
**User's
Manual**

**DM7560
Digital Multimeter
Communication Interface**

Thank you for purchasing the DM7560 Digital Multimeter.

This Communication Interface User's Manual explains the following interface features and commands.

- USB interface
- GP-IB interface (/C1 option)
- LAN interface (/C2 option)
- RS-232 interface (/C2 option)

To ensure correct use, please read this manual thoroughly before operation.

Keep this manual in a safe place for quick reference in the event that a question arises.

List of Manuals

The following manuals, including this one, are provided as manuals for the DM7560. Please read all manuals.

Manual Title	Manual No.	Description
DM7560 Digital Multimeter User's Manual	IM DM7560-01EN	The supplied CD contains the PDF file of this manual. Explains all DM7560 features, except for the communication features, and how to use them.
DM7560 Digital Multimeter Getting Started Guide	IM DM7560-02EN	The guide explains the handling precautions and specifications of the DM7560.
DM7560 Digital Multimeter Communication Interface User's Manual	IM DM7560-17EN	This manual. The supplied CD contains the PDF file of this manual. The manual explains the DM7560 communication interface features and instructions on how to use them.
DM7560 Digital Multimeter User's Manual	IM DM7560-92Z1	Document for China

The "EN" and "Z1" in the manual numbers are the language codes.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
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Symbols and Notation Used in This Manual

Unit

k: Denotes 1000.

Example: 100 kS/s (sample rate)

K: Denotes 1024.

Example: 720 KB (file size)

Displayed Characters

Bold characters in procedural explanations are used to indicate panel keys and soft keys that are used in the procedure and menu items that appear on the screen.

Notes and Cautions

The notes and cautions in this manual are categorized using the following symbols.



Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION

Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

French

AVERTISSEMENT

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

ATTENTION

Attire l'attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d'endommager l'instrument ou les données de l'utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

Note

Calls attention to information that is important for proper operation of the instrument.

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1.1 Remote Control

This instrument can be operated by remote control through an external controller (usually a personal computer) in almost the same way as when you operate it manually using buttons. Data on measurement results and panel setup can also be transferred by remote control. So you can collect data using a personal computer and configure the automatic measurement system.

There are four methods for operating this instrument by remote control:

- 1 Remote control by using the standard USB with which this instrument is equipped (You need to install the USB driver contained in the CD in your PC.)
- 2 Remote control by using the standard LAN (ethernet) with which this instrument is equipped
- 3 Remote control by using the RS-232 interface
- 4 Remote control by using the GP-IB interface

The following interfaces are factory options.

LAN&RS-232 interface	: /C2
GP-IB interface	: /C1

Interfaces used remotely are set by using REMOTE from the SYSTEM menu of this instrument. Refer to the following sections for the setting and control methods of each interface.

USB interfaces are standard on the majority of personal computers and are therefore a useful method of remote control. However, note that the connection cable length poses a limitation.

LAN interfaces are also standard on the majority of personal computers, and can be used by connecting to an existing network environment instead of by directly connecting a cable. However, this method requires a unique IP address to be assigned to this instrument.

Restrictions of remote control

It is possible to remotely control almost all of the functions provided on this instrument.

However, the power switch ON/OFF, various settings about remote interface in the SYSTEM menu, offline browse function and VALUE TO USBMEM function etc. cannot be controlled remotely.

For details about functions operated through the remote control and control commands, see Chapter 3, Remote control commands.

Communication library (TCMTL) and the sample program

You can obtain the communication library (TCMTL) and the sample program from the YOKOGAWA website (URL: <http://tmi.yokogawa.com/service-support/downloads/>). See the website for details.

1.2 Remote/Local Control

A state, in which each function of this instrument is remotely controlled by messages sent through the interface, is called "remote mode". On the contrary, a state, in which the instrument is operated by panel key entries, is called "local mode."

In the remote mode, all panel keys except for the LOCAL(SHIFT) key become invalid. At this time, the REMOTE indicator **REMOTE** is displayed in the annunciator.

Shift to remote mode

When the command system shifts to remote mode, this instrument does the following behavior.

- It becomes a measurement halt state. Use the command (INITiate command and READ? query, etc.) that changes to the trigger waiting state when measuring. (Refer to "3.5.4 TRIGger subsystem" for details.)
- Offline browse state is released.
- If the bulk log is being executed, the bulk log is stopped.
- The setting of an external trigger is changed according to the remote setting of the trigger source.

Shift to local mode

Execute after confirming the action of all command/query transmitted till then is completed by using * OPC? query (Refer to section 3.4.5) etc. when switching to the local mode. The unanticipated operation may be caused when shifting to the local mode without waiting for the completion of processing.

When the command system shifts to local mode, this instrument does the following behavior.

- The setting of an external trigger returns to the state when not depending on the setting of the trigger source remotely, and having set it in the local at the end.

In the method of switching local mode / remote mode, there are different parts in each interface.

Refer to the following for details.

- USB : Section 1.3.2
- LAN : Section 1.4.6
- RS-232 : Section 1.5.5
- GP-IB : Section 1.6.4

1.3 Remote Control Using USB

This instrument can be operated through remote controls by using a USB interface by connecting the USB port on the back panel and a computer.

You need to install the USB driver contained in the CD in your PC.

The USB interface is handled as a COM port.

Use a USB 2.0 A/B cable to connect this instrument to a computer.

Note: A cable for noise reduction (shielding) may be required and is recommended when operating this instrument through remote controls using a LAN in a problematic noise environment. For more information, contact an /C1 sales representative or a service center.

1.3.1 Settings for this instrument

From the SYSTEM menu, set REMOTE to "USB".

1.3.2 Remote/local controls

a. Local mode

In local mode, the instrument is operated by using keys from a panel.

REMOTE icon is off.

This instrument is in local mode when the power is turned on.

There are three ways to return to an instrument that is running in remote mode to local mode.

- Restart the power.
- Press the LOCAL ([SHIFT]) key.
- Close the corresponding COM port on the computer.

b. Remote mode

In remote mode, this instrument is remotely controlled by messages sent through an interface.

All panel keys except for the LOCAL ([SHIFT]) key become invalid.

The REMOTE icon is ON during the remote period.

This instrument switches to remote mode when the COM port described above has been opened and a message has been received from a computer.

c. Local lock out mode

This instrument does not support local lock out mode other than for the GP-IB interface. When a lock out operation is necessary, use the GP-IB interface.

1.4 Remote Control Using a LAN

This instrument's remote control can be used with a LAN interface when connected to a computer via the Ethernet port on the rear panel.

This instrument can be plugged into a network or connected directly to a host computer.

This instrument has an Auto-MDIX function, so a cross or straight Ethernet cable can be used to connect it.

Note: A cable for noise reduction (shielding) may be required and is recommended when operating this instrument through remote controls using a LAN in a problematic noise environment. For more information, contact an /C1 sales representative or a service center.

LAN interface is a factory option (LAN&RS-232 interface: /C2).

1.4.1 Settings for this instrument

In the SYSTEM menu, set REMOTE to "TCP/IP".

When set to TCP/IP, the following settings can be entered (these settings cannot be modified by remote control).

Table 2-1. Communication Settings when LAN is Selected for REMOTE

Setting	Function
IP ADDRESS	The IP address can be set when DHCP is "OFF". The default setting is 192.168.0.1. The IP address allocated can be confirmed when DHCP is "ON".
SUBNET MASK	The subnet mask can be set when DHCP is "OFF". The default setting is 255.255.255.0. The subnet mask allocated can be confirmed when DHCP is "ON".
DEFAULT GW	The default gateway can be set when DHCP is "OFF". The default setting is 0.0.0.0. The default gateway allocated can be confirmed when DHCP is "ON".
DHCP	Sets the DHCP function to "On" or "Off". When set to "On", the required connection information is obtained automatically. When set to "OFF", set the "IP ADDRESS", "SUBNET MASK", and "DEFAULT GW" separately. The default setting is "OFF".
MAC ADDRESS	The MAC address value that is unique to each instrument unit can be confirmed. This MAC address is an instrument-specific value and cannot be modified.

- When settings have been changed, new LAN settings become valid when the power supply to this instrument is turned back ON.
- For details of the settings, check with the administrator of the network to be connected.

1.4.2 Communication settings on computer

The communication settings for control software when using remote control with the TCP/IP interface are described below.

Table 2-2. Communication Settings when LAN is Selected for REMOTE

Item	Setting
TCP/IP port number (connect to)	34490
Delimiter (transmit *1)	LF or CR+LF
Delimiter (receive-*2)	LF or CR+LF

*1 This means a computer sends data to this instrument.

*2 This means a computer receives data from this instrument.

1.4.3 Connect to network

Before this instrument is connected to a network, a query for information must be sent to the network administrator. If an incorrect address is specified for the network, unexpected operations may occur both on the network and in this instrument.

Note) If the computer and this instrument are included in the different networks (i.e. not exist on the same subnet), it is necessary to set the gateway correctly.

To check the physical connection between this instrument and a computer, perform the following steps.

1. When a cable has not been connected, set the network connection settings correctly, and turn OFF the power temporarily
2. Leave the power OFF and connect the cable. Use a cable to connect to the network terminal such as a hub on this instrument or a computer. This instrument has an Auto-MDIX function, and either a cross or straight cable can be used for this connection.
3. Turn ON the power to this instrument.

1.4.4 Check IP connection

A “ping” command from the computer can be used to check connections on the IP network. This command sends IP packets to the network equipment, and normal status of the IP network is confirmed when the corresponding response is received.

The “ping” command can be used in a Windows or UNIX environment. In the case of Windows, enter a command such as the following at the command prompt.

```
C:\>ping 192.168.0.1 (*)
```

(*)The arguments that follow “ping” in this command specify the network equipment whose connection will be checked, so enter the IP address assigned to this instrument. In this input example, “192.168.0.1” is used, but this part should be replaced to match the target use environment. Also, if DHCP is used to validate auto assignment of IP addresses, set the actually allocated IP address in the REMOTE setting under the SYSTEM menu.

When the connection is normal, the execution result of the “ping” command appears as follows.

```
C:\>ping 192.168.0.1
```

```
Pinging 192.168.0.1 with 32 bytes of data:
```

```
Reply from 192.168.0.1: bytes=32 time<10ms TTL=128
Reply from 192.168.0.1: bytes=32 time=20ms TTL=128
Reply from 192.168.0.1: bytes=32 time=20ms TTL=128
Reply from 192.168.0.1: bytes=32 time=30ms TTL=128
```

```
Ping statistics for 192.168.0.1:
```

```
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 4ms, Average = 3ms
```

```
C:\>
```


1.4 Remote Control Using a LAN

Alternatively, when there is some kind of obstacle in the network, so that a timeout occurs without receiving a response, the execution result of the “ping” command appears as follows.

```
C:\ >ping 192.168.0.1

Pinging 192.168.0.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\ >
```

When a timeout has occurred, there may be a problem in this instrument or the computer, such as the IP address setting or the network connection.

1.4.5 Communication mode

Communication between this instrument and a computer uses TCP/IP. Perform the following steps to make a TCP/IP connection.

1. After power-on, this instrument waits for a TCP/IP connection request from the computer at the specified port number (see Table 2-2).
2. The computer issues a TCP/IP connection request to this instrument.
3. This instrument receives the TCP/IP connection request, and establishes a connection.
4. After the TCP/IP connection is established, communication is operated by sending and receiving a simple 7-bit ASCII character string.
5. A command or query is sent in the direction of computer → this instrument. The command or query message is a character string that ends with either CR+LF or LF.
6. This instrument, having received a command or query, selects and executes it, and if the query is received normally, it will return a response message. The response message is a character string to which a delimiter (by DELIMITER setting of SYSTEM-REMOTE menu) has been added.

Moreover, note that only one computer unit can be connected to this instrument at one time.

1.4.6 Remote/local control

a. Local mode

When in local mode, this instrument's operations can be controlled using the keys on the panel. The REMOTE LED is OFF.

At power-on, this instrument is set to local mode.

The following are three ways to return this instrument to local mode when it is operating in remote mode.

- Turn the power supply OFF and then ON again.
- Press the LOCAL ([RES]) key.
- Disconnect the TCP connection from the computer.

When this instrument's power is turned OFF and ON again to return from remote mode to local mode, the computer's TCP connection is not broken.

b. Remote mode

In remote mode, this instrument's operations are controlled by messages via an interface. All key input from the panel is ignored, except for the LOCAL ([SHIFT]) key.

The REMOTE LED is ON during the remote period.

This instrument switches to remote mode when the COM port described above has been opened and a message has been received from a computer.

c. Local lock out mode

This instrument does not support local lock out mode other than for the GP-IB interface. When a lock out operation is necessary, use the GP-IB interface.

1.5 Remote Control Through RS-232 Interface

An RS-232 interface can be used to enable remote control of this instrument by connecting the RS-232 port on the rear panel to an external instrument..

The RS-232 interface is a factory option (LAN&RS-232 interface: /C2).

1.5.1 Settings for this instrument

Set "RS232" for REMOTE under the SYSTEM menu.

Before connecting this instrument to an external instrument for communications, settings for serial communications must be entered on both this instrument and the external instrument.

The following types of settings can be entered as RS232 settings (these settings cannot be changed via remote control).

Table 2-3. Communication Settings when RS232 Is Selected for REMOTE

Setting	Function
Rate	Sets baud rate. Select one of the following: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 (bps).
Parity	Sets parity bit. Select one of the following: None, Even, Odd.
Stop-bit	Sets stop bit. Select one of the following: 1, 2.
DELIM	Sets delimiter. Select one of the following: CR+LF, LF.

Note: that the number of data bits is fixed as 8 bits and the number of start bits is fixed as 1 bit.

For details about how to set the external instrument, see the instruction manual supplied with the external instrument to perform the setup necessary to communicate with the instrument.

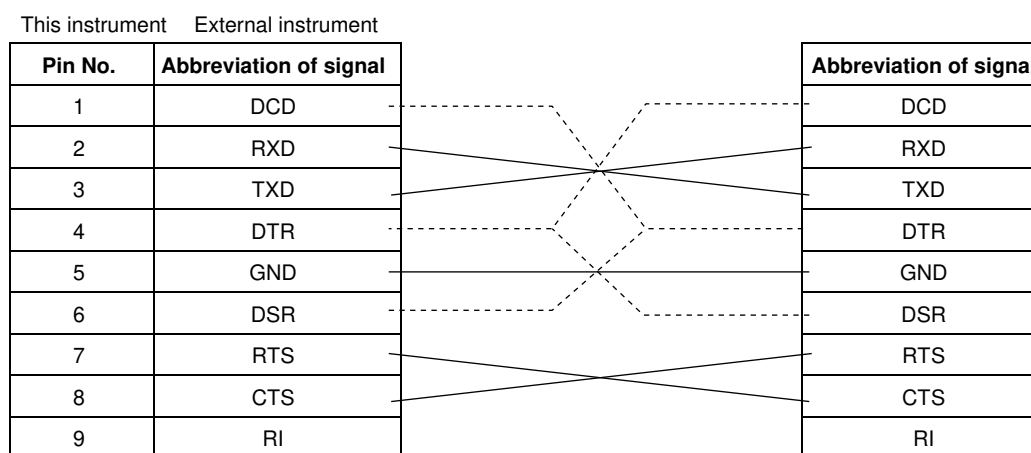
If the baud rate is set at a high speed, an overrun error may occur. In such cases, try operating it at a lower baud rate.

1.5.2 Connection with external instruments

The RS-232 port of this instrument uses a 9-pin D-SUB connector and inch screws (4-40 UNC). The following Table shows the signal lines and functions of the RS-232 interface.

Pin No.	Abbreviation of signal	Function	Remarks
1	DCD	Receive carrier detection	Not used in this instrument.
2	RXD	Receive data	
3	TXD	Send data	
4	DTR	Data terminal ready	Not used in this instrument.
5	GND	Signal ground	
6	DSR	Data set ready	Not used in this instrument.
7	RTS	Transmission request	
8	CTS	Transmission enable	
9	RI	Called signal	Not used in this instrument.

When connecting the instrument to a personal computer, use of cable generally called “cross cable” makes it possible to perform the remote control. However, to ensure safe operation, check the connector shape and pin assignments of both the instrument and computer before connecting to the personal computer, and then prepare a proper cable.



1.5.3 Communication mode

This instrument uses the full-duplex communication method. Therefore, the instrument may start sending the response message even while it is receiving the message. Normally, this is not a problem since the data receive buffer is provided. However, if any problem is foreseen, the flow control must be taken into consideration.

This instrument performs the hardware flow control. The instrument does not have other flow controls and the hardware flow control cannot be made invalid.

With this instrument, when internal processing lacks the space to obtain input data, the RTS signal is set to low level. When there is room for this processing, the RTS signal is set to high level.

This instrument is unable to transmit data when the CTS signal is at low level.

1.5.4 Synchronization

This instrument can use only hardware flow control for the synchronization in the serial communication with the external instrument.

To perform the synchronization with the software, it is recommended to create a remote program that the last message unit of the message to be sent to this instrument is used as a query (command that requests the response message from this instrument) and the next message is sent after the response has been received from this instrument. .OPC? query (see section 3.4.5), etc. can be used.

1.5.5 Remote/local control

a. Local mode

In the local mode, operation of the instrument is controlled through panel key operation.

The REMOTE LED is off.

This instrument enters the local mode when the power is turned on.

The following two kinds of methods are provided to return the mode from the remote mode to the local mode.

- Turn off the power, and turn it on again.
- Press the LOCAL ([RES]) key.

b. Remote mode

In the remote mode, operation of the instrument is controlled by messages sent through the interface. All panel key entries except for the LOCAL ([SHIFT]) key become invalid.

The REMOTE icon is lit during remote control.

If the instrument receives the message from the external instrument, it then enters the remote mode. At this time, as soon as the instrument receives the start byte of the message correctly, it then enters the remote mode.

c. Local lock out mode

This instrument does not support local lock out mode other than for the GP-IB interface. When a lock out operation is necessary, use the GP-IB interface.

1.6 Remote Control Through GP-IB Interface

Remote control of this instrument via a GP-IB interface is enabled by connecting the GP-IB port on the rear panel to a computer.

The electrical, mechanical, and functional specifications conform to the IEEE Std.488.1 and JIS C 1901.

Specifications related to commands, formats, protocols, etc., conform to IEEE Std. 488.2.

The GP-IB interface is a factory option (GP-IB interface: /C1).

1.6.1 Settings for this instrument

Set "GPIB" for REMOTE under the SYSTEM menu.

The following types of settings can be entered as GPIB settings (these settings cannot be changed via remote control).

Table 2-4. Communication Settings when GP-IB Is Selected for REMOTE

Setting	Function
Address	Sets instrument address (listener address, talker address). Values from 0 to 30 can be set.
DELIM	Set delimiter. (For transmission) Select one of the following: CR+LF, LF. EOI is sent regardless of the setting.

* When this instrument receives a message, it is recognized as a delimiter, regardless of whether the message is LF, CR+LF, or EOI.

1.6.2 Interface functions

This instrument has the IEEE488.1 subsets about GP-IB as shown in Table 2-5.

Table 2-5. GP-IB interface functions

SH1	Supports all source handshake functions.
AH1	Supports all acceptor handshake functions.
T5	Specifies and cancels the talker by means of basic talker, serial poll, and MLA.
TE0	Does not support the extended talker function.
L4	Specifies and cancels the listener by means of basic listener and MTA.
LE0	Does not support the extended listener function.
SR1	Supports all the service request functions.
RL1	Supports all the remote local functions.
PP0	Does not support the parallel poll function.
DC1	Supports all instrument clear functions.
DT1	Supports all instrument trigger functions.
C0	Does not support the controller function.
E2	Uses the 3-state driver.

1.6.3 Connections

CAUTION

- Before connecting or disconnecting the cables, always turn off the power to all the instruments connected to the GP-IB cable.
 - To operate the GP-IB system, turn on all the instruments connected to the system bus.
-

Note

- Up to 15 GP-IB instruments can be connected to one system.
 - The total length of the cables used to connect instruments in the system is 20m or less and 2m × (the number of instruments making up the system) or less.
 - The length of each cable used in the system is freely decided by the person in charge of system configuration. However, if the length of the cable connecting two instruments is 4m or more, noise margin shall be taken into consideration.
 - A desired cable connection method (star or daisy chain, etc.) can be selected by the user. However, use of the connection that creates the ground loop is not allowed.
 - The number of cable stacks on the connector located on the rear panel of the instrument shall be 3 or less due to mechanical strength.
 - The connection cable applicable to the IEEE 488.1 or JIS C 1901 standard shall be used. To improve the reliability of the system, it is recommended to use the cable, on which the EMS measures are taken (connector with metallic housing).
 - The GP-IB system needs to be operated in an electrically and mechanically good environment. Before configuring the system, see clause 6 and appendix J of JIS C 1901.
-

1.6.4 Remote/local control

This instrument has all the remote and local functions defined in the IEEE Std. 488.1 and JIS C 1901. For details about transition of the remote and local modes, see the section, RL function, in the specification.

a. Local mode

In the local mode, operation of the instrument is controlled through panel key operation. The REMOTE LED is off. This instrument enters the local mode when the power is turned on. The following four kinds of methods are provided to return the mode from the remote mode to the local mode (if the GP-IB interface is used).

- Turn off the power, and turn it on again.
- Set the REN line to “false” (electrically high level).
- Press the LOCAL ([SHIFT]) key.
- Set this instrument to listener and send the address command GTL.

b. Remote mode

In the remote mode, operation of the instrument is controlled by messages sent through the interface. All panel key entries except for the LOCAL ([SHIFT]) key become invalid. The REMOTE icon is lit during remote control. To change the operation mode of the instrument from the local mode to the remote mode, it is necessary to set this instrument to listener (MLA is received) with the REN line set at “true” (electrically low level).

c. Local lock out mode

This instrument enters the local lock out mode in any of the following cases.

- The universal command LLO is received in the remote mode.
- The instrument enters the remote mode after the universal command LLO has been received.

In the local lock out mode, it is prevented that the mode is returned to the local mode even though the operator presses the LOCAL ([SHIFT]) key.

The operation and response except for that the LOCAL ([SHIFT]) key input is ignored are the same as those in the remote mode.

To return the instrument from the local lock out mode to the local mode, set the instrument to listener and send the GTL message. However, when the mode is changed to the remote mode again, the instrument enters the local lock out mode even though the LLO command is not received newly.

To cancel the local lock out mode completely (to return to the remote mode), it is necessary to temporarily change the mode to the local mode in any of the following manner.

- Turn off the power, and turn it on again.
- Set the REN line to "false" (electrically high level).

1.6.5 GET (Group Execute Trigger)

This instrument starts measurement when the address command GET was received in which measuring status is trigger wait status and the trigger source is BUS.

When the instrument receives the GET command, the NDAC signal is held to hold the handshake off until the internal process (starting of measurement) is completed.

1.6.6 DCL • SDC

Upon receiving the universal command DCL (Instrument Clear), this instrument initializes the instrument function. The same initialization occurs when this instrument is being set to "listener" and receives the address command SDC (Selected Instrument Clear).

The DCL or SDC message shows that the following initialization is being executed.

- Data input/output is terminated, and the input buffers and the output queue are cleared. The MAV bit of status byte register is also cleared. (As a result, the MSS bit may be affected by these operations.) See section "3.3 Status report structure."
- If the instrument is performing the measurement, the measurement is stopped and the instrument is put in the HOLD mode.

When this instrument receives the DCL or SDC interface message, the NDAC signal is held to hold the handshake off until the internal microprocessor recognizes the signal receive.

1.6.7 Handshake

If the delimiter or EOI reception detects the end of the message, interpretation of the command in the buffer starts. During command interpretation or execution, the next message is not received.

At the beginning byte of the next message, handshake is held off. If command interpretation or execution ends, handshake restarts.

2.1 Command System

It is the command system in accordance with SCPI which is widely used for instrument control. It allows all functions of this instrument to be used.

2.2 Message Rules

For remote control of this instrument, the controller (computer) sends program messages according to the format structure.

The remote commands used by this instrument conform to general-purpose interface bus (GP-IB) IEEE Std. 488.2. With regard to USB, LAN, and RS-232 interfaces as well, all applicable parts are similar to the GP-IB interface.

Remarks:

The elements defined in IEEE 488.2 are given as follows.

<PROGRAM MESSAGE>	→<PROGRAM MESSAGE>
<CHARACTER PROGRAM DATA>	→<CHARACTER PROGRAM DATA>
<DECIMAL NUMERIC PROGRAM DATA>	→<NUMERIC PROGRAM DATA>
<SUFFIX PROGRAM DATA>	→<SUFFIX PROGRAM DATA>
<STRING PROGRAM DATA>	→<STRING PROGRAM DATA>
<RESPONSE MESSAGE>	→<RESPONSE MESSAGE>
<CHARACTER RESPONSE DATA>	→<CHARACTER RESPONSE DATA>
<NR1 NUMERIC RESPONSE DATA>	→<NR1 NUMERIC RESPONSE DATA>
<NR2 NUMERIC RESPONSE DATA>	→<NR2 NUMERIC RESPONSE DATA>
<NR3 NUMERIC RESPONSE DATA>	→<NR3 NUMERIC RESPONSE DATA>
<STRING RESPONSE DATA>	→<STRING RESPONSE DATA>
<ARBITRARY ASCII RESPONSE DATA>	→<ARBITRARY ASCII RESPONSE DATA>

In this instruction manual, Command syntax/Query syntax are to write as following rules:

- Parameter choices are to enclose by brace “{}” and each choice is to punctuate by vertical bar “|.” Only one choice can be used from the choices. Both brace/vertical bar do not send as program message.
- Triangle bracket “< >” denotes that it is necessary to specify value as a parameter. Refer to each command explanation for the parameter details.
- Square bracket “[]” denotes to be able to omit. This square bracket does not send as a program parameter.

2.2.1 Input/output buffer

The command interpreted in the buffer and execute it in this product when the program message input from a remote interface is preserved in the input buffer once, and you detect the terminal of the program message by the delimiter (or, EOI). The next message is not received while interpreting the command and executing it. The input buffer is cleared when the interpretation and the execution of the command end, and restart the reception of the program message.

The size of this input buffer is 255 bytes.

As for the part that exceeded it, when the program message of length that exceeds this is input, only the part that reads, was thrown away, and left in the buffer is interpreted the command and executed. The length of the entire program message must not exceed the size of the input buffer when using the multi command (Refer to section 2.2.3). Moreover, the delimiter is contained in the length of the program message.

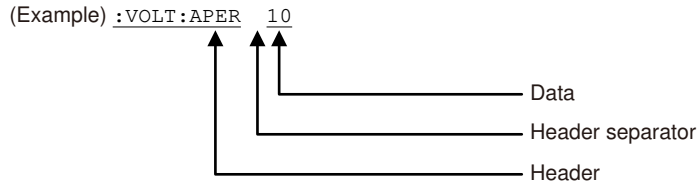
Moreover, this instrument has the output buffer (Output queue) in 255 bytes. When the output buffer becomes full, the response message in the part that exceeds the size of the buffer is thrown away without being transmitted. Moreover, query error at this time is generated. The number of response messages of total bytes to query must not exceed the size of the buffer when using the multi command (Refer to section 2.2.3). Moreover, the delimiter is contained in the length of the response message.

It does not receive the limitation of these sizes of the I/O buffer for command/query that treats the following data with large size.

- FETCh?
- READ?
- R?
- CALCulate2:TRANsform:HISTogram:ALL?
- CALCulate2:TRANsform:HISTogram:DATA?
- HCOpy[:SDUMp]:DATA?
- SETUP:TRANsfer / SETUP:TRANsfer?
- DATA:REMOve?

2.2.2 Message format

One message unit consists of a header, the data, and a header separator that divides these two major parts.



a. Header

The header consists of ASCII characters. The header is composed of one to four mnemonic parts separated by a colon (:) and expresses the function or operation of this instrument. The string in the example above is a command used when setting up this instrument. When the string is a query that looks for a setting (in which cases, this instrument creates response data), the header ends with a question mark "?".

b. Header separator

This code separates the header and the data. The header separator is a space code (ASCII characters) of at least one character. The white space character defined in IEEE 488.2 may be used.

The command without the data part does not need the header separator.

Additionally, it is not allowed to omit the data part except for commands without the data part in this instrument.

c. Data

The data is a parameter describing the concrete setting of the function specified in the header. This part may consist of mnemonics (strings) or numerical values.

When multiple parameters are needed, a comma "," is used to separate respective parameters. The number of parameters and the configuration depend on the command. For details on the data format, see the description of relevant command.

2.2.3 Multi-commands

Multiple message units can be assembled to configure one message. Respective message units are separated and connected with a semicolon ";".

(Example) `:VOLT:AC:NULL ON ; :VOLT:DC:NULL ON`

The instrument-specific commands for this instrument are a hierarchical command called "compound command program header." For example, the parent command INPA can be combined with subcommands such as AC and DC to build a header (e.g., :VOLT:AC or :VOLT:DC). When the message units, each of which has a header composed of a common parent command, are combined to build one message, the parent command may be omitted on the second and following message units.

(Example) `: VOLT:AC:NULL ON ; :VOLT:AC:BAND 20`

The above message can be written in the following format.

`: VOLT:AC:NULL ON ; BAND 20` (If the parent command is omitted, care should be taken so that the colon (:) is not put in the header part.) This function specifies the parent command `:VOLT:AC` as the header path.

The header path designation is valid only within the message (until the delimiter). In the next message, the parent command of the start message unit is specified as a header path. Therefore, if the colon (:) for the first character of the header part is omitted at the top of the message, the message is determined as parent command.

(Example) `: VOLT:AC:NULL ON`

The above message can be written in the following format.

`: VOLT:AC:NULL ON`

If "`VOLT:AC:NULL ON ; BAND 20`" is sent as one message, it is interrupted correctly.

However, "`:VOLT:AC:NULL ON ; BAND 20`" is sent with it separated into "`VOLT:AC:NULL ON`" and "`BAND 3,`" it is determined as an error.

(This instrument does not have the BAND parent command.)

If the message is started with a colon (:), this command is determined as a parent command. The header path is also updated and this command becomes a new header path.

(Example) `: VOLT:AC:NULL ON ; BAND 20 ; : VOLT:DC:NULL ON ; NPLC 1`

The header path is `VOLT:AC:`. The header path is `VOLT:DC:`.

This instrument does not perform command retrieval by going upstream command tree. Therefore in the case a message unit of different parent commands is to be one message, please always start by putting colon (:) at the head of message unit to be header path switched.

(Example) `: VOLT:AC:NULL ON ; BAND 20 ; : VOLT:DC:NULL ON ; NPLC 1`

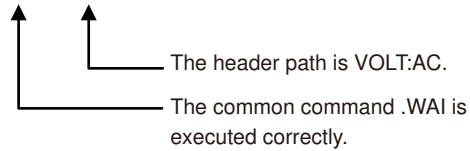
This part cannot be omitted.

2.2 Message Rules

The above header path rules do not apply to the common commands (.WAI, .OPC, etc.) defined in IEEE488.2.

The common commands are executed with the header path omitted. However, the header path destination is not broken and the previous header path is valid when interpreting the next message unit after the common command.

(Example) :VOLT:AC:NULL ON; *WAI; BAND 20



2.2.4 Query

A message whose header ends with a question mark "?" is called a query. The query is a command used to inquire settings and measurement results. Upon reception of a query, this instrument creates a response message and stores it in the output queue.

When (a part of) the response message remains in the output queue and a new message is received, the current contents of the output queue are cleared, causing a query error (service request event).

Depending on the type of query, the created response message, in which multiple message units are connected by a semicolon (;).

For details of response message format, see the description of relevant query.

2.2.5 Mnemonic

The header mnemonic is formed from ASCII codes for A to Z, 0 to 9, and an underscore (_).

ASCII's A to Z characters are not case-sensitive. In other words, there is no distinction between uppercase and lowercase letters, as they are interpreted in the same way.

In this instrument, the response message unit created corresponding to the query is composed of only data part without header.

The mnemonic of the data part of the response message that the instrument sends is always upper-case.

2.2.6 Data format

a. <CHARACTER PROGRAM DATA> / <CHARACTER RESPONSE DATA>

As with header mnemonics, <CHARACTER PROGRAM DATA> and <CHARACTER RESPONSE DATA> are data are formed from a combination of ASCII codes for A to Z, 0 to 9, and an underscore (_).

```
:VOLT:AC:NULL ON;:DISP:WIND:BACK WHITE
```

In this example, ON and WHITE, which are the parameters for the :VOLT:AC:NULL command and the :DISP:WIND:BACK command respectively, serve as the <CHARACTER PROGRAM DATA>. As with the header mnemonic, the ASCII codes used in <CHARACTER PROGRAM DATA> are not case-sensitive and abbreviation is available.

This instrument always creates uppercase character response data for the <RESPONSE MESSAGE>.

b. <NUMERIC PROGRAM DATA> / <NUMERIC RESPONSE DATA>

Numerical data can be formatted as an integer (NR1), real number (NR2), or exponent (NR3).

If the message is described in the form of ":VOLT:AC:NULL:VAL 50E-3", "50E-3" corresponds to the numeric program data. The following numerical values are all interpreted as identical values.

$$0.05 = 50E-3 = 5e-2 = 5E-2 = 50e-3$$

After <NUMERIC PROGRAM DATA>, <SUFFIX PROGRAM DATA> that is expressed in V or mV units can be added.

The <SUFFIX PROGRAM DATA> is divided into two parts: one is the unit itself (e.g., V (volts) or Hz (hertz)); and the other is the multiplier for the unit, i.e., m (milli) or k (kilo).

Note : NR3 range

The numbers of effective digits of the mantissa part are 13 digits.

The digit that exceeds the number of effective digits is dropped below when the number of digits is exceeded it. It doesn't become an error.

The exponent part is interpreted as having the correct format only when the numeric value is within the range of E±99.

If this range is exceeded, a command error occurs and the value is discarded.

Also, each command has a separate numeric value range, and execution errors occur according to the specific settings. For details, see the command descriptions.

Note : MIN/MAX/DEF parameters

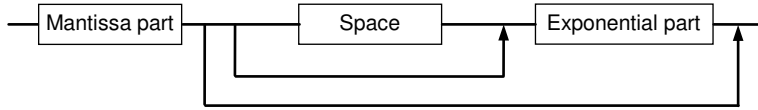
In some commands, either of MIN/MAX/DEF can be specified for a parameter instead of the set value. When these are specified, the defined maximum value / minimum value / default value of each command are set.

Either of MIN/MAX can be similarly specified for an option parameter in some query.

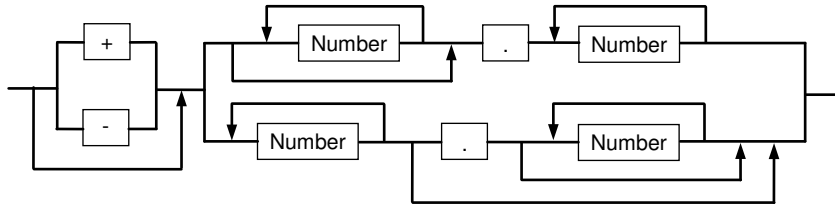
When these are not specified, the current value is returned, and the defined minimum value/maximum value of each command is returned as < numeric response data > when specifying it.

2.2 Message Rules

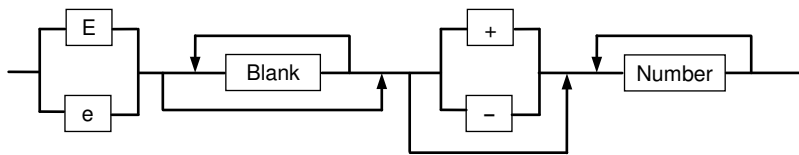
- The <NUMERIC PROGRAM DATA> received by this instrument can have any of the formats listed below.



The format of the mantissa part is shown below.

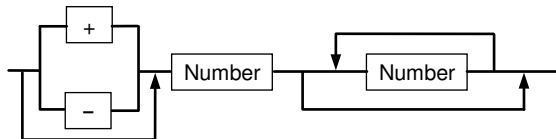


The format of the exponential part is shown below.

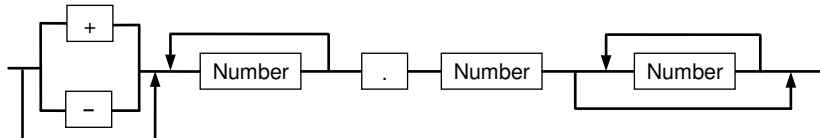


Remarks: Space or blank in the above format includes <white space> defined in IEEE488.2.

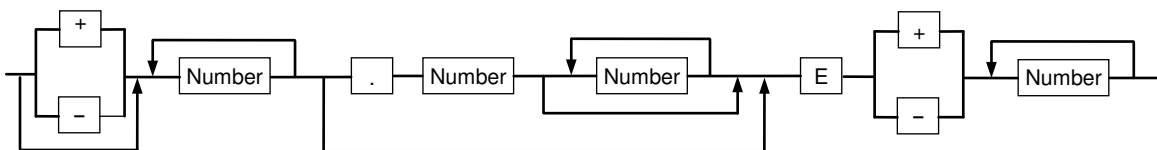
- <NUMERIC RESPONSE DATA> sent by this instrument can have any of the formats listed below.
NR1 (Integer) type



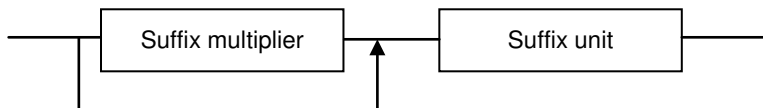
NR2 (Real number) type



NR3 (Exponent) type



- The format of <SUFFIX PROGRAM DATA> received by this instrument is shown below.



Suffix multipliers that can be set are listed in the table below.

Suffix Multipliers that can be set

Definition	Notation	Reading
1E12	T	Tera
1E9	G	Giga
1E6	MA ("M" when Hz or OHM)	Mega
1E3	K	Kilo
1E-3	M (cannot be set when Hz or OHM)	Milli
1E-6	U	Micro
1E-9	N	Nano
1E-12	P	Pico

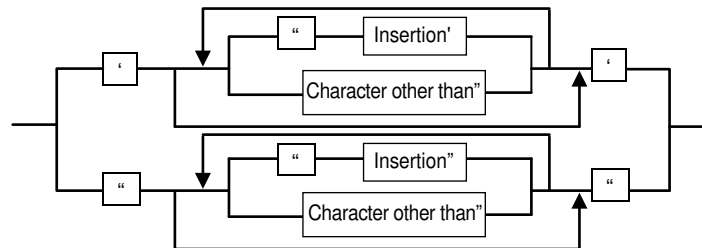
Suffixes that can be set are "V", "S", "SEC", "HZ", "PCT", "DEG", and "OHM".

c. <ARBITRARY ASCII RESPONSE DATA>

This data is response data created by this instrument composed of text characters including ASCII characters not allowed in <CHARACTER RESPONSE DATA> and Numeric value response data. If a new query message unit exits between the query returning <ARBITRARY ASCII RESPONSE DATA> and delimiter, the response is not created for such query and this state is determined as a query error.

d. <character string program data>/<character string response data>

The <character string program data> which this instrument receives is as follows. Moreover the <character string response data> that this instrument creates, punctuates the following double quotation (") and is then to be character.



The data punctuated by single quotation (') or double quotation (") is processed as <character string program data>.

In the case two 2 punctuated characters (' or ") in the <character string program data> continue, it is recognized as one 1 punctuated character (' or ").

The <character string program data> permits all JIS code characters with 7 bits. However In the case characters not permitted by each command are included, it becomes command error.

2.3 Status Report Structure

2.3.1 Service requests (SRQ)

If an operation is completed or an error occurs, this instrument outputs a service request using a GP-IB interface (i.e., it sets the SRQ line to “L”).

While only one SRQ line, which is wired-OR connection, is used on the bus line for the service request, this instrument has multiple service request events. To identify the cause of the service request, the controller must execute a serial poll or read the internal status register of this instrument.

When using an interface other than GP-IB, the service request or serial polling cannot be used.

Therefore, it is necessary to make a program that the controller reads the status register inside the instrument when necessary.

2.3.2 Status byte register

This register allows serial polling via the GP-IB system bus or a readout using a .STB? query.

This register is the last stage of the hierarchical status information on this instrument.

This register consists of 8 bits; these bits have the following contents.

- OPS (Bit 7) This is returned as bit 7 of serial poll or .STB? Query response.
This is summary messages of operation event status register.
- RQS (Bit 6) When serial polling is executed, a message is returned as bit 6 of the status byte of serial poll response. A message is generated when other bits in the status byte register (ESB, MAV,..., MEV) are masked by the service request enable register, and consequently, the logical sum of all bits is changed from 0 to 1. RQS is cleared when the logical sum described above is changed from 0 to 1, the power is turned on, or serial polling is executed.
- MSS (Bit 6) A message is returned as bit 6 of the .STB? query response. MSS connects the logical sum of all bits when other bits in the status byte register (ESB, MAV,..., MEV) are masked by the service request enable register.
- ESB (Bit 5) A message is returned as bit 5 of the serial poll or .STB? query response. This is a summary message connected to the logical sum when the standard event status register is masked by standard event status register.
- MAV (Bit 4) A message is returned as bit 4 of the serial poll or .STB? query response. This is a summary message connected to the output queue.
- QES (Bit 3) This is returned as bit 3 of serial poll or .STB? Query response.
This is summary messages of questionable event status register.
- (Bit 2) This instrument does not use bit 2 of the status byte register. Bit 2 is always set to 0.
- (Bit 1) This instrument does not use bit 1 of the status byte register. Bit 1 is always set to 0.
- MEV (Bit 0) A message is returned as bit 0 of the serial poll or .STB? query response. This is a summary message connected to the measurement event status register.

2.3.3 Service request enable register

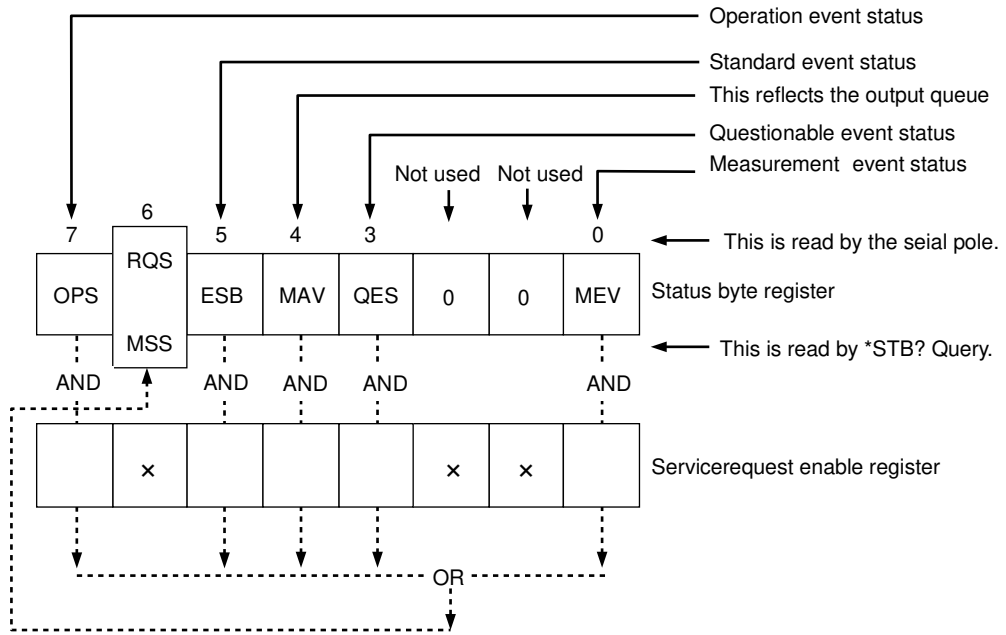
The service request enable register masks the status byte register. A message is returned to the RQS or MSS bit, depending on the result of masking. (Consequently, this register masks the SRQ output of GP-IB.)

The mask pattern is can be set using the .SRE command and read using the .SRE? query.

Whether or not the contents of this register are cleared (to 0) as the power is turned on is set using the *PSC command.

This does not directly affect the GP-IB instrument clear message and the *CLS command.

Status byte register format



2.3.4 Standard event status register

This register can be read using the .ESR? query. After the contents of this register are masked by the standard event status enable register, the logical sum of all bits is connected to the ESB bit of the status byte register.

The contents of this register are cleared (that is, set to 0) when the register is read using the .CLS command or .ESR? query.

This register consists of 8 bits, and each bit has the following contents.

PON (Bit 7) After the power is turned on, this bit is set to 1.

(Bit 6) This instrument does not use bit 6. Bit 6 is always set to 0.

CME (Bit 5) If a command error occurs, this bit is set to 1. This indication shows that some error exists in the command syntax.

EXE (Bit 4) If the execution error is given, this bit is set to 1. This indication shows that the command cannot be executed or could not be completely normally.

DDE (Bit 3) If an instrument-specific error occurs, this bit is set to 1. This is a summary message of the DDER register.

QYE (Bit 2) If a query error occurs, this bit is set to 1. This indication shows that an error occurs when the controller attempts to read the message from this instrument without sending the query command, or the next message is sent before the response message has not been completely read.

(Bit 1) This instrument does not use bit 1. Bit 1 is always set to 0.

OPC (Bit 0) When the operation is completed, this bit is set to 1. This bit supports the *OPC-command-based controller-instrument synchronization.

2.3.5 Standard event status enable register

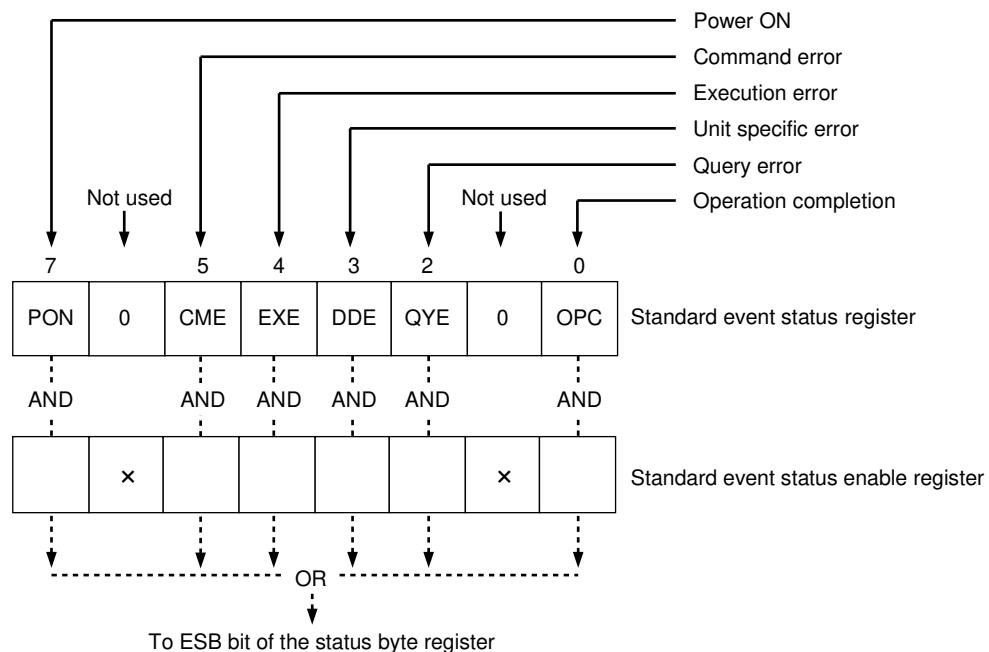
The standard event status enable register masks the standard event status register. A message is returned to the ESB bit of the status byte register, depending on the results of masking.

The mask pattern can be set using the *ESE command and read using an *ESE? query.

Whether or not the contents of this register are cleared (to 0) as the power is turned on is set using the *PSC command.

This does not directly affect the GP-IB instrument clear message and the *CLS command.

Standard event status enable register format



2.3.6 Output queue

The output queue is an output buffer in which the response message to the controller is stored.

Appropriate response messages are stored in the output queue, depending on the type of query.

The MAV bit of the status byte register is set to 1 so long as data of one byte or greater exists in the output queue.

The contents of this output queue are cleared (that is, set to 0) when the power is turned on or the instrument clear command is executed. When the output queue is not empty and a new program message is sent before the controller reads all the data bytes, a query error occurs and the contents of the output queue are also cleared.

When using a serial interface, the serial polling cannot be used. As a result, the MAV bit cannot be utilized efficiently. (As the MAV bit status is read using the .STB? query, the contents of the previous queue are already sent.) Additionally, this instrument uses the full-duplex communication. Therefore, the instrument receives the program message even though the output queue is not empty (data sending). As a result, the query error is not given.

2.3.7 Instrument specific error occurrence event status register

This is a register that reports abnormal status of the instrument. It is readable by :DDER? Query.

After reading, the register is cleared to 0.

In .CLS command, the register is cleared to 0 at the time of power-up.

This register is 8 bit configuration and the description is as follows:

SPE (Bit 7) Indicates parity error occurrence in serial interface.

SFE (Bit 6) Indicates framing error in serial interface.

SOE (Bit 5) Indicates overrun error in serial interface.

(Bit 4) This instrument does not use this bit.
This bit is normally set at "0".

HLE (Bit 3) Indicates upper and lower limit value setting error (H<L) of limit operation.

(Bit 2) This instrument does not use this bit.
This bit is normally set at "0".

OVM (Bit 1) Shows that the scaling calculation result over scaling occurs.

(Bit 0) This instrument does not use this bit.
This bit is normally set at "0".

2.3.8 Instrument specific error occurrence event enable register

This register is used to mask the instrument specific error occurrence event status register.

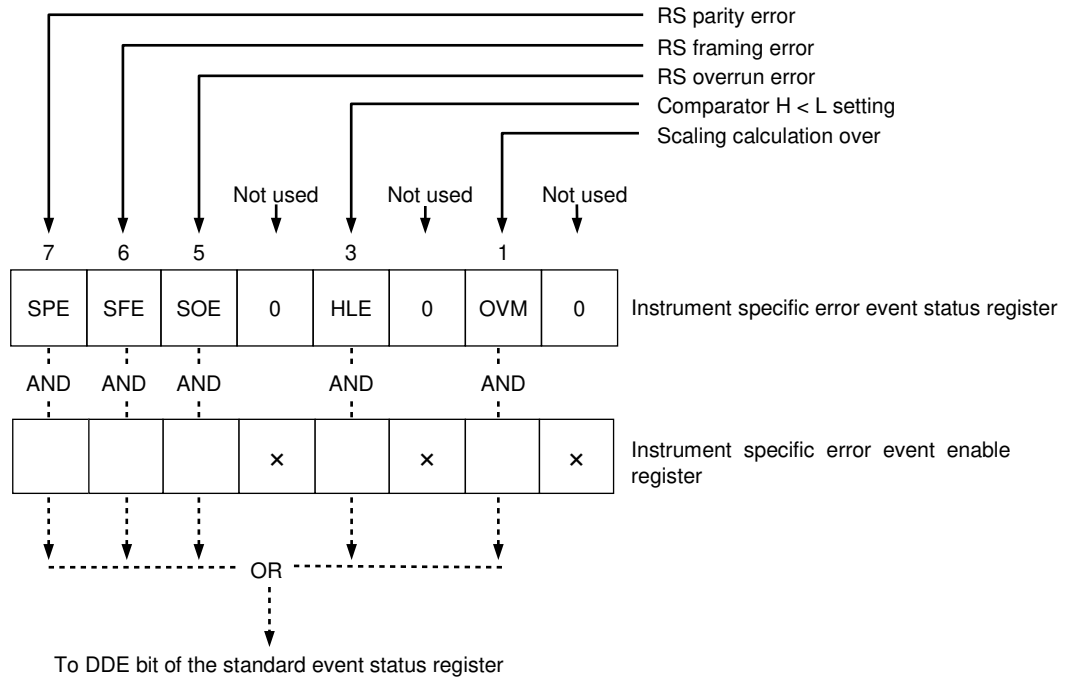
According to the masked results, the DDE bit of the standard event status register is set.

It is possible to set the mask pattern using the :DDEE command and to read it using the :DDEE[?] query.

Whether or not the contents of this register are cleared (set to 0) as the power is turned on is set using the .PSC command.

This setting is not affected by the instrument clear nor .CLS command.

DDE event register format



2.3.9 Measurement event status register

This is a register that reports measuring status. It is readable by :MESR? query.

After reading, the register is cleared to 0.

In *CLS command, the register is cleared to 0 at the time of power-up.

This register is 8 bit configuration and the description is as follows:

- Lout (Bit 7) This bit is set to "1" if the measurement result is smaller than the lower limit value when the limit calculation is specified.
- Hout (Bit 6) This bit is set to "1" if the measurement result is larger than the upper limit value when the limit calculation is specified.
- GO (Bit 5) This bit is set to "1" if the measurement result is in a range between the upper and lower limit values when the limit calculation is specified.
- (Bit 4) This bit is not used in this instrument and is normally "0".
- CAL(Bit 3) Becomes 1 at the time of calibration completion.
- BLC (Bit 2) Becomes 1 when logging in the bulk mode is completed, and does not become 1 at ABORT.
- BLSE (Bit 1) Becomes 1 when STOP EVENT is detected by logging in the bulk mode.
- SDR (Bit 0) Becomes 1 when measurement is completed.

2.3.10 Measurement event enable register

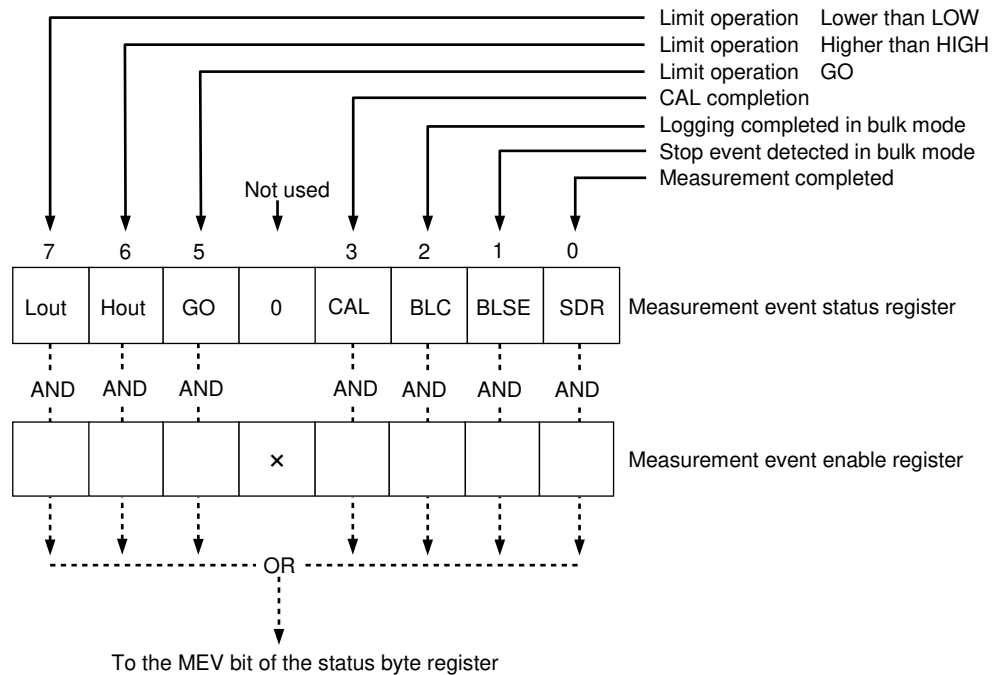
This register is used to mask the measurement event status register. According to the masked results, the MEV bit of the status byte register is set.

It is possible to set the mask pattern using the :MESE command and to read it using the :MESE? query.

Whether or not the contents of this register are cleared (set to 0) as the power is turned on is set using the *PSC command.

This setting is not affected by the instrument clear nor *CLS command.

Measurement event status register format



2.3.11 Operation condition status register

This is a register that reports the instrument status. It is readable by :STATus:OPERation:CONDition? query.

There is no change of the register value by reading.

This register indicates a latest status. In the case SRQ occurrence factor is to obtain, please use an operation event status register (and enable register).

This register is 16 bit configuration and the description is as follows:

(Bit 6-15) This instrument does not use this bit.
 This bit is normally set at "0".

WTR (Bit 5) Becomes 1 when measurement is trigger wait status.

MSR (Bit 4) Becomes 1 during measuring status.

(Bit 0-3) This instrument does not use this bit.
 This bit is normally set at "0".

2.3.12 Operation event status register

This is a register that reports change of the instrument status. It is readable by :STATus:OPERation[:EVENT]? query. After reading or by *CLS command, the registered is cleared to 0. This register maintains status change until it is cleared. This is used in the case SRQ occurrence factor is obtained. In the case a latest status is obtained, please use the operation condition status register.

This register is 16 bit configuration and the description is as follows:

(Bit 6-15) This instrument does not use this bit.
This bit is normally set at "0".

WTR (Bit 5) Sets to 1 when measurement is trigger wait status.

MSR (Bit 4) Becomes 1 during measuring status.

(Bit 0-3) This instrument does not use this bit.
This bit is normally set at "0".

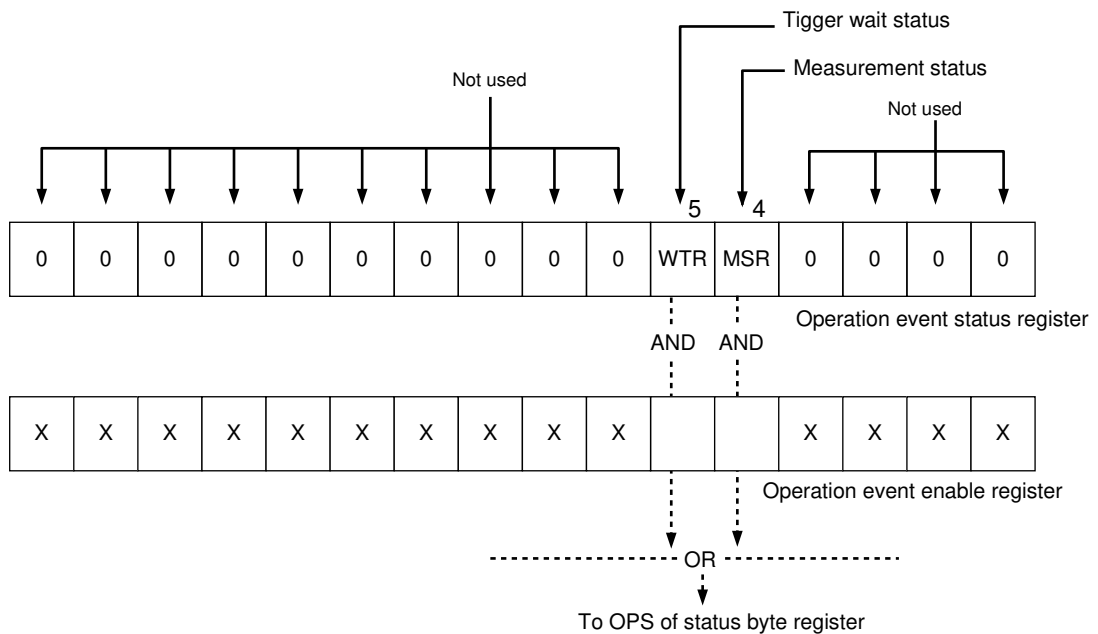
2.3.13 Operation event enable register

This is a register to mask an operation event status register. Depending upon the masked result, OPS bit of standard event status register is set.

It is possible to set and read out the mask pattern by :STATus:OPERation:ENABLE[?] command.

This register is *PSC command and is settable whether it is to be 0 or not at the time of power-up. It is not affected by instrument clear and *CLS command.

Operation event status constitution



2.3.14 Questionable condition status register

This is a register that reports abnormal status of the instrument. It is readable by :STATus:QUESionable:CONDition? query. There is no change of register value by reading. This register indicates a latest status. In the case SRQ occurrence factor is obtained, please use the questionable event status register (and enable register).

This register is 16 bit configuration and the description is as follows:

- (Bit 15) This instrument does not use this bit.
This bit is normally set at "0".
- FUL(Bit 14) Since a storage number exceeds the set number due to FIFO storage of LOG, it becomes 1 in the case data from beginning is destroyed.
- (Bit 13) This instrument does not use this bit.
This bit is normally set at "0".
- Hout (Bit 12) Becomes 1 in the case limit calculation result is larger than upper limit value.
- Lout (Bit 11) Becomes 1 in the case limit calculation result is smaller than lower limit value.
- (Bit 10) This instrument does not use this bit.
This bit is normally set at "0".
- OVR (Bit 9) This bit is normally set at "0". Please perform reading by an event status register.
- (Bit 5-8) This instrument does not use this bit.
This bit is normally set at "0".
- OVT (Bit 4) This bit is normally set at "0". Please perform reading by an event status register.
- (Bit 2-3) This instrument does not use this bit.
This bit is normally set at "0".
- OVC (Bit 1) This bit is normally set at "0". Please perform reading by an event status register.
- OVV (Bit 0) This bit is normally set at "0". Please perform reading by an event status register.

2.3.15 Questionable event status register

This is a register that reports abnormal status of the instrument. It is readable by :STATus:QUETionable[:EVENT]? query. After reading or by .CLS command, the register is cleared to 0.

This register maintains status change until it is cleared. This is used for obtaining SRQ occurrence factor. In order to obtain a latest abnormal status, please use questionable condition status register. This register is 16 bit configuration and the description is as follows:

(Bit 15) This instrument does not use this bit.
This bit is normally set at "0".

OVM (Bit 14) Since a storage number exceeds the set number due to FIFO storage of LOG, it becomes 1 in the case data from beginning is destroyed.

(Bit 13) This instrument does not use this bit.
This bit is normally set at "0".

Hout (Bit 12) Becomes 1 in the case limit calculation result is larger than upper limit value.

Lout (Bit 11) Becomes 1 in the case limit calculation result is smaller than lower limit value.

(Bit 10) This instrument does not use this bit.
This bit is normally set at "0".

OVR (Bit 9) Becomes 1 in the case $2W\Omega/4W\Omega$ measurement becomes overload.

(Bit 5-8) This instrument does not use this bit.
This bit is normally set at "0".

OVT(Bit 4) Becomes 1 in the case TEMP measurement becomes overload.

(Bit 2-3) This instrument does not use this bit.
This bit is normally set at "0".

OVC (Bit 1) Becomes 1 in the case DCI/ACI measurement becomes overload.

OVV (Bit 0) Becomes 1 in the case DCV/ACV measurement becomes overload.

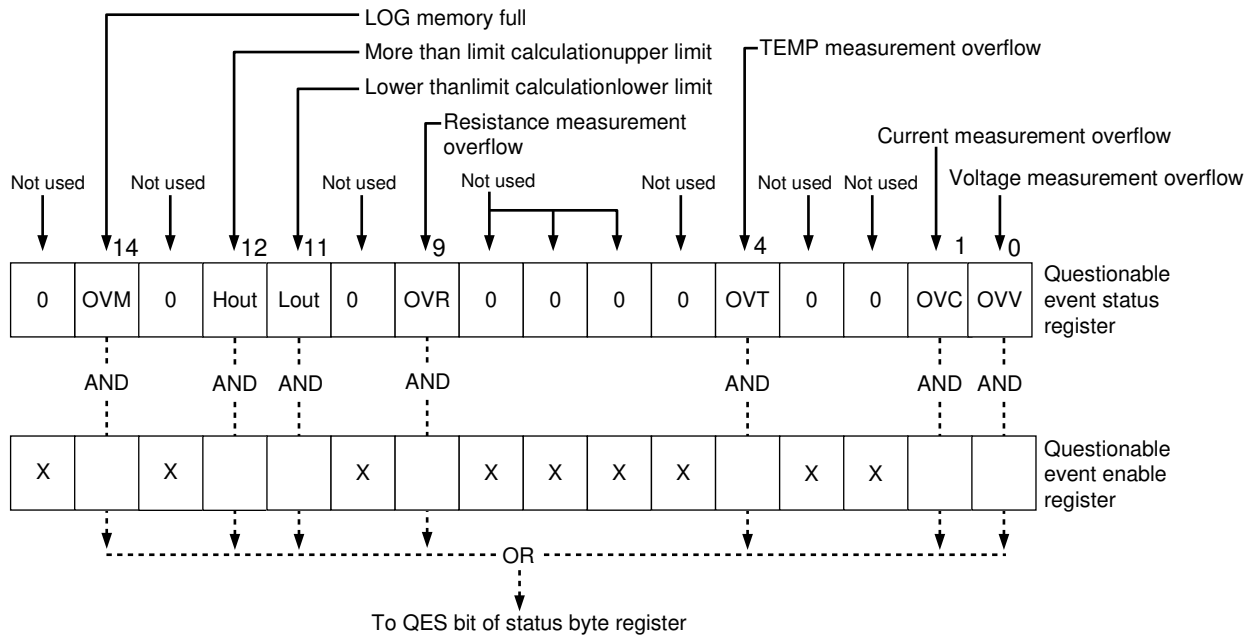
2.3.16 Questionable event enable register

This is a register to mask questionable event status register. Depending upon the masked result, QES bit of standard event status register is set.

It is possible to set and read out the mask pattern by :STATus:QUESionable:ENABLE[?] command. This register is *PSC command and is settable whether it is cleared to 0 or not at the time of power-up.

This is not affected by instrument clear and *CLS command.

Questionable event status constitution



2.4 Common Commands

This section describes the commands defined in the IEEE Std. 488.2 standard, which are built-into this instrument.

These common commands can be used in either SCPI-compliant command system.

2.4.1 List of Common Commands

Syntax	Name	Function
*IDN?	Identification Query	Queries instrument-specific information.
*RST	Reset	Initializes settings to default values.
*TST?	Test Query	Returns results of normal confirmation of firmware.
*OPC	Operation Complete	When the current operation is fully completed, the operation end message (OPC bit) is set to "1" in the standard event status register.
*OPC?	Operation Complete Query	"1" is returned when the current operation is fully completed.
*WAI	Wait	Execution of subsequent commands is held pending until the current operation is fully completed.
*CLS	Clear Status	Clears the standard event status register and the event register specifically for this instrument, also clears corresponding bit in the status byte register.
*ESE <>	Event Status Enable	Sets values to the standard event status enable register.
*ESE?	Event Status Enable Query	Queries contents of standard event status enable register.
*ESR?	Event Status Register Query	Queries contents of standard event status register. At the same time, it clears the standard event status register.
*PSC <>	Power on Status Clear	Sets auto clearing upon power-on of the register group, including the service request enable register, standard event status enable register, and event enable register for this instrument.
*PSC?	Power on Status Clear Query	Queries the Power on Status Clear settings.
*SRE <>	Service Request Enable	Sets values to the service request enable register.
*SRE?	Service Request Enable Query	Queries the service request enable register.
*STB?	Status Byte Query	Queries the status byte and master summary status bit (MSS message).
*TRG	Trigger	Issues trigger.
*RCL <>	Recall	Recalls setup file stored in internal memory.
*SAV <>	Save	Saves current settings to setup file in internal memory.

2.4.2 *IDN? query (Identification Number)

This reads instrument-specific information for this instrument.

Query syntax

*IDN?

Response message <maker_name>, <model_number>, <serial_number>, <software_revision>

The response is configured of four fields separated by commas. The fields are as follows.

<maker_name>	Manufacturer	YOKOGAWA
<model_number>	Model No.	DM7560
<serial_number>	Serial No.	ASCII numeric value (unsigned <NR2>)
<software_revision>	Revision No.	ASCII numeric value (unsigned <NR2>)

Remarks

The response data uses four fields to form the <ARBITRARY ASCII RESPONSE DATA> format. Therefore, the *IDN? query must be the last query in <PROGRAM MESSAGE>. If this rule is violated, the query error is given and the response message corresponding to the queries after the *IDN? query are not created and sent.

2.4.3 *RST command (Reset)

The *RST command initializes the internal setup to its default values.

At this time, however, the settings of the remote interfaces are not changed.

Command syntax

*RST

Remarks

If this command is performed during trigger wait status or measurement, the instrument enters the HOLD mode.

2.4.4 *TST? query (Test)

This confirms firmware normality and returns the result.

Query syntax

*TST?

If this query is executed during trigger waiting status or measurement, the execution error occurs and no response is done.

Response message <result>

<result> shows the test results in the <NR1 NUMERIC RESPONSE DATA> format.

Normal case becomes 0.

Abnormal case becomes -1.

2.4.5 *OPC/*OPC? command/query (Operation Complete)

When this instrument receives the *OPC command, it sets the operation completion message (OPC bit) of the standard event status register to “1” after the operation of the instruments, which are specified by commands and queries sent before this command, has been completed.

In the case of a query, when an instrument operation that was specified by a command or query prior to this command is fully completed, ASCII character 1 is stored in the output queue (is not set to standard event status register).

Command syntax

*OPC

Query syntax

*OPC?

Response message 1

The response message is “1” in the <NR1 NUMERIC RESPONSE DATA> format.

2.4.6 *WAI command (Wait)

The *WAI command holds the execution of subsequent commands and queries until the operation of the instruments, which are specified by commands and queries sent before this command, has been completed.

Command syntax

*WAI

2.4.7 *CLS command (Clear Status)

The *CLS command clears both the standard event status register and instrument specific event register of this instrument. Additionally, this command clears the summary bit in the status byte register influenced by the contents of these registers and queues.

Command syntax

*CLS

2.4.8 *ESE/*ESE? command/query (Event Status Enable)

The *ESE command is used to set or read the standard event status enable register.

Command syntax

*ESE <mask_arg>

<mask_arg> is a parameter to set the standard event status enable register and is a numeric value ranging from "0" to "255" in the <NUMERIC VALUE PROGRAM DATA> format. If the numeric value is outside the range, it is rounded to the maximum or minimum value as appropriate and specified, and the execution error is given.

One meaning is assigned to each bit of the standard event status register. When a bit corresponding to the enable register is set to "1", relevant event becomes enabled (this affects the status byte register). On the contrary, when a bit is set to "0", relevant event becomes disabled (this does not affect the status byte register).

Query syntax

*ESE?

Response message <mask>

<mask> is a numeric value ranging from "0" to "189" in the <NR1 NUMERIC RESPONSE DATA> format that the setting of each bit in the standard event status enable register is weighted by exponentiation of "2".

Remarks: Structure of standard event status enable register

Bit	Weighting	Meaning
7	128	PON - Power ON
6	64	(URQ) - Not used in this instrument.
5	32	CME - Command error
4	16	EXE - Execution error
3	8	DDE - Instrument specific error
2	4	QYE - Query error
1	2	(RQC) - Not used in this instrument.
0	1	OPC - Operation complete

This instrument does not use bit 2 and 6. Therefore, even though all bits of this register are set at "1", the maximum value of the response message becomes 189 (= 255 - 64 - 2).

2.4.9 *ESR? query (Event Status Register)

This reads the current contents of the standard event status register.

When the contents of the event status register are read, they are then cleared.

Query syntax

*ESR?

Response message <status>

<status> is a numeric value ranging from “0” to “189” in the <NR1 NUMERIC RESPONSE DATA> format that the value of each bit in the standard event status register is weighted by exponentiation of “2”.

Remarks: Structure of standard event status register

Bit	Weighting	Meaning
7	128	PON - Power ON
6	64	(URQ) - Not used in this instrument.
5	32	CME - Command error
4	16	EXE - Execution error
3	8	DDE - Instrument specific error
2	4	QYE - Query error
1	2	(RQC) - Not used in this instrument.
0	1	OPC Operation complete

This instrument does not use bit 1 and 6. Therefore, even though all bits of this register are set at “1”, the maximum value of the response message becomes 189 (= 255 . 64 . 2).

2.4.10 *PSC/*PSC? command/query (Power on Status Clear)

The *PSC command controls the automatic clear of the service request enable register, standard event status enable register, and instrument-specific event enable register groups at power on.

The values set by the .PSC command can be obtained using the .PSC? query. If the value of the response data is “0”, the status of each enable register is retained even while the power is off. If the value of the response data is “1”, this shows that each of above enable registers is cleared when the power is turned on again.

Command syntax

*PSC <psc_flag_arg>

<psc_flag_arg> is a parameter for setting of the power on status clear flag and is a numeric value ranging “-32767” to “+32767” in the <NUMERIC VALUE PROGRAM DATA> format.

When <psc_flag_arg> is set at “0”, the status of each enable register is retained even while the power is turned off. When <psc_flag_arg> is set at “1” (value other than “0”), each enable register is cleared when the power is turned on again.

Query syntax

*PSC?

Response message <psc_flag>

<psc_flag> is a numeric value showing the contents of the power on status clear flag and is normally “0” or “1” in the <NR1 NUMERIC RESPONSE DATA> format.

2.4.11 *SRE/*SRE? command/query (Service Request Enable)

The *SRE command is used to set and read the service request enable register.

Command syntax

*SRE <mask_arg>

<mask_arg> is a parameter to set the service request enable register and is a numeric value ranging from "0" to "255" in the <NUMERIC VALUE PROGRAM DATA> format.

If the numeric value is outside the range, it is rounded to the maximum or minimum value as appropriate and specified, and the execution error is given.

One meaning is assigned to each bit of the service request enable register. When a bit corresponding to the enable register is set to "1", relevant event becomes enabled (this causes the service request to occur). On the contrary, when a bit is set to "0", relevant event becomes disabled (this does not cause the service request to occur).

Query syntax

*SRE?

Response message <mask>

<mask> is a numeric value ranging from "0" to "185" in the <NR1 NUMERIC RESPONSE DATA> format that the setting of each bit in the service request enable register is weighted by exponentiation of "2".

Remarks: Structure of service request enable register

Bit	Weighting	Meaning
7	128	OES- Operation event status
6	64	RQS/MSS- Request service/message summary status
5	32	ESB- Event status
4	16	MAV- Message available
3	8	QES- Questionable event status
2	4	XXX- Since this instrument does not use this bit, the bit is always set at "0".
1	2	XXX- Since this instrument does not use this bit, the bit is always set at "0".
0	1	MEV- Measurement event status

The response data is created assuming that bit 6 is always "0" regardless of the designation of the *SRE command parameter. However, note that this bit is always determined as enable during actual operation.

Since the instrument does not use bits 1 and 2, and the response of bit 6 is "0", the maximum value of the response message becomes 185 (= 128 + 32 + 16 + 8 + 1) even though all bits of this register are set at "1".

2.4.12 *STB? query (Status Byte)

Here, the status byte and master summary status bit (MSS message) can be read.

Query syntax
*STB?

Response message <status>

<status> is a numeric value ranging from "0" to "249" in the <NR1 NUMERIC RESPONSE DATA> format that the value of each bit in the status byte register is weighted by exponentiation of "2".

Remarks: Structure of status byte register

Bit	Weighting	Meaning
7	128	OPS- Operation event status
6	64	RQS/MSS-Request service/Message summary status
5	32	ESB- Event status
4	16	MAV- Message available
3	8	QES- Questionable event status
2	4	XXX- Since this instrument does not use this bit, the bit is always set at "0".
1	2	XXX- Since this instrument does not use this bit, the bit is always set at "0".
0	1	MEV- Measurement event status

This instrument does not use bits 1 and 2. Therefore, even though all bits of this register are set at "1", the maximum value of the response message becomes 249 (= 128 + 64 + 32 + 16 + 8 + 1).

When the contents of the status byte register are read using the .STB? query, the MSS message is used for bit 6 instead of RQS in conformity with the IEEE488.2 standard. Other bits become the same values read by the serial polling.

The MSS message is obtained by logical OR of all bits except for bit 6 after the contents of the status byte register are masked (logical AND) according to the contents of the service request enable register.

The RQS message is basically retained in the status byte register until the serial polling is performed. On the contrary, the MSS message affects the internal status of the instrument at real-time.

2.4.13 .TRG command (Trigger)

When a trigger source is in BUS, the trigger is forced to generate.

When the instrument is trigger wait status, measurement is started.

Command syntax
*TRG

Remarks

In the case the instrument is not trigger wait status, it becomes an execution error.

2.4.14 *RCL command (Recall)

Recalls setup file stored in this instrument's internal memory.

Command syntax

*RCL <register_number_arg>

<register_number_arg> is used to specify a parameter for setting of the setup No. to be recalled and is a numeric value ranging from "0" to "10" in the <NUMERIC VALUE PROGRAM DATA> format.

If the numeric value is outside the range, it is discarded and the execution error is given.

A numeric value corresponding to the register No. to be selected for the save/recall operation of the local operation is specified.

Remarks

The parameter cannot be omitted. If omitted, command error is given.

If an integer value that <register_number_arg> is rounded is outside the range, the execution error is given and the recall operation is not performed.

If this query is executed during trigger waiting status or measurement, the execution error occurs and no response is done.

2.4.15 *SAV command (Save)

The setup information is saved into the internal memory of this instrument.

Command syntax

*SAV <register_number_arg>

<register_number_arg> is used to specify a parameter for setting of the setup No. to be saved and is a numeric value ranging from "0" to "10" in the <NUMERIC VALUE PROGRAM DATA> format.

If the numeric value is outside the range, it is discarded and the execution error is given.

A numeric value corresponding to the setup No. to be selected for the save/recall operation of the local operation is specified.

Remarks

The parameter cannot be omitted. If omitted, command error is given.

If an integer value that <register_number_arg> is rounded is outside the range, the execution error is given and the save operation is not performed.

If this query is executed during trigger waiting status or measurement, the execution error occurs and no response is done.

2.5 Instrument-Specific Commands

This section explains the instrument-specific commands (SCPI conforming form) provided by the multimeter. The instrument-specific commands related to status reports are described in section 2.3, and for common commands provided by this instrument, refer to section 2.4. And, instrument-specific commands might not be able to be used according to the model. Confirm the explanation of each command/query in detail.

2.5.1 List of Instrument-specific Commands

2.5.1.1 List of Instrument-specific Commands (Math calculation relation)

Syntax	Parameter	Function
:CALCulate[1]		
:LIMit:LOWer:STATe[?] [:DATA][?]	<off_on > <NUMERIC PROGRAM DATA>	Limit function On/Off setting & reading of Lower limit judgment Setting & reading of lower limit value
:LIMit:UPPer :STATe[?] [:DATA][?]	<off_on > <NUMERIC PROGRAM DATA>	On/Off setting & reading of upper limit judgment Setting & reading of upper value
:SMOothing:STATe[?] :POINts[?]	<off_on > <NUMERIC PROGRAM DATA>	Smoothing function On/Off setting & reading of smoothing function Setting & reading of number of samples of smoothing
:SCALing :STATe[?] :MODE[?] :VALA[?] :VALB[?] :VALC[?] :VALD[?]	<off_on > SCALE REC <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA>	Scaling function On/Off setting & reading of scaling function Setting & reading of selection of (X-A)*B/C D/X Setting & reading of parameter A Setting & reading of parameter B Setting & reading of parameter C Setting & reading of parameter D
:DB :STATe[?] :MODE[?] :RELative :STATe[?] :VALue[?]	<off_on > DBM DBV <off_on > <NUMERIC PROGRAM DATA>	dB calculation function On/Off reading & setting of dB calculation function Setting & reading of selection of dB calculation On/Off setting & reading of relative calculation function Setting & reading of relative value
:DBM :REFerence[?]	<NUMERIC PROGRAM DATA>	Setting & reading of dBm standard resistance value
:DBV:REFerence[?]	<NUMERIC PROGRAM DATA>	Setting & reading of dBV standard voltage value
:AVERage:STATe[?] :CLEar :AVERage? :MAXimum? :MINimum? :SDEViation? :PTPeak? :COUNT?	<off_on >	Statistic calculation function On/Off reading & setting of statistic calculation function Initialization of statistic calculation Reading of average value of statistic calculation Reading of maximum value of statistic calculation Reading of minimum value of statistic calculation Reading of standard deviation of statistic calculation Reading of peak-to-peak of statistic calculation Reading of data quantity of statistic calculation

2.5.1.2 List of Instrument-specific Commands (Graph display relation)

Syntax	Parameter	Function
: CALCulate2 TRANSform		
HISTogram :ALL? :DATA? :POINTs[?] :RANGE :MODE[?] :AUTO:COUNT[?] :CENTer[?] :BWIDth[?]	<NUMERIC PROGRAM DATA> AUTO MANUAL FULLSCALE <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA>	Histogram display setting subsystem Reading of range information and bin data Reading of bin data Setting & reading of bin quantity Setting & reading of range mode Setting & reading of measuring quantity for auto range decision Setting & reading of range median Setting & reading of range bin width
:TCHart:RANGE:MODE[?] [:UPPer][?] :OFFSet[:DIV][?] :OFFSet:VALue[?]	AUTO MANUAL FULLSCALE <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA>	Trend chart display setting subsystem Setting & reading of range mode Setting & reading of range value Setting & reading of offset value in DIV unit Setting & reading of offset value
:AMETer:RANGE : MODE[?] [:UPPer][?] :OFFSet[:DIV][?] :OFFSet:VALue[?] :LOG:MAX[?] :LOG:MIN[?] :TITLE:MODE[?] :TEXT	AUTO FULLSCALE MANUAL LOG <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> UNIT BLANK TEXT <Character program data>	Arc scale meter display setting subsystem Setting & reading of range mode Setting & reading of range value Setting & reading of of offset value in DIV unit Setting & reading of offset value Setting & reading of LOG display maximum value Setting & reading of LOG display minimum value Setting & reading of title display mode Setting & reading of title display character string
:METEr:RANGE :AUTO[?] MODE[?] [:UPPer][?] :OFFSet[:DIV][?] :OFFSet:VALue[?] LOG:MAX[?] :LOG:MIN[?]	<off_on> AUTO FULLSCALE MANUAL LOG <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA>	Analog Meter display setting subsystem Setting & reading of range mode AUTO Setting & reading of range mode Setting & reading of range value Setting & reading of of offset value in DIV unit Setting & reading of offset value Setting & reading of LOG display maximum value Setting & reading of LOG display minimum value

2.5 Instrument-specific Commands

2.5.1.3 List of Instrument-specific Commands (Trigger relation)

Syntax	Parameter	Function
:SAMPle		
:COUNT[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples obtained by one time trigger
:TIMer[?]	<NUMERIC PROGRAM DATA>	Setting & reading of interval time of sampling
:TRIGger		
:SOURce[?]	IMM EXT BUS	Setting & reading of trigger source
:COUNT[?]	<NUMERIC PROGRAM DATA> INF	Setting & reading of trigger frequency up to measurement stop
:DELay[?]	<NUMERIC PROGRAM DATA>	Setting & reading of trigger delay time
:SLOPe[?]	POS NEG	Setting & reading of EXT trigger polarity

2.5.1.4 List of Instrument-specific Commands List (Measurement/measured value setting relation)

Syntax	Parameter	Function
:INITiate[:IMMediate]		Transition to trigger wait status
:ABORt		Stop measuring and transition to measurement stop status
:READ?		Transition to trigger wait status and reading of measure value
:FETCh?		Read latest measured value and wait for completion while measuring
:R?		Read the measured data and erase data read out
:MEASure		
[:VOLTage] [:DC] ?	<range>,<resolution>	Set to DCV (direct current voltage), measure and read the measured value
[:VOLTage] :AC?	<range>,<resolution>	Set to ACV (alternating current voltage), measure and read the measured value
:CURRent [:DC] ?	<range>,<resolution>	Set to DCI (direct current), measure and read the measured value
:CURRent :AC?	<range>,<resolution>	Set to ACI (alternating current), measure and read the measured value
:RESistance?	<range>,<resolution>	Set to 2W Ω (2 terminal registers), measure and read the measured value
:FRESistance?	<range>,<resolution>	Set to 4W Ω (4 terminal registers), measure and read the measured value
:CONTinuity?		Continuity test, read the measured value
:FREQuency?	<range>,<resolution>	Set to FREQ (frequency), measure and read the measured value
:PERiod?	<range>,<resolution>	Set to period (period mode of FREQ), measure and read the measured value
:TEMPerature?	<senser>	Set to TEMP (temperature), measure and read the measured value
:DIODE?		Set to DIOD (diode measurement), measure and read the measured value

2.5.1.5 List of Instrument-specific Commands (DCV - direct current voltage measurement relation)

Syntax	Parameter	Function
:CONFIgure		
[:VOLTage] [:DC]	<range>,<resolution>	Set to DCV (direct current voltage).
[:SENSe] :VOLTage [:DC]		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERTure[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:RESolution[?]	<NUMERIC PROGRAM DATA>	Setting & reading of resolution of sampling rate
:RANGe :AUTO[?]	<off_on >	On/Off setting & reading of auto range
[:UPPer][?]	<NUMERIC PROGRAM DATA>	Setting & reading of range
:ZERO:AUTO[?]	<off_on >	On/Off setting & reading of auto zero
:NULL:STATe[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value
:IMPedance :AUTO[?]	<off_on >	On/Off setting & reading of automatic setting of input impedance

2.5.1.6 List of Instrument-specific Commands (ACV - alternating current voltage measurement relation)

Syntax	Parameter	Function
:CONFigure		
[[:VOLTage]:AC	<range>,<resolution>	Set to ACV (alternating current voltage)
[[:SENSe]:VOLTage :AC		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERTure[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:RANGE :AUTO[?]	<off_on >	On/Off setting & reading of auto range
[:UPPer][?]	<NUMERIC PROGRAM DATA>	Setting & reading of range
:NULL:STATE[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value
:BANDwidth[?]	<NUMERIC PROGRAM DATA>	Setting & reading of band width
:FREQuency[?]	<off_on>	On/Off setting & reading of display of frequency measured value

2.5.1.7 List of Instrument-specific Commands (DCI - deirect current measurement relation)

Syntax	Parameter	Function
:CONFigure		
:CURRent[:DC]	<range>,<resolution>	Set to DCI (direct current)
[[:SENSe]:CURRent[:DC]		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERTure[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:RESolution[?]	<NUMERIC PROGRAM DATA>	Setting & reading of resolution of sampling rate
:RANGE :AUTO[?]	<off_on >	On/Off setting & reading of auto range
[:UPPer][?]	<NUMERIC PROGRAM DATA>	Setting & reading of range
:ZERO:AUTO[?]	<off_on >	On/Off setting & reading of auto zero
:NULL:STATE[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value

2.5.1.8 List of Instrument-specific Commands (ACI - alternating current measurement relation)

Syntax	Parameter	Function
:CONFigure		
:CURRent:AC	<range>,<resolution>	Set to ACI (alternating current)
[[:SENSe]:CURRent :AC		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERTure[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:RANGE:AUTO[?]	<off_on >	On/Off setting & reading of auto range
[:UPPer][?]	<NUMERIC PROGRAM DATA>	Setting & reading of range
:NULL:STATE[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value
:BANDwidth[?]	<NUMERIC PROGRAM DATA>	Setting & reading of band width

2.5 Instrument-specific Commands

2.5.1.9 List of Instrument-specific Commands (2W Ω - 2 terminal register measurement relation)

Syntax	Parameter	Function
:CONFigure		
:RESistance	<range>,<resolution>	Set to 2W Ω (2 terminal registers)
[[:SENSe] :RESistance		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERture[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:RESolution[?]	<NUMERIC PROGRAM DATA>	Setting & reading of resolution of sampling rate
:RANge :AUTO[?]	<off_on >	On/Off setting & reading of auto range
[:UPPer] [?]	<NUMERIC PROGRAM DATA>	Setting & reading of range
:ZERO:AUTO[?]	<off_on >	On/Off setting & reading of auto zero
:NULL:STATe[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value

2.5.1.10 List of Instrument-specific Commands (4W Ω - 4 terminal register measurement relation)

Syntax	Parameter	Function
:CONFigure		
:FRESistance	<range>,<resolution>	Set to 4W Ω (4 terminal registers)
[[:SENSe] :FRESistance		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERture[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:RANge :AUTO[?]	<off_on >	On/Off setting & reading of auto range
[:UPPer] [?]	<NUMERIC PROGRAM DATA>	Setting & reading of range
:NULL:STATe[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value

2.5.1.11 List of Instrument-specific Commands (CONT - continuity test measurement relation)

Syntax	Parameter	Function
:CONFigure		
:CONTinuity	<range>,<resolution>	Set to CONT (continuity test)
[[:SENSe] :CONTinuity		
:THReshold[?]	<NUMERIC PROGRAM DATA>	Setting & reading of threshold

2.5.1.12 List of Instrument-specific Commands (FREQ - frequency measurement relation)

Syntax	Parameter	Function
:CONFigure		
:FREQuency	<range>,<resolution>	Set to FREQ(frequency)
[[:SENSe] :FREQuency		
:APERture[?]	<NUMERIC PROGRAM DATA>	Setting & reading of gate time
:NULL:STATe[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value
:VOLTagE :RANge :AUTO[?]		On/Off setting & reading of ACV auto range for frequency measurement
[:UPPer] [?]		Setting & reading of ACV range for frequency measurement
:ACV[?]	<off_on >	On/Off setting & reading of ACV measurement display

2.5.1.13 List of Instrument-specific Commands (PER - period measurement relation)

Syntax	Parameter	Function
:CONFigure		
:PERiod	<range>,<resolution>	Set to period (Period mode in FREQ)
[[:SENSe] :PERiod		
:APERTure[?]	<NUMERIC PROGRAM DATA>	Setting & reading of gate time
:NULL:STATE[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value
:VOLTage:RANGe:AUTO[?]		On/Off setting & reading of ACV auto range for period measurement
:UPPer[?]		Setting & reading of ACV range for period measurement
:ACV[?]	<off_on>	On/Off setting & reading of ACV measurement display

2.5.1.14 List of Instrument-specific Commands (TEMP - temperature measurement relation)

Syntax	Parameter	Function
:CONFigure		
:TEMPerature	<sense>	Set to TEMP (temperature measurement)
[[:SENSe] :TEMPerature		
:NPLC[?]	<NUMERIC PROGRAM DATA>	Setting & reading of PLC converted value of sampling rate
:SRATE[?]	<NUMERIC PROGRAM DATA>	Setting & reading of number of samples of sampling rate
:APERTure[?]	<NUMERIC PROGRAM DATA>	Setting & reading of integration time of sampling rate
:ZERO:AUTO[?]	<off_on >	On/Off setting & reading of auto zero
:NULL:STATE[?]	<off_on >	On/Off setting & reading of null calculation
:VALue[?]	<NUMERIC PROGRAM DATA>	Setting & reading of null value
:TRANsducer:TYPE[?]	TC RTD FRTD	Setting & reading of selection of sensor
:TRANsducer :TC :TYPE[?]	R K T J E	Setting & reading of selection of thermocouple
:CJUNction[?]	<NUMERIC PROGRAM DATA>	Setting & reading of thermocouple correction value
:TRANsducer:RTD	PT100 JPT100	Setting & reading of selection of 2 terminal resistance temperature detector
:TYPE[?]		
:TRANsducer:FRTD	PT100 JPT100	Setting & reading of selection of 4 terminal resistance temperature detector
:TYPE[?]		

2.5.1.15 List of Instrument-specific Commands (DIOD - diode measurement relation)

Syntax	Parameter	Function
:CONFigure		
:DIODE		Set to DIOD (diode measurement)

2.5 Instrument-specific Commands

2.5.1.16 List of Instrument-specific Commands (Other commands)

Syntax	Parameter	Function
:DISPlay		
[:WINDow[1 2]] [:STATe] [?]	<off_on>	On/Off setting & reading of screen display
:WINDow[1 2] :BACKground:COLor [?]	BLACK WHITE	Setting & reading of screen background color
:WINDow[1] :MODE [?]	NUMERIC HISTOGRAM TREND LIMIT METER	Mode setting & reading of primary screen
:WINDow2 :MODE [?]	NUMERIC METER LIMIT STATISTIC HISTOGRAM CURSOR	Mode setting & reading of secondary screen
:MENU:ANIMation[:STATe] [?]	<off_on>	On/Off setting & reading of menu animation display
:NUMeric:DIGIts	<NUMERIC PROGRAM DATA>	Setting & reading of digit mask for primary numeric value display
:NUMeric:FONT	SEVEN NORMAL	Setting & reading of font for primary numeric value display
:NUMeric:SIZE	NORMAL LARGE	Setting & reading of character size for primary numeric value display
:SYSTem		
:BEEPer:IMMediate		Beep sounding
:LIMit:STATe [?]	OFF GO NOGO	Setting & reading of beep sounding by limit operation result
:KEY:STATe [?]	<off_on >	Setting & reading of beep sounding by key operation
:CAUTION:STATe [?]	<off_on >	Setting & reading of beep sounding at error
:LFRequency [?]		Setting & reading of power supply frequency
:LFRequency:AUTO [?]	<off_on >	On/Off setting & reading of automatic judgment of power supply frequency
:ACTual?		Setting & reading of power supply frequency measurement and result
:PRESet	OFF DATETIME SETUPNAME	Recall in default setup
:HEADer:TYPE [?]	<day>,<month>,<year>,<hour>,<min>,<sec>	Setting & reading of selection of header section display
:DATEtime [?]	<min>,<sec>	Setting & reading of date and time
:OUTPut		
[:STATe] [?]	<off_on>	On/Off setting & reading of DIO output
:HCOpy		
[:SDUMp:] DATA [?]		Reading of screen hardcopy data
:DATA:FORMat [?]	BMP PNG TIFF	Setting & reading of hardcopy format
:DATA:COLor [?]	<off_on>	Setting & reading of hardcopy data color
:DATA:STORe	<Character string program>	Storage execution of hardcopy in USB
:DATA:STORe:DIR	<NUMERIC PROGRAM DATA>	Setting & reading of storage folder of setup in USB
:MEMory		
:NSTates?		Setting & reading of reservable number of setup
:STATe:CATalog?		Reading of setup name list
:NAME [?]	<NUMERIC PROGRAM DATA>	Setting & reading of specified setup name
:RECall:AUTO [?]	<off_on>	On/Off setting & reading of setup recall when energizing
:RECall:SElect [?]	<NUMERIC PROGRAM DATA>	Setting & reading of setup to be recalled when turning on the power supply
:SETUP		
:STORe	<NUMERIC PROGRAM DATA>	Storage execution of setup in USB
:STORe:DIRectory [?]	<NUMERIC PROGRAM DATA>	Setting & reading of setup storage folder in USB
:LOAD	<NUMERIC PROGRAM DATA>	Call execution of setup from USB
:LOAD:DIRectory [?]	<NUMERIC PROGRAM DATA>	Setting & reading of call folder of setup from USB
:TRANsfer:STATe [?]	<preamble><setup data>	Setting & reading of setup at data transmission
:NAME [?]	<NUMERIC PROGRAM DATA>	Setting & reading of setup name

:DATA		LOG relation
:MODE[?] :REMove?	NORMAL BULK <NUMERIC PROGRAM DATA>	Setting & reading of setup LOG mode Reading and erasing LOG data of specified quantity
:LAST? :POINTs? :DELeTe		Reading just before measured data Reading of Number of data in LOG data LOG data clear
:BULK:LENGth[?] :POST[?]	<NUMERIC PROGRAM DATA> <NUMERIC PROGRAM DATA>	Setting & reading of LOG memory length Setting & reading of number of post readings
:EVENt[?] :LEVel[:VALue][?] :LEVel:SLOPe[?]	NONE EXT LEVEL LIMIT <NUMERIC PROGRAM DATA> NEG POS	Setting & reading of stop event Setting & reading of evel threshold Setting & reading of slope that steps over level threshold
:LIMint[?] :STATe[?]	GO NOGO HIGH LOW	Setting & reading of limit stop condition Acquisition of state of bulk log
:DIRectory		Setting & reading of directory for copying in USB memory
:COPY		Copying LOG data in USB memory

2.5.1.17 List of status register control related commands

Syntax	Parameter	Function
:DDER?		Instrument specific error occurrence and event status register reading
:DDEE[?]	<NUMERIC PROGRAM DATA>	Instrument specific error occurrence and event enable register setting & reading
:MESR?		Measurement and event status register reading
:MESE?	<NUMERIC PROGRAM DATA>	Measurement and event enable register setting & reading
:STATus		
:OPERation:CONDition? [:EVENt]?		Operation condition status register reading Operation event status register reading
:ENABle[?]	<NUMERIC PROGRAM DATA>	Operation event enable register setting & reading
:QUESionable:CONDition? [:EVENt]?		Questionable condition status register reading Questionable event status register reading
:ENABle[?]	<NUMERIC PROGRAM DATA>	Questionable event enable register setting & reading

2.5.2 Route command

This paragraph explains commands that do not belong to the subsystem.

2.5.2.1 ABORt command

Transit measuring status of this instrument to measuring stop status.
If measurement waits for trigger or is being done, measurement is stopped.

Command syntax

:ABORt

2.5.2.2 INITiate[:IMMediate] command

If the log mode is NORMAL

Transit measuring status of this instrument from measuring stop status to trigger wait status.
After the trigger event occurs for specified times, this instrument returns to measuring stop status. For status transit by the trigger event, refer to "2.5.4 TRIGger subsystem" .

If the log mode is BULK

Transit measuring status of this instrument from measuring stop status to bulk log execution status.

In bulk log execution status, sampling and recording on the log data are continuously done. After the data for the specified post-reading times is recorded after detecting stop event, this instrument returns to measuring stop status. However, if the stop event is NONE, this instrument does not move to the measurement stop status until ABORted. When LIMIT calculation is OFF and when this command is executed after the stop event is set LIMIT, the execution error occurs.

Command syntax

:INITiate[:IMMediate]

After this command is sent and the trigger condition is fulfilled, measurement is started.
If it is already trigger wait status or being measured, execution becomes error without doing anything.

Remark

INITiate command clears the log data recorded until then.

2.5.2.3 FETCh? query

All measured data in the LOG data is returned from the forefront (the oldest data). Attribute information of time stamp, etc. is not appended. The LOG data by reading is not changed. In case measuring status is trigger wait status or being measured, the measured data is returned after measurement completion.

In case measurement is stopped, the measured data is immediately returned.

This command cannot be used with multi-commands.

Query syntax
:FETCh?

In case when LOG data is empty or the trigger count is set to INF, response message is not returned, resulting in execution error.

Response message <meas_data>
<meas_data> is "NR3 numerical response data" format, and each measured data is punctuated by comma (.).

2.5.2.4 READ? query

The measuring status of this instrument is transited from measuring stop status to the trigger wait status. Measurement with trigger condition fulfilled is thereafter started, and after measurement completion all measured data in the LOG data is returned from the forefront (the oldest data). Attribute information of time stamp, etc. is not appended. The LOG data by reading is not changed.

This command cannot be used with multi-commands.

Query syntax
:READ?

:READ? send becomes the same meaning as FETCh? send after INITiate send.

If the trigger is already wait status or being measured, it becomes execution error without doing anything.

In case the trigger count is set to INF, response message is not returned, resulting in execution error.

Response message <meas_data_block>
<meas_data_block> becomes the data that each measured data of "NR3 numerical response data" format is punctuated by comma (,) and then connected.

2.5 Instrument-specific Commands

2.5.2.5 R? query

The measured data of assigned quantity is read out from the forefront (the oldest data) of LOG data.

The read measurement data is deleted from the LOG data.

The attribute information of time stamp, etc. is appended on the measured data.

Query syntax

:R? [<max_count>]

In case number of measured data in LOG data does not fulfill <max_count> and parameter is not specified, all the measured data is returned.

If LOG data is empty, response message is not returned; resulting in execution error.

If LOG mode is NORMAL, the query can be executed regardless of measuring status. At that time, this query does not wait for measuring completion (not done by :FETCH? query).

If this query is executed in measurement when LOG mode is BULK, response message is not returned; resulting in execution error.

Response message < Preamble >< Measured data block >

< Preamble >

#8xxxxxxx

Xxxxxxxx : 8 digit ASCII codes showing number of byte of measured data

<Measured data block>

This becomes the data of which the measured data of assigned quantity in LOG data is punctuated by CR+LF.

Each measured data becomes the data of which the following items are punctuated by comma (,).

Measured value of <NR3 numerical data> format

Time stamp

Attribute information

The time stamp format is as follows:

“Year/Month/Date Hour: Minute: Second”, μ second

The attribute information format is as follows:

“Function name”, “NULL operation”, “MATH calculation”, “Error information”

2.5.3 CALCulate subsystem

This performs various setting of operation relations such as scaling and statistic calculation.

```
CALCulate1:LIMit
CALCulate1:SMOothing
CALCulate1:SCALe
CALCulate1:DB
CALCulate1:AVERAge

CALCulate2:TRANsform:HISTogram
CALCulate2:TRANsform:TCHart
CALCulate2:TRANsform:METER
```

2.5.3.1 CALCulate1:LIMit subsystem

2.5.3.1.1 CALCulate[1]:LIMit:LOWer:STATe command/query

This performs setting/reading of ON/OFF of the lower limit judgment for limit function.

Command syntax

```
:CALCulate[1]:LIMit:LOWer:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:LIMit:LOWer:STATe?
```

Response message <off_on>

<off_on> is <NR1 numerical response data > format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.3.1.2 CALCulate[1]:LIMit:LOWer[:DATA] command/query

This performs setting/reading of lower limit value for limit function.

Command syntax

```
:CALCulate[1]:LIMit:LOWer[:DATA] {<limit_data>|MIN|MAX|DEF}
```

<limit_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	-999.9999E+12

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:LIMit:LOWer[:DATA]? [{MIN|MAX}]
```

Response message <limit_data>

<limit_data> is <NR3 numerical response data> format figures.

2.5.3.1.3 CALCulate[1]:LIMit:UPPer:STATe command/query

This performs setting/reading of ON/OFF of the upper limit judgment for limit function.

Command syntax

```
:CALCulate[1]:LIMit:UPPer:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:LIMit:UPPer:STATe?
```

Response message <off_on>

<off_on> is <NR1 numerical response data > format.

0 and 1 denote OFF and ON respectively.

2.5.3.1.4 CALCulate[1]:LIMit:UPPer[:DATA] command/query

This performs setting/reading of upper limit value for limit function.

Command syntax

```
:CALCulate[1]:LIMit:UPPer[:DATA] {<limit_data>|MIN|MAX|DEF}
```

<limit_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+999.9999E+12

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:LIMit:UPPer[:DATA]? [{MIN|MAX}]
```

Response message <limit_data>

<limit_data> is <NR3 numerical response data> format figures.

2.5 Instrument-specific Commands

2.5.3.2 CALCulate1:SMOothing subsystem

The smoothing function can set every each measuring function.

This subsystem performs setting or reading of the smoothing function for measuring function during startup.

2.5.3.2.1 CALCulate[1]:SMOothing:STATe command/query

This performs setting/reading of ON/OFF for the smoothing function.

Command syntax

```
:CALCulate[1]:SMOothing:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SMOothing:STATe?
```

Response message <off_on>

<off_on> is <NR1 numerical response data > format.

0 and 1 denote OFF and ON respectively.

2.5.3.2.2 CALCulate[1]:SMOothing:POINTs command/query

This performs setting/reading of number of sample point for the smoothing function.

Command syntax

```
:CALCulate[1]:SMOothing:POINTs {<point_data>|MIN|MAX|DEF}
```

<point_data>

<Numerical program data>	Resolution	Default value
2~100	1	10

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SMOothing:POINTs? [{MIN|MAX}]
```

Response message <point_data>

<point_data> is <NR1 numerical response data> format figures.

2.5.3.3 CALCulate1:SCALing subsystem

2.5.3.3.1 CALCulate[1]:SCALing:STATe command/query

This performs setting/reading of ON/OFF for the scaling function.

Command syntax

```
:CALCulate[1]:SCALing:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

The scaling function and dB calculation function are exclusive functions. When this command and scaling calculation turn ON, the dB calculation function becomes OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SCALing:STATe?
```

Response message <off_on>

<off_on> is <NR1 numerical response data > format.

0 and 1 denote OFF and ON respectively.

2.5.3.3.2 CALCulate[1]:SCALing:MODE command/query

This performs setting/reading of mode setting for the scaling function.

Command syntax

```
:CALCulate[1]:SCALing:MODE <scale_mode>
```

<scale_mode>

<Character program data>	Setting
SCAL	$(X-A)*B/C$
REC	D/X

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SCALing:MODE?
```

Response message <scale_mode>

<scale_mode> is <Character response data> format.

2.5 Instrument-specific Commands

2.5.3.3.3 CALCulate[1]:SCALing:VALA command/query

This performs setting/reading of parameter “A” for the scaling function.
The scaling function is used when mode is ”SCAL (X-A).B/C”.

Command syntax

```
:CALCulate[1]:SCALing:VALA {<val_data>|MIN|MAX|DEF}
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+1.0000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SCALing:VALA? [{MIN|MAX}]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format figures.

2.5.3.3.4 CALCulate[1]:SCALing:VALB command/query

This performs setting/reading of parameter “B” for the scaling function.
The scaling function is used when mode is “SCAL (X-A).B/C”.

Command syntax

```
:CALCulate[1]:SCALing:VALB {<val_data>|MIN|MAX|DEF}
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+1.0000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SCALing:VALB? [{MIN|MAX}]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format figures.

2.5.3.3.5 CALCulate[1]:SCALing:VALC command/query

This performs setting/reading of parameter “C” for the scaling function.
The scaling function is used when mode is “SCAL (X-A).B/C”.

Command syntax

```
:CALCulate[1]:SCALing:VALC {<val_data>|MIN|MAX|DEF}
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+1.0000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SCALing:VALC? [{MIN|MAX}]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format figures.

2.5.3.3.6 CALCulate[1]:SCALing:VALD command/query

This performs setting/reading of parameter “D” for the scaling function.
The scaling function is used when mode is “SCAL D/X”.

Command syntax

```
:CALCulate[1]:SCALing:VALD {<val_data>|MIN|MAX|DEF}
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+1.0000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:SCALing:VALD? [{MIN|MAX}]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format figures.

2.5.3.4 CALCulate1:DB subsystem

2.5.3.4.1 CALCulate[1]:DB:STATe command/query

This performs setting/reading of ON/OFF for the dB calculation.

The dB calculation is only effective for DCV and ACV. In case other measuring function has been selected, execution error occurs and command cannot be executed. The query repeats OFF.

Command syntax

```
:CALCulate[1]:DB:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

The scaling function and dB calculation function are exclusive functions. The dB calculation turns ON by this command, the scaling function turns OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:DB:STATe?
```

Response message <off_on>

<off_on> is <NR1 numeral response data> format.

0 and 1 denote OFF and ON respectively.

2.5.3.4.2 CALCulate[1]:DB:MODE command/query

This performs setting/reading of mode for the dB calculation.

Command syntax

```
:CALCulate[1]:DB:MODE <db_mode>
```

<db_mode>

<Character program data>	Setting
DBM	dBm calculation
DBV	dBV calculation

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:DB:MODE?
```

Response message <db_mode>

<db_mode> is <Character response data> format.

2.5.3.4.3 CALCulate[1]:DB:RELative:STATe command/query

This performs setting/reading of ON/OFF of relative value calculation for the dB calculation.

Command syntax

```
:CALCulate[1]:DB:RELative:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:DB:RELative:STATe?
```

Response message <off_on>

<off_on> is <NR1 numeral response data> format.

0 and 1 denote OFF and ON respectively.

2.5.3.4.4 CALCulate[1]:DB:RELative:VALue command/query

This performs setting/reading of relative value calculation for the dB calculation.

Command syntax

```
:CALCulate[1]:DB:RELative:VALue {<val_data>|MIN|MAX|DEF}
```

<val_data>

<Numerical program data>	Resolution	Default value
-500.0000 to +500.0000	0.0001	0.0000

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:DB:RELative:VALue? [{MIN|MAX}]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format figures.

2.5 Instrument-specific Commands

2.5.3.4.5 CALCulate[1]:DBM:REFerence command/query

This performs setting/reading of standard resistance in dBm mode for the dB calculation.

Command syntax

```
:CALCulate[1]:DBM:REFerence {<ref_ohm>|MIN|MAX|DEF}
```

<ref_ohm>

<Numerical program data>	Default value
4,8,16,32,50,75,93,110,124,125,135,150,200,250,300,500,600,800,900,1000,1200, 8000	4

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

The numerical number other than specified one is set by rounding up in lower side number of the specified numerical number, and does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:DBM:REFerence? [{MIN|MAX}]
```

Response message <ref_ohm>

<ref_ohm> is <NR1 numerical response data> format figures.

2.5.3.4.6 CALCulate[1]:DBV:REFerence command/query

This performs setting/reading of standard voltage in dBV mode for the dB calculation.

Command syntax

```
:CALCulate[1]:DBV:REFerence {<ref_volt>|MIN|MAX|DEF}
```

<ref_volt>

<Numerical program data>	Default value
1.0E-6, 1.0E-3, 1.0	1.0E-6

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

The numerical number other than specified one is set by rounding up in lower side number of the specified numerical number, and does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:DBV:REFerence? [{MIN|MAX}]
```

Response message <ref_volt>

<ref_volt> is <NR3 numerical response data> format figures.

2.5.3.5 CALCulate1:AVERage subsystem

This paragraph explains of the command/query related to the statistic calculation (STATISTIC).

2.5.3.5.1 CALCulate[1]:AVERage:STATe command/query

This performs setting/reading of ON/OFF for the statistic calculation (STATISTIC).

Command syntax

```
:CALCulate[1]:AVERage:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:CALCulate[1]:AVERage:STATe?
```

Response message <off_on>

<off_on> is <NR1 numeral response data> format.

0 and 1 denote OFF and ON respectively.

2.5.3.5.2 CALCulate[1]:AVERage:CLEar command

This initializes the sampling results of statistic calculation (STATISTIC).

Command syntax

```
:CALCulate[1]:AVERage:CLEar
```

2.5.3.5.3 CALCulate[1]:AVERage:COUNT query

This reads out number of calculation sample for the statistic calculation (STATISTIC).

Query syntax

```
:CALCulate[1]:AVERage:COUNT?
```

Response message <count>

<count> is <NR1 numerical response data> format.

2.5.3.5.4 CALCulate[1]:AVERage:AVERage query

As calculation results for the statistic calculation (STATISTIC), an average value is read out.

Query syntax

```
:CALCulate[1]:AVERage:AVERage?
```

In case effective calculation results are obtained, NAN (9.91E+37) returns.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.3.5.5 CALCulate[1]:AVERage:MAXimum query

As calculation results for the statistic calculation (STATISTIC), maximum value is read out.

Query syntax

```
:CALCulate[1]:AVERage:MAXimum?
```

In case effective calculation results are obtained, NAN (9.91E+37) returns.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.3.5.6 CALCulate[1]:AVERage:MINimum query

As calculation results for the statistic calculation (STATISTIC), minimum value is read out.

Query syntax

```
:CALCulate[1]:AVERage:MINimum?
```

In case effective calculation results are obtained, NAN (9.91E+37) returns.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.3.5.7 CALCulate[1]:AVERage:SDEViation query

As calculation results for the statistic calculation (STATISTIC), standard deviation is read out.

Query syntax

```
:CALCulate[1]:AVERage:SDEViation?
```

In case effective calculation results are obtained, NAN (9.91E+37) returns.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

Remarks

This query always returns the value of 1σ though one value from the range of 1σ to 6σ can be selected in the setting of SECONDARY STATISTIC (statistical calculation result) display of the main unit.

2.5.3.5.8 CALCulate[1]:AVERage:PTPeak query

As calculation results for the statistic calculation (STATISTIC), Peak-to-Peak value is read out.

Query syntax

```
:CALCulate[1]:AVERage:PTPeak?
```

In case effective calculation results are obtained, NAN (9.91E+37) returns.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.3.6 CALCulate2:TRANSform:HISTogram subsystem

2.5.3.6.1 CALCulate2:TRANSform:HISTogram:CLEar command

The histogram data is initialized.

Command syntax

```
:CALCulate2:TRANSform:HISTogram:CLEar
```

2.5.3.6.2 CALCulate2:TRANSform:HISTogram:COUNT query

It reads the sample counts included in the histogram data.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:COUNT?
```

Response message <count>

<count> is <NR1 numeric value response data> format.

2.5.3.6.3 CALCulate2:TRANSform:HISTogram:ALL query

Numerical data of histogram display including range information is read out.

This command cannot be used with multi command.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:ALL?
```

Response message <histogram_all_block>

<histogram_all_block> becomes the format of which the following data is punctuated by comma (,).

Range lower limit value

Range upper limit value

Total number of data

Smaller number of measured data than range lower limit value

Number of data of each bin

Larger number of measured data than range upper limit value

2.5.3.6.4 CALCulate2:TRANSform:HISTogram:DATA query

Only bin data is reads out from numerical data of histogram display.

This command cannot be used with multi command.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:DATA?
```

Response message <histogram_data_block>

<histogram_data_block> becomes the format of which the following data is punctuated by comma (,).

Smaller number of measured data than range lower limit value

Number of data of each bin

Larger number of measured data than range upper limit value

In case the range information is required, use :CALCulate2:TRANSform:HISTogram:ALL?

2.5 Instrument-specific Commands

2.5.3.6.5 CALCulate2:TRANSform:HISTogram:POINTs command/query

This sets and reads out number of bin of the histogram display.

Command syntax

```
:CALCulate2:TRANSform:HISTogram:POINTs {<point>|MIN|MAX|DEF}
```

<point>

<Numerical program data>	Default value
2, 4, 5, 10, 20, 40, 50, 100, 200, 400	20

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

The numerical number other than specified one is set by rounding up in higher side number of the specified numerical number, and does not become execution error.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:POINTs? [{MIN|MAX}]
```

Response message <point>

<point>is <NR1 numerical response data> format figures.

2.5.3.6.6 CALCulate2:TRANSform:HISTogram:RANGe:MODE command/query

This sets and reads out range mode of the histogram display.

Command syntax

```
:CALCulate2:TRANSform:HISTogram:RANGe:MODE <range_mode>
```

<range_mode>

<Character program data>	Setting
AUTO	Auto range
MANUAL	Manual setting
FULLSCALE	Full scale range

Query syntax

```
:CALCulate2:TRANSform:HISTogram:RANGe:MODE?
```

Response message <range_mode>

<range_mode> is <character response data> format.

2.5.3.6.7 CALCulate2:TRANSform:HISTogram:RANGe:CENTer command/query

This sets and reads out the center value of the histogram display.

The range of histogram is “center value +/- whole width”.

Command syntax

```
:CALCulate2:TRANSform:HISTogram:RANGe:CENTer {<range_
center>|MIN|MAX|DEF}
```

<range_center>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.0000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value within range, and becomes execution error.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:RANGe:CENTer? [{MIN|MAX}]
```

Response message <range_center>

<range_center> is <NR3 numerical response data> format.

Regardless of the range mode, the center value of the current histogram display is returned.

2.5.3.6.8 CALCulate2:TRANSform:HISTogram:RANGe:BWIDth query

This reads out bin width (width of one bin) in the histogram display.

The bin width of histogram is “whole width / number of bins”.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:RANGe:BWIDth?
```

Response message <bin_width>

<bin_width> is <NR3 numerical response data> format.

Regardless of the range mode, the bin width of the current histogram display is returned.

2.5 Instrument-specific Commands

2.5.3.6.9 CALCulate2:TRANSform:HISTogram:RANGE:SPAN command/query

This sets and reads out the whole width of the histogram display.
The range of histogram is "center value +/- whole width".

Command syntax

```
:CALCulate2:TRANSform:HISTogram:RANGE:SPAN {< range_  
span> | MIN | MAX | DEF }
```

<range_data>

<Numerical program data>	Resolution	Default value
100E-12 ~ 500E+12	1,2,5 steps	10.0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

The value other than specified value is rounded up to large one. No execution error occurs.

The range mode of histogram is automatically set to MANUAL.

Query syntax

```
:CALCulate2:TRANSform:HISTogram:RANGE:SPAN? [ {MIN | MAX} ]
```

Response message <range_data>

<range_data> is <NR3 numerical response data> format.

Regardless of the range mode, the whole width of the current histogram display is returned.

2.5.3.7 CALCulate2:TRANSform:TCHart subsystem

2.5.3.7.1 CALCulate2:TRANSform:TCHart:CLEar command

This initializes data of the trend chart.

Command syntax

```
:CALCulate2:TRANSform:TCHart:CLEar
```

2.5.3.7.2 CALCulate2:TRANSform:TCHart:RANGe:MODE command/query

This sets and reads out range mode of the vertical axis in the trend chart display.

Command syntax

```
:CALCulate2:TRANSform:TCHart:RANGe:MODE <range_mode>
```

<range_mode>

<Character program data>	Setting
AUTO	Auto range
FULLSCALE	Full scale range
MANUAL	Manual setting

Query syntax

```
:CALCulate2:TRANSform:TCHart:RANGe:MODE?
```

Response message <range_mode>

<range_mode> is <character response data> format.

2.5.3.7.3 CALCulate2:TRANSform:TCHart:RANGe[:UPPer] command/query

This sets and reads out range of the trend chart display.

Command syntax

```
:CALCulate2:TRANSform:TCHart:RANGe[:UPPer] {<range_data>|MIN|MAX|DEF}
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-12 to 500E+12	1,2 and 5 steps	1.0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Values except specified values are rounded up in larger values. This does not become execution error.

The range mode of trend chart display is automatically set to MANUAL.

Query syntax

```
:CALCulate2:TRANSform:TCHart:RANGe[:UPPer]? [{MIN|MAX}]
```

Response message <range_data>

<range_data> is <NR3 numerical response data> format.

When the range mode has been set to exception of MANUAL, it becomes execution error and returns 9.91E+37.

2.5 Instrument-specific Commands

2.5.3.7.4 CALCulate2:TRANSform:TCHart:RANGe:OFFSet[:DIV] command/query

This sets and reads out range offset value of the vertical axis in the trend chart display in DIV unit.

Command syntax

```
:CALCulate2:TRANSform:TCHart:RANGe:OFFSet[:DIV] {<offset_div>|MIN|MAX|DEF}
```

<offset_div>

<Numerical program data>	Resolution	Default value
-100,000 ~ +100,000	1	0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

The range mode of trend chart display is automatically set to MANUAL.

Query syntax

```
:CALCulate2:TRANSform:TCHart:RANGe:OFFSet[:DIV]? [{MIN|MAX}]
```

Response message <offset_div>

<offset_div> is <NR1 numerical response data> format.

When the range mode has been set to exception of MANUAL, it becomes execution error and returns 9.91E+37.

2.5.3.7.5 CALCulate2:TRANSform:TCHart:RANGe:OFFSet:VALue command/query

This sets and reads out range offset value of the vertical axis in the trend chart display.

Command syntax

```
:CALCulate2:TRANSform:TCHart:RANGe:OFFSet:VALue {<offset_data>|MIN|MAX|DEF}
```

<offset_data>

<Numerical program data>	Resolution	Default value
$\pm 100,000 \times \text{<range>}$	$1 \times \text{<range>}$	0

In the table above, <range> is the range set value of the trend chart display. Setting of this command is done after conversion in DIV unit. Therefore, the value is rounded to the integral multiplication of the range set value in the trend chart. Values out of range are rounded to a maximum/ minimum value; resulting in execution error.

The range mode of trend chart display is automatically set to MANUAL.

Query syntax

```
:CALCulate2:TRANSform:TCHart:RANGe:OFFSet:VALue? [{MIN|MAX}]
```

Response message <offset_data>

<offset_data> is <NR3 numerical response data> format.

When the range mode has been set to exception of MANUAL, it becomes execution error and returns 9.91E+37.

2.5.3.8 CALCulate2:TRANSform:AMETer subsystem

2.5.3.8.1 CALCulate2:TRANSform:AMETer:RANGe:MODE command/query

It sets/ reads the range mode in arc scale meter display.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:MODE <range_mode>
```

<range_mode>

<Character program data>	Setting contents
AUTO	Auto range
FULLSCALE	Full scale range
MANUAL	Manual setting
LOG	Logarithm scale setting

Query syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:MODE?
```

Response message <range_mode>

<range_mode> is <character response data> format.

2.5.3.8.2 CALCulate2:TRANSform:AMETer:RANGe[:UPPer] command/query

It sets/ reads the range in manual mode of arc scale meter display.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe[:UPPer] {<range_
data> | MIN | MAX | DEF }
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-12 ~ 500E+12	1-2-5 step	1.0

The value out of the range is rounded to the maximum or minimum value and the execution error occurs.

The value other than a specified value is rounded up and the execution error does not occur.

The range mode of arc scale meter display is automatically set to AUTO.

Query syntax

```
:CALCulate2:TRANSform:AMETer:RANGe[:UPPer]? [ {MIN | MAX } ]
```

Response message <range_data>

<range_data> is <NR3 numeric value response data> format.

If the range mode is set to the other than MANUAL, the execution error occurs and 9.91E+37 is returned.

2.5 Instrument-specific Commands

2.5.3.8.3 CALCulate2:TRANSform:AMETer:RANGe:OFFSet[:DIV] command/query

It sets/ reads the offset value in the manual mode of arc scale meter display in DIV unit.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:OFFSet[:DIV] {<offset_  
div>|MIN|MAX|DEF}
```

<offset_div>

<Numerical program data>	Resolution	Default value
-100,000 ~ +100,000	1	0

The value out of the range is rounded to the maximum or minimum value and the execution error occurs.

The range mode of arc scale meter display is automatically set to MANUAL.

Query syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:OFFSet[:DIV]? [{MIN|MAX}]
```

Response message <offset_div>

<offset_div> is <NR1 numeric value response data> format.

If the range mode is set to the other than MANUAL, the execution error occurs and 9.91E+37 is returned.

2.5.3.8.4 CALCulate2:TRANSform:AMETer:RANGe:OFFSet:VALue command/query

It sets/ reads the offset value in the manual mode of arc scale meter display.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:OFFSet:VALue {<offset_  
data>|MIN|MAX|DEF}
```

<offset_data>

<Numerical program data>	Resolution	Default value
$\pm 100,000 \times \langle \text{range} \rangle$	$1 \times \langle \text{range} \rangle$	0

<range> is the range setting value of analog meter display.

This command makes setting after conversion into DIV unit. Therefore, the value is rounded to the integer time of the range setting value of the analog meter.

The value out of the range is rounded to the maximum or minimum value and the execution error occurs.

The range mode of arc scale meter display is automatically set to MANUAL.

Query syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:OFFSet:VALue? [{MIN|MAX}]
```

Response message <offset_data>

<offset_data> is <NR3 numeric value response data> format.

If the range mode is set to the other than MANUAL, the execution error occurs and 9.91E+37 is returned.

2.5.3.8.5 CALCulate2:TRANSform:AMETer:RANGe:LOG:MAX command/query

It sets/ reads the maximum display value in the LOG mode of arc scale meter display.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:LOG:MAX {<range_
data> | MIN | MAX | DEF}
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-11 ~ 100E+12	Value of n-th power of 10 (n: integer)	1.0

The value out of the range is rounded within the range and the execution error occurs. The setting value to be acquired is only the value of n-th power of 10 (n: integer). If the other value than this is set, the value is rounded up. In this case, the execution error does not occur.

In addition, the maximum and minimum values in the display range of LOG mode shall satisfy the relation express below.

$$1.0E+6 \geq \text{max. value} / \text{min. value} \geq 1.0E+1$$

If this condition is not satisfied as a result of setting the maximum value, the minimum value is automatically reset.

The range mode of arc scale meter display is automatically set to LOG.

Query syntax

```
:CALCulate2:TRANSform:AMETer: RANGe:LOG:MAX? [{MIN|MAX}]
```

Response message <range_data>

<range_data> is <NR3 numeric value response data> format.

If the range mode is set to the other than LOG, the execution error occurs and 9.91E+37 is returned.

2.5 Instrument-specific Commands

2.5.3.8.6 CALCulate2:TRANSform:AMETer:RANGe:LOG:MIN command/query

It sets/ reads the minimum display value in the LOG mode of arc scale meter display.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:LOG:MIN {<range_  
data> | MIN | MAX | DEF }
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-12 ~ 10E+12	Value of n-th power of 10 (n: integer)	1.0

The value out of the range is rounded within the range and the execution error occurs. The setting value to be acquired is only the value of n-th power of 10 (n: integer). If the other value than this is set, the value is rounded down. In this case, the execution error does not occur.

In addition, the maximum and minimum values in the display range of LOG mode shall satisfy the relation express below.

$$1.0E+6 \geq \text{max. value} / \text{min. value} \geq 1.0E+1$$

If this condition is not satisfied as a result of setting the minimum value, the maximum value is automatically reset.

The range mode of arc scale meter display is automatically set to LOG.

Query syntax

```
:CALCulate2:TRANSform:AMETer: RANGe:LOG:MIN? [ {MIN | MAX} ]
```

Response message <range_data>

<range_data> is <NR3 numeric value response data> format.

If the range mode is set to the other than LOG, the execution error occurs and 9.91E+37 is returned.

2.5.3.8.7 CALCulate2:TRANSform:AMETer:TITLE:MODE command/query

It sets/ reads the title display mode in arc scale meter.

Command syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:TITLE:MODE <title_mode>
```

<title_mode>

<Character program data>	Setting
UNIT	Unit display
BLANK	No title
TEXT	Arbitrary character string display

Query syntax

```
:CALCulate2:TRANSform:AMETer:RANGe:TITLE:MODE?
```

Response message <title_mode>

<title_mode> is <character response data> format.

2.5.3.8.8 CALCulate2:TRANSform:AMETer:TITLE:TEXT command/query

It sets/ reads the arbitrary character string which is displayed when TEXT is selected in the title display of arc scale meter.

Command syntax

```
CALCulate2:TRANSform:AMETer:RANGe:TITLE:TEXT <title_text>
```

<title_text>

<Character string program data>
<ul style="list-style-type: none"> Character string enclosed by double quotation marks or single quotation marks (8 characters or less) Character possible to be used : 0 to 9, a to z, A to Z, !"#\$\$%&'()*+,-./:;<=>?@[\\]^_`{ }~ ad SP (however, the same character as the enclosed character should not be duplicated)

For other than characters possible to be used, the command error occurs.

For details of <Character string program data>, refer to Section 2.2.

Query syntax

```
:SETUP:NAME?
```

2.5 Instrument-specific Commands

2.5.3.9 CALCulate2:TRANSform:METER subsystem

2.5.3.9.1 CALCulate2:TRANSform:METER:RANGe:AUTO command/query

This sets and reads out ON/OFF of auto range in the analog meter display. When auto range is ON, the display range is full scale of the measuring range.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGe:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

For ON, AUTO; for OFF, MANUAL

Query syntax

```
:CALCulate2:TRANSform:METER:RANGe:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numeral response data> format.
0 and 1 denote OFF and ON respectively.

ON if the range is set to AUTO, OFF for others.

Remarks

This command/ query is used to make compatibility with version 2.xx or before of the firmware. For version 3.xx or later, use of ":CALCulate2:TRANSform:METER:RANGe:MODE[?]" command/ query which supports AUTO mode and LOG mode is recommended (refer to "2.5.3.9.2 CALCulate2:TRANSform:METER:RANGe:MODE command/query".)

2.5.3.9.2 CALCulate2:TRANSform:METER:RANGe:MODE command/query

It sets/ reads the range mode in analog meter display.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGe:MODE <range_mode>
```

<range_mode>

<Character program data>	Setting contents
AUTO	Auto range
FULLSCALE	Full scale range
MANUAL	Manual setting
LOG	Logarithm scale setting

Query syntax

```
:CALCulate2:TRANSform:METER:RANGe:MODE?
```

Response message <range_mode>

<range_mode> is <Character response data> format.

2.5.3.9.3 CALCulate2:TRANSform:METER:RANGe[:UPPer] command/query

This sets and reads out the range in the manual mode of analog meter display.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGe[:UPPer] {<range_
data> | MIN | MAX | DEF }
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-12 to 500E+12	1,2,5 steps	1.0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

The numerical number other than specified one is set by rounding up in upper side number of the specified numerical number.

The range mode of the analog meter display is set to MANUAL automatically.

Query syntax

```
:CALCulate2:TRANSform:METER:RANGe[:UPPer]? [{MIN | MAX}]
```

Response message <range_data>

<range_data> is <NR3 numeral response data> format.

When the range mode has been set to exception of MANUAL, it becomes execution error and returns 9.91E+37.

2.5 Instrument-specific Commands

2.5.3.9.4 CALCulate2:TRANSform:METER:RANGE:OFFSet[:DIV] command/query

This sets and reads out the offset value in the manual mode of analog meter display.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGE:OFFSet[:DIV] {<offset_  
div>|MIN|MAX|DEF}
```

<offset_div>

<Numerical program data>	Resolution	Default value
-100,000 ~ +100,000	1	0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

The range mode of the analog meter display is set to MANUAL automatically.

Query syntax

```
:CALCulate2:TRANSform:METER:RANGE:OFFSet[:DIV]? [{MIN|MAX}]
```

Response message <offset_div>

<offset_div> is <NR1 numeral response data> format.

When the range mode has been set to exception of MANUAL, it becomes execution error and returns 9.91E+37.

2.5.3.9.5 CALCulate2:TRANSform:METER:RANGE:OFFSet:VALue command/query

This sets and reads out the offset value in the manual mode of analog meter display.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGE:OFFSet:VALue {<offset_  
data>|MIN|MAX|DEF}
```

<offset_data>

<Numerical program data>	Resolution	Default value
$\pm 100,000 \times \text{<range>}$	$1 \times \text{<range>}$	0

<range> is the range set value of analog meter display.

This command makes setting after conversion in DIV unit. Therefore, the value is rounded to the integral multiplication of range set value of the analog meter.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

The range mode of the analog meter display is set to MANUAL automatically.

Query syntax

```
:CALCulate2:TRANSform:METER:RANGE:OFFSet:VALue? [{MIN|MAX}]
```

Response message <offset_data>

<offset_data> is <NR3 numeral response data> format.

If range mode is set to other than MANUAL, it becomes execution error and returns 9.91E+37.

2.5.3.9.6 CALCulate2:TRANSform:METER:RANGE:LOG:MAX command/ query

It sets/ reads the maximum display value in LOG mode of analog meter display.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGE:LOG:MAX {<range_
data>|MIN|MAX|DEF}
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-11 ~ 100E+12	Value of n-th power of 10 (n: integer)	1.0

The value out of the range is rounded within the range and the execution error occurs. The setting value to be acquired is only the value of n-th power of 10 (n: integer). If the other value than this is set, the value is rounded up. In this case, the execution error does not occur.

In addition, the maximum and minimum values in the display range of LOG mode shall satisfy the relation express below.

$$1.0E+6 \geq \text{max. value} / \text{min. value} \geq 1.0E+1$$

If this condition is not satisfied as a result of setting the maximum value, the minimum value is automatically reset.

The range mode of analog meter display is automatically set to LOG.

Query syntax

```
:CALCulate2:TRANSform:METER: RANGE:LOG:MAX? [ {MIN|MAX} ]
```

Response message <range_data>

<range_data> is <NR3 numeric value response data> format.

If the range mode is set to the other than LOG, the execution error occurs and 9.91E+37 is returned.

2.5 Instrument-specific Commands

2.5.3.9.7 CALCulate2:TRANSform:METER:RANGE:LOG:MIN command/ query

It sets/ reads the minimum display value in LOG mode of analog meter display.

Command syntax

```
:CALCulate2:TRANSform:METER:RANGE:LOG:MIN {<range_  
data> | MIN | MAX | DEF }
```

<range_data>

<Numerical program data>	Resolution	Default value
1.0E-12 ~ 10E+12	Value of n-th power of 10 (n: integer)	1.0

The value out of the range is rounded within the range and the execution error occurs. The setting value to be acquired is only the value of n-th power of 10 (n: integer). If the other value than this is set, the value is rounded down. In this case, the execution error does not occur.

In addition, the maximum and minimum values in the display range of LOG mode shall satisfy the relation express below.

$$1.0E+6 \geq \text{max. value} / \text{min. value} \geq 1.0E+1$$

If this condition is not satisfied as a result of setting the minimum value, the maximum value is automatically reset.

The range mode of analog meter display is automatically set to LOG.

Query syntax

```
:CALCulate2:TRANSform:METER:RANGE:LOG:MIN? [ {MIN | MAX} ]
```

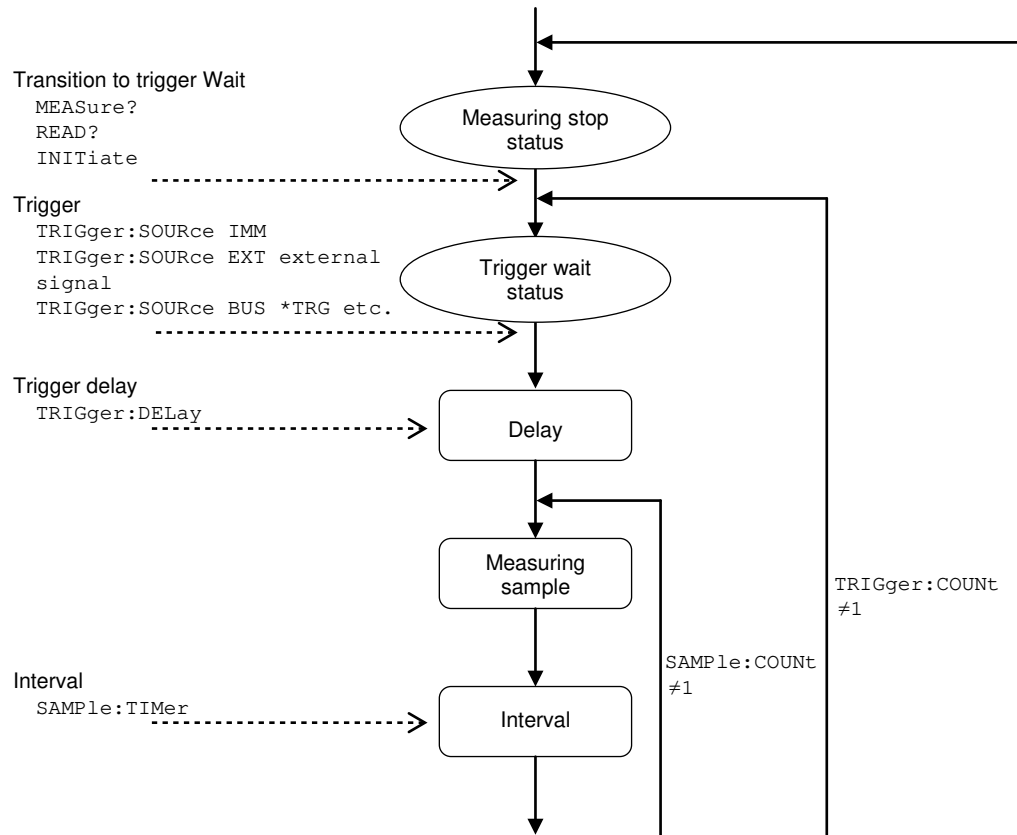
Response message <range_data>

<range_data> is <NR3 numeric value response data> format.

If the range mode is set to the other than LOG, the execution error occurs and 9.91E+37 is returned.

2.5.4 TRIGger subsystem

The following figure shows the trigger system.



The REMOTE indicator of the annunciator cuts the measurement halt condition and besides in the above figure (The trigger waiting state and the measurement are operating) as follows and it changes.

Indicator display	State shown by indicator
REMOTE	Measurement stop state *
REMOTE	State of waiting for trigger or measuring

* It becomes a measurement stop state whenever remote mode changes to local mode.

2.5 Instrument-specific Commands

2.5.4.1 TRIGger:SOURce command/query

This sets and reads the trigger source.

Command syntax

```
:TRIGger:SOURce <trig_src>
```

<trig_src>

<Character program data>	Setting
IMM	Auto trigger
EXT	External trigger
BUS	*Trigger by TRG

In the bulk mode, setting can be made only to IMM. If other than IMM is set, execution error occurs. In addition, if EXT (external trigger) is set to log stop event in the bulk mode, external trigger input becomes available automatically.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:TRIGger:SOURce?
```

Response message <trig_src>

<trig_src> is <character response data> format.

Remark

In a remote mode, an external trigger is assumed to be effective when the trigger source is EXT, and it is assumed when it is invalid besides. In a remote mode, an external trigger is assumed to be effective when the trigger source is EXT, and it is assumed when it is invalid besides.

Moreover, the setting of the trigger source is disregarded oppositely in a local mode, and the movement of an external trigger follows the setting of the TRIG-EXT TRIG menu.

However, the trigger slope setting of an external trigger becomes common in a local mode and a remote mode.

2.5.4.2 TRIGger:COUNT command/query

This sets and reads the trigger frequency up to stop of measurement.

Command syntax

```
:TRIGger:COUNT {<trig_num>|MIN|MAX|DEF}
```

<trig_num>

<Numerical program data>	Default value
1 to 50000 (MAX)	1
INF (<Numerical program data>)	

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

The trigger count function is only usable for remote. If the INF is set, it becomes continuous measurement setting.

In bulk mode, this setting becomes invalid.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:TRIGger:SOURce? [{MIN|MAX}]
```

Response message <trig_num>

<trig_num> is <NR3 numerical response data> format.

In case INF has been set, NAN(9.91E+37) is returned.

Remark

The frequency of the trigger is a effective setting only in remote state. It is disregarded in the local state.

2.5 Instrument-specific Commands

2.5.4.3 TRIGger:DElay command/query

This sets and reads out the delay time from trigger signal to first sampling.

Command syntax

```
:TRIGger:DElay {<timer>|MIN|MAX|DEF}
```

<timer>

<Numerical program data>	Resolution	Default value
0 to 3600	0.01E-3	0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical values under resolution are rounded up to the nearest whole number.

In bulk mode, this setting becomes invalid.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:TRIGger:DElay? [{MIN|MAX}]
```

Response message <timer>

<timer> is <NR3 numerical response data> format.

2.5.4.4 TRIGger:SLOPe command/query

This sets and reads out the trigger slope of external trigger (EXT).

Command syntax

```
:TRIGger:SLOPe <slope>
```

<slope>

<Character program data>	Setting
POS	Trigger at rising
NEG	Trigger at falling

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:TRIGger:SLOPe?
```

Response message <slope>

<slope> is <character response data> format.

2.5.5 SAMPLE subsystem

This sets the measurement frequency in combination with TRIGger subsystem.

2.5.5.1 SAMPLE:COUNT command/query

This sets and reads the number of data obtained by one time trigger.

Command syntax

```
:SAMPLE:COUNT {<count>|MIN|MAX|DEF}
```

<Numerical program data>	Resolution	Default value
1 to 100000	1	1

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

In bulk mode, this setting becomes invalid.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:SAMPLE:COUNT? [{MIN|MAX}]
```

Response message <count>

<count> is <NR1 numerical response data> format.

2.5.5.2 SAMPLE:TIMER command/query

This sets and reads out the interval time for sampling.

Command syntax

```
:SAMPLE:TIMER {<timer>|MIN|MAX|DEF}
```

<timer>

<Numerical program data>	Resolution	Default value
0 to 3600	0.01E-3	0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical values under resolution are rounded up to the nearest whole number.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:SAMPLE:TIMER? [{MIN|MAX}]
```

Response message <timer>

<timer> is <NR3 numerical response data> format.

2.5.6 CONFigure subsystem

This performs basic setting of measurement function specified.

Since the measurement becomes stop status after execution of this command, the required function can be changed from basic setting before measurement.

When measurement is performed, it is necessary to transit the instrument to the trigger wait status with INIT command or READ? query.

(Basic setting)

Setting item	Setting	Remarks
AC BANDWIDTH	MID (20Hz~)	ACI and ACV only
AUTO ZERO	ON	*1
Input impedance Auto	ON	DCV only
SAMPLE COUNT	1	
TRIG COUNT	1	
TRIG INTERVAL	0 ms	
TRIG DELAY	0 ms	
TRIG SOURCE	IMM	
NULL	OFF	*1
SMOOTHING	OFF	*1
MATH	OFF (Scale and dB calculation)	
LIMIT	OFF	
Statistic calculation	ON	
LOG MODE	NORMAL	

* 1: Only settings of specified functions are changed.

2.5.6.1 CONFigure[:VOLTage][:DC] command

This sets the measuring function to DCV.

Range and measuring resolution are set with parameter.

Command syntax

```
:CONFigure[:VOLTage][:DC] [{<range>|MIN|MAX|DEF}
[, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
100E-3,1,10,100,1000	
AUTO(<Character program data>)	AUTO

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×1ppm to range×10ppm	range×1ppm

The setting range/default values differ by range setting.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

It is set to the sampling rate responded to the resolution set.

When the parameter is omitted, the default value is set.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5 Instrument-specific Commands

2.5.6.2 CONFigure[:VOLTage]:AC command

This sets the measuring function to ACV.

Range and measuring resolution are set with parameter.

Command syntax

```
:CONFigure[:VOLTage]:AC [{<range>|MIN|MAX|DEF}  
[, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
100E-3,1,10,100,750 AUTO(<Character program data>)	AUTO

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×1ppm	range×1ppm

ACV resolution is range×1ppm fixing.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.3 CONFigure:CURRent[:DC] command

This sets the measuring function to DCI.

Range and measuring resolution are set with parameter.

Command syntax

```
:CONFigure:CURRent[:DC] [{<range>|MIN|MAX|DEF}
[, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
1E-3,10E-3,100E-3,1,3 AUTO(<Character program data>)	AUTO

This allows unit "A".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×1ppm to range×10ppm	range×1ppm

The setting range/default values differ by range setting.

Values beyond the limit are rounded up in maximum/minimum values and become execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

It is set to the sampling rate responded to the resolution set.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5 Instrument-specific Commands

2.5.6.4 CONFigure:CURRent:AC command

This sets the measuring function to ACI.

Range and measuring resolution are set with parameter.

Command syntax

```
:CONFigure:CURRent:AC [{<range>|MIN|MAX|DEF} [, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
1,3 AUTO(<Character program data>)	AUTO

This allows unit "A".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×1ppm	range×1ppm

ACI resolution is range×1ppm fixing.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.5 CONFIGure:RESistance command

This sets the measuring function to 2WΩ.

Range and measuring resolution are set with parameter.

Command syntax

```
:CONFIGure:RESistance [{<range>|MIN|MAX|DEF} [, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
100,1E+3,10E+3,100E+3,1E+6,10E+6,100E+6 AUTO(<Character program data>)	AUTO

This allows unit "OHM".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×1ppm to range×10ppm	range×1ppm

The setting range/default values differ by range setting.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

It is set to the sampling rate responded to the resolution set.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5 Instrument-specific Commands

2.5.6.6 CONFIGure:FRESistance command

This sets the measuring function to $4W\Omega$.

Range and measuring resolution are set with parameter.

Command syntax

```
:CONFIGure:FRESistance [{<range>|MIN|MAX|DEF}[, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
100,1E+3,10E+3,100E+3,1E+6,10E+6,100E+6 AUTO(<Character program data>)	AUTO

This allows unit "OHM".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×1ppm	range×1ppm

$4W\Omega$ resolution is range×1ppm fixing.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.7 CONFIGure:CONTInuity command

This sets the measuring function to CONT.

There is no parameter.

Command syntax

```
:CONFIGure:CONTInuity
```

The threshold is set to 10Ω .

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.8 CONFigure:FREQuency command

This sets the measuring function to FREQ and sets the mode to FREQ.
Range and measuring resolution are set with parameter.

Command syntax

```
:CONFigure:FRESistance [{<range>|MIN|MAX|DEF}, {<reso>|MIN|MAX|DEF}]
```

<range>

<Numerical program data>	Default value
3 to 300E+3	20

This allows unit "HZ".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×0.1ppm to range×100ppm	range×1ppm

The setting range/default values differ by range setting.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

It is set to the gate time corresponding to the resolution set.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5 Instrument-specific Commands

2.5.6.9 CONFigure:PERiod command

This sets the measuring function to **FREQ** and sets the mode to **PERIOD**.
Range and measuring resolution are set with parameter.

Command syntax

```
:CONFigure:PERiod [{<range>|MIN|MAX|DEF}[, {<reso>|MIN|MAX|DEF}]]
```

<range>

<Numerical program data>	Default value
3E-6 to 300E-3	50E-3

This allows unit "S".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the parameter is omitted, the default value is set.

<reso>

<Numerical program data>	Default value
range×0.1ppm to range×100ppm	range×1ppm

The setting range/default values differ by range setting.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

It is set to the gate time responded to the resolution set.

When the parameter is omitted, the default value is set.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.10 CONFigure:TEMPerature command

This sets the measuring function to **TEMP**.
Temperature sensor type is set with parameter.

Command syntax

```
:CONFigure:TEMPerature <type>
```

<type>

<Character program data>	Setting
TC	Thermocouple
RTD	Resistance temperature detector 2W
FRTD	Resistance temperature detector 4W

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.11 CONFigure:DIODe command

This sets the measuring function to DIOD.
There is no parameter.

Command syntax

```
:CONFigure:DIODe
```

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.6.12 CONFigure query

This repeats the measuring function and setting during selection.
This reads out the setting corresponding to parameters of each measuring function.

Query syntax

```
:CONFigure?
```

Response message

```
Measuring function name <range>,<resolution>
```

2.5.7 MEASure subsystem

This performs basic setting of the specified measuring function, starts measuring immediately and returns the measured result after measurement completion. The setting cannot be changed before measurement.

The basic setting is common to CONFigure command. Please refer to it for details.

:MEASure:<function>? send is the same as the send of READ? after CONFigure:<function> send.

Query syntax

```
:MEASure[:VOLTage][:DC]?  
:MEASure[:VOLTage]:AC?  
:MEASure:CURREnt[:DC]?  
:MEASure:CURREnt:AC?  
:MEASure:RESistance?  
:MEASure:FRESistance?  
:MEASure:CONTinuity?  
:MEASure:FREQuency?  
:MEASure:PERiod?  
:MEASure:TEMPerature?  
:MEASure:DIODE?
```

Since the parameter of each measuring function is common to CONFigure subsystem, refer to it.

If :MEASure:<function>? query is executed in trigger waiting status or measurement, execution error occurs and response is not returned.

Response message <meas_data>

<meas_data> is <NR3 numerical response data> format.

2.5.8 SENSE subsystem

```

:SENSe:VOLTage:DC
:SENSe:VOLTage:AC
:SENSe:CURRent:DC
:SENSe:CURRent:AC
:SENSe:RESistor
:SENSe:FRESistor
:SENSe:CONTinuity
:SENSe:FREQuency
:SENSe:PERiod
:SENSe:TEMPerature
:SENSe:DIODE

```

The following table shows the relation of NPLC/AppertureTime/Resolution when the sampling rate is set.

Correspondence table of sampling rate setting

Power supply frequency =60Hz				
NPLC	AppertureTime [sec]	Sampling Rate[sample/sec]		Resolution
		AutoZero=OFF	AutoZero=ON	
24	400E-3	2.5	1	Range×1ppm
6	100E-3	10	4	
1	16.667E-3	60	20	
0.6	10E-3	100	100	Range×10ppm
0.12	2E-3	500	500	
0.06	1E-3	1E+3	1E+3	
0.03	500E-6	2E+3	2E+3	
0.008	133.33E-6	7.5E+3	7.5E+3	
0.004	66.667E-6	15E+3	15E+3	
0.002	33.333E-6	30E+3	30E+3	

Power supply frequency =50Hz				
NPLC	AppertureTime [sec]	SamplingRate [sample/sec]		Resolution
		AutoZero=OFF	AutoZero=ON	
20	400E-3	2.5	1	Range×1ppm
5	100E-3	10	4	
1	20E-3	50	20	
0.5	10E-3	100	100	Range×10ppm
0.1	2E-3	500	500	
0.05	1E-3	1E+3	1E+3	
0.025	500E-6	2E+3	2E+3	
0.00667	133.333E-6	7.5E+3	7.5E+3	
0.00333	66.667E-6	15E+3	15E+3	
0.00167	33.333E-6	30E+3	30E+3	

2.5 Instrument-specific Commands

2.5.8.1 [SENSe]:FUNction[:ON] command/query

This sets and reads out the measuring function.

Command syntax

```
[ :SENSe ] :FUNction [:ON] <func_str>
```

<func_str>

<Character program data>	Setting
VOLTage[:DC]	DCV (DC voltage)
VOLTage:AC	ACV (AC voltage)
CURRent[:DC]	DCI (DC current)
CURRent:AC	ACI (AC current)
RESistance	2W Ω (2 terminal resistor)
FRESistance	4W Ω (4 terminal resistor)
CONTinuity	CONT (continuity)
FREQuency	FREQ (Freq) (frequency)
PERiod	FREQ (Period) (period)
TEMPerature	TEMP (temperature)
DIODE	DIOD (diode)

<Character string program data> is the character string enclosed with double quotation (") or single quotation (').

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FUNction [:ON] ?
```

Response message "<func_str>"

<func_str> is <numerical response data> format.

The character string with double quotation (") is returned.

2.5.8.2 SENSE:VOLTage:DC subsystem

2.5.8.2.1 [SENSe]:VOLTage[:DC]:NPLCycles command/query

DCV sampling rate is set and read out with PLC converted value (sampling/power supply cycle).

Command syntax

```
[ :SENSe ] :VOLTage [ :DC ] :NPLCycles { <nplc> | MIN | MAX | DEF }
```

<nplc>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1.67E-3	2E-3
3.33E-3	4E-3
6.67E-3	8E-3
25E-3	30E-3
50E-3	60E-3
100E-3	120E-3
500E-3	600E-3
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.2.2 [SENSE]:VOLTage[:DC]:SRATE command/query

This sets and reads out the sampling rate of DCV measurement.

Command syntax

```
[ :SENSE ] :VOLTage [:DC] :SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Numerical program data>		
Power supply frequency 50Hz	Power supply frequency 60Hz	AutoZero
2.5 (DEF)	2.5 (DEF)	1 (DEF)
10	10	4
50	60	20
100	100	100
500	500	500
1E+3	1E+3	1E+3
2E+3	2E+3	2E+3
7.5E+3	7.5E+3	7.5E+3
15E+3	15E+3	15E+3
30E+3	30E+3	30E+3

The setting range differs by the power supply frequency and AutoZero setting of DCV. For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSE ] :VOLTage [:DC] :SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5.8.2.3 [SENSe]:VOLTage[:DC]:APERTure command/query

The sampling rate of DCV measurement is set and read out with the time.

Command syntax

```
[ :SENSe ] :VOLTage [:DC] :APERTure { <time> | MIN | MAX | DEF }
```

<time>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
33.333E-6	33.333E-6
66.667E-6	66.667E-3
133.33E-6	133.33E-6
500E-6	500E-6
1E-3	1E-3
2E-3	2E-3
10E-3	10E-3
20E-3	16.667E-3
100E-3	100E-3
400E-3 (DEF)	400E-3 (DEF)

The setting range differs by the power supply frequency.

It allows unit "S".

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [:DC] :APERTure? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.2.4 [SENSe]:VOLTage[:DC]:RESolution command/query

The sampling rate of DCV is set and read out with measuring resolution.

Command syntax

```
[ :SENSe ] :VOLTage [:DC] :RESolution {<reso> | MIN | MAX | DEF }
```

<reso>

<Numerical program data>	Default value
range×1ppm to range×10ppm	range×1ppm

Range is the range set value of DCV.

The setting range/default value differs by the range setting.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [:DC] :RESolution? [ {MIN | MAX} ]
```

Response message <reso>

<reso> is <NR3 numerical response data> format.

2.5.8.2.5 [SENSe]:VOLTage[:DC]:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range for DCV measurement.

Command syntax

```
[ :SENSe ] :VOLTage [:DC] :RANGe :AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [:DC] :RANGe :AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.2.6 [SENSe]:VOLTage[:DC]:RANGe[:UPPer] command/query

This sets and reads out DCV measuring range.

Command syntax

```
[ :SENSe ] :VOLTage [ :DC ] :RANGe [ :UPPer ] { <range> | MIN | MAX | DEF }
```

<range>

<Numerical program data>	Default value
100E-3	1000
1	
10	
100	
1000	

This allows unit “V”.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of DCV measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :RANGe [ :UPPer ] ? [ { MIN | MAX } ]
```

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5 Instrument-specific Commands

2.5.8.2.7 [SENSe]:VOLTage[:DC]:ZERO:AUTO command/query

This sets and reads out ON/OFF of the auto zero function of DCV measurement.
If ONCE is set, auto zero operation is executed once and then OFF is set.

Command syntax

```
[ :SENSe ] :VOLTage [ :DC ] :ZERO:AUTO <off_on_once>
```

<off_on_once>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)
ONCE	-

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :ZERO:AUTO?
```

Response message <off_on_once>

<off_on_once> is <character response data> format.

2.5.8.2.8 [SENSe]:VOLTage[:DC]:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of DCV measurement.

Command syntax

```
[ :SENSe ] :VOLTage [ :DC ] :NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :NULL [ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.2.9 [SENSe]:VOLTage[:DC]:NULL:VALue command/query

This sets and reads out the null value of DCV measurement.
It is used for the null measurement of DCV measurement.

Command syntax

```
[ :SENSe ] :VOLTage [ :DC ] :NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.00000E+0

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :NULL:VALue? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.2.10 [SENSe]:VOLTage[:DC]:IMPedance:AUTO command/query

This sets and reads out ON/OFF of input impedance auto setting of DCV measurement.

Command syntax

```
[ :SENSe ] :VOLTage [ :DC ] :IMPedance:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If OFF is set, the input impedance is fixed to 10MΩ.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :IMPedance:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.8.3 SENSE:VOLTage:AC subsystem

2.5.8.3.1 [SENSe]:VOLTage:AC:NPLCycles command/query

The sampling rate of ACV measurement is set and read out with PLC converted value (sampling cycle/power supply cycle).

Command syntax

```
[ :SENSe ] :VOLTage:AC:NPLCycles { <nplc> | MIN | MAX | DEF }
```

<nplc>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the bandwidth setting of ACV is MID(20Hz~), it is fixed to default value.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5.8.3.2 [SENSe]:VOLTage:AC:SRATE command/query

This sets and reads out the sampling rate of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage :AC :SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Numerical program data>			
Power supply frequency 50Hz		Power supply frequency 60Hz	
2.5	(DEF)	2.5	(DEF)
10		10	
50		60	

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

When the bandwidth setting of ACV is MID(20Hz~), it is fixed to default value.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage [ :DC ] :SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.3.3 [SENSe]:VOLTage:AC:APERture command/query

The sampling rate of ACV measurement is set and read out with the time.

Command syntax

```
[ :SENSe ] :VOLTage:AC:APERture { <time> | MIN | MAX | DEF }
```

<time>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
20E-3	16.667E-3
100E-3	100E-3
400E-3 (DEF)	400E-3 (DEF)

The setting range differs by the power supply frequency.

This allows unit "S".

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the bandwidth setting of ACV is MID(20Hz~), it is fixed to default value.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:APERture? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5.8.3.4 [SENSe]:VOLTage:AC:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage:AC:RANGe:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:RANGe:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.3.5 [SENSe]:VOLTage:AC:RANGe[:UPPer] command/query

This sets and reads out the range of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage:AC:RANGe[:UPPer] {<range> | MIN | MAX | DEF }
```

<range>

<Numerical program data>	Default value
100E-3	750
1	
10	
100	
750	

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of ACV measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:RANGe[:UPPer]? [ {MIN | MAX} ]
```

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5 Instrument-specific Commands

2.5.8.3.6 [SENSe]:VOLTage:AC:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage:AC:NULL[ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:NULL[ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.3.7 [SENSe]:VOLTage:AC:NULL:VALue command/query

This sets and reads out the null value of ACV measurement.

It is used for the null measurement of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage:AC:NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:NULL:VALue? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.3.8 [SENSe]:VOLTage:AC:BANDwidth command/query

This sets and reads out the bandwidth of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage:AC:BANDwidth { <bandwidth> | MIN | MAX | DEF }
```

<bandwidth>

<Numerical program data>	Default value
20	20
200	

This allows unit "Hz".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:BANDwidth? [ { MIN | MAX } ]
```

Response message <bandwidth>

<bandwidth> is <NR1 numerical response data> format.

2.5.8.3.9 [SENSe]:VOLTage:AC:FREQuency command/query

This sets and reads out ON/OFF of the measured result display of frequency measurement at the time of ACV measurement.

Command syntax

```
[ :SENSe ] :VOLTage:AC:FREQuency <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:FREQuency?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.8.4 SENSE:CURRENT:DC subsystem

2.5.8.4.1 [SENSe]:CURRENT[:DC]:NPLCycles command/query

The sampling rate of DCI measurement is set and read out with PLC converted value (sampling cycle/power supply cycle).

Command syntax

```
[ :SENSe ] :CURRENT [ :DC ] :NPLCycles { <nplc> | MIN | MAX | DEF }
```

<nplc>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1.67E-3	2E-3
3.33E-3	4E-3
6.67E-3	8E-3
25E-3	30E-3
50E-3	60E-3
100E-3	120E-3
500E-3	600E-3
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRENT [ :DC ] :NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5.8.4.2 [SENSe]:CURRent[:DC]:SRATE command/query

This sets and reads out the sampling rate of DCI measurement.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Numerical program data>		
Power supply frequency 50Hz	Power supply frequency 60Hz	AutoZero
2.5 (DEF)	2.5 (DEF)	1 (DEF)
10	10	4
50	60	20
100	100	100
500	500	500
1E+3	1E+3	1E+3
2E+3	2E+3	2E+3
7.5E+3	7.5E+3	7.5E+3
15E+3	15E+3	15E+3
30E+3	30E+3	30E+3

The setting range differs by the power supply frequency and AutoZero setting of DCI. For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.4.3 [SENSe]:CURRent[:DC]:APERture command/query

The sampling rate of DCI measurement is set and read out with the time.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :APERture { <time> | MIN | MAX | DEF }
```

<time>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
33.333E-6	33.333E-3
66.667E-6	66.667E-3
133.33E-6	133.33E-6
500E-6	500E-6
1E-3	1E-3
2E-3	2E-3
10E-3	10E-3
20E-3	16.667E-3
100E-3	100E-3
400E-3 (DEF)	400E-3 (DEF)

The setting range differs by the power supply frequency.

This allows unit "S".

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :APERture? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5.8.4.4 [SENSe]:CURRent[:DC]:RESolution command/query

The sampling rate of DCI is set and read out with the measured resolution.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :RESolution { <reso> | MIN | MAX | DEF }
```

<reso>

<Numerical program data>	Default value
range×1ppm to range×10ppm	range×1ppm

Range is the range set value of DCI.

The setting range/default value differs by the range setting.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :RESolution? [ { MIN | MAX } ]
```

Response message <reso>

<reso> is <NR3 numerical response data> format.

2.5.8.4.5 [SENSe]:CURRent[:DC]:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range of DCI measurement.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :RANGe :AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :RANGe :AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.8.4.6 [SENSe]:CURRent[:DC]:RANGe[:UPPer] command/query

This sets and reads out the range of DCI measurement.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :RANGe [ :UPPer ] { <range> | MIN | MAX | DEF }
```

<range>

<Numerical program data>	Default value
1E-3	1
10E-3	
100E-3	
1	
3	

This allows unit "A".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of DCI measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :RANGe [ :UPPer ] ? [ { MIN | MAX } ]
```

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5.8.4.7 [SENSe]:CURRent[:DC]:ZERO:AUTO command/query

This sets and reads out ON/OFF of auto zero function of DCI measurement.

If ONCE is set, auto zero operation is executed once and then OFF is set.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :ZERO:AUTO <off_on_once>
```

<off_on_once>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)
ONCE	-

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :ZERO:AUTO?
```

Response message <off_on_once>

<off_on_once> is <character response data> format.

2.5.8.4.8 [SENSe]:CURRent[:DC]:NULL:STATe command/query

This sets and reads out ON/OFF of null measurement of DCI measurement.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :NULL [ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.8.4.9 [SENSe]:CURRent[:DC]:NULL:VALue command/query

This sets and reads out the null value of DCI measurement.

It is used for the null measurement of DCI measurement.

Command syntax

```
[ :SENSe ] :CURRent [ :DC ] :NULL:VALue { <val_data> [ MIN | MAX | DEF ] }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

This allows unit "A".

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :NULL:VALue ? [ { MIN | MAX } ]
```

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.5 SENSE:CURRENT:AC subsystem

2.5.8.5.1 [SENSE]:CURRENT:AC:NPLCycles command/query

The sampling rate of ACI measurement is set and read out with PLC converted value (sampling cycle/power supply cycle).

Command syntax

```
[ :SENSE ] :CURRENT:AC:NPLCycles { <nplc> | MIN | MAX | DEF }
```

<nplc>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the bandwidth setting of ACI is MID(20Hz~), it is fixed to the default value.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSE ] :CURRENT:AC:NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5.8.5.2 [SENSe]:CURRent:AC:SRATE command/query

This sets and reads out the sampling rate of ACI measurement.

Command syntax

```
[ :SENSe ] :CURRent :AC :SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
2.5 (DEF)	2.5 (DEF)
10	10
50	60

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

When the bandwidth setting of ACI is MID(20Hz~), it is fixed to the default value.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent [ :DC ] :SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.5.3 [SENSe]:CURRent:AC:APERture command/query

The sampling rate of ACI measurement is set and read out with the time.

Command syntax

[:SENSe] :CURRent:AC:APERture { <time> | MIN | MAX | DEF }

<time>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
20E-3	16.667E-3
100E-3	100E-3
400E-3 (DEF)	400E-3 (DEF)

The setting range differs by the power supply frequency.

This allows unit "S".

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

When the bandwidth setting of ACI is MID(20Hz~), it is fixed to the default value.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

[:SENSe] :CURRent:AC:APERture? [{ MIN | MAX }]

Response message <time>

<time> is <NR3 numerical response data> format.

2.5.8.5.4 [SENSe]:CURRent:AC:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range of ACI measurement.

Command syntax

```
[ :SENSe ] :CURRent :AC :RANGe :AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent :AC :RANGe :AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.5.5 [SENSe]:CURRent:AC:RANGe[:UPPer] command/query

This sets and reads out the range of ACI measurement.

Command syntax

```
[ :SENSe ] :CURRent :AC :RANGe [ :UPPer ] { <range> | MIN | MAX | DEF }
```

<range>

<Numerical program data>	Default value
1	1
3	

This allows unit "A".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of ACI measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent :AC :RANGe [ :UPPer ] ? [ { MIN | MAX } ]
```

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5 Instrument-specific Commands

2.5.8.5.6 [SENSe]:CURRent:AC:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of ACI measurement.

Command syntax

```
[ :SENSe ] :CURRent :AC :NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent :AC :NULL [ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.5.7 [SENSe]:CURRent:AC:NULL:VALue command/query

This sets and reads out the null value of ACI measurement.

It is used for the null measurement of ACI measurement.

Command syntax

```
[ :SENSe ] :CURRent :AC :NULL :VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

This allows unit "A".

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent :AC :NULL :VALue ? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.5.8 [SENSe]:CURRent:AC:BANDwidth command/query

This sets and reads out the bandwidth of ACI measurement.

Command syntax

```
[ :SENSe ] :CURRent :AC :BANDwidth { <bandwidth> | MIN | MAX | DEF }
```

<bandwidth>

<Numerical program data>	Default value
20	20
200	

This allows unit "Hz".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CURRent :AC :BANDwidth? [ { MIN | MAX } ]
```

Response message <bandwidth>

<bandwidth> is <NR1 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.6 SENSE:RESistance subsystem

2.5.8.6.1 [SENSe]:RESistance:NPLCycles command/query

The sampling rate of $2W\Omega$ measurement is set and read out with PLC converted value (sampling cycle/power supply cycle).

Command syntax

```
[ :SENSe ] :RESistance :NPLCycles { <nplc> | MIN | MAX | DEF }
```

<nplc>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1.67E-3	2E-3
3.33E-3	4E-3
6.67E-3	8E-3
25E-3	30E-3
50E-3	60E-3
100E-3	120E-3
500E-3	600E-3
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance :NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5.8.6.2 [SENSe]:RESistance:SRATE command/query

This sets and reads out the sampling rate of $2W\Omega$ measurement.

Command syntax

```
[ :SENSe ] :RESistance:SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Numerical program data>		
Power supply frequency 50Hz	Power supply frequency 60Hz	AutoZero
2.5 (DEF)	2.5 (DEF)	1 (DEF)
10	10	4
50	60	20
100	100	100
500	500	500
1E+3	1E+3	1E+3
2E+3	2E+3	2E+3
7.5E+3	7.5E+3	7.5E+3
15E+3	15E+3	15E+3
30E+3	30E+3	30E+3

The setting range differs by the power supply frequency and the auto zero setting of $2W\Omega$. For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.6.3 [SENSe]:RESistance:APERture command/query

The sampling rate of 2WΩ measurement is set and read out with the time.

Command syntax

```
[ :SENSe ] :RESistance:APERture { <time> | MIN | MAX | DEF }
```

<time>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
33.333E-6	33.333E-6
66.667E-6	66.667E-6
133.33E-6	1E-3
500E-6	2E-3
1E-3	10E-3
2E-3	16.667E-3
10E-3	100E-3
20E-3	400E-3 (DEF)
100E-3	
400E-3 (DEF)	

The setting range differs by the power supply frequency.

This allows unit "S".

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:APERture? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5.8.6.4 [SENSe]:RESistance:RESolution command/query

The sampling rate of 2 WΩ is set and read out with the measured resolution.

Command syntax

```
[ :SENSe ] :RESistance:RESolution { <reso> | MIN | MAX | DEF }
```

<reso>

<Numerical program data>	Default value
range×1ppm to range×10ppm	range×1ppm

The range is range set value of 2WΩ.

The setting range/default value differs by the range setting.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:RESolution? [ { MIN | MAX } ]
```

Response message <reso>

<reso> is <NR3 numerical response data> format.

2.5.8.6.5 [SENSe]:RESistance:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range of 2WΩ measurement.

Command syntax

```
[ :SENSe ] :RESistance:RANGe:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:RANGe:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.8.6.6 [SENSe]:RESistance:RANGe[:UPPer] command/query

This sets and reads out the range of $2W\Omega$ measurement.

Command syntax

[:SENSe] :RESistance:RANGe [:UPPer] { <range> | MIN | MAX | DEF }

<range>

<Numerical program data>	Default value
100	1E+6
1E+3	
10E+3	
100E+3	
1E+6	
10E+6	
100E+6	

This allows unit "OHM".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of $2W\Omega$ measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

[:SENSe] :RESistance:RANGe [:UPPer] ? [{ MIN | MAX }]

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5.8.6.7 [SENSe]:RESistance:ZERO:AUTO command/query

This sets and reads out ON/OFF of the auto zero function of $2W\Omega$ measurement.
If ONCE is set, auto zero operation is executed once and then OFF is set.

Command syntax

```
[ :SENSe ] :RESistance:ZERO:AUTO <off_on_once>
```

<off_on_once>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)
ONCE	-

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:ZERO:AUTO?
```

Response message <off_on_once>

<off_on_once> is <character response data> format.

2.5.8.6.8 [SENSe]:RESistance:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of $2W\Omega$ measurement.

Command syntax

```
[ :SENSe ] :RESistance:NULL[ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:NULL[ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.8.6.9 [SENSe]:RESistance:NULL:VALue command/query

This sets and reads out the null value of $2W\Omega$ measurement.
It is used for the null measurement of $2W\Omega$ measurement.

Command syntax

```
[ :SENSe ] :RESistance:NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

This allows unit "OHM".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :RESistance:NULL:VALue? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.7 SENSE:FRESistance subsystem

2.5.8.7.1 [SENSE]:FRESistance:NPLCycles command/query

The sampling rate of 4WΩ measurement is set and read out with PLC converted value (sampling cycle/power supply cycle).

Command syntax

```
[ :SENSE ] :FRESistance:NPLCycles { <nplc> [ MIN | MAX | DEF ] }
```

<nplc>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSE ] :FRESistance:NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.7.2 [SENSe]:FRESistance:SRATE command/query

This sets and reads out the sampling rate of 4WΩ measurement.

Command syntax

```
[ :SENSe ] :FRESistance :SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Numerical program data>	Default value
1	1
4	
20	

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FRESistance :SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5.8.7.3 [SENSe]:FRESistance:APERture command/query

The sampling rate of 4WΩ measurement is set and read out with the time.

Command syntax

```
[ :SENSe ] :FRESistance:APERture { <time> | MIN | MAX | DEF }
```

<time>

<Numerical program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
20E-3	16.667E-3
100E-3	100E-3
400E-3 (DEF)	400E-3 (DEF)

The setting range differs by the power supply frequency.
This allows unit "S".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FRESistance:APERture? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.7.4 [SENSe]:FREStance:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range of 4WΩ measurement.

Command syntax

```
[ :SENSe ] :FREStance:RANGe:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FREStance:RANGe:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.7.5 [SENSe]:FREStance:RANGe[:UPPer] command/query

This sets and reads out the range of 4WΩ measurement.

Command syntax

```
[ :SENSe ] :FREStance:RANGe[:UPPer] {<range> | MIN | MAX | DEF }
```

<range>

<Numerical program data>	Default value
100	1E+6
1E+3	
10E+3	
100E+3	
1E+6	
10E+6	
100E+6	

This allows unit "OHM".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of 4WΩ measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FREStance:RANGe[:UPPer]? [ {MIN | MAX} ]
```

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5.8.7.6 [SENSe]:FRESistance:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of 4WΩ measurement.

Command syntax

```
[ :SENSe ] :FRESistance:NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FRESistance:NULL [ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.7.7 [SENSe]:FRESistance:NULL:VALue command/query

This sets and reads out the null value of 4WΩ measurement.

It is used for the null measurement of 4WΩ measurement.

Command syntax

```
[ :SENSe ] :FRESistance:NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

This allows unit "OHM".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FRESistance:NULL:VALue? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.8 SENSE:CONTInuity subsystem

2.5.8.8.1 [SENSe]:CONTInuity:THReshold command/query

This sets and reads out the threshold of CONT.

Command syntax

```
[ :SENSe ] :CONTInuity:THReshold { <threshold> | MIN | MAX | DEF }
```

<threshold>

<Numerical program data>	Resolution	Default value
1 to 1000	0.1	10

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical numbers under resolution are rounded up to the nearest whole number.

It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :CONTInuity:THReshold? [ { MIN | MAX } ]
```

Response message <threshold>

<threshold> is <NR3 numerical response data> format.

2.5.8.9 SENSE:FREQUENCY subsystem

2.5.8.9.1 [SENSE]:FREQUENCY:APERture command/query

This sets and reads out the gate time of FREQ measurement.

Command syntax

```
[ :SENSe ] :FREQUENCY :APERture { <time> | MIN | MAX | DEF }
```

<time>

<Numerical program data>	Default value
1E-3	100E-3
10E-3	
100E-3	
1.0E0 *	

This allows unit "S".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FREQUENCY :APERture? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.9.2 [SENSe]:FREQuency:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of FREQ measurement.

Command syntax

```
[ :SENSe ] :FREQuency:NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FREQuency:NULL [ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.9.3 [SENSe]:FREQuency:NULL:VALue command/query

This sets and reads out the null value of FREQ measurement.

It is used for the null measurement of FREQ measurement.

Command syntax

```
[ :SENSe ] :FREQuency:NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

This allows unit "HZ".

Values beyond the limit are rounded up in maximum/minimum values and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FREQuency:NULL:VALue? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.9.4 [SENSe]:FREQuency:VOLTAge:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range for alternating current voltage to be used for FREQ measurement.

Command syntax

```
[ :SENSe ] :FREQuency :VOLTAge :RANGe :AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTAge :AC :RANGe :AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.8.9.5 [SENSe]:FREQuency:VOLTage:RANGe[:UPPer] command/query

This sets and reads out the range for alternating current voltage to be used for FREQ measurement.

Command syntax

[:SENSe] :FREQuency :VOLTage :RANGe [:UPPer] { <range> | MIN | MAX | DEF }

<range>

<Numerical program data>	Default value
100E-3	
1	
10	750
100	
750	

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range setting of AC voltage used for FREQ measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

[:SENSe] :VOLTage :AC :RANGe [:UPPer] ? [{ MIN | MAX }]

Response message <range>

<range> is <NR3 numerical response data> format.

When parameter is not available, current range set value returns.

The range setting of ACV measurement is returned.

2.5.8.9.6 [SENSe]:FREQuency:ACV command/query

This sets and reads out ON/OFF of the measured result display of ACV measurement at the time of FREQ measurement.

Command syntax

```
[ :SENSe ] :FREQuency :ACV <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :FREQuency :ACV?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.10 SENSE:PERiod subsystem**2.5.8.10.1 [SENSe]:PERiod:APERture command/query**

This sets and reads out the gate time of FREQ measurement.

Command syntax

```
[ :SENSe ] :PERiod :APERture {<time> | MIN | MAX | DEF}
```

<time>

<Numerical program data>	Default value
1E-3	100E-3
10E-3	
100E-3	
1.0E0 *	

This allows unit "S".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :PERiod :APERture? [ {MIN | MAX} ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.10.2 [SENSe]:PERiod:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of FREQ measurement.

Command syntax

```
[ :SENSe ] :PERiod:NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Query syntax

```
[ :SENSe ] :PERiod:NULL [ :STATe ] ?
```

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.10.3 [SENSe]:PERiod:NULL:VALue command/query

This sets and reads out the null value of FREQ measurement.

It is used for the null measurement of FREQ measurement.

Command syntax

```
[ :SENSe ] :PERiod:NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.000000E+0

This allows unit "S".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Query syntax

```
[ :SENSe ] :PERiod:NULL:VALue? [ { MIN | MAX } ]
```

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.10.4 [SENSe]:PERiod:VOLTage:RANGe:AUTO command/query

This sets and reads out ON/OFF of the auto range for alternating current voltage to be used for FREQ measurement (Period mode).

Command syntax

```
[ :SENSe ] :PERiod:VOLTage:RANGe:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:RANGe:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.10.5 [SENSe]:PERiod:VOLTage:RANGe[:UPPer] command/query

This sets and reads out the range for alternating current voltage to be used for FREQ measurement (Period mode).

Command syntax

```
[ :SENSe ] :PERiod:VOLTage:RANGe [ :UPPer ] { <range> | MIN | MAX | DEF }
```

<range>

<Numerical program data>	Default value
100E-3	750
1	
10	
100	
750	

This allows unit "V".

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

The auto range of FREQ measurement is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :VOLTage:AC:RANGe [ :UPPer ] ? [ { MIN | MAX } ]
```

Response message <range>

<range> is <NR3 numerical response data> format.

A current range set value returns when parameter is not available.

2.5 Instrument-specific Commands

2.5.8.10.6 [SENSe]:PERiod:ACV command/query

This sets and reads out ON/OFF of the measured result display of ACV measurement at the time of FREQ measurement (Period mode).

Command syntax

```
[ :SENSe ] :PERiod:ACV <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :PERiod:ACV?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.
0 and 1 denote OFF and ON respectively.

2.5.8.11 SENSE:TEMPerature subsystem

2.5.8.11.1 [SENSE]:TEMPerature:NPLCycles command/query

The sampling rate of TEMP measurement is set and read out with PLC converted value (sampling cycle/power supply cycle).

Command syntax

```
[ :SENSE ] :TEMPerature:NPLCycles { <nplc> | MIN | MAX | DEF }
```

<nplc>

<Character program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
1.67E-3	2E-3
3.33E-3	4E-3
6.67E-3	8E-3
25E-3	30E-3
50E-3	60E-3
100E-3	120E-3
500E-3	600E-3
1	1
5	6
20 (DEF)	24 (DEF)

The setting range differs by the power supply frequency.

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSE ] :TEMPerature:NPLCycles? [ { MIN | MAX } ]
```

Response message <nplc>

<nplc> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.11.2 [SENSe]:TEMPerature:SRATE command/query

This sets and reads out the sampling rate of TEMP measurement.

Command syntax

```
[ :SENSe ] :TEMPerature :SRATE { <sample_rate> | MIN | MAX | DEF }
```

<sample_rate>

<Character program data>		
Power supply frequency 50Hz	Power supply frequency 60Hz	AutoZero
2.5 (DEF)	2.5 (DEF)	1 (DEF)
10	10	4
50	60	20
100	100	100
500	500	500
1E+3	1E+3	1E+3
2E+3	2E+3	2E+3
7.5E+3	7.5E+3	7.5E+3
15E+3	15E+3	15E+3
30E+3	30E+3	30E+3

The setting range differs by AutoZero setting of TEMP and the power supply frequency. For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSe subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature :SRATE? [ { MIN | MAX } ]
```

Response message <sample_rate>

<sample_rate> is <NR3 numerical response data> format.

2.5.8.11.3 [SENSe]:TEMPerature:APERture command/query

The sampling rate of TEMP measurement is set and read out with the time.

Command syntax

```
[ :SENSe ] :TEMPerature :APERture { <time> | MIN | MAX | DEF }
```

<time>

<Character program data>	
Power supply frequency 50Hz	Power supply frequency 60Hz
33.333E-6	33.333E-6
66.667E-6	66.667E-6
133.333E-6	133.333E-6
500E-6	500E-6
1E-3	1E-3
2E-3	2E-3
10E-3	10E-3
20E-3	16.667E-3
100E-3	100E-3
400E-3 (DEF)	400E-3 (DEF)

The setting range differs by the power supply frequency.

This allows unit "S".

For the correspondence to sampling rate, please refer to the correspondence table in the beginning of SENSE subsystem.

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in larger number. It does not become execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature :APERture ? [ { MIN | MAX } ]
```

Response message <time>

<time> is <NR3 numerical response data> format.

2.5 Instrument-specific Commands

2.5.8.11.4 SENSE]:TEMPerature:NULL:STATe command/query

This sets and reads out ON/OFF of the null measurement of TEMP measurement.

Command syntax

```
[ :SENSe ] :TEMPerature:NULL [ :STATe ] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:NULL [ :STATe ] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.8.11.5 [SENSe]:TEMPerature:NULL:VALue command/query

This sets and reads out the null value of TEMP measurement.

It is used for the null measurement of TEMP measurement.

Command syntax

```
[ :SENSe ] :TEMPerature:NULL:VALue { <val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-999.9999E+12 ~ +999.9999E+12	0.000001E-12	+0.000000E+0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:NULL:VALue ? [ { MIN | MAX } ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.11.6 [SENSe]:TEMPerature:ZERO:AUTO command/query

This sets and reads out ON/OFF of the auto zero function of TEMP measurement.
If ONCE is set, auto zero operation is executed once and then OFF is set.

Command syntax

```
[ :SENSe ] :TEMPerature:ZERO:AUTO <off_on_once>
```

<off_on_once>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)
ONCE	-

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:ZERO:AUTO?
```

Response message <off_on_once>

<off_on_once> is <character response data> format.

2.5.8.11.7 [SENSe]:TEMPerature:TRANsducer:TYPE command/query

This sets and reads out the selection of the sensor of TEMP measurement.

Command syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:TYPE <sensor>
```

<sensor>

<Character program data>	<Numerical program data>
TC	Thermocouple
RTD	Terminal resistance temperature detector 2W
FRTD	Terminal resistance temperature detector 4W

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:TYPE?
```

Response message <sensor>

<sensor> is <character response data> format.

2.5 Instrument-specific Commands

2.5.8.11.8 [SENSe]:TEMPerature:TRANsducer:TC:TYPE command/query

This sets and reads out the thermocouple calculation as sensor for TEMP measurement.

Command syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:TC:TYPE <tc_type>
```

<tc_type>

<Character program data>
R
K
T
J
E

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:TC:TYPE?
```

Response message <tc_type>

<tc_type> is <character response data> format.

2.5.8.11.9 [SENSe]:TEMPerature:TRANsducer:TC:CJUNction command/query

This sets and reads out the cold junction in sensor thermocouple of TEMP measurement.

Command syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:TC:CJUNction {<val_data> | MIN | MAX | DEF }
```

<val_data>

<Numerical program data>	Resolution	Default value
-50.000 ~ +100.000	0.001	0.0

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:TC:CJUNction? [ {MIN | MAX} ]
```

Response message <val_data>

<val_data> is <NR3 numerical response data> format.

2.5.8.11.10 [SENSe]:TEMPerature:TRANsducer:RTD:TYPE command/query

This sets and reads out 2 terminal resistance temperature detectors as TEMP measuring sensor.

Command syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:RTD:TYPE <rtd_type>
```

<rtd_type>

<Character program data>
PT100
JPT100

4 terminal measuring setting is also changed.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:RTD:TYPE?
```

Response message <rtd_type>

<rtd_type> is <character response data> format.

2.5.8.11.11 [SENSe]:TEMPerature:TRANsducer:FRTD:TYPE command/query

This sets and reads out 4 terminal resistance temperature detectors as TEMP measuring sensor.

Command syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:FRTD:TYPE <rtd_type>
```

<rtd_type>

<Character program data>
PT100
JPT100

2 terminal measuring setting is also changed.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
[ :SENSe ] :TEMPerature:TRANsducer:FRTD:TYPE?
```

Response message <rtd_type>

<rtd_type> is <character response data> format.

2.5.9 DISPlay subsystem

2.5.9.1 DISPlay[:WINDow[1|2][:STATe]] command/query

This sets and reads out ON/OFF of the screen display of this instrument.

Command syntax

```
:DISPlay[:WINDow[1|2][:STATe]] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Both Window1 and Window2 become full screen.

Query syntax

```
:DISPlay[:WINDow[1|2][:STATe]]?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

It is returned that both Window1 and Window2 become full screen.

2.5.9.2 DISPlay:WINDow[1|2]:BACKground:COLor command/query

This sets and reads out the background color of screen display of this instrument.

Command syntax

```
:DISPlay:WINDow[1|2]:BACKground:COLor <back_col>
```

<back_col>

<Character program data>	Setting
BLACK	Background color Black
WHITE	Background color White

Both Window1 and Window2 become full screen.

Query syntax

```
:DISPlay:WINDow[1|2]:BACKground:COLor?
```

Response message <back_col>

<back_col> is <character response data> format.

It is returned that both Window1 and Window2 become full screen.

2.5.9.3 DISPLAY:WINDow[1]:MODE command/query

This sets and reads out the display mode of PRIMARY display section of this instrument screen.

Command syntax

```
:DISPlay:WINDow[1]:MODE <win1_mode>
```

<win1_mode>

<Character program data>	Setting
NUMERIC	Normal Measure value display
TREND	Trend chart display
HISTOGRAM	Histogram chart display
LIMIT	LIMIT calculation judgment result display
METER	Arc scale meter display

Query syntax

```
:DISPlay:WINDow[1]:MODE?
```

Response message <win1_mode>

<win1_mode> is <character response data> format.

2.5.9.4 DISPLAY:WINDow2:MODE command/query

This sets and reads out the display mode of SECONDARY display section of this instrument screen.

Command syntax

```
:DISPlay:WINDow2:MODE <win2_mode>
```

<win2_mode>

<Character program data>	Setting
NUMERIC	Normal measured value display
METER	Analog meter display
LIMIT	LIMIT calculation judgment result display*
STATISTIC	Statistic calculation result (MAX/MIN/AVG/ σ , etc.)*
HISTOGRAM	Histogram related figure (rang/ERR/TOTAL, etc.)*
TREND	Trend chart related figure*
CURSOR	Cursor measured value*

* : Only the case which each function has been set to ON.

When non-displayable setting was specified, it becomes execution error.

Query syntax

```
:DISPlay:WINDow2:MODE?
```

Response message <win2_mode>

<win2_mode> is <character response data> format.

2.5 Instrument-specific Commands

2.5.9.5 DISPLAY:MENU:ANIMATION[:STATE] command/query

This sets and reads out ON/OFF of the animation display function of menu display of this instrument screen.

Command syntax

```
:DISPLAY:MENU:ANIMATION <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Query syntax

```
:DISPLAY:MENU:ANIMATION?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.9.6 DISPLAY:NUMERIC:DIGITS command/ query

It sets/ reads the number of display valid digits for the digit mask function in the numeric value display of PRIMARY display part.

Command syntax

```
:DISPLAY:NUMERIC:DIGITS {<digits>|MIN|MAX|DEF}
```

<digits>

<Numerical program data>	Default value
4 to 7	7

The value out of the range is rounded to the maximum or minimum value and the execution error occurs.

To set the digits mask function OFF, set the maximum value (7 or 6) to <digits>.

Query syntax

```
:DISPLAY:NUMERIC:DIGITS?
```

Response message <digits>

<digits> is <NR1 numeric value response data> format.

2.5.9.7 DISPlay:NUMeric:FONT command/ query

It sets/ reads the font to be used for numeric value display of PRIMARY display part.

Command syntax

```
:DISPlay:NUMeric:FONT <font>
```


<Character program data>	Setting contents
NORMAL	Gothic font
SEVEN	7-segment display type font

Query syntax

```
:DISPlay:NUMeric:FONT?
```

Response message

 is <Character response data> format.

2.5.9.8 DISPlay:NUMeric:SIZE command/ query

It sets/ reads the font size to be used for numeric value display of PRIMARY display part.

Command syntax

```
:DISPlay:NUMeric:SIZE <size>
```

<size>

<Character program data>	Setting contents
NORMAL	Numeric value display in normal size
LARGE	Numeric value display in large size

Query syntax

```
:DISPlay:NUMeric:SIZE?
```

Response message <size>

<size> is <Character response data> format.

2.5.10 SYSTem subsystem

2.5.10.1 SYSTem:BEEPer[:IMMediate] command

One time beep is sounded.

Command syntax

:SYSTem:BEEPer[:IMMediate]

2.5.10.2 SYSTem:BEEPer:LIMit:STATe command/query

This sets and reads out the beep sound rumbling condition by judgment result in limit function.

Command syntax

:SYSTem:BEEPer:LIMit:STATe <off_go_nogo>

<off_go_nogo>

<Character program data>	Setting
OFF	Beep sound is OFF.
GO	Within the setting range of measuring value
NOGO	Beyond the setting range of measuring value

Query syntax

:SYSTem:BEEPer:LIMit:STATe?

Response message <off_go_nogo>

<off_go_nogo> is <character response data> format.

2.5.10.3 SYSTem:BEEPer:KEY:STATe command/query

This sets and reads ON/OFF of beep sound rumbling when a key is pressed.

Command syntax

:SYSTem:BEEPer:KEY:STATe <off_on>

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Query syntax

:SYSTem:BEEPer:KEY:STATe?

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.10.4 SYSTem:BEEPer:CAUTion:STATe command/query

This sets and reads out ON/OFF of the beep sound rumbling at the time of error data acquisition. In case measurement is overload or overflow, the range setting makes Upper<Lower cases into the error status by limit calculation.

Command syntax

```
:SYSTem:BEEPer:CAUTion:STATe <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Query syntax

```
:SYSTem:BEEPer:CAUTion:STATe?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.10.5 SYSTem:LFRrequency:AUTO command/query

This sets and reads out ON/OFF of the auto judgment of power supply frequency.

Command syntax

```
:SYSTem:LFRrequency:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:SYSTem:LFRrequency:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5 Instrument-specific Commands

2.5.10.6 SYSTem:LFRequency:ACTual query

This measures the power supply frequency and the measured value is returned.

Query syntax

```
:SYSTem:LFRequency:ACTual?
```

If this command is executed during trigger waiting status or measurement, the execution error occurs, and the response is not returned.

Response message <lfreq>

<lfreq> is <NR1 numerical response data> format.

50 or 60 returns.

2.5.10.7 SYSTem:LFRequency command/query

This sets the power supply frequency to be used for measurement.

The query reads out the power supply frequency being used for measurement.

Command syntax

```
:SYSTem:LFRequency <lfreq>
```

<lfreq>

<Numerical program data>
50,60

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

Numerical number other than the specified value is rounded up in smaller number. It does not become execution error.

The auto judgment function of power supply frequency is automatically set to OFF.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:SYSTem:LFRequency?
```

Response message <lfreq>

<lfreq> is <NR1 numerical response data> format.

When the auto judgment of power supply frequency is ON, the frequency of measured value is returned.

2.5.10.8 SYSTem:PRESet command

This returns the setup to default.
The remote setting is not changed.

Command syntax

```
:SYSTem:PRESet
```

In case execution is done under trigger wait status or during measurement, it becomes measuring stop status.

2.5.10.9 SYSTem:HEADer:TYPE command/query

This sets and reads out the character string calculation to be displayed on screen header.

Command syntax

```
:SYSTem:HEADer:TYPE <header>
```

<header>

<Character program data>	Setting
OFF	No display
DATETIME	Current hour display
SETUPNAME	Current setup name display

Query syntax

```
:SYSTem:HEADer:TYPE?
```

Response message <header>

<header> is <character response data> format.

2.5 Instrument-specific Commands

2.5.10.10 SYSTem:DATEtime command/query

This sets and reads out the current date and time.

Command syntax

```
:SYSTem:DATEtime <day>, <month>, <year>, <hour>, <min>, <sec>
```

Parameter	Setting	<Character program data>
<day>	Day	1 to 31
<month>	Month	1 to 12
<year>	Year	2000 to 2099
<hour>	Hour	0 to 23
<min>	Minute	0 to 59
<sec>	Second	0 to 59

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:SYSTem:DATEtime?
```

Response message <day>, <month>, <year>, <hour>, <min>, <sec>

Each parameter is <NR1 numerical response data> format.

2.5.11 OUTPut subsystem

2.5.11.1 OUTPut[:STATe] command/query

This sets and reads out ON/OFF of the DIO interface output function.
This is effective only when DIO option (/CMP) is installed on this instrument.

Command syntax

```
:OUTPut [:STATe] <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

Query syntax

```
:OUTPut [:STATe] ?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

2.5.12 HCOPy subsystem

2.5.12.1 HCOPy[:SDUMp]:DATA query

This reads out the picture data of hard copy of screen.

This reads out the picture data created by format of hard copy being set.

This command cannot be used as the multi commands.

Query syntax

:HCOPy[:SDUMp]:DATA?

Response message <preamble><hard copy data>

<preamble>

#8xxxxxxx

xxxxxxx : 8 digit ASCII code showing number of byte of hard copy data

<hard copy data>

Picture data created by format of hard copy being set

2.5.12.2 HCOPy[:SDUMp]:DATA:STORe:DIRectory command/query

This sets and reads out the directory name when the picture data of hard copy of screen is stored in the file in USB memory.

Command syntax

:HCOPy[:SDUMp]:DATA:STORe:DIRectory <directory>

<directory>

<Character program data>
<ul style="list-style-type: none">• Usable character• Alphanumeric character - !#\$%&'()-@^_{}~"• Maximum 8 characters• Enclosed by single quotation (') or double quotation (")

Please refer to section 2.2 for the details of <Character program data>.

Query syntax

: HCOPy[:SDUMp]:DATA:STORe:DIRectory?

Response message <directory>

<directory> is <character response data> format.

2.5.12.3 HCOPY[:SDUMp]:DATA:STORe command

This stores the picture data of hard copy of screen into USB memory as file.
This creates the picture data by the format of hard copy being set.

Command syntax

```
:HCOPY[:SDUMp]:DATA:STORe <filename>
```

<filename>

<Character program data>	Setting
<ul style="list-style-type: none"> Usable character Alphanumeric character !#\$%&'()-@^_{}~" space allowed Maximum 8 characters End 4 of characters are only figure numeral. Enclosed by single quotation (') or double quotation (") 	<p>Specifies file name to be stored to USB memory.</p> <p>Directory should be specified by HCOPY:SDUMp:DATA:STORe:DIRectory command.</p>

2.5.12.4 HCOPY[:SDUMp]:DATA:FORMat command/query

This sets and reads out the format of hard copy of screen.

Command syntax

```
:HCOPY[:SDUMp]:DATA:FORMat <format>
```

<format>

<Character program data>	Setting
BMP	Bit map picture
PNG	PNG form picture
TIFF	TIFF form picture

Query syntax

```
:HCOPY[:SDUMp]:DATA:FORMat?
```

Response message <format>

<format> is <character response data> format.

2.5 Instrument-specific Commands

2.5.12.5 HCOPY[:SDUMp]:DATA:COLor command/query

This sets and reads out ON/OFF of the color mode of hard copy of screen.

Command syntax

```
:HCOPY[:SDUMp]:DATA:COLor <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

Turning ON becomes color setting.

Setting to OFF becomes monochrome setting.

Query syntax

```
:HCOPY[:SDUMp]:DATA:COLor?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

Color setting and monochrome setting become ON and OFF respectively.

2.5.13 MEMory subsystem

2.5.13.1 MEMory:NSTates query

This reads out the number of storable setup into internal memory.

Query syntax

```
:MEMory:NSTates?
```

Response message <setup_num>

<setup_num> is <NR1 numerical response data> format.

2.5.13.2 MEMory:STAtE:CATalog query

This reads out the name list of setup stored into the internal memory.

Query syntax

```
:MEMory:STAtE:CATalog?
```

Response message <setup_name_list>

<setup_name_list> is <character response data> format.

BY enclosing the setup name by double quotation ("), the character string punctuated by comma (,) returns.

2.5.13.3 MEMory:STAtE:NAME query

This reads out the name of setup stored into internal memory.

The setup name in internal memory cannot be changed.

Query syntax

```
:MEMory:STAtE:NAME? <setup_num>
```

<setup_num>

<Numerical program data>
1 to 10

Numerical values other than the range become command error.

Response message <setup_name>

<setup_name> is <character response data> format.

The character string enclosed the setup name by double quotation (") returns.

The name of setup specified by <setup_num> in internal memory returns.

2.5 Instrument-specific Commands

2.5.13.4 MEMory:STATe:RECall:AUTO command/query

When turning the power supply of this instrument ON, this sets and reads out ON/OFF of the function which recalls the specified setup.

Command syntax

```
:MEMory:STATe:RECall:AUTO <off_on>
```

<off_on>

<Character program data>	<Numerical program data>
OFF	0
ON	1 (Excluding 0)

When ON is set, it is started up by setup stored in the internal memory and by the setup specified at the time of previous completion.

When OFF is set, it is started up by the default setup.

Query syntax

```
: MEMory:STATe:RECall:AUTO?
```

Response message <off_on>

<off_on> is <NR1 numerical response data> format.

0 and 1 denote OFF and ON respectively.

If start up is set at the default setup, it deems to be OFF, and in other case, it deems to be ON.

2.5.13.5 MEMory:STATe:RECall:SElect command/query

This sets and reads out the setup to be recalled when the power supply of this instrument is ON.

Command syntax

```
:MEMory:STATe:RECall:SElect <setup_num>
```

<setup_num>

<Numerical program data>
0 to 10

Numerical values other than the range become command error.

If 0 is set, it is started up by the setup at the time of previous completion.

Query syntax

```
:MEMory:STATe:RECall:SElect?
```

Response message <setup_num>

<setup_num> is <NR1 numerical response data> format.

When the start up by the setup at the time of previous completion has been set, 0 is returned.

2.5.14 SETUP subsystem

2.5.14.1 SETUP:NAME command/query

This sets and reads out the name of current setup.

Command syntax

```
:SETUP:NAME <setup_name>
```

<setup_name>

<Character program data>
<ul style="list-style-type: none"> • Character string enclosed by double quotation or single quotation (15 characters or less) • Usable characters 0 - 9a - z A - Z !"#\$%&'()*+,-./:;<=>?@[^_`{ }~ and SP (However, use the same character as enclosure character two repeatedly.)

Characters other than usable ones become command error.

Please refer to section 2.2 for the details of <Character program data>

Query syntax

```
:SETUP:NAME?
```

Response message <setup_name>

<setup_name> is <character response data> format.

2.5.14.2 SETUP:LOAD:DIRectory command/query

This sets and reads out the directory name when recalling the setup from file in USB memory.

Command syntax

```
:SETUP:LOAD:DIRectory <directory>
```

<directory>

<Character program data>
<ul style="list-style-type: none"> • Usable character Alphanumeric character - !#\$%&'()-@^_{}~" • Maximum 8 characters • Enclose by single quotation (') or double quotation (")

Please refer to section 2.2 for the details of <Character program data>.

Query syntax

```
:SETUP:LOAD:DIRectory?
```

Response message <directory>

<directory> is <character response data> format.

2.5 Instrument-specific Commands

2.5.14.3 SETUP:LOAD command

This recalls the setup from the file in USB memory.

Command syntax

```
:SETUP:LOAD <filename>
```

<filename>

<Character program data>	Setting
<ul style="list-style-type: none">Usable character Alphanumeric character - !#\$%&'()-@^_{}~"Maximum 8 charactersEnclose by single quotation (') or double quotation (")	Specifies file name to be stored to USB memory. Directory should be specified by SETUP:LOAD:DIRectory command.

Please refer to section 2.2 for the details of <Character program data>.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5.14.4 SETUP:STORe:DIRectory command/query

This sets and reads out the directory name when saving the setup into file in USB memory.

Command syntax

```
:SETUP:STORe:DIRectory <directory>
```

<directory>

<Character program data>
<ul style="list-style-type: none">Usable character Alphanumeric character - !#\$%&'()-@^_{}~"Maximum 8 charactersEnclose by single quotation (') or double quotation (")

Please refer to section 2.2 for the details of <Character program data>.

Query syntax

```
:SETUP:STORe:DIRectory?
```

Response message <directory>

<directory> is <character response data> format.

2.5.14.5 SETUP:STORe command

This saves current setup into the file in USB memory.

Command syntax

```
:SETUP:STORe <filename>
```

<filename>

<Character program data>	Setting
<ul style="list-style-type: none"> • Usable character Alphanumeric character - !#\$%&'()-@^_{}~" • Eight character fixation • Only the numeric character: the end four characters. • Enclose by single quotation (') or double quotation (") 	<p>Specifies file name to be stored to USB memory.</p> <p>Directory should be specified by SETUP:STORe:DIRector command.</p>

Please refer to section 2.2 for the details of <Character program data>.

If this command is executed during trigger waiting status or measurement, none is done and the execution error occurs.

2.5 Instrument-specific Commands

2.5.14.6 SETUP:TRANSfer command/query

The command writes the setup data into this instrument, and changes in accordance with the setup data written into this instrument setting.

The query reads out current setup as the setup data.

This command cannot be used as multi command.

In addition, if this command/query is executed in trigger waiting status or measurement, none is done and execution error occurs.

Command syntax

```
:SETUP:TRANSfer <delimiter><preamble><setup data>
```

<delimiter>

Refer to each interface section written in "2 Remote control".

<preamble>

```
#8xxxxxxx
```

Xxxxxxxx : ASCII character string of eight digits that shows number of bytes for < setup data >
Insert 0 in the head and make it to eight digits when the number of bytes are less than eight digits.

It becomes # 80000478 when the number of bytes for < setup data > is 478 bytes.

<setup data>

Setup data of this instrument

The following data can be used.

Data read out by SETUP:TRANSfer:? query

Data stored in USB memory by SETUP:STORe command

Instrument operation: Data stored in USB memory by SETUP-SAVE

Transmit this command according to the procedure of the following 2 steps.

Step 1:

Transmit the SETUP:TRANSfer command without putting the parameter. As a result, it enters the state that the main unit can receive the setup data (Include preamble)

Step 2:

Transmit < setup data > by putting < preamble > of the above-mentioned format.

Query syntax

```
:SETUP:TRANSfer?
```

Response message <preamble><setup data>

This is same format as command.

2.5.15 DATA subsystem

2.5.15.1 DATA:MODE command/query

This sets/reads out the operation mode of logging function.

Command syntax

```
:DATA:MODE <data_mode>
```

< data_mode>

<Character program data>	Setting contents
NORMAL	Normal mode
BULK	Bulk mode

If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

```
:DATA:MODE?
```

Response message <data_mode>

<data_mode> is <character response data> format.

Remark

If the log mode is bulk, the buk log is started by INITiate command or READ? query.

Until the specified stop condition is satisfied or ABORt command is used for forcible stop in the bulk log execution status, sampling and recording on the log data are continuously executed.

In the bulk log execution status, almost all remote commands/queries result in execution error.

Valid commands/queries even in the bulk log execution status are as follows:

- *OPC
- *OPC?
- *WAI
- *RST
- *ESR?
- :MESR?
- :FETCh?
- :DATA:BULK:STATe?
- :ABORt

2.5 Instrument-specific Commands

2.5.15.2 DATA:REMove query

This reads out arbitrary quantity of measured data and erases the measured data read out from LOG data. The data becomes assigned quantity from the forefront (the oldest data) in LOG data. It is possible to execute during measurement.

This command cannot be used as multi command.

Query syntax

:DATA:REMove? <data_count>

<data_count>

<Numerical program data>
1 to 100000

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

In case assigned quantity of data does not exist in LOG data, both reading and erasing are not performed, and it becomes execution error.

Response message <log_data_block>

<log_data_block> is data connected specified quantity by punctuating the character string of <NR3 numerical response data> format by comma (,).

An attribute information is not added.

2.5.15.3 DATA:LAST query

This reads out 1 data of measured data just before completion. Erasing of the read data is not performed.

It is possible to execute during measurement.

Query syntax

:DATA:LAST?

In case the measured data does not exist in LOG data, the query returns NAN(+9.91E+37), and it becomes execution error.

Response message <log_data>

<log_data> is <NR3 numerical response data>format. Attribute information is not added.

2.5.15.4 DATA:POINTs query

This reads out number of measured data being stored in LOG data.

Query syntax

:DATA:POINTs?

Response message <data_points>

<data_points> is <NR1 numerical response data>format. The values of 0 to 100000 returns.

2.5.15.5 DATA:DELeTe command

This erases all data in LOG data.

Command syntax

```
:DATA:DELeTe
```

2.5.15.6 DATA:BULK:LENGth command/query

This sets/reads out the memory length for the bulk mode.

Command syntax

```
:DATA:BULK:LENGth <length>
```

<length>

<Nemerial program data>	Default value
1,000	1000
2,000	
5,000	
10,000	
20,000	
50,000	
100,000	

Any value out of the range is rounded to a maximum / minimum value; resulting in the execution error.

A numeric value other than the specified value is rounded up. The execution error does not occur.

If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

```
:DATA:BULK:LENGth? [ {MIN|MAX} ]
```

Response message <length>

<length> is the <NR3 numeric value response data> format.

2.5 Instrument-specific Commands

2.5.15.7 DATA:BULK:POST command/query

This sets/reads out the post-reading count (percent specified) for the bulk mode. It is available when the stop event is other than NONE.

Command syntax

:DATA:BULK:POST <post>

<post>

<Numerical program data>	Resolution	Default value
0 ~ 100	1	50

Any value out of the range is rounded to a maximum / minimum value; resulting in the execution error.

If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

:DATA:BULK:POST? [{MIN|MAX}]

Response message <post>

<post> is <NR1 numeric value response data> format.

2.5.15.8 DATA:BULK:EVENT command/query

This sets/reads out the stop event for the bulk mode.

Command syntax

:DATA:BULK:EVENT <event>

<event>

<Character program data>	Setting
NONE	No stop event*
EXT	External trigger
LEVEL	Level
LIMIT	Limit calculation

* For "NONE", measurement in the bulk mode does not stop automatically. Use ABORt command to stop measurement. If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

:DATA:BULK:EVENT?

Response message < event >

<event > is <Character response data> format.

2.5.15.9 DATA:BULK:LEVel[:VALue] command/query

This is used when the stop event in the bulk mode is set to Level. It sets/acquires the threshold value which is used as the condition to generate the stop event.

Command syntax

```
:DATA:BULK:LEVel[:VALue] <level>
```

< level >

<Numerical program data>	Resolution	Default value
-999.9999E+12 to +999.9999E+12	0.000001E-12	+0.0000E+0

Any value out of the range is rounded to a maximum/minimum value; resulting in the execution error.

If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

```
:DATA:BULK:LEVel[:VALue]? [{MIN|MAX}]
```

Response message <level>

<level> is <NR3 numeric value response data> format.

2.5.15.10 DATA:BULK:LEVel:SLOPe command/query

This is used when the stop event in the bulk mode is set to Level. It sets/acquires the slope which is used as the condition to generate the stop event.

Command syntax

```
:DATA:BULK:LEVel:SLOPe <slope>
```

<slope>

<Character program data>	Setting
NEG	Stop event occurs at falling across the threshold value.
POS	Stop event occurs at rising across the threshold value.

If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

```
:DATA:BULK:LEVel:SLOPe?
```

Response message < slope >

< slope > is <Character response data> format.

2.5 Instrument-specific Commands

2.5.15.11 DATA:BULK:LIMit command/query

This is used when the stop event in the bulk mode is set to Limit calculation. It sets/acquires the limit calculation result which is used as the condition to generate the stop event.

Command syntax

```
:DATA:BULK:LIMit <limit>
```

<limit>

<Character program data>	Setting
GO	Event occurs when the limit calculation result is Go.
NOGO	Event occurs when the limit calculation result is No Go.
HIGH	Event occurs when the limit calculation result is High.
LOW	Event occurs when the limit calculation result is Low.

If this command is executed in trigger waiting status or measurement, none is done; resulting in execution error.

Query syntax

```
:DATA:BULK:LIMit?
```

Response message < limit >

< limit > is <Character response data> format.

2.5.15.12 DATA:BULK:STATe query

This acquires the logging status in the bulk mode.

Query syntax

```
:DATA:BULK:STATe?
```

Response message <status>,<count>,<remain>

<status>

Character string indicating the logging in the bulk mode. <status> is <Character program data> format.

<status>

<Character program data>	Statis
STOP	Lot stopped
WAIT	Waiting for stop event
POST	Log recording after stop event detection

<count>

Data counts of log recorded. <count> is <NR1 numeric value response data> format. It is 0 when log stops.

<remain>

Data count required to be acquired after stop event detection. <remain> is <NR1 numeric value response data> format. It is 0 when the stop event is NONE. In addition, it is 0 when log stops.

2.5.15.13 DATA:DIRectory command/query

This sets and reads out the directory when LOG data is copied in USB memory.

Command syntax

```
:DATA:DIRectory <directory>
```

<directory>

<Character program data>
<ul style="list-style-type: none"> Usable character Alphanumeric character - !#\$%&'()-@^_{}~" Maximum 8 characters Enclose by single quotation (') or double quotation (")

Please refer to section 2.2 for the details of <Character program data>.

Query syntax

```
:DATA:DIRectory?
```

Response message <directory>

<directory> is <character response data> format.

2.5.15.14 DATA:COpy command

This copies LOG data in USB memory from forefront (the oldest data).

Command syntax

```
:DATA:COpy <filename>,<time_offon>,<attrib_offon>
```

<filename>

<Character program data>	Setting
<ul style="list-style-type: none"> Usable character Alphanumeric character - !#\$%&'()-@^_{}~" Eight character fixation Only the numeric character: the end four characters. Enclose by single quotation (') or double quotation (") 	Specifies file name to be stored to USB memory. Directory should be specified by DATA:DIRectory command.

Please refer to section 2.2 for the details of <Character program data>.

<time_offon>

<Character program data>	<Numerical program data>	Setting
OFF	0	No time stamp available
ON	1 (Excluding 0)	Time stamp added

<attrib_offon>

<Character program data>	<Numerical program data>	Setting
OFF	0	No attribute information
ON	1 (Excluding 0)	Attribute inf. added

The attribute information becomes as follows:

“Function name”, “NULL operation”, “MATH calculation”, “Error information”

2.5.16 STATus subsystem

2.5.16.1 STATus:OPERation:CONDition query

This reads out the operation condition status register.

Query syntax

```
:STATus:OPERation:CONDition?
```

The register value by reading is not changed.

Response message <status>

<status> is <NR1 numerical response data> format.

The values from 0 to 65535 (16 bits) are repeated. For the description of each bit, please refer to "2.3 Status report structure."

2.5.16.2 STATus:OPERation[:EVENT] query

This reads out the operation event status register.

Query syntax

```
:STATus:OPERation[:EVENT]?
```

The register is cleared to 0 after reading.

Response message <status>

<status> is <NR1 numerical response data> format.

The values from 0 to 65535(16 bits) are repeated. For the description of each bit, please refer to "2.3 Status report structure."

2.5.16.3 STATus:OPERation:ENABLE command/query

This sets and reads out the operation event enable register.

Command syntax

```
:STATus:OPERation:ENABLE <status_mask>
```

<status_mask>

<Numerical program data>
0 to 65535

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

In case 1 was set to the bits (bit 0.3 and 6.15) not used for this instrument, it becomes invalid. However it does not become an execution error.

Query syntax

```
:STATus:OPERation:ENABLE?
```

Response message <status_mask>

<status_mask> is <NR1 numerical response data> format.

The values from 0 to 65535(16 bits) are repeated. For the description of each bit, please refer to "2.3 Status report structure."

2.5.16.4 STATUS:OPERation:CONDition query

This reads out the operation condition status register.

Query syntax

```
:STATus:OPERation:CONDition?
```

The register value by reading is not changed.

Response message <status>

<status> is <NR1 numerical response data> format.

The values from 0 to 65535(16 bits) are repeated. For the description of each bit, please refer to "2.3 Status report structure."

2.5.16.5 STATUS:QUEStionable[:EVENT] query

This reads out the questionable event status register.

Query syntax

```
:STATus:QUEStionable[:EVENT]?
```

The register is cleared to 0 after reading.

Response message <status>

<status> is <NR1 numerical response data> format.

The values from 0 to 65535(16 bits) are repeated. For the description of each bit, please refer to "2.3 Status report structure."

2.5.16.6 STATUS:QUEStionable:ENABle command/query

This sets and reads out the questionable event enable register.

Command syntax

```
:STATus:QUEStionable:ENABle <status_mask>
```

<status_mask>

<Numerical program data>
0 to 65535

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

In case 1 was set to the bits (bit 2.3, 5.8, 10, 13 and 15) not used for this instrument, it becomes invalid. However it does not become an execution error.

Query syntax

```
:STATus:QUEStionable:ENABle?
```

Response message <status_mask>

<status_mask> is <NR1 numerical response data> format.

The values from 0 to 65535(16 bits) are repeated. For the description of each bit, please refer to "2.3 Status report structure."

2.5.17 Status register control related command of instrument-specific

2.5.17.1 DDER query

This reads out the instrument-specific error occurrence event status register.
For details of the register, refer to “2.3.7 Instrument-specific error occurrence, event, status register”.

Query syntax

:DDER?

The register is cleared to 0 after reading.

Response message <status>

<status> is <NR1 numerical response data> format.

The values from 0 to 255(8 bits) are repeated.

2.5.17.2 DDEE command/query

This sets and reads out the instrument-specific error occurrence event enable register.
For details of the register, refer to “2.3.8 Instrument-specific error occurrence, event, enable register”.

Command syntax

:DDEE <status_mask>

<status_mask>

<Numerical program data>
0 to 255

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

In case 1 was set to the bits (bit 0, 2 and 4) not used for this instrument, it becomes invalid.

However it does not become an execution error.

Query syntax

:DDEE?

Response message <status_mask>

<status_mask> is <NR1 numerical response data> format.

The values from 0 to 255 (8 bits) are repeated.

2.5.17.3 MESR query

This reads out the measurement event status register.

For details of the register, refer to “2.3.9 Measurement, event, status register”.

Query syntax

:MESR?

The register is cleared to 0 after reading.

Response message <status>

<status> is <NR1 numerical response data> format.

The values from 0 to 255 (8 bits) are repeated.

2.5.17.4 MESE command/query

This sets and reads out the measurement event enable register.

For details of the register, refer to “2.3.10 Measurement, event, enable register”.

Command syntax

:MESE <status_mask>

<status_mask>

<Numerical program data>
0 to 255

Numerical value beyond limit is set by rounding up maximum value/minimum value, and becomes execution error.

In case 1 was set to the bits (bit 0, 2 and 4) not used for this instrument, it becomes invalid.

However it does not become execution error.

Query syntax

:MESE?

Response message <status_mask>

<status_mask> is <NR1 numerical response data> format.

The values from 0 to 255 (8 bits) are repeated.

2.6 Adjustment by Remote

This section explains the command/query to be used for calibrating this instrument.

2.6.1 Remote adjustment command/query List

The following table shows the remote adjustment command/query.

Syntax	Function	Remark
:CAL	Adjustment subsystem	
:ENT	Shifting to adjustment mode	
:EXIT <param>	Shifting from adjustment mode to normal mode (measurement)	<param> "ON" : Adjusted value writing "OFF": No adjusted value writing
:SAV?	Adjusted value write. Result returning	Response 0: Success, -1: Fail
:DCV:ZERO?	DCV offset (0V) adjustment	
:DCV:V100M:POS?	DCV +100mV full scale adjustment	
:DCV:V100M:NEG?	DCV -100mV full scale adjustment	
:DCV:V1:POS?	DCV +1V full scale adjustment	
:DCV:V1:NEG?	DCV -1V full scale adjustment	
:DCV:V10:POS?	DCV +10V full scale adjustment	
:DCV:V10:NEG?	DCV -10V full scale adjustment	
:DCV:V100:POS?	DCV +100V full scale adjustment	
:DCV:V100:NEG?	DCV -100V full scale adjustment	
:DCV:V1000:POS?	DCV +1000V full scale adjustment	
:DCV:V1000:NEG?	DCV -1000V full scale adjustment	
:ACV:V100M:ZERO?	ACV 100mV linearity adjustment 5%	
:ACV:V100M:FULL?	ACV 100mV linearity adjustment Full	
:ACV:V1:ZERO?	ACV 1V linearity adjustment 5%	
:ACV:V1:FULL?	ACV 1V linearity adjustment Full	
:ACV:V10:ZERO?	ACV 10V linearity adjustment 5%	
:ACV:V10:FULL?	ACV 10V linearity adjustment Full	
:ACV:V100:ZERO?	ACV 100V linearity adjustment 5%	
:ACV:V100:FULL?	ACV 100V linearity adjustment Full	
:ACV:V750:ZERO?	ACV 750V linearity adjustment 5%	
:ACV:V750:FULL?	ACV 750V linearity adjustment Full	
:ACFC:HZ100K:V100M?	ACV 100kHz 100mV frequency characteristic adjustment	
:ACFC:HZ100K:V1?	ACV 100kHz 1V frequency characteristic adjustment	
:ACFC:HZ100K:V10?	ACV 100kHz 10V frequency characteristic adjustment	
:ACFC:HZ100K:V100?	ACV 100kHz 100V frequency characteristic adjustment	
:ACFC:HZ100K:V750?	ACV 100kHz 750V frequency characteristic adjustment	
:DCI:ZERO?	DCI Offset (0A) adjustment	
:DCI:A1M:POS?	DCI +1mA full scale adjustment	
:DCI:A1M:NEG?	DCI -1mA full scale adjustment	

Syntax	Function	Remark
:DCI:A10M:POS?	DCI +10mA full scale adjustment	
:DCI:A10M:NEG?	DCI -10mA full scale adjustment	
:DCI:A100M:POS?	DCI +100mA full scale adjustment	
:DCI:A100M:NEG?	DCI -100mA full scale adjustment	
:DCI:A1:POS?	DCI +1A full scale adjustment	
:DCI:A1:NEG?	DCI -1A full scale adjustment	
:DCI:A3:POS?	DCI +3A full scale adjustment	
:DCI:A3:NEG?	DCI -3A full scale adjustment	
:ACI:A1:ZERO?	ACI 1A linearity adjustment 5%	
:ACI:A1:FULL?	ACI 1A linearity adjustment Full	
:ACI:A3:ZERO?	ACI 3A linearity adjustment 5%	
:ACI:A3:FULL?	ACI 4A linearity adjustment Full	
:RES:OHM100:ZERO?	2WΩ 100Ω offset adjustment	
:RES:OHM1K:ZERO?	2WΩ 1kΩ offset adjustment	
:RES:OHM10K:ZERO?	2WΩ 10kΩ offset adjustment	
:RES:OHM100K:ZERO?	2WΩ 100Ω offset adjustment	
:RES:OHM1M:ZERO?	2WΩ 1MΩ offset adjustment	
:RES:OHM10M:ZERO?	2WΩ 10MΩ offset adjustment	
:RES:OHM100:FULL? <param>	2WΩ 100Ω full scale adjustment	
:RES:OHM1K:FULL? <param>	2WΩ 1kΩ full scale adjustment	
:RES:OHM10K:FULL? <param>	2WΩ 10kΩ full scale adjustment	
:RES:OHM100K:FULL? <param>	2WΩ 100kΩ full scale adjustment	
:RES:OHM1M:FULL? <param>	2WΩ 1MΩ full scale adjustment	
:RES:OHM10M:FULL? <param>	2WΩ 10MΩ full scale adjustment	
:RES:OHM100M?	2WΩ 100MΩ adjustment	
:FRES:OHM100:ZERO?	4WΩ 100Ω offset adjustment	
:FRES:OHM1K:ZERO?	4WΩ 1kΩ offset adjustment	
:FRES:OHM10K:ZERO?	4WΩ 10kΩ offset adjustment	
:FRES:OHM100K:ZERO?	4WΩ 100kΩ offset adjustment	
:FRES:OHM1M:ZERO?	4WΩ 1MΩ offset adjustment	
:FRES:OHM10M:ZERO?	4WΩ 10MΩ offset adjustment	
:FRES:OHM100:FULL? <param>	4WΩ 100Ω full scale adjustment	
:FRES:OHM1K:FULL? <param>	4WΩ 1kΩ full scale adjustment	
:FRES:OHM10K:FULL? <param>	4WΩ 10kΩ full scale adjustment	
:FRES:OHM100K:FULL? <param>	4WΩ 100kΩ full scale adjustment	
:FRES:OHM1M:FULL? <param>	4WΩ 1MΩ full scale adjustment	
:FRES:OHM10M:FULL? <param>	4WΩ 10MΩ full scale adjustment	
:FRES:OHM100M?	4WΩ 100MΩ adjustment	
:FREQ?	FREQ (1.0kHz) adjustment	

2.6.2 Shift to adjustment mode and return to normal (measurement) mode

Adjustment in remote is performed by the adjustment mode. In order to shift to the adjustment mode, the following command is used.

:CAL:ENT

Moreover, in order to return from the adjustment mode to the normal (measurement) mode, the following command is used.

:CAL:EXIT <param>

<param>

<Character program data>	<Numerical program data>	Setting
OFF	0	No adjusted value writing
ON	1 (Excluding 0)	Adjusted value written

In case the adjusted values are not written, it is disposed, and is not reflected.

2.6.3 Adjusted value writing

The adjustment done by the adjustment mode does not become valid unless it is written in this instrument memory. To perform writing, the following query is to be used. Writing success (0)/fail (-1) are returned.

:CAL:SAV?

Furthermore, writing can also be done by parameter setting of shift command from the adjustment mode to normal mode.

2.6.4 Each adjustment menu

The adjustment procedures for each item are as follows:

1. Connect to the calibrator which outputs the calibration signal.

Preparation for adjusting each item is the same as manual configuration. Please refer to "Instruction Manual." 2. Send the query. In order to perform the adjustment, the query corresponding to the adjustment item should be sent.

Example) Full scale adjustment of DCV, 100V range and minus (-) side

:CAL:DCV:DCV:V100:NEG?

3. Receive the query response.

All query responses are as follows:

<NR1 numerical response data>	Response description
0	Adjust succeeded Adjust result is within spec.
-1	Adjust failed Adjust result is out of spec.

However the adjusted value of failed item is not updated even if adjusted value writing is done. Of the adjustment query, the response may take several 10 seconds. The timeout of external instrument to be controlled should take sufficiently, or countermeasure to perform synchronous communication by SRQ is required.

2.6.5 Adjustment menu required parameter

Full scale adjustment (except 100MΩ) of the resistance measurement (2WΩ and 4WΩ) needs the value shown by the calibrator as a parameter. The parameter should be entered with <NR3 numerical program data> format.

(Example) Full scale calibration of 4WΩ and 100kΩ range (Calibrator output is 100.0016k Ω)

:CAL:FRES:OHM100K? 100.0016E+3