N: CALCulate[<chno>]:FORMat ISCHart

{POLAR}
O: POLAR
N: CALCulate[<chno>]:FORMat POLar

{LIN MAG}
O: LINMAG
N: CALCulate[<chno>]:FORMat MLINear

{More 1/2}	Calls the format menu (2 of 2).

Format menu (2 of 2)

{SWR}	O: SWR
	N: CALCulate[<chno>]:FORMat SWR
{REAL}	O: REAL
	N: CALCulate[<chno>]:FORMat REAL
{IMAG}	O: IMAG
	N: CALCulate[<chno>]:FORMat IMAGinary
{PHASE -∞,+∞}	O: UNWRAP
	N: CALCulate[<chno>]:FORMat UPHase
{LOG MAG & PHASE}	O: LOGMP
	N: CALCulate[<chno>]:FORMat MLOPhase
{LOG MAG & DELAY}	O: LOGMD
	N: CALCulate[<chno>]:FORMat MLODelay
{LIN MAG & PHASE}	O: LINMP
	N: CALCulate[<chno>]:FORMat MLIPhase
{More 2/2}	Calls the format menu (1 of 2).

(3) SCALE

Scale menu

{AUTO SCALE}	O: AUTO
	N: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:AUTO ONCE
{/DIV}	O: SDIV <real>
	N: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:PDIVision <real>
{REF VALUE}	O: REFV <real>
	N: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:RLEVel <real>
{REF POS}	O: REFP <real>
	N: DISPlay[:WINDow[<chno>]]:Y[<trace>][:SCALe]:RPOSition <real>

{REF LINE}	O: REFL <bool>
	N: DISPlay[:WINDow[<chno>]]:Y[<trace>]RLINe <bool>
{SCAL FOR 2nd / 1st}	O: SCALF{1ST I 2ND}
	N: See Note.

NOTE: In IEEE488.2-1987 command mode, TRACE is selected by the parameter <trace> in each GPIB command.
<trace>=0,1,8,9 (0:CH1 TRACE 1st, 1:CH2 TRACE 1st, 8:CH1 TRACE 2nd, 9:CH2 TRACE 2nd)

(4) DISPLAY

Display menu (1 of 2)

{DUAL CH ON/OFF}	O: DUAL <bool>
	N: DISPlay:DUAL <bool>
{SPLIT CH ON/OFF}	O: SPLIT <bool>
	N: DISPlay:FORMat {ULOWer I FBACk}

NOTE: SPLIT CH:

ULOWer;	***Split display***
FBACk;	***Over-wrap display***

{DISPLAY DATA}	O: DISPDATA
	N: DISPlay[:WINDow[<chno>]]:TRACe:ASSign DATA
{DISPLAY MEMORY}	O: DISPMEM
	N: DISPlay[:WINDow[<chno>]]:TRACe:ASSign MEMory
{DISPLAY DATA & MEM}	O: DISPDM
	N: DISPlay[:WINDow[<chno>]]:TRACe:ASSign DMEMory
{DEFINE TRACE [ ]}	Calls the trace operation menu (see step (4-2)).
{DATA Æ MEMORY}	O: DTOM
	N: TRACe[<chno>]:COPY DATA
{More 1/2}	Calls the display menu (2 of 2).

Display menu (2 of 2)

{GRATICULE ON/OFF}	O: GRAT <bool>
	N: DISPlay[:WINDow[<chno>]]:TRACe:GRATicule [:STATe] <bool>
{LABEL}	Calls the label menu (see step (4-1)).
{COLOR}	No GPIB commands are available.
{DEFAULT COLOR}	No GPIB commands are available.
{More 2/2}	Calls the display menu (1 of 2).

(4-1) Label menu

{DONE}	O: LABEL <str>
	N: DISPlay[:WINDow[<chno>]]:TEXT[:DATA] {<str> | <block>}
{CURSOR→}	There is no GPIB command to be applied.
{CURSOR←}	There is no GPIB command to be applied.
{BACKSPACE}	There is no GPIB command to be applied.
{DELETE CHAR}	There is no GPIB command to be applied.
{CLEAR LINE}	There is no GPIB command to be applied.
{CANCEL}	Calls the display menu (2 of 2) (See step(4))

(4-2) Trace operation menu

{DATA/MEM}	O: DISPDDM ON
	N: CALCulate[<chno>]:MATH[:EXPRession]:NAME DDM
{DATA-MEM}	O: There is no GPIB command to be applied.
	N: CALCulate[<chno>]:MATH[:EXPRession]:NAME DSM
{DATA*MEM}	O: There is no GPIB command to be applied.
	N: CALCulate[<chno>]:MATH[:EXPRession]:NAME DMM
{DATA+MEM}	O: There is no GPIB command to be applied.
	N: CALCulate[<chno>]:MATH[:EXPRession]:NAME DAM
{OFF}	O: DISPDDM OFF
	N: CALCulate[<chno>]:MATH[:EXPRession]:NAME NONE
{Return}	Returns to the display menu (1 of 2) (See step (4)).

(5) AVG

Average menu

{AVG STATE ON/OFF}	O:	AVER <bool>
	N:	[SENSe:]AVERage[<chno>][:STATe] <bool>
{AVG COUNT}	O:	AVERFACT <int>/ AVR{2 | 4 | 8 | 16 | 32 | 64 | 128}
	N:	[SENSe:]AVERage[<chno>]:COUNt <int>
{AVG RESTART}	O:	AVERREST
	N:	[SENSe:]AVERage[<chno>]:RESTart
{GROUP DELAY APERTURE}	O:	APERTP <real>
	N:	CALCulate[<chno>]:GDAPerture:APERture <real>
{SMOOTHING ON/OFF}	O:	SMOO <bool>
	N:	CALCulate[<chno>]:SMOothing:STATe <bool>
{SMOOTHING APERTURE}	O:	SMOOAPER <REAL>
	N:	CALCulate[<chno>]:SMOothing:APERture <real>
{IF RBW [ ]}	O:	RBW <int> / RBW{1K | 300 | 100 | 30 | 10}HZ / RBWAUTO
	N:	[SENSe:]BANDwidth[:RESolution] <real>
		[SENSe:]BANDwidth[:RESolution]:AUTO <bool>

(6a) ATT (Available for the R3752H/53H Series)

Attenuator menu

{Rch : ATT [ ]} Calls the attenuator selection menu (see step (6-1a)).

O: ATTIR <int>/ ATTIRAUTO/ RI{50 | 1}A{20 | 0}

N: INPut1:ATTenuation <int>/ INPut1:ATTenuation:AUTO <bool>

NOTE: This is not displayed in R3753E.

{Rch : IMP 1MΩ/50Ω}

O: IMPIR <int>/ RI{50 | 1}A{20 | 0}

N: INPut1:INPedance <int>

NOTE: This is not displayed in R3753E.

{Ach : ATT [ ]} Calls the attenuator selection menu (see step (6-1a)).

O: ATTIA <int>/ ATTIAAUTO/ AI{50 | 1}A{20 | 0}

N: INPut2:ATTenuation <int>/ INPut2:ATTenuation:AUTO <bool>

{Ach : IMP 1MΩ/50Ω} O: IMPIA <int>/ AI{50 | 1}A{20 | 0}

N: INPut2:IMPedance <int>

{Bch : ATT [ ]} Calls the attenuator selection menu (see step (6-1a)).

O: ATTIB <int>/ ATTIBAUTO/ BI{50 | 1}A{20 | 0}

N: INPut3:ATTenuation <int>/ INPut3:ATTenuation:AUTO <bool>

NOTE: This is not displayed in R3753B/E.

{Bch : IMP 1MΩ/50Ω} O: IMPIB <int>/ BI{50 | 1}A{20 | 0}

N: INPut3:IMPedance <int>

NOTE: This is not displayed in R3753B/E.

{CREAR TRIP} O: CLRTRIP

N: [SENSe:]POWer:AC:PROTection:CLEar

(6-1a) Attenuator selection menu

{INPUT ATT AUTO} O: ATTI{R | A | B}AUTO

N: INPut[<input>]:ATTenuation:AUTO <bool>

{INPUT ATT 0dB} O: ATTI{R | A | B}0

N: INPut[<input>]:ATTenuation 0

{INPUT ATT 20dB} O: ATTI{R | A | B}20

N: INPut[<input>]:ATTenuation 20

{Return} Returns to the attenuator menu (see step (6a)).

<input> = {1 | 2 | 3} (1:Rch, 2:Ach, 3:Bch)

(6b) Function (Available for the R3754 Series)

Attenuator menu

{Rch : ATT [ ]}	O: ATTIR{AUTO | 0 | 25}
	N: INPut1:ATTenuation:AUTO ON/ INPut1:ATTenuation {0 | 25}
{Rch : AMP 0dB/16dB}	O: AMPIR{0 | 16}
	N: INPut1:GAIN {0 | 16}
{Ach : ATT [ ]}	O: ATTIA{AUTO | 0 | 25}
	N: INPut2:ATTenuation:AUTO ON/ INPut2:ATTenuation {0 | 25}

NOTE: This menu is displayed only when Option 10 or 11 is installed.

{Ach : AMP 0dB/16dB}	O: AMPIA{0 | 16}
	N: INPut2:GAIN {0 | 16}

NOTE: This menu is displayed only when Option 10 or 11 is installed.

{Bch : ATT [ ]}	O: ATTIB{AUTO | 0 | 25}
	N: INPut3:ATTenuation:AUTO ON/ INPut3:ATTenuation {0 | 25}

NOTE: This menu is displayed only when Option 11 is installed.

{Bch : AMP 0dB/16dB}	O: AMPIB{0 | 16}
	N: INPut3:GAIN {0 | 16}

NOTE: This menu is displayed only when Option 11 is installed.

(7) CAL

Calibration menu (1 of 2)

{NORMALIZE (THRU)}	O : NORM ON
	N : [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] NORMalize
{NORMALIZE (SHORT)}	O : NORMS ON
	N : [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] SNORmalize
{CAL MENU}	Calls the full calibration selection menu (see step (7-1)).
{CORRECT ON/OFF}	O : CORRECT <bool>
	N : [SENSe:]CORRection[<chno>]:CSET:STATe <bool>
{INTERPOLATE ON/OFF}	O : INTERPOL
	N : [SENSe:]CORRection[<chno>]:CSET:INTerpolate <bool>
{PORT EXTENSION}	Calls the port extension menu (see step (7-2)).
{Z0 VALUE}	O : SETZ0 <real> / MKRZO{50 | 75}
	N : CALCulate[<chno>]:TRANsform:IMPedance: CIMPedance <real>
{More 1/2}	Calls the calibration menu (2 of 2).

Calibration menu (2 of 2)

{ELEC DELAY ON/OFF}	O : LENGTH <bool>
	N : [SENSe:]CORRection[<chno>]:EDELay:STATe <bool>
{ELECTRICAL DELAY}	O : ELED <real>
	N : [SENSe:]CORRection[<chno>]:EDELay[:TIME] <real>
{ELECTRICAL LENGTH}	O : LENGVAL <real>
	N : [SENSe:]CORRection[<chno>]:EDELay:DISTance <real>
{VELOCITY FACTOR}	O : VELOFACT <real>
	N : [SENSe:]CORRection[<chno>]:RVELocity:COAX <real>
{PHASE OFFSET VALUE}	O : PHAO
	N : [SENSe:]CORRection[<chno>]:OFFSet:PHASe <real>
{PHASE SLOPE}	O : PHASLO <real>
	N : [SENSe:]CORRection[<chno>]:SLOPe:PHASe <real>
{More 2/2}	Calls the calibration menu (1 of 2).

(7-1) Full calibration selection menu

{1PORT FULL CAL}	Calls the 1 port full calibration menu (see step (7-1-1)).
{TRANS FULL CAL}	Calls the Transmission full menu (see step (7-2-1)).
{CLEAR CAL DATA}	O : CLEAR
	N : [SENSe:]CORRection[<chno>]:COLLect:DELete
{Return}	Returns to the calibration menu (1 of 2) (see step (7))

(7-1-1) 1 port full calibration menu

{OPEN}	O : OPEN
	N : [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] OPEN
{SHORT}	O : SHORT
	N : [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] SHORt
{LOAD}	O : LOAD
	N : [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] LOAD
{DONE 1-PORT}	O : DONE / DONE1PORT
	N : [SENSe:]CORRection[<chno>]:COLLect:SAVE

(7-1-2) 1 port full calibration menu

{OPEN}	O: IMPOPEN
	N: [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] IOPen
{SHORT}	O: IMPSHORT
	N: [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] ISHort
{LOAD}	O: IMPLD50
	N: [SENSe:]CORRection[<chno>]:COLLect[:ACQuire] ILOad50
{DONE TRANS}	O: DONE
	N: [SENSe:]CORRection[<chno>]:COLLect:SAVE

(7-2a) Port extension menu (Available for the R3752H/53H Series)

{EXTENSION ON/OFF} O: PORE <bool>

N: [SENSe:]CORRection[<chno>]:PEXTension:STATe <bool>

{EXTENSION INPUT R} O: EPORTR <real>

N: [SENSe:]CORRection[<chno>]:PEXTension:TIME1 <real>

NOTE: This is not displayed in R3753E.

{EXTENSION INPUT A} O: EPORTA <real>

N: [SENSe:]CORRection[<chno>]:PEXTension:TIME2 <real>

{EXTENSION INPUT B} O: EPORTB <real>

N: [SENSe:]CORRection[<chno>]:PEXTension:TIME3 <real>

NOTE: This is not displayed in R3753B/E.

{EXTENSION PORT 1} O: EPORT1 <real>

N: [SENSe:]CORRection[<chno>]:PEXTension:TIME4 <real>

NOTE: This can be set only when S parameter test set is connected with R3753A.

{EXTENSION PORT 2} O: EPORT2 <real>

N: [SENSe:]CORRection[<chno>]:PEXTension:TIME5 <real>

NOTE: This can be set only when S parameter test set is connected with R3753A.

{Return} Returns to the calibration menu (2 of 2).

(7-2b) Port extension menu (Available for the R3754 Series)

{EXTENSION ON/OFF}	O :	PORE <bool>
	N :	[SENSe:]CORRection[<chno>]:PEXTension:STATe <bool>
{EXTENSION INPUT R}	O	: EPORTR <real>
	N :	[SENSe:]CORRection[<chno>]:PEXTension:TIME1 <real>
{EXTENSION INPUT A}	O :	EPORTA <real>
	N :	[SENSe:]CORRection[<chno>]:PEXTension:TIME2 <real>

NOTE: This menu is displayed only when Option 10 or 11 is installed.

{EXTENSION INPUT B}	O :	EPORTB <real>
	N :	[SENSe:]CORRection[<chno>]:PEXTension:TIME3 <real>

NOTE: This menu is displayed only when Option 11 is installed.

{Return} Returns to the calibration menu (2 of 2).

(7-3) Calibration standard definition menu (Available for the R3754 Series)

{OPEN STD}	O:	STDO{RS I LS I CP}<real>
	N:	[SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard: {OIMPedance I OINDuctance I OCAPacitance} <real>
{SHORT STD}	O:	STDS{RS I LS I CP}<real>
	N:	[SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard: {SIMPedance I SINDuctance I SCAPacitance} <real>
{LOAD STD}	O:	STDL{RS I LS I CP}<real>
	N:	[SENSe:]CORRection[<chno>]:CKIT:DEFine:STANdard: {LIMPedance I LINDuctance I LCAPacitance} <real>
{SAVE STD VALUE}	O:	STDSAVE
	N:	[SENSe:]CORRection[<chno>]:CKIT:DEFine:SAVE

(8) MKR

Marker menu

{ACTIVATE MARKER [ ]}	Calls the active marker menu (1 of 2) (see step (8-1)).
{MARKER ALL OFF}	O : MKRAOFF
	N : MARKer[<chno>]:AOFF
{ΔMODE MENU}	Calls the delta mode menu (see step (8-2)).
{MKR LIST ON/OFF}	O : There is no GPIB command to be applied.
	N : MARKer[<chno>]:LIST <bool>
{MARKER MODE MENU}	Calls the marker mode menu (see step (8-3)).

To acquire the marker data, use the following commands can be used.

O: MKR{1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10}A?
N: FETch[<chno>][:MARKer][:ACTivate]?
FETch[<chno>][:MARKer]:NUMBer<n>?

(8-1) Active marker menu (1 of 2)

{MARKER 1}	O: MKR1A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 1[,<real>]
{MARKER 2}	O: MKR2A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 2[,<real>]
{MARKER 3}	O: MKR3A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 3[,<real>]
{MARKER 4}	O: MKR4A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 4[,<real>]
{MARKER 5}	O: MKR5A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 5[,<real>]
{ACTIVATE MKR OFF}	O: MKROFF
	N: MARKer[<chno>]:ACTivate:STATe <bool>
{Return}	Returns to the marker menu (see step (8)).
{More 1/2}	Calls the active marker menu (2 of 2).

Active marker menu (2 of 2)

{MARKER 6}	O: MKR6A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 6[,<real>]
{MARKER 7}	O: MKR7A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 7[,<real>]
{MARKER 8}	O: MKR8A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 8[,<real>]
{MARKER 9}	O: MKR9A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 9[,<real>]
{MARKER 10}	O: MKR10A <real>
	N: MARKer[<chno>]:ACTivate[:NUMBer] 10[,<real>]
{ACTIVATE MKR OFF}	O: MKROFF
	N: MARKer[<chno>]:ACTivate:STATe <bool>
{Return}	Returns to the marker menu (see step (8)).
{More 2/2}	Calls the active marker menu (1 of 2).

(8-2) Delta mode menu

{ΔMODE OFF}	O: DMKROF
	N: MARKer[<chno>]:DELTa[:MODE] OFF
{ΔREF=ΔMKR}	O: DMKRC
	N: MARKer[<chno>]:DELTa[:M0DE] CHILd
{ΔREF=ACT MKR}	Calls the ACT MKR menu (see step (8-2-1)).
	O: DMKRA
	N: MARKer[<chno>]:DELTa[:M0DE] COMPare
{ΔREF=FIXED MKR}	O: DMKRF
	N: MARKer[<chno>]:DELTa[:MODE] FIXed
{FIXED MKR POSITION}	Calls FIXED MKR setting menu (see step (8-2-2)).
{Return}	Returns to the marker menu (see step (8)).

Select the compare marker before setting the delta mode to ΔREF=ACT MKR.

(See ACT MKR menu.)

(8-2-1) ACT MKR menu (1 of 2)

{COMPARE MARKER 1}	O:	DMKR1O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 1[,<real>]
{COMPARE MARKER 2}	O:	DMKR2O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 2[,<real>]
{COMPARE MARKER 3}	O:	DMKR3O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 3[,<real>]
{COMPARE MARKER 4}	O:	DMKR4O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 4[,<real>]
{COMPARE MARKER 5}	O:	DMKR5O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 5[,<real>]
{ACTIVATE MARKER [ ]}	Calls the active marker menu (1 of 2) (see step (8-1)).	
{Return}	Returns to the delta mode menu (see step (8-2)).	
{More 1/2}	Calls ACT MKR menu (2 of 2)	

ACT MKR menu (2 of 2)

{COMPARE MARKER 6}	O:	DMKR6O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 6[,<real>]
{COMPARE MARKER 7}	O:	DMKR7O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 7[,<real>]
{COMPARE MARKER 8}	O:	DMKR8O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 8[,<real>]
{COMPARE MARKER 9}	O:	DMKR9O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 9[,<real>]
{COMPARE MARKER 10}	O:	DMKR10O <real>
	N:	MARKer[<chno>]:DELTa:COMPare 10[,<real>]
{ACTIVATE MARKER [ ]}	Calls the active marker menu (1 of 2) (see step (8-1)).	
{Return}	Returns to the delta mode menu (see step (8-2)).	
{More 2/2}	Calls ACT MKR menu (1 of 2).	

(8-2-2) FIXED MKR setting menu (1 of 2)

{FIXED MKR STIMULUS} O: FMKRS <real>
N: MARKer[<chno>]:FIXed:STIMulus <real>

{FIXED MKR VALUE} O: FMKRV <real>
N: MARKer[<chno>]:FIXed:VALue <real>

{FIXED MKR AUX VALUE} O: There is no GPIB command to be applied.
N: MARKer[<chno>]:FIXed:AVALue <real>

{FIXED MKR → ACTIVE MKR}
O: MKRFIX
N: MARKer[<chno>]:LET FIXed

{Return} Returns to the delta mode menu (see step (8-2)).

(8-3) Marker mode menu

{MKR CMP/UNCMP} O: MKRCMP/ MKRUCMP
N: MARKer[<chno>]:COMPensate <bool>

{MKR CPL/UNCPL} O: MKRCOUP/ MKRUCOUP
N: MARKer[<chno>]:COUPle <bool>

{CONVERSION MKR MENU [ ]}
Calls the conversion marker menu (see step (8-3-1)).

{SMITH MKR MENU [ ]} Calls the smith marker menu (see step (8-3-2)).

{POLAR [ ] MKR MENU} Calls the polar marker menu (see step (8-3-3)).

{Return} Returns to the marker menu (see step (8)).

(8-3-1) Conversion marker menu

{DEFAULT} O: ZYMKDFLT
N: MARKer[<chno>]:CONVert[:MODE] DEFault

{LIN MKR} O: ZYMKLIN
N: MARKer[<chno>]:CONVert[:MODE] LINear

{Re/Im} O: ZYMKRI
N: MARKer[<chno>]:CONVert[:MODE] RIMaginary

{Return} Returns to the marker mode menu (see step (8-3)).
Returns to the calibration menu (1 of 2) (see step (7)).

(8-3-2) Smith marker menu

{LIN MKR}	O:	SMKRLIN
	N:	MARKer[<chno>]:SMITh MLINear
{LOG MKR}	O:	SMKRLOG
	N:	MARKer[<chno>]:SMITh MLOGarithmic
{Re/Im MKR}	O:	SMKRRI
	N:	MARKer[<chno>]:SMITh RIMaginary
{R+jX MKR}	O:	SMKRRX
	N:	MARKer[<chno>]:SMITh IMPedance
{G+jB MKR}	O:	SMKRGB
	N:	MARKer[<chno>]:SMITh ADMittance
{Z0 VALUE}	O:	SETZ0 <real> / MKRZO{50 | 75}
	N:	CALCulate[<chno>]:TRANsform:IMPedance:CIMPedance <real>
{Return}		Returns to the marker mode menu (see step (8-3)).

(8-3-3) Polar marker menu

{LIN MKR}	O:	PMKRLIN
	N:	MARKer[<chno>]:POLar MLINear
{LOG MKR}	O:	PMKRLOG
	N:	MARKer[<chno>]:POLar MLOGarithmic
{Re/Im MKR}	O:	PMKRRI
	N:	MARKer[<chno>]:POLar RIMaginary
{Z0 VALUE}	O:	SETZ0 <real> / MKRZO{50 | 75}
	N:	CALCulate[<chno>]:TRANsform:IMPedance:CIMPedance <real>
{Return}		Returns to the marker mode menu (see step (8-3)).

(9) MKR→

Marker search menu

{MARKER → START}	O: MKRSTAR
	N: MARKer[<chno>]:LET STARt
{MARKER → STOP}	O: MKRSTOP
	N: MARKer[<chno>]:LET STOP
{MARKER → CENTER}	O: MKRCENT
	N: MARKer[<chno>]:LET CENTer
{MARKER → SPAN}	O: MKRSPAN
	N: MARKer[<chno>]:LET SPAN
{MARKER → REF.VALUE}	O: MKRREF
	N: MARKer[<chno>]:LET RLEVel
{PART SRCH [ ]}	Calls the partial search menu (see step (9-1)).
{MKR SEARCH [ ]}	Calls the search menu (see step (9-2)).

(9-1) Partial search menu

{ΔMODE MENU}	Calls the delta mode menu (see step (8-2)).
{SET RANGE}	O: There is no GPIB command to be applied.
	N: MARKer[<chno>]:SEARch:PARTial:SRANge
{STATISTICS [ ]}	O: MKRSTAT<bool>
	N: MARKer[<chno>]:STATistics <bool>
{PART SRCH ON/OFF}	O: MKRPART <bool>
	N: MARKer[<chno>]:SEARch:PARTial[:STATe] <bool>
{Return}	Returns to the marker search menu (see step (9)).

NOTE: ***To obtain the analysis result, use the following:***
O: REPSTAT?
N: FETCh[<chno>][:MARKer]:STATistics?

(9-2) Search menu

{MKR SEARCH OFF}	O: SRCHOFF
	N: MARKer[<chno>]:SEARch[:MODE] OFF
{MAX}	O: MAXSRCH
	N: MARKer[<chno>]:SEARch[:MODE] MAX
{MIN}	O: MINSRCH
	N: MARKer[<chno>]:SEARch[:MODE] MIN
{TARGET}	Calls the target menu (see step (9-2-1)).
	O: ZRPSRCH (0° SEARCH)
	N: MARKer[<chno>]:SEARch[:MODE] TARGet
{RIPPLE}	Calls the ripple menu (see step (9-2-2)).
	O: DRIPPL1
	N: MARKer[<chno>]:SEARch[:MODE] RIPPle
{FLTR ANAL}	Calls the filter analysis menu (see step (9-2-3)).
{TRACKING ON/OFF}	O: MKRTRAC <bool>
	N: MARKer[<chno>]:SEARch:TRACking <bool>
{Return}	Returns to the marker search menu (see step (9)).

(9-2-1) Target menu

{TARGET VALUE}	O: There is no command to be applied.
	N: MARKer[<chno>]:SEARch:TARGet[:MODE] VALue MARKer[<chno>]:SEARch:TARGet:VALue <real>
{0°}	O: ZRPSRCH
	N: MARKer[<chno>]:SEARch:TARGet[:MODE] ZERO
{±180°}	O: There is no command to be applied.
	N: MARKer[<chno>]:SEARch:TARGet[:MODE] PI
{LEFT SEARCH}	O: There is no command to be applied.
	N: MARKer[<chno>]:SEARch:TARGet:LEFT
{RIGHT SEARCH}	O: There is no command to be applied.
	N: MARKer[<chno>]:SEARch:TARGet:RIGHt
{Return}	Returns to the search menu (see step (9-2)).

(9-2-2) Ripple menu

{MAX∩}	O:	There is no command to be applied.
	N:	MARKer[<chno>]:SEARch:RIPPle[:MODE] MAX
{MIN∪}	O:	There is no command to be applied.
	N:	MARKer[<chno>]:SEARch:RIPPle[:MODE] MIN
{DMAX∩-MIN∪}	O:	DRIPPL1
	N:	MARKer[<chno>]:SEARch:RIPPle[:MODE] BOTH
{ΔX}	O:	DLTX <real>
	N:	MARKer[<chno>]:SEARch:RIPPle:DX <real>
{ΔY}	O:	DLTY <real>
	N:	MARKer[<chno>]:SEARch:RIPPle:DY <real>
{Return}		Returns to the search menu (see step (9-2)).

(9-2-3) Filter analysis menu

{WIDTH VALUE }	O:	T{3 I 6 I 60}DB/ T{3 I 6}DEG/ TXDB <real>/ TXDEG <real>
	N:	MARKer[<chno>]:FANalysis:WIDTh <real>
{FILTER TYPE BAND/NOTC}	O:	{FANABAND I FANANOTCH}
	N:	MARKer[<chno>]:FANalysis:TYPE {BAND I NOTCh}
{SEARCH FROM [ ]}		Calls the search reference menu (see step (9-2-4)).
{DISPLAY MODE ABS/REL}	O:	FANAABS I FANAREL
	N:	MARKer[<chno>]:FANalysis:FORMat {ABSolute I RELative}
{SEARCH IN/OUT}	O:	TIN/ TOUT
	N:	MARKer[<chno>]:FANalysis:DIRection {IN I OUT}
{FILTER ANAL ON/OFF}	O:	FLTANA <bool>
	N:	MARKer[<chno>]:FANalysis[:STATe] <bool>
{Return}		Returns to the search menu (see step (9-2)).

The filter analysis data can be acquired using the following command.

O: TXDB?/ TXDEG?

N: FETch[<chno>][:MARKer]:FANalysis?

(9-2-4) Search reference menu

{ACTIVE MARKER}	O:	TREFACT
	N:	MARKer[<chno>]:FANalysis:REFerence ACTive
{MAXIMUM VALUES}	O:	TREFMAX
	N:	MARKer[<chno>]:FANalysis:REFerence MAXimum
{REFERENCE LINE}	O:	TREFREF
	N:	MARKer[<chno>]:FANalysis:REFerence RLINe
{Return}	Returns the Filter analysis menu (see step (9-2-3)).	

A.3.4 INSTRUMENT STATE Block

(1) SAVE

Save menu

{SAVE REGISTER}	Calls the save register menu (1 of 4) (see step (1-1)).
{CLEAR REGISTER}	Calls the clear register menu (1 of 4) (see step (1-2)).
{STORE FILE}	Calls the store file menu (see step (1-3)).
{PURGE FILE}	Calls the purge file menu (see step (1-4)).
{FORMAT DISK}	There are no GPIB commands to be applied.

(1-1) Save register menu (1 of 4)

{SAVE REG-1}	O: SAVEREG1
	N: *SAV 1/ REGister:SAVE 1
{SAVE REG-2}	O: SAVEREG2
	N: *SAV 2/ REGister:SAVE 2
{SAVE REG-3}	O: SAVEREG3
	N: *SAV 3/ REGister:SAVE 3
{SAVE REG-4}	O: SAVEREG4
	N: *SAV 4/ REGister:SAVE 4
{SAVE REG-5}	O: SAVEREG5
	N: *SAV 5/ REGister:SAVE 5
{RENAME REG}	There are no GPIB commands to be applied.
{Return}	Returns to the save menu (see step (1)).
{More 1/4}	Calls the save register menu (2 of 4).

Save register menu (2 of 4)

{SAVE REG-6}	O: SAVEREG6
	N: *SAV 6/ REGister:SAVE 6
{SAVE REG-7}	O: SAVEREG7
	N: *SAV 7/ REGister:SAVE 7
{SAVE REG-8}	O: SAVEREG8
	N: *SAV 8/ REGister:SAVE 8
{SAVE REG-9}	O: SAVEREG9
	N: *SAV 9/ REGister:SAVE 9
{SAVE REG-10}	O: SAVEREG10
	N: *SAV 10/ REGister:SAVE 10
{RENAME REG}	There are no GPIB commands to be applied.
{Return}	Returns to the save menu (see step (1)).
{More 2/4}	Calls the save register menu (3 of 4).

Save register menu (3 of 4)

{SAVE REG-11}	O: SAVEREG11
	N: *SAV 11/ REGister:SAVE 11
{SAVE REG-12}	O: SAVEREG12
	N: *SAV 12/ REGister:SAVE 12
{SAVE REG-13}	O: SAVEREG13
	N: *SAV 13/ REGister:SAVE 13
{SAVE REG-14}	O: SAVEREG14
	N: *SAV 14/ REGister:SAVE 14
{SAVE REG-15}	O: SAVEREG15
	N: *SAV 15/ REGister:SAVE 15
{RENAME REG}	No GPIB commands are available.
{Return}	Calls the Save menu (see step (1)).
{More 3/4}	Calls the Save register menu (4 of 4)

Save register menu (4 of 4)

{SAVE REG-16}	O: SAVEREG16
	N: *SAV 16/ REGister:SAVE 16
{SAVE REG-17}	O: SAVEREG17
	N: *SAV 17/ REGister:SAVE 17
{SAVE REG-18}	O: SAVEREG18
	N: *SAV 18/ REGister:SAVE 18
{SAVE REG-19}	O: SAVEREG19
	N: *SAV 19/ REGister:SAVE 19
{SAVE REG-20}	O: SAVEREG20
	N: *SAV 20/ REGister:SAVE 20
{RENAME REG}	No GPIB commands are available.
{Return}	Calls the Save menu (see step (1)).
{More 4/4}	Calls the Save register menu (1 of 4)

(1-2) Clear register menu (1 of 4)

{CLEAR REG-1}	O: CLRREG1
	N: REGister:CLEar 1
{CLEAR REG-2}	O: CLRREG2
	N: REGister:CLEar 2
{CLEAR REG-3}	O: CLRREG3
	N: REGister:CLEar 3
{CLEAR REG-4}	O: CLRREG4
	N: REGister:CLEar 4
{CLEAR REG-5}	O: CLRREG5
	N: REGister:CLEar 5
{RENAME REG}	There are no GPIB commands to be applied.
{Return}	Returns to the save menu (see step (1)).
{More 1/4}	Calls the clear register menu (2 of 4).

Clear register menu (2 of 4)

{CLEAR REG-6}	O:	CLRREG6
	N:	REGister:CLEar 6
{CLEAR REG-7}	O:	CLRREG7
	N:	REGister:CLEar 7
{CLEAR REG-8}	O:	CLRREG8
	N:	REGister:CLEar 8
{CLEAR REG-9}	O:	CLRREG9
	N:	REGister:CLEar 9
{CLEAR REG-10}	O:	CLRREG10
	N:	REGister:CLEar 10
{RENAME REG}	There are no GPIB commands to be applied.	
{Return}	Returns to the save menu (see step (1)).	
{More 2/4}	Calls the clear register menu (3 of 4)	

Clear register menu (3 of 4)

{CLEAR REG-11}	O:	CLRREG11
	N:	REGister:CLEar 11
{CLEAR REG-12}	O:	CLRREG12
	N:	REGister:CLEar 12
{CLEAR REG-13}	O:	CLRREG13
	N:	REGister:CLEar 13
{CLEAR REG-14}	O:	CLRREG14
	N:	REGister:CLEar 14
{CLEAR REG-15}	O:	CLRREG15
	N:	REGister:CLEar 15
{RENAME REG}	There are no GPIB commands to be applied.	
{Return}	Returns to the Clear menu (see step (1)).	
{More 3/4}	Calls the Clear register menu (4 of 4)	

Clear register menu (4 of 4)

{CLEAR REG-16}	O:	CLRREG16
	N:	REGister:CLEar 16
{CLEAR REG-17}	O:	CLRREG17
	N:	REGister:CLEar 17
{CLEAR REG-18}	O:	CLRREG18
	N:	REGister:CLEar 18
{CLEAR REG-19}	O:	CLRREG19
	N:	REGister:CLEar 19
{CLEAR REG-20}	O:	CLRREG20
	N:	REGister:CLEar 20
{RENAME REG}	There are no GPIB commands to be applied.	
{Return}	Returns to the Clear menu (see step (1)).	
{More 4/4}	Calls the clear register menu (1 of 4)	

(1-3) Store file menu

{STORE}	O:	STFILE <str>
	N:	FILE:STORe <str>
{ROLL ↑}	No GPIB commands are available.	
{ROLL ↓}	No GPIB commands are available.	
{DEFINE STORE}	Calls the file data menu (see step (1-3-1)).	
{EDIT NAME}	No GPIB commands are available.	
{NAME ↑}	No GPIB commands are available.	
{NAME ↓}	No GPIB commands are available.	
{CANCEL}	No GPIB commands are available.	

<str> in "STORE" is file name.

(1-3-1) File data menu

{STATE ON/OFF}	O:	DSSTATE <bool>
	N:	FILE:STATe:CONDition <bool>
{RAY ARRAY ON/OFF}	O:	RAWARY <bool>
	N:	FILE:STATe:RAW <bool>
{CORR COEF ON/OFF}	O:	CORARY <bool>
	N:	FILE:STATe:CORRection <bool>
{DATA ARRAY ON/OFF}	O:	DATAARY <bool>
	N:	FILE:STATe:DATA <bool>
{MEM ARRY ON/OFF}	O:	MEMARY <bool>
	N:	FILE:STATe:MEMory <bool>
{Return}	Returns to the save menu (see step (1)).	

(1-4) Purge file menu

{PURGE}	O:	PURGE <str>
	N:	FILE:DELete <str>
{CURSOR↑}	There is no GPIB command to be applied.	
{CURSOR ↓}	There is no GPIB command to be applied.	
{Return}	Returns to the save menu (see step (1)).	

<str> in "PURGE" is file name.

(2) RECALL

Recall menu (1 of 4)

{RECALL REG-1}	O: RECLREG1
	N: *RCL 1/ REGister:RECall 1
{RECALL REG-2}	O: RECLREG2
	N: *RCL 2/ REGister:RECall 2
{RECALL REG-3}	O: RECLREG3
	N: *RCL 3/ REGister:RECall 3
{RECALL REG-4}	O: RECLREG4
	N: *RCL 4/ REGister:RECall 4
{RECALL REG-5}	O: RECLREG5
	N: *RCL 5/ REGister:RECall 5
{RECALL POWER OFF}	O: RECLPOFF
	N: *RCL POFF/ REGister:RECall POFF
{LOAD FILE}	O: LDFILE <str>
	N: FILE:LOAD <str>
{More 1/4}	Calls the recall menu (2 of 4).

<str> in "LOAD FILE" is file name.

Recall menu (2 of 4)

{RECALL REG-6}	O: RECLREG6
	N: *RCL 6/ REGister:RECall 6
{RECALL REG-7}	O: RECLREG7
	N: *RCL 7/ REGister:RECall 7
{RECALL REG-8}	O: RECLREG8
	N: *RCL 8/ REGister:RECall 8
{RECALL REG-9}	O: RECLREG9
	N: *RCL 9/ REGister:RECall 9
{RECALL REG-10}	O: RECLREG10
	N: *RCL 10/ REGister:RECall 10
{RECALL POWER OFF}	O: RECLPOFF
	N: *RCL POFF/ REGister:RECall POFF

{LOAD FILE}	O: LDFILE <str>
	N: FILE:LOAD <str>
{More 2/4}	Calls the recall menu (3 of 4).

<str> in"LOAD FILE" is file name.

Recall menu (3 of 4)

{RECALL REG-11}	O: RECLREG11
	N: *RCL 11/REGister:RECall 11
{RECALL REG-12}	O: RECLREG12
	N: *RCL 12/REGister:RECall 12
{RECALL REG-13}	O: RECLREG13
	N: *RCL 13/REGister:RECall 13
{RECALL REG-14}	O: RECLREG14
	N: *RCL 14/REGister:RECall 14
{RECALL REG-15}	O: RECLREG15
	N: *RCL 15/REGister:RECall 15
{RECALL POWER OFF}	O: RECLPOFF
	N: *RCL POFF/REGister:RECall POFF
{LOAD FILE}	O: LDFILE <str>
	N: FILE:LOAD <str>
{More 3/4}	Calls the Recall menu (4 of 4)

The <str> of LOAD FILE is the filename.

Recall menu (4 of 4)

{RECALL REG-16}	O:	RECLREG16
	N:	*RCL 16/REGister:RECall 16
{RECALL REG-17}	O:	RECLREG17
	N:	*RCL 17/REGister:RECall 17
{RECALL REG-18}	O:	RECLREG18
	N:	*RCL 18/REGister:RECall 18
{RECALL REG-19}	O:	RECLREG19
	N:	*RCL 19/REGister:RECall 19
{RECALL REG-20}	O:	RECLREG20
	N:	*RCL 20/REGister:RECall 20
{RECALL POWER OFF}	O:	RECLPOFF
	N:	*RCL POFF/REGister:RECall POFF
{LOAD FILE}	O:	LDFILE <str>
	N:	FILE:LOAD <str>
{More 4/4}	Calls the Recall menu (1 of 4)	

The <str> of LOAD FILE is the filename.

(3) SYSTEM

System menu

{SYSTEM DRIVE}	No GPIB commands are available.

NOTE: ***Specify the drive name with the file name as follows:***
"[drive name:]<file name>"

{SET CLOCK}	Calls the real time clock menu (see step (3-1)).	
{LIMIT MENU}	Calls the Limit line menu (see step (3-2)).	
{FUNCTION}	Calls the function menu (see step (3-3)).	
{SET KEYBOARE 101/106}	No GPIB commands are available.	
{FIRMWARE REVISION}	O:	Equivalent to IDNT?.
	N:	Equivalent to *IDNT?.

(3-1) Real time clock menu

{YEAR}	O:	YEAR <int>
	N:	SYSTem:DATE <year>,<month>,<day>
{MONTH}	O:	MONTH <int>
	N:	SYSTem:DATE <year>,<month>,<day>
{DAY}	O:	DAY <int>
	N:	SYSTem:DATE <year>,<month>,<day>
{HOUR}	O:	HOUR <int>
	N:	SYSTem:TIME <hour>,<minute>,<second>
{MINUTE}	O:	MINUTE <int>
	N:	SYSTem:TIME <hour>,<minute>,<second>
{SECOND}	O:	SECOND <int>
	N:	SYSTem:TIME <hour>,<minute>,<second>
{Return}	Returns to the system menu (see step (3)).	

(3-2) Limit line menu

{LIMIT LINE ON/OFF} O: LIMITLINE

N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:LINE <bool>

{LIMIT TEST ON/OFF} O: LIMITEST

N: DISPlay[:WINDow[<chno>]:LIMit[<parano>][:STATe] <bool>

{BEEP [ ]} Calls the Beep menu (see step (3-2-8)).

{LIMIT MODE MENU} Calls the Limit mode menu (see step (3-2-1)).

{EDIT LIMIT LINE} Calls the Edit limit menu (1 of 2) (see step (3-2-2)).

{SELECT DATA 1ST/2ND} O: LPAR<int>

N: No commands are available.

NOTE: In the IEEE488.2-1987 command mode, this is specified with the parameter <parano> in each command.

{LIMIT LINE OFFSETS} Calls the Offset limit menu (see step (3-2-7)).

{Return} Returns to the System menu (see step (3)).

(3-2-1) Limit mode menu

{1ST DATA ON/OFF} O: LIMPAR<bool>

NOTE: Use LPAR to set "1ST/2ND" for the IEEE488.1-1987 commands.

N: DISPlay[:WINDow[<chno>]]:LIMit1:PARameter[:STAte] <bool>

{2ND DATA ON/OFF} O: LIMPAR<bool>

NOTE: Use LPAR to set "1ST/2ND" for the IEEE488.1-1987 commands.

N: DISPlay[:WINDow[<chno>]]:LIMit2:PARameter[:STAte] <bool>

{MAG DATA LIN/LOG}
O: LIMSLIN/LIMSLOG (Smith representation)
LIMPLIN/LIMPLOG (Polar representation)

N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]
:PARameter:SmithLIMit
{LINear | LOGarithmic} (Smith representation)
DISPlay[:WINDow[<chno>]]:LIMit[<parano>]
:PARameter:PolarLIMit
{LINear | LOGarithmic} (Polar representation)

{Return} Returns to the Limit menu (see step (3-2)).

(3-2-2) Edit limit menu (1 of 2)

{SEGMENT}
O: LSEG
N: No commands are available.

{SELECT DATA 1ST/2ND}
O: LPAR<int>
N: No commands are available.

{EDIT SEGMENT} Calls Edit segment menu (see step (3-2-4)).

{DELETE}
O: No commands are available
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:
SEGMent<n>:DELete

{ADD SEGMENT}
O: No commands are available.
N: No commands are available.

{LINE TYPE} Calls the Limit type menu (see step (3-2-6)).

{DONE}
O: No commands are available.
N: No commands are available.

{More1/2} Calls Edit limit menu (2 of 2) (see step (3-2-3)).

(3-2-3) Edit limit menu (2 of 2)

{LIMIT LINE ON/OFF}
O: LIMITLINE
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:LINE
<bool>

{LIMIT TEST ON/OFF}
O: LIMITEST
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>][:STATe]
<bool>

{BEEP [ ]} Calls the Beep mode menu (see step (3-2-8)).

{MAG DATA LIN/LOG}
O: LIMSLIN/LIMSLOG (Smith representation)
LIMPLIN/LIMPLOG (Polar representation)
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]
:PARameter:SmithLIMit
{LINear | LOGarithmic} (Smith representation)
DISPlay[:WINDow[<chno>]]:LIMit[<parano>]
:PARameter:PolarLIMit
{LINear | LOGarithmic} (Polar representation)

{LIMIT MODE MENU} Calls Limit mode menu (see step (3-2-1)).

{LIMIT LINE OFFSETS} Calls Offset limit menu (see step (3-2-7)).

{CLEAR LIST} Calls clear limit menu (see step (3-2-5)).

{More2/2} Calls Edit limit menu (1 of 2) (see step (3-2-2)).

(3-2-4) Edit segment menu

{STIMULUS VALUE}
O: LIMS<real>
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:
SEGMent<n>:STMulus <real>

{MARKER TO STIMULUS}
O: No GPIB commands are available.
N: No GPIB commands are available.

{UPPER LIMIT}
O: LIMU<real>
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:
SEGMent<n>:UPPer <real>

{LOWER LIMIT}
O: LIML<real>
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:
SEGMent<n>:LOWer <real>

{DELTA LIMIT}
O: No GPIB commands are available.
N: No GPIB commands are available.

{MIDDLE LIMIT}
O: No GPIB commands are available.
N: No GPIB commands are available.

{MARKER TO MIDDLE}
O: No GPIB commands are available.
N: No GPIB commands are available.

{Return} Returns to Edit limit menu (1 of 2) (see step (3-2-2)).

(3-2-5) Clear limit menu

{YES}
O: LSEGCL
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:CLEar

{NO}
Calls the Edit limit menu (2 of 2) (see step (3-2-3)).

(3-2-6) Limit type menu

{SLOPING LINE}
O: LIMTSLP
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:
SEGMent<n>:TYPE
SLINe

{FLAT LINE}
O: LIMTFLT
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:
SEGMent<n>:TYPE
FLINe

{SINGLE POINT}
O: LIMTSP
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:
SEGMent<n>:TYPE
SPOint

{LIMIT COLOR}
O: LIMC<int>
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:
SEGMent<n>:COLor <int>

{WAVE COLOR}
O: LIMWC<int>
N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:
SEGMent<n>:WCOLor <int>

{Return}
Returns to Edit limit menu (1 of 2) (see step (3-2-2)).

(3-2-7) Offset limit menu

{STIMULUS OFFSET}
O: LIMISTIO<real>
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:
OFFSet:STIMulus <real>

{AMPLITUDE OFFSET}
O: LIMIAMPO<real>
N: DISPlay[:WINDow[<chno>]:LIMit[<parano>]:
OFFSet:AMPLitude <real>

{MARKER TO AMP.OFS}
O: No GPIB commands are available.
N: No GPIB commands are available.

{Return}
Returns to Limit menu (see step (3-2)).

(3-2-8) Beep mode menu

{OFF}	O: FAILBEEP OFF/PASSBEEP OFF
	N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP OFF
{FAIL}	O: FAILBEEP ON
	N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP:FOR FAIL
{PASS}	O: PASSBEEP ON
	N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:BEEP:FOR PASS
{BEEP TONE}	O: BEEPTPONE<int>
	N: DISPlay[:WIN-Dow[<chno>]]:LIMit[<parano>]:BEEP:TONE <int>
{Return}	Returns to Limit menu (see step (3-2)).

Obtaining the result based on the Limit line criteria

To obtain PASS/FAIL information on all segments,

O: No GPIB commands are available.

N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:REPort?

To obtain the PASS/FAIL information based on the test result, the following can be used:

O: LIMRES?

N: DISPlay[:WINDow[<chno>]]:LIMit[<parano>]:RESult?

(3-3) Function menu

{CDMA IF FILTER}	Calls the CDMA filter analysis menu (see step (3-3-1)).
{DIRECT ANALYSIS}	Calls the direct analysis menu (see step (3-4)). (Available for the R3754 Series)
{Return}	Returns to System menu (see step (3)).

(3-3-1) CDMA IF filter analysis menu

{CDMA IF GATE [ ]} Calls the CDMA IF gate menu (see step (3-3-2)).

{CDMA FILTER ANALYSIS [ ]}
Calls the CDMA filter analysis menu (see step (3-3-4)).

{CDMA PHASE LINEARITY [ ]}
O: CDMAPLIN<bool>
N: CALCulate[<chno>]:CDMA:PLINearity:STATe <bool>

{PHASE LINEARITY [ ]} Calls the PHASE LINEARITY analysis menu (see step (3-3-5)).

{Return} Returns to the Function menu (see step (3-3)).

To obtain the analysis result of "CDMA PHASE LINEARITY", use the following:

O: PLINREP?

N: FETCh[<chno>]:PLINearity?

(3-3-2) CDMA IF gate menu

{CDMA GATE [ ]}	O: CDMA<bool>
	N: CALCulate[<chno>]:CDMA:GATE:STATe <bool>
{CDMA GATE START [ ]}	O: CDMASTAR<real>
	N: CALCulate[<chno>]:CDMA:GATE:STARt <real>
{CDMA GATE STOP [ ]}	O: CDMASTOP<real>
	N: CALCulate[<chno>]:CDMA:GATE:STOP <real>
{GATE SHAPE [ ]}	Calls the CDMA filter gate shape menu (see step (3-3-3)).
{Return}	Returns to CDMA IF filter menu (see step (3-3-1)).

(3-3-3) CDMA filter gate shape menu

{MAXIMUM}	O: CDMSMAXI
	N: CALCulate[<chno>]:CDMA:GATE:WINDow MAXimum
{WIDE}	O: CDMSWIDE
	N: CALCulate[<chno>]:CDMA:GATE:WINDow WIDE
{NORMAL}	O: CDMSNORM
	N: CALCulate[<chno>]:CDMA:GATE:WINDow NORMal
{MINIMUM}	O: CDMSMINI
	N: CALCulate[<chno>]:CDMA:GATE:WINDow MINimum
{CDMA IF}	O: CDMSCDMA
	N: CALCulate[<chno>]:CDMA:GATE:WINDow CDMA
{Return}	Returns to CDMA IF gate menu (see step (3-3-2)).

(3-3-4) CDMA filter analysis menu

{CDMA FILTER ANALYSIS [ ]}	O: CDMAFANA<bool>
	N: CALCulate[<chno>]:CDMA:FANalysis:STATe <bool> *1
{WIDTH VALUE}	O: CDMATXCB<real>
	N: CALCulate[<chno>]:CDMA:FANalysis:WIDTe <real>
{ATTN FREQ1}	O: CDMAATT1<real>
	N: CALCulate[<chno>]:CDMA:FANalysis:ATTenuation1 <real>
{ATTN FREQ2}	O: CDMAATT2<real>
	N: CALCulate[<chno>]:CDMA:FANalysis:ATTenuation2 <real>
{Return}	Returns to CDMA IF filter analysis menu (see step (3-3-1)).

*1: CDMA filter analysis result is obtained by using "FETCh[<chno>]: CDMA:FANalysis?".

(3-3-5) Phase linearity analysis menu

{PHASE LINEARITY [ ]}	O:	PLINE<bool>
	N:	CALCulate[<chno>]:PLINearity::STATe<bool>
{PARTIAL ON/OFF}	O:	PLINPART<bool>
	N:	CALCulate[<chno>]:PLINearity:PARTial<bool>
{Return}	Returns to CDMA IF filter analysis menu (see step (3-3-1)).	

To obtain the analysis result of "PHASE LINEARITY", use the following:

O: PLINREP?

N: FETCh[<chno>]:PLINearity?

(3-4) Direct analysis menu (Available for the R3754 Series)

{FILTER ANALYSIS}	Calls the filter analysis menu (see step (3-4-1)).	
{RESONATOR ANALYSIS}	Calls the resonator analysis menu (see step (3-4-2)).	
{EQUIVALENT ANALYSIS}	Calls the equivalent circuit analysis menu (see step (3-4-3)).	
{RIPPLE X VALUE}	O:	THRX<real>
	N:	CALCulate[<chno>]:WANalysis:RIPPle:DX <real>
{RIPPLE Y VALUE}	O:	THRY<real>
	N:	CALCulate[<chno>]:WANalysis:RIPPle:DY <real>
{PARTIL ON/OFF}	O:	ANARPART<bool>
	N:	CALCulate[<chno>]:WANalysis:RANGe:PARTial <bool>

(3-4-1) Filter analysis menu

{-3,XdB BND WIDTH(MAX)}	O:	OUTPXFIL?
	N:	CALCulate[<chno>]:WANalysis:FILTer:MAXimum?
{-3,XdB BND WIDTH(Fc)}	O:	OUTPCFIL?
	N:	CALCulate[<chno>]:WANalysis:FILTer:CFRequency?
{BAND WIDTH}	O:	WAXDB<real>
	N:	CALCulate[<chno>]:WANalysis:FILTer:WIDth <real>
{D VALUE}	O:	WAD<real>
	N:	CALCulate[<chno>]:WANalysis:FILTer:DIFFerence <real>
{F1 VALUE}	O:	WAF1<real>
	N:	CALCulate[<chno>]:WANalysis:FILTer:RFRequency <real>
{F2 VALUE}	O:	WAF2<real>
	N:	CALCulate[<chno>]:WANalysis:FILTer:SFRequency <real>
{FC VALUE}	O:	WAFC<real>
	N:	CALCulate[<chno>]:WANalysis:FILTer:NFRequency <real>

(3-4-2) Resonance analysis menu

{RESONATOR (0 PHASE)}	O:	OUTPRESO?
	N:	CALCulate[<chno>]:WANalysis:RESonator:ZPHase?
{RESONATOR (RIPPLE)}	O:	OUTPRESR?
	N:	CALCulate[<chno>]:WANalysis:RESonator:RIPPle?
{RESONATOR (AdB,BdB)}	O:	OUTPRESF?
	N:	CALCulate[<chno>]:WANalysis:RESonator:MMIN?
{A dB VALUE}	O:	WAXA<real>
	N:	CALCulate[<chno>]:WANalysis:RESonator:BELow <real>
{B dB VALUE}	O:	WAXB<real>
	N:	CALCulate[<chno>]:WANalysis:RESonator:ABOVe <real>

(3-4-3) Equivalent circuit analysis menu

{EQUIVALENT 4-DEVICE}	O:	EQUCPARS4?
	N:	CALCulate[<chno>]:WANalysis:EQUivalent:DEVice4
{EQUIVALENT 6-DEVICE}	O:	EQUCPARA?
	N:	CALCulate[<chno>]:WANalysis:EQUivalent:DEVice6

(4) PRESET

[PRESET]	O:	IP
	N:	SYSTem:PRESet

A.3.5 GPIB Block

(1) PROGRAM

[PROGRAM]	There is no GPIB command to be applied to the following menus which are called by this key. • Controller menu • Load menu • Drive menu

(2) REMOTE/LCL

GPIB menu

{SYSTEM CONTROLLER}	There is no GPIB command to be applied.
{TALKER LISTENER}	There is no GPIB command to be applied.
{SET ADDRESS}	Calls the address menu. (See step (2-1).)

(2-1a) Address menu (Available for the R3752H/53H Series)

{ADDRESS R3753}	There is no GPIB command to be applied.
{ADDRESS PLOTTER}	There is no GPIB command to be applied.
{ADDRESS PRINTER}	There is no GPIB command to be applied.
{Return}	Returns to the GPIB menu. (See step (2).)

(2-1b) Address menu (Available for the R3754 Series)

{ADDRESS R3754}	There is no GPIB command to be applied.
{ADDRESS PLOTTER}	O: ADDRPLOT <int> N: HCOPy:DEVice:ADDRess <int>
{ADDRESS PRINTER}	There is no GPIB command to be applied.
{Return}	Returns to the GPIB menu. (See step (2).)

A.4 Initial Settings

Table A4-1 Initial Settings (1 of 4)

Function		Initialization Method	
		Power ON or Preset	*RST
Stimulus			
Sweeping type		Linear frequency sweeping	Same as left column
Continuous sweeping		ON	OFF
Trigger source		Internal (FREE RUN)	Same as left column
Trigger delay		OFF (0sec)	Same as left column
Sweeping time	(R3752H/53H)	30msec (Manual)	120msec(Auto)
	(R3754)	Auto	Auto
Number of measurement point		201	1201
Start frequency	(R3752H/53H)	5Hz	5Hz
	(R3754)	10kHz	10kHz
Stop frequency	(R3752H/53H)	500MHz	500MHz
	(R3754)	150MHz	150MHz
Center frequency	(R3752H/53H)	250.0000025MHz	250.0000025MHz
	(R3754)	75.005MHz	75.005MHz
Frequency span	(R3752H/53H)	499.999995MHz	499.999995MHz
	(R3754)	149.99MHz	149.99MHz
Frequency display		Start/Stop	Start/Stop
Fixed frequency of level sweeping			
	(R3752H/53H)	100MHz	100MHz
	(R3754)	10MHz	10MHz
Output level	(R3752H/53H)	0dBm	0dBm
	(R3754)	5dBm	5dBm
Start level		-43dBm	-43dBm
Stop level	(R3752H/53H)	0dBm	21dBm
	(R3754)	5dBm	21dBm
Trip (Only R3752H/53H)		Clear	Clear
2-channel interlocking		ON	ON
Program sweeping segment		All clear	All clear
Output port		Port 2 *1	Port 2 *1

*1: In the R3752H/R3753H series, Port 1 is set when E type is used.
For the R3754 series without OPTION 10 or OPTION 11 installed, Port 1 is set.

Table A4-1 Initial Settings (2 of 4)

Function	Initialization Method	
	Power ON or Preset	*RST
Response		
Dual channel	OFF	OFF
Active channel	1	1
Resolution bandwidth		
(R3752H/53H)	10kHz	10kHz
(R3754)	Auto	Auto
Input port selection condition	A/R *1	A/R *1
Averaging	OFF (number of times: 16)	OFF (number of times: 16)
Trace operation	NONE	NONE
Conversion	NONE	NONE
Characteristic impedance Z0	50	50
Measurement format	LOGMAG&PHASE	LOGMAG&PHASE
Group delay aperture	OFF (Aperture 10%)	0.01%
Smoothing	10%	OFF (Aperture 10%)
Display	Data	Data
Split/Overlap	Overlap	Overlap
Label	Non	Non
Calibration		
Correction measurement	OFF	OFF
Calibration data	Clear	Clear
Electrical length correction	OFF(0sec)	OFF(0sec)
Phase offset	OFF(0°)	OFF(0°)
Measurement end extension correction	OFF	OFF
R Input	0sec	0sec
A Input	0sec	0sec
B Input	0sec	0sec
Port 1 (Only R3752H/53H)	0sec	0sec
Port 2 (Only R3752H/53H)	0sec	0sec
Propagation constant	1	1

*1: In the R3752H/R3753H series, "A" is set when E type is used.
For the R3754 series without OPTION 10 or OPTION 11 installed, "R" is set.

Table A4-1 Initial Settings (3 of 4)

Function	Initialization Method	
	Power ON or Preset	*RST
The value per division of Y-axis		
Logarithm amplitude	10dB	10dB
Phase	45°	45°
Group delay	0.1μsec	0.1μsec
Smith chart	-	-
Polar coordinate	-	-
Linear amplitude	0.1	0.1
SWR	1	1
Real part	1	1
Imaginary part	1	1
Continuous phase	360°	360°
Reference position		
Logarithm amplitude	100%	100%
Phase	50%	50%
Group delay	50%	50%
Smith chart	-	-
Polar coordinate	-	-
Linear amplitude	0%	0%
SWR	0%	0%
Real part	100%	100%
Imaginary part	100%	100%
Continuous phase	50%	50%
Reference value		
Logarithm amplitude	0dB	0dB
Phase	0°	0°
Group delay	0sec	0sec
Smith chart	1	1
Polar coordinate	1	1
Linear amplitude	0	0
SWR	1	1
Real part	10	10
Imaginary part	10	10
Continuous phase	0°	0°

Table A4-1 Initial Settings (4 of 4)

Function	Initialization Method	
	Power ON or Preset	*RST
Input attenuator		
R Input	AUTO	AUTO
A Input	AUTO	AUTO
B Input	AUTO	AUTO
Input impedance (Only R3752H/ 53H)		
R Input	50Ω	50Ω
A Input	50Ω	50Ω
B Input	50Ω	50Ω
Input preamplifie (Only R3754)		
R Input	0dB	0dB
A Input	0dB	0dB
B Input	0dB	0dB
CDMA IF filter analysis		
CDMA IF filter gate function	OFF	OFF
CDMA IF filter gate start time	0sec	0sec
CDMA IF filter gate stop time	6μsec	6μsec
CDMA IF filter gate shape	CDMA IF	CDMA IF
CDMA IF filter magnitude analysis	OFF	OFF
Search attenuation	6dB	6dB
Guaranteed attenuation measurement		
First frequency	900kHz	900kHz
Second frequency	1.2MHz	1.2MHz
Phase linearity analysis	OFF	OFF

Table A4-2 Backup Memory Settings (factory default settings)

Item	Initial Setting
GPIB address	11
System controller/addressable	Addressable
Printer GPIB address	18
Plotter GPIB address	5
Serial port setting	Baud rate: 9600, Character lengths: 8 bits, Parity: Non, Stop bit: 1
Save register	All clear
Calibration Standard (Only R3754)	
Open Rs	1GΩ
Open Ls	0H
Open Cp	0F
Short Rs	0Ω
Short Ls	0H
Short Cp	0F
Load Rs	50Ω
Load Ls	0H
Load Cp	0F

A.5 Multi-Line Interface Message

	PCG														SCG	
	ACG		UCG		LAG				TAG							
	0		1		2		3		4		5		6		7	
	ascii	msg	ascii	msg	ascii	msg	ascii	msg	ascii	msg	ascii	msg	ascii	msg	ascii	msg
0	NUL		DEL		SP		0		@		P		’		p	
1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
2	STX		DC2		"		2		B		R		b		r	
3	ETX		DC3		#		3		C		S		c		s	
4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
5	ENQ	PPC	NAK	PPU	%		5		E		U		e		u	
6	ACK		SYN		&		6		F		V		f		v	
7	BEL		ETB		’	①	7	①	G	②	W	②	g		w	
8	BS	GET	CAN	SPE	(		8		H		X		h		x	
9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
10	LF		SUB		*		:		J		Z		j		z	
11	VT		ESC		+		;		K		[		k		{	
12	FF		FS		,		<		L		\		l		|	
13	CR		GS		-		=		M		]		m		}	
14	SO		RS		.		>		N		^		n		-	
15	SI		US		/		?	UNL	O		-	UNT	o		DEL	

NOTE:PCG: Primary command group
ACG: Address command group
UCG: Universal command group
LAG: Listener address group
TAG: Talker address group
SCG: Second command group (defined by PCG)
①: Listener address to be allocated for devices
②: Talker address to be allocated for devices

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