RM3544-01
RM3545, RM3545-01, RM3545-02
RM3545A-1, RM3545A-2
RM3546

Communication Command Instruction Manual

RESISTANCE METER

Check for the latest edition and other language versions.

- ✓ This command manual provides information to help you program the HIOKI Resistance Meter Series: RM3544, RM3545, RM3545A, and RM3546.
- ✓ For information on the remote interface configuration of the resistance meters, please refer to the main unit's instruction manual.
- ✓ Although all reasonable care has been taken in the production of this instruction manual, should you find any points which are unclear or in error, please contact your local distributor or HIOKI's website.(https://www.hioki.com/contact)
- ✓ The material contained in this document is subject to being changed, without notice, in future editions.
- ✓ Unauthorized copying and replication of the contents of this instruction manual are strictly prohibited.

EN

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Contents

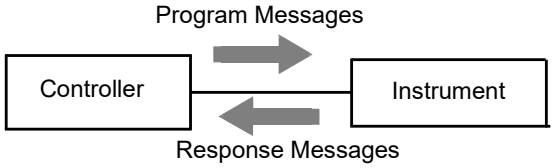
1 Introduction

In this publication, items relevant only to the RM3544-01 are indicated as RM3544, and items relevant only to the RM3545, RM3545-01, and RM3545-02 are indicated as RM3545, and items relevant only to the RM3545A-1, RM3545A-2 are indicated as RM3545A , and items relevant only to the RM3546 is indicated as RM3546. Also, the RM3545, RM3545-01, RM3545-02, RM3545A-1, RM3545A-2, and RM3546 are indicated as “the instrument.”

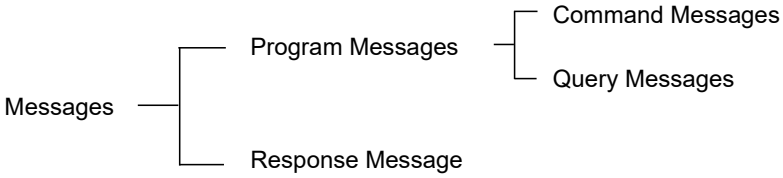
The LAN interface is equipped on the RM3545A-1, RM3545A-2, and RM3546 models. The GP-IB interface is available only on the RM3545-01.

When coding a program, it is convenient to use the Command monitor function, as it displays commands and responses on the measurement screen. For more information on the command monitoring function, please find the main unit’s instruction manual.

Messages can be either program messages, sent from the controller such as PC to the instrument, or response messages, sent from the instrument to the controller.



Messages are categorized as follows:



Message Format

Program Messages

Program messages can be either Command Messages or Query Messages.

(1) Command Messages

Instructions to control the instrument, such as to change settings or reset

Example: (instruction to set the measurement range)

RESISTANCE:RANGE 100E3

Header portion Space Data portion

(2) Query Messages

Requests for responses relating to results of operation or measurement, or the state of instrument settings

Example: (request for the current measurement range)

RESISTANCE:RANGE?

Header portion Question mark

See: “Headers (p.2)”, “Separators (p.3)”, “Data Formats (p.4)”

Response Messages

When a query message is received, its syntax is checked and a response message is generated.
The **:SYSTem:HEADer** command determines whether headers are prefixed to response messages.

Header ON	**:SENSE:RESISTANCE:RANGE 100.000E+03**
Header OFF	**100.000E+03**
	(The current resistance measurement range is 100kΩ)

At power-on, Header OFF is selected.
If an error occurs when a query message is received, no response message is generated for that query.
Some query message has no header, such as **:FETCH?** and **:CALCulate:LIMit:RESult?**.

Command Syntax

Command names are chosen to mnemonically represent their function, and can be abbreviated. The full command name is called the “long form”, and the abbreviated name is called the “short form”. The command references in this manual indicate the short form in upper-case letters, extended to the long form in lower case letters. The commands are not case-sensitive.

ADJUST?	OK (long form)
ADJ?	OK (short form)
ADJU?	Error
AD?	Error

Response messages generated by the instrument are in long form and in upper case letters.

Headers

Headers must always be prefixed to program messages.

(1) Command Program Headers

There are three types of commands: Simple, Compound, and Standard.

- **Headers for Simple Commands**
  This header type is a sequence of letters and digits
  :ESE0
- **Headers for Compound Commands**
  These headers consist of multiple simple command type headers separated by colons “:”
  :SAMPle:RATE
- **Headers for Standard Commands**
  This header type begins with an asterisk “*”, indicating that it is a standard command defined by IEEE 488.2.
  ***RST**

(2) Query Program Header

The following commands are used to request results of operations/measured values/the current setting states.
As shown by the following examples, a query is formed by appending a question mark “**?**” after a program header.

:FETCh?
:CALCulate:LIMit:REFerence?

Characters within square brackets [ ] may be omitted.

[:SENSe:]RESistance:RANGe → Either form is valid
:SENSe:RESistance:RANGe
RESistance:RANGe

Message Terminators

This instrument recognizes the following message terminators (delimiters):

[RS-232C/USB/LAN]
- CR
- CR+LF

[GP-IB]
- LF
- CR+LF
- EOI
- LF with EOI

Response message terminator can be selected from the below.
For information on settings, see “Delimiter Setting” (p. 70).

[RS-232C/USB/LAN]
- CR+LF

[GP-IB]
- LF with EOI (default setting)
- CR+LF with EOI

Separators

(1) Message Unit Separator

Multiple messages can be written in one line by separating them with semicolons “;”

:SYSTEM:LFREQUENCY 60;*IDN?

- When messages are combined in this way and if one command contains an error, subsequent messages will not be processed.
- A query message must be the last item in a line. No messages can follow a query message.

(2) Header Separator

In a message consisting of both a header and data, the header is separated from the data by a space “ ” (ASCII code 20H).

:SYSTEM:HEADER OFF

(3) Data Separator

In a message containing multiple data items, commas are required to separate the data items from one another.

:CALCulate:LIMit:BEEPer IN,1,0

Data Formats

The instrument uses character data, decimal numeric data and character string data depending on the command. Make sure that the data is provided in the specified format.

(1) Character Data

Character data always begins with an alphabetic character, and subsequent characters may be either alphabetic or numeric. Character data is not case-sensitive, although response messages from the instrument are only upper case. When command data portion lists <1/0/ON/OFF>, “1” corresponds to “ON” and “0” corresponds to “OFF”. The both alphabetic string and numeric data are interchangeable.

:SYSTEM:HEADER OFF

(2) Decimal Numeric Data

Numerical data formats include NR1, NR2, and NR3 formats. The instrument accepts both signed and unsigned numbers, respectively. For unsigned numbers, the instrument treats them as positive numbers. If the precision of the value exceeds the range of the instrument, it will be rounded off.

- NR1 Integer data (e.g.: +12, -23, 34)
- NR2 Fixed-point data (e.g.: +1.23, -23.45, 3.456)
- NR3 Floating-point exponential representation data (e.g.: +1.0E-2, -2.3E+4)

The term “NRf format” includes all three of the above numeric decimal formats.
The instrument accepts NRf format data. The format of response data is specified for each command, and the data is sent in that format.

Note: A “+” sign is returned as a space (ASCII code 20H).

:ESE0 106

:FETCH?
+106.5710E+03

(3) Character string data

- Character string data is enclosed by quotation marks.
- This type of data consists of 8-bit ASCII characters.
- Characters that cannot be handled by the instrument are replaced with a parameter error.
- As for quotation marks, the sender uses double quotes (") only, while the receiver receives both double quotes and single quotes (').

:SYSTem:PANel:NAME 1, “PANEL_01”

[GP-IB]

The instrument does not fully support IEEE 488.2. As much as possible, please use the data formats shown in the Reference section.
Also, be careful to avoid constructing single commands line that could overflow the input buffer or output queue.

Compound Command Header Omission

Compound commands that have a common leading part (e.g., **:CALCulate:LIMit:REFerence** and **:CALCulate:LIMit:PERCent**) can omit the common part(here, **:CALCulate:LIMit:**) only if they are written in succession.
This common portion is called the “current path”, and until this is cleared, subsequent commands will be regarded as their current paths are omitted.

This usage of the current path is shown in the following example:

Full expression

:CALCulate:LIMit:REFerence 1.0E+3;:CALCulate:LIMit:PERCent 1.0

Compacted expression

:CALCulate:LIMit:REFerence 1.0E+3;PERCent 1.0

This portion becomes the current path, and can be omitted from the messages immediately following.

A 'Current path' is cleared in the following cases: when the power is turned on, when a reset operation is performed via key input, when a colon ':' is detected at the first header, or when a message terminator is detected.
Standard command messages can be executed regardless of the current path. They have no effect upon the current path.

A colon “:” is not required at the first header on a Simple or Compound command. However, to avoid confusion with abbreviated forms and to prevent operational mistakes, we recommend always placing a colon at the first header.

Output Queue and Input Buffer

Output Queue

Response messages are stored in the output queue until they were read by the controller. The output queue is also cleared in the following circumstances:

- The instruments are powered on.
- Device clear [GP-IB]
- When a query error occured

The output queue size is 64 bytes. If response messages overflow the storage size, a query error is generated and the output queue is cleared.
Also, with GP-IB, if a new message is received while data remains in the output queue, the output queue is cleared and a query error is generated.

Input Buffer

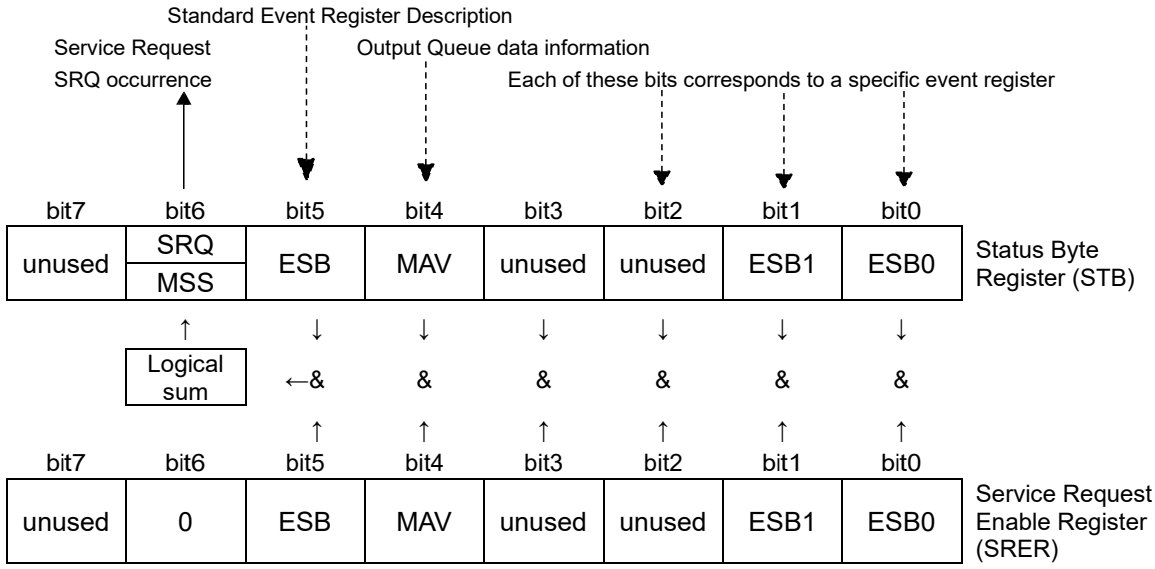
The input buffer size is 256 bytes.
If more than 256 bytes of data are sent and the input buffer becomes full, the USB and GP-IB communication will enter WAITING state until the input buffer becomes available.
The RS-232C and LAN interface will not accept data beyond 256 bytes.

Note: The length of each command line must be less than 256 bytes.

Status Byte Register

[GP-IB]

This instrument implements the status model specified in IEEE 488.2 for the parts related to serial polling by the service request function. An "event" is a condition that causes a service request to be generated.



Overview of Service Request Occurrence

The Status Byte Register contains information from the Event Register and the Output Queue. The Service Request Enable Register allows you to select the necessary information from this information. When the selected information is set, bit 6 (MSS Master Summary Status Bit) of the Status Byte Register is set, generating an SRQ (Service Request) message, which causes a service request.

Note:SRQ (Service Request) is a GP-IB function only. However, STB (Status Byte Register) information can be acquired with RS-232C/USB/LAN using the *STB? command.

[RS-232C/USB/LAN]

RS-232C/USB/LAN does not provide a function for issuing service requests. Still, SRER setup and STB reading are available.

Status Byte Register (STB)

The Status Byte Register is an 8-bit register that is output from the instrument to the controller when a serial poll is performed. If any bit in the Status Byte Register, among the enabled Service Request Enable Register, changes from '0' to '1', the MSS bit will become '1'. At the same time, the SRQ bit will also change to "1," and a service request will occur.

The SRQ bit is always synchronized with a service request. Normally, it is only read when polled and is cleared at the same time. The MSS bit can only be read with the ***STB?** query; however, it is not cleared until the event is cleared with the ***CLS** or other commands.

Bit 7		unused
Bit 6	SRQ	Set to 1 when a service request is dispatched.
	MSS	This is the logical sum of the other bits of the Status Byte Register.
Bit 5	ESB	Standard Event Status (logical sum) bit This is logical sum of the Standard Event Status Register.
Bit 4	MAV	Message available Indicates that a message is present in the output queue.
Bit 3		unused
Bit 2		unused
Bit 1	ESB1	Event Status (logical sum) bit 1 This is the logical sum of Event Status Register 1.
Bit 0	ESB0	Event Status (logical sum) bit 0 This is the logical sum of Event Status Register 0.

Service Request Enable Register (SRER)

When each bit in the Service Request Enable Register is set to "1", the corresponding bit in the Status Byte Register becomes available.

Event Registers

Standard Event Status Register (SESR)

The Standard Event Status Register is an 8-bit register. If any bit in the Standard Event Status Register is set to 1 (after masking by the Standard Event Status Enable Register), bit 5 (ESB) of the Status Byte Register is set to 1.

See: “Standard Event Status Register (SESR) and Standard Event Status Enable Register (SESER)” (p.9)

The Standard Event Status Register is cleared in the following situations:

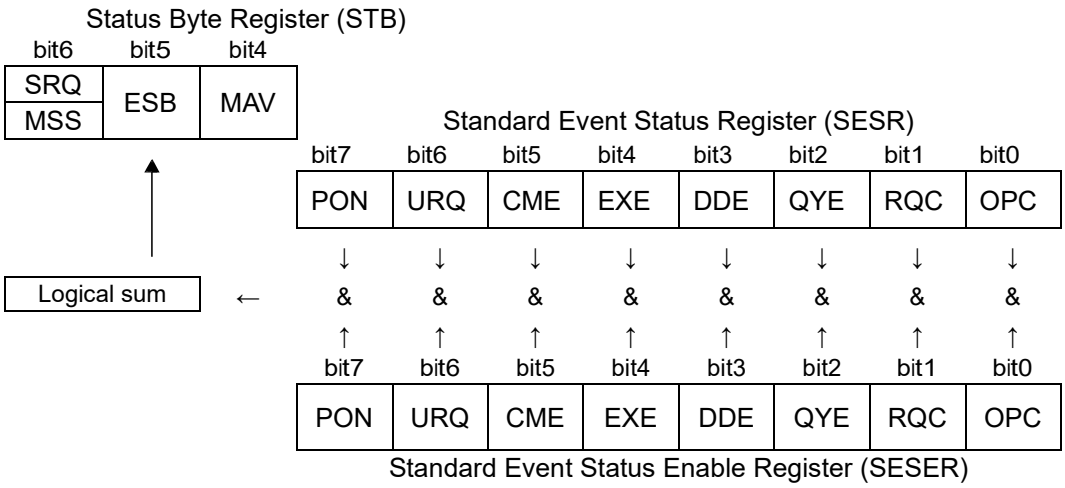
- When a ***CLS** command is executed
- When an event register query (***ESR?**) is executed
- When the instrument is powered on

Bit 7	PON	**Power-On Flag** Set to 1 when the power is turned on, or upon recovery from an outage.
Bit 6	URQ	**User Request** unused
Bit 5	CME	**Command error (The command to the message terminator is ignored.)** This bit is set to 1 when a received command contains a syntactic or semantic error: ・Program header error ・Incorrect number of data parameters ・Invalid parameter format ・Received a command not supported by the instrument
Bit 4	EXE	**Execution Error** This bit is set to 1 when a received command cannot be executed for some reason. ・The specified data value is outside of the set range ・The specified setting data cannot be set ・Execution is prevented by some other operation being performed
Bit 3	**(unused)** DDE	**Not used by this instrument** **Device-Dependent Error** This bit is set to 1 when a command cannot be executed due to some reason other than a command error, a query error or an execution error.
Bit 2	QYE	**Query Error (the output queue is cleared)** This bit is set to 1 when a query error is detected by the output queue control. ・When an attempt has been made to read an empty output queue (GP-IB only) ・When the data overflows the output queue ・When data in the output queue has been lost ・When the next command is received while there is data in the output queue
Bit 1	RQC **(unused)**	**Request Control**
Bit 0	OPC	**Operation Complete** This bit is set to 1 in response to an “***OPC**” command. ・It indicates the completion of operations of all messages up to the “***OPC**” command

Standard Event Status Enable Register (SESER)

Setting any bit of the Standard Event Status Enable Register to 1 enables access to the corresponding bit of the Standard Event Status Register.

Standard Event Status Register (SESR) and Standard Event Status Enable Register (SESER)



Device-Specific Event Status Registers (ESR0 and ESR1)

The instruments provide two Event Status Registers for controlling events. Each event register is an 8-bit register. RM3545 RM3545A RM3546 Event Status Register 1 is availabe only for RM3545/RM3545A/RM3546.

If any bit in the Status Byte Register, among the enabled Service Request Enable Register, changes from '0' to '1', the following register will be set:

- For Event Status Register 0, bit 0 (ESB0) of the Status Byte Register (STB) is set to 1.
- For Event Status Register 1, bit 1 (ESB1) of the Status Byte Register (STB) is set to 1.

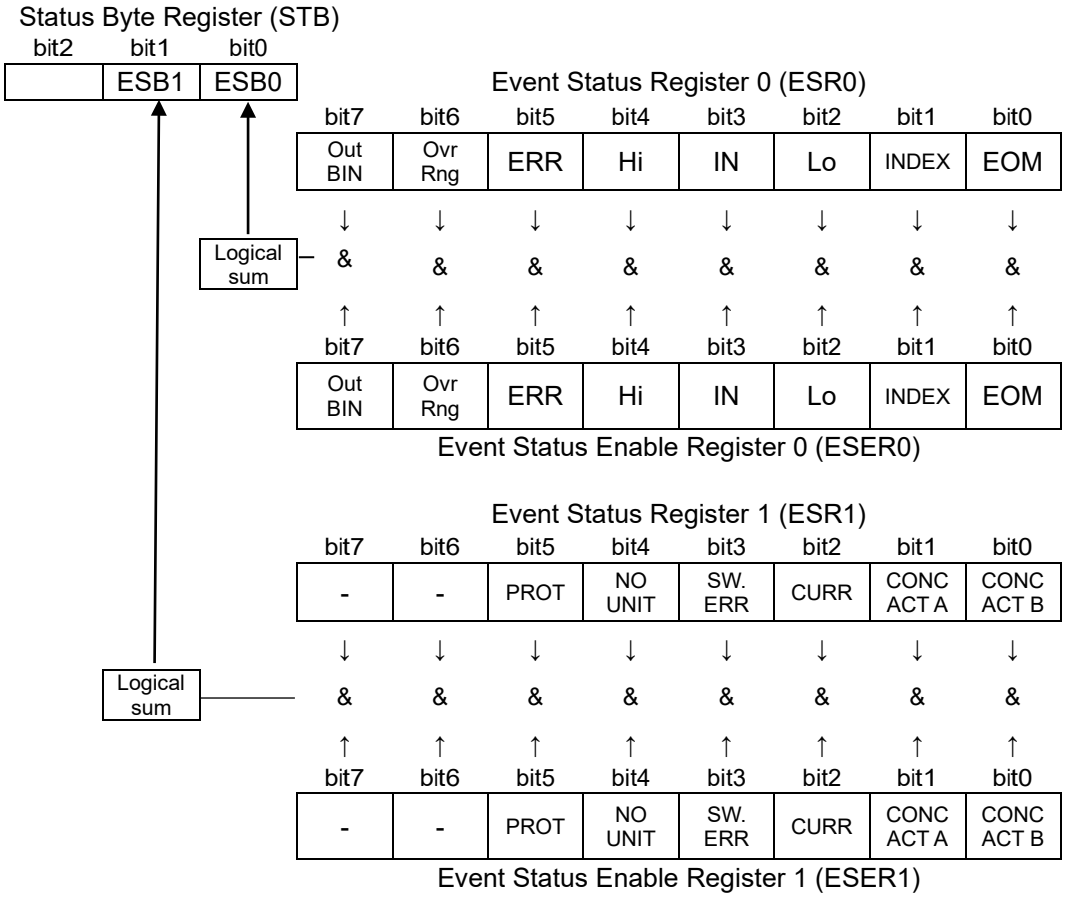
Event Status Registers 0 and 1 are cleared in the following situations:

- When a ***CLS** command is executed
- When an Event Status Register query (**:ESR0?** or **:ESR1?**) is executed
- When the instrument is powered on

Event Status Register 0 (ESR0)		
Bit 7	OutBIN	Out of BIN RM3545 RM3545A RM3546
Bit 6	OvrRng	Out-of-Range
Bit 5	ERR	Measurement Fault
Bit 4	Hi	High Comparator Result
Bit 3	IN	IN Comparator Result
Bit 2	Lo	Low Comparator Result
Bit 1	INDEX	End of Reading
Bit 0	EOM	End of Measurement

Event Status Register 1 (ESR1) RM3545 RM3545A RM3546		
Bit 7		Unused
Bit 6		Unused
Bit 5	PROTECT	Over-voltage/temperature Protection RM3546
Bit 4	NO UNIT	Multiplexer Unit Not Inserted, Terminal Setting Error
Bit 3	SW.ERR	Multiplexer Relay Hot Switching Prevention Function Fault
Bit 2	CURR	Current Monitor Fault
Bit 1	CONTACT TERM.A	Contact Check – A side Fault
Bit 0	CONTACT TERM.B	Contact Check – B side Fault

Event Status Registers 0 (ESR0) and 1 (ESR1), and Event Status Enable Registers 0 (ESER0) and 1 (ESER1)



Register Reading and Writing

Register	Read	Write
Status Byte Register	*STB?	-
Service Request Enable Register	*SRE?	*SRE
Standard Event Status Register	*ESR?	-
Standard Event Status Enable Register	*ESE?	*ESE
Event Status Register 0	:ESR0?	-
Event Status Enable Register 0	:ESE0?	:ESE0
Event Status Register 1	:ESR1?	-
Event Status Enable Register 1	:ESE1?	:ESE1

GP-IB Commands(RM3545-01)

The following commands can be used for performing interface functions.

Command	Description	
GTL	Go To Local	Cancels the Remote state and enters the Local state.
LLO	Local Lock Out	Disables all keys, including the Local key.
DCL	Device CLear	Clears the input buffer and the output queue.
SDC	Selected Device Clear	Clears the input buffer and the output queue.
GET	Group Execute Trigger	When an external trigger (trigger source <EXTERNAL>) occurs, processes one sample.

Initialization Items

Item	Initialization Method	At Power-on	Key Reset	*RST Command	Device Clear (GP-IB only)	*CLS Command	Factory Default
LAN setting RM3545A RM3546	IP address	-	0.0.0.0	-	-	-	0.0.0.0
	Subnet mask		255.255.255.0				255.255.255.0
	Gateway		0.0.0.0				0.0.0.0
	Communications command port number		23				23
GP-IB Address RM3545-01		-	1	-	-	-	1
RS-232C setting (baud rate)		-	9600	-	-	-	9600
Device-specific functions (range, etc.)		-	●	●	-	-	●
Output Queue		●	●	-	●	-	●
Input buffer		●	●	-	●	-	●
Status Byte Register		●	●	-	●*1	●*2	●
Event registers		●*3	●	-	-	●	●
Enable register		●	●	-	-	-	●
Current path		●	●	-	●	-	●
Headers on/off		OFF	OFF	OFF	-	-	OFF

Response message terminator (GP-IB) RM3545-01	LF+EOI	LF+EOI	-	-	-	LF+EOI
Response message separator	;	;	;	-	-	;

*1. Only the MAV bit (bit 4) is cleared.
*2. All bits except the MAV bit are cleared.
*3. Except the PON bit (bit 7).

Command Execution Time

Command execution time indicates the time for analyzing and processing long form commands.
However, execution time for the commands with data is defined according to the data format specified in the <data portion>, and for query commands it is the time when the header is ON.

- Display delays may occur depending on the frequency of communication processes and process contents.
- All commands except ***TRG** and **:INIT** are processed sequentially.
- In communications with the controller, time must be added for data transmission. USB, LAN and GP-IB transfer time depends on the controller.
  The RS-232C transfer time, with start bit 1, data length 8, no parity, and stop bit 1, has a total of 10-bit. When the transfer speed (baud rate) setting is N bps, the general result will be as follows:
  Transfer time T [1 character/sec] = Baud rate N [bps]/10 [bits]
  Since a measurement value is 11 characters, a 1 data transfer time will be 11/T.
  (Example) For 9600 bps, 11/(9600/10) = Approx. 11 ms
- Wait until measurements stabilize after a change before using a setting command.

Command	Execution time (except communication time)	
	RM3544	RM3545, RM3545A, RM3546
***RST**	700 ms or less	1.5s or less
:RESistance:RANGe	300 ms or less	100 ms or less
:SAMPle:RATE	200 ms or less	30 ms or less
[:SENSe:]CH	-	50 ms or less *1
:ADJust?	600 ms or less *2	
:FETCh?	5 ms or less	
:READ?	Measurement time + 15 ms or less	
:SYSTem:PANel:LOAD	500 ms or less	Panel 1 to 30:100 ms or less Panel 31 to 38:200 ms or less
:SYSTem:CALibration	-	400ms or less
***TST?**	1 s or less	
:UNIT:TEST?	3s or less	
Commands other than those above	10 ms or less	

*1 If there is a counter-electromotive force, such as a transformer, the switching takes longer due to the hot switching prevention function for the relay. The hot switching prevention function is canceled when the counter-electromotive force is lost or a maximum 1 second + delay set value elapses.
*2 Manual range, for one channel

About Communication Errors

An error occurs when messages are executed in the following cases:

- Command Error
  When message syntax (spelling) is invalid
  When the data format in a command or query is invalid
- Query Error
  When the response message exceeds 64 bytes
- Execution Error
  When invalid character or numeric data is present

2 Message List

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545	By channel	RM3545A / RM3546	By channel
Standard Commands							
*IDN?	(<Manufacturer name>,<Model name>,<Serial number>,<Software version>)	Queries the Device ID.	√	√	–	√	–
*RST		Initializes the device.	√	√	–	√	–
*TST?	(0 to 3)	Initiates a self-test and queries the result.	√	√	–	√	–
*OPC		Requests an SRQ after execution completion.	√	√	–	√	–
*OPC?	(1)	Queries execution completion.	√	√	–	√	–
*WAI		Wait for operations to finish.	√	√	–	√	–
*CLS		Clears the event registers and the Status Byte Register.	√	√	–	√	–
*ESE	0 to 255	Sets the Standard Event Status Enable Register.	√	√	–	√	–
*ESE?	0 to 255	Queries the Standard Event Status Enable Register.	√	√	–	√	–
*ESR?	0 to 255	Queries the Standard Event Status Register.	√	√	–	√	–
*SRE	0 to 255	Sets the Service Request Enable Register.	√	√	–	√	–
*SRE?	(0 to 255)	Queries the Service Request Enable Register.	√	√	–	√	–
*STB?	(0 to 255)	Queries the Status Byte Register.	√	√	–	√	–
*TRG		Executes one sampling.	√	√	–	√	–
Event Registers							
:ESE0	0 to 255	Sets the Event Status Enable Register 0.	√	√	–	√	–
:ESE0?	(0 to 255)	Queries the Event Status Enable Register 0.	√	√	–	√	–
:ESR0?	(0 to 255)	Queries the Event Status Register 0.	√	√	–	√	–
:ESE1	0 to 255	Sets the Event Status Enable Register 1.	√	√	–	√	–
:ESE1?	(0 to 255)	Queries the Event Status Enable Register 1.	√	√	–	√	–
:ESR1?	(0 to 255)	Queries the Event Status Register 1.	√	√	–	√	–
Reading Measured Values							
:FETCh?	RM3544:[<LIMit>](<Measurement value>[,<HI/IN/LO/OFF/ERR>]) RM3545/RM3545A/RM3546:[<LIMit/JUDGe/LIMJdge>,<Channel number>](Measured value>,[<HI/IN/LO/OFF/ERR][<PASS/FAIL/OFF/ERR>]	Reads the most recent measurement. • When data has been omitted: Reads the measurement value only. • When data has been set to LIMit: Reads the measurement value and comparator result. • When data has been set to JUDGe: Reads the measured value and PASS/FAIL result.• When data has been set to LIMJdge: Reads the measured value, and comparator and PASS/FAIL results.	√	√	√	√	√
:FETCh:TEMPerature?	(<Temperature measurement value>)	Reads the temperature measurement value.	√	√	–	√	–
:READ?	RM3544:(<Measurement value>) RM3545/RM3545A/RM3546:<NDATa/JUDGe> For scanning OFF/STEP:(<Measured value>) For AUTO scanning:([<	Waits for trigger and reads the measured value. RM3545/RM3545A/RM3546: Responds with the total judgment or PASS/FAIL result only if NDATa is included in the data formats.	√	√	–	√	–

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545	By channel	RM3545A / RM3546	By channel
	Measured value>,<Measured value> ,…<Measured value>] [<PASS/FAIL/OFF/ERR>])	Adds and responds with the total judgment if JUDGe is included in the data formats.					
:MEASure:RESistance?	[<Expected measurement value>](measurement value)	Presets to the specified resistance measurement range; then measures.	√	√	–	√	–
:MEASure:RESistance:LP?	[<Expected measurement value>](measurement value)	Presets to the specified Low-Power Resistance measurement range; then measures.	–	√	–	√	–
:MEASure:TEMPerature?	(<Temperature measurement value>)	Reads the temperature measurement value.	√	√	–	√	–
:ABORt		:READ /Scan measurement / Scan zero adjustment is aborted (forcibly terminated).	√	√	–	√	–
Zero Adjustment							
:ADJust?	(0/1)	Executes zero adjustment.	√	√	–	√	–
:ADJust:CLEar		Clears zero adjustment.	√	√	√	√	√
:ADJust:STATe?	(ON/OFF)	Queries the zero adjustment execution state.	–	√	√	√	√
:ADJust:ENABle	1/0/ON/OFF	Sets the scan zero adjustment execution (execution error for [:SENSe:]CH FRONT).	–	√	√	√	√
:ADJust:ENABle?	(ON/OFF)	Queries the scan zero adjustment execution (execution error for [:SENSe:]CH FRONT).	–	√	√	√	√
Measurement Speed							
:SAMPle:RATE	RM3544:FAST/MEDium/SLOW RM3545/RM3545A/RM3546 :FAST/MEDium/SLOW1/SLOW2	Sets the measurement speed.	√	√	√	√	√
:SAMPle:RATE?	RM3544:(FAST/MEDIUM/SLOW) RM3545/RM3545A/RM3546 :(FAST/MEDIUM/SLOW1/SLOW2)	Queries the measurement speed.	√	√	√	√	√
Averaging Functions							
:CALCulate:AVERage:STATe	1/0/ON/OFF	Sets the averaging function execution.	√	√	√	√	√
:CALCulate:AVERage:STATe?	(ON/OFF)	Queries the averaging function execution.	√	√	√	√	√
:CALCulate:AVERage:COUNt	2 to 100	Sets the average count.	√	√	√	√	√
:CALCulate:AVERage:COUNt?	(2 to 100)	Queries the average count.	√	√	√	√	√
Comparator							
:CALCulate:LIMit:STATe	1/0/ON/OFF	Sets the comparator operating state.	√	√	√	√	√
:CALCulate:LIMit:STATe?	(ON/OFF)	Queries the comparator operating state.	√	√	√	√	√
:CALCulate:LIMit:BEEPer	RM3544:<HI/IN/LO>,<0 to 3 (Type)>,<0 to 5 (Count)> RM3545/RM3545A/RM3546 :<HI/IN/LO/PASS/FAIL>,<0 to 3 (Type)>,<0 to 5 (Count)>	Sets the beep sound.	√	√	√	√	√
:CALCulate:LIMit:BEEPer?	RM3544:<HI/IN/LO>(<HI/IN/LO>,<0 to 3 (Type)>,<0 to 5 (Count)>) RM3545/RM3545A/RM3546 :<HI/IN/LO/PASS/FAIL>(<HI/IN/LO>,<0 to 3 (Type)>,<0 to 5 (Count)>)	Queries the beep sound.	√	√	√	√	√
:CALCulate:LIMit:MODE	ABSolute/REFerence	Sets the judgment mode.	√	√	√	√	√
:CALCulate:LIMit:MODE?	(ABSOLUTE/REFERENCE)	Queries the judgment mode.	√	√	√	√	√
:CALCulate:LIMit:UPPer	<Upper threshold>	Sets the upper threshold.	√	√	√	√	√
:CALCulate:LIMit:UPPer?	(<Upper threshold>)	Queries the upper threshold.	√	√	√	√	√
:CALCulate:LIMit:LOWer	<Lower threshold>	Sets the lower threshold.	√	√	√	√	√
:CALCulate:LIMit:LOWer?	(<Lower threshold>)	Queries the lower threshold.	√	√	√	√	√

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545		RM3545A / RM3546	
					By channel		By channel
:CALCulate:LIMit:REFerence	<Reference resistance>	Sets the reference resistance. (Channel 1 can be set for commands other than ([:SENSe:]CH FRONT.)	√	√	√	√	√
:CALCulate:LIMit:REFerence?	(<Reference resistance>)	Queries the reference resistance. (Response may be Channel1 for commands other than [:SENSe:] CH FRONT.)	√	√	√	√	√
:CALCulate:LIMit:PERCent	<Range [%]>	Sets the judgment range.	√	√	√	√	√
:CALCulate:LIMit:PERCent?	(<Range [%]>)	Queries the judgment range.	√	√	√	√	√
:CALCulate:LIMit:RESult?	[<Channel number>] (HI/IN/LO/OFF/ERR)	Queries the comparator result.	√	√	√	√	√
:CALCulate:LIMit:JUDGe:CONDition	OFF/IN/HI/LO/HILO/ALL	Sets the PASS judgment conditions.	–	√	√	√	√
:CALCulate:LIMit:JUDGe:CONDition?	(OFF/IN/HI/LO/HILO/ALL)	Queries the PASS judgment conditions.	–	√	√	√	√
:CALCulate:LIMit:JUDGe?	[<Channel number>] (PASS/FAIL/OFF/ERR)	Queries the PASS/FAIL result.	–	√	√	√	√
:CALCulate:LIMit:JUDGe:TOTal?	(PASS/FAIL/OFF/ERR)	Queries the total judgment result.	–	√	√	√	√
BIN Functions							
:CALCulate:BIN:STATe	1/0/ON/OFF	Sets the measurement execution.	–	√	–	√	–
:CALCulate:BIN:STATe?	(ON/OFF)	Queries the BIN measurement execution.	–	√	–	√	–
:CALCulate:BIN:ENABle	<Mask pattern>	Sets the mask pattern.	–	√	–	√	–
:CALCulate:BIN:ENABle?	(<Mask pattern>)	Queries the mask pattern.	–	√	–	√	–
:CALCulate:BIN:MODE	<BINNo.>,<ABSolute/REFerence>	Sets the judgment mode.	–	√	–	√	–
:CALCulate:BIN:MODE?	<BINNo.>(<ABSOLUTE/REFERENCE>)	Queries the judgment mode.	–	√	–	√	–
:CALCulate:BIN:UPPer	<BINNo.>,<Upper threshold>	Sets the upper threshold.	–	√	–	√	–
:CALCulate:BIN:UPPer?	<BINNo.>(<Upper threshold>)	Queries the upper threshold.	–	√	–	√	–
:CALCulate:BIN:LOWer	<BINNo.>,<Lower threshold>	Sets the lower threshold.	–	√	–	√	–
:CALCulate:BIN:LOWer?	<BINNo.>(<Lower threshold>)	Queries the lower threshold.	–	√	–	√	–
:CALCulate:BIN:REFerence	<BINNo.>,<Reference resistance>	Sets the reference resistance.	–	√	–	√	–
:CALCulate:BIN:REFerence?	<BINNo.>(<Reference resistance>)	Queries the reference resistance.	–	√	–	√	–
:CALCulate:BIN:PERCent	<BINNo.>,<Range [%]>	Sets the judgment range.	–	√	–	√	–
:CALCulate:BIN:PERCent?	<BINNo.>(<Range [%]>)	Queries the judgment range.	–	√	–	√	–
:CALCulate:BIN:RESult?	0 to 1023	Queries the comparator result.	–	√	–	√	–
Statistical Functions							
:CALCulate:STATistics:STATe	1/0/ON/OFF	Sets the statistical calculation function execution.	–	√	–	√	–
:CALCulate:STATistics:STATe?	(ON/OFF)	Queries the statistical calculation function execution.	–	√	–	√	–
:CALCulate:STATistics:CLEar	Clear Statistical Calculation Result		–	√	–	√	–
:CALCulate:STATistics:NUMBer?	(<Total data count>,<Valid data count>)	Queries the data count.	–	√	–	√	–
:CALCulate:STATistics:MEAN?	(<Mean>)	Queries the mean value.	–	√	–	√	–
:CALCulate:STATistics:MAXimum?	(<Maximum value>,<Data no.>)	Queries the maximum value.	–	√	–	√	–
:CALCulate:STATistics:MINimum?	(<Minimum value>,<Data no.>)	Queries the minimum value.	–	√	–	√	–
:CALCulate:STATistics:LIMit?	(<Hi count>,<IN count>,<Lo count>,<Measurement fault count>	Queries the comparator results.	–	√	–	√	–
:CALCulate:STATistics:BIN?	(<BIN0 count>,...,<BIN9 count>,<OUT count>, <Measurement fault count>)	Queries the BIN result.	–	√	–	√	–
:CALCulate:STATistics:DEViation?	(<σn>,<σn-1>)	Queries the standard deviation.	–	√	–	√	–

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545		RM3545A / RM3546	
					By channel		By channel
:CALCulate:STATistics:CP?	(<Cp>,<Cpk>)	Queries the process capability indices.	–	√	–	√	–
Scaling							
:CALCulate:SCALing:STATe	1/0/ON/OFF	Sets the scaling function execution.	√	√	√	√	√
:CALCulate:SCALing:STATe?	(ON/OFF)	Queries the scaling function execution.	√	√	√	√	√
:CALCulate:SCALing:PARameterA	<0.2000E-3 to 2.0000E+3>	Sets the scaling gain.	√	√	√	√	√
:CALCulate:SCALing:PARameterA?	(0.2000E-3 to 2.0000E+3)	Queries the scaling gain.	√	√	√	√	√
:CALCulate:SCALing:PARameterB	RM3544:<0.0000E-9 to ±1.0000E+9> RM3545:<0.0000E-9 to ±9.0000E+9>	Sets the scaling offset.	√	√	√	√	√
:CALCulate:SCALing:PARameterB?	RM3544: (0.0000E-9 to ±1.0000E+9) RM3545: (0.0000E-9 to ±9.0000E+9)	Queries the scaling offset.	√	√	√	√	√
:CALCulate:SCALing:UNIT	<OFF/OHM/Any unit>	Sets the scaling unit.	√	√	√	√	√
:CALCulate:SCALing:UNIT?	(OFF/OHM/Any unit)	Queries the scaling unit.	√	√	√	√	√
Temperature Conversion (ΔT)							
:CALCulate:TCONversion:DELTa:STATe	1/0/ON/OFF	Sets the temperature conversion execution.	–	√	√	√	√
:CALCulate:TCONversion:DELTa:STATe?	(ON/OFF)	Queries the temperature conversion execution.	–	√	√	√	√
:CALCulate:TCONversion:DELTa:PARameter	<Initial resistance>,<Initial temperature>,<Constant>	Sets the temperature conversion constant.	–	√	√	√	√
:CALCulate:TCONversion:DELTa:PARameter?	(<Initial resistance>,<Initial temperature>,<Constant>)	Queries the temperature conversion constant.	–	√	√	√	√
Temperature Correction (TC)							
:CALCulate:TCORrect:STATe	1/0/ON/OFF	Sets the temperature correction execution.	√	√	√	√	√
:CALCulate:TCORrect:STATe?	(ON/OFF)	Queries the temperature correction execution.	√	√	√	√	√
:CALCulate:TCORrect:PARameter	<Reference temperature>, <Temperature coefficient>	Sets the temperature correction constant.	√	√	√	√	√
:CALCulate:TCORrect:PARameter?	(<Reference temperature>, <Temperature coefficient>)	Queries the temperature correction constant.	√	√	√	√	√
Advanced Temperature Correction (A-TC) RM3546							
:ATC:TCORrect:STATe	1/0/ON/OFF	Sets the advanced temperature correction execution	–	–	–	√	√
:ATC:TCORrect:STATe?	(ON/OFF)	Queries the advanced temperature correction execution	–	–	–	√	√
:ATC:TCORrect:PARamete	<Reference temperature>, <Temperature coefficient>	Sets the constant for welding points	–	–	–	√	√
:ATC:TCORrect:PARameter?	(<Reference temperature>, <Temperature coefficient>)	Queries the constant for welding points	–	–	–	√	√
:ATC:TCONversion:DELTa:PARameter	<Resistance value>, <Reference temperature>, <Temperature coefficient>	Sets the constant for temperature measurement points	–	–	–	√	√
:ATC:TCONversion:DELTa:PARameter?	(<Resistance value>, <Reference temperature>, <Temperature coefficient>)	Queries the constant for temperature measurement points	–	–	–	√	√
:ATC:TERMinal	<Unit No>, <A Terminal Number>, <B Terminal Number>	Sets the connection for temperature measurement points	–	–	–	√	√
:ATC:TERMinal?	(<Unit No>, <A Terminal Number>, <B Terminal Number>)	Queries the connection for temperature measurement points	–	–	–	√	√
:ATC:RATE	FAST/MEDium/SLOW1/SLOW2	Sets the measurement speed for temperature measurement	–	–	–	√	√

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545		RM3545A / RM3546	
					By channel		By channel
:ATC:RATE?	(FAST/MEDium/SLOW1/SLOW2)	Queries the measurement speed for temperature measurement	–	–	–	√	√
:ATC:RANGe:AUTO	1/0/ON/OFF	Sets the AUTO range for temperature measurement	–	–	–	√	√
:ATC:RANGe:AUTO?	(ON/OFF)	Queries the AUTO range for temperature measurement	–	–	–	√	√
:ATC:RANGe	0 to 1200E+6	Sets the range for temperature measuremen	–	–	–	√	√
:ATC:RANGe?	(1000.000E-6 to 1000.000E+6)	Queries the range for temperature measuremen	–	–	–	√	√
:ATC:DELay:AUTO	1/0/ON/OFF	Sets the preset for delay time in temperature measurement	–	–	–	√	√
:ATC:DELay:AUTO?	(ON/OFF)	Queries the preset for delay time in temperature measurement	–	–	–	√	√
:ATC:DELay	<Delay time>	Sets the custom delay time for temperature measurement	–	–	–	√	√
:ATC:DELay?	(0 to 9.999)	Queries the custom delay time for temperature measurement	–	–	–	√	√
:ATC:AVERage:STATe	1/0/ON/OFF	Sets the averaging for temperature measurement	–	–	–	√	√
:ATC:AVERage:STATe?	(ON/OFF)	Queries the averaging for temperature measurement	–	–	–	√	√
:ATC:AVERage:COUNt	2 to 100	Sets the number of averages for temperature measurement	–	–	–	√	√
:ATC:AVERage:COUNt?	(2 to 100)	Queries the number of averages for temperature measurement	–	–	–	√	√
:ATC:AOVC	1/0/ON/OFF	Sets the advanced offset voltage compensation for temperature measurement	–	–	–	√	√
:ATC:AOVC?	(ON/OFF)	Queries the advanced offset voltage compensation for temperature measurement	–	–	–	√	√
:ATC:PR:STATe	1/0/ON/OFF	Sets the pure resistance mode for temperature measurement	–	–	–	√	√
:ATC:PR:STATe?	(ON/OFF)	Queries the pure resistance mode for temperature measurement	–	–	–	√	√
:ATC:CURRent	HIGH/LOW	Sets the measurement current for temperature measurement	–	–	–	√	√
:ATC:CURRent?	(1A/0.1A)	Queries the measurement current for temperature measurement	–	–	–	√	√
:ATC:CONTactcheck	1/0/ON/OFF	Sets the contact check for temperature measurement	–	–	–	√	√
:ATC:CONTactcheck?	(ON/OFF)	Queries the contact check for temperature measurement	–	–	–	√	√
:ATC:CIMProve	1/0/ON/OFF	Sets the probe contact improvement for temperature measurement	–	–	–	√	√
:ATC:CIMProve?	(ON/OFF)	Queries the probe contact improvement for temperature measurement	–	–	–	√	√

Reading measurement values of Advanced Temperature Correction (A-TC) RM3546

:ATC:FETCh?	[ATC/ATCR/R/T] <Channel Number>, (<Resistance Value /Temperature: Response differs in the data section>)	Reading the last measurement value using A-TC When data is omitted: Returns the same response as A-TC. When data is ATC: <Corrected resistance value>, <Uncorrected resistance value>, <Uncorrected temperature> When data is ATCR: <Corrected resistance value> When data is R: <Uncorrected resistance value> When data is T: <Uncorrected temperature>	–	–	–	√	√

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545	By channel	RM3545A / RM3546	By channel
:ATC:READ?	[ATC/ATCR/R/T] <Channel Number>, (<Resistance Value /Temperature: Response differs in the data section>)	Start A-TC measurement and read the measurement values after completion When data is omitted: Returns the same response as A-TC. When data is ATC: <Corrected resistance value>, <Uncorrected resistance value>, <Uncorrected temperature> When data is ATCR: <Corrected resistance value> When data is R: <Uncorrected resistance value> When data is T: <Uncorrected temperature>	–	–	–	√	√
:ATC:INITiate		Start A-TC Measurement	–	–	–	√	√
LCD Settings							
:DISPlay:CONTrast	<0 to 100>	Sets the contrast.	√	√	-	√	-
:DISPlay:CONTrast?	(0 to 100)	Queries the contrast.	√	√	-	√	-
:DISPlay:BACKlight	<0 to 100>	Sets the backlight brightness.	√	√	-	√	-
:DISPlay:BACKlight?	(0 to 100)	Queries the backlight brightness.	√	√	-	√	-
Memory Function							
:MEMory:STATe	1/0/ON/OFF	Sets the memory mode.	–	√	-	√	-
:MEMory:STATe?	(ON/OFF)	Queries the memory mode.	–	√	-	√	-
:MEMory:CLEar		Clears the memory data.	–	√	-	√	-
:MEMory:COUNt?	(0 to 50)	Queries the number of measurements stored in memory.	–	√	-	√	-
:MEMory:DATA?	<Measurement value>,<Measurement value>,...,<Measurement value>	Reads the measurements stored in memory.	–	√	-	√	-
Hold							
[:SENSe:]HOLD:AUTO	1/0/ON/OFF	Sets the auto hold execution.	√	√	–	√	–
[:SENSe:]HOLD:AUTO?	(ON/OFF)	Queries the auto hold execution.	√	√	–	√	–
[:SENSe:]HOLD:STATe?	(ON/OFF)	Queries the hold state.	√	√	–	√	–
[:SENSe:]HOLD:OFF		Cancels hold.	√	√	–	√	–
Multiplexer Settings							
[:SENSe:]WIRE	4/2/W4/W2	Sets the measurement method.	–	√	–	√	–
[:SENSe:]WIRE?	(W4/W2)	Queries the measurement method.	–	√	–	√	–
[:SENSe:]SCAN:MODE	OFF/AUTO/STEP	Sets the scanning function.	–	√	–	√	–
[:SENSe:]SCAN:MODE?	(OFF/AUTO/STEP)	Queries the scanning function.	–	√	–	√	–
[:SENSe:]SCAN:STATe?	(1/0)	Queries the scanning execution state.	–	√	–	√	–
[:SENSe:]SCAN:RESet		Initializes the scan channel and measured value or judgment value.	–	√	–	√	–
[:SENSe:]SCAN:FAIL:STOP	1/0/ON/OFF	Sets the scan fail stop.	–	√	–	√	–
[:SENSe:]SCAN:FAIL:STOP?	(ON/OFF)	Queries the scan fail stop.	–	√	–	√	–
[:SENSe:]SCAN:DATA?	<Measured value>,<Measured value> …,<Measured value>	Reads the scanned measured data in a batch.	–	√	–	√	–
[:SENSe:]FRONtcheck?	(1/0)	Queries the front measurement terminal connection.	–	√	–	√	–
[:SENSe:]CH	FRONt/0/<Channel number>	Sets the channel switching.	–	√	–	√	–
[:SENSe:]CH?	(FRONT/<Channel number>)	Queries the channel switching.	–	√	–	√	–
[:SENSe:]CH:STATe	<1/0/ON/OFF>,[<Channel number>]	Sets the channel for the multiplexer to be used (execution error when the front measurement terminal is used).	–	√	√	√	√
[:SENSe:]CH:STATe?	[<Channel number>] (ON/OFF)	Queries the channel for the multiplexer to be used (execution error when the front measurement terminal is used).	–	√	√	√	√
[:SENSe:]CH:AVAilable?	(Number of channels)	Queries the number of channels for the multiplexer to be used.	–	√	–	√	–

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545		RM3545A / RM3546	
					By channel		By channel
[:SENSe:]INSTrument	INTernal/EXTernal	Sets the use of external equipment (execution error when the front measurement terminal is used).	–	√	√	√	√
[:SENSe:]INSTrument?	(INTERNAL/EXTERNAL)	Queries the use of external equipment (execution error when the front measurement terminal is used).	–	√	√	√	√
[:SENSe:]TERMinal	<Unit number>,<A terminal number>,<B terminal number>	Sets the allocation of terminals for the multiplexer (the current flows from terminal B to terminal A, execution error when the front measurement terminal is used).	–	√	√	√	√
[:SENSe:]TERMinal?	(<Unit number>,<A terminal number>,<B terminal number>)	Queries the allocation of terminals for the multiplexer (the current flows from terminal B to terminal A, execution error when the front measurement terminal is used).	–	√	√	√	√
Multiplexer Channel Reset							
[:SENSe:]CHReset		Resets the multiplexer channel settings including the measurement conditions.	–	√	–	√	–
Low-Power Resistance Measurement							
[:SENSe:]RESistance:LP:STATe	1/0/ON/OFF	Sets the Low-Power Resistance measurement.	–	√	√	√	√
[:SENSe:]RESistance:LP:STATe?	(ON/OFF)	Queries the Low-Power Resistance measurement.	–	√	√	√	√
Pure Resistance Measurement							
[:SENSe:]RESistance:PR:STATe	1/0/ON/OFF	Sets the Pure Resistance measurement.	–	–	–	√	√
[:SENSe:]RESistance:PR:STATe?	(ON/OFF)	Queries the Pure Power Resistance measurement.	–	–	–	√	√
Measurement Range							
[:SENSe:]RESistance:RANGe	RM3544:0 to 3.5E+6 RM3545/RM3545A/RM3546 :0 to 1200E+6	Sets the resistance measurement range.	√	√	√	√	√
[:SENSe:]RESistance:RANGe?	RM3544:(30.000E-3 to 3.0000E+6) RM3545:(10.00000E-3 to 1000.0000E+6) RM3545A/RM3546:(1000.000E-6 to 1000.0000E+6)	Queries the resistance measurement range.	√	√	√	√	√
[:SENSe:]RESistance:RANGe:AUTO	1/0/ON/OFF	Sets the resistance measurement AUTO range.	√	√	√	√	√
[:SENSe:]RESistance:RANGe:AUTO?	(ON/OFF)	Queries the resistance measurement AUTO range.	√	√	√	√	√
[:SENSe:]RESistance:LP:RANGe	0 to 1000E+0	Sets the Low-Power Resistance measurement range.	–	√	√	√	√
[:SENSe:]RESistance:LP:RANGe?	(1000.00E-3 to 1000.00E+0)	Queries the Low-Power Resistance measurement range.	–	√	√	√	√
100MΩ Range High Precision Function							
[:SENSe:]RESistance:PRECision	1/0/ON/OFF	Sets the 100MΩ range high precision function.	–	√	√	√	√
[:SENSe:]RESistance:PRECision?	(ON/OFF)	Queries the 100MΩ high precision function.	–	√	√	√	√
Switching Measurement Current							
[:SENSe:]RESistance:CURRent	HIGH/LOW	Sets the measurement current.	–	√	√	√	√
[:SENSe:]RESistance:CURRent?	(HIGH/LOW)	Queries the measurement current.	–	√	√	√	√
Offset Voltage Compensation Function (OVC)							
[:SENSe:]RESistance:OVC	1/0/ON/OFF	Sets the Offset Voltage compensation function execution.	–	√	√	√	√
[:SENSe:]RESistance:OVC?	(ON/OFF)	Queries the Offset Voltage Compensation function execution.	–	√	√	√	√

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545	By channel	RM3545A / RM3546	By channel
Advanced Offset Voltage Compensation Function (A-OVC) RM3546							
[:SENSe:]RESistance:AOVC	1/0/ON/OFF	Sets the Advanced Offset Voltage Compensation function execution.	–	–	–	√	√
[:SENSe:]RESistance:AOVC?	(ON/OFF)	Queries the Advanced Offset Voltage Compensation function execution.	–	–	–	√	√
Contact Improver							
[:SENSe:]RESistance:CIMProve	ON/OFF/1/0	Sets the Contact Improver.	–	√	√	√	√
[:SENSe:]RESistance:CIMProve?	(ON/OFF)	Queries the Contact Improver.	–	√	√	√	√
Current Error Mode							
[:SENSe:]RESistance:ERRor:CURRentcheck	ERRor/OVER	Sets the current error mode.	√	√	√	√	√
[:SENSe:]RESistance:ERRor:CURRentcheck?	(ERRor/OVER)	Queries the current error mode.	√	√	√	√	√
[:SENSe:]RESistance:ERRor:OVER	ERRor/NORMal	Setting the overrange external Err terminal	–	–	–	√	–
[:SENSe:]RESistance:ERRor:OVER?	(ERRor/NORMal)	Queries the overrange external Err terminal	–	–	–	√	–
Contact Check							
[:SENSe:]RESistance:CONTactcheck	ON/OFF/1/0	Sets the resistance measurement contact check.	–	√	√	√	√
[:SENSe:]RESistance:CONTactcheck?	(ON/OFF)	Queries the resistance measurement contact check.	–	√	√	√	√
[:SENSe:]RESistance:LP:CONTactcheck	ON/OFF/1/0	Sets the Low-Power Resistance measurement contact check.	–	√	√	√	√
[:SENSe:]RESistance:LP:CONTactcheck?	(ON/OFF)	Queries the Low-Power Resistance measurement contact check.	–	√	√	√	√
Setting Number of Digits							
[:SENSe:]RESistance:DIGits	RM3544:4/5 RM3545/RM3545A/RM3546:5/6/7	Sets the measurement value's number of digits.	√	√	–	√	–
[:SENSe:]RESistance:DIGits?	RM3544:(4/5) RM3545/RM3545A/RM3546:(5/6/7)	Queries the measurement value's number of digits.	√	√	–	√	–
Temperature Measurement (Analog Input)							
[:SENSe:]TEMPerature:SENSor	THERmistor/ANALog	Sets the temperature sensor.	–	√	–	√	–
[:SENSe:]TEMPerature:SENSor?	(THERMISTOR/ANALOG)	Queries the temperature sensor.	–	√	–	√	–
[:SENSe:]TEMPerature:PARameter	<V1>,<T1>,<V2>,<T2>	Sets the analog input scaling constants.	–	√	–	√	–
[:SENSe:]TEMPerature:PARameter?	(<V1>,<T1>,<V2>,<T2>)	Queries the analog input scaling constants.	–	√	–	√	–
Trigger							
:INITiate:CONTinuous	1/0/ON/OFF	Sets the continuous measurement.	√	√	–	√	–
:INITiate:CONTinuous?	(ON/OFF)	Queries the continuous measurement.	√	√	–	√	–
:INITiate[:IMMediate]		Initiates the trigger wait state.	√	√	–	√	–
:TRIGger:SOURce	IMMediate/EXTernal	Sets the trigger source.	√	√	–	√	–
:TRIGger:SOURce?	(IMMEDIATE/EXTERNAL)	Queries the trigger source.	√	√	–	√	–
:TRIGger:EDGE	1/0/ON/OFF	Sets the trigger logic (ON edge/OFF edge).	√	√	–	√	–
:TRIGger:EDGE?	(ON/OFF)	Queries the trigger logic (ON edge/OFF edge).	√	√	–	√	–
Delay							
:TRIGger:DELay	<Delay time>	Sets the delay time.	–	√	√	√	√
:TRIGger:DELay?	(0 to 9.999)	Queries the delay time.	–	√	√	√	√
:TRIGger:DELay:AUTO	1/0/ON/OFF	Sets the preset delay.	–	√	√	√	√
:TRIGger:DELay:AUTO?	(ON/OFF)	Queries the preset delay.	–	√	√	√	√
Self-Calibration							
:SYSTem:CALibration		Executes self-calibration.	–	√	–	√	–
:SYSTem:CALibration:AUTO	1/0/ON/OFF	Sets the automatic self-calibration.	–		–		–
:SYSTem:CALibration:AUTO?	(ON/OFF)	Queries the automatic self-calibration.	–	√	–	√	–

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545	By channel	RM3545A / RM3546	By channel
Saving and Reading Measurement Conditions							
:SYSTem:PANel:SAVE	<TableNo>	Saves the panel.	√	√	–	√	–
:SYSTem:PANel:LOAD	<TableNo>,<Zero adjustment load=1/0/ON/OFF>	Reads the panel.	√	√	–	√	–
:SYSTem:PANel:NAME	<TableNo>,<Panel name>	Sets the panel name.	√	√	–	√	–
:SYSTem:PANel:NAME?	<TableNo> (<Panel name>)	Obtains the panel name.	√	√	–	√	–
:SYSTem:PANel:CLEar	<TableNo>	Clears the panel.	√	√	–	√	–
Absolute Value Display							
:SYSTem:ABSolute	1/0/ON/OFF	Sets for absolute value display	–	–	–	√	–
:SYSTem:ABSolute?	(ON/MENU/OFF)	Queries for absolute value display	–	–	–	√	–
Key-Lock							
:SYSTem:KLOCk	1/0/ON/OFF	Sets the key-lock.	√	√	–	√	–
:SYSTem:KLOCk?	(ON/MENU/OFF)	Queries the key-lock.	√	√	–	√	–
Line Frequency							
:SYSTem:LFRequency	AUTO/50/60	Sets the AC line frequency.	√	√	–	√	–
:SYSTem:LFRequency?	(AUTO/50/60)	Queries the AC line frequency.	√	√	–	√	–
Clock							
:SYSTem:DATE	<Year>,<Month>,<Day>	Sets the system date.	–	√	–	√	–
:SYSTem:DATE?	(<Year>,<Month>,<Day>)	Queries the system date.	–	√	–	√	–
:SYSTem:TIME	<Hour>,<Minute>,<Second>	Sets the system time.	–	√	–	√	–
:SYSTem:TIME?	(<Hour>,<Minute>,<Second>)	Queries the system time.	–	√	–	√	–
Key Beeper							
:SYSTem:BEEPer:STATe	1/0/ON/OFF	Sets the key beeper.	√	√	–	√	–
:SYSTem:BEEPer:STATe?	(ON/OFF)	Queries the key beeper.	√	√	–	√	–
Communications Settings							
:SYSTem:LOCal		Enables the local control state.	√	√	–	√	–
:SYSTem:DATAout	1/0/ON/OFF	Sets the measurement-synchronized data output.	√	√	–	√	–
:SYSTem:DATAout?	(ON/OFF)	Queries the measurement-synchronized data output.	√	√	–	√	–
:SYSTem:HEADer	1/0/ON/OFF	Sets the header presence.	√	√	–	√	–
:SYSTem:HEADer?	(ON/OFF)	Queries the header presence.	√	√	–	√	–
:SYSTem:TERMinator	0/1	Sets the command delimiter.	–	√	–	√	–
:SYSTem:TERMinator?	(0/1)	Queries the command delimiter.	–	√	–	√	–
:SYSTem:COMMunicate	USB/LAN/RS232c/PRINter	Sets the Communication interface	–	–	–	√	–
:SYSTem:COMMunicate?	(USB/LAN/RS232C/PRINRER)	Queries the Communication interface	–	–	–	√	–
:SYSTem:COMMunicate:MONitor	1/0/ON/OFF	Sets the Communication monitor	–	–	–	√	–
:SYSTem:COMMunicate:MONitor?	(ON/OFF)	Queries the Communication monitor	–	–	–	√	–
:SYSTem:COMMunicate:LAN:IPADdress	IP address	Sets the IP address	–	–	–	√	–
:SYSTem:COMMunicate:LAN:IPADdress?	(IP address)	Queries the IP address	–	–	–	√	–
:SYSTem:COMMunicate:LAN:SMASk	Sub-net mask	Sets the Sub-net mask for LAN	–	–	–	√	–
:SYSTem:COMMunicate:LAN:SMASk?	(Sub-net mask)	Queries the Sub-net mask for LAN	–	–	–	√	–
:SYSTem:COMMunicate:LAN:GATeway	Gateway	Sets the Gateway for LAN	–	–	–	√	–
:SYSTem:COMMunicate:LAN:GATeway?	(Gateway)	Queries the Gateway for LAN	–	–	–	√	–
:SYSTem:COMMunicate:LAN:CONTrol	Port NO.	Sets the LAN port number	–	–	–	√	–
:SYSTem:COMMunicate:LAN:CONTrol?	(Port NO.)	Queries the LAN port number	–	–	–	√	–
:SYSTem:COMMunicate:LAN:MAC?	(MAC address)	Queries the MAC address for LAN	–	–	–	√	–
:SYSTem:COMMunicate:LAN:UPDate		Update LAN settings	–	–	–	√	–

Message [ ]: Omissible	Data Formats [ ]: Omissible ( ): Response data	Description	Corresponding Model				
			RM 3544	RM3545	By channel	RM3545A / RM3546	By channel
:SYSTem:COMMunicate:RS232C:SPEED	Baud rate	Sets the RS-232C communication speed	-	-	-	√	-
:SYSTem:COMMunicate:RS232C:SPEED?	(9600/19200/38400/115200)	Queries the RS-232C communication speed	-	-	-	√	-
System Reset							
:SYSTem:RESet	Baud rate	Executes reset, including the saved data on measurement conditions.	√	√	–	√	–
EXT I/O							
:IO:MODE?	(NPN/PNP)	Queries the NPN/PNP switch status.	√	√	–	√	–
:IO:INPut?	(0 to 3)	Executes the external I/O input.	√	√	–	√	–
:IO:OUTPut	0 to 7	Executes the external I/O output.	√	√	–	√	–
:IO:FILTer:STATe	1/0/ON/OFF	Sets the TRIG/PRINT signal filter function execution.	√	√	–	√	–
:IO:FILTer:STATe?	(ON/OFF)	Queries the TRIG/PRINT signal filter function execution.	√	√	–	√	–
:IO:FILTer:TIME	<0.050 to 0.500>	Sets the TRIG/PRINT signal filter time.	√	√	–	√	–
:IO:FILTer:TIME?	(0.050 to 0.500)	Queries the TRIG/PRINT signal filter time.	√	√	–	√	–
:IO:JUDGe:MODE	JUDGe/BCD	Selects the judgment mode/BCD mode.	√	√	–	√	–
:IO:JUDGe:MODE?	(JUDGE/BCD)	Queries the judgment mode/BCD mode.	√	√	–	√	–
:IO:EOM:MODE	<HOLD/PULSe>	Sets the EOM output mode.	√	√	–	√	–
:IO:EOM:MODE?	(<HOLD/PULSE>)	Queries the EOM output mode.	√	√	–	√	–
:IO:EOM:PULSe	<Pulse width>	Sets the EOM pulse width.	√	√	–	√	–
:IO:EOM:PULSe?	(0.001 to 0.100)	Queries the EOM pulse width.	√	√	–	√	–
Multiplexer Unit							
:UNIT:IDN?	<Unit number> (<Model name>,<Serial number>)	Queries the unit.	–	√	–	√	–
:UNIT:SCOunt?	<Unit number> (<Relay count>)	Queries the relay usage count.	–	√	–	√	–
:UNIT:TEST?	<Unit number> (<0 to 8>)	Queries the unit test and result.	–	√	–	√	–

3 Message Reference

Message Reference Interpretation

< >: Indicates the contents (character or numeric parameters) of the data portion of a message. Character parameters are returned as all capital letters.

Numeric Parameters:

- NRf Number format may be any of NR1, NR2 and NR3
- NR1 Integer data (e.g.: +12, -23, 34)
- NR2 Fixed-point data (e.g.: +1.23, -23.45, 3.456)
- NR3 Floating-point exponential representation data (e.g.: +1.0E-2, -2.3E+4)

Shows the command description.

Shows the message syntax. Explains the command data or response message. Describes the message.

Shows an example of an actual command application. (Normally described with HEADER OFF [except the HEADER command itself].)

Read/Write the Standard Event Status Enable Register (SESER)

Syntax

Command: **∗ESE** <0 to 255 (NR1)>

Query: **∗ESE?**

Response: <0 to 255 (NR1)>

Description

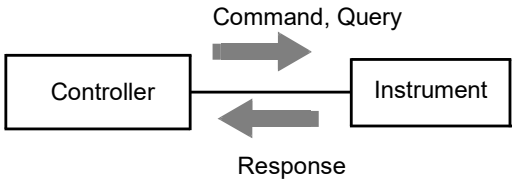
Command: The SESER mask is set to the numerical value 0 to 255. The initial value (at power-on) is 0.

Query: The contents of the SESER, as set by the ∗ESE command, are returned as an NR1 value (0 to 255).

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC

Example **∗ESE 36**

(Sets bits 5 and 2 of SESER)



Standard Commands

(1) System Data Command

Query Device ID (Identification Code)

Syntax Query ***IDN?**

Response <Manufacturer name>,<Model name>,<Serial number>,<Software version>

Example
*IDN?
HIOKI,RM3545,123456789,V1.00
The Device ID is HIOKI RM3545, 123456789, software version 1.00. The <Model name> includes the following devices in addition to the example RM3544-01, RM3545-01, RM3545-02, RM3545A-1, RM3545A-2 and RM3546.

Note The response message has no header.

(2) Internal Operation Command

Initialize Device

Syntax Command ***RST**

Description Command Resets the instrument to its initial state.

Note The communications state is not initialized.
RM3545 RM3545A RM3546 An execution error occurs during scanning.

Execute Self-Test and Query Result

Syntax Query ***TST?**

Response <0 to 15 (NR1)>

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
unused	unused	unused	unused	Blown FUSE	memory	CPU RAM	CPU ROM

Description Perform the instrument self-test and return the result as NR1 value 0 to 15.
Returns zero when no error occurs.

Example
*TST?
4
A memory error occurred. Correct measurement may not be possible. Obtain repair before further use.

Note RM3545 RM3545A RM3546 An execution error occurs during scanning.

(3) Synchronization Commands

Set OPC bit of SESR when Finished with All Pending Operations

Syntax Command **∗OPC**

Description Sets OPC bit 0 of the Standard Event Status Register (SESR) when all commands prior to ∗OPC have finished processing.

Respond with ASCII "1" when Finished with All Pending Operations

Syntax Query **∗OPC?**

Response **1**

Description Responds with ASCII "1" when all commands prior to ∗OPC have finished processing.

Wait for Pending Commands to Finish

Syntax Command **∗WAI**

Description The instrument waits until all prior commands finish before executing any subsequent commands.

(4) Status and Event Control Commands

Clear Event Register, Status Byte Register (Except Output Queue)

Syntax Command **∗CLS**

Description Clears the event status registers. The Status Byte Register bits corresponding to the event status registers are also cleared. (SESR, ESR0, ESR1)

Note [RS-232C/USB/LAN] The output queue is unaffected.

[GP-IB] The output queue, various enable registers and MAV bit 4 of the Status Byte Register are unaffected.

Read/Write Standard Event Status Enable Register (SESER)

Syntax Command **∗ESE** <0 to 255 (NR1)>

Query **∗ESE?**

Response <0 to 255 (NR1)>

Description Command The SESER mask is set to the numerical value 0 to 255. The initial value (at power-on) is 0.

Query The contents of the SESER, as set by the ∗ESE command, are returned as an NR1 value (0 to 255).

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC

Example ∗ESE 36

(Sets bits 5 and 2 of SESER)

Read and Clear Standard Event Status Register (SESR)

Syntax

Query ***ESR?**

Response <0 to 255 (NR1)>

Description

Returns the contents of the SESR as an NR1 value from 0 to 255, then clears register contents.

The response message has no header.

[RS-232C/USB/LAN]

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
PON	unused	CME	EXE	DDE	QYE	unused	OPC

[GP-IB]

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
PON	URQ	CME	EXE	DDE	QYE	RQC	OPC

Example

*ESR?

32

Bit 5 of the SESR has been set to 1.

Write and Read Standard Event Status Enable Register (SRER)

Syntax

Command ***SRE** <0 to 255 (NR1)>

Query ***SRE?**

Response <0 to 255 (NR1)>

Description

Command: The SRER mask is set to the numerical value 0 to 255.
Although NRf numerical values are accepted, values to the right of the decimal are rounded to the nearest integer.
Bit 6 and unused bits 2, 3 and 7 are ignored. The data is initialized to zero at power-on.

Query: The contents of the SRER, as set by the *SRE command, are returned as an NR1 value (0 to 255). Bit 6 and unused bits 2, 3 and 7 always return as zero.

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
unused	0	ESB	MAV	unused	unused	ESB1	ESB0

Example

*SRE

33

Set SRER bits 0 and 5 to 1.

*SRE?

33

SRER bits 0 and 5 have been set to 1.

Read Status Byte and MSS Bit

Syntax

Query **∗STB?**

Response <0 to 255 (NR1)>

Description

The contents of the STB are returned as an NR1 value (0 to 255).
The response message has no header.

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
unused	MSS	ESB	MAV	unused	unused	ESB1	ESB0

Example

∗STB?
16
STB bit 4 has been set to 1.

Request a Sample

Syntax

Command **∗TRG**

Description

Performs one measurement when external triggering (trigger source <EXTERNAL>) is enabled.
When Statistical Calculation is ON, imports calculation data. RM3545 RM3545A RM3546
When the memory function is enabled, the measured value is stored. RM3545 RM3545A RM3546
It may be necessary to insert wait processing after panel load or range selection. Wait time depends on Measurement target.

Example

:TRIG:SOUR EXT;∗TRG

Device-Specific Commands

(1) Event Status Register

Set and Query Device-Specific Event Status Enable Register ESER0

Syntax

Command **:ESE0** <0 to 255 (NR1)>

Query **:ESE0?**

Response <0 to 255 (NR1)>

Description

Command

Sets the mask pattern in Event Status Enable Register 0 (ESER0) for the Event Status Register.

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
OutBIN	OvrRng	ERR	Hi	IN	Lo	INDEX	EOM

Note

Data initializes to zero at power-on.
OvrRng and ERR can not be Changed by RES:ERR:CURR OVER.

Read Device-Specific Event Status Register ESR0

Syntax

Query :ESR0?

Response <0 to 255 (NR1)>

Note Executing ESR0? clears the contents of ESR0.

Set and Query Device-Specific Event Status Enable Register ESER1 RM3545 RM3545A RM3546

Syntax

Command :ESE1 <0 to 255 (NR1)>

Query :ESE1?

Response <0 to 255 (NR1)>

Description

Command Sets the mask pattern in Event Status Enable Register 1 (ESER1) for the Event Status Register.

128	64	32	16	8	4	2	1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
unused	unused	PROT	NO UNIT	SW.ERR	CURR	CONTACT A	CONTACT B

Overvoltage Protection: PROT (bit 5) is only for RM3546.

Data initializes to zero at power-on.

Read Device-Specific Event Status Registers ESR1 RM3545 RM3545A RM3546

Syntax

Query :ESR1?

Response <0 to 255 (NR1)>

Note Executing ESR1? clears the contents of ESR1.

(2) Reading Measured Values

Measurement Value Formats

・Resistance (absolute value display: unit Ω)

RM3544

Measurement Range	Measured Value	±OvrRng	Measurement Fault
30mΩ	± □□ . □□□ E-03	±10.000E+19	10.000E+29
300mΩ	± □□□ . □□ E-03	±100.00E+18	100.00E+28
3Ω	± □. □□□□ E+00	±1.0000E+20	1.0000E+30
30Ω	± □□. □□□ E+00	±10.000E+19	10.000E+29
300Ω	± □□□. □□ E+00	±100.00E+18	100.00E+28
3kΩ	± □. □□□□ E+03	±1.0000E+20	1.0000E+30
30kΩ	± □□. □□□ E+03	±10.000E+19	10.000E+29
300kΩ	± □□□. □□ E+03	±100.00E+18	100.00E+28
3MΩ	± □. □□□□ E+06	±1.0000E+20	1.0000E+30

RM3545 RM3545A RM3546

Low-Power	Measurement Range	Measured Value	±OvrRng	Measurement Fault
OFF	1000μΩ	± □□□□ . □□□ E-06	±1000.000E+17	1000.000E+27
	10mΩ	± □□ . □□□□□ E-03	±10.00000E+19	10.00000E+29
	100mΩ	± □□□ . □□□□ E-03	±100.0000E+18	100.0000E+28
	1000mΩ	± □□□□ . □□□ E-03	±1000.000E+17	1000.000E+27
	10Ω	± □□ . □□□□□ E+00	±10.00000E+19	10.00000E+29
	100Ω	± □□□ . □□□□ E+00	±100.0000E+18	100.0000E+28
	1000Ω	± □□□□ . □□□ E+00	±1000.000E+17	1000.000E+27
	10kΩ	± □□ . □□□□□ E+03	±10.00000E+19	10.00000E+29
	100kΩ	± □□□ . □□□□ E+03	±100.0000E+18	100.0000E+28
	1000kΩ	± □□□□ . □□□ E+03	±1000.000E+17	1000.000E+27
	10MΩ	± □□ . □□□□□ E+06	±10.00000E+19	10.00000E+29
	100MΩ	± □□□ . □□□□ E+06	±100.0000E+18	100.0000E+28
	1000MΩ	± □□□□ . □□□ E+06	±1000.000E+17	1000.000E+27
ON	1000mΩ	± □□□□ . □□ E-03	±1000.00E+17	1000.00E+27
	10Ω	± □□ . □□□□ E+00	±10.0000E+19	10.0000E+29
	100Ω	± □□□ . □□□ E+00	±100.000E+18	100.000E+28
	1000Ω	± □□□□ . □□ E+00	±1000.00E+17	1000.00E+27

Note: • The decimal point position and exponent part will change according to the scaling gain.
For information on scaling, see the instrument's instruction manual.
• When the displayed number of digits has changed, the undisplayed digits will become 0. The number of characters in the measurement value format will not change.
• 1000μΩ range are only available in RM3545A and RM3546.

• Resistance (relative value display: unit %)

RM3544

Measured Value	±OvrRng	Measurement Fault
± □□□ . □□ E+00	±100.00E+18	100.00E+28

RM3545 RM3545A RM3546

Measured Value	±OvrRng	Measurement Fault
± □□□ . □□□ E+00	±100.000E+18	100.000E+28

• Temperature / Temperature conversion display (unit °C)

Z2001 temperature sensor

Measured Value	±OvrRng	Measurement Fault
± □□ . □ E+00	±10.0E+19	10.0E+29

Analog output thermometer
Temperature conversion display

Measured Value	±OvrRng	Measurement Fault
± □□□ . □ E+00	±100.0E+18	100.0E+28

Note: For positive measured values, a space (ASCII 20H) represents the sign.

Time to receive measured values is different for the :FETCh? and :READ? commands.
See: Data Exporting Methods (p.80), Triggering (p.62)
Also see “4 Multiplexer Commands (p.76)” for the multiplexer unit.

Read Most Recent Measurement

Syntax

Query

:FETCh? [LIMit] RM3544

:FETCh? [<LIMit/JUDGe/LIMJUdge>,]
[<Channel number>] RM3545 RM3545A RM3546
<Channel number> = 1 to 42

Response

RM3544
<Measurement value> [, <HI/IN/LO/OFF/ERR>]
RM3545 RM3545A RM3546
<Measurement value> [, <HI/IN/LO/OFF/ERR>]
[, <PASS/FAIL/OFF/ERR>]
See: “Measurement Value Formats” (p.28)

Description

Reads the most recent measurement. No trigger occurs.
See: Data Exporting Methods (p.80), Triggering (p.62)
Data and response are as follows.

data	Response
omitted	Reads the measurement value only.
LIMit	Reads the measurement value and comparator result.
JUDGe RM3545	Reads the measurement value and PASS/FAIL result.
LIMJdge RM3545 RM3545A RM3546	Reads the measurement value, comparator result and PASS/FAIL result.

RM3545 RM3545A RM3546
By assigning a channel number to the data, the value of the channel number is read. If a measurement has not been performed, the value for a measurement fault is returned. The channel number is not returned. If the channel number is omitted, the measured value of the current channel is read.

The correspondence between “Judgment” and their response is as follows.

Judgment	Response
Hi	HI
IN	IN
Lo	LO
Comparator not used	OFF
Measurement Fault	ERR

Example

(RM3544 examples)
```
:FETC?
102.50E-03
:FETC? LIM
102.50E-03, HI
```
(RM3545 ,RM3545A, RM3546 examples)
```
:FETC?
1023.579E-03
:FETC? LIM
1023.579E-03, IN
```
(Examples when the RM3545-02 multiplexer is used)
```
:FETC?              ... Obtains the measured value of the current channel.
 1023.579E-03
:FETC? LIMJ         … Obtains the current measured value and judgment.
 1023.579E-03,IN,PASS
:FETC? 10           …Obtains the measured value of Channel 10.
 1023.579E-00
:FETC? LIMJ,10      …Obtains the measured value of Channel 10 and judgment.
1023.579E-03,IN,PASS
```

Note

If a measurement has not been performed, the value for a measurement fault is returned. RM3545 RM3545A RM3546

In the following cases, an execution error occurs.
- When the front terminal is used or the scanning function is OFF, JUDGe or LIMJdge is selected as the data.
- When the front terminal is used, a channel number is specified for the data.
- During auto scanning

Read Temperature Measurement Value

Syntax

Query **:FETCh:TEMPerature?**

Response <Measurement value>

See: "Measurement Value Formats" (p.28)

Description

Reads the last (most recent) temperature measurement value.
Performs the same operation as :MEASure:TEMPerature?.

Example

```
:FETC:TEMP?
 25.1E+00
```

Measure (Await Triggers and Read Measurements)

Syntax

Query **:READ?** RM3544

:READ? [<NDATa/JUDGe>] RM3545 RM3545A RM3546

Response RM3544 <Measurement value>

RM3545 RM3545A RM3546

The response varies depending on the scanning function or command data portion. Data and response are as follows.

Scanning function	Data	Response
OFF	None	Reads the measured value only. <Measured value>
AUTO	Omitted	Reads only the measured values of all channels. <Measured value>,<Measured value>, …<Measured value>
	NDATa	Reads the total judgment only. <Total judgment result>
	JUDGe	Reads the measured values and total judgment results of all channels. <Measured value>,<Measured value>,…<Measured value>,<Total judgment result>
STEP	None	Reads only the measured value of the current channel. <Measured value>

<Total judgment result> = <PASS/FAIL/OFF/ERR>

See: "Measurement Value Formats" (p.28)

Description

Switches from the Idle State to the Trigger Wait State, then reads the next measured value. With the auto range enabled, the most suitable range is selected before measurement.

See: "5 Data Exporting Methods" (p.80), Triggering (p.62)

Trigger Source	Operation
IMMediate	Triggers and reads the measured value.
EXTernal	Triggers by TRIG signal input, and continuously reads the measured values.

RM3545 RM3545A RM3546

When the scanning function is set to AUTO or STEP, the Trigger Wait State is entered and scanning begins after a trigger is detected.
The following operations are performed according to the scanning function.

Scanning function	Operation
AUTO	All channels are measured when a trigger is received. After all the channels are measured, a response is returned. The measured values at the time of scanning completion are separated by commas (",") and returned. Only the data with [:SENSe:]STATe ON is returned. The number of data items is the same as the channel count that can be obtained using a [:SENSe:]CH:AVAilable? query. If a measurement has not been performed, the value for a measurement fault is returned.
STEP	One channel is measured when a trigger is received. A response is returned after one channel is measured.

Note

- Automatically switches to :INITiate:CONTinuous OFF when this message is received.
- The next command does not execute until measurement is finished. However, *TRG and :ABORt are received.
- If a trigger is input with the *TRG command, an external trigger (trigger source <EXTERNAL>) is enabled and a command is sent. With GP-IB, after the command is sent and then after allowing a wait time corresponding to the sampling time, specify the talker.
- With an external trigger (trigger source <EXTERNAL>), the measurement value's response will be doubled when the data output function is ON. When using, switch the data output function OFF.
- It may be necessary to insert wait processing after panel load or range selection. Wait time depends on Measurement target.
- RM3545 RM3545A RM3546 An execution error occurs during auto scanning.

Resistance Measurement in the range corresponding to expected measurement values RM3545 RM3545A RM3546

Syntax

Query **:MEASure:RESistance?** <Expected measurement value>
<Expected measurement value> = 0 to 1200E+06
Response <Measurement value>
See: “Measurement Value Formats” (p.28)

Description

When an expected measurement value is specified, the corresponding measurement range will be set. When no values are specified, the device will operate in auto-ranging.

The MEASURE command operates as follows:

1. Disables continuous measurement of the trigger system.
2. Enables the internal trigger (trigger source <IMMEDIATE>).
3. Switches Low-Power Resistance measurement to OFF.
4. Moves to the specified range.
5. Executes one-time trigger.
6. Reads the measurement value.

The MEASURE command executes the following commands internally:
RES:LP:STAT OFF
RES:RANG <Expected measurement value>
(If the <Expected measurement value> is not present, then :RANG:AUTO ON)
:INIT:CONT OFF
:TRIG:SOUR IMM
:READ?

Example

```
:MEAS:RES?
  150.1124E+03
```

Note

- When the scaling function is being used, set the <expected value> to the value that existed prior to scaling (value in the range being used).
- If a transformer, coil, or other sample is inductive, measurement data may be returned before values have stabilized in auto range. In this case, either specify the range and measure, or utilize the delay function.
- An execution error occurs when the auto range is turned ON if the comparator function and BIN measurement function are ON.
- When the scanning function is set to STEP or AUTO, an execution error occurs.

Low-Power Resistance Measurement in the range corresponding to expected measurement values. RM3545 RM3545A RM3546

Syntax

Query **:MEASure:RESistance:LP?** <Expected measurement value>

<Expected measurement value> = 0 to1200E+00

Response <Measurement value>

See: "Measurement Value Formats" (p.28)

Description

When an expected measurement value is specified, the corresponding measurement range will be set. When no values are specified, the device will operate in auto-ranging.

The MEASURE command operates as follows:

1. Disables continuous measurement of the trigger system.
2. Enables internal trigger (trigger source <IMMEDIATE>).
3. Switches Low-Power Resistance measurement to ON.
4. Moves to the specified range.
5. Executes one-time trigger.
6. Reads the measurement value.

The MEASURE command executes the following commands internally:

RES:LP:STAT ON
RES:LP:RANG <Expected measurement value>
(If the <Expected measurement value> is not present, then :RANG:LP:AUTO ON)
:INIT:CONT OFF
:TRIG:SOUR IMM
:READ?

Example

```
:MEAS:RES:LP?
 104.140E+00
```

Note

- When the scaling function is being used, set the <expected value> to the value that existed prior to scaling (value in the range being used).
- If a transformer, coil, or other sample is inductive, measurement data may be returned before values have stabilized in auto range. At such time, either specify the range and measure, or utilize the delay function.
- An execution error occurs when the auto range is turned ON if the comparator function and BIN measurement function are ON.
- When the scanning function is set to STEP or AUTO, an execution error occurs.

Read Temperature Measurement Value

Syntax

Query **:MEASure:TEMPerature?**

Response <Measurement value>

See: "Measurement Value Formats" (p.28)

Description

Reads the last (most recent) temperature measurement value.
Performs the same operation as :FETCh:TEMPerature?.

Example

```
:MEAS:TEMP?
 25.1E+00
```

Abort Measurement

Syntax

Query **:ABORt**

Description

Executes :READ /Scan measurement/Scan zero adjustment is abort (forced ermination).

Example

```
:READ?
:ABOR
```

Executes an abort.

Note

An abort cannot be executed as the instrument waits until all prior commands finish if the query is sent after *WAI command.

(3) Zero Adjustment

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Execute Zero Adjustment

Syntax
Query **:ADJust?**
Response <0/1>

0 = Indicates zero adjustment succeeded.
1 = Indicates that zero adjustment has failed. For information on zero adjustment, see the instrument instruction manual.

Description
RM3545 RM3545A RM3546
Executes scan zero adjustment (performs zero adjustment for the channels with :ADJust:ENABle ON) if the scanning function of the multiplexer is set to STEP or AUTO. Zero adjustment is performed only for the current channel if the scanning function is OFF. Scan zero adjustment can be aborted using :ABORt.

Clear Zero Adjustment

Syntax
Command **:ADJust:CLEar**

Description
Clears any zero-adjustment offset.

Example
ADJ:CLE

Note
RM3545 RM3545A RM3546
When the multiplexer is used, zero adjustment for the current channel is canceled.

Query Zero Adjustment Execution State RM3545 RM3545A RM3546

Syntax
Query **:ADJust:STATe?**
Response <ON/OFF>

Example
CH 10
:ADJ:STAT?
ON

Set and Query Scan Zero Adjustment Execution RM3545 RM3545A RM3546

Syntax
Command **:ADJust:ENABle** <1/0/ON/OFF>
Query **:ADJust:ENABle?**
Response <ON/OFF>

Example
CH 10
:ADJ:ENAB ON
:ADJ:ENAB?
ON

(4) Measurement Speed

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query Measurement Speed

Syntax

Command **:SAMPle:RATE** <Measurement speed>
RM3544 <Measurement speed>=FAST/MEDium/SLOW
SLOW1/SLOW2 are handled the same as with SLOW.
RM3545 RM3545A RM3546<Measurement speed>=
FAST/MEDium/SLOW1 /SLOW2
SLOW is handled the same as with SLOW2.

Query **:SAMPle:RATE?**

Response RM3544 <Measurement speed>=FAST/MEDium/SLOW
RM3545 RM3545A RM3546 <Measurement speed>=
FAST/MEDium/SLOW1 /SLOW2

Example

```
:SAMP:RATE MED
:SAMP:RATE?
MEDIUM
```

(5) Averaging Function

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Execute and Query Averaging Function

Syntax

Command **:CALCulate:AVERage:STATe** <1/0/ON/OFF>

Query **:CALCulate:AVERage:STATe?**

Response <ON/OFF>

Example

```
:CALC:AVER:STAT ON
:CALC:AVER:STAT?
ON
```

Set and Query Average Count

Syntax

Command **:CALCulate:AVERage:COUNt** <Count>

Query **:CALCulate:AVERage:COUNt?**

Response <Count (NR1)> = 2 to 100

Example

```
:CALC:AVER:COUN 10
:CALC:AVER:COUN?
10
```

(6) Comparator

- When making comparator settings by commands, the measurement range is not automatically selected.

Execute and Query Comparator

Syntax

Command **:CALCulate:LIMit:STATe** <1/0/ON/OFF>

Query **:CALCulate:LIMit:STATe?**

Response <ON/OFF>

Example

```
:CALC:LIM:STAT ON
:CALC:LIM:STAT?
ON
```

Note When the comparator is executed, the auto range , the temperature conversion function and BIN function enter the OFF state.
RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query Beeper

Syntax

Command **:CALCulate:LIMit:BEEPer** <Condition>,<Type>,<Count>
Query **:CALCulate:LIMit:BEEPer?** <Condition>
Response <Condition>,<Type>,<Count>
<Condition> = RM3544 HI/ IN /LO
RM3545 RM3545A RM3546 HI/ IN /LO /PASS/ FAIL
<Type> = 0: Buzzer OFF, 1 to 3: Type 1 to 3
<Count> = 0: Continuous, 1 to 5: Count [times]

Example

```
:CALC:LIM:BEEP IN,1,0
:CALC:LIM:BEEP? IN
IN,1,0
```

Note

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query Judgment Mode

Syntax

Command **:CALCulate:LIMit:MODE** <ABSolute/REFerence>
Query **:CALCulate:LIMit:MODE?**
Response <ABSOLUTE/REFERENCE>
<ABSOLUTE> = Upper threshold/Lower threshold comparison
<REFERENCE> = Reference percentage/tolerance comparison

Example

```
:CALC:LIM:MODE ABS
:CALC:LIM:MODE?
ABSOLUTE
```

Note

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query ABS Mode Upper Comparator Threshold Values

Syntax

Command **:CALCulate:LIMit:UPPer** <Upper threshold>
Query **:CALCulate:LIMit:UPPer?**
Response <Upper threshold[Ω]>
RM3544 <Upper threshold[Ω]> = 0 to 1E+9 (NR3)
RM3545 RM3545A RM3546 <Upper threshold[Ω]> = 0 to 9E+9 (NR3)

Example

```
:CALC:LIM:UPP 1.0
```

The upper threshold is 1.0Ω (regardless of range).

Note

The value will be 0 when the upper threshold is less than 1E-9.
RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query ABS Mode Lower Comparator Threshold Values

Syntax

Command **:CALCulate:LIMit:LOWer** <Lower threshold>
Query **:CALCulate:LIMit:LOWer?**
Response <Lower threshold[Ω]>
RM3544 <Lower threshold[Ω]> = 0 to 1E+9 (NR3)
RM3545 RM3545A RM3546 <Lower threshold[Ω]> = 0 to 9E+9 (NR3)

Example

```
:CALC:LIM:LOW 0.9
```

The lower threshold is 0.9Ω (regardless of range).

Note

The value will be 0 when the lower threshold is less than 1E-9.
RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query REF% Mode Reference Resistance

Syntax

Command **:CALCulate:LIMit:REFerence** <Reference Resistance>
Query **:CALCulate:LIMit:REFerence?**
Response <Reference Resistance[Ω]>

RM3544 <Reference Resistance[Ω]> = 1E-9 to 1E+9 (NR3)
RM3545 RM3545A RM3546 <Reference Resistance[Ω]> = 1E-9 to 9E+9 (NR3)/CH1
Channel 1 can be set as a reference value when the multiplexer is used.

Example

:CALC:LIM:REF 1.2E+3
The reference resistance is 1.2kΩ (regardless of range).

Note

When the reference resistance is less than 1E-9, an execution error occurs.
RM3545 RM3545A RM3546 An execution error occurs during scanning.

Set and Query REF% Mode Judgment Range

Syntax

Command **:CALCulate:LIMit:PERCent** <Range[%]>
Query **:CALCulate:LIMit:PERCent?**
Response <Range[%]>

RM3544 <Range[%]> = 0 to 99.99 (NR2)
RM3545 RM3545A RM3546
<Range[%]> = 0 to 99.999 (NR2)

Example

:CALC:LIM:PERC 1.5

Note

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Query Judgment Result

Syntax

Query **:CALCulate:LIMit:RESult?** RM3544
:CALCulate:LIMit:RESult? [<Channel number>]
RM3545 RM3545A RM3546 <Channel number> = 1 to 42
Response <HI/IN/LO/OFF/ERR>

Description

RM3545 RM3545A RM3546
The comparator result of the channel number is read by assigning a channel number to the data.
If a measurement has not been performed, ERR is returned. The channel number is not returned. If the channel number is omitted, the comparator result of the current channel is read.

Example

:CALC:LIM:RES? ... Obtains the comparator result of the current channel.
HI
:CALC:LIM:RES? 10 … Obtains the comparator result of Channel 10.
IN

Set and Query PASS Judgment Condition RM3545 RM3545A RM3546

Syntax

Command **:CALCulate:LIMit:JUDGe:CONDition** <Condition>
Query **:CALCulate:LIMit:JUDGe:CONDition?**
Response <Condition>
<Condition> = OFF/IN/HI/LO/HILO/ALL

Example

:CALC:LIM:JUDG:COND IN
:CALC:LIM:JUDG:COND?
IN

Note

An execution error occurs during scanning.

Query PASS/FAIL Result RM3545 RM3545A RM3546

Syntax

Query **:CALCulate:LIMit:JUDGe?** [<Channel number>]
<Channel number> = 1 to 42
Response <PASS/FAIL/OFF/ERR>

Description

The PASS/FAIL result of the channel number is read by assigning a channel number to the data. If a measurement has not been performed, OFF is returned. The channel number is not returned. If the channel number is omitted, the comparator result of the current channel is read.

Example

```
:CALC:LIM:JUDG?          ... Obtains the PASS/FAIL result of the current channel.
PASS
:CALC:LIM:JUDG? 10       …Obtains the PASS/FAIL result of Channel 10.
FAIL
```

Note

When the front terminal is used or the scanning function is OFF, an execution error occurs.

Query Total Judgment Result RM3545 RM3545A RM3546

Syntax

Query **:CALCulate:LIMit:JUDGe:TOTal?**
Response <PASS/FAIL/OFF/ERR>

Example

```
:CALC:LIM:JUDG:TOT?
PASS
```

Note

When the front terminal is used or the scanning function is OFF, an execution error
An execution error occurs during scanning.occurs.
If a measurement has not been performed, OFF is returned.

(7) BIN Function RM3545 RM3545A RM3546

An execution error occurs during scanning.

Execute and Query BIN Measurement

Syntax

Command **:CALCulate:BIN:STATe** <1/0/ON/OFF>
Query **:CALCulate:BIN:STATe?**
Response <ON/OFF>

Example

```
:CALC:BIN:STAT ON
:CALC:BIN:STAT?
ON
```

Note

When the BIN function is executed, the comparator function, auto range, and temperature conversion function all switch to OFF.
In addition, the front terminal is used as a measurement terminal.

Set Mask Pattern

Syntax

Command **:CALCulate:BIN:ENABle** <Mask pattern>
Query **:CALCulate:BIN:ENABle?**
Response <Mask pattern (NR1)> = 0 to 1023 (decimal number)
"1" will be the BIN number bit used to execute the BIN measurement.

512	256	128	64	32	16	8	4	2	1
bit9	bit8	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
BIN9	BIN8	BIN7	BIN6	BIN5	BIN4	BIN3	BIN2	BIN1	BIN0

Example

```
:CALC:BIN:ENAB 15
```

BIN0 to BIN3 can be used.

Set and Query Judgment Mode

Syntax

Command **:CALCulate:BIN:MODE** <BIN No.>,<ABSolute/REFerence>
Query **:CALCulate:BIN:MODE?** <BIN No.>
Response <ABSOLUTE/REFERENCE>

<BIN No.> = 0 to 9
<ABSOLUTE> = Upper threshold/Lower threshold comparison
<REFERENCE> = Reference percentage/tolerance comparison

Example

```
:CALC:BIN:MODE 0,ABS
:CALC:BIN:MODE? 0
ABSOLUTE
```

Set and Query ABS Mode Upper Comparator Threshold Values

Syntax

Command **:CALCulate:BIN:UPPer** <BIN No.>,<Upper threshold>
Query **:CALCulate:BIN:UPPer?** <BIN No.>
Response <Upper threshold[Ω]>

<Upper threshold[Ω]> = 0 to 9E+9 (NR3)

Example

```
:CALC:BIN:UPPer 0,1.0
```

The upper threshold is 1.0Ω (regardless of range).

Note The value will be 0 when the upper threshold is less than 1E-9.

Set and Query ABS Mode Lower Comparator Threshold Values

Syntax

Command **:CALCulate:BIN:LOWer** <BIN No.>,<Lower threshold>
Query **:CALCulate:BIN:LOWer?**
Response <Lower threshold[Ω]>

<Lower threshold[Ω]> = 0 to 9E+9 (NR3)

Example

```
:CALC:BIN:LOW 0,0.9
```

The lower threshold is 0.9Ω (regardless of range).

Note The value will be 0 when the lower threshold is less than 1E-9.

Set and Query REF% Mode Reference Resistance

Syntax

Command **:CALCulate:BIN:REFerence** <BIN No.>, <Reference Resistance>
Query **:CALCulate:BIN:REFerence?** <BIN No.>
Response <Reference Resistance[Ω]>

<BIN No.> = 0 to 9
<Reference Resistance[Ω]> = 1E-9 to 9E+9 (NR3)

Example

```
:CALC:BIN:REF 0,1.2E+3
```

The reference resistance is 1.2kΩ (regardless of range).

Note When the reference resistance is less than 1E-9, a command error occurs.

Set and Query REF% Mode Judgment Range

Syntax

Command **:CALCulate:BIN:PERCent** <BIN No.>,<Range[%]>
Query **:CALCulate:BIN:PERCent?** <BIN No.>
Response <Range[%]>

<BIN No.> = 0 to 9
<Range[%]> = 0 to 99.999 (NR2)

Example

```
:CALC:BIN:PERC 0,1.5
```

Query Judgment Result

Syntax Query **:CALCulate:BIN:RESult?**

Response <Result (NR1)> = 0 to 1024 (decimal number)

"1" will be the BIN number bit for the PASS with BIN measurement.

1024

bit10	bit9	bit8	bit7	bit6	bit5
OB	BIN9	BIN8	BIN7	BIN6	BIN5
	bit4	bit3	bit2	bit1	bit0
	BIN4	BIN3	BIN2	BIN1	BIN0

Example
```
:CALC:BIN:RES?
128
```
BIN7 is PASS.

(8) Statistical Functions RM3545 RM3545A RM3546

- A data sample can be taken by the following three methods:
  1. Press the [ENTER] key.
  2. Input the TRIG signal from EXT I/O.
  3. Send a *TRG command.
- The :CALCulate:STATistics:STATe command does not clear calculation results.
- When the valid data count is 0, σ_{n-1} returns 0.
- Even if the calculation results are cleared, the statistical calculation function does not switch to OFF.
- The upper threshold of Cp and Cpk is 99.99. If Cp or Cpk exceeds 99.99, the value 99.99 is returned.

An execution error occurs during scanning.

Execute Statistical Calculation

Syntax Command **:CALCulate:STATistics:STATe** <1/0/ON/OFF>

Query **:CALCulate:STATistics:STATe?**

Response <ON/OFF>

Example
```
:CALC:STAT:STAT ON
:CALC:STAT:STAT?
ON
```

Note When the statistical calculation function is executed, the temperature conversion function switches to OFF.
In addition, the front terminal is used as a measurement terminal.

Clear Statistical Calculation Results

Syntax Command **:CALCulate:STATistics:CLEar**

Query Data Count

Syntax Query **:CALCulate:STATistics:NUMBer?**

Response <Total data count (NR1)>,<Valid data count (NR1)>

Data count = 0 to 30000

Example
```
:CALC:STAT:NUMB?
23456,23449
```

Query Mean Value

Syntax Query **:CALCulate:STATistics:MEAN?**

Response <Mean[Ω] (NR3)>

Example
```
:CALC:STAT:MEAN?
11.4859E+03
```

Query Maximum Value

Syntax Query **:CALCulate:STATistics:MAXimum?**
Response <Maximum value[Ω] (NR3)>,<Data No. of Maximum value (NR1)>

Example
```
:CALC:STAT:MAX?
12.4859E+03,1124
```

Query Minimum Value

Syntax Query **:CALCulate:STATistics:MINimum?**
Response <Minimum value[Ω] (NR3)>,<Data No. of Minimum value (NR1)>

Example
```
:CALC:STAT:MIN?
10.4859E+03,1125
```

Query Comparator Results

Syntax Query **:CALCulate:STATistics:LIMit?**
Response <Hi count (NR1)>,<IN count (NR1)>,<Lo count (NR1)>,
<Measurement fault count (NR1)>,<Out-of-range count (NR1)>

Example
```
:CALC:STAT:BIN?
1516,9310,737,16,5
```

Query BIN Result

Syntax Query **:CALCulate:STATistics:BIN?**
Response <BIN0 count (NR1)>,…<BIN9 count (NR1)>,<OUT count (NR1)>,
<Measurement fault count (NR1)>

Example
```
:CALC:STAT:BIN?
1516,9310,10,10,10,10,10,10,10,100,737,16
```

Query Standard Deviation

Syntax Query **:CALCulate:STATistics:DEViation?**
Response <σ_n[Ω] (NR3)>,<σ_{n-1}[Ω] (NR3)>

Example
```
:CALC:STAT:DEV?
0.0159E-3,0.0161E-3
```

Query Process Capability Indices

Syntax Query **:CALCulate:STATistics:CP?**
Response <Cp (NR2)>,<Cpk (NR2)>

Example
```
CALC:STAT:CP?
0.86,0.14
```

(9) Scaling

RM3545 RM3545A RM3546 An execution error occurs during scanning.

Execute and Query Scaling Function

Syntax Command **:CALCulate:SCALing:STATe** <1/0/ON/OFF>
Query **:CALCulate:SCALing:STATe?**
Response <ON/OFF>

Example
```
:CALC:SCAL:STAT ON
:CALC:SCAL:STAT?
ON
```

Note When the scaling function is turned ON, the Advanced Temperature Correction is turned OFF.

Set and Query Scaling Correction Coefficient

Syntax
Command **:CALCulate:SCALing:PARameterA** <Correction coefficient>
Query **:CALCulate:SCALing:PARameterA?**
Response <Correction coefficient (NR3)>
<Correction coefficient> = 0.2000E-03 to 1.9999E+03

Example
:CALC:SCAL:PARA 2E+00
:CALC:SCAL:PARA?
0.2000E+00

Set and Query Scaling Offset

Syntax
Command **:CALCulate:SCALing:PARameterB** <Offset>
Query **:CALCulate:SCALing:PARameterB?**
Response <Offset [Ω]>
RM3544 <Offset> = -1.0000E+09～1.0000E+09
RM3545 RM3545A RM3546 <Offset> = -1.0000E+09～9.0000E+09

Example
:CALC:SCAL:PARB 1E+03
:CALC:SCAL:PARB?
1.0000E+03

Note When the offset is less than +/-1E-9, “0” will result.

Set and Query Scaling Unit

Syntax
Command **:CALCulate:SCALing:UNIT** <Unit>
Query **:CALCulate:SCALing:UNIT?**
Response <Unit>
<Unit> = OFF(no unit)/OHM[Ω]/Any unit (any unit is character string data:maximum 3 characters)
For information on character string data, see Data Formats. (p.4)

Example
:CALC:SCAL:UNIT “m”
:CALC:SCAL:UNIT?
“m”

(10) Temperature Conversion (ΔT) RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Execute and Query Temperature Conversion (ΔT)

Syntax
Command **:CALCulate:TCONversion:DELTa:STATe** <1/0/ON/OFF>
Query **:CALCulate:TCONversion:DELTa:STATe?**
Response <ON/OFF>

Example
:CALC:TCON:DELT:STAT ON
:CALC:TCON:DELT:STAT ON?
ON

Note When the temperature conversion function is executed, the comparator function, temperature correction function, BIN function, and statistical calculation function switch to OFF.

Set and Query Temperature Conversion (ΔT)

Syntax
Command **:CALCulate:TCONversion:DELTa:PARameter** <Initial resistance>,<Initial temperature>,<Constant>
Query **:CALCulate:TCONversion:DELTa:PARameter?**
Response <Initial resistance[Ω]>,<Initial temperature[°C]>,<Constant[°C]>
<Initial resistance[Ω]> = 0 to 9000.000E+6 (NR3)
<Initial temperature[°C]> = -10.0 to 99.9 (NR2)
<Constant[°C]> = -999.9 to 999.9 (NR2)

Example
:CALC:TCON:DELT:PAR 100,20,235
:CALC:TCON:DELT:PAR?
100.000E+0,20.0E+0,235.0

(11) Temperature Correction (TC)

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Execute and Query Temperature Correction (TC)

Syntax
Command **:CALCulate:TCORrect:STATe** <1/0/ON/OFF>
Query **:CALCulate:TCORrect:STATe?**
Response <ON/OFF>

Example
```
:CALC:TCOR:STAT ON
:CALC:TCOR:STAT?
ON
```

Note RM3545 RM3545A RM3546 When the temperature correction function is executed, the temperature conversion function switches to OFF.

Set and Query Temperature Correction (TC)

Syntax
Command **:CALCulate:TCORrect:PARameter** <Reference temperature>,<Temperature coefficient>
Query **:CALCulate:TCORrect:PARameter?**
Response <Reference temperature [ºC]>,<Temperature coefficient [ppm/°C]>
<Reference temperature[°C]> = -10.0 to 99.9 (NR2)
RM3544
<Temperature coefficient [ppm/°C]> = -9999 to 9999 (NR1)
RM3545 RM3545A RM3546
<Temperature coefficient [ppm/°C]> = -99999 to 99999 (NR1)

Example
```
:CALC:TCOR:PAR 20,3930
:CALC:TCOR:PAR?
70.0,4500
```

(12) Advanced Temperature Correction (A-TC) RM3546

Set and Query Advanced Temperature Correction (A-TC)

Syntax
Command **:ATC:TCORrect:STATe** <1/0/ON/OFF>
Query **:ATC:TCORrect:STATe?**
Response <ON/OFF>

Example
```
:ATC:TCOR:STAT ON
:ATC:TCOR:STAT?
ON
```

Note When the Advanced Temperature Correction (A-TC) is set to ON, the temperature conversion, temperature correction, and scaling function are set to “OFF”.

Set and Query Reference temperature and Temperature Coefficient for Weld location

Syntax
Command **:ATC:TCORrect:PARameter** <Reference temperature>,<Temperature coefficient>
Query **:ATC:TCORrect:PARameter?**
Response <Reference temperature [ºC]>,<Temperature coefficient [ppm/°C]>
<Reference temperature[°C]> = -10.0 to 99.9 (NR2)
<Temperature coefficient [ppm/°C]> = -99999 to 99999 (NR1)

Example
```
:ATC:TCOR:PAR 23,3800
:ATC:TCOR:PAR?
23.0,3800
```

Set and Query Resistance value, Reference Temperature, and Temperature coefficient for Temperature Measurement area

Syntax

Command **:ATC:TCONversion:DELTa:PARameter** <Resistance Value>,<Reference temperature>,<Temperature coefficient>

Query **:ATC:TCONversion:DELTa:PARameter?**

Response <Resistance Value>,<Reference temperature>,<Temperature coefficient>

<Resistance Value [Ω]> = 0.001E-6 to 9000.000E+6 (NR3)
<Reference temperature[°C]> = -10.0 to 99.9 (NR2)
<Temperature coefficient [ppm/°C]> = -99999 to 99999 (NR1)

Example

```
:ATC:TCON:DELT:PAR 16.5E-3,23,4000
:ATC:TCON:DELT:PAR?
1.650000E-02,23.0,4000
```

Set and Query Z3003 pin allocation for Temperature measurement area

Syntax

Command **:ATC:TERMinal** <Unit No>, <Terminal A Number>, <Terminal B Number>

Query **:ATC:TERMinal?**

Response <Unit No>, <Terminal A Number>, <Terminal B Number>

<Unit No> = 1 / 2 (NR1)
<Terminal A Number> = 1 to 10 (NR1)
<Terminal B Number> = 1 to 10 (NR1)

Example

```
:ATC :TERM 1,1,1
:ATC :TERM?
1,1,1
```

Set and Query Measurement speed for Temperature measurement area

Syntax

Command **:ATC:RATE** < Measurement Speed >
<Measurement Speed> = FAST / MEDium / SLOW1 / SLOW2
SLOW is treated the same as SLOW2.

Query **:ATC:RATE?**

Response <Measurement Speed> = FAST / MEDium / SLOW1 / SLOW2

Example

```
:ATC:RATE MED
:ATC:RATE?
MEDIUM
```

A

Set and Query AUTO-ranging for Temperature measurement area

Syntax

Command **:ATC:RANGe:AUTO** <1/0/ON/OFF>

Query **:ATC:RANGe:AUTO?**

Response <ON/OFF>

Example

```
:ATC:RANG:AUTO ON
:ATC:RANG:AUTO?
ON
```

Set and Query Measurement range for Temperature measurement area

Syntax

Command **:ATC:RANGe** <Expected Measurement Value>
Query **:ATC:RANGe?**
Response <Measurement Range (NR3)>

<Expected Measurement Value> = 0 to 1200E+06
<Measurement Range (NR3)> = 1000. 000E-6 /10.00000E-3/ 100.0000E-3/ 1000.000E-3/ 10.00000E+0/100.0000E+0/ 1000.000E+0/ 10.00000E+3/100.0000E+3/ 1000.000E+3/10.00000E+6/100.0000E+6/ 1000.000E+6

Example

:ATC:RANG 56E-3
The 100 mΩ range is going to be selected for the temperature measurement.
:ATC:RANG?
100.0000E-3

Note When the multiplexer measurement method is 2-wire, the range cannot be set to 10Ω or lower.

Set and Query Preset delay for Temperature measurement area

Syntax

Command **:ATC:DELay:AUTO** <1/0/ON/OFF>
Query **:ATC:DELay:AUTO?**
Response <ON/OFF>

Example

:ATC:DEL:AUTO ON
:ATC:DEL:AUTO?
ON

Set and Query User-set delay time for Temperature measurement area

Syntax

Command **:ATC:DELay** <Delay Time>
Query **:ATC:DELay?**
Response <Delay Time>

<Delay Time> = 0 to 9.999 (NR2) [seconds]

Example

:ATC:DEL 0.015
:ATC:DEL?
0.015

Set and Query Averaging Function for Temperature measurement area

Syntax

Command **:ATC:AVERage:STATe** <1/0/ON/OFF>
Query **:ATC:AVERage:STATe?**
Response <ON/OFF>

Example

:ATC:AVER:STAT ON
:ATC:AVER:STAT?
ON

Set and Query Averaging iterations for Temperature measurement area

Syntax

Command **:ATC:AVERage:COUNt** <Count>
Query **:ATC:AVERage:COUNt?**
Response <Count (NR1)> = 2 to 100

Example

:ATC:AVER:COUN 4
:ATC:AVER:COUN?
4

Set and Query Advanced Offset Voltage Compensation (A-OVC) for Temperature measurement area

Syntax

Command **:ATC:AOVC** <1/0/ON/OFF>
Query **:ATC:AOVC?**
Response <ON/OFF>

Example

:ATC:AOVC ON
:ATC:AOVC?
ON

Set and Query Pure Resistance Mode (PR) for Temperature Measurement area

Syntax

Command **:ATC:PR:STATe** <1/0/ON/OFF>
Query **:ATC:PR:STATe?**
Response <ON/OFF>

Example

:ATC:PR:STAT ON
:ATC:PR:STAT?
ON

Set and Query Measurement Current for Temperature Measurement area

Syntax

Command **:ATC:CURRent** <HIGH/LOW>
Query **:ATC:CURRent?**
Response <1A/0.1A>

Example

:ATC:CURR HIGH
:ATC:CURR?
1A

Set and Query Contact Check for Temperature Measurement area

Syntax

Command **:ATC:CONTactcheck** <1/0/ON/OFF>
Query **:ATC:CONTactcheck?**
Response <ON/OFF>

Example

:ATC:CONT ON
:ATC:CONT?
ON

Set and Query Contact Check for Temperature Measurement area

Syntax

Command **:ATC:CIMProve** <1/0/ON/OFF>
Query **:ATC:CIMProve?**
Response <ON/OFF>

Example

:ATC:CIMP ON
:ATC:CIMP?
ON

(13) Reading Measured Values in Advanced Temperature Correction (A-TC) RM3546

Reading the Last Measurement Value in Advanced Temperature Correction (A-TC)

Syntax

Query **:ATC:FETCh?** <ATC/ATCR/R/T>

Response <Channel Number>, <Resistance Value/Temperature>
The content of the response following <Channel Number> corresponds to the arguments of the data section.

Description

Reading the last (most recent) measurement value in the Advanced Temperature Correction (A-TC).
The correspondence between the arguments and their responses is as follows:

Argument	Response
Omission	Processed as “ATC”
ATC	Returns the measurement values of the welding points before and after correction: <Channel Number>, <Resistance Value After Correction>, <Resistance Value Before Correction>, <Temperature Before Correction>
ATCR	Returns the measurement values of the welding points after correction: <Channel Number>, <Resistance Value After Correction>
R	Returns the measurement values of the welding points before correction: <Channel Number>, <Resistance Value Before Correction>
T	Returns the measurement values of the welding points before correction: <Channel Number>, <Temperature Before Correction>

The configuration for A-TC (p.84)

Example

```
ATC:FETCh? ATC
 1,100.000E-06, 139.300E-06, 100.00E+00
```

NOTE

The execution error (Err:032) will occur in the following cases:
The MUX (Multiplexer) is OFF
During scanning

Reading measurement values with Advanced Temperature Correction (A-TC)

Syntax Query **:ATC:READ?** <ATC/ATCR/R/T>
Response <Channel Number>, <Resistance Value/Temperature>
The content of the response following <Channel Number> corresponds to the arguments of the data section.

Description Initiating the A-TC function and reading the measurement values after the measurement is completed.
The correspondence between the arguments and their responses is as follows:

argument	response
Omission	The same as the argument ATC
ATC	Returns the measurement values of the welding points before and after correction: <Channel Number>, <Resistance Value After Correction>, <Resistance Value Before Correction>, <Temperature Before Correction>
ATCR	Returns the measurement values of the welding points after correction: <Channel Number>, <Resistance Value After Correction>
R	Returns the measurement values of the welding points before correction: <Channel Number>, <Resistance Value Before Correction>
T	Returns the measurement values of the welding points before correction: <Channel Number>, <Temperature Before Correction>

The configuration for A-TC(p.84)

Example
```
ATC:READ? ATC
 1,100.000E-06, 139.300E-06, 100.00E+00
```

NOTE The execution error (Err:032) will occur in the following cases:
The MUX (Multiplexer) is OFF
The scan function is set to Auto or Step
When obtaining corrected measurement values with the scan function set to Auto or Step, please use :READ?.

Starting measurement in Advanced Temperature Correction (A-TC).

Syntax Command **:ATC:INITiate**

Description Start the A-TC measurement and wait for it to complete.
The configuration method for A-TC(p.84)

Example
```
:ATC:INITiate
```

NOTE The execution error (Err:032) will occur in the following cases:
The MUX (Multiplexer) is OFF
The scan function is set to Auto or Step
When obtaining corrected measurement values with the scan function set to Auto or Step, please use :READ?.

(14) LCD Settings

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Contrast

Syntax
Command **:DISPlay:CONTrast** <0 to 100>
Query **:DISPlay:CONTrast?**
Response <0 to 100 (NR1)>

Example
```
:DISP:CONT 80
:DISP:CONT?
80
```

Set and Query Backlight

Syntax
Command **:DISPlay:BACKlight** <0 to 100>
Query **:DISPlay:BACKlight?**
Response <0 to 100 (NR1)>

Example
```
:DISP:BACK 50
:DISP:BACK?
50
```

(15) Memory Functions RM3545 RM3545A RM3546

You can save and load up to 50 measurement data entries. This function cannot be used when a multiplexer is used. An execution error occurs.
This is enabled only with a remote command.
Measurement values are entered in memory through the [ENTER] key, TRIG signal, and *TRG command.

Set and Query Memory Functions

Syntax
Command **:MEMory:STATe** <1/0/ON/OFF>
Query **:MEMory:STATe?**
Response <ON/OFF>

Note Changing the memory mode setting erases the stored data.

Example
```
:MEM:STAT ON
:MEM:STAT?
ON
```

Clear Memory Data

Syntax
Command **:MEMory:CLEar**
Example :MEM:CLE

Query Memory Data Count

Syntax
Query **:MEMory:COUNt?**
Response <Memory data count (NR1) > = 0 to 50

Example
```
:MEM:COUN?
3
```

Read Memory Data

Syntax
Query **:MEMory:DATA?**
Response <Measurement value>,<Measurement value>,...,
<Measurement value>

Description Measured values transferred from memory are separated by commas (","). The number of stored measurement values to be exported can be acquired by the :MEMory:COUNt? query.
See: "Measurement Value Formats" (p.28)

Note When fifty (50) measurement values have been entered into memory, no additional measurement values can be stored until the memory content is cleared.

(16) Hold

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Execute and Query Auto Hold

Syntax
Command **[:SENSe:]HOLD:AUTO** <1/0/ON/OFF >
Query **[:SENSe:]HOLD:AUTO?**
Response <ON/OFF>

Example
```
HOLD:AUTO ON
HOLD:AUTO?
ON
```

Note When auto hold is executed, :INITIATE:CONTINUOUS ON and internal trigger (trigger source <IMMEDIATE>) are enabled.

Query Auto Hold State

Syntax
Query **[:SENSe:]HOLD:STATe?**
Response <ON/OFF>

Description Queries the current hold state.
<ON> = HOLD indicator on the screen turns on, and hold is executed.
<OFF> = HOLD indicator on the screen turns off, and hold is not executed.

Example
```
HOLD:STAT?
ON
```

Cancel Hold

Syntax
Command **[:SENSe:]HOLD:OFF**

Description Cancels the hold state. (HOLD indicator on the screen turns off.)

Example
```
HOLD:OFF
```

(17) Multiplexer Settings RM3545 RM3545A RM3546

- Also see "4 Multiplexer Commands (p.76)" for the multiplexer unit.

Set and Query Measurement Method

Syntax
Command **[:SENSe:]WIRE** <4/2/W4/W2>
Query **[:SENSe:]WIRE?**
Response <W4/W2>
<4/W4> = 4-wire type
<2/W2> = 2-wire type

Example
```
WIRE W4
WIRE?
W4
```

Note When the measurement method is switched, the multiplexer channel reset is activated. The multiplexer settings including the measurement conditions are reset. Make sure to determine the measurement method before measuring each channel.
An execution error occurs during scanning.

Set and Query Scanning Function

Syntax
Command **[:SENSe:]SCAN:MODE** <OFF/AUTO/STEP>
Query **[:SENSe:]SCAN:MODE?**
Response <OFF/AUTO/STEP>

Example
```
SCAN:MODE:AUTO
SCAN:MODE?
AUTO
```

Note An execution error occurs during scanning.

Query Scanning Execution State

Syntax
Query **[:SENSe:]SCAN:STATe?**
Response <0/1/2 (NR1)>

Description
Responds with whether scanning is being executed or not.
0 is returned when the scanning function is OFF or scanning is paused.
1 is returned during auto scanning or step scanning.
2 is returned during the scanning and the measuring.

Example
```
(During step scanning)
SCAN:STAT?
1
*TRG
SCAN:STAT?
1
*TRG
SCAN:STAT?
0
```

Initialize Scan Channel and Measured Value or Judgment Value

Syntax Command **[:SENSe:]SCAN:RESet**

Description Returns the scan channel to the initial channel. Also, the measured value and judgment value are cleared and the instrument is set to the non-measurement state.

Set and Query Scan Fail Stop

Syntax Command **[:SENSe:]SCAN:FAIL:STOP** <1/0/ON/OFF>
Query **[:SENSe:]SCAN:FAIL:STOP?**
Response <ON/OFF>

Example
```
:SCAN:FAIL:STOP ON
:SCAN:FAIL:STOP?
ON
```

Note An execution error occurs during scanning.

Read Scanned Measurement Data in a Batch

Syntax Query **[:SENSe:]SCAN:DATA?**
Response <Measured value>,<Measured value>, …<Measured value>

Description The measured values at the time of scanning completion are separated by commas (","). Only the data with [:SENSe:]STATe ON is returned. The number of data items is the same as the channel count that can be obtained using a [:SENSe:]CH:AVAirable? query. If a measurement has not been performed, the value for a measurement fault is returned.
See: "Measurement Value Formats" (p.28)

Example
```
CH:AVA?
3
SCAN:DATA?
1023.579E-00,1000.000E-03, 100.0000E-03
```

Note An execution error occurs during scanning.

Query Connected to The Front Mesurement Terminal

Syntax Query **[:SENSe:]FRONtcheck?**
Response <1/0 (NR1)>
<0> = A test lead is not connected to the front measurement terminal.
<1> = A test lead is connected to the front measurement terminal.

Description If a test lead is connected to the front terminal, the data cannot be displayed properly when a measurement is performed using a multiplexer. When there is a possibility that a test lead may be connected to the front terminal, make sure to check that the response is 0.

Example Check the front measurement terminal.
```
FRON?
0
```
Measurement
```
READ?
1020.000E-03, 100.000E-03, 100.000E-03
```

Note An execution error occurs during scanning.

Set and Query Channel Switching

Syntax

Command **[:SENSe:]CH** <FRONt/0/Channel number>
Query **[:SENSe:]CH?**
Response <FRONT/Channel number>

<FRONt><0> = The front terminal is used as a measurement terminal.
<Channel number> = 1 to 42 (NR1) (The measurement terminal is used as a multiplexer.)

Description

Sets the switching of the multiplexer channel and queries the current channel.
The measurement conditions, measurement, and comparator result of each channel need to be set and obtained after the channel is switched.
See: “4 Multiplexer Commands (p.76)”.

Example

The front terminal is used.
```
CH FRON
CH?
FRONT
```
Check the front measurement terminal.
```
FRON?
0
```
Use a multiplexer and switch the channel to 10.
```
CH 10
CH?
10
```

Note

When the channel is not set to the front terminal, the statistical calculation function and memory function switch to OFF.
If a test lead is connected to the front terminal, the data cannot be displayed properly when a measurement is performed using a multiplexer. When there is a possibility that a test lead may be connected to the front terminal, make sure to check that the response to the [:SENSe:]FRONtcheck? command is 0.
An execution error occurs during scanning.

Set and Query Multiplexer Channel

Syntax

Command **[:SENSe:]CH:STATe** <1/0/ON/OFF>[,<Channel number>]
Query **[:SENSe:]CH:STATe?** [<Channel number>]
Response <ON/OFF>

<Channel number> = 1 to 42 (NR1)

Example

```
CH:STAT ON,10
CH:STAT? 10
ON
```

Note

An execution error occurs during scanning.

Query Multiplexer Channel Count

Syntax

Query **[:SENSe:]CH:AVAilable?**
Response <Channel count (NR1)>

Description

Only the number of the channels with [:SENSe:]CH:STATe ON is returned.

Example

```
CH:AVA?
20
```

Note

An execution error occurs during scanning.

Setting and Query Multiplexer channel pin assignment

Syntax
Command **[:SENSe:]INSTrument** <INTernal/EXTernal>
Query **[:SENSe:]INSTrument?**
Response <INTernal/ EXTernal>
<INTernal> = Measurement using RM3545, RM3545A and RM3546
<EXTernal> = Measurement using external equipment (multiplexer EX terminal is used.)

Example
CH 10
INST INT
INST?
INT

Note When the front terminal is used, an execution error occurs.
An execution error occurs during scanning.

Set and Query Allocation of Multiplexer Channel Terminals

Syntax
Command **[SENSe:]TERMinal** <Unit number>,<A terminal number>,<B terminal number>
Query **[:SENSe:]TERMinal?**
Response <Unit number>,<A terminal number>,<B terminal number>
<Unit number> = 1/2 (NR1)
<Terminal A number> = 1 to 10 (NR1) for 4-wire type, 1 to 21 (NR1) for 2-wire type
<Terminal B number> = 1 to 10 (NR1) for 4-wire type, 1 to 21 (NR1) for 2-wire type

Example
CH 10
TERM 1,1,2
TERM?
1,1,2

Note When the front terminal is used, an execution error occurs.
The measurement current flows from terminal B to terminal A.
An execution error occurs during scanning.

(18) Multiplexer Channel Reset RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Execute Multiplexer Channel Reset

Syntax
Command **[:SENSe:]CHReset**

Description Initializes the multiplexer channel settings including the measurement conditions.

Note An execution error occurs when the front terminal is used as a measurement terminal or during scanning.

(19) Low-Power Resistance Measurement RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Low-Power Resistance Measurement

Syntax

Command	**[:SENSe:]RESistance:LP:STATe** <1/0/ON/OFF>
Query	**[:SENSe:]RESistance:LP:STATe?**
Response	<ON/OFF>

Example

RES:LP:STAT ON
Selects the Low-Power Resistance measurement.
RES:LP:STAT?
OFF
The Resistance measurement has been selected.

(20) Pure Resistance measurement RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Low-Power Resistance Measurement

Syntax

Command	**[:SENSe:]RESistance:PR:STATe** <1/0/ON/OFF>
Query	**[:SENSe:]RESistance:PR:STATe?**
Response	<ON/OFF>

Example

RES:LP:STAT ON
Selects the Pure Resistance measurement.
RES:LP:STAT?
OFF
The Resistance measurement has been selected.

(21) Measurement Range

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Resistance Measurement Range

Syntax

Command **[:SENSe:]RESistance:RANGe** <Expected measurement value>
Query **[:SENSe:]RESistance:RANGe?**
Response <Measurement Range (NR3)>

RM3544
<Expected measurement value> = 0 to 3.5E+06
<Measurement Range (NR3)> = 30.000E-3/ 300.00E-3/ 3.0000E+0/ 30.000E+0/300.00E+0/ 3.0000E+3/ 30.000E+3/ 300.00E+3/3.0000E+6

RM3545 RM3545A RM3546
<Expected measurement value> = 0 to 1200E+06
<Measurement Range (NR3)> = 1000. 000E-6 *1/ 10.00000E-3/100.0000E-3/1000.000E-3/ 10.00000E+0/100.0000E+0/1000.000E+0/ 10.00000E+3/100.0000E+3/1000.000E+3/ 10.00000E+6/100.0000E+6/1000.000E+6

*1 : RM3545A and RM3546 only

Description

Command

Enter the expected measurement value. The instrument is set to the most suitable range for measuring the given numerical value data. When the scaling function is being used, set the <Expected measurement value> to the value that existed prior to scaling (value in range being used).
When a range is set, the auto-range function will be automatically turned off.

Query

Queries the measurement range setting.

The setting will be that of Low-Power OFF. For the Low-Power ON setting, use:
[:SENSe:]RESistance:LP:RANGe
[:SENSe:]RESistance:LP:RANGe?

Example

RES:RANG 95
RM3544 Sets the Resistance measurement to the 300Ω range.
RM3545 RM3545A RM3546 Sets the Resistance measurement to the□ 100Ω range.

Note

RM3545 RM3545A RM3546 When the multiplexer measurement method is the 2-line type, the measurement range is not set to 10Ω or less.

Set and Query Resistance Measurement Auto Range

Syntax

Command **[:SENSe:]RESistance:RANGe:AUTO** <1/0/ON/OFF>
Query **[:SENSe:]RESistance:RANGe:AUTO?**
Response <ON/OFF>

Description

The auto range setting will be the same for Low-Power OFF/ON.

Example

RES:RANG:AUTO OFF
RES:RANG:AUTO?
OFF

Note

An execution error occurs when the auto range is turned ON if the comparator function and BIN measurement function are ON.

Set and Query Low-Power Resistance Measurement Range RM3545 RM3545A

Syntax

Command **[:SENSe:]RESistance:LP:RANGe** <Expected measurement value>
Query **[:SENSe:]RESistance:LP:RANGe?**
Response <Measurement Range (NR3)>

<Expected measurement value> = 0 to 1200E+00
<Measurement Range (NR3)> = 1000.00E-03/10.0000E+00/100.000E+00/1000.00E+00

Description

Command
Enter the expected measurement value. The instrument is set to the most suitable range for measuring the given numerical value data. When the scaling function is being used, set the <Expected measurement value> to the value that existed prior to scaling (value in range being used).
Query
Queries the measurement range setting.

The setting will be that of Low-Power ON. For the Low-Power OFF setting, use:
[:SENSe:]RESistance:RANGe
[:SENSe:]RESistance:RANGe?

Example

RES:LP:RANG?
1000.00E+00
Low-Power Resistance measurement has been set to the 1000mΩ range.

(22) 100MΩ Range High Precision Function RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query 100MΩ Range High Precision Function RM3545 RM3545A RM3546

Syntax

Command **[:SENSe:]RESistance:PRECision** <1/0/ON/OFF>
Query **[:SENSe:]RESistance:PRECision?**
Response <ON/OFF>

Description

The 100MΩ range becomes the high precision mode. The 1000MΩ range cannot be used when the high precision function is ON.

Example

:RES:PREC ON
:RES:PREC?
ON

(23) Switching Measurement Current RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Measurement Current RM3545 RM3545A RM3546

Syntax

Command **[:SENSe:]RESistance:CURRent** <HIGH/LOW>
Query **[:SENSe:]RESistance:CURRent?**
Response <HIGH/LOW>

Description The measurement current will be as shown in the table below.

Range	Measurement Current		Compatible models		
	High	Low	RM3545	RM3545A	RM3546
1000 μΩ	1 A	500 mA*2	–	√ (High only)	√
PR1000 μΩ*1			–	√ (High only)	√
10 mΩ	1 A	500 mA*2	√ (High only)	√ (High only)	√
PR10 mΩ*1			–	√ (High only)	√
100 mΩ	1 A	100 mA	√	√	√
PR100 mΩ*1		–	–	√ (High only)	√ (High only)
1000 mΩ	100 mA	10 mA	√	√	√
10 Ω	10 mA	1 mA	√	√	√
100 Ω	10 mA	1 mA	√	√	√

*1 : PR mode is RM3545A and RM3546 only

*2 : 500 mA is RM3546 only

Example

```
:RES:CURR HIGH
:RES:CURR?
HIGH
```

(24) Offset Voltage Compensation Function (OVC) RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Offset Voltage Compensation Function (OVC)

Syntax

Command **[:SENSe:]RESistance:OVC** <1/0/ON/OFF>
Query **[:SENSe:]RESistance:OVC?**
Response <ON/OFF>

Example

```
RES:OVC ON
RES:OVC?
ON
```

Note When Low-Power is ON, the query response will definitely be ON.

(25) Advanced Offset Voltage Compensation Function (A-OVC) RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Offset Advanced Voltage Compensation Function (A-OVC)

Syntax

Command	**[:SENSe:]RESistance:AOVC** <1/0/ON/OFF>
Query	**[:SENSe:]RESistance:AOVC?**
Response	<ON/OFF>

Example

```
RES:OVC ON
RES:OVC?
ON
```

Note When in Low-Power Resistance Measurement mode, the OVC function is forcibly turned ON. The response to the query will also be ON.

(26) Contact Improver RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Contact Improver Operating Mode

Syntax

Command	**[:SENSe:]RESistance:CIMProve** <1/0/ON/OFF>
Query	**[:SENSe:]RESistance:CIMProve?**
Response	<ON/OFF>

Example

```
RES:CIMP ON
RES:CIMP?
ON
```

Note When in Low-Power Resistance Measurement mode, the OVC function is forcibly turned ON. The response to the query will also be ON.

(27) Current Error Mode

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Current Error Mode

Syntax

Command	**[:SENSe:]RESistance:ERRor:CURRentcheck** <ERRor/OVER>
Query	**[:SENSe:]RESistance:ERRor:CURRentcheck?**
Response	<ERROR/OVER>

<ERROR> = Current error
<OVER> = Out-of-range

Example

```
RES:ERR:CURR ERR
RES:ERR:CURR?
ERROR
```

Set and Query Overrange external Err terminal RM3545A RM3546

Syntax

Command	**:SENSe:RESistance:ERRor:OVER** <ERRor/NORMal>
Query	**:SENSe:RESistance:ERRor:OVER?**
Response	<ERRor/NORMal>

<ERRor> = External Err terminal output when over range
<NORMal> = External Err terminal does not output when over range

Description Use when you want to distinguish between over range and Hi/Lo during judgment.

Note *RST command does not revert to default.
:SYSTem:RESet returns to default.

(28) Contact Check RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs. Contact check errors can be checked using the event status register. (p.27)

Set and Query Resistance Measurement Contact Check

Syntax
Command **[:SENSe:]RESistance:CONTactcheck** <1/0/ON/OFF>
Query **[:SENSe:]RESistance:CONTactcheck?**
Response <ON/OFF>

Description The setting will be that of Low-Power OFF. For the Low-Power ON setting, use:
[:SENSe:]RESistance:LP:CONTactcheck
[:SENSe:]RESistance:LP:CONTactcheck?

Example
RES:CONT ON
RES:CONT?
ON

Note Contact check cannot be ON when the multiplexer measurement method is the 2-wire type. An execution error occurs.

Set and Query Low-Power Resistance Measurement Contact Check

Syntax
Command **[:SENSe:]RESistance:LP:CONTactcheck** <1/0/ON/OFF>
Query **[:SENSe:]RESistance:LP:CONTactcheck?**
Response <ON/OFF>

Description The setting will be that of Low-Power ON. For the Low-Power OFF setting, use:
[:SENSe:]RESistance:CONTactcheck
[:SENSe:]RESistance:CONTactcheck?

Example
RES:LP:CONT ON
RES:LP:CONT?
ON

(29) Setting Number of Digits

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Measurement Value's Number of Digits

Syntax
Command **[:SENSe:]RESistance:DIGits** <Number of digits>
Query **[:SENSe:]RESistance:DIGits?**
Response <Number of digits>
RM3544 <Number of digits> = 4/5 (NR1)
RM3545 RM3545A RM3546 <Number of digits> = 5/6/7 (NR1)

Example
:RES:DIG 5
:RES:DIG?
5

Note When Low-Power is ON, six (6) digits will actually be displayed even when the number of digits is set to seven (7).

(30) Temperature Measurement (Analog Input) RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Select and Query Temperature Sensor

Syntax

Command **[:SENSe:]TEMPerature:SENSor** <THERmistor/ANALog>

Query **[:SENSe:]TEMPerature:SENSor?**

Response <THERMISTOR/ANALOG>

<THERMISTOR> = Z2001 temperature sensor is used as the temperature sensor.
<ANALOG> = Analog output thermometer is used as the temperature sensor.

Example

```
TEMP:SENS ANAL
TEMP:SENS?
ANALOG
```

Set and Query Analog Input Parameters

Syntax

Command **[:SENSe:]TEMPerature:PARameter** <V1>,<T1>,<V2>,<T2>

Query **[:SENSe:]TEMPerature:PARameter?**

Response <V1>,<T1>,<V2>,<T2>

<V1> = 0 to 2.00 (NR2).....Reference voltage 1 [V]
<T1> = -99.9 to 999.9 (NR2).....Reference temperature 1 [°C]
<V2> = 0 to 2.00 (NR2).....Reference voltage 2 [V]
<T2> = -99.9 to 999.9 (NR2).....Reference temperature 2 [°C]

Example

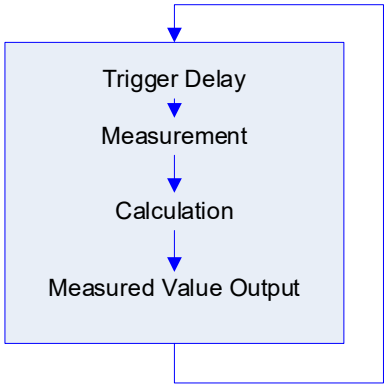
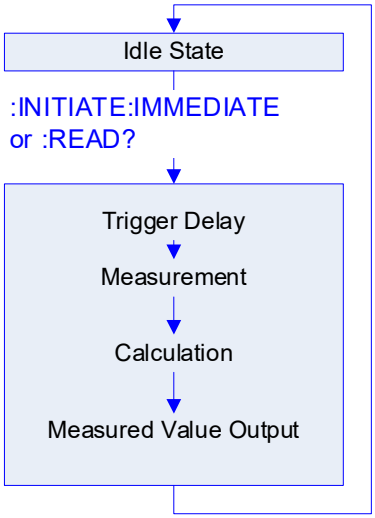
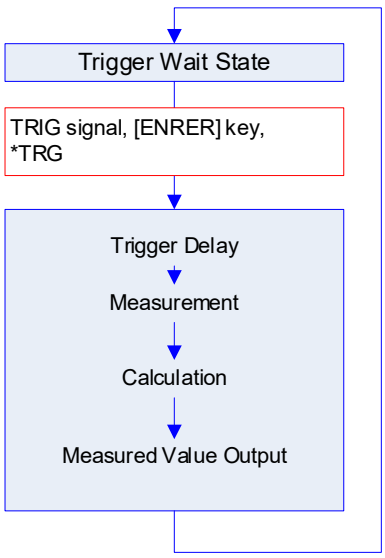
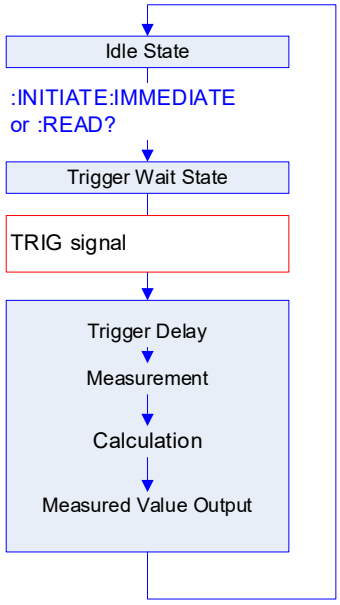
```
TEMP:PAR 0,-10,2,100
TEMP:PAR?
0.00,0.00,1.00,100.0
```

0°C is displayed with 0 V, and 100°C is displayed with 1 V.

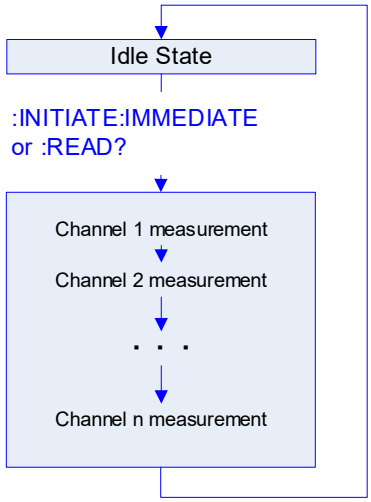
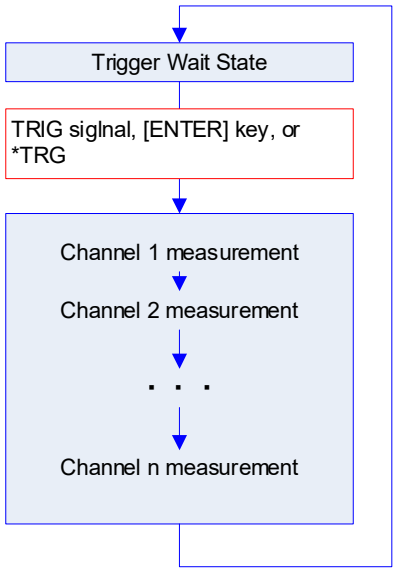
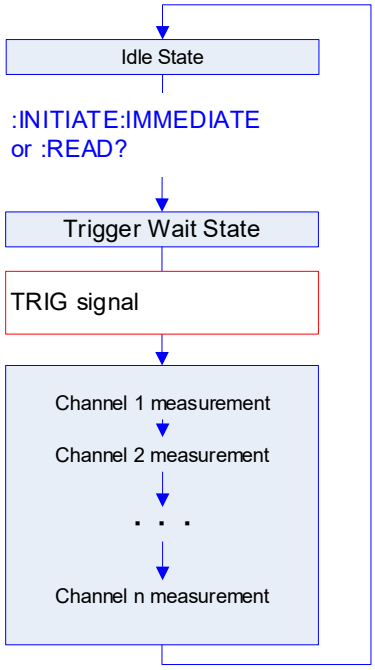
(31) Triggering

Relationship between Trigger Source and Continuous Measurement Operation
Operation depends on the continuous measurement setting (:INITIATE:CONTINUOUS) (p.65) and the trigger source setting (:TRIGGER:SOURCE) (p.65) as follows.
See: “4 Data Exporting Methods” (p.80)
Also see “4 Multiplexer Commands (p.76)” for the multiplexer unit.

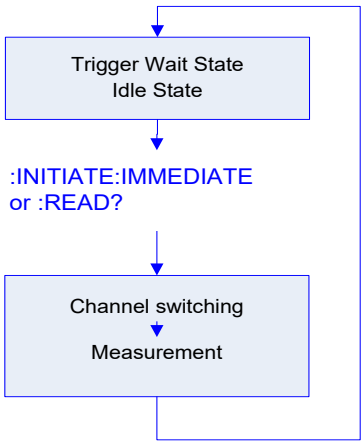
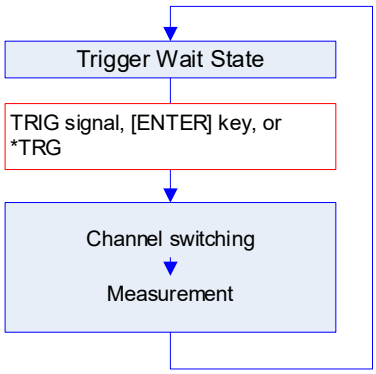
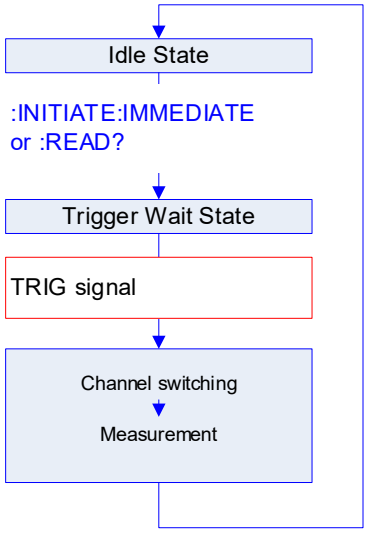
- RM3544, RM3545 RM3545A and RM3546 When the front measurement terminal is used or the scanning function is set to OFF **(:SENSE:SCAN:MODE OFF)**

Measurement Flow		Continuous Measurement Command-Specific Settings	
		:INITIATE:CONTINUOUS ON	**:INITIATE:CONTINUOUS OFF**
Trigger Source	**:TRIGGER:SOURCE IMM**	Free-Run state. Measurement continues automatically. 	Trigger by **:INITIATE** (or **:READ?**) command. 
	:TRIGGER:SOURCE EXT	Trigger by TRIG signal, [ENTER] key or ***TRG** command. After measurement, enters the trigger wait state. 	Issue **:INITIATE** (or **:READ?**) command to wait for trigger. Trigger by TRIG signal. 

• RM3545 RM3545A RM3546 When the scanning function is set to AUTO (**:SENSE:SCAN:MODE AUTO**)

Measurement flow		Continuous Measurement Command-Specific Settings	
		:INITIATE:CONTINUOUS ON	**:INITIATE:CONTINUOUS OFF**
Trigger Source	**:TRIGGER:SOURCE IMM**		Triggered by :INITIATE (or :READ?) command. 
	:TRIGGER:SOURCE EXT	Triggered by TRIG signal, [ENTER] key, or ∗TRG command. After measurement, enters the Trigger Wait State. 	Issue :INITIATE (or :READ?) command to enter the Trigger Wait State. Triggered by TRIG signal. 

• RM3545 RM3545A RM3546 When the scanning function is set to STEP (**:SENSE:SCAN:MODE STEP**)

Measurement flow		Continuous Measurement Command-Specific Settings	
		:INITIATE:CONTINUOUS ON	**:INITIATE:CONTINUOUS OFF**
Trigger Source	**:TRIGGER:SOURCE IMM**		Triggered by :INITIATE (or :READ?) command. 
	:TRIGGER:SOURCE EXT	Triggered by TRIG signal, [ENTER] key, or ∗TRG command. After measurement, enters the Trigger Wait State. 	Issue :INITIATE (or :READ?) command to enter the Trigger Wait State. Triggered by TRIG signal. 

The :INITIATE:CONTINUOUS OFF is can only be set by Remote command.
If this has been set to OFF, when operation is returned to the Local state or power is turned off, the :INITIATE:CONTINUOUS ON state occurs when power is turned back on.
See “Return to Local Control” (p.70) or Exporting measured values: “Data Exporting Methods” (p.80)

Set and Query Continuous Measurement

Syntax

Command **:INITiate:CONTinuous** <1/0/ON/OFF>
Query **:INITiate:CONTinuous?**
Response <ON/OFF>
<ON> = Continuous Measurement Enabled
<OFF> = Continuous Measurement Disabled

Description

- Continuous Measurement Enabled:
  After measurement, enters the Trigger Wait State. When there is an internal trigger (trigger source <IMMEDIATE>), the next trigger is promptly generated and enters a free run state.
- Continuous Measurement Disabled:
  After measurement, enters the Idle State instead of the Trigger Wait State.
- Triggering is ignored in the Idle State. Executing :INITiate[:IMMediate] enables the Trigger Wait State.
- Continuous measurement is enabled upon exiting from the Remote State.

Example

```
:INIT:CONT OFF
:INIT:CONT?
ON
```

Note

RM3545 RM3545A RM3546
If executed while the Scan measurement is in progress, Err032 occurs.

Set Trigger Wait

Syntax

Command **:INITiate[:IMMediate]**

Description

Switches triggering from the Idle State to the Trigger Wait State.

Example

Disable continuous measurement, and read one value for each trigger event.
Sending
:TRIG:SOUR IMM ..... Trigger immediately when entering Trigger Wait State.
:INIT:CONT OFF..... Disables continuous measurement.
:INIT ..... Enable Trigger Wait. Trigger immediately upon :TRIG:SOUR IMM.

Note

- When this message is received, automatically switches to :INITIATE:CONTINUOUS OFF.
- When there is an internal trigger (trigger source <IMMEDIATE>), triggering promptly occurs and enters the idle state.
- When there is an external trigger (trigger source <EXTERNAL>), the external trigger wait state is entered. When a trigger is received, a single measurement is performed and enters the idle state.

Set and Query Trigger Source

Syntax

Command **:TRIGger:SOURce** <IMMediate/EXTernal>
Query **:TRIGger:SOURce?**
Response <IMMEDIATE/EXTERNAL>
<IMMEDIATE> = Internal triggering
<EXTERNAL> = External triggering

Example

```
:TRIG:SOUR IMM
:TRIG:SOUR?
IMMEDIATE
```

Note

RM3545 RM3545A RM3546
If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Trigger Signal Logic

Syntax
Command **:TRIGger:EDGE** <1/0/ON/OFF>
Query **:TRIGger:EDGE?**
Response <ON/OFF>
<ON> = ON edge (OFF→ON)
<OFF> = OFF edge (ON→OFF)

Example
:TRIG:EDGE ON
:TRIG:EDGE?
ON

Note RM3545 RM3545A RM3546 An execution error occurs during scanning.

(32) Delay RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Delay

Syntax
Command **:TRIGger:DELay** <Delay time>
Query **:TRIGger:DELay?**
Response <Delay time>
<Delay time> = 0 to 9.999 (NR2) [sec]

Example
:TRIG:DEL 0.01
:TRIG:DEL?
0.010

Note When the delay is at the default setting (:TRIGger:DELay:AUTO ON), setting values are invalid (disabled). When setting the delay, be sure to turn the default setting OFF.

Set and Query Preset Delay

Syntax
Command **:TRIGger:DELay:AUTO** <1/0/ON/OFF>
Query **:TRIGger:DELay:AUTO?**
Response <ON/OFF>

Setting When the auto delay (preset setting) is set to ON, the delay will be the value specified internally.
When set to OFF, the set delay value (:TRIGger:DELay <delay time>) will govern.

Example
:TRIG:DEL:AUTO ON
:TRIG:DEL:AUTO?
ON

(33) Self-Calibration RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Execute Self-Calibration

Syntax
Command **:SYSTem:CALibration**

Note If this command is received while measuring, self-calibration executes after the measurement is finished.

Execute and Set Self-Calibration

Syntax

Command **:SYSTem:CALibration:AUTO** <1/0/ON/OFF>
Query **:SYSTem:CALibration:AUTO?**
Response <ON/OFF>
<ON> = AUTO Self-Calibration selected
<OFF> = MANUAL Self-Calibration selected

Example

```
:SYST:CAL:AUTO OFF
:SYST:CAL:AUTO?
OFF
```

(34) Saving and Reading Measurement Conditions

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Save and Read Measurement Conditions

Syntax

Command **:SYSTem:PANel:SAVE** <Table No>
:SYSTem:PANel:LOAD <Table No>,<Zero adjustment load>
RM3544 <Table No> = 1 to 10 (NR1)
RM3545 RM3545A RM3546
<Table No> = 1 to 30 (NR1) (When the front terminal is used as a measurement terminal.)/31 to 38 (NR1)
(When the multiplexer is used as a measurement terminal.)
<Zero adjustment load> = 1/0/ON/OFF
<ON> = Zero adjustment value is also read during panel loading.
<OFF> = Zero adjustment is not read during panel loading.

Example

```
:SYST:PAN:SAVE 10
:SYST:PAN:LOAD 5,OFF
```

Note

When the measurement conditions for the Table No. have already been saved and :SYSTem:PANel:SAVE is executed, the measurement conditions will be overwritten.
When the Table No. that does not have the measurement conditions is specified and :SYSTem: PANel:LOAD is executed., an execution error will occur.
RM3545 RM3545A RM3546 When the front terminal is used as a measurement terminal, the measurement conditions cannot be saved to 31 to 38. When the multiplexer is used, the measurement conditions cannot be saved to 1 to 30. When a test lead is connected to the front measurement terminal, cannot be read to 31 to 38.An execution error occurs in either case.

Set and Query Panel Name

Syntax

Command **:SYSTem:PANel:NAME** <Table No>,<Panel name (character string data: maximum 10 characters)>
Query **:SYSTem:PANel:NAME?** <Table No>
Response <Table No>,<Panel name (character string data: maximum 10 characters)>
RM3544 <Table No> = 1 to 10 (NR1)
RM3545 RM3545A RM3546 <Table No> = 1 to 38 (NR1)
For information on character string data, see Data Formats. (p.4)

Example

```
:SYST:PAN:NAME 1,“PANEL_1”
:SYST:PAN:NAME? 1
1,“PANEL_1”
```

Clear Panel

Syntax Command **:SYSTem:PANel:CLEar** <Table No>
RM3544 <Table No> = 1 to 10 (NR1)
RM3545 RM3545A RM3546 <Table No> = 1 to 38 (NR1)

Example
```
:SYST:PAN:CLE 10
```

(35) Absolute Value Display

Set and Query Absolute Value Display

Syntax Command **:SYSTem:ABSolute** <1/0/ON/OFF>
Query **:SYSTem:ABSolute?**
Response <ON/OFF>

Example
```
:SYST:ABS ON
:SYST:ABS?
ON
```

(36) Key-Lock

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Key-Lock State

Syntax Command **:SYSTem:KLOCk** <1/0/ON/OFF>
Query **:SYSTem:KLOCk?**
Response <ON/MENU/OFF>

Description Switches to FULL key-lock state. (Prohibits all setting changes by key operation.)
MENU is returned during MENU key-lock state. the scanning and the measuring.

Example
```
:SYST:KLOC ON
:SYST:KLOCK?
ON
```

(37) Line Frequency

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Line Frequency

Syntax Command **:SYSTem:LFRequency** <AUTO/50/60>
Query **:SYSTem:LFRequency?**
Response <AUTO/50/60>

Example
```
:SYST:LFR 50
:SYST:LFR?
50
```

(38) Clock RM3545 RM3545A RM3546

If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query System Date

Syntax

Command **:SYSTem:DATE** <Year>,<Month>,<Day>
Query **:SYSTem:DATE?**
Response <Year>,<Month>,<Day>

<Year> = 00 to 99 (NR1)
<Month> = 01 to 12 (NR1)
<Day> = 01 to 31 (NR1)

Description Sets and queries the date of the real-time system clock.

Example

:SYST:DATE 13,01,10
Sets the date to January 10, 2013.
:SYST:DATE?
13,12,10
The date is December 10, 2013.

Note Attempting to set an out-of-range numerical value returns an execution error. Attempting to set a non-existent date (such as 13,06,31) returns an execution error.

Set and Query System Time

Syntax

Command **:SYSTem:TIME** <Hour>,<Minute>,<Second>
Query **:SYSTem:TIME?**
Response <Hour>,<Minute>,<Second>

<Hour> = 00 to 23 (NR1)
<Minute> = 00 to 59 (NR1)
<Second> = 00 to 59 (NR1)

Description Sets the time of the real-time system clock.

Example

:SYST:TIME 08,25,00
Sets the time to 8:25 and 00 seconds.
:SYST:TIME?
23,09,53
The time is 23:09 and 53 seconds.

Note Attempting to set an out-of-range numerical value returns an execution error. Attempting to set a non-existent time (such as 09,06,71) returns an execution error.

(39) Key Beeper

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Set and Query Key Beeper

Syntax

Command **:SYSTem:BEEPer:STATe** <1/0/ON/OFF>
Query **:SYSTem:BEEPer:STATe?**
Response <ON/OFF>

Example

:SYST:BEEP:STAT ON
:SYST:BEEP:STAT?
ON

(40) Communications Settings

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Return to Local Control

Syntax Command **:SYSTem:LOCal**

Description Disables communications remote control and re-enables local control. The panel keys are re-enabled.

Example
```
:SYST:LOC
```

Set and Query Measurement-Synchronized Data Output [RS-232C/USB/LAN]

Syntax Command **:SYSTem:DATAout** <1/0/ON/OFF>
Query **:SYSTem:DATAout?**
Response <ON/OFF>

Description
<ON> = With an external trigger (trigger source <EXTERNAL>), measurement values are automatically sent when trigger measurements are completed. When there is an internal trigger (trigger source <IMMEDIATE>), measurement values are automatically sent when the [ENTER] key is pressed and TRIG signal have been input.
<OFF> =Measured values are not automatically sent.

Note This command is not applicable to the GP-IB Interface.

Set and Query Header Presence

Syntax Command **:SYSTem:HEADer** <1/0/ON/OFF>
Query **:SYSTem:HEADer?**
Response <ON/OFF>

Example
```
:SYST:HEAD ON
:SYST:HEAD?
:SYSTEM:HEADER ON
:SYST:HEAD OFF
:SYST:HEAD?
OFF
```

Note When turning the power on or after the *RST command, this is initialized to OFF (no header).

Set and Query Delimiter

Syntax Command **:SYSTem:TERMinator** <0/1>
Query **:SYSTem:TERMinator?**
Response <0/1>
<0> = LF+EOI
<1> = CR, LF+EOI

Example
```
:SYST:TERM 1
:SYST:TERM?
0
```

Note
- At power-on, this is set to 0 (LF+EOI).
- The RS-232C/USB/LAN delimiter is fixed as CR+LF.

Set and Query Communication interface

Syntax

Command **:SYSTem:COMMunicate** <USB/LAN/RS232c/PRINter>
Query **:SYSTem:COMMunicate?**
Response <USB/LAN/RS232C/PRINTER>

<USB> = USB
<LAN> = LAN RM3545A RM3546
<RS232c> = RS232C
<PRINter> = PRINTER(RS232C)

Description Configure and inquire about communication interfaces

Example

:SYST:COMM USB
:SYST:COMM?
USB

Note Changes the interface upon receiving a command.
(Communication during command will be disconnected)

Set and Query Command Monitor

Syntax

Command **:SYSTem:COMMunicate:MONitor** <1/0/ON/OFF>
Query **:SYSTem:COMMunicate:MONitor?**
Response <ON/ OFF>

<1/ON> = display ON
<0/OFF> =display OFF

Description Configure the command monitor.

Note

Set and Query IP Adress RM3545A RM3546

Syntax

Command **:SYSTem:COMMunicate:LAN:IPADdress** <IP address>
Query **:SYSTem:COMMunicate:LAN:IPADdress?**
Response <IP address>

<IP adress> = nnn,nnn,nnn,nnn

Description Sets and queries the LAN IP address.

Example

:SYST:COMM:LAN:IPAD 192,168,1,2
:SYST:COMM:LAN:UPD
:SYST:COMM:LAN:IPAD?
192,168,1,2

Note Updates are reflected when you run ":SYSTem:COMMunicate:LAN:UPDate"
Parameter separator is ",". Please do not separate with "."

Set and Query LAN sub-net mask RM3545A RM3546

Syntax

Command **:SYSTem:COMMunicate:LAN:SMASk** <subnet mask>
Query **:SYSTem:COMMunicate:LAN:SMASk?**
Response <subnet mask>

<subnet mask> = nnn,nnn,nnn,nnn

Description Sets and queries the LAN subnet mask.

Example

:SYST:COMM:LAN:SMAS 255,255,0,0
:SYST:COMM:LAN:UPD
:SYST:COMM:LAN:SMAS?
255,255,0,0

Note Updates are reflected when you run ":SYSTem:COMMunicate:LAN:UPDate"
Parameter separator is ",". Please do not separate with "."

Set and Query LAN gateway RM3545A RM3546

Syntax
Command **:SYSTem:COMMunicate:LAN:GATeway** <gateway>
Query **:SYSTem:COMMunicate:LAN:GATeway?**
Response <gateway>

<gateway> = nnn,nnn,nnn,nnn

Description Sets and queries the LAN gateway.
Example
:SYST:COMM:LAN:GAT 192,168,1,1
:SYST:COMM:LAN:UPD
:SYST:COMM:LAN:GAT?
192,168,1,1

Note Updates are reflected when you run ":SYSTem:COMMunicate:LAN:UPDate"
Parameter separator is ",". Please do not separate with "."

Set and Query LAN port RM3545A RM3546

Syntax
Command **:SYSTem:COMMunicate:LAN:CONTrol** <port NO.>
Query **:SYSTem:COMMunicate:LAN:CONTrol?**
Response <port NO.>

<port No.> = 11～65535(80 is excluded)

Description Sets and queries the LAN port number.
Example
:SYST:COMM:LAN:CONT 3545
:SYST:COMM:LAN:UPD
:SYST:COMM:LAN:CONT?
3545

Note Updates are reflected when you run ":SYSTem:COMMunicate:LAN:UPDate"

Query MAC address RM3545A RM3546

Syntax
Query **:SYSTem:COMMunicate:LAN:MAC?**
Response <MAC address>

Description It will respond with the LAN MAC address as a hexadecimal string separated by hyphens.
Example
:SYST:COMM:LAN:MAC?
"00-01-67-07-03-85"

Update LAN settings RM3545A RM3546

Syntax
Command **:SYSTem:COMMunicate:LAN:UPDate**

Description If you change the LAN IP address, subnet mask, gateway, or port using a command, it will be reflected using this command.

Note If communicating via LAN, the connection will be disconnected.

Set and Query RS-232C Communication speed RM3545A RM3546

Syntax
Command **:SYSTem:COMMunicate:RS232C:SPEED** <baud rate>
Query **:SYSTem:COMMunicate:RS232C:SPEED?**
Response <baud rate>

<baud rate> = 9600/19200/38400/115200 (NR1)

Description Change and inquire about RS-232C communication speed.
Example
:SYST:COMM:RS232C 9600
:SYST:COMM:RS232C:SPEED?
9600

(41) System Reset

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Execute System Reset

Syntax Command **:SYSTem:RESet**

Description Initializes all except communications and clock settings. After initialization, panel data, too, is initialized.

(42) EXT I/O

RM3545 RM3545A RM3546 If executed while the Scan measurement is in progress, Err032 occurs.

Query NPN/PNP Switch Status

Syntax Query **:IO:MODE?**
Response <NPN/PNP>

Example
```
:IO:MODE?
NPN
```

External I/O Input

Syntax Query **:IO:INPut?**
Response 0 to 3 (NR1)

Description Reads the ON edge of TRIG of the EXT I/O and the PRINT terminal, and then clears them. (If the trigger signal edge has the OFF edge setting, the TRIG terminal reads the OFF edge.)
When the edge is detected, the bits are set. When reading is performed through this query, it is cleared to 0. Also, input by key is also detected in the same manner as signals.

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	-	-	-	-	-	-	PRINT	TRIG
Pin No.	-	-	-	-	-	-	26	1

See the instrument instruction manual regarding external control (EXT I/O) as well.

Note While the filter setting of the input signal is ON, the edge after the set filter time will be read.

External I/O Output

Syntax Command **:IO:OUTPut** <Output data 0 to 7>

Description When the judgment output mode is selected with the EXT I/O output mode, any 3-bit data can be output from the EXT I/O terminal.

	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	-	-	-	-	-	OUT2	OUT1	OUT0
Pin No.	-	-	-	-	-	19	37	18

See the instrument instruction manual regarding external control (EXT I/O) as well.

Execute and Query TRIG/PRINT Signal's Filter Function

Syntax Command **:IO:FILTer:STATe** <1/0/ON/OFF>
Query **:IO:FILTer:STATe?**
Response <ON/OFF>

Example
```
:IO:FILT:STAT ON
:IO:FILT:STAT?
ON
```

Set and Query TRIG/PRINT Signal's Filter Time

Syntax
Command :IO:FILTer:TIME <Filter time>
Query :IO:FILTer:TIME?
Response <Filter time>
<Filter time> = 0.05 to 0.50 (NR2) [sec]

Example
:IO:FILT:TIME 0.1
:IO:FILT:TIME?
0.10

Set and Query Judgment Mode/BCD Mode

Syntax
Command :IO:JUDGe:MODE <JUDge/BCD>
Query :IO:JUDGe:MODE?
Response <JUDGE/BCD>
<JUDGE> = Judgment mode
<BCD> = BCD mode

Example
:IO:JUDG:MODE BCD
:IO:JUDG:MODE?
BCD

Set and Query EOM Output Method

Syntax
Command :IO:EOM:MODE <HOLD/PULSe>
Query :IO:EOM:MODE?
Response <HOLD/ PULSE>
<HOLD> = Holds the EOM signal until measurement starts by the next trigger signal.
<PULSE> = Sets EOM=OFF according to the specified pulse width.

Example
:IO:EOM:MODE PULS
:IO:EOM:MODE?
PULSE

Set and Query EOM Pulse Width

Syntax
Command :IO:EOM:PULSe <Pulse width>
Query :IO:EOM:PULSe?
Response <Pulse width (NR2)>
<Pulse width> = 0.001 to 0.100 (NR2) [sec]

Example
:IO:EOM:PULS 0.005
:IO:EOM:PULS?
0.005

(43) Multiplexer Unit RM3545 RM3545A RM3546

• Also see 4 Multiplexer Commands (p.76)" for the multiplexer unit.
If executed while the Scan measurement is in progress, Err032 occurs.

Query Unit

Syntax
Query :UNIT:IDN? <Unit number>
<Unit number> = 1/2
Response <Model name>,<Serial number>
If the unit is not inserted: <Model name> = NONE

Example
:UNIT:IDN? 1
Z3003,123456789

Query Relay Usage Count

Syntax

Query **:UNIT:SCOunt?** <Unit number>
<Unit number> = 1/2
Response <Relay count (NR1)>

Description

Responds with the count of the relay with the highest usage count of all the relays for each unit.
-1 is returned if the unit is not inserted and an execution error occurs.

Example

```
:UNIT:SCO? 1
10000
```

Query Multiplexer Unit Test Execution and Result

Syntax

Query **:UNIT:TEST?** <Unit number>
<Unit number> = 1/2
Response <0 to 8 (NR1)>

128	64	32	16	8	4	2	1
bit7	bit6	bit5	bit7	bit3	bit2	bit1	bit0
Unused	Unused	Unused	Unused	NO UNIT	Blown FUSE	FRONT ERR	UNIT ERR

Description

Performs a multiplexer test and responds with the result in NR1 number (0 to 4).
0 is returned if there is no error.
UNIT ERR(1)
Multiplexer short circuit resistance check error
FRONT ERR(2)
When a test lead is connected to the front measurement terminal. Remove the test lead and execute the test again.
Blown FUSE (4)
The fuse on the back of the instrument for measurement terminal protection has been blown. Replace the fuse and execute the test again.
NO UNIT(8)
The unit is not inserted. Insert the unit and execute the test again.
For information on unit test, see the instrument instruction manual.

Example

```
:UNIT:TEST? 1
0
```

Note

RM3545 RM3545A RM3546
If executed while the Scan measurement is in progress, Err032 occurs.

4 Multiplexer Commands

RM3545 | RM3545A | RM3546

Multiplexer Settings

There are two types of multiplexer commands, commands for individual channels and those common to all channels. The commands for individual channels are applied to the current channel. When specifying a channel, it is necessary to switch the channel in advance.
Check Message List to see the type of each command.

For example, [:SENSe:]RESistance:RANGe is a command for individual channels and [:SENSe:]RESistance:DIGits is a command common to all channels. An example of command communication is shown below.

CH?	
5	The current channel number is 5.
RES:RANG?	
1	The resistance range of Channel 5 is 1Ω.
RES:DIG?	
7	The number of digits is 7 and this is common to all channels.
CH 3	Switches the channel number to 3.
RES:RANG 10	Switches the resistance range of Channel 3 to 10Ω.
RES:DIG 6	The number of digits is 6 and this is common to all channels.

The state after command execution is as follows.
• Current channel: 3
• State of each channel

Channel	Measurement range	Number of digits
3	10Ω range	6
5	1Ω range	

Example A1: Setting all channels in a batch

CH:STAT ON,1	Channel 1 is used.
CH:STAT ON,2	Channel 2 is used.
CH:STAT ON,3	Channel 3 is used.
CH 1	Channel 1 settings
TERM 1,1,2	Measures between Unit 1 TERM 1 and TERM 2.
RES:RANG 10E-03	Sets the range.
:CALC:LIM:STAT ON	Sets the comparator.
:CALC:LIM:UPP 10E-03	
:CALC:LIM:LOW 1E-03	
:CALC:LIM:JUDG:COND IN	
CH 2	Channel 2 settings
TERM 1,3,4	Measures between Unit 1 TERM 3 and TERM 4
RES:RANG 10E-03	Sets the range.
:CALC:LIM:STAT ON	Sets the comparator.
:CALC:LIM:UPP 8E-03	
:CALC:LIM:LOW 3E-03	
:CALC:LIM:JUDG:COND IN	

Example A2: Performing a measurement while switching the terminal

:INIT:CONT ON	Continuous measurement ON
:TRIG:SOUR IMM	Internal trigger
SCAN:MODE OFF	Scan OFF
CH:STAT ON,1	Channel 1 is used.
CH 1	Channel 1 settings
TERM 1,1,2	Measures between Unit 1 TERM 1 and TERM 2.
:FETC?	
10.00000E+00	
TERM 1,3,4	Measures between Unit 1 TERM 3 and TERM 4.
:FETC?	
20.00000E+00	
TERM 1,5,6	Measures between Unit 1 TERM 5 and TERM 6.
:FETC?	
30.00000E+00	

Multiplexer Measurement

Using a multiplexer, a measurement can be performed in various ways when the scanning function, trigger source, and continuous measurement are combined.
See: Triggering (p.62), “4 Data Exporting Methods” (p.80)

(1) Performing a measurement while the channel is switched by a command without using the scanning function

Example B1-1 Activating the trigger using a command with continuous measurement OFF

SCAN:MODE OFF	Scan OFF
:TRIG:SOUR IMM	Internal trigger
:INIT:CONT OFF	Continuous measurement OFF
CH:STAT ON,1	Selects the channel to be used.
CH:STAT ON,2	
CH 1	Switches the channel.
:READ?	Reads the measured value.
1020.000E-03	
CH 2	Switches the channel.
:READ?	Reads the measured value.
100.000E-03	

(2) Executing scanning using a command

Example B2-1 When the scanning function is set to AUTO (SCAN:MODE AUTO)

SCAN:MODE:AUTO	Scanning function: AUTO
:TRIG:SOUR IMM	Internal trigger (continuous measurement OFF)
CH:STAT ON,1	Selects the channel to be used.
CH:STAT ON,2	
:READ?	Executes scanning (all channels measured).
1020.000E-03, 100.000E-03	Reads the measured values of all channels.
:CALC:LIM:RES? 1	Obtains the comparator result of each channel.
HI	
:CALC:LIM:RES? 2	
IN	
:CALC:LIM:JUDG? 1	Obtains the PASS/FAIL result of each channel.
FAIL	
:CALC:LIM:JUDG? 2	
PASS	
:CALC:LIM:JUDG:TOT?	Obtains the total judgment result.
FAIL	
:READ? NDAT	Executes scanning (all channels measured).
FAIL	Reads the total judgment result.

:READ? JUDG 1020.000E-03, 100.000E-03,FAIL	Executes scanning (all channels measured). Reads the measured values of all channels and total judgment result.

Example B2-2 When the scanning function is set to STEP (SCAN:MODE STEP)

SCAN:MODE STEP	Scanning function: STEP
:TRIG:SOUR IMM	Internal trigger (continuous measurement OFF)
CH:STAT ON,1 CH:STAT ON,2	Selects the channel to be used.
:READ? 1020.000E-03	Measures Channel 1 and reads the measured value.
:CALC:LIM:RES? HI	Reads the comparator result of Channel 1.
:CALC:LIM: JUDG? FAIL	Reads the PASS/FAIL result of Channel 1.
:READ? 100.000E-03	Measures Channel 2 and reads the measured value.
:CALC:LIM:RES? IN	Reads the comparator result of Channel 2.
:CALC:LIM:JUDG? PASS	Reads the PASS/FAIL result of Channel 2.
:CALC:LIM:JUDG:TOT? FAIL	Obtains the total judgment result.
SCAN:RES	Clears the measured value and switches to Channel 1.

(3) Executing scanning using an external trigger

Example B3-1 When the scanning function is set to AUTO (SCAN:MODE AUTO)

SCAN:MODE:AUTO	Scanning function: AUTO
:TRIG:SOUR EXT	External trigger
CH:STAT ON,1 CH:STAT ON,2	Selects the channel to be used.
:READ?	Waits for a trigger (continuous measurement OFF).
(External trigger input) 1020.000E-03, 100.000E-03	Reads the measured values of all channels.

SCAN:MODE AUTO	Scanning function: AUTO
:TRIG:SOUR EXT	External trigger
:INIT:CONT ON	Continuous measurement ON
CH:STAT ON,1 CH:STAT ON,2 CH:STAT ON,3	Selects the channel to be used.
(External trigger input)	Executes scanning.
:FETC? 1 1020.000E-03 :FETC? LIM,2 100.000E-03,HI :FETC? JUDG,3 100.000E-03,PASS	Reads the measured values and judgment values of all channels.
:SCAN:DATA? 1020.000E-03, 100.000E-03, 100.000E-03	Reads the measured values of all channels.

Example B3-2 When the scanning function is set to STEP (SCAN:MODE STEP)

SCAN:MODE STEP	Scanning function: STEP
:TRIG:SOUR IMM	Internal trigger (continuous measurement OFF)
CH:STAT ON,1	Selects the channel to be used.
CH:STAT ON,2	
:READ?	Measures Channel 1.
(External trigger input)	
1020.000E-03	Reads the measured value of Channel 2.
:READ?	Measures Channel 2.
(External trigger input)	
100.000E-03	Reads the measured value of Channel 2.
SCAN:RES	Clears the measured value and switches to Channel 1.

SCAN:MODE STEP	Scanning function: STEP
:TRIG:SOUR EXT	External trigger
:INIT:CONT ON	Continuous measurement ON
CH:STAT ON,1	Selects the channel to be used.
CH:STAT ON,2	
CH:STAT ON,3	
(External trigger input)	Measures Channel 1.
:FETC?	Reads the measured value of Channel 1.
1020.000E-03	
(External trigger input)	Measures Channel 2.
:FETC? LIM	Reads the measured value and comparator result of Channel 2.
100.000E-03,HI	
(External trigger input)	Measures Channel 3.
:FETC? JUDG	Reads the measured value and PASS/FAIL result of Channel 3.
100.000E-03,PASS	
SCAN:RES	Clears the measured value and switches to Channel 1.

SCAN:MODE STEP	Scanning function: STEP
:TRIG:SOUR EXT	External trigger
:INIT:CONT ON	Continuous measurement ON
CH:STAT ON,1	Selects the channel to be used.
CH:STAT ON,2	
CH:STAT ON,3	
(External trigger input)	Measures Channel 1.
(External trigger input)	Measures Channel 2.
(External trigger input)	Measures Channel 3.
:FETC? 1	Reads the measured values and judgment values of all channels.
1020.000E-03	
:FETC? LIM,2	
100.000E-03,HI	
:FETC? JUDG,3	
100.000E-03,PASS	
:SCAN:DATA?	Reads the measured values of all channels.
1020.000E-03, 100.000E-03, 100.000E-03	
SCAN:RES	Clears the measured value and switches to Channel 1.

5 Data Exporting Methods

Basic Data Exporting Methods

Flexible data exporting is available depending on the application.

Export Free-Run Data

Default Setting	**:INITiate:CONTinuous ON** (continuous measurement enable) **:TRIGger:SOURce IMMediate** (internal triggering)
Exporting	**:FETCh?** Imports the most recent measurement. RM3545 RM3545A RM3546 When the scanning function is set to AUTO or STEP, free-run data cannot be exported.

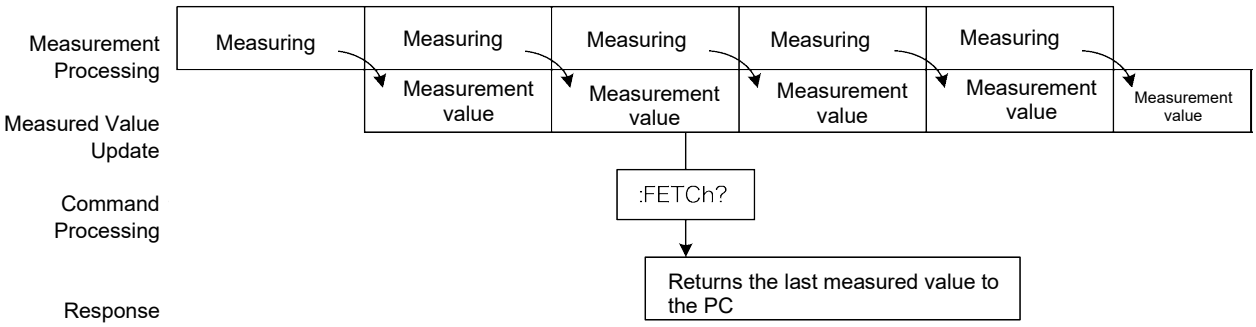
Export by Controller (PC, PLC) Triggering

Default Setting	**:INITiate:CONTinuous OFF** (continuous measurement disable) **:TRIGger:SOURce IMMediate** (internal triggering)
Exporting	**:READ?** A trigger occurs, and a measurement is performed and the result is transferred. RM3545 RM3545A RM3546 When the scanning function is set to AUTO or STEP, scanning begins when :READ? is received (a trigger is not required separately).
Note	When :READ? is sent, **:INITiate:CONTinuous OFF** automatically occurs.

Export by Pressing [ENTER] Key or Applying TRIG Signal

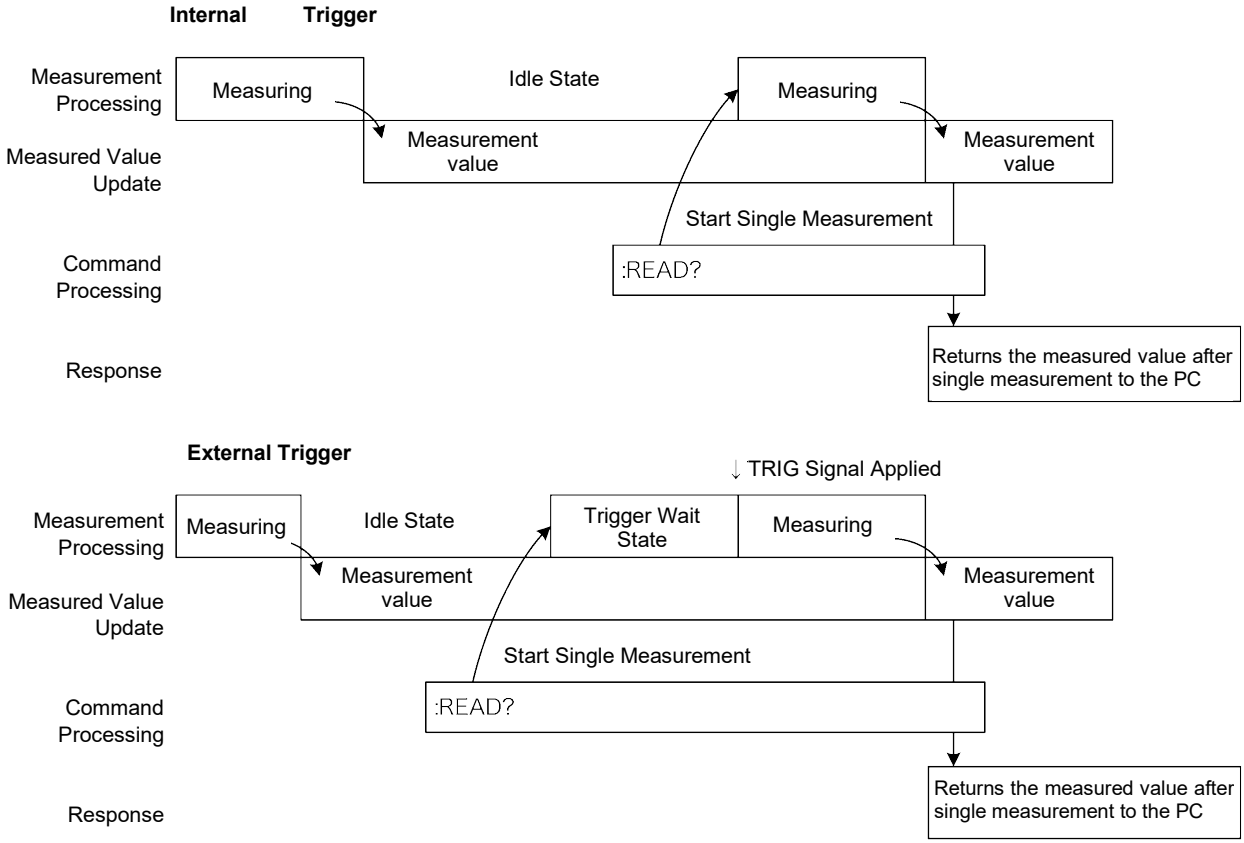
Default Setting	**:INITiate:CONTinuous OFF** (continuous measurement disable) **:TRIGger:SOURce EXT** (external triggering)
Exporting	**:READ?** When triggered by the [ENTER] Key or TRIG signal, a measurement is performed and the result is transferred.
Note	When :READ? is sent, **:INITiate:CONTinuous OFF** automatically occurs.

Using the **:FETCh?** Command during Continuous Measurement with Internal Triggering



This is the simplest method for exporting measured values. It is ideal when measurement (tact) time is not limited, and when external synchronization is not needed. After connecting to the measurement target, wait for twice the measurement time before exporting the measured value.

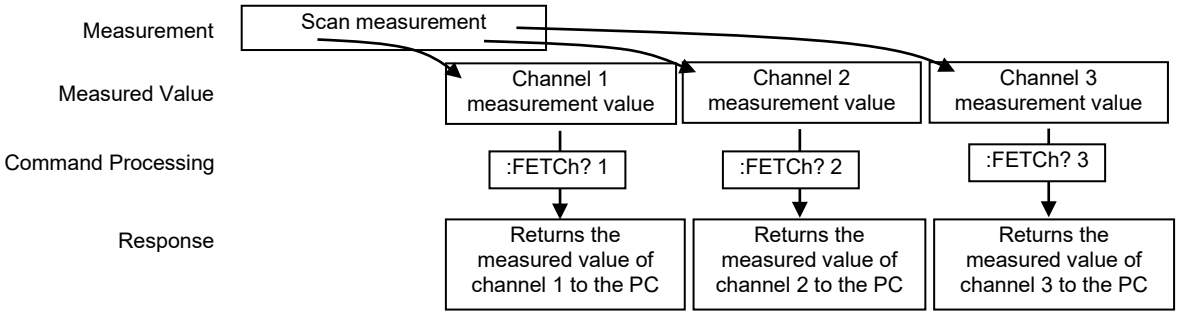
Using the **:READ?** Command while Continuous Measurement is Disabled



Use this method to measure (and export) synchronously with the controller (PC, PLC) or external trigger signal. Measurement time can be minimized.

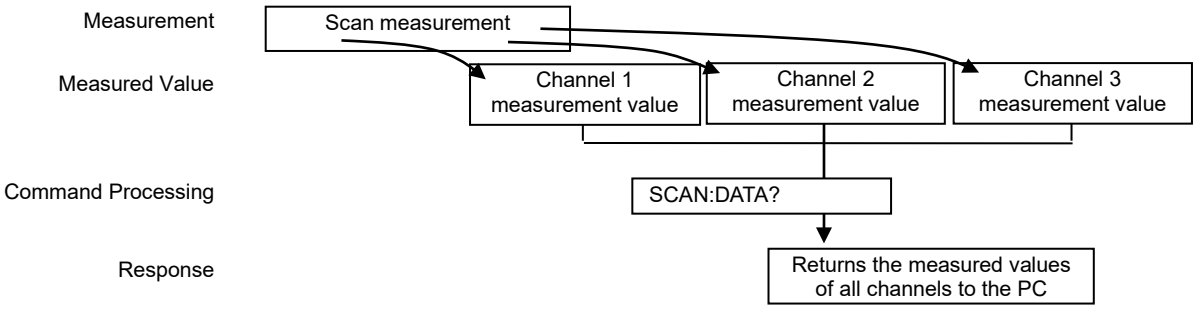
Using the **:FETCh?** Command when the Scanning Function is Set to AUTO or STEP RM3545 RM3545A RM3546

When the scanning function is set to AUTO or STEP, the measured value of any channel is obtained with the :FETCh? command after scanning.



Using the **SCAN:DATA?** Command when the Scanning Function is Set to AUTO or STEP RM3545 RM3545A RM3546

When the scanning function is set to AUTO or STEP, the measured values of all channels are obtained with the SCAN:DATA? command after scanning.



6 Examples of communication commands

This section introduces the communication commands used when controlling the instrument using the communication function.
When sending a command, it is necessary to add a message terminator (CR+LF, etc.), but this notation is omitted in this explanation. Similarly, the terminator (CR+LF) added to the response is also omitted.

You can also download sample programs compatible with various programming languages from our website. Please refer to this when creating communication programs for measuring instruments.
Please search for Sample program for communication with HIOKI products on an internet search site.

Confirmation before measurement

This is an example of checking the status of the device and acquiring information about the device before measurement.

	Content	Send from controller to instrument	Example of response of this device
1	Communication confirmation	*IDN?	HIOKI,RM3545A-2,230822756,V1.00
2	Check date	:SYST:DATE?	23,10,1
3	Check the time	:SYST:TIME?	12,34,56
4	Self-test confirmation	*TST?	0

Setting measurement conditions

Set measurement conditions.
・Range：1000mΩ
・Sampling：FAST
・Trigger：EXTERNAL
・Eomparator：ON, ABS mode, Upper limit 1000mΩ, lower limit 500mΩ, Sound the buzzer on Hi and Lo

	Content	Send from controller to instrument	Example of response of this device
1	Set measurement range to 1000mΩ	:RES:RANG 1E+0	
2	Set sampling to FAST	:SAMP:RATE FAST	
3	Select external trigger	:TRIG:SOUR EXT	
4	Continuous measurement ON	:INIT:CONT ON	
5	Comparator ABS mode	:CALC:LIM:MODE ABS	
6	IN buzzer OFF	:CALC:LIM:BEEP IN,0,0	
7	Hi buzzer type 1 continuous	:CALC:LIM:BEEP HI,1,0	
8	Lo buzzer type 1 continuous	:CALC:LIM:BEEP LO,1,0	
9	Upper limit value 1Ω	:CALC:LIM:UPP 1E+0	
10	Lower limit value 0.5Ω	:CALC:LIM:LOW 0.5E+0	
11	Comparator ON	:CALC:LIM:STAT ON	

Simple resistance measurement

Capture 10 measurements and save as a text file.

	Content	Send from controller to instrument	Example of response of this device
1	Select internal trigger	:TRIG:SOUR IMM	
2	Continuous measurement ON	:INIT:CONT ON	
3	Get the latest measurements	:FETCH?	(measured value)
4	Save (measured value) to text file		
5	Repeat steps 3 and 4 10 times		

Resistance measurement using computer keys

Measure and import data using computer keystrokes and save as a text file.

	Content	Send from controller to instrument	Example of response of this device
1	Select internal trigger	:TRIG:SOUR IMM	
2	Continuous measurement OFF	:INIT:CONT OFF	
3	(Waiting for computer key input)		
4	Get measured value after measurement	:READ?	(measured value)
5	Save (measured value) to text file		
6	Repeat steps 3 to 5		

Measurement by external trigger 1

Measure and import data using an external trigger ([ENTER] key, TRIG signal input) or computer key input, and save it as a text file.

	Content	Send from controller to instrument	Example of response of this device
1	Select external trigger	:TRIG:SOUR EXT	
2	Continuous measurement OFF	:INIT:CONT OFF	
3	Get measured value after measurement	:READ?	
4	(send external trigger or trigger command)	*TRG	(measured value)
5	Save (measured value) to text file		
6	Repeat steps 3 to 5		

Measurement by external trigger 2

Capture data using an external trigger ([ENTER] key, TRIG signal input) and save it as a text file. (The main unit is in continuous measurement mode, and the latest measured value is acquired at the timing of trigger input.)

	Content	Send from controller to instrument	Example of response of this device
1	Select internal trigger	:TRIG:SOUR IMM	
2	Continuous measurement ON	:INIT:CONT ON	
3	Clear external I/O trigger input confirmation	:IO:INP?	1
4	Wait for external I/O trigger input	:IO:INP?	1
5	Get the latest measurements	:FETCH?	(measured value)
6	Save (measured value) to text file		
7	Repeat steps 4 to 6		

LAN communication setting example RM3545A RM3546

This is an example of setting the IP address, port number, etc.

	Content	Send from controller to instrument	Example of response of this device
1	IP address settings	:SYST:COMM:LAN:IPAD 172,16,1,100	
2	Setting the subnet mask	:SYST:COMM:LAN:SMASk 255,255,255,0	
3	Setting the default gateway	:SYST:COMM:LAN:GAT 172,16,1,1	
4	Setting the port number	:SYST:COMM:LAN:CONT 523	
5	Confirming LAN settings (LAN restart)	:SYST:COMM:LAN:UPD	
6	Check IP address	:SYST:COMM:LAN:IPAD?	172,16,1,100
7	Check subnet mask	:SYST:COMM:LAN:SMASk?	255,255,255,0
8	Checking the default gateway	:SYST:COMM:LAN:GAT?	172,16,1,1
9	Check port number	:SYST:COMM:LAN:CONT?	523

Example of Advanced Temperature Correction (A-TC) RM3546

This is an example of the settings and measurement value acquisition when the scan function is OFF.

	Content	Send from controller to instrument	Example of response of this device
1	Channel Settings	:CH 1	
2	CH1 ON	:CH:STAT ON,1	
3	SCAN Settings	:SCAN:MODE OFF	
4	A-TC ON	:ATC:TCOR:STAT ON	
5	Weld Location Terminal Assignment Settings	:TERM 1,1,1	
6	Weld Location Constant Settings	:ATC:TCOR:PAR 20,3930	
7	Weld Location Range Settings	:RES:RANG:AUTO ON	
8	Weld Location Speed Settings	:SAMP:RATE MED	
9	Weld Location Averaging Settings	:CALC:AVER:STAT ON	
10	Weld Location Averaging Count Settings	:CALC:AVER:COUN 2	
11	Weld Location A-OVC ON	:RES:AOVC ON	
12	Temperature Measurement Terminal Assignment Settings	:ATC:TERM 1,2,2	

13	Temperature Measurement Constant Settings	:ATC:TCON:DELT:PAR 100.000E-6,20,3930	
14	Temperature Measurement Range Settings	:ATC:RANG:AUTO ON	
15	Temperature Measurement Speed Settings	:ATC:RATE MED	
16	Temperature Measurement Averaging Settings	:ATC:AVER:STAT ON	
17	Temperature Measurement Averaging Count Settings	:ATC:AVER:COUN 2	
18	Temperature Measurement A-OVC ON	:ATC:AOVC ON	
19	Start A-TC Measurement and Read Measurement Values	:ATC:READ? ATC or :ATC:INIT :ATC:FETCh? ATC	1,100.000E-06, 139.300E-06, 100.00E+00

This is an example of the settings and measurement value acquisition when the scan function is set to AUTO.

	Content	Send from controller to instrument	Example of response of this device
1	Channel Settings	:CH 1	
2	CH1 ON (Following CH1 settings)	:CH:STAT ON,1	
3	A-TC ON	:ATC:TCOR:STAT ON	
4	Weld Location Terminal Assignment Settings	:TERM 1,1,1	
5	Weld Location Constant Settings	:ATC:TCOR:PAR 20,3930	
6	Weld Location Range Settings	:RES:RANG:AUTO ON	
7	Weld Location Speed Settings	:SAMP:RATE MED	
8	Weld Location Averaging Settings	:CALC:AVER:STAT ON	
9	Weld Location Averaging Count Settings	:CALC:AVER:COUN 2	
10	Weld Location A-OVC ON	:RES:AOVC ON	
11	Temperature Measurement Terminal Assignment Settings	:ATC:TERM 1,2,2	
12	Temperature Measurement Constant Settings	:ATC:TCON:DELT:PAR 100.000E-6,20,3930	
13	Temperature Measurement Range Settings	:ATC:RANG:AUTO ON	
14	Temperature Measurement Speed Settings	:ATC:RATE MED	
15	Temperature Measurement Averaging Settings	:ATC:AVER:STAT ON	
16	Temperature Measurement Averaging Count Settings	:ATC:AVER:COUN 2	
17	Temperature Measurement A-OVC ON	:ATC:AOVC ON	
18	Channel Settings	:CH 2	
19	CH2 ON (Following CH2 settings)	:CH:STAT ON,2	
20	A-TC ON	:ATC:TCOR:STAT ON	
21	Weld Location Terminal Assignment Settings	:TERM 1,3,3	
22	Weld Location Constant Settings	:ATC:TCOR:PAR 20,3930	
23	Weld Location Range Settings	:RES:RANG:AUTO ON	
24	Weld Location Speed Settings	:SAMP:RATE MED	
25	Weld Location Averaging Settings	:CALC:AVER:STAT ON	
26	Weld Location Averaging Count Settings	:CALC:AVER:COUN 2	
27	Weld Location A-OVC ON	:RES:AOVC ON	
28	Temperature Measurement Terminal Assignment Settings	:ATC:TERM 1,4,4	

29	Temperature Measurement Constant Settings	:ATC:TCON:DELT:PAR 100.000E-6,20,3930	
30	Temperature Measurement Range Settings	:ATC:RANG:AUTO ON	
31	Temperature Measurement Speed Settings	:ATC:RATE MED	
32	Temperature Measurement Averaging Settings	:ATC:AVER:STAT ON	
33	Temperature Measurement Averaging Count Settings	:ATC:AVER:COUN 2	
34	Temperature Measurement A-OVC ON	:ATC:AOVC ON	
35	SCAN Settings	:SCAN:MODE Auto	
36	Execute Measurement and Acquire Measurement Values (Only the resistance values corrected by A-TC are output.)	:READ?	100.000E-06,200.000E-06

7 Sample Programs

Using Visual Basic

These programs can be created using Visual Basic 2022.
Describes an example of how to use the Visual Basic 2022 to operate from a Computer via RS-232C/USB, incorporate measurement values, and save measurement values to a file.

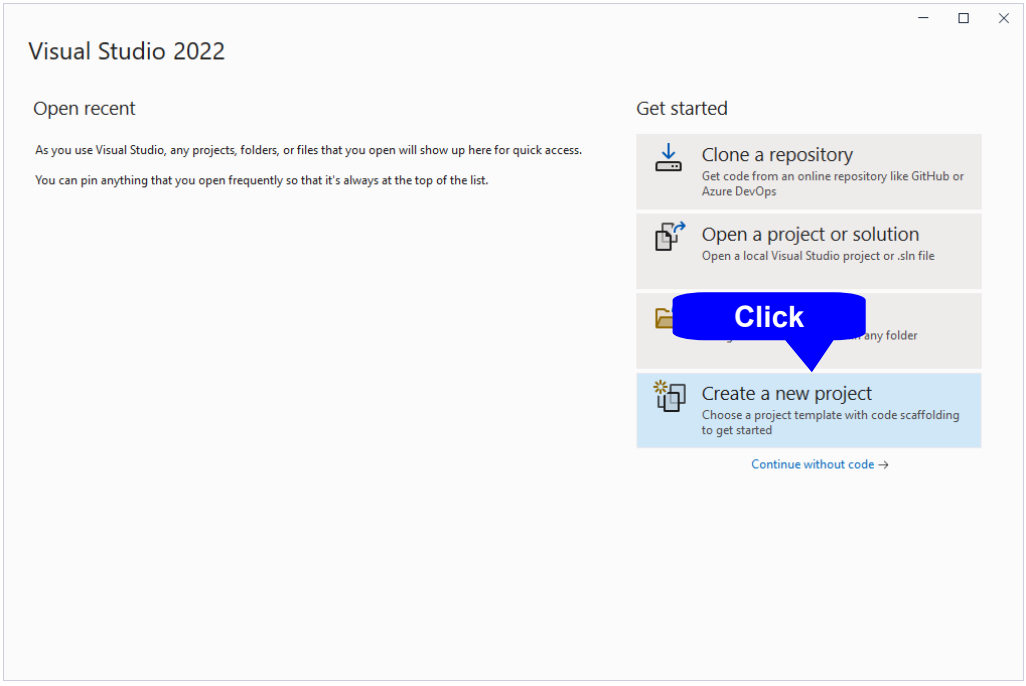
Visual Basic 2022 is referred to as VB2022 hereafter.

Note: Depending on the environment of the PC and VB2022, the procedure may differ slightly from the one described here. For a detailed explanation on how to use VB2022, refer to the instruction manual or Help of VB2022.

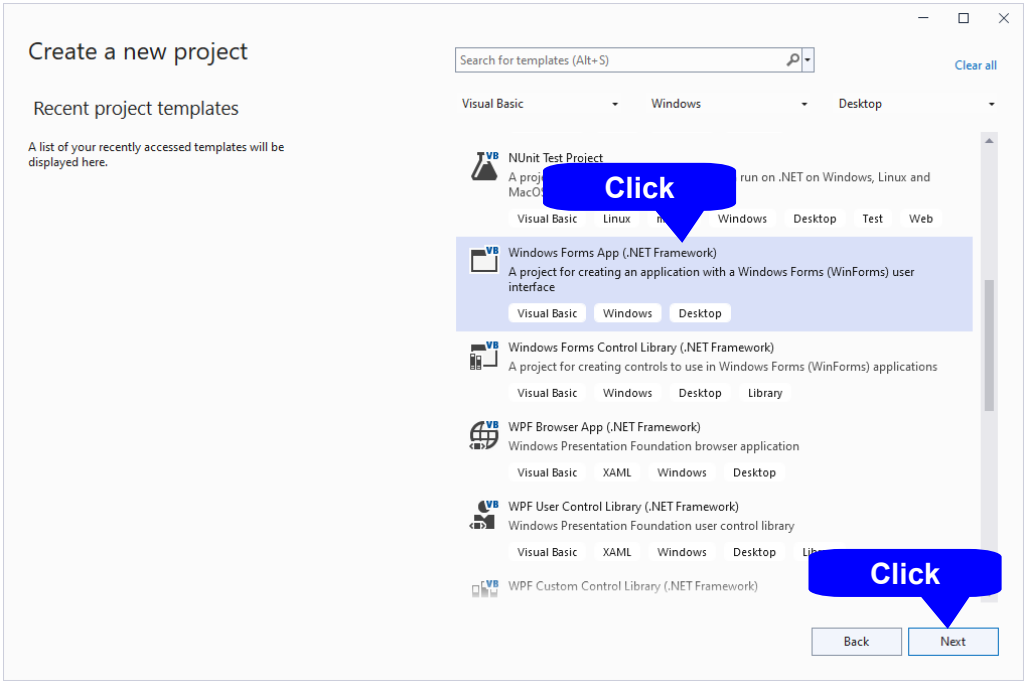
1. Create a new project.

1. Startup Visual Studio.

2. Select [Create a new project].

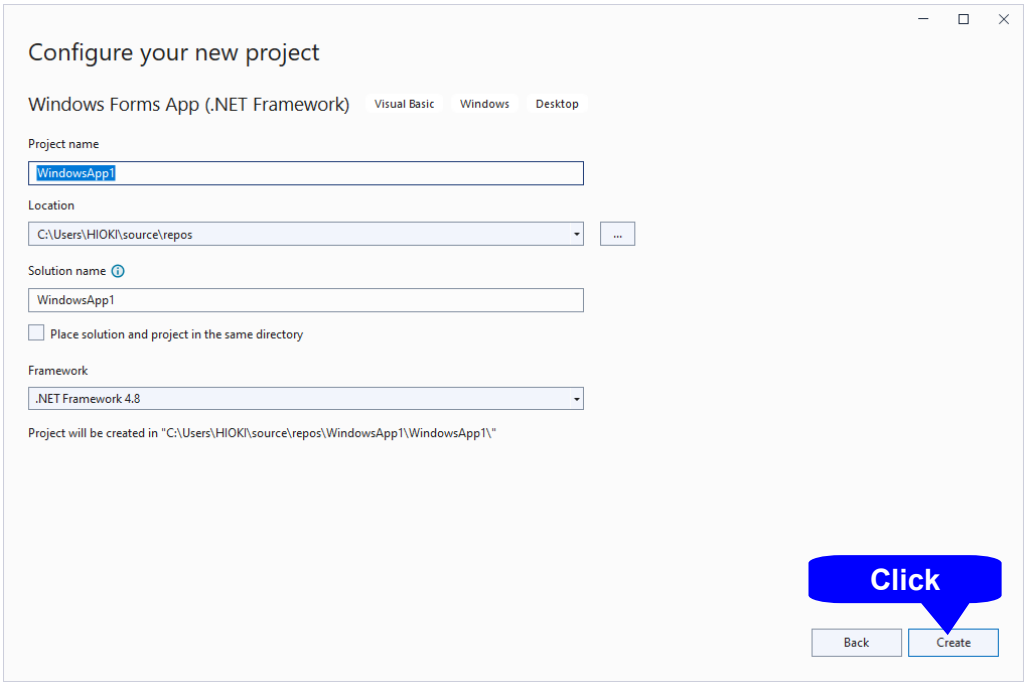


3. Select [Visual Basic]-[Windows]-[Desktop]-[Windows Forms App (.NET Framework)] from the templates.



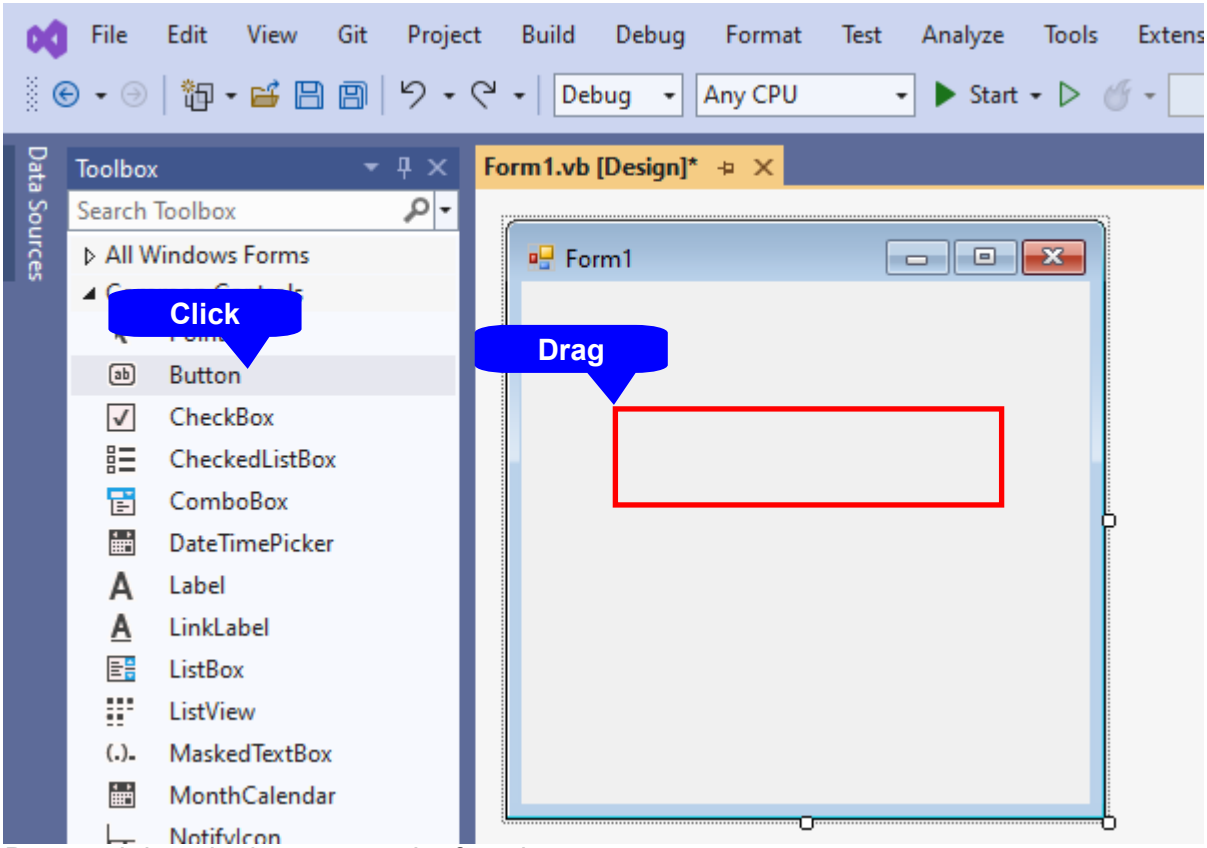
4. Click [Next].

5. Click [Create].



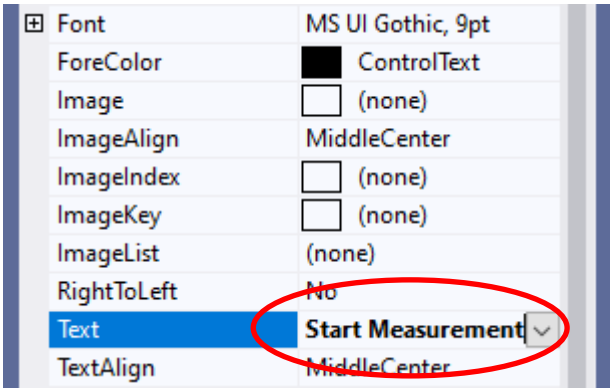
2. Place a button.

1. Click [Button] from [Common Controls] of [Toolbox].

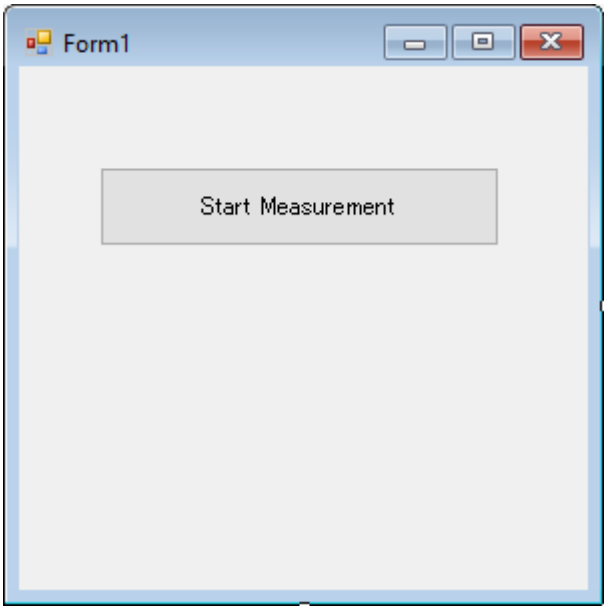


2. Drag and drop the button onto the form layout screen.

3. Change [Text] to “Start Measurement” from the Properties window.

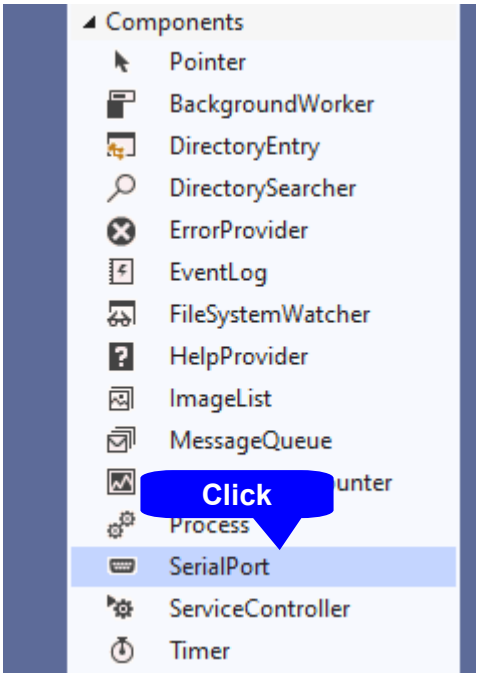


4. The [Start Measurement] is placed on the form.

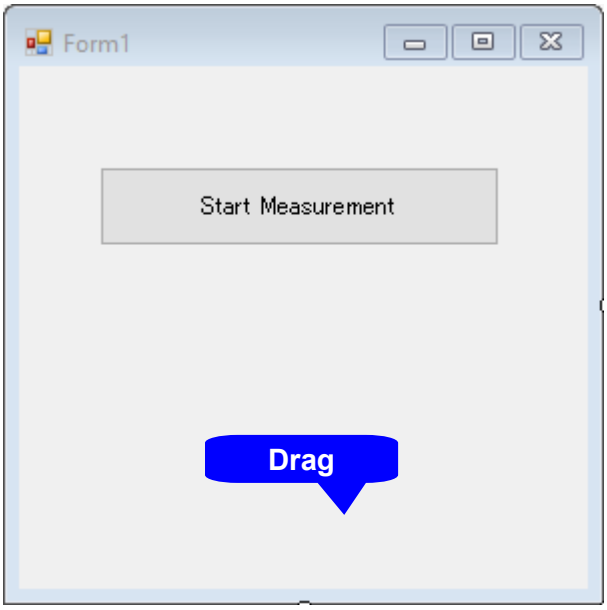


3. Place a serial communication component.

1. Click [SerialPort] from [Components] of [Toolbox].

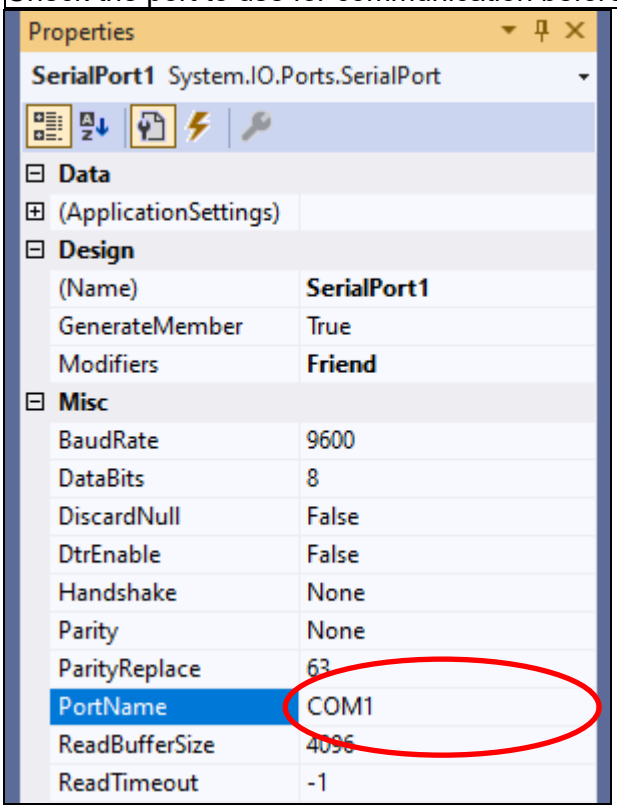


2. Drag and drop the [SerialPort] component onto the form layout screen.



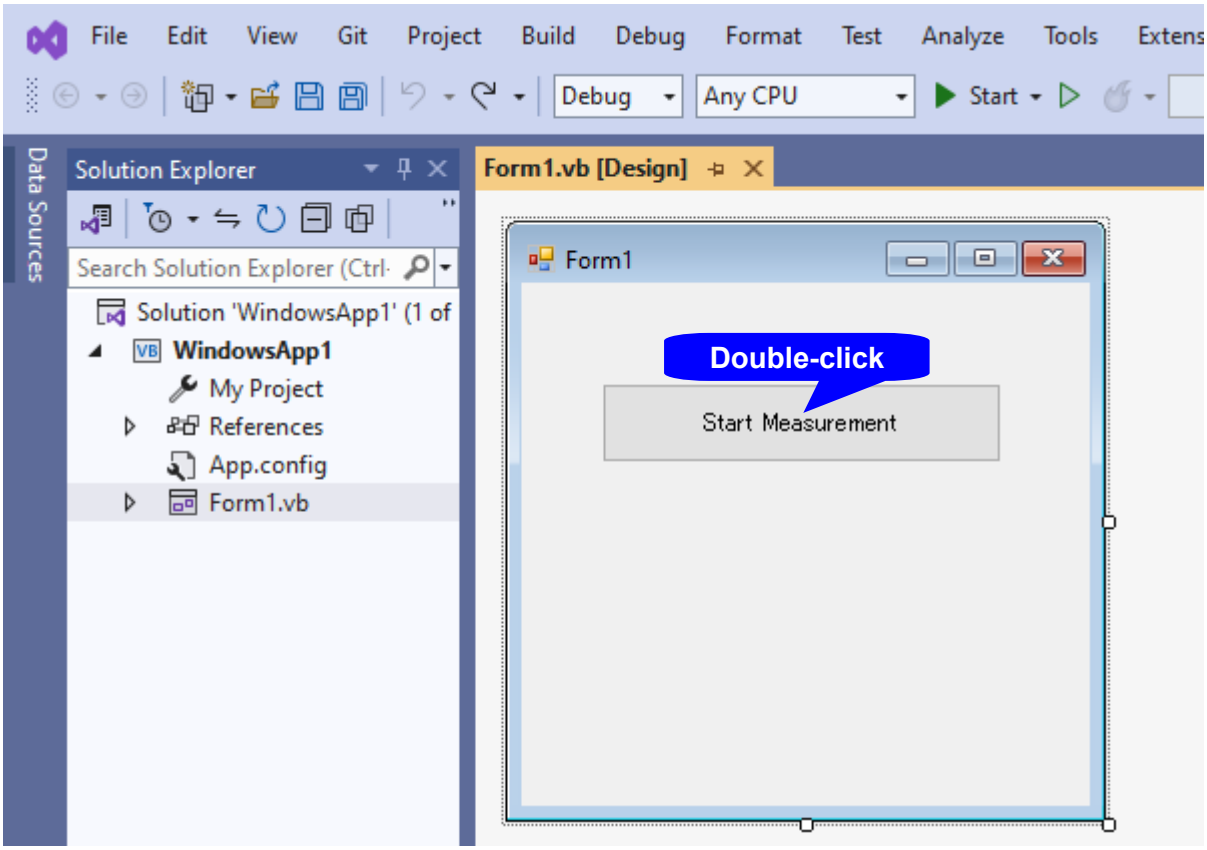
3. Change [PortName] to the port name to use for communication from the properties window.

Check the port to use for communication beforehand.

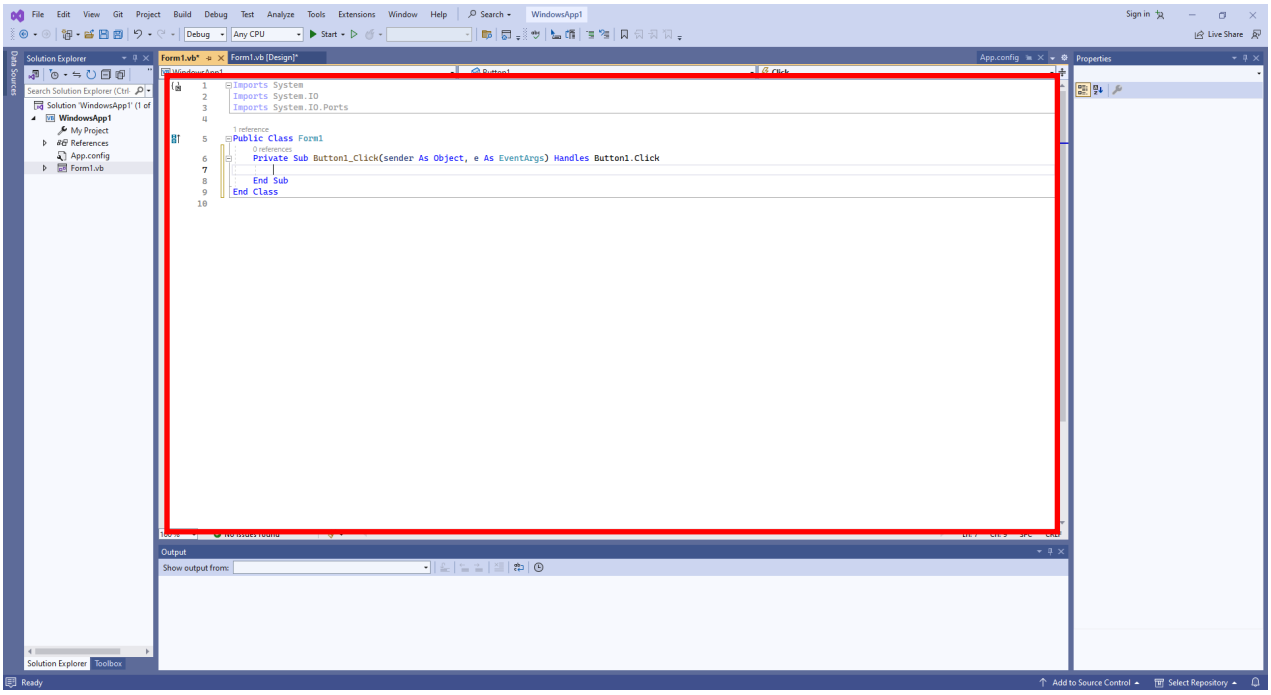


4. Describe the code.

1. Double-click the placed button to display the code editor.



2. Enter the sample program into the code editor.



3. Select [Save All] from the [File] menu.

Shown below is a sample program which uses VB2022 to enact RS-232C/USB communication, set the instrument measurement conditions, read measurement results and then save them to file.
The sample program will be written in the following manner.

Description of creation procedure	Description in sample program
Button created to begin measurement	Button1

When the [Begin Measurement] button is pressed, the instrument performs 10 measurements and writes the measurement values to a “data.csv” file.
When the [X] button is pressed, the program closes.
The following program is written entirely in [Form1] code.

```
Imports System.IO.Ports

Public Class Form1
    'Perform process when Button1 is pressed
    Private Sub Button1_Click(sender As Object, e As EventArgs) Handles Button1.Click
        Dim recvstr As String
        Dim i As Integer
        Try
            Button1.Enabled = False 'Disable buttons during communication
            SerialPort1.NewLine = vbCrLf    'Terminator setting
            SerialPort1.ReadTimeout = 2000  '2 seconds time out
            SerialPort1.Open()  'Open a port
            SendSetting(SerialPort1)    'Instrument settings
            FileOpen(1, "data.csv", OpenMode.Output)    'Create text file to be saved
            For i = 1 To 10
                SerialPort1.WriteLine(":FETCH?")
                                    'Begin measurement and read measurement results command
                recvstr = SerialPort1.ReadLine()    'Read measurement results
                WriteLine(1, recvstr)   'Write to file
            Next i
            FileClose(1)    'Close file
            SerialPort1.Close()  'Close port
            Button1.Enabled = True
        Catch ex As Exception
            MessageBox.Show(ex.Message, "Error", MessageBoxButtons.OK, MessageBoxIcon.Error)
        End Try
    End Sub

    'Set measurement conditions
    Private Sub SendSetting(ByVal sp As SerialPort)
        Try
            sp.WriteLine(":TRIG:SOUR IMM")  'Select internal triggering
            sp.WriteLine(":INIT:CONT ON")   'Continuous measurement ON
        Catch ex As Exception
            MessageBox.Show(ex.Message, "Error", MessageBoxButtons.OK, MessageBoxIcon.Error)
        End Try
    End Sub
End Class
```

Using Visual C#

These programs can be created using Visual C# 2022.
Describes an example of how to use the Visual C# 2022 to operate from a Computer via LAN, incorporate measurement values, and save measurement values to a file.

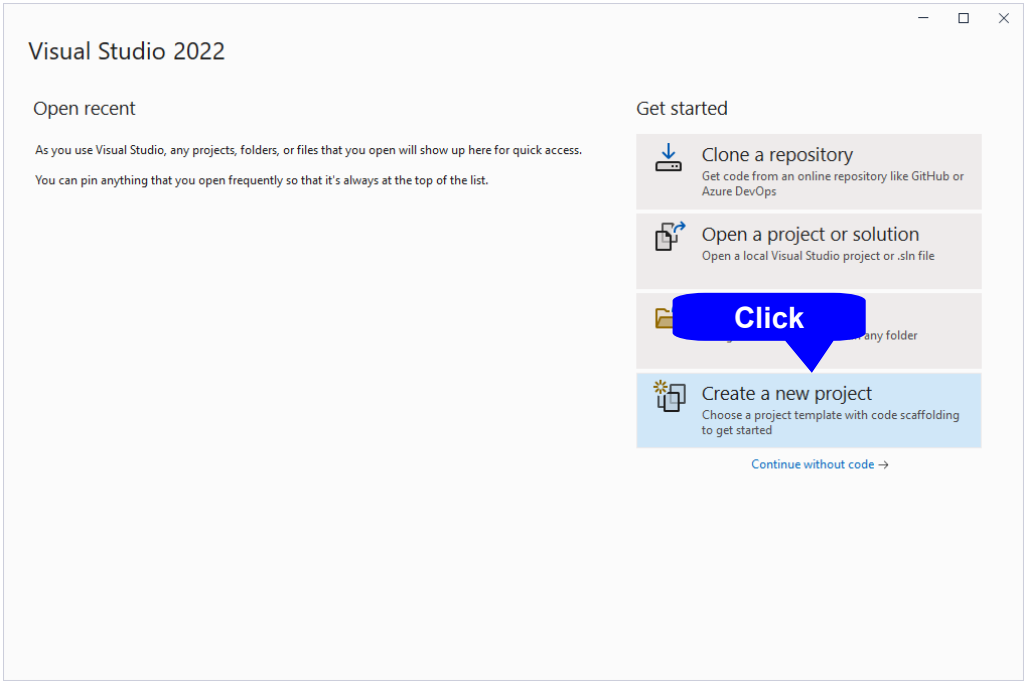
Visual Basic C# 2022 is referred to as CS2022 hereafter.

Note: Depending on the environment of the PC and CS2022, the procedure may differ slightly from the one described here. For a detailed explanation on how to use CS2022, refer to the instruction manual or Help of CS2022.

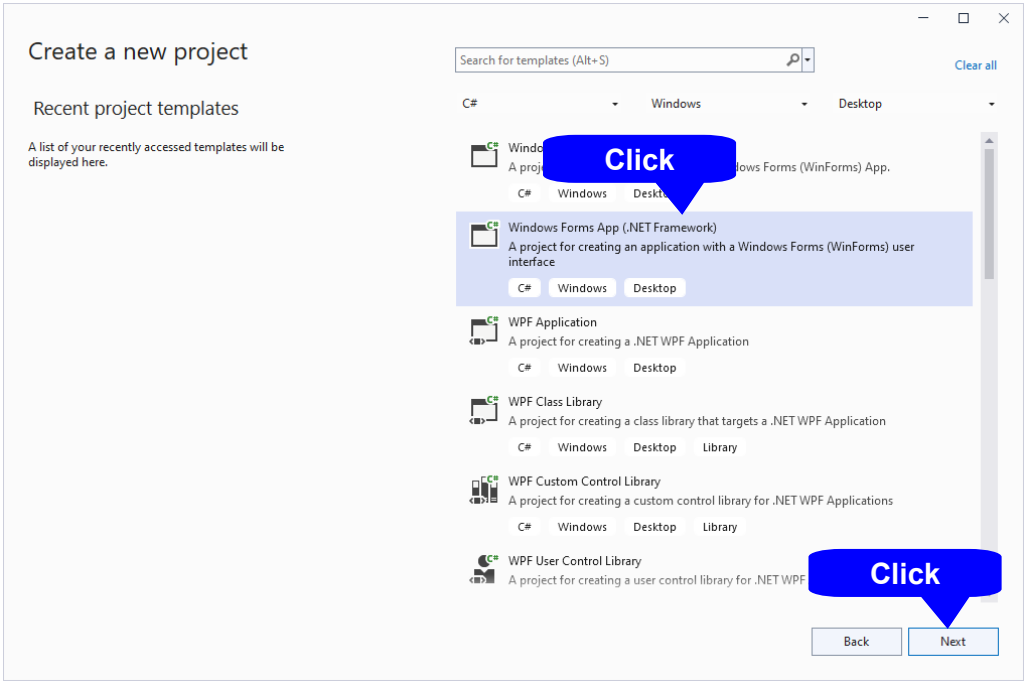
1. Create a new project.

1. Startup Visual Studio.

2. Select [Create a new project].

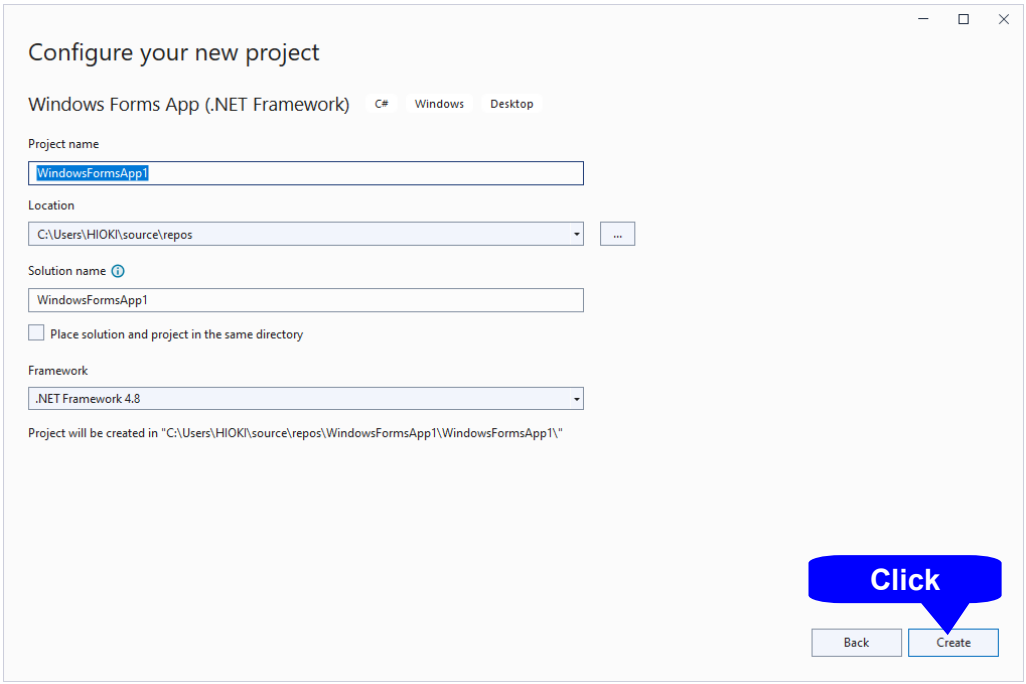


3. Select [C#]-[Windows]-[Desktop]-[Windows Forms App (.NET Framework)] from the templates.



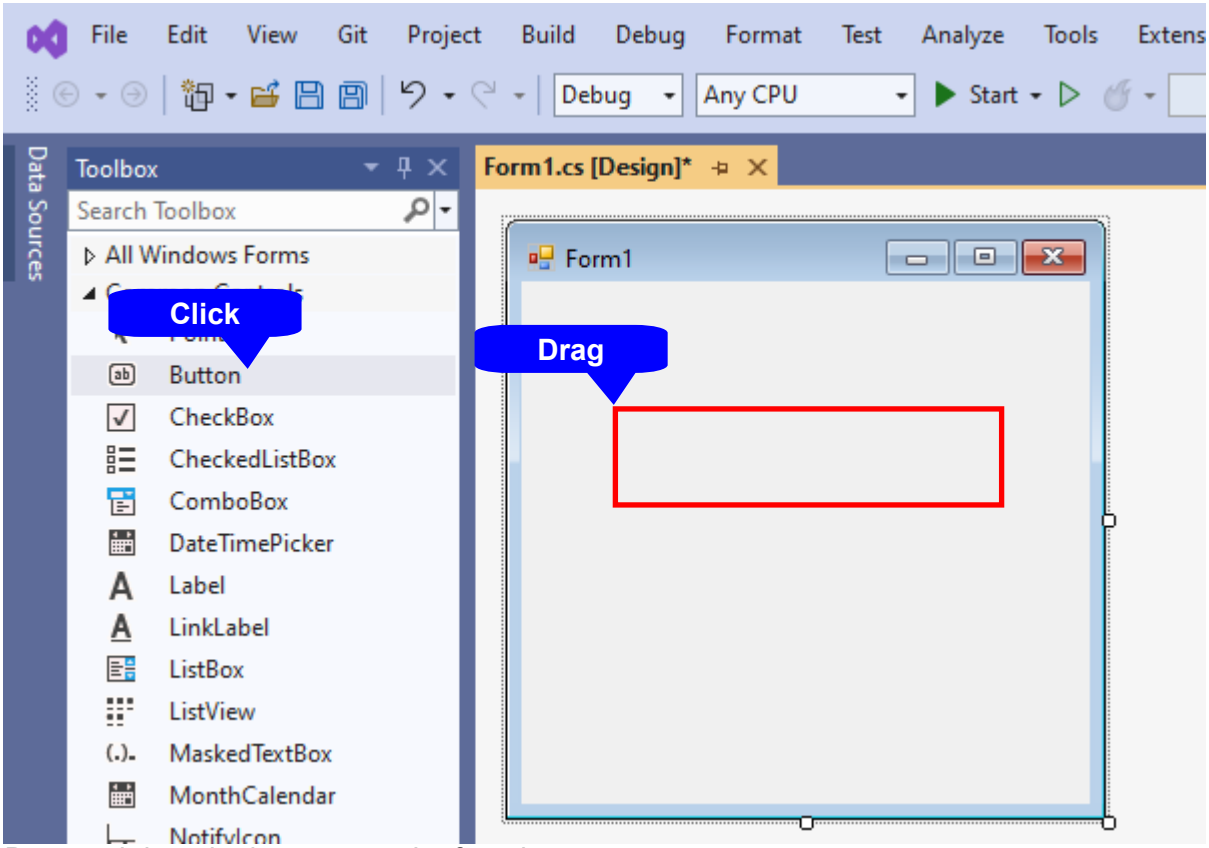
4. Click [Next].

5. Click [Create].



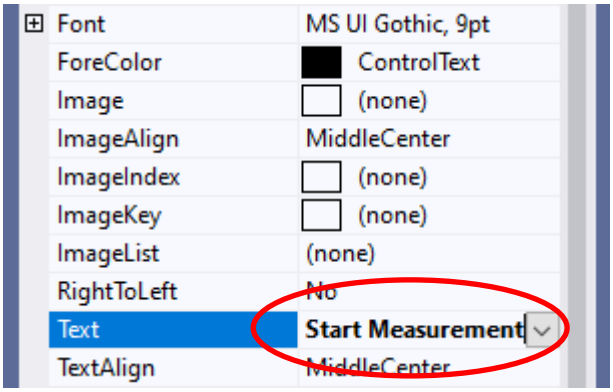
2. Place a button.

1. Click [Button] from [Common Controls] of [Toolbox].

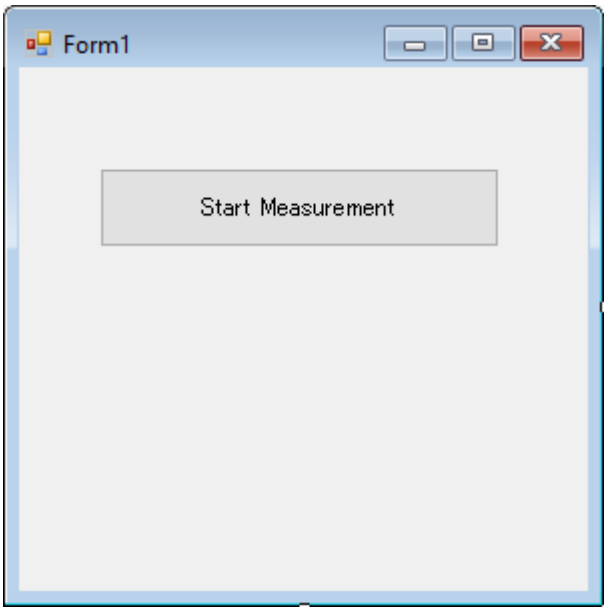


2. Drag and drop the button onto the form layout screen.

3. Change [Text] to “Start Measurement” from the Properties window.

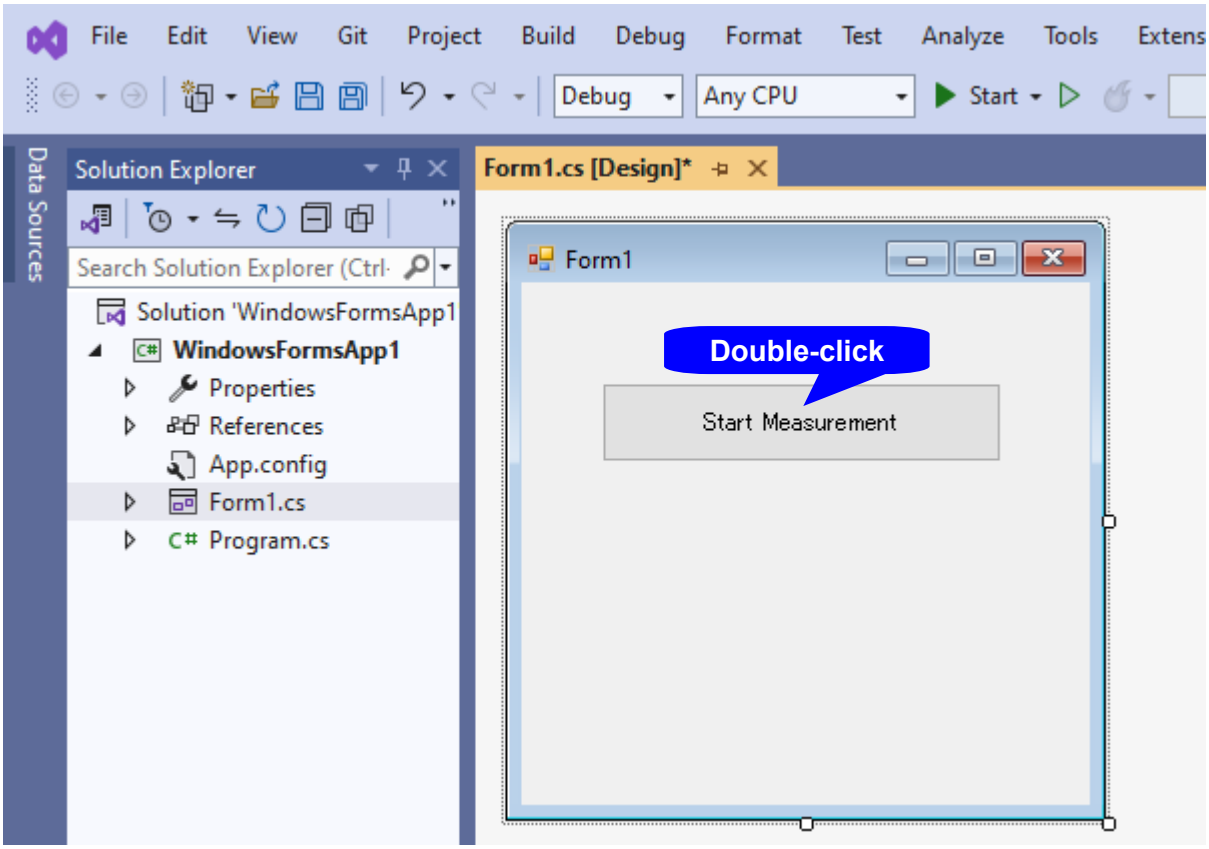


4. The [Start Measurement] is placed on the form.

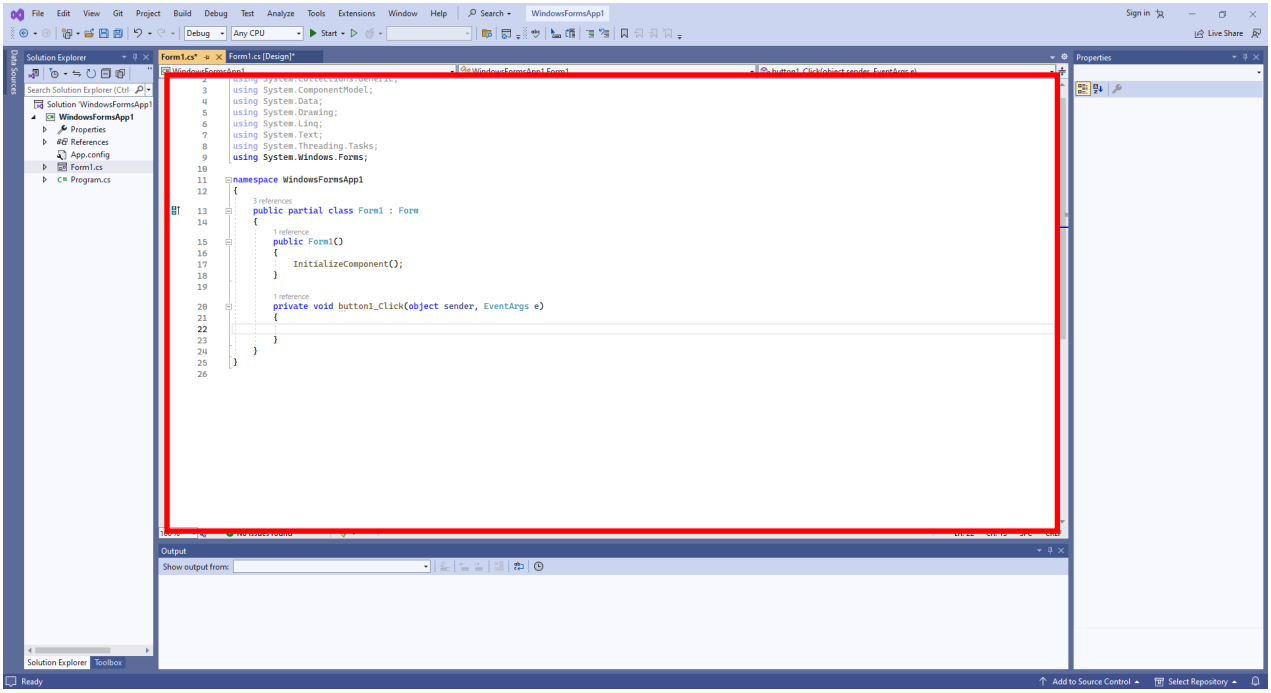


4. Describe the code.

1. Double-click the placed button to display the code editor.



2. Enter the sample program into the code editor.



3. Select [Save All] from the [File] menu.

Shown below is a sample program which uses CS2022 to enact LAN communication, set the instrument measurement conditions, read measurement results and then save them to file.
The sample program will be written in the following manner.

Description of creation procedure	Description in sample program
Button created to begin measurement	button1

When the [Begin Measurement] button is pressed, the instrument performs 10 measurements and writes the measurement values to a “data.csv” file.
When the [X] button is pressed, the program closes.
The following program is written entirely in [Form1] code.

```
using System;
using System.Diagnostics;
using System.IO;
using System.Net;
using System.Net.Sockets;
using System.Reflection;
using System.Text;
using System.Windows.Forms;

namespace WindowsFormsApp1
{
    public partial class Form1 : Form
    {
        private TcpClient LanSocket;                // LAN socket
        private String MsgBuf = "";                 // Received data
        private const long Timeout_default = 2000;  // Receive timeout default time (ms)

        public Form1()
        {
            InitializeComponent();
        }

        private void button1_Click(object sender, EventArgs e)
        {
            String ip = "192.168.0.1";              // IP address
            String port = "23";                     // Port number
            int i;

            button1.Enabled = false;                // Disable buttons during communication

            // Connect
            if (OpenInterface(ip, port))
            {
                // Open text file to output test result values
                Assembly myAssembly = Assembly.GetEntryAssembly();
                string path = Path.GetDirectoryName(myAssembly.Location);
                                        // Output path (where executable file is located)
                StreamWriter fp = new StreamWriter(path + "\\data.csv", false, Encoding.UTF8);

                // Set measurement conditions
                SendMsg(":TRIG:SOUR IMM");          // Select internal triggering
                SendMsg(":INIT:CONT ON");           // Continuous measurement ON

                for (i = 1; i <= 10; i++)
                {
                    SendQueryMsg(":FETCH?");        // Get the latest measurement results
                    fp.Write(MsgBuf + "\r\n");      // Write to file
                }

                // Close the file
                fp.Close();

                // Disconnection
                CloseInterface();
```

```
            // Enaable buttons
            button1.Enabled = true;
        }
    }

    // Connect
    private Boolean OpenInterface(String ipaddress, String port)
    {
        Boolean ret = false;
        IPAddress ip = new IPAddress(0);          // IP address

        try
        {
            if (System.Net.IPAddress.TryParse(ipaddress, out ip))
            {
                LanSocket = new TcpClient();      // Create LAN socket object
                LanSocket.NoDelay = true;     // Disable transmission delay (Nagle algorithm)
                LanSocket.Connect(ip, Convert.ToInt32(port));   // LAN socket open
                ret = true;
            }
        }
        catch (Exception e)
        {
            MessageBox.Show(e.Message);
        }
        return ret;
    }

    // Disconnection
    private Boolean CloseInterface()
    {
        Boolean ret = false;

        try
        {
            LanSocket.Close();                    // LAN socket close
            ret = true;
        }
        catch (Exception e)
        {
            MessageBox.Show(e.Message);
        }
        return ret;
    }

    // Send command
    private Boolean SendMsg(String strMsg)
    {
        Boolean ret = false;
        Byte[] sendBuffer;

        try
        {
            strMsg += "\r\n";                             // Add terminator "CR+LF"
            sendBuffer = Encoding.Default.GetBytes(strMsg); // Convert to byte type
            LanSocket.GetStream().Write(sendBuffer, 0, sendBuffer.Length);
                                                          // Write to send buffer
            ret = true;
```

```
            }
            catch (Exception e)
            {
                MessageBox.Show(e.Message);
            }
            return ret;
        }

        // Receive command response
        private Boolean ReceiveMsg(long timeout = Timeout_default)
        {
            Boolean ret = false;
            Byte[] rcv = new Byte[1024];
            System.Diagnostics.Stopwatch sw = new System.Diagnostics.Stopwatch();

            try
            {
                MsgBuf = "";                                    // Clear received data
                sw.Start();                                     // Start stopwatch for timeout

                // Loop until terminator "LF" is received
                while (true)
                {
                    // Received one character at a time
                    if (LanSocket.GetStream().DataAvailable)
                                                // Read if data is in the receive buffer
                    {
                        LanSocket.GetStream().Read(rcv, 0, 1);
                                                // Read one character from the receive buffer
                        if (Convert.ToChar(rcv[0]) == '\n')
                                                // Terminate when terminator "LF" is received
                        {
                            break;
                        }
                        else if (Convert.ToChar(rcv[0]) == '\r')
                                                // Ignore terminator 'CR'
                        {
                            ;
                        }
                        else
                        {
                            MsgBuf += Convert.ToChar(rcv[0]);  // Save received data
                        }
                    }
                    // Timeout processing
                    if (sw.ElapsedMilliseconds > timeout)
                    {
                        MsgBuf = "Timeout";
                        MessageBox.Show(MsgBuf);
                        return ret;
                    }
                }
                sw.Stop();                                      // Stop the stopwatch
                ret = true;
            }
            catch (Exception e)
            {
                MsgBuf = "Error";
                MessageBox.Show(e.Message);
```

```
            }
            return ret;
        }

        // Send and receive commands
        private Boolean SendQueryMsg(String strMsg, long timeout = Timeout_default)
        {
            Boolean ret = false;

            ret = SendMsg(strMsg);            // Send command
            if (ret)
            {
                ret = ReceiveMsg(timeout);    // Receive response after successful transmission
            }
            return ret;
        }
    }
}
```

8 Device Compliance Statement [GP-IB] RM3545

"Information on compliance to standards" based on the IEEE 488.2 standard

Item	Description
1. IEEE 488.1 interface functions	See: "GP-IB Specifications (Interface Functions) (RM3545-01 only)" (Instrument instruction manual)
2. Operation with a device address other than 0 through 30	A setting outside the 0 to 30 range cannot be made.
3. Timing of changed device address recognition	A change of address is recognized immediately after changing.
4. Device settings at power on	The status information is cleared, and all other items are preserved. However, the header on/off setting, and response message separator and terminator are all initialized.
5. List of message exchange options	• Input buffer capacity and operation See:"Input Buffer" (p.5) Queries to which multiple response message units are returned :FETCh? :READ? :CALCulate:LIMit:BEEPer? :CALCulate:STATistics:NUMBer? :CALCulate:STATistics:MAXimum? :CALCulate:STATistics:MINimum? :CALCulate:STATistics:LIMit? :CALCulate:STATistics:BIN? :CALCulate:STATistics:DEViation? :CALCulate:STATistics:CP? :CALCulate:TCONversion:DELTa:PARameter? :CALCulate:TCORrect:PARameter? :MEMory:DATA? [:SENSe:]SCAN:DATA? [:SENSe:]TERMinal? [:SENSe:]TEMPerature:PARameter? :UNIT:IDN? :SYSTem:DATE? :SYSTem:TIME? • Queries producing responses when syntax checking is performed: All queries produce responses when syntax checking is performed. • Whether any queries produce responses when read: There are no queries which produce response messages when they are read in by the controller. • Whether any commands are coupled: There are no relevant commands.

Item	Description
6. Summary of functional elements for use when constructing device specific commands, and whether compound commands or program headers can be used	The followings can be used: • Program message • Program message terminator • Program message unit • Program message unit separator • Command message unit • Query message unit • Command program header • Query program header • Program data • Character program data • Decimal program data • Character string program data • Compound commands and program headers
7. Buffer capacity limitations for block data	Block data is not used.
8. Summary of program data elements used in expressions, and deepest nesting level allowable in sub-expressions, including syntax restrictions imposed by the device	Sub-expressions are not used. Character data, decimal data and character string program data are the only program data elements used.
9. Response syntax for queries	See: Message Reference (p.23)
10. Transmission congestion relating to device-to-device messages which do not conform to the general principles for basic response messages	There are no device to device messages.
11. Response capacity for block data	Block data does not appear in responses.
12. Summary of standard commands and queries used	See: Message List (p.13)
13. Device state after a calibration query has been completed without any problem	The “∗CAL?” query is not used.
14. Existence/nonexistence of “∗DDT” command	The “∗DDT” command is not used.
15. Existence/nonexistence of macro command	Macros are not used.
16. For queries related to identification, explanation of the response to the “∗IDN?” query	See: Standard Commands (p.24)
17. Capacity of the user data storage area reserved for when the “∗PUD” command and the “∗PUD?” query are being executed	The “∗PUD” command and the “∗PUD?” query are not used. Further, there is no user data storage area.
18. Resources when the “∗RDT” command and the “∗RDT?” query are being used	The “∗RDT” command and the “∗RDT?” query are not used. Further, there is no user data storage area.
19. Conditions which are influenced when “∗RST”, “∗LRN?”, “∗RCL”, and “∗SAV” are used	“∗LRN?”, “∗RCL”, and “∗SAV” are not used. The “∗RST” command returns the instrument to its initial state. See: Standard Commands (p.24), Initialization Items (p.11)
20. Scope of the self-testing executed as a result of the “∗TST?” query	See: Standard Commands (p.24)
21. Additional organization of the status data used in a device status report	See: Event Registers (p.8)
22. Whether commands are overlap or sequential type	All the commands are sequential commands.
23. Criterion relating to the functions required at the nstant that the termination message is produced, as a response to each command	Termination occurs when the command has been parsed. The :READ? query finishes when the measurement data is received.

HIOKI

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