User's
Manual

CW240
CLAMP-ON POWER METER
Communication Functions

IM CW240C-E

YOKOGAWA
Yokogawa M&C Corporation

IM CW240C-E
1st Edition

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Introduction

This user's manual is applicable to the CW240 clamp-on power meter, and provides information necessary for using communication functions and creating communication programs.

- For details on the function or how to operate the CW240, see the IM CW240-E user's manual, "CW240 Clamp-on Power Meter."

Precautions for Safe Use of the Instrument

■ Regarding This User's Manual

(1) This manual should be provided to the end user. Keep this manual in a safe place.

(2) Read this manual carefully to gain a thorough understanding of how to operate this product before you start using it.

(3) This manual is intended to describe the functions of this product.Yokogawa M&C Corporation (hereinafter simply referred to as Yokogawa M&C) does not guarantee that these functions are suited to the particular purpose of the user.

(4) The contents of this manual may not be transcribed or reproduced, in part or whole, without prior permission.

(5) The contents of this manual are subject to change without prior notice.

(6) Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention however , please contact your nearest Yokogawa M&C representative or our sales office.

■ Regarding Protection, Safety, and Prohibition Against Unauthorized Modification

(1) In order to protect the product and the system controlled by it from damage and ensure its safe use, make certain that all of the instructions and precautions relating to safety contained in this manual are strictly adhered to. Yokogawa M&C does not guarantee safety if products are not handled according to these instructions.

(2) The following safety symbols are used on the product and/or in this manual.

⚠ Danger! Handle with Care.

This symbol indicates that the operator must refer to an explanation in the user's manual in order to avoid risk of injury or death of personnel or damage to the instrument.

⚠ CAUTION

Indicates a hazard that may result in an injury to the user and/or physical damage to the product or other equipment unless the described instruction is abided by.

NOTE

Indicates information that is essential for handling the instrument or that should be noted in order to familiarize yourself with the instrument's operating procedures and/or functions.

SEE ALSO
Indicates the reference location(s) for further information on the present topic.

[NOTE]

Draws attention to information that is essential for understanding the operation and/or features of the product.

■ Description of Displays

(1) Some of the representations of product displays shown in this manual may be exaggerated, simplified, or partially omitted for reasons of convenience when explaining them.

(2) Figures and illustrations representing the controller's displays may differ from the actual displays in regard to the positions and/or indicated characters (upper-case or lower-case, for example), to the extent that they do not impair correct understanding of the functions and the proper operation and monitoring of the system.

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(1) Yokogawa M&C does not make any warranties regarding the product except those mentioned in the WARRANTY that is provided separately.

(2) Yokogawa M&C assumes no liability to any party for any loss or damage, direct or indirect, caused by the use of the product, or any unpredictable defect of that.

(3) Be sure to use spare parts approved by Yokogawa M&C when replacing parts or consumables.

(4) Modification of the product is strictly prohibited.

(5) Reverse engineering such as the disassembly or decompilation of software is strictly prohibited.

(6) No portion of the product supplied by Yokogawa M&C may be transferred, exchanged, leased or sublet for use by any third party without the prior permission of Yokogawa M&C.

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CW240
CLAMP-ON POWER METER
Communication Functions

IM CW240C-E 1st Edition

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1. RS-232 Communication Function

1.1 RS-232 Interface Specifications

Receiving Function

With this function, you can make settings via an RS-232 communication interface in basically the same way as you do with the panel keys.

Sending Function

With this function, you can output setup data, measured data, and error codes via the RS-232 communication interface.

RS-232 Interface Specifications

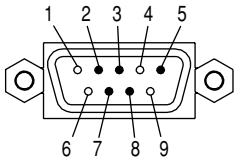
Electrical and Mechanical characteristics:	Conforms to EIA RS-232
Connection:	Point-to-point
Communication:	Full duplex
Synchronization:	Start-stop synchronization
Baud rate:	1200, 2400, 4800, 9600, 19200, and 38400 bps
Start bit:	1 bit (fixed)
Data length:	7 or 8 bits
Parity:	Even, odd, or none
Stop bit:	1 or 2 bits
Connector:	9-pin D-sub
Hardware handshake:	For CA (RTS) and CB (CTS) signals, a selection can be made as to whether the signals are always logically "true" or are used as control-line signals.
Software handshake:	Flow control can be carried out using X-ON and X-OFF codes. X-ON: ASCII 11H X-OFF: ASCII 13H
Receive buffer length:	2048 bytes
Send buffer length:	50k bytes

1.2 Connecting CW240 through RS-232 Interface

When connecting the CW240 to a computer, make sure the methods used for handshake, data transmission rate, and data format are the same on both the CW240 and the computer.

For details, see the following pages. Also, be sure to use interface cables that match the specifications of the CW240.

● Connector and Signal Names



Pin 2: RD (Receive Data)
Data received from the personal computer.
Signal direction: Input

Pin 3: SD (Send Data)
Data transmitted to a personal computer.
Signal direction: Output

Pin 5: SG (Signal Ground)
Ground for signals.

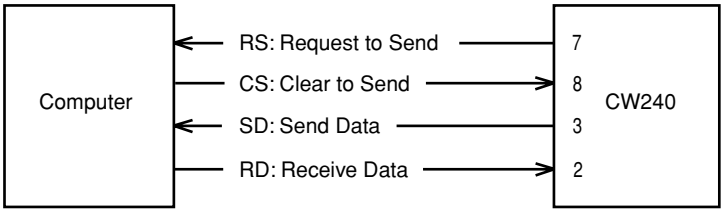
Pin 7: RS (Request to Send)
Signal used for handshake when receiving data from a personal computer.
Signal direction: Output

Pin 8: CS (Clear to Send)
Signal used for handshake when transmitting data to a personal computer.
Signal direction: Input

* Pins 1, 4, 6 and 9 are not used.

● Signal Direction

The figure below shows the directions of the signals used by the RS-232 interface of the CW240.



● Table of RS-232 Standard Signals and Their CCITT Codes

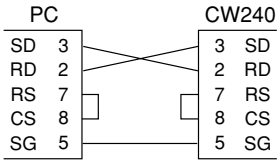
Pin No. (9-pin connector)	Code			Description
	RS-232	CCITT	JIS	
5	AB (GND)	102	SG	Signal Ground
3	BA (TXD)	103	SD	Transmitted Data
2	BB (RXD)	104	RD	Received Data
7	CA (RTS)	105	RS	Request to Send
8	CB (CTS)	106	CS	Clear to Send

● Examples of Connecting Signal Lines

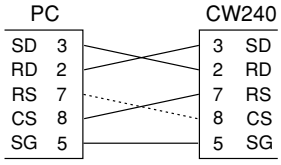
■ Personal computer

In general, use a cross cable.

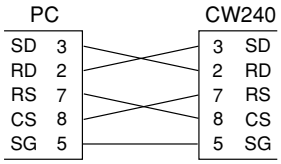
• OFF-OFF/XON-XON



• XON-RTS (XON-RS)



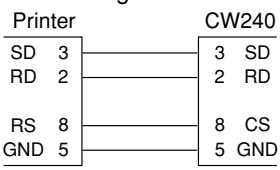
• CTS-RTS (CS-RS)



■ Printer

Use a straight cable.

Use a straight cable.



Please refer to the IM CW240 user's manual for the signals on the printer side.

1.3 Handshake Methods

For the CW240 clamp-on power meter to be able to communicate with a personal computer through the RS-232 interface, the equipment on both sides must agree on a set of rules and go through a series of procedures relating to electrical signals to ensure reliable data exchange. This series of procedures is called a handshake. Because there are many handshake methods that can be used in combination with a computer. It is essential that the same method is chosen for the meter and the computer.

You can choose from any of the four methods shown in the following table.

Handshake Methods (○ means it is a valid selection)

Handshake method	Data Sending Control (Control of sending data to a computer)			Data Receiving Control (Control of receiving data from a computer)		
	Software Handshake	Hardware Handshake	No handshake	Software Handshake	Hardware Handshake	No handshake
	Stops sending when X-OFF is received. Resumes when X-ON is received.	Stops sending when CB (CTS) is false. Resumes when it is true.		Sends X-OFF when receive data buffer is 3/4 full. Sends X-ON when receive data buffer is 1/4 full.	Sets CA (RTS) to False when receive data buffer is 3/4 full. Sets to True when receive data buffer is 1/4 full.	
OFF/OFF			○			○
XON/XON	○			○		
XON/RS	○				○	
CS/RS		○			○	

The default method is "OFF/OFF."

OFF-OFF

● Send Data Control

There is no handshake between the meter and the computer. The "X-OFF" and "X-ON" signals are treated as data, and CS is ignored.

● Receive Data Control

There is no handshake between the meter and the computer. When the receive buffer is full, all extra data are discarded.

RS is fixed to true.

XON-XON

● Send Data Control

A software handshake is performed between the meter and the computer. If the "X-OFF" code is received when data is being sent to the computer, the meter stops sending data. When it receives the next "X-ON" code, it resumes data sending. The CS signal from the computer is ignored.

● Receive Data Control

A software handshake is performed between the meter and the computer. When there is 512 bytes of free space in the receive buffer, the meter sends an "X-OFF" code. When the free space is 1536 bytes, it sends an "X-ON" code.

RS is fixed to true.

XON-RS

● Send Data Control

A software handshake is performed between the meter and the computer. If the "X-OFF" code is received when data is being sent to the computer, the meter stops sending data. When it receives the next "X-ON" code, it resumes data sending. The CS signal from the computer is ignored.

● Receive Data Control

A hardware handshake is performed between the meter and the computer. When there is 512 bytes of free space in the receive buffer, the meter sets "RS=False." When the free space is 1536 bytes, it sets "RS=True".

CS-RS

● Send Data Control

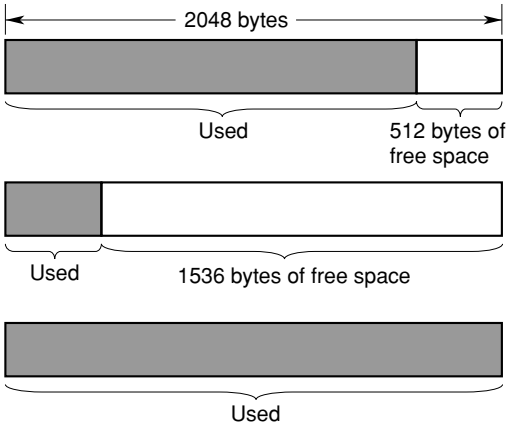
A hardware handshake is performed between the meter and the computer. If CS becomes False when data is being sent to the computer, the meter stops sending data. When CS becomes True, it resumes data sending. The "X-ON" and "X-OFF" are treated as data.

● Receive Data Control

A hardware handshake is performed between the meter and the computer. When there is 512 bytes of free space in the receive buffer, the meter sets "RS=False." When the free space is 1536 bytes, it sets "RS=True".

Precautions on Data Receive Control

When the CW240 power meter is controlling receive data by means of a handshake, additional data may be sent from the computer even if there is less than 512 bytes of free space in the receive buffer. If the receive buffer becomes full, all extra data are discarded regardless of the handshake. When the receive buffer recovers free space, it resumes data storing.



In communication based on handshaking, the meter stops receiving data if it cannot transfer data internally fast enough and the buffer's free space becomes less than 512 bytes.

If the free space increases to 1536 bytes as a result of continuing internal data transfer, the meter resumes data receiving.

Regardless of the handshake, all extra data will be discarded if the buffer becomes full.

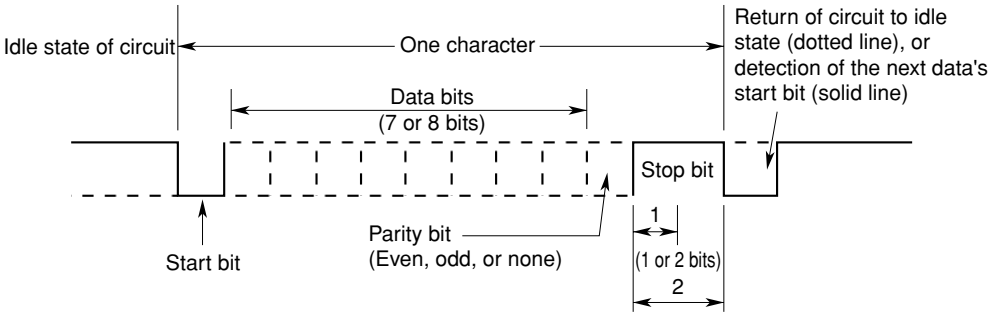
Data Receive Control Using Handshaking

TIP

The program on the personal computer must be designed so that the receive buffers on the meter and the personal computer do not become full.

1.4 Matching the Data Format

The CW240 uses start-stop synchronization to communicate through its RS-232 interface. In communication based on start-stop synchronization, a start bit is added every time a character is transmitted, where the start bit is followed by data, parity, and stop bits (see the figure below).



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2. Communication Commands

2.1 Messages

Messages

Communication between the CW240 clamp-on power meter and a personal computer is carried out in blocks of data called messages. Messages sent by the personal computer to the CW240 are called program messages, and messages received by the personal computer from the CW240 are called response messages.

If a received program message contains a query command (a command which requests a response), the CW240 returns a response message. A single response message is always returned in response to a single program message.

Program Messages

As explained above, program messages are sent from the personal computer to the CW240. The format of a program message is shown below.

<Program message unit>;<Program message unit>; ··· <Program message unit><PMT>

<Program message unit>

A program message is a train of one or more program message units; each unit corresponds to one command. The CW240 executes the commands in the order that they are received.

Each program unit is separated by a semicolon (;).

<PMT>

PMT is a terminator used to terminate each program message. For the CW240, the terminator is a string of CR (ASCII-code “0DH”) and LF (ASCII-code “0AH”) characters.

● Format of Program Message Unit

The format of a program message unit is shown below.

<Program header> Space <Program data>

<Program header>

The program header contains the command type.

<Program data>

If there are certain conditions for executing a command, they are appended as program data. The program data follows the program header and is separated from the program header by a space (ASCII-code “20H”). If there are multiple data, they are separated by a comma (,).

Response Messages

As explained earlier, response messages are sent by the CW240 to the personal computer. The format of a response message is shown below.

<Response message>;<Response message>; ··· <Response message><RMT>

<Response message unit>

A response message is a train of one or more response message units; each response message unit corresponds to one response.

Each response unit is separated by a semicolon (;).

<RMT>

RMT is a terminator used to terminate each response message. For the CW240, the terminator is a string of CR (ASCII-code “0DH”) and LF (ASCII-code “0AH”) characters.

● Format of Response Message Unit

The format of a response message unit is shown below.

<Response header> Space <Response data>

<Response header>

It is possible to program the CW240 so a response header precedes the response data. Response data is separated from the header by a space.

<Response data>

Response data contains the contents of the response. If there are multiple data, they are separated by a comma (,).

If a program message contains multiple queries, the responses are made in the same order as the queries. For most queries, the CW240 returns only one response message unit. The CW240 returns more than one response message unit to some queries, however. The first query is always answered with the first response message unit. However, the nth query does not always agree with the nth response message unit. To be certain that the given response message unit corresponds to the correct query, place one query in each program message.

Precautions when Exchanging Messages

- You can send the next message at any time, if the previously sent message did not contain any queries.
- If the previous program message contained a query, you cannot send the next message until the entire response message is received. If you send the next program message before any response message is received or after only part of a message is received, an error will occur. The response message that was not received at all or completely will be discarded.
- If the personal computer tries to receive a response message when there is none, an error will occur. An error also occurs if the personal computer tries to receive a response message before it finishes sending the program message.
- If a program message contains multiple units and some of the units are incomplete, the CW240 will pick up the incomplete units and attempt to execute them. These attempts may not always be successful, however. In addition, even if the program message contained queries, they may not always be responded to.

Deadlock

The CW240 has receive and send buffers for storing program and response messages. The receive buffer has a capacity of 2048 bytes and the send buffer can store 50 kbytes. (The number of bytes available will vary depending on the operating conditions of the CW240.) If both buffers become full at the same time, the CW240 becomes inoperative. This condition is called a deadlock. To resume normal operation, discard response messages. A deadlock will not occur, however, if the size of the program message including the <PMT> is kept below the number of bytes above. A deadlock never occurs if no query is included in the program message.

2.2 Commands

Commands

There are two types of command (program header) that can be sent from the personal computer to the CW240. They differ in the format of their program headers.

Common Command Header

Commands defined in IEEE 488.2-1987 are called common commands. The header format of a common command is shown below. An asterisk (*) always precedes a common command.

*<Mnemonic>?

*<Mnemonic>

Compound Header

Commands other than common commands, that are dedicated to the CW240, are classified and arranged in a hierarchy according to their functions. The format of a compound header is shown below. A colon (:) is used to specify a lower-level header.

*<Mnemonic>:<Mnemonic> ··· :<Mnemonic>?

*<Mnemonic>:<Mnemonic> ··· :<Mnemonic>

Simple Header

A simple header is a functionally independent command with no hierarchical structure. The format of a simple header is shown below.

*<Mnemonic>?

*<Mnemonic>

When Concatenating Commands

- **Command Group**

  A group of commands which share the same compound header is called a command group. A command group may contain sub-groups.

  Example `:STARt:EXECute`

  `:STARt:METHod`

  `:STARt:TIME`

- **When Concatenating Commands of the Same Group**

  The CW240 stores information on which hierarchical level the command currently being executed belongs to, and performs analysis on the assumption that the next command will also belong to the same level. Therefore, you may omit the header of the next command if the two commands belong to the same group.

  Example `:STARt:METHod TIME; TIME 2003,8,12,18,21<PMT>`

- **When Concatenating Commands of Different Groups**

  Include a colon (:) before the header, if the following command does not belong to the same group as the preceding command.

  Example `:STARt:METHod TIME;:STOP:METHod TIME<PMT>`

- **When Concatenating Common Commands**

  Common commands defined in IEEE 488.2-1987 are independent of hierarchy. A colon (:) is not necessary before a common command.

  Example `:STARt:METHod TIME;*CLS;TIME 2003,8,12,18,21<PMT>`

- **When Separating Commands with <PMT>**

  If a terminator is used to separate two commands, each command is a separate message. Specify the command header for each command even when the commands from the same command group are being concatenated.

Rules of Header Interpretation

The CW240 interprets a received header according to the following rules.

- Mnemonics are not case-sensitive.

  Example: `SYSTem` can also be written as `system` or `System`.

- The lower-case portion of a header can be omitted.

  Example: `SYSTem` can also be written as `SYSTE` or `SYST`.

- The question mark (?) at the end of the header denotes a query. You cannot omit the question mark.

  Example: `SYSTem?` cannot be abbreviated to anything shorter than `SYST?`.

2.3 Response

Upon receiving a query from the personal computer, the CW240 returns a response message to the computer. A response message is sent in either of the following forms.

- **Response consisting of a header and data**

  If the response can be used directly as a program message, the response message will include the command header.

- **Response consisting of data only**

  If the response cannot be used directly as a program message (i.e., the response is a query-only command), the response message will include only the data. However, some query-only commands will include a header.

● When you want a response without a header

You can have the header removed from a response that has a header and data by using the `COMMunicate:HEADer` command.

2.4 Data

Data

The data section comes after the header. A space must be included between the header and the data. The data contains conditions and values. It is classified as follows.

Data	Description
<Numeric>	Numerical value
<Decimal>	Value expressed as a decimal number
<Voltage>, <Current>, <Frequency>	Value with a physical dimension
<Character data>	Specified character string (mnemonic).
<Boolean>	Indicates ON/OFF. Specify with [ON], [OFF], or a value.
<Character string data>	Arbitrary character string

<Decimal>

<Decimal> indicates a value expressed as a decimal number, as shown in the table below. Decimal values are given in the NR form specified in ANSI X3.42-1975.

Symbol	Description	Example
<NR1>	Integer	125 -1 +1000
<NR2>	Fixed-point number	125.0 -.90 +00.1
<NR3>	Floating-point number	125.0E+0 -9E-1 +.1E4
<NRf>	Any of the forms <NR1> to <NR3> is allowed.	

- <NRf> represents the case when any of the forms <NR1> to <NR3> can be used. The CW240 accepts decimal values from the personal computer in any form.
- The form, among <NR1> to <NR3>, used for the response message is predetermined for each query. The same form is used irrespective of whether the value is large or small.
- When using <NR3>, the “+” after the “E” can be omitted, but the “–” cannot.
- If a value outside the setting range is specified, the closest valid value will be used.
- If the value specified is beyond the precision of the CW240, the value will be rounded.

<Voltage>, <Time>, <Frequency>

<Voltage>, <Time> and <Frequency> indicate decimal values which have a physical dimension. <Multiplier> or <Unit> can be attached to the <NRf> form. The values are specified in any of the following forms.

Form	Example
<NRf><Multiplier><Unit>	5MV
<NRf><Unit>	5E-3V
<NRf><Multiplier>	5M
<NRf>	5E-3

<Multiplier>

The following multipliers are available.

Symbol	Word	Description
EX	Exa	10^{18}
PE	Peta	10^{15}
T	Tera	10^{12}
G	Giga	10^{9}
MA	Mega	10^{6}
K	Kilo	10^{3}
M	Mili	10^{-3}
U	Micro	10^{-6}
N	Nano	10^{-9}
P	Pico	10^{-12}
F	Femto	10^{-15}

<Unit>

The following units are available.

Symbol	Word	Description
V	Volt	Voltage
A	Ampere	Current
HZ	Hertz	Frequency
KHZ	Kilohertz	Frequency

- <Multiplier> and <Unit> are not case-sensitive.
- “U” is used to indicate “μ”.
- “MA” is used for Mega (M) to distinguish it from Mili. If used for current, however, “MA” is interpreted as Milliampere. To refer to Megaampere, write as “MAA”.
- If both <Multiplier> and <Unit> are omitted, the default unit (V, A or Hz) will be used.
- Response messages are always expressed in the <NR3> form. The default unit is used without the <Multiplier> or the <Unit>.

<Character Data>

<Character data> is a data of specific characters (mnemonic). It is mainly used to indicate options and is chosen from character strings given in { }. For interpretation rules, see “Rules of Header Interpretation.”

Form	Example
{U1 | U2 | U3}	U1

<Boolean>

<Boolean> is a type of data that indicates ON or OFF, and is expressed in one of the following forms.

Form	Example
{ON|OFF|<NRF>}	ON OFF 1 0

- When expressing <Boolean> in <NRf> form, OFF is selected if the rounded integer value is “0” and ON is selected if the rounded integer is “non 0.”
- A response message is always “1” if the value is ON and “0” if it is OFF.

<Character String Data>

<Character string data> is an arbitrary character string unlike the <character data>, which uses only specific characters. The character string must be enclosed in single quotation marks (‘) or double quotation marks (“).

Form	Example
<Character string data>	'ABC' "IEE488.2-1987"

- If a character string contains a double quotation mark (“), use two double quotation marks (“ “) to indicate it. This rule also applies to a single quotation mark (‘) within a character string.
- Response messages always use double quotation marks (“) around the character string.
- Since <Character string data> is an arbitrary character string, leaving the end single quotation mark (‘) or double quotation mark (“) will cause the CW240 to interpret the program message unit as part of the <character string data>. As a result, errors may not be detected properly.

<Filename>

<Filename> is data that denotes a file name. It is expressed in one of the following forms.

Form	Example
{ <NRf>|<Character data>|<Character string data>}	1 CASE "CASE"

- In the <NRf> form, a file name is an ASCIII code obtained by rounding an 8-digit value into an integer (for example, “1” denotes “00000001.”). A negative value is not allowed, however.
- In the <character data> or <character string data> form, a file name is the first eight characters.
- A response message is always returned in the <character string data> form.

2.5 Output Queue and Error Queue

● Output Queue

The output queue is provided to store response messages to queries. For example, when the `:MEASure:VALUe?` query is sent to request output of measured data, the response data will be stored in the output queue until it is read out.

Data items are stored in sequence in the output queue and then read out on a first-in-first-out basis. The output queue is emptied in any of the following cases, in addition to a case when it is entirely read out.

- A new message is received from the personal computer.
- A deadlock occurs.
- The power is turned on again.

● Error Queue

The error queue stores the error number when an error occurs. For example, if the personal computer sends an illegal program message, the error queue stores error number 102.

The contents of the error queue can be read using the `STATus:ERRor?` query. As with the output queue, messages in the error queue are read out on a first-in-first-out basis.

If the error queue overflows, the last error queue is replaced with error number 350.

The error queue is emptied in either of the following cases, in addition to a case when it is entirely read out).

- The `*CLS` command is received.
- The power is turned on again.

Error Code (Error No.)	Contents	Description and Corrective Measures
102	Syntax Error	Syntax error other than the ones listed below
200	Execution Error	Cannot execute the command
350	Queue Overflow	Read the error queue
430	Query DEADLOCKED	Limit the length of the program message including the<PMT>to the following buffer lengths or less: Receive buffer length: 2048 bytes Send buffer length: 50k bytes

2.6 Communication Commands

Click each command for detailed descriptions 

Command	Description
*CLS	Clears the error queue
*IDN?	Queries the meter model
:1PCOnnect	Sets/queries the destination to which the 1-phase 3-wire component of a 3-phase 3-wire and 1-phase 3-wire system is connected
:AINP:CH1	Sets/queries the A/D-input range (CH1)
:AINP:CH2	Sets/queries the A/D-input range (CH2)
:AOUT:CH1	Sets/queries the D/A-output data items (CH1)
:AOUT:CH2	Sets/queries the D/A-output data items (CH2)
:AOUT:CH3	Sets/queries the D/A-output data items (CH3)
:AOUT:CH4	Sets/queries the D/A-output data items (CH4)
:AVERaging	Sets/queries the number of averaging times
:BACKlight	Sets/queries the backlight
:BEEP	Sets/queries the beep function
:CARD:DELEte	Deletes the file of PC card
:CARD:DIREctory?	Queries the file name of PC card
:CARD:DOWNload	Download from internal memory to PC card
:CARD:DOWNload:ALL	Download all the file of internal memory to PC card
:CARD:FORMat	Formats the PC card
:CARD:PICKout?	Transfers the file from the PC card
:CARD:SETTing:LOAD	Loads a setting file from the PC card
:CARD:SETTing:SAVE	Saves a setting file to the PC card
:CARD:STATe?	Queries the PC card status
:CLAMp	Sets/queries the type of clamp(Model name of Clamp-on Probe)
:COMMunicate:HEADer	Sets/queries whether or not the header of communication-output
:CONNect	Sets/queries the RS-232 connection destination
:CONTrast	Sets/queries the LCD contrast
:CT	Sets/queries the CT ratio
:CURRent:RANGe	Sets/queries the current range
:DISPlay:MEASure	Sets/queries measurement data items of display

Click each command for detailed descriptions 

Command	Description
:DISPlay:MODE	Sets/queries the mode of display
:DOUTput:COPY:DATAout	Saves on-screen data (as with the COPY key)
:DOUTput:COPY:MEDIa	Sets/queries the saving and printing destination for on-screen data
:DOUTput:ITEM1	Sets/queries group 1 of output data items
:DOUTput:ITEM2	Sets/queries group 2 of output data items
:DOUTput:ITEM3	Sets/queries group 3 of output data items
:DOUTput:ITEM4	Sets/queries group 4 of output data items
:DOUTput:ITEM5	Sets/queries group 5 of output data items
:DOUTput:MEDIa	Sets/queries the saving destination for output data items
:DOUTput:SAVE	Saves measurement data (as with the SAVE key)
:DOUTput:WAVE	Sets/queries the state of the saving function for waveform data files
:FILEname:CHANge	Changes/queries a filename
:FILEname:MEASure	Sets/queries a filename of measurement date
:FILTer	Sets/queries the low-pass filter for frequency source
:FREQuency	Sets/queries the measurement frequency
:HOLD	Sets/queries the display holding status
:HPA	Sets/queries the calcutational method
:HYSTeresis	Sets/queries the hysteresis factor in percentage
:ID	Sets/queries the ID number
:INTErval	Sets/queries the interval
:KLOCk	Sets/queries the keylock function
:LANGuage	Sets/queries the language
:LOAD	Sets/queries the number of system loads
:MEASure:STATe?	Queries the state of integration measurement
:MEASure:TIME:START?	Queries the date and time of the actual start of integration measurement
:MEASure:TIME:STOP?	Queries the date and time of the actual stop of integration measurement
:MEASure:VALUe?	Queries measurement values
:MEMOry:DIREctory?	Queries the file name of internal memory

Click each command for detailed descriptions 

Command	Description
:MEMOry:FORMat	Formats data files on internal memory
:MEMOry:PICKout?	Transfers the file from internal memory
:MEMOry:SETTing:DELEte	Deletes a setting file from internal memory
:MEMOry:SETTing:FORMat	Formats setting files on internal memory
:MEMOry:SETTing:LOAD	Loads a setting file from internal memory
:MEMOry:SETTing:SAVE	Saves a setting file to internal memory
:OPERationvar	Sets/queries whether the reactive power method is set to ON or OFF
:ORDEr	Sets/queries the order of harmonics' bar graphs to display
:RESEt	Resets the system
:SAMPling	Sets/queries the sampling method
:SOURce	Sets/queries the frequency source
:STARt:EXECute	Starts integration measurement
:STARt:METHod	Sets/queries the starting method of integration measurement
:STARt:TIME	Sets/queries the date and time of the start of integration measurement
:STATus:ERRor?	Queries the error codes that occurred
:STDVoltage	Sets/queries the reference (standard) voltage
:STOP:EXECute	Stops integration measurement forcibly
:STOP:METHod	Sets/queries the stopping method of integration measurement
:STOP:TIME	Sets/queries the date and time of the stop of integration measurement
:SYSTem:DATE	Sets/queries the date
:SYSTem:TIME	Sets/queries the time
:THD	Sets/queries the method of Total Harmonic Distortion
:THREshold:DIP	Sets/queries the threshold value of voltage dips
:THREshold:INTErruption	Sets/queries the threshold value of momentary voltage interruptions
:THREshold:SWELl	Sets/queries the threshold value of voltage swells
:TIMEr	Sets/queries the end-of- measurement timer setting
:VDETect:MEASure	Sets/queries whether or not to detect voltage fluctuation (voltage quality)

Click each command for detailed descriptions 

Command	Description
:VDETect:VALUe?	Queries detected voltage fluctuation (voltageequality) values
:VOLT:RANGe	Sets/queries the voltage range
:VT	Sets/queries the VT ratio
:WH:CLEAr	Executes clearing of integrated values to zero
:WH:INTErval:DIGIt	Sets/queries the position of the decimal point of electric energy (Interval of Demand measure mode)
:WH:INTErval:UNIT	Sets/queries the unit of electric energy (Interval of Demand measure mode)
:WH:TOTAl:DIGIt	Sets/queries the position of the decimal point of electric energy
:WH:TOTAl:UNIT	Sets/queries the unit of electric energy
:WIRIng	Sets/queries the wiring type

2.7 Detailed Description of Communication Commands

Clears the error queue

Syntax

```
*CLS
```

Example

Commands `*CLS`

Queries the meter model

Syntax

```
*IDN?
```

Response

<Character string 1>,<Character string 2>,<Numeric3>,<Character string 4>

<Character string 1> = Manufacturer "YOKOGAWA"

<Character string 2> = Model "CW240"

<Numeric3> = Serial No. 0 (always 0)

<Character string 4> = Firmware version "F1.00"

Example

Queries `*IDN?`

Response `"YOKOGAWA", "CW240",0, "F1.00"`

Sets/queries the destination to which the 1-phase 3-wire component of a 3-phase 3-wire and 1-phase 3-wire system is connected

Syntax

`:1PCOnnect` <Character>

`:1PConnect?`

<Character> = {`R-S`|`S-T`|`T-R`}

Example

Commands `:1PCO R-S`

Queries `:1PCO?`

Response (Header ON) `:1PCONNECT R-S`

(Header OFF) `R-S`

Sets/queries the A/D-input range (CH1)

Syntax

:AINP:CH1 <Character>

:AINP:CH1?

<Character> = {100MV|1V|5V}

Example

Commands	:AINP:CH1 100MV
Queries	:AINP:CH1?
Response (Header ON)	:AINP:CH1 100MV
(Header OFF)	100MV

Sets/queries the A/D-input range (CH2)

Syntax

:AINP:CH2 <Character>

:AINP:CH2?

<Character> = {100MV|1V|5V}

Example

Commands	:AINP:CH2 100MV
Queries	:AINP:CH2?
Response (Header ON)	:AINP:CH2 100MV
(Header OFF)	100MV

Sets/queries the D/A-output data items (CH1)

Syntax

:AOUT:CH1 <Numeric1>,<Numeric2>,<Character3>,<Numeric4>,<Numeric5>, <Character 6>

:AOUT:CH1?

<Numeric1> = 1 to 4:Number of system loads

<Numeric2> = 0 to 6

0:Normal measurement

1:Electric energy

2:Harmonics level

3:Harmonics content

4:Phase angle of harmonics

5:Total harmonics

6:Total harmonic distortion (THD)

<Character 3> = {U1|U2|U3|UAVE|I1|I2|I3|I4|IAVE|P|Q|S|PF|PA|F|WH+|WH-|VARH+|VARH-|U1_3P|U2_3P|U3_3P|UAVE_3P|I1_3P|I2_3P|I3_3P|IAVE_3P|P_3P|Q_3P|S_3P|PF_3P|PA_3P|WH+_3P|WH-_3P|VARH+_3P|VARH-_3P|U1_1P|U2_1P|UAVE_1P|I1_1P|I2_1P|IAVE_1P|P_1P|Q_1P|S_1P|PF_1P|PA_1P|WH+_1P|WH-_1P|VARH+_1P|VARH-_1P}

<Numeric4> = 1 to 50:Output order(ORD.)

<Numeric5> = 1/10/100:Output scaling(MAG.:magnification)

<Character 6> = {1K|5K|10K|50K|100K|500K|1MA}:Electric energy's output rating(OUTPUT RATE)

Example

Commands :AOUT:CH1 1,0,P,1,1,1K

Queries :AOUT:CH1?

Response (Header ON) :AOUT:CH1 1,0,P,1,1,1K

(Header OFF) 1,0,P,1,1,1K

NOTE

- <Numeric 4> to<Character 6> are omitted for normal measurement, total harmonics, and THD.
- <Numeric 4> and <Numeric 5> are omitted for electric energy.
- <Character 6> is omitted for the harmonics level and harmonics content.
- <Numeric 5> and <Character 6> are omitted for the phase angle of harmonics.

Sets/queries the D/A-output data items (CH2)

Syntax

:AOUT:CH2 <Numeric1>,<Numeric2>,<Character3>,<Numeric4>,<Numeric5>, <Character 6>

:AOUT:CH2?

<Numeric1> = 1 to 4:Number of system loads

<Numeric2> = 0 to 6

0:Normal measurement

1:Electric energy

2:Harmonics level

3:Harmonics content

4:Phase angle of harmonics

5:Total harmonics

6:Total harmonic distortion

<Character 3> = {U1|U2|U3|UAVE|I1|I2|I3|I4|IAVE|P|Q|S|PF|PA|F|WH+|WH-|VARH+|VARH-|U1_3P|U2_3P|U3_3P|UAVE_3P|I1_3P|I2_3P|I3_3P|IAVE_3P|P_3P|Q_3P|S_3P|PF_3P|PA_3P|WH+_3P|WH-_3P|VARH+_3P|VARH-_3P|U1_1P|U2_1P|UAVE_1P|I1_1P|I2_1P|IAVE_1P|P_1P|Q_1P|S_1P|PF_1P|PA_1P|WH+_1P|WH-_1P|VARH+_1P|VARH-_1P}

<Numeric4> = 1 to 50:Output order(ORD.)

<Numeric5> = 1/10/100:Output scaling(MAG.:magnification)

<Character 6> = {1K|5K|10K|50K|100K|500K|1MA}:Electric energy's output rating(OUTPUT RATE)

Example

Commands :AOUT:CH2 1,0,Q,1,1,1K

Queries :AOUT:CH2?

Response (Header ON) :AOUT:CH2 1,0,Q,1,1,1K

(Header OFF) 1,0,Q,1,1,1K

NOTE

- <Numeric 4> to<Character 6> are omitted for normal measurement, total harmonics, and THD.
- <Numeric 4> and <Numeric 5> are omitted for electric energy.
- <Character 6> is omitted for the harmonics level and harmonics content.
- <Numeric 5> and <Character 6> are omitted for the phase angle of harmonics.

Sets/queries the D/A-output data items (CH3)

Syntax

:AOUT:CH3 <Numeric1>,<Numeric2>,<Character3>,<Numeric4>,<Numeric5>, <Character 6>

:AOUT:CH3?

<Numeric1> = 1 to 4:Number of system loads

<Numeric2> = 0 to 6

0:Normal measurement

1:Electric energy

2:Harmonics level

3:Harmonics content

4:Phase angle of harmonics

5:Total harmonics

6:Total harmonic distortion

<Character 3> = {U1|U2|U3|UAVE|I1|I2|I3|I4|IAVE|P|Q|S|PF|PA|F|WH+|WH-|VARH+|VARH-|U1_3P|U2_3P|U3_3P|UAVE_3P|I1_3P|I2_3P|I3_3P|IAVE_3P|P_3P|Q_3P|S_3P|PF_3P|PA_3P|WH+_3P|WH-_3P|VARH+_3P|VARH-_3P|U1_1P|U2_1P|UAVE_1P|I1_1P|I2_1P|IAVE_1P|P_1P|Q_1P|S_1P|PF_1P|PA_1P|WH+_1P|WH-_1P|VARH+_1P|VARH-_1P}

<Numeric4> = 1 to 50:Output order(ORD.)

<Numeric5> = 1/10/100:Output scaling(MAG.:magnification)

<Character 6> = {1K|5K|10K|50K|100K|500K|1MA}:Electric energy's output rating(OUTPUT RATE)

Example

Commands :AOUT:CH3 1,0,S,1,1,1K

Queries :AOUT:CH3?

Response (Header ON) :AOUT:CH3 1,0,S,1,1,1K

(Header OFF) 1,0,S,1,1,1K

NOTE

- <Numeric 4> to <Character 6> are omitted for normal measurement, total harmonics, and THD.
- <Numeric 4> and <Numeric 5> are omitted for electric energy.
- <Character 6> is omitted for the harmonics level and harmonics content.
- <Numeric 5> and <Character 6> are omitted for the phase angle of harmonics.

Sets/queries the D/A-output data items (CH4)

Syntax

:AOUT:CH4 <Numeric1>,<Numeric2>,<Character3>,<Numeric4>,<Numeric5>, <Character 6>

:AOUT:CH4?

<Numeric1> = 1 to 4:Number of system loads

<Numeric2> = 0 to 6

0:Normal measurement

1:Electric energy

2:Harmonics level

3:Harmonics content

4:Phase angle of harmonics

5:Total harmonics

6:Total harmonic distortion

<Character 3> = {U1|U2|U3|UAVE|I1|I2|I3|I4|IAVE|P|Q|S|PF|PA|F|WH+|WH-|VARH+|VARH-|U1_3P|U2_3P|U3_3P|UAVE_3P|I1_3P|I2_3P|I3_3P|IAVE_3P|P_3P|Q_3P|S_3P|PF_3P|PA_3P|WH+_3P|WH-_3P|VARH+_3P|VARH-_3P|U1_1P|U2_1P|UAVE_1P|I1_1P|I2_1P|IAVE_1P|P_1P|Q_1P|S_1P|PF_1P|PA_1P|WH+_1P|WH-_1P|VARH+_1P|VARH-_1P}

<Numeric4> = 1 to 50:Output order(ORD.)

<Numeric5> = 1/10/100:Output scaling(MAG.:magnification)

<Character 6> = {1K|5K|10K|50K|100K|500K|1MA}:Electric energy's output rating(OUTPUT RATE)

Example

Commands :AOUT:CH4 1,0,F,1,1,1K

Queries :AOUT:CH4?

Response (Header ON) :AOUT:CH4 1,0,F,1,1,1K

(Header OFF) 1,0,F,1,1,1K

NOTE

- <Numeric 4> to <Character 6> are omitted for normal measurement, total harmonics, and THD.
- <Numeric 4> and <Numeric 5> are omitted for electric energy.
- <Character 6> is omitted for the harmonics level and harmonics content.
- <Numeric 5> and <Character 6> are omitted for the phase angle of harmonics.

Sets/queries the number of averaging cycles for on-screen readings

Syntax

:AVERaging <Numeric>

:AVERaging?

<Numeric> = 1/2/5/10/20

Example

Commands	:AVER 5
Queries	:AVER?
Response (Header ON)	:AVERAGING 5
(Header OFF)	5

Sets/queries the backlight

Syntax

:BACKlight <Boolean>

:BACKlight?

Example

Commands	:BACK ON
Queries	:BACK?
Response (Header ON)	:BACKLIGHT 1
(Header OFF)	1

Sets/queries the beep function

Syntax

:BEEP <Boolean>

:BEEP?

Example

Commands	:BEEP ON
Queries	:BEEP?
Response (Header ON)	:BEEP 1
(Header OFF)	1

Deletes the file of PC card

Syntax

:CARD:DELEte <Filename>

Example

Commands	:CARD:DELE 240AM000.CSV

Queries the file name of PC card

Syntax

:CARD:DIREctory? <Character>

<Character>= {MEAS | INST | WAVE | SET | ALM | BMP}

MEAS: Measurement file
INST: Short interval file
WAVE: Waveform file
SET: Setting file
ALM: Detected voltage fluctuation file (Voltage quaity)
BMP: Screen file (Hard copy)

Response

<Filename>,<Size>,...

Example

Queries :CARD:DIRE? MEAS
Response 240AM000,1024

Downloads from internal memory to PC card

Syntax

:CARD:DOWNload <Filename 1>,<Filename 2>

<Filename 1> = Filename of internal memory
<Filename 2> = Filename to save of the PC card

Example

Commands :CARD:DOWN 240AM000.CSV, 240AM999.CSV

Downloads all the files of internal memory to PC card

Syntax

:CARD:DOWNload:ALL

Example

Commands :CARD:DOWN:ALL

Formats the PC card

Syntax

:CARD:FORMat

Example

Commands :CARD:FORM

Transfers the file from the PC card

Syntax

:CARD:PICKout? <Filename 1>,<Numeric2>,<Numeric3>

<Filename 1> = Filename to transfer

<Numeric2> = Start point.

<Numeric3> = Stop point.

Response

STX(02)+Transfers the data+ETX(03)

Example

Queries	:CARD:PICK? 240AM000.CSV,1,1000
Response	STX(02)CW240,.....ETX(03)
	Returns the data of 240AM000.CSV file (1 byte to 1000 bytes)

NOTE

To execute this command, specify the RS-232 handshake settings between the CW240 and a personal computer to "CS/RS" beforehand.

Loads a setting file from the PC card

Syntax

:CARD:SETTing:LOAD <Character>

<Character> = Character data of up to 8 alphanumeric character

Example

Commands	:CARD:SETT:LOAD 240MC000

Saves a setting file to the PC card

Syntax

:CARD:SETTing:SAVE <Character>

<Character> = Character data of up to 8 alphanumeric character

Example

Commands	:CARD:SETT:SAVE 240MC000

Queries the PC card status

Syntax

:CARD:STATe?

Response

1:The PC card is set.

0: The PC card is not set.

Example

Queries	:CARD:STAT?
Response (Header ON)	:CARD:STATE 1
(Header OFF)	1

Sets/queries the type of clamp (Model name of Clamp-on Probe)

Syntax

:CLAMp <Numeric1>,<Character 2>

:CLAMp?

Response (Header ON) :CLAM <Character 3>,<Character 4>, <Character 5>,<Character 6>

(Header OFF) <Character 3>,<Character 4>,<Character 5>, <Character 6>

<Numeric1> = 1 to 4 : Number of system loads

<Character 3> to <Character 6> = {96036|96033|96030|96031|96032| 96034_1|96034_2|96034_3|96035_1|96035_2}

Example

Commands	:CLAM 1,96033
Queries	:CLAM?
Response (Header ON)	:CLAMP 96033,96030,96031,96032
(Header OFF)	96033,96030,96031,96032

Sets/queries whether or not the header of communication-output

Syntax

:COMMunicate:HEADer <Boolean>

:COMMunicate:HEADer?

Example

Commands	:COMM:HEAD ON
Queries	:COMM:HEAD?
Response (Header ON)	:COMMUNICATE:HEADER 1
(Header OFF)	1

Sets/queries the RS-232 connection destination

Syntax

:CONNect <Character>

:CONNect?

<Character> = {PC|PRINTER}

Example

Commands	:CONN PC
Queries	:CONN?
Response (Header ON)	:CONNECT PC
(Header OFF)	PC

Sets/queries the LCD contrast

Syntax

:CONTrast <Numeric>

:CONTrast?

<Numeric> = 1 to 8

Example

Commands	:CONT 4
Queries	:CONT?
Response (Header ON)	:CONTRAST 4
(Header OFF)	4

Sets/queries the CT ratio

Syntax

:CT <Numeric1>,<Numeric2>

:CT?

Response (Header ON) :CT <Numeric3>,<Numeric4>,<Numeric5>, <Numeric6>

(Header OFF) <Numeric3>,<Numeric4>,<Numeric5>,<Numeric6>

<Numeric1> = 1 to 4 : Number of system loads

<Numeric2> = 0.01 to 9999.99 : CT ratio

<Numeric3> = CT ratio of 1-system load

<Numeric4> = CT ratio of 2-system load

<Numeric5> = CT ratio of 3-system load

<Numeric6> = CT ratio of 4-system load

Example

Commands	:CT 1,2.0
Queries	:CT?
Response (Header ON)	:CT 2.00,3.00,4.00,5.00
(Header OFF)	2.00,3.00,4.00,5.00

Sets/queries the current range

Syntax

:CURRent:RANGe <Numeric1>,<Character 2>

:CURRent:RANGe?

Response (Header ON) :CURRENT:RANGE <Character 3>,<Character 4>, <Character 5>,<Character 6>

(Header OFF) <Character 3>,<Character 4>,<Character 5>, <Character 6>

<Numeric1> = 1 to 4 : Number of system loads

<Character 2> = {200MA|500MA|1A|2A|5A|10A|20A|30A|50A|75A| 100A|150A|200A|300A|500A|750A|1KA|1.5KA|2KA| 3KA}

<Character 3> = Current range of 1-system load

<Character 4> = Current range of 2-system load

<Character 5> = Current range of 3-system load

<Character 6> = Current range of 4-system load

Example

Commands :CURR:RANG 1,5A

Queries :CURR:RANG?

Response (Header ON) :CURRENT:RANGE 5A,10A,20A,30A

(Header OFF) 5A,10A,20A,30A

Sets/queries the data items of display

Syntax

```
:DISPlay:MEASure <Numeric1>,<Numeric2>,<Numeric3>
:DISPlay:MEASure?
```

<Numeric1> = 0:List (LIST)
1:Detailed Power (POWER)
2:Electric energy (INTEGRATE)
3:Demand (DEMAND)
4:Expanded view (ZOOM)
5:Harmonics list (LIST)
6:Harmonics graph (GRAPH)
7:Vector harmonics (VECTOR)
8:Voltage and current waveform (U&I WAVEFORM)
9:Voltage waveform (U WAVEFORM)
10:Current waveform (I WAVEFORM)
11:Voltage fluctuation (VOLT. QUALITY)
12:Wiring diagram (WIRING DIAG.)
13:Wiring check (WIRING CHECK)

<Numeric2> = 1 to 4 : Number of system loads

<Numeric3> = 0:Instantaneous value (INTER.)
1:Average value (AVE.)
2:Maximum value (MAX.)
3:Minimum value (MIN.)

Example

Commands	`:DISP:MEAS 0,1,0`
Queries	`:DISP:MEAS?`
Response (Header ON)	`:DISPLAY:MEASURE 0,1,0`
(Header OFF)	`0,1,0`

Sets/queries the mode of display

Syntax

:DISPlay:MODE <Character>

:DISPlay:MODE?

<Character> = {TOP|MEAS|SET|FILE}

TOP: Top menu (TOP MENU)

MEAS: Measurement mode (MEASURE)

SET: Setting mode (SET UP)

FILE: File mode (FILE)

Example

Commands :DISP:MODE MEAS

Queries :DISP:MODE?

Response (Header ON) :DISPLAY:MODE MEAS

(Header OFF) MEAS

Saves on-screen data (as with the COPY key)

Syntax

:DOUTput:COPY:DATAout

Example

Commands :DOUT:COPY:DATA

Sets/queries the saving and printing destination for on-screen data

Syntax

:DOUTput:COPY:MEDIa <Character>

:DOUTput:COPY:MEDIa?

<Character> = {PRINTER|CARD|MEMORY}

Example

Commands :DOUT:COPY:MEDI CARD

Queries :DOUT:COPY:MEDI?

Response (Header ON) :DOUTPUT:COPY:MEDIA CARD

(Header OFF) CARD

Sets/queries group 1 of output data items

Syntax

:DOUTput:ITEM1 <Numeric>

:DOUTput:ITEM1?

<Numeric> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	THD	Total harmonics	Phase angle of harmonics	Harmonics content	Harmonics level	Integration and demand	Normal measure-ment

Example

Commands :DOUT:ITEM1 1

Queries :DOUT:ITEM1?

Response (Header ON) :DOUTPUT:ITEM1 1

(Header OFF) 1

Sets/queries group 2 of output data items

Syntax

:DOUTput:ITEM2 <Numeric>

:DOUTput:ITEM2?

<Numeric> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
				Minimum value (MIN.)	Maximum value (MAX.)	Average value (AVE.)	Instantane-ous value (INTER.)

Example

Commands :DOUT:ITEM2 15

Queries :DOUT:ITEM2?

Response (Header ON) :DOUTPUT:ITEM2 15

(Header OFF) 15

Sets/queries group 3 of output data items

Syntax

:DOUTput:ITEM3 <Numeric>

:DOUTput:ITEM3?

<Numeric> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
				4-system load	3-system load	2-system load	1-system load

Example

Commands :DOUT:ITEM3 15

Queries :DOUT:ITEM3?

Response (Header ON) :DOUTPUT:ITEM3 15

(Header OFF) 15

Sets/queries group 4 of output data items

Syntax

:DOUTput:ITEM4 <Numeric>

:DOUTput:ITEM4?

<Numeric> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
P	I4	I3	I2	I1	U3	U2	U1

Example

Commands :DOUT:ITEM4 255

Queries :DOUT:ITEM4?

Response (Header ON) :DOUTPUT:ITEM3 255

(Header OFF) 255

Sets/queries group 5 of output data items

Syntax

`:DOUTput:ITEM5` <Numeric1>,<Numeric2>,<Numeric3>,<Numeric4>,
<Numeric5>,<Numeric6>,<Numeric7>,<Numeric8>

`:DOUTput:ITEM5?`

<Numeric1> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
					All orders	All odd	All even

<Numeric2> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
8th-order	7th	6th	5th	4th	3rd	2nd	1st

<Numeric3> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
16th-order	15th	14th	13th	12th	11th	10th	9th

<Numeric4> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
24th-order	23th	22th	21th	20th	19th	18th	17th

<Numeric5> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
32th-order	31th	30th	29th	28th	27th	26th	25th

<Numeric6> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
40th-order	39th	38th	37th	36th	35th	34th	33th

<Numeric7> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
48th-order	47th	46th	45th	44th	43th	42th	41th

<Numeric8> =

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
						50th-order	49th

Example

Commands `:DOUT:ITEM5 0,255,255,255,255,255,255,255,3`

Queries `:DOUT:ITEM5?`

Response (Header ON) `:DOUTPUT:ITEM5 0,255,255,255,255,255,255,255,3`

(Header OFF) `0,255,255,255,255,255,255,255,3`

Sets/queries the saving destination for output data items

Syntax

:DOUTput:MEDIa <Character>

:DOUTput:MEDIa?

<Character> = {CARD|MEMORY}

Example

Commands	:DOUT:MEDI CARD
Queries	:DOUT:MEDI?
Response (Header ON)	:DOUTPUT:MEDIA CARD
(Header OFF)	CARD

Saves measurement data (as with the SAVE key)

Syntax

:DOUTput:SAVE

Example

Commands	:DOUT:SAVE

Sets/queries the state of the saving function for waveform data files

Syntax

:DOUTput:WAVE <Boolean>

:DOUTput:WAVE?

Example

Commands	:DOUT:WAVE ON
Queries	:DOUT:WAVE?
Response (Header ON)	:DOUTPUT:WAVE 1
(Header OFF)	1

Changes/queries a filename

Syntax

:FILEname:CHANge <Character 1>,<Filename 2>,<Filename 3>

<Character 1> = {CARD|MEMORY}

<Filename 2> = Old filename

<Filename 3> = New filename

Example

Commands	:FILE:CHAN CARD,240AM000.CSV,MEASURE.CSV

Sets/queries a filename of measurement date

Syntax

:FILEname:MEASure <Character>

:FILEname:MEASure?

<Character> = Character data of up to 8 alphanumeric character

Description

When <Character> is omitted, the filename is cleared.

Example

Commands	:FILE:MEAS 240AM000
Queries	:FILE:MEAS?
Response (Header ON)	:FILENAME:MEASURE 240AM000
(Header OFF)	240AM000

Sets/queries the low-pass filter for frequency source

Syntax

:FILTer <Boolean>

:FILTer?

Example

Commands	:FILT ON
Queries	:FILT?
Response (Header ON)	:FILTER 1
(Header OFF)	1

Sets/queries the measurement frequency

Syntax

:FREQuency <Numeric>

:FREQuency?

<Numeric> = 50/60

Example

Commands	:FREQ 50
Queries	:FREQ?
Response (Header ON)	:FREQUENCY 50
(Header OFF)	50

Sets/queries the display holding status

Syntax

```
:HOLD <Boolean>
:HOLD?
```

Example

Commands	`:HOLD ON`
Queries	`:HOLD?`
Response (Header ON)	`:HOLD 1`
(Header OFF)	`1`

Sets/queries the calcutational method

Syntax

`:HPA` <Numeric>

`:HPA?`

<Numeric> = 0/1

0:Fundamental wave (FUNDAME. WAVE)

1:U1

Example

Commands	`:HPA 0`
Queries	`:HPA?`
Response (Header ON)	`:HPA 0`
(Header OFF)	`0`

Sets/queries the hysteresis factor in percentage

Syntax

`:HYSTeresis` <Numeric>

`:HYSTeresis?`

<Numeric> = 0 to 10

Example

Commands	`:HYST 10`
Queries	`:HYST?`
Response (Header ON)	`:HYSTERESIS 10`
(Header OFF)	`10`

Sets/queries the ID number

Syntax

:ID <Numeric>

:ID?

<Numeric> = 1 to 999

Example

Commands :ID 1

Queries :ID?

Response (Header ON) :ID 1

(Header OFF) 1

Sets/queries the interval

Syntax

:INTErval <Character>

:INTErval?

<Character>= {WAVE|0.1S|0.2S|0.5S|1S|2S|5S|10S|15S|1M|2M|5M|10M|15M|30M|1H}

WAVE:1 Single waveform

0.1S:100msec

0.2S:200msec

0.5S:500msec

1S:1sec

2S:2sec

5S:5sec

10S:10sec

15S:15sec

1M:1min

2M:2min

5M:5min

10M:10min

15M:15min

30M:30min

1H:1hour

Example

Commands :INTE 1S

Queries :INTE?

Response (Header ON) :INTERVAL 1S

(Header OFF) 1S

Sets/queries the keylock function

Syntax

:KLOCk <Boolean>

:KLOCk?

Example

Commands	:KLOCK ON
Queries	:KLOCK?
Response (Header ON)	:KLOCK 1
(Header OFF)	1

Sets/queries the language

Syntax

:LANGuage <Character>

:LANGuage?

<Character> = {JAPANESE|ENGLISH|GERMAN|FRENCH|ITALIAN|SPANISH}

Example

Commands	:LANG JAPANESE
Queries	:LANG?
Response (Header ON)	:LANGUAGE JAPANESE
(Header OFF)	JAPANESE

Sets/queries the number of system loads

Syntax

:LOAD <Numeric>

:LOAD?

<Numeric> = 1 to 4

Example

Commands	:LOAD 1
Queries	:LOAD?
Response (Header ON)	:LOAD 1
(Header OFF)	1

Queries the state of integration measurement

Syntax

```
:MEASure:STATe?
```

Response

<Numeric> = 0/1/2

0:Halted

1:On standby

2:In progress

Example

Queries	`:MEAS:STAT?`
Response (Header ON)	`:MEASURE:STATE 0`
(Header OFF)	`0`

Queries the date and time of the actual start of integration measurement

Syntax

```
:MEASure:TIME:STARt?
```

Response

(Header ON)	`:MEASURE:TIME:START <year>,<month>,<day>,<hour>,<min>,<sec>`
(Header OFF)	`<year>,<month>,<day>,<hour>,<min>,<sec>`

Example

Queries	`:MEAS:TIME:STAR?`
Response (Header ON)	`:MEASURE:TIME:START 2003,8,4,17,0,0`
(Header OFF)	`2003,8,4,17,0,0`

Queries the date and time of the actual stop of integration measurement

Syntax

```
:MEASure:TIME:STOP?
```

Response

(Header ON)	`:MEASURE:TIME:STOP <year>,<month>,<day>,<hour>,<min>,<sec>`
(Header OFF)	`<year>,<month>,<day>,<hour>,<min>,<sec>`

Example

Queries	`:MEAS:TIME:STOP?`
Response (Header ON)	`:MEASURE:TIME:STOP 2003,8,4,17,0,0`
(Header OFF)	`2003,8,4,17,0,0`

Queries measurement values

Syntax

```
:MEASure:VALUe?
```

Response

(Header ON) <Header><Numeric>

(Header OFF) <Numeric>

:Outputs text of the items specified by the ":DOUTput:ITEM<x>" command.

<Header> = Same as the header used for saving the detected fluctuation values as files.

<Numeric> =

Date	yyyy/mm/dd
Time	hh:mm:ss
Elapsed Time or Elapsed Period	hhhhh:mm:ss
Electric energy	±1.23456E+00
Data other than electric energy	±1.234E+00

Example

Queries `:MEAS:VALU?`

Response (Header ON)
```
DATE 2003/08/12,TIME 15:25:00,|
ETIME 00:01:00,U1_INST(V),|
+1.000E+02,.....
```

(Header OFF)
```
2003/08/12,15:25:00,00:10:00,|
+1.000E+02,.....
```

Queries the file name of internal memory

Syntax

`:MEMOry:DIREctory?` <Character>

<Character> = {MEAS | INST | WAVE | SET | ALM | BMP}

MEAS:Measurement file

INST:Short interval file

WAVE:Waveform file

SET:Setting file

ALM:Detected voltage fluctuation file (Voltage quality)

BMP:Screen file (Hard copy)

Response

<Filename>,<Size>,...

Example

Queries `:MEMO:DIRE? MEAS`

Response `240AM000,1024`

Formats data files on internal memory

Syntax

:MEMOry:FORMat

Example

Commands :MEMO:FORM

Transfers the file from internal memory

Syntax

:MEMOry:PICKout? <Filename 1>,<Numeric2>,<Numeric3>

<Filename 1> = A filename to transfer

<Numeric2> = Start position

<Numeric3> = Stop position

Response

STX(02)+Transferred data +ETX(03)

Example

Queries :MEMO:PICK? 240AM000.CSV,1,1000

Response STX(02)CW240,.....ETX(03)

Returns the data of 240AM000.CSV file (1 byte to 1000 bytes)

NOTE

To execute this command, specify the RS-232 handshake settings between the CW240 and a personal computer to "CS/RS" beforehand.

Deletes a setting file from internal memory

Syntax

:MEMOry:SETTing:DELEte <Character>

<Character> = Character data of up to 8 alphanumeric character

Example

Commands :MEMO:SETT:DELE 240MC000.SET

Formats setting files on internal memory

Syntax

:MEMOry:SETTing:FORMat

Example

Commands :MEMO:SETT:FORM

Loads a setting file from internal memory

Syntax

:MEMOry:SETTing:LOAD <Character>

<Character> = Character data of up to 8 alphanumeric character

Example

Commands :MEMO:SETT:LOAD 240MC000.SET

Saves a setting file to internal memory

Syntax

:MEMOry:SETTing:SAVE <Character >

<Character> = Character data of up to 8 alphanumeric character

Example

Commands :MEMO:SETT:SAVE 240MC000.SET

Sets/queries whether the reactive power method is set to ON or OFF

Syntax

:OPERationvar <Boolean>

:OPERationvar?

Example

Commands :OPER ON

Queries :OPER?

Response (Header ON) :OPERATIONVAR 1

(Header OFF) 1

Sets/queries the order of harmonics' bar graphs to display

Syntax

:ORDEr <Character>

:ORDEr?

<Character> = {ALL|ODD}

ALL: All orders

ODD: Odd

Example

Commands :ORDE ALL

Queries :ORDE?

Response (Header ON) :ORDER ALL

(Header OFF) ALL

Resets the system

Syntax

:RESEt

Example

Commands :RESE

Sets/queries the sampling method

Syntax

:SAMPling <Character>

:SAMPLing?

<Character> = {PLL|FIX}

PLL:PLL

FIX:Fixed clock

Example

Commands :SAMP PLL

Queries :SAMP?

Response (Header ON) :SAMPLING PLL

(Header OFF) PLL

Sets/queries the frequency source

Syntax

:SOURce <Character>

:SOURce?

<Character> = {U1|U2|U3}

U1: Voltage input terminal 1

U2: Voltage input terminal 2

U3: Voltage input terminal 3

Example

Commands :SOUR U1

Queries :SOUR?

Response (Header ON) :SOURCE U1

(Header OFF) U1

Starts integration measurement

Syntax

:STARt:EXECute

Example

Commands :STAR:EXEC

Sets/queries the starting method of integration measurement

Syntax

:STARt:METHod <Character>

:STARt:METHod?

<Character> = {MANUAL|TIME|JUST}

MANUAL: Manual

TIME: Time

JUST: Measurement starts at the optimum time for the set interval.

Example

Commands	:STAR:METH TIME
Queries	:STAR:METH?
Response (Header ON)	:START:METHOD TIME
(Header OFF)	TIME

Sets/queries the date and time of the start of integration measurement

Syntax

:STARt:TIME <year>,<month>,<day>,<hour>,<min>

:STARt:TIME?

Example

Commands	:STAR:TIME 2003,8,4,16:20
Queries	:STAR:TIME?
Response (Header ON)	:START:TIME 2003,8,4,16:20
(Header OFF)	2003,8,4,16:20

Queries the error codes that occurred

Syntax

:STATus:ERRor?

Example

Queries	:STAT:ERR?
Response (Header ON)	:STAT:ERR 0
(Header OFF)	0

Sets/queries the reference (standard) voltage

Syntax

:STDVoltage <Numeric>

:STDVoltage?

<Numeric> = 100/101/110/120/200/202/208/220/
230/240/277/346/380/400/480/600/1000

Example

Commands	:STDV 100
Queries	:STDV?
Response (Header ON)	:STDVOLTAGE 100
(Header OFF)	100

Stops integration measurement forcibly

Syntax

:STOP:EXECute

Example

Commands	:STOP:EXEC

Sets/queries the stopping method of integration measurement

Syntax

:STOP:METHod MANUAL/TIME/TIMER

:STOP:METHod?

<Character> = {MANUAL|TIME|TIMER}

MANUAL: Manual

TIME: Time

TIMER: Timer

Example

Commands	:STOP:METH TIME
Queries	:STOP:METH?
Response (Header ON)	:STOP:METHOD TIME
(Header OFF)	TIME

Sets/queries the date and time of the stop of integration measurement

Syntax

```
:STOP:TIME <year>,<month>,<day>,<hour>,<min>
:STOP:TIME?
```

Example

Commands	:STOP:TIME 2003,8,4,16:20
Queries	:STOP:TIME?
Response (Header ON)	:STOP:TIME 2003,8,4,16:20
(Header OFF)	2003,8,4,16:20

Sets/queries the date

Syntax

```
:SYSTem:DATE <year>,<month>,<day>
:SYSTem:DATE?
```

Example

Commands	:SYST:DATE 2003,8,4
Queries	:SYST:DATE?
Response (Header ON)	:SYSTEM:DATE 2003,8,4
(Header OFF)	2003,8,4

Sets/queries the time

Syntax

```
:SYSTem:TIME <hour>,<min>,<sec>
:SYSTem:TIME?
```

Example

Commands	:SYST:TIME 16,50,0
Queries	:SYST:TIME?
Response (Header ON)	:SYST:TIME 16,50,0
(Header OFF)	16,50,0

Sets/queries the method of Total Harmonic Distortion

Syntax

:THD <Character>

:THD?

<Character> = {F|R}

F:THD-F

R:THD-R

Example

Commands	:THD F
Queries	:THD?
Response (Header ON)	:THD F
(Header OFF)	F

Sets/queries the threshold value of voltage dips

Syntax

:THREshold:DIP <Numeric>

:THREshold:DIP?

<Numeric> = 0 to 100

Example

Commands	:THRE:DIP 90
Queries	:THRE:DIP?
Response (Header ON)	:THRESHOLD:DIP 90
(Header OFF)	90

Sets/queries the threshold value of momentary voltage interruptions

Syntax

:THREshold:INTErruption <Numeric>

:THREshold:INTErruption?

<Numeric> = 0 to 100

Example

Commands	:THRE:INTE 90
Queries	:THRE:INTE?
Response (Header ON)	:THRESHOLD:INTERRUPTION 90
(Header OFF)	90

Sets/queries the threshold value of voltage swells

Syntax

:THREshold:SWELl <Numeric>

:THREshold:SWELl?

<Numeric> = 0 to 200

Example

Commands	:THRE:SWEL 100
Queries	:THRE:SWEL?
Response (Header ON)	:THRESHOLD:SWELL 100
(Header OFF)	100

Sets/queries the end -of- measurement timer setting

Syntax

:TIMEr <Numeric1>,<Numeric2>,<Numeric3>

:TIMEr?

<Numeric1> = Hour data (0 to 8784)

<Numeric2> = Minute data (0 to 59)

<Numeric3> = Second data (0 to 59)

Example

Commands	:TIME 1,0,0
Queries	:TIME?
Response (Header ON)	:TIMER 1,0,0
(Header OFF)	1,0,0

Sets/queries whether or not to detect voltage fluctuation (voltage quality)

Syntax

:VDETect:MEASure <Boolean>

:VDETect:MEASure?

Example

Commands	:VDET:MEAS ON
Queries	:VDET:MEAS?
Response (Header ON)	:VDETECT:MEASURE 1
(Header OFF)	1

Queries detected voltage fluctuation (voltage quality) values

Syntax

```
:VDETect:VALUe?
```

Response

(Header ON) <Number of detected values>,<Header><Numeric>

(Header OFF) <Number of detected values>,<Numeric>

<Number of detected values> = 0 to 100

<Header> = Same as the header used for saving the detected fluctuation values as files.

<Numeric> =

Header item		Detected value data
Number		1 to 100
Detection date		yyyy/mm/dd
Detection time		hh:mm:ss
Detection time (msec)		nnn
Fluctuation type		SWELL, DIP, INTER
Voltage input	Wirings other than 3-phase 3-wire and 1-phase 3-wire	U1, U2, U3
	3-phase 3-wire and 1-phase 3-wire	U1_3P, U2_3P, U3_3P U1_1P, U2_1P
Start/end		IN, OUT
Detected RMS voltage (V)		0.000E±00
Time period		hhhh:mm:ss
Time period (msec)		nnn

Example

Queries `:VDET:VALU?`

Response (Header ON)
```
5,NO 1,DATE 2003/08/12,
TIME 15:25:00,000,TYPE SWELL,.....
```

(Header OFF)
```
5,2003/08/12,15:25:00,000,SWELL,.....
```

Sets/queries the voltage range

Syntax

```
:VOLT:RANGe <Numeric>
:VOLT:RANGe?
```

<Numeric> = 150/300/600/1000

Example

Commands `:VOLT:RANG 150`

Queries `:VOLT:RANG?`

Response (Header ON) `:VOLT:RANGE 150`

(Header OFF) `150`

Sets/queries the VT ratio

Syntax

:VT <Numeric>

:VT?

<Numeric> = 0.01 to 9999.99

Example

Commands	:VT 2.0
Queries	:VT?
Response (Header ON)	:VT 2.00
(Header OFF)	2.00

Executes clearing of integrated values to zero

Syntax

:WH:CLEAr

Example

Commands	:WH:CLEA

Sets/queries the position of the decimal point of electric energy (Interval of Demand measure mode)

Syntax

:WH:INTErval:DIGIt <Character>

:WH:INTErval:DIGIt?

<Character> = {STD|000.000|0000.00|00000.0|000000|AUTO}

Example

Commands	:WH:INTE:DIGI STD
Queries	:WH:INTE:DIGI?
Response (Header ON)	:WH:INTERVAL:DIGIT STD
(Header OFF)	STD

Sets/queries the unit of electric energy (Interval of Demand measure mode)

Syntax

:WH:INTErval:UNIT <Character>

:WH:INTErval:UNIT?

<Character> = {MWH|WHH|KWH|MAWH|GWH}

Example

Commands	:WH:INTE:UNIT KWH
Queries	:WH:INTE:UNIT?
Response (Header ON)	:WH:INTERVAL:UNIT KWH
(Header OFF)	KWH

Sets/queries the position of the decimal point of electric energy

Syntax

:WH:TOTAl:DIGIt <Character>

:WH:TOTAl:DIGIt?

<Character> = {STD|000.000|0000.00|00000.0|000000|AUTO}

Example

Commands	:WH:TOTA:DIGI STD
Queries	:WH:TOTA:DIGI?
Response (Header ON)	:WH:TOTAL:DIGIT STD
(Header OFF)	STD

Sets/queries the unit of electric energy

Syntax

:WH:TOTAl:UNIT <Character>

:WH:TOTAl:UNIT?

<Character> = {MWH|WH|KWH|MAWH|GWH}

Example

Commands	:WH:TOLA:UNIT KWH
Queries	:WH:TOTA:UNIT?
Response (Header ON)	:WH:TOTAL:UNIT KWH
(Header OFF)	KWH

Sets/queries the wiring type

Syntax

:WIRIng <Character>

:WIRIng?

<Character> = {1P2W|1P3W|1P3W3I|3P3W2I|3P3W3I|3P4W|3P3W4I|
3P3W+1P3W}

Example

Commands	:WIRI 1P2W
Queries	:WIRI?
Response (Header ON)	:WIRING 1P2W
(Header OFF)	1P2W

2.8 Valid/Invalid Communication Command Tables

The following tables list valid/invalid commands in each measurement mode and setting.

○: Indicates the command is valid.

×: Indicates the command is invalid.

State / Command	Integration measurement halted		Integration measurement on standby		Integration measurement in progress	
	Continuous	Hold	Continuous	Hold	Continuous	Hold
*CLS	○	○	○	○	○	○
*IDN?	○	○	○	○	○	○
:1PCOnnect	○	×	×	×	×	×
:1PCOnnect?	○	○	○	○	○	○
:AINP:CH1	○	×	×	×	×	×
:AINP:CH1?	○	○	○	○	○	○
:AINP:CH2	○	×	×	×	×	×
:AINP:CH2?	○	○	○	○	○	○
:AOUT:CH1	○	×	×	×	×	×
:AOUT:CH1?	○	○	○	○	○	○
:AOUT:CH2	○	×	×	×	×	×
:AOUT:CH2?	○	○	○	○	○	○
:AOUT:CH3	○	×	×	×	×	×
:AOUT:CH3?	○	○	○	○	○	○
:AOUT:CH4	○	×	×	×	×	×
:AOUT:CH4?	○	○	○	○	○	○
:AVERaging	○	×	×	×	×	×
:AVERaging?	○	○	○	○	○	○
:BACKlight	○	○	○	○	○	○
:BACKlight?	○	○	○	○	○	○
:BEEP	○	○	○	○	○	○
:BEEP?	○	○	○	○	○	○
:CARD:DELEte	○	○	×	×	×	×
:CARD:DIREctory?	○	○	○	○	○	○
:CARD:DOWNload	○	○	×	×	×	×
:CARD:DOWNload:ALL	○	○	×	×	×	×
:CARD:FORMat	○	○	×	×	×	×
:CARD:PICKout?	○	○	○	○	○	○
:CARD:SETTing:LOAD	○	×	×	×	×	×
:CARD:SETTing:SAVE	○	○	×	×	×	×
:CARD:STATe?	○	○	○	○	○	○
:CLAMp	○	×	×	×	×	×
:CLAMp?	○	○	○	○	○	○
:COMMunicate:HEADer	○	○	○	○	○	○
:COMMunicate:HEADer?	○	○	○	○	○	○
:CONNect	○	×	×	×	×	×
:CONNect ?	○	○	○	○	○	○
:CONTrast	○	○	○	○	○	○
:CONTrast?	○	○	○	○	○	○
:CT	○	×	×	×	×	×
:CT?	○	○	○	○	○	○
:CURRent:RANGe	○	×	×	×	×	×
:CURRent:RANGe?	○	○	○	○	○	○

State / Command	Integration measurement halted		Integration measurement on standby		Integration measurement in progress	
	Continuous	Hold	Continuous	Hold	Continuous	Hold
:DISPlay:MEASure	○	○	○	○	○	○
:DISPlay:MEASure ?	○	○	○	○	○	○
:DISPlay:MODE	○	○	○	○	○	○
:DISPlay:MODE?	○	○	○	○	○	○
:DOUTput:COPY:DATAout	○	○	×	×	×	×
:DOUTput:COPY:MEDIa	○	×	×	×	×	×
:DOUTput:COPY:MEDIa?	○	○	○	○	○	○
:DOUTput:ITEM1	○	×	×	×	×	×
:DOUTput:ITEM1?	○	○	○	○	○	○
:DOUTput:ITEM2	○	×	×	×	×	×
:DOUTput:ITEM2?	○	○	○	○	○	○
:DOUTput:ITEM3	○	×	×	×	×	×
:DOUTput:ITEM3?	○	○	○	○	○	○
:DOUTput:ITEM4	○	×	×	×	×	×
:DOUTput:ITEM4?	○	○	○	○	○	○
:DOUTput:ITEM5	○	×	×	×	×	×
:DOUTput:ITEM5?	○	○	○	○	○	○
:DOUTput:MEDIa	○	×	×	×	×	×
:DOUTput:MEDIa?	○	○	○	○	○	○
:DOUTput:SAVE	○	○	×	×	×	×
:DOUTput:WAVE	○	×	×	×	×	×
:DOUTput:WAVE?	○	○	○	○	○	○
:FILEname:CHANge	○	○	×	×	×	×
:FILEname:MEASure	○	○	×	×	×	×
:FILEname:MEASure?	○	○	○	○	○	○
:FILTer	○	×	×	×	×	×
:FILTer?	○	○	○	○	○	○
:FREQuency	○	×	×	×	×	×
:FREQuency?	○	○	○	○	○	○
:HOLD	○	○	○	○	○	○
:HOLD?	○	○	○	○	○	○
:HPA	○	×	×	×	×	×
:HPA?	○	○	○	○	○	○
:HYSTeresis	○	×	×	×	×	×
:HYSTeresis?	○	○	○	○	○	○
:ID	○	×	×	×	×	×
:ID?	○	○	○	○	○	○
:INTErval	○	×	×	×	×	×
:INTErval?	○	○	○	○	○	○
:KLOCk	○	○	○	○	○	○
:KLOCk?	○	○	○	○	○	○
:LANGuage	○	×	×	×	×	×
:LANGuage?	○	○	○	○	○	○
:LOAD	○	×	×	×	×	×
:LOAD?	○	○	○	○	○	○
:MEASure:STATe?	○	○	○	○	○	○
:MEASure:TIME:START?	○	○	○	○	○	○
:MEASure:TIME:STOP?	○	○	○	○	○	○
:MEASure:VALUe?	○	○	○	○	○	○

State / Command	Integration measurement halted		Integration measurement on standby		Integration measurement in progress	
	Continuous	Hold	Continuous	Hold	Continuous	Hold
:MEMOry:DIREctory?	○	○	○	○	○	○
:MEMOry:FORMat	○	○	×	×	×	×
:MEMOry:PICKout?	○	○	○	○	○	○
:MEMOry:SETTing:DELEte	○	○	×	×	×	×
:MEMOry:SETTing:FORMat	○	○	×	×	×	×
:MEMOry:SETTing:LOAD	○	×	×	×	×	×
:MEMOry:SETTing:SAVE	○	○	×	×	×	×
:OPERationvar	○	×	×	×	×	×
:OPERationvar?	○	○	○	○	○	○
:ORDEr	○	×	×	×	×	×
:ORDEr?	○	○	○	○	○	○
:RESEt	○	×	×	×	×	×
:SAMPling	○	×	×	×	×	×
:SAMPling?	○	○	○	○	○	○
:SOURce	○	×	×	×	×	×
:SOURce?	○	○	○	○	○	○
:STARt:EXECute	○	×	×	×	×	×
:STARt:METHod	○	○	○	○	○	○
:STARt:METHod?	○	×	×	×	×	×
:STARt:TIME	○	○	○	○	○	○
:STARt:TIME?	○	×	×	×	×	×
:STATus:ERRor?	○	○	○	○	○	○
:STDVoltage	○	×	×	×	×	×
:STDVoltage?	○	○	○	○	○	○
:STOP:EXECute	×	×	○	×	○	×
:STOP:METHod	○	×	×	×	×	×
:STOP:METHod?	○	○	○	○	○	○
:STOP:TIME	○	×	×	×	×	×
:STOP:TIME?	○	○	○	○	○	○
:SYSTem:DATE	○	×	×	×	×	×
:SYSTem:DATE?	○	○	○	○	○	○
:SYSTem:TIME	○	×	×	×	×	×
:SYSTem:TIME?	○	○	○	○	○	○
:THD	○	×	×	×	×	×
:THD?	○	○	○	○	○	○
:THREshold:DIP	○	×	×	×	×	×
:THREshold:DIP?	○	○	○	○	○	○
:THREshold:INTErruption	○	×	×	×	×	×
:THREshold:INTErruption?	○	○	○	○	○	○
:THREshold:SWELl	○	×	×	×	×	×
:THREshold:SWELl?	○	○	○	○	○	○
:TIMEr	○	×	×	×	×	×
:TIMEr?	○	○	○	○	○	○

State / Command	Integration measurement halted		Integration measurement on standby		Integration measurement in progress	
	Continuous	Hold	Continuous	Hold	Continuous	Hold
:VDETect:MEASure	○	×	×	×	×	×
:VDETect:MEASure?	○	○	○	○	○	○
:VDETect:VALUe?	○	○	○	○	○	○
:VOLT:RANGe	○	×	×	×	×	×
:VOLT:RANGe?	○	○	○	○	○	○
:VT	○	×	×	×	×	×
:VT?	○	○	○	○	○	○
:WH:CLEAr	○	×	×	×	×	×
:WH:INTErval:DIGIt	○	×	×	×	×	×
:WH:INTErval:DIGIt?	○	○	○	○	○	○
:WH:INTErval:UNIT	○	×	×	×	×	×
:WH:INTErval:UNIT?	○	○	○	○	○	○
:WH:TOTAl:DIGIt	○	×	×	×	×	×
:WH:TOTAl:DIGIt?	○	○	○	○	○	○
:WH:TOTAl:UNIT	○	×	×	×	×	×
:WH:TOTAl:UNIT?	○	○	○	○	○	○
:WIRIng	○	×	×	×	×	×
:WIRIng?	○	○	○	○	○	○

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