
**User's
Manual**

**MC300
Pressure Controller**

Thank you for purchasing the MC300 Pressure Controller.

This user's manual explains the functions and operation of this instrument. To ensure correct use, please read this manual thoroughly before operation.

After reading this manual, keep it in a safe place. The manuals for this instrument are listed on the next page. Please read all manuals.

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

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

Notes

- The contents of this manual are subject to change without prior notice as a result of improvements to the product's performance and functionality. Refer to our website to view our latest manuals.
- The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
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Manuals

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

Manuals included with the product

| Manual title | Manual No. | Title |
|--|------------------|---|
| MC300 Pressure Controller Getting Started Guide | IM MC300-02EN | Explains the handling precautions, basic operations, and specifications of this instrument. |
| MC300 Pressure Controller Request to Download Manuals | IM MC300-73Z2 | Describes the manuals provided on the website. |
| China RoHS Information | IM CROHS11-92Z1 | Document for China |
| Safety Instruction Manual | IM 00C01C01-01Z1 | Safety manual (European languages) |

Manuals provided on the website

Download the following manuals from our website.

| Manual title | Manual No. | Title |
|--|---------------|---|
| Model MC300 Pressure Controller User's Manual | IM MC300-01EN | This manual. Explains all the instrument's functions and instructions on how to use them. |

For details on downloading manuals, see Request to Download Manuals (IM MC300-73Z2). To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

The "EN," "Z1," and "Z2" in the manual numbers are the language codes.

Conventions Used in This Manual

Notes

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



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

WARNING

Provides precautions to avoid the risk of fatal or serious injury to the user if the product is mishandled.

CAUTION

Provides precautions to avoid the risk of minor injury to the user or damage to property if the product is mishandled.

Note

Provides important information for handling this instrument.

Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

k: Denotes 1000.

Example: 100 kPa (pressure value)

K: Denotes 1024.

Example: 720 KB (file size)

Notations used in the procedural explanations

The contents of the procedural explanations are indicated using the following symbols.

Procedure

Carry out the procedure according to the step numbers. All procedures are written under the assumption that you are starting operation at the beginning of the procedure, so you may not need to carry out all the steps in a procedure when you are changing the settings.

Explanation

This section describes the setup items and the limitations regarding the procedures.

Characters and terminology used in procedural explanations

Panel keys and soft keys

Bold characters used in the procedural explanations indicate panel keys or soft keys (setup menus).

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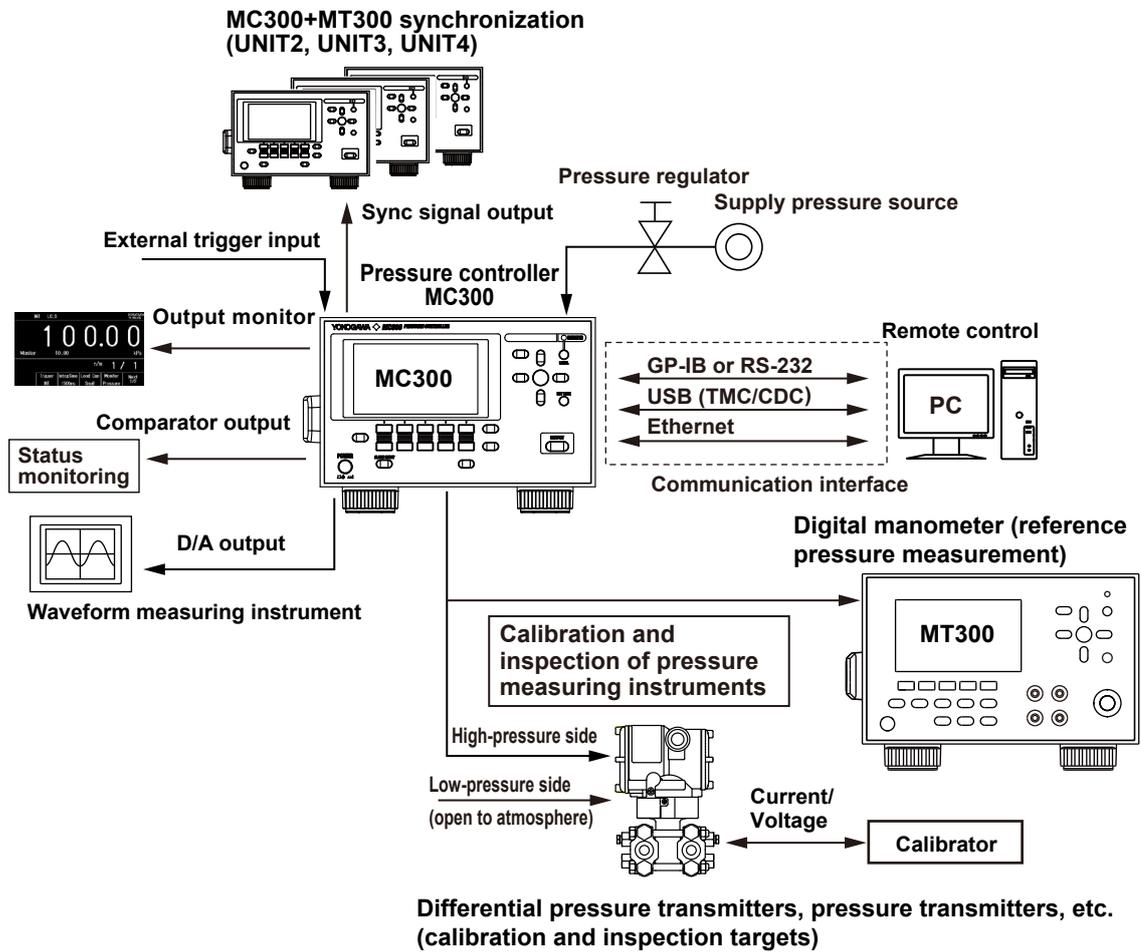
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1.1 System Configuration

System configuration



1.2 Pressure Output Function

Pressure output

Outputs air at the set pressure from the pressure output port.

Pressure type and range

Outputs gauge pressure with atmospheric pressure as zero. The range depends on the suffix code.

- -G01: gauge pressure 10 kPa
- -G03: gauge pressure 200 kPa

Pressure unit

You can set any display unit from a list of units according to the suffix code.

- -U1: Pa, hPa, kPa, MPa, mbar, bar, atm
- -U2: Pa, hPa, kPa, MPa, mbar, bar, atm, mmHg, inHg, gf/cm², kgf/cm², Torr, psi, mmH₂O (@4°C, @20°C), ftH₂O (@4°C, @20°C), inH₂O (@4°C, @20°C)

When you add the /MD option (for biomedical pressure measurement instruments) to -U1, the following are added to the display units for -U1.

You cannot combine -U2 with /MD.

- /MD: mmHg, cmHg, mHg, mmH₂O, cmH₂O, mH₂O, mTorr, Torr

Pressure output value

Sets the pressure output value.

Output setting range:

- -G01: -0.12 kPa to 12 kPa gauge
- -G03: -2.4 kPa to 240 kPa gauge

Output mode

This instrument provides the following three pressure output modes:

Divider output (normal output), Auto-step output, and Sweep output

Divider output (normal output)

- Outputs the set pressure value (pressure setpoint). If you set the division ratio (n/m) for the pressure setpoint, the instrument can output pressure in divisions. A division ratio of 1/1 is the normal output.
- Outputs pressure equal to n/m of the pressure setpoint
(n = 0 to m, m = 1 to 25, n/m ≤ 100 %)

Auto-step output

- Automatically outputs divider output in steps. You set the interval time and repeat On/Off.
- Outputs pressure equal to n/m of the pressure setpoint
(n = 0 to m, m = 1 to 25, n/m ≤ 100 %)
- Interval time: 10 s to 600 s (setting resolution: 5 s)
- Repeat On/Off: Off (once) or On (continuous) (can be stopped midway)

Sweep output

- Linearly outputs between the set lower limit and upper limit over the interval time. You set the sweep direction, interval time, and repeat On/Off.
- Switchable sweep direction (increasing or decreasing)
- Interval time: 15 s to 600 s (setting resolution: 5 s)
- Repeat On/Off: Off (once) or On (continuous) (can be stopped midway)

Load capacity (volume of the output load)

The volume downstream of the pressure output port is called the load capacity. You can set the load capacity as a guideline for your operating conditions. Setting a load capacity appropriate for the conditions improves the responsiveness of pressure output. In general, the smaller the actual load capacity, the faster the response speed.

| Setting | Guideline load capacity |
|---------|-----------------------------|
| Small | 0 to 100 cm ³ |
| Middle | 100 to 500 cm ³ |
| Large | 500 to 1000 cm ³ |

Output hold

In auto-step output or sweep output, you can hold the output value during a transition.

Zero calibration

Zero calibration (Zero CAL) is the correction for the effects of changes in temperature and installation environment to output pressure with high accuracy.

After this instrument has warmed up, be sure to perform zero calibration before outputting pressure.

Also, if the operating environment changes while pressure is being output continuously, or if you change the instrument's orientation, perform zero calibration again.

For details, see section 2.6 in the Getting Started Guide.

Zero calibration history and initialization

The zero calibration value is stored in this instrument. You can display a list of zero calibration history values.

You can also initialize the zero calibration value.

For details, see section 3.5 in the Getting Started Guide.

1.3 Output Monitor Function

Output monitor

Measures and displays the output pressure using the sensor in the pressure control unit.

Pressure measurement range

- 10 kPa range: –12.0000 to 12.0000 kPa, resolution 0.0001 kPa
- 200 kPa range: –156.000 to 240.000 kPa, resolution 0.001 kPa

Display format

- Pressure: Displays the pressure value measured by the sensor.
- Percent: Displays the value as a percentage of the pressure setpoint.

Display update interval

- 250 ms (fixed)

Measurement integration time

Select from the following.

- 250 ms, 1500 ms, 2500 ms, 4000 ms

Output stability monitor

The instrument can evaluate the output monitor value against the pressure setpoint and output the evaluation result.

Allowable deviation

The allowable deviation setting determines the evaluation limits (upper and lower limits) relative to the pressure setpoint.

- Allowable deviation setting range: 0.01 % to 10.00 % of full scale, resolution 0.01 %

Stable status indication

The instrument compares the output monitor value with the set evaluation limits and indicates the stability status (whether the value is within the allowable range) by the color of the monitor display value. This is valid when the output monitor's display format is set to pressure.

- Stable: Green
- Other: White

Comparator output

The instrument compares the output monitor value with the set evaluation limits and outputs the result from the comparator output terminal.

- Output signals: HI/IN/LO, BUSY

Trigger function

Select one of three trigger sources for capturing the output monitor value. Comparator output can be synchronized with the trigger input. For an external trigger, you can set the delay time.

- Internal trigger: Display update (update interval: 250 ms)
- External trigger: External signal input (TRIG IN/SYNC IN), communication command
- Sync trigger: External signal input (TRIG IN/SYNC IN)

Synchronization

By connecting multiple MC300 and MT300 units, you can synchronize the data acquisition timing and display updates using an internal MC300 signal or a signal output from an external device. Up to four units can be synchronized.

D/A output function

The instrument converts the output monitor value to a voltage by D/A conversion and outputs it from the monitor D/A output terminal.

D/A output

You can select one of two D/A output ranges: 2 V DC or 5 V DC. The D/A conversion interval is fixed at 2 ms. The pressure output range is displayed by linearly scaling it to the D/A output range.

- D/A output ranges: 2 V DC, 5 V DC

D/A scaling

Outputs any selected range within the output monitor pressure measurement range at the full scale of the D/A output range. You can set D/A scaling using either of the following methods: two-point mode or direct input mode.

Two-point mode

- Set the upper/lower limits (Span Upper/Span Lower) of the span (output monitor value) and the corresponding upper/lower limits (Scale Upper/Scale Lower) of the scale (D/A output value).
- Span upper/lower limit setting range and resolution:
 - 10 kPa range: -10.0000 to 10.0000 kPa, resolution 0.0001 kPa
 - 200 kPa range: -200.000 to 200.000 kPa, resolution 0.001 kPa
- Scale upper/lower limit setting range and resolution:
 - 2 V range: -2.0000 to 2.0000 V, resolution 0.0001 V
 - 5 V range: -5.0000 to 5.0000 V, resolution 0.0001 V

Direct input mode

- Directly enters and sets the pressure measurement gain (Gain) per 1 V of voltage output (D/A output) and the pressure measurement offset (Offset) at 0 V voltage output (D/A output).

1.4 Data Storage

Pressure output setup data and instrument setup parameters are automatically stored in the instrument's internal memory.

Data and parameters stored

Data is stored in FLASH (flash memory) or the MC SERVO CPU (servo control CPU).

Data and parameters stored in FLASH (flash memory)

- Factory default setup parameters: Set and stored at the factory. This also includes instrument-specific information.
- Adjustment data: Set and stored at the factory.
- System and communication setup data: Stores system and communication settings.
- Output setup data: Stores settings related to output operation.
- Measurement setup data: Stores settings related to measurement data.

Data stored in the MC SERVO CPU (servo control CPU)

- Pressure adjustment data: Set and stored at the factory.
- Zero calibration value data: Stores the latest zero calibration value.
- Zero calibration value history data: Stores the history of zero calibration values.

Data initialization

For the list of initial settings (default values), see appendix 1 in the Getting Started Guide (IM MC300-02EN).

Some data can be initialized.

Initialization of setup data

Initializing setup data resets the output setup data and measurement setup data. For details, see section 3.4 and appendix 1 in the Getting Started Guide (IM MC300-02EN).

The corresponding communication command is *RST (see chapter 11).

However, when using the compatible communication command RC via communication, the instrument initializes the output setup data, measurement setup data and zero calibration value data.

For the data stored by the instrument, see section 4.1.

Initialization of the zero calibration value

Initializing zero calibration resets the zero calibration value. For details, see section 3.5 in the Getting Started Guide (IM MC300-02EN).

The corresponding communication command is :SENSe:ZERO:INITialize (see chapter 11).

1.5 Communication Function

You can connect the instrument to a PC via the selected communication interface and remotely control the instrument from the PC.

Communication interface

Either the GP-IB interface or the RS-232 interface is installed, depending on the suffix code.

GP-IB interface

Installed when -C01 is selected. Connect via GP-IB to remotely control the instrument from a PC.

RS-232 interface

Installed when -C02 is selected. Connect via RS-232 to remotely control the instrument from a PC.

USB PC interface

Connect to the Type B connector to remotely control the instrument from a PC via TMC or CDC communication.

The USB interface does not provide a storage function.

Ethernet interface

Connect via Ethernet to remotely control the instrument from a PC.

Remote control

You can remotely control the instrument from a PC using dedicated communication commands.

The following operations can be controlled remotely.

- MC300 settings
- Loading of MC300 setup parameters
- Loading of output setup data and measurement data

This instrument is compatible with the communication commands used by our previous model, the MC100.

The instrument is also compatible with some commands used by products from other manufacturers.

1.6 Other Functions

Key lock function

Locks key operation on the operation panel.

- Off: Does not lock key operation (key lock released)
- Z.LOCK: Locks only ZERO CAL
- K.LOCK: Locks all keys except KEY LOCK, OUTPUT, and ALARM RESET
- A.LOCK: Locks all keys except KEY LOCK and ALARM RESET

Error messages

Displays error messages, information, and warnings on the screen, or stores them in the history (error log). For details, see section 5.2 in the Getting Started Guide (IM MC300-02EN).

Language for error messages

Select the language for error messages from English, Japanese, Chinese, or Korean.

User character input function

You can enter any character string as a memo.

Range information display

You can display the pressure type and range on the screen. You can select the display color for range information from eight colors.

By changing the colors, you will be able to distinguish pressure types and ranges by color.

Display brightness setting

You can set the display brightness in five levels. You can change the brightness according to the operating environment of the instrument.

Beep setting

Beeps are used to indicate the operation status of the device. You can set it from the UTILITY menu.

You can turn the beeps on or off for the following conditions. You cannot change the volume.

- When an error is detected during a self-test executed at power-on or executed manually (error codes: * 920 to 959)
- When you press a key

However, the beep that indicates error code 904 (internal power supply abnormality detection) cannot be turned off.

Units for biomedical pressure measuring instruments (/MD option)

You can set units for biomedical pressure measuring instruments. In addition to the pressure units of suffix code -U1, you can select the following units. You cannot combine with -U2.

- mmHg, cmHg, mHg, mmH₂O, cmH₂O, mH₂O, mTorr, Torr

2.1 Setting the Pressure Display Unit

This section explains how to set the display unit of the pressure setpoint and monitor display (pressure).

Procedure

Setting the Pressure Display Unit

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key and then the **Next 1/2** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **Unit** soft key.

| | | | | | |
|--|------|-----|----------|-----------|----------|
| | Unit | D/A | Zero Set | Auto Hold | Next 2/2 |
| | kPa | Off | On Off | On Off | |

3. The Unit menu appears. Press the soft key for the unit (Unit) you want to set. The displayed items differ depending on the pressure unit suffix code.

When -U1 is selected

Press the Next 1/2 soft key to select units for two screens.

| | | | | | |
|--|------|-----|-----|-----|----------|
| | Unit | | | | Next 1/2 |
| | Pa | hPa | kPa | MPa | |
| | Unit | | | | Next 2/2 |
| | mbar | bar | | atm | |

When -U2 is selected

Press the Next 1/7 to Next 6/7 soft keys to select units for seven screens.

| | | | | | |
|--|-----------|------------|-----------|------------|----------|
| | Unit | | | | Next 1/7 |
| | Pa | hPa | kPa | MPa | |
| | Unit | | | | Next 2/7 |
| | mbar | bar | | atm | |
| | Unit | | | | Next 3/7 |
| | mmH2O @4C | mmH2O @20C | inH2O @4C | inH2O @20C | |
| | Unit | | | | Next 4/7 |
| | ftH2O @4C | ftH2O @20C | | | |
| | Unit | | | | Next 5/7 |
| | mmHg | inHg | | | |
| | Unit | | | | Next 6/7 |
| | gf/cm2 | kgf/cm2 | | | |
| | Unit | | | | Next 7/7 |
| | psi | Torr | | | |

Note

If the /MD option is added when -U1 is selected, additional display units are available.

4. Press the soft key for the unit (Unit) you want to set.

2.1 Setting the Pressure Display Unit

Explanation



Pressure display units

The selectable display units differ depending on the pressure unit suffix code.

Also, if the /MD option (for biomedical pressure measuring instruments) is added when -U1 is selected, additional display units are available.

Default: kPa (for all suffix codes)

| Suffix code | Selectable display units |
|----------------|---|
| -U1 | Pa, hPa, kPa, MPa, mbar, bar, atm |
| -U2 | Pa, hPa, kPa, MPa, mbar, bar, atm, mmHg, inHg, gf/cm ² , kgf/cm ² , Torr, psi, mmH ₂ O (@4°C, @20°C), ftH ₂ O (@4°C, @20°C), inH ₂ O (@4°C, @20°C) |
| -U1+/MD option | Pa, hPa, kPa, MPa, mbar, bar, atm, mmHg, cmHg, mHg, mmH ₂ O, cmH ₂ O, mH ₂ O, mTorr, Torr |

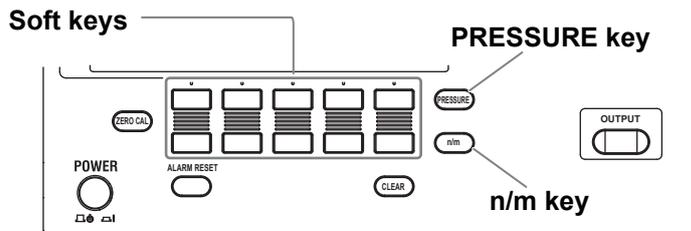
2.2 Setting the Pressure Output Value

Sets the pressure output value.

Procedure

Setting the Pressure Output Value

1. Press **PRESSURE** (pressure setting selector key).



2. The up and down soft keys become the pressure setting keys.



3. Use the up and down soft keys (pressure setting keys) for each digit to enter the numbers and set the pressure output value.

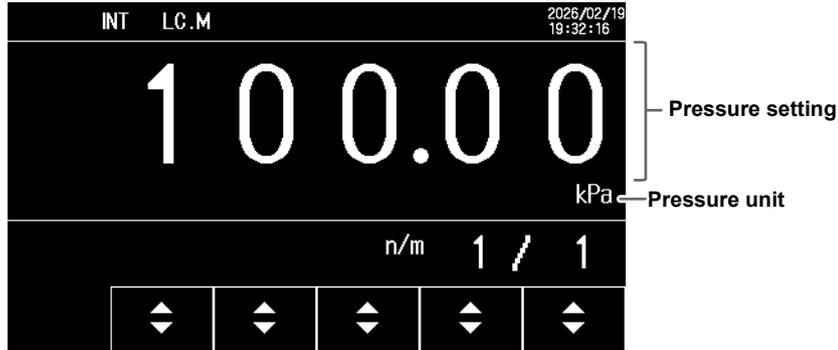


Note

If you increase a digit past 9 using its corresponding soft key, the value carries to the next digit and becomes 10 (within the settable range). Conversely, if you decrease a digit, the value borrows from the next higher digit.

2.2 Setting the Pressure Output Value

Explanation



Setting the pressure output value

Here, you set the pressure value to be output. Use the up and down soft keys (pressure setting keys) for each digit to make the setting.

Negative pressure output values (vacuum pressure) within the output setup range can also be set.

Default value: 0

Pressure output value setting range and accuracy-guaranteed range

| | -G01 model (10 kPa range) | -G03 model (200 kPa range) |
|----------------------------------|---------------------------|----------------------------|
| Output setting range | -0.12 kPa to 12 kPa | -2.4 kPa to 240 kPa |
| Accuracy-guaranteed range | 0 kPa to 10 kPa | 0 kPa to 200 kPa |

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2.3 Setting the Load Capacity

This section explains how to set the load capacity for your operating conditions.

Procedure

Setting the load capacity (Load Cap)

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key.



2. Press the **Load Cap** soft key.



3. The Load Capacity menu appears. Press the soft key for the load capacity you want to set. The setting status appears at the top of the screen.



Load capacity setting status
 LC.S: Small (0 to 100 cm³)
 LC.M: Middle (100 to 500 cm³)
 LC.L: Large (500 to 1000 cm³)



Explanation

Load capacity (volume of the output load)

The volume downstream of the pressure output port is called the load capacity. You can set the load capacity as a guideline for your operating conditions.

Default value: Small

| Setting | Guideline load capacity | Indication at the top of the screen |
|---------|-----------------------------|-------------------------------------|
| Small | 0 to 100 cm ³ | LC.S |
| Middle | 100 to 500 cm ³ | LC.M |
| Large | 500 to 1000 cm ³ | LC.L |

Purpose of setting the load capacity

Setting a load capacity appropriate for the conditions improves the responsiveness of pressure output. In general, the smaller the actual load capacity, the faster the response time.

2.4 Setting the Pressure Output Mode

This section explains how to set the mode for outputting the set pressure.

Note

If you will use the output monitor function described in chapter 3, set the output monitor function before performing the procedures in this section through section 2.9. When the output monitor function is set, the settings from this section onward are reset.

Explanation

Three pressure output modes

In addition to normal output, which continuously outputs the set pressure value, this instrument provides the following three output modes:

- Divider output (normal output)
- Auto-step output
- Sweep output

Divider output (normal output)

Outputs pressure as an n/m fraction of the set pressure output value.

A division ratio of 1/1 corresponds to normal output.

- $n = 0$ to m , $m = 1$ to 25, $n/m \leq 100\%$

Auto-step output

Automatically performs divider output in steps according to the interval time.

You set the interval time and repeat On/Off.

- Interval time: 10 s to 600 s (setting resolution: 5 s)
- Repeat On/Off: Off (once) or On (continuous) (can be stopped midway)

Sweep output

Linearly outputs between the set lower limit and upper limit over the interval time.

You set the sweep direction, interval time, and repeat On/Off.

- Switchable sweep direction (increasing or decreasing)
- Interval time: 15 s to 600 s (setting resolution: 5 s)
- Repeat On/Off: Off (once) or On (continuous) (can be stopped midway)

The following sections explain how to set each mode.

2.5 Divider Output (Normal Output)

This section explains how to set divider output (normal output).

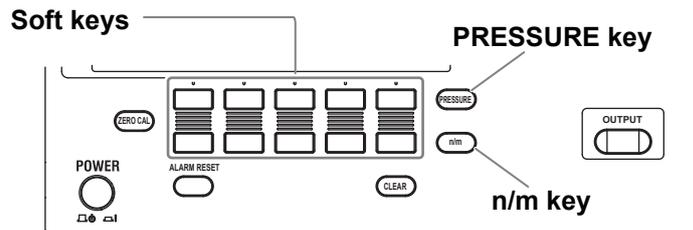
Procedure

Setting the Pressure Output Value

1. Set the pressure output value according to section 2.2.

Setting division ratio for divider output

2. Press n/m (division ratio setting selection key).



3. The upper and lower soft keys become the division ratio setting keys.



4. Use the upper and lower soft keys (division ratio setting keys) corresponding to each value of the division ratio (n/m) to enter the numbers and set the division ratio (n/m).



Note

Using the corresponding soft keys for n and m, you can display and set up to two digits for each value.



2.5 Divider Output (Normal Output)

Explanation



Divider output (normal output)

Outputs pressure as an n/m fraction of the set pressure output value.

Divider output can also be applied on the negative side (vacuum pressure), but output cannot cross zero.

Setting division ratio (n/m)

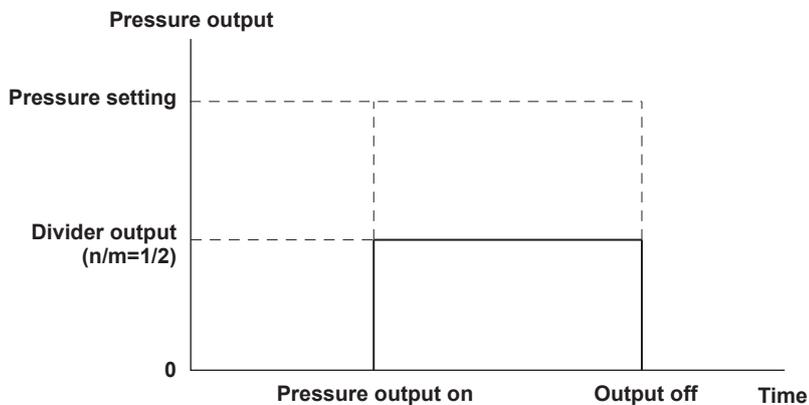
Sets the division ratio (n/m).

Default value: $n/m = 1/1$

| | Division ratio numerator n | Division ratio denominator m |
|----------------------|-------------------------------------|------------------------------|
| Setting range | 0 to division ratio denominator (m) | 1 to 25 |

($n/m \leq 100\%$)

Example of divider output (when $n/m = 1/2$)



Normal output

Normal output continuously outputs the set pressure value.

If no division ratio is set (division ratio $n/m = 1/1$), the setting is normal output.

2.6 Auto-Step Output

This section explains how to set auto-step output.

Note

If you will use the output monitor function described in chapter 3, set the output monitor function before performing the procedure in this section. When the output monitor function is set, the settings in this section are reset.

Procedure

Setting the pressure output value (pressure setpoint)

1. Set the pressure output value (pressure setpoint) (see section 2.2).

Setting division ratio (n/m)

2. Set the number of divisions (m) for the pressure setpoint and the start step (n) (for the procedure, see section 2.5).

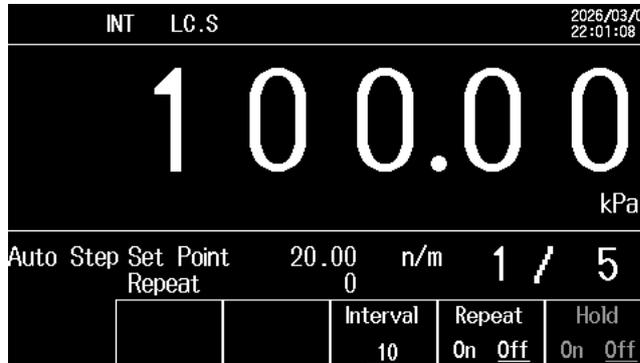
Setting output mode to auto-step output (Auto Step)

3. Press **MENU** to display the menu screen. Press the **Auto Step** soft key.



Setting interval time (Interval)

4. The auto-step output setting menu appears. Press the **Interval** soft key.



5. The interval time input box appears. Use the arrow keys (**▲** and **▼**) to enter the interval time (s).



6. Press **ENTER** to confirm the value and return to the auto-step output setting menu.



Setting Repeat On/Off (Repeat)

- In the auto-step output setting menu, pressing the Repeat soft key toggles the setting between On and Off.

On: Repeat enabled (continuous)

Off: No repeat (once only)

| | | | | | |
|--|--|--|----------|--------|--------|
| | | | Interval | Repeat | Hold |
| | | | 15 | On Off | On Off |

Setting auto hold (Auto Hold)

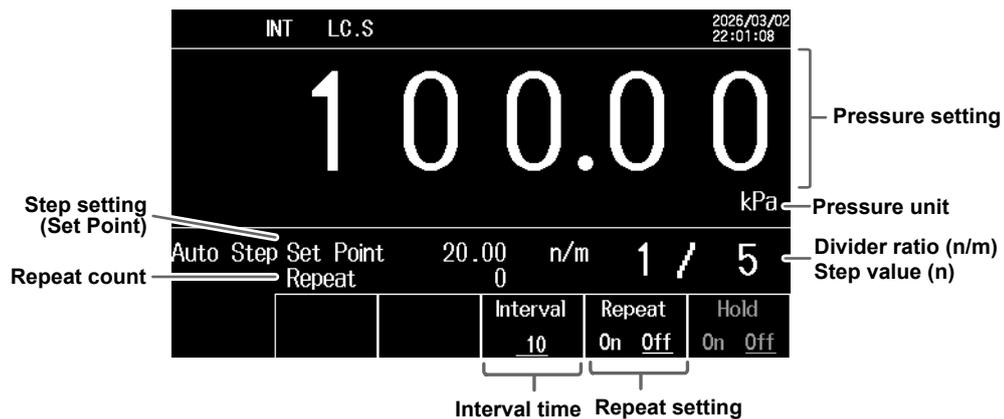
- Set auto hold as necessary. For details, see section 2.9.

Holding the output (Hold)

- During auto-step output operation, the output can be paused (held) while maintaining the output. For details, see section 2.11.

Explanation

Auto-step output screen



Auto-step output

Outputs the pressure setpoint divided by the number of divisions (m). Each divider output is performed and output automatically in steps according to the interval time.

When pressure output starts, the output first moves to and outputs the set value of the start step (n). After the interval time elapses, the output automatically increases step by step, and divider output is performed at each step for the same interval time.

When the pressure setpoint is reached, the output then decreases step by step while continuing divider output. When it reaches the set value of the start step again, one auto step output operation (one cycle) is completed.

Auto-step output can also be used on the negative side (vacuum pressure), but output cannot cross zero.

Setting division ratio (n/m)

Sets the number of divisions (m) and the start step (n) for auto step output.

The setting range for the division ratio (n/m) is the same as for divider output (see section 2.5).

Default value: $n/m = 1/1$

Note

The start step (n) can be set to a value other than 1. For example, if the pressure setpoint is 100 kPa and the division ratio is set to $n/m = 2/5$, the set value of the start step is 40 kPa, and divider output is then performed automatically at 60 kPa, 80 kPa, 100 kPa, and so on.

Display of step value (n)

During auto-step operation, the current step value (n) is displayed.

Display of step setpoint (Set Point)

During auto step operation, the set value output at the current step (n) is displayed.

Interval time (Interval)

Sets the time (s) during which divider output is performed at one step.

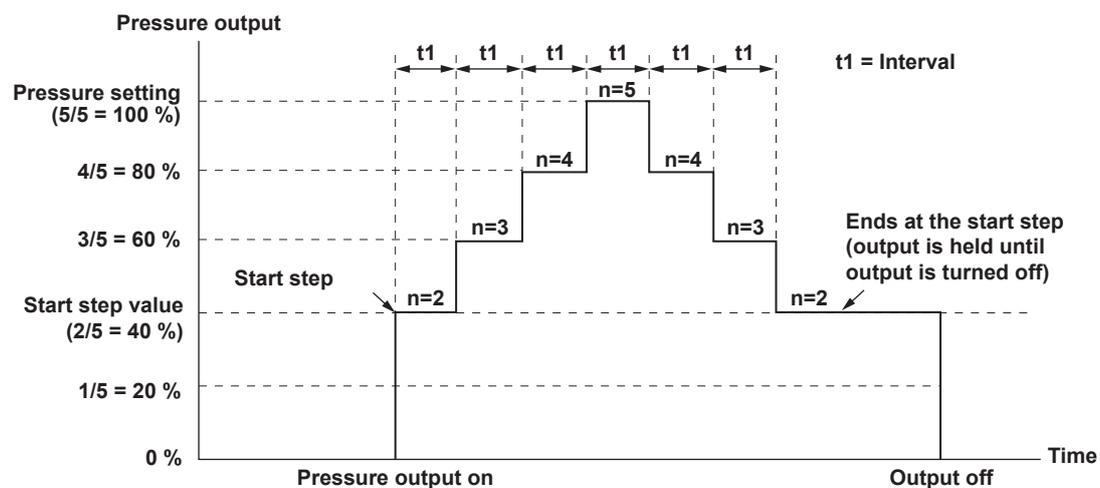
Setting range: 10 s to 600 s (setting resolution: 5 s)

Default value: 10 s

Note

Auto-step output cannot be started when the pressure setpoint is 0 or when $n = m$.

Example of auto-step output (when $n = 2$, $m = 5$, and no repeat)



Repeat setting (Repeat)

Sets Repeat On/Off for auto step output.

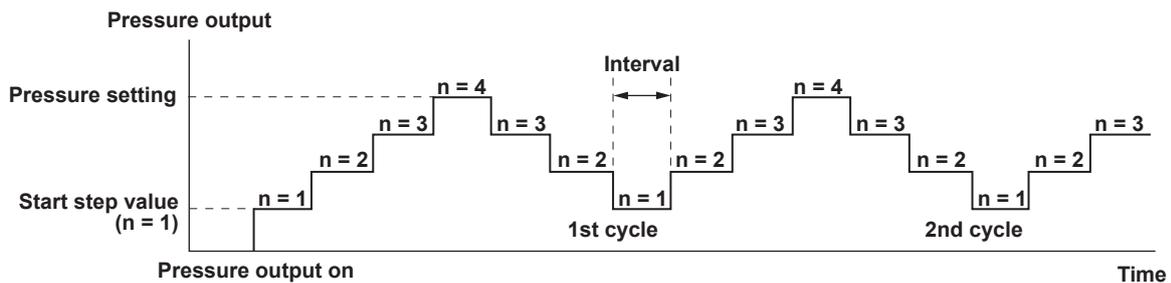
This sets whether the output is repeated, where one repetition is defined as the output moving from the start step value to the pressure setpoint and then back again to the start step value.

- On: Repeat enabled (continuous)
- Off: No repeat (once only)

Default value: Off

Even during operation with On (Repeat enabled), you can press the Repeat soft key to switch to Off (No repeat). In that case, the current cycle is completed and auto-step output ends.

Example of repeated auto-step output (when $n = 1$, $m = 4$, and repeat enable)



Display of repeat count (Repeat)

During auto step operation, the number of repetitions (Repeat) is counted and displayed.

Note

- If Repeat is set to Off, the output mode automatically changes from auto-step output to divider output (normal output) after one cycle is completed.
- If the Repeat or Hold setting is changed during auto step operation, that cycle is not added to the repeat count.
- When the displayed repeat count exceeds 9999, it is reset to 0 and it restarts from 0.

Auto hold (Auto Hold)

As soon as pressure output is turned on, the output can move to the start step value and it can be automatically paused (auto hold) while maintaining the output. Then, the hold can be released at any time to start the auto-step output.

For details on auto hold, see section 2.9.

Holding the output (Hold)

During auto step output operation, the output can be paused (held) while maintaining the output.

For details on hold, see section 2.11.

2.7 Sweep Output

This section explains how to set sweep output.

Note

If you will use the output monitor function described in chapter 3, set the output monitor function before performing the procedure in this section. When the output monitor function is set, the settings in this section are reset.

Procedure

Setting the pressure output value (pressure setpoint)

1. Set the pressure output value (pressure setpoint) (see section 2.2). This set value becomes the sweep upper limit.

Setting output mode to sweep output (Sweep)

2. Press **MENU** to display the menu screen. Press the **Sweep** soft key.

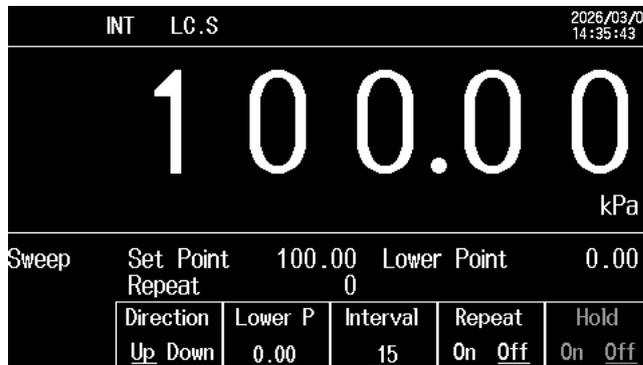


Setting sweep direction (Direction)

3. The sweep output setting menu appears. Pressing the Direction soft key switches the sweep direction between up and down.

Up: Increasing direction

Down: Decreasing direction



Setting sweep lower limit (Lower Point)

4. In the sweep output setting menu, press the **Lower P** soft key.



5. The input box for the sweep lower limit appears. Use the arrow keys (**▲**, **▼**, **◀**, **▶**) to enter the sweep lower limit numerically.

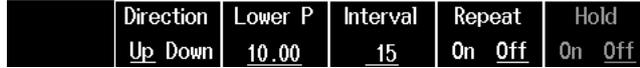


6. Press **ENTER** to confirm the value and return to the sweep output setting menu.



Setting interval time (Sweep Interval)

7. In the sweep output setting menu, press the **Interval** soft key.



8. The interval time input box appears. Use the arrow keys (▲ and ▼) to enter the interval time (s).



9. Press **ENTER** to confirm the value and return to the sweep output setting menu.



Setting Repeat On/Off (Repeat)

10. In the sweep output setting menu, pressing the Repeat soft key toggles the setting between On and Off.

On: Repeat enabled (continuous)

Off: No repeat (once only)



Setting auto hold (Auto Hold)

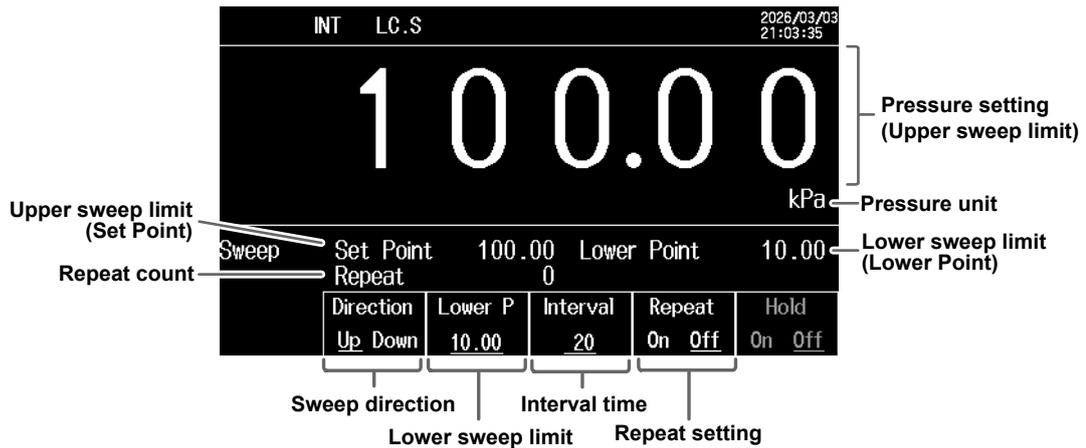
11. Set auto hold as necessary. For details, see section 2.9.

Holding the output (Hold)

12. During sweep output operation, the output can be paused (held) while maintaining the output. For details, see section 2.11.

Explanation

Sweep output screen



Sweep output

Linearly outputs between the sweep lower limit and the sweep upper limit (pressure setpoint) over the interval time.

Depending on the sweep direction setting, one sweep in either the increasing direction or the decreasing direction counts as one sweep output operation (one cycle).

Sweep output can also be used on the negative side (vacuum pressure) or across the zero point.

Sweep direction (Direction)

Sets the sweep direction for sweep output to either the increasing direction or the decreasing direction.

- Up: Increasing direction (from the sweep lower limit to the sweep upper limit)
- Down: Decreasing direction (from the sweep upper limit to the sweep lower limit)

Default value: Up

Even during sweep output operation, pressing the Direction soft key changes the setting. The sweep direction changes at the moment the setting is changed.

Sweep upper limit (Set Point)

The pressure setpoint becomes the sweep upper limit.

Sweep lower limit (Lower Point)

Sets the sweep lower limit for sweep output.

The sweep lower limit can be set within the output setting range (see section 2.2) to a value less than the sweep upper limit.

Default value: 0

Interval time (Interval)

Sets the time (s) for one sweep output operation.

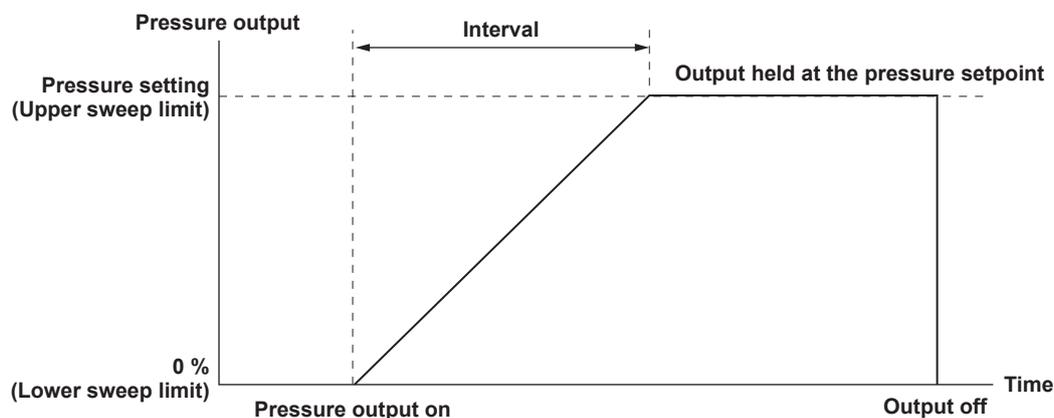
Setting range: 15 s to 600 s (setting resolution: 5 s)

Default value: 15 s

Note

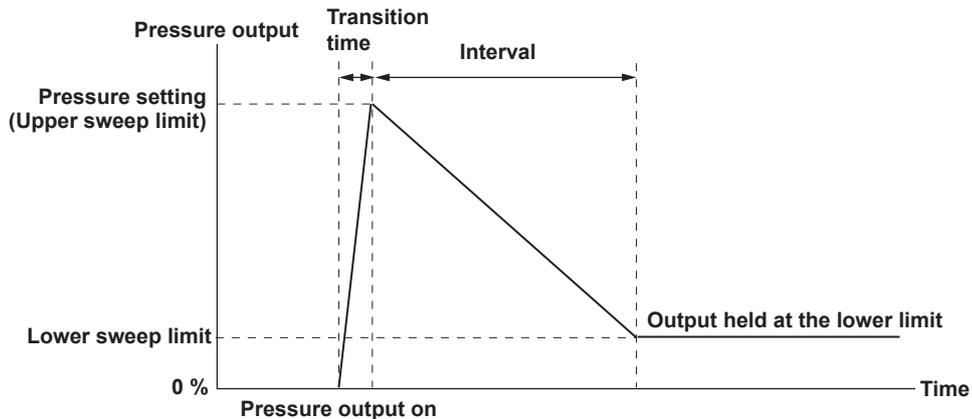
Sweep output cannot be started when the sweep lower limit is greater than or equal to the sweep upper limit (pressure setpoint).

Example of sweep output (when the lower limit is 0, sweep direction is Up, and no repeat)



2.7 Sweep Output

Example of sweep output (when the lower limit is 0, sweep direction is Down, and no repeat)



Repeat setting

Sets Repeat On/Off for sweep output. Sets whether to repeat a round trip of sweep increase → decrease or sweep decrease → increase.

- On: Repeat enabled (continuous)
- Off: No repeat (once only)

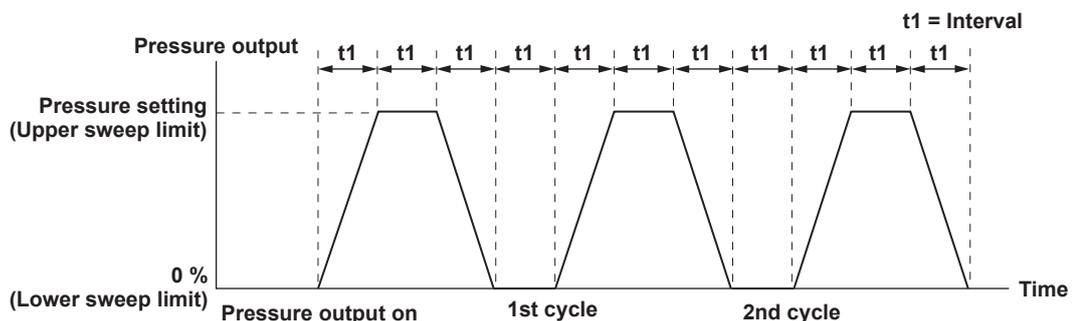
Default value: Off

If Off (No repeat) is set, either one upward sweep (lower limit → upper limit) or one downward sweep (upper limit → lower limit) is output, depending on the sweep direction setting.

If On (Repeat enabled) is set, the output is held for the interval time at the upper limit for an upward sweep or at the lower limit for a downward sweep, and then sweep output is repeated over each interval time while alternating the sweep direction. In this case, one round trip of upward sweep → downward sweep or downward sweep → upward sweep is counted as one repetition (one cycle).

Even during operation with On (Repeat enabled), you can press the Repeat soft key to switch to Off (No repeat). In that case, the current cycle is completed and sweep output ends.

Example of repeated sweep output (when the lower limit is 0, the sweep direction is Up, and repeat enable)



Display of repeat count

The actual number of repetitions is displayed on the screen as the repeat count (Repeat).

Note

- If the settings for sweep direction (Direction), Repeat, or Hold are changed during sweep operation, that cycle is not added to the repeat count.
- When the displayed repeat count exceeds 9999, it is reset to 0 and it restarts from 0.

Auto hold (Auto Hold)

As soon as pressure output is turned on, the output can move to the sweep lower limit when the sweep direction is Up, or to the sweep upper limit (pressure setpoint) when the sweep direction is Down, and the output can be automatically paused (auto hold) while maintaining the output. Then, the hold can be released at any time to start the sweep output.

For details on auto hold, see section 2.9.

Holding the output (Hold)

During sweep output operation, the output can be paused (held) while maintaining the output.

For details on hold, see section 2.11.

2.8 Setting Repeat

Explanation

Repeat setting

For auto-step output and sweep output, you can set whether to repeat the output cycle.

- On: Repeat enabled (continuous)
- Off: No repeat (once only)

Default value: Off

For the procedure, see sections 2.6 and 2.7, respectively.

2.9 Setting Auto Hold

This section explains auto hold for auto-step output and sweep output.

Procedure

Setting Auto Hold On/Off (Auto Hold)

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key and then the **Next 1/2** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Pressing the **Auto Hold** soft key toggles the setting between On and Off.

On: Enables automatic pause (auto hold)

Off: Disables automatic pause (auto hold)

| | | | | | |
|--|------|-----|----------|-----------|------|
| | Unit | D/A | Zero Set | Auto Hold | Next |
| | kPa | Off | On Off | On Off | 2/2 |

Releasing pause (Hold)

3. If the output is paused (held) by auto hold, the pause can be released.
The display menu differs depending on the output mode.

In auto-step output

HOLD appears at the top of the auto-step output screen, and Hold in the auto-step output setting menu turns On, enabling the On/Off setting.

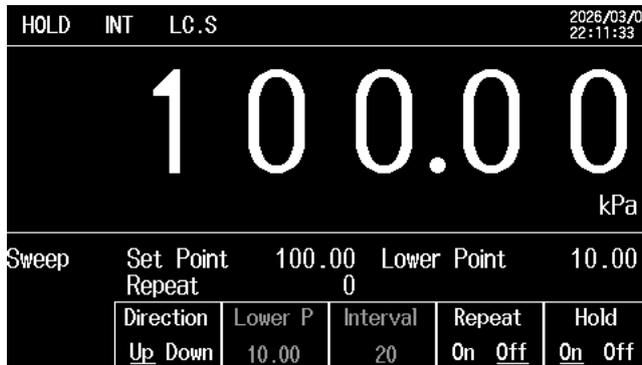
| | | | | | |
|-----------|-----------|----------|------------------------|--------|-----|
| HOLD | INT | LC.S | 2026/03/03 22:14:42 | | |
| 100.00 | | | | | kPa |
| Auto Step | Set Point | 20.00 | n/m | 1 / 5 | |
| | Repeat | 0 | | | |
| | | Interval | Repeat | Hold | |
| | | 10 | On Off | On Off | |

Press the **Hold** soft key to turn it Off, and the pause (Hold) is released. The HOLD indication at the top of the screen disappears.

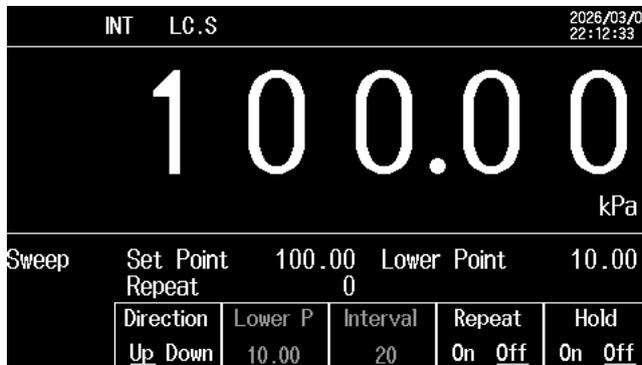
| | | | | | |
|-----------|-----------|----------|------------------------|--------|-----|
| | INT | LC.S | 2026/03/03 22:15:30 | | |
| 100.00 | | | | | kPa |
| Auto Step | Set Point | 20.00 | n/m | 1 / 5 | |
| | Repeat | 0 | | | |
| | | Interval | Repeat | Hold | |
| | | 10 | On Off | On Off | |

In sweep output

HOLD appears at the top of the sweep output screen, and Hold in the sweep output setting menu turns On, enabling the On/Off setting.



Press the **Hold** soft key to turn it Off, and the pause (Hold) is released. The HOLD indication at the top of the screen disappears.



Explanation

Auto hold (Auto Hold)

For auto-step output or sweep output, sets whether the output is automatically paused (auto hold) after pressure output is turned on. Operation differs depending on the output mode.

- On: Enables automatic pause (auto hold)
- Off: Disables automatic pause (auto hold)

Default value: Off

In auto-step output

When auto hold is On, the output moves to the start step value as soon as pressure output is turned on, then automatically pauses (auto hold) while maintaining the output.

Release Hold at any time to start auto-step output.

In sweep output

When auto hold is On, the output moves to the sweep lower limit or the sweep upper limit (pressure setpoint) as soon as pressure output is turned on, then automatically pauses (auto hold) while maintaining the output.

When the sweep direction is Up, the output moves to the sweep lower limit. When the sweep direction is Down, it moves to the sweep upper limit (pressure setpoint).

Release Hold at any time to start sweep output.

For the procedure for setting the start step value for auto-step output and the lower limit and pressure setpoint for sweep output, see sections 2.6 and 2.7, respectively.

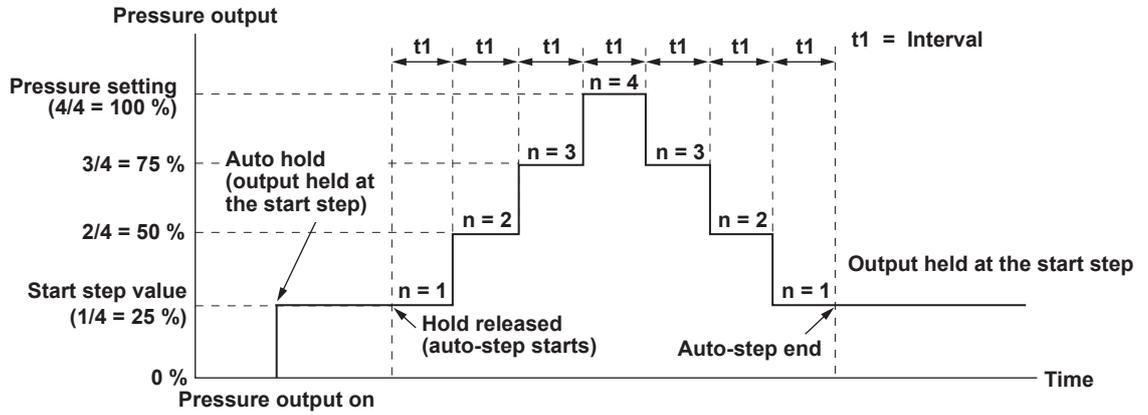
Releasing pause (Hold)

In the auto-step output setting menu or the sweep output setting menu, the Hold On/Off setting becomes effective. Turning it Off releases the pause (Hold).

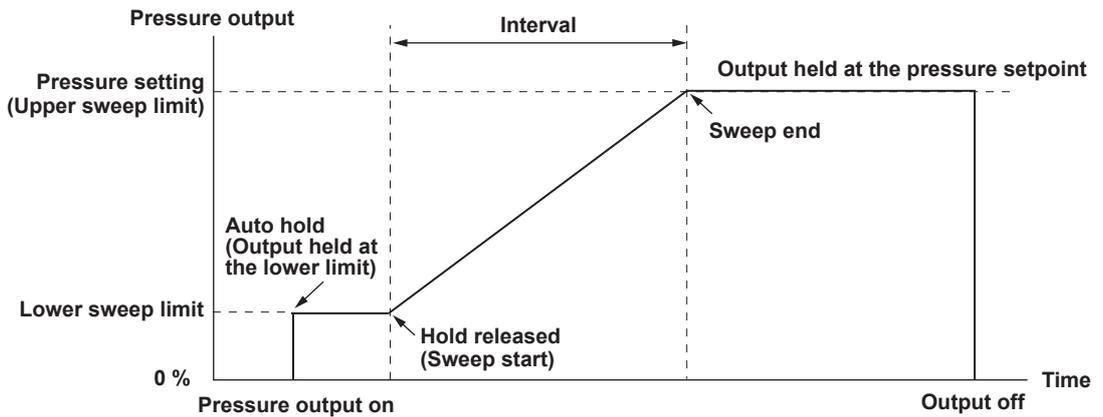
After the pause (Hold) is released, auto-step output or sweep output starts.

For details on Hold, see section 2.11.

Example of auto hold On for auto-step output (when $n = 1$ and $m = 4$)

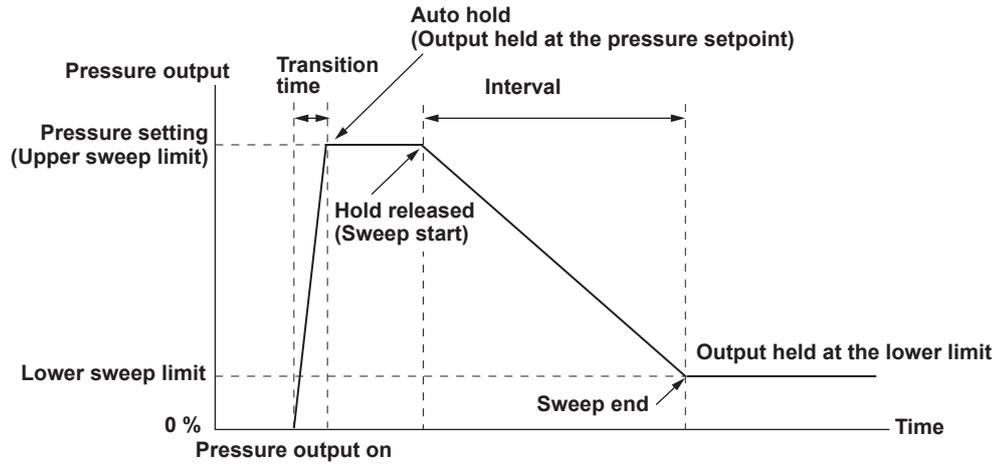


Example of auto hold On for sweep output (when the lower limit is not 0 and the sweep direction is Up)



2.9 Setting Auto Hold

Example of auto hold On for sweep output (when the lower limit is not 0 and the sweep direction is Down)



2.10 Turning Pressure Output On and Off



WARNING

Before outputting pressure from the instrument, ensure that the tubing is properly installed. If the tubing is not properly installed, air leakage may cause injury or damage to the instrument.

French

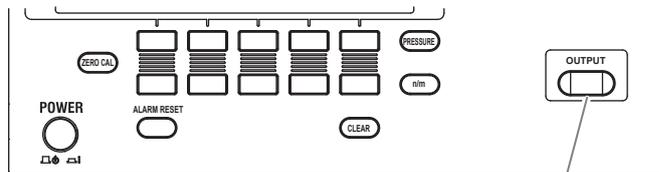


AVERTISSEMENT

Avant de générer de la pression à partir de l'instrument, assurez-vous que la tubulure est correctement installée. Si la tubulure n'est pas correctement installée, une fuite d'air peut causer des blessures ou endommager l'instrument.

Procedure

1. Press **OUTPUT**.
The OUTPUT LED lights, and air at the set pressure is output from the pressure output port.
2. To stop the output while pressure is being output, press **OUTPUT** again. The OUTPUT LED turns off.



OUTPUT key 
Key for turning pressure output on and off

Explanation

Turning pressure output on

After completing the settings for pressure output, turn the output on when you want to output air at the set pressure to the connected device.

Turning pressure output off

Turn the output off to stop pressure output.

Pressure output setting range

| | -G01 model (10 kPa range) | -G03 model (200 kPa range) |
|----------------------|---------------------------|----------------------------|
| Output setting range | -0.12 kPa to 12 kPa | -2.4 kPa to 240 kPa |

When not in use

Keep the output off when pressure output is not in use.

Note

- Turn the pressure output off when performing zero calibration.
- Turn the pressure output off while configuring the settings for pressure output.

2.11 Holding the Output

This section explains how to hold the output during auto-step output or sweep output.

Procedure

Holding the output (Hold)

1. The output can be held during pressure output.

The display menu differs depending on the output mode.

In auto-step output

The Hold setting in the auto-step output setting menu becomes effective. Press the **Hold** soft key to hold the output. HOLD appears at the top of the screen.

| | | | | | |
|--|--|--|----------|--------|--------|
| | | | Interval | Repeat | Hold |
| | | | _10 | On Off | On Off |
| | | | Interval | Repeat | Hold |
| | | | _10 | On Off | On Off |

In sweep output

The Hold setting in the sweep output setting menu becomes effective. Press the **Hold** soft key to hold the output. HOLD appears at the top of the screen.

| | | | | | |
|--|-----------|---------|----------|--------|--------|
| | Direction | Lower P | Interval | Repeat | Hold |
| | Up Down | 10.00 | _20 | On Off | On Off |
| | Direction | Lower P | Interval | Repeat | Hold |
| | Up Down | 10.00 | _20 | On Off | On Off |

Releasing output hold

2. When Hold is on, press the **Hold** soft key to turn it off. This releases output Hold and resumes auto-step output or sweep output. The HOLD indication at the top of the screen disappears.

Explanation

Holding the output (Hold)

In auto-step output or sweep output, the output can be held while pressure is being output.

- On: Holds the output
- Off: Releases output Hold

Default value: Off

Releasing output hold

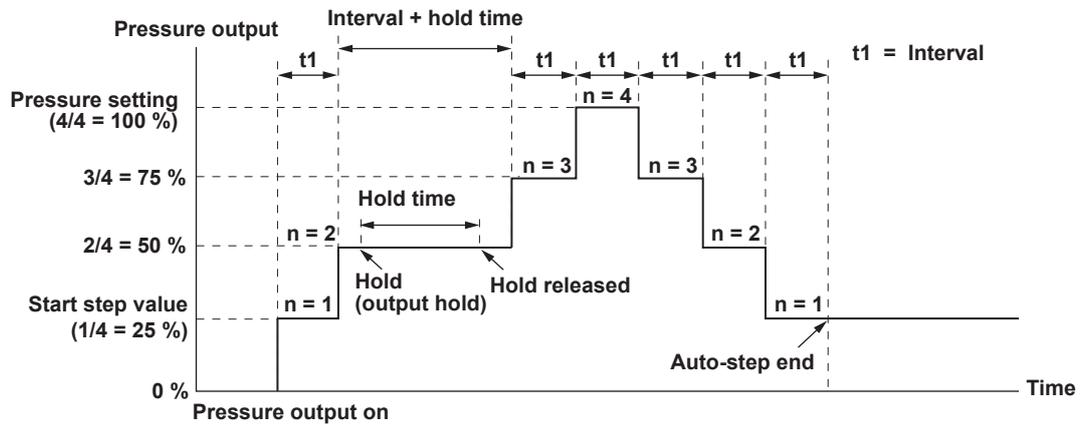
If hold is turned off while output hold is active during auto-step output or sweep output, output hold is released and auto-step output or sweep output resumes. The hold time is not counted as part of the interval time.

For auto-step output, the remaining interval time is output at the step where the output was being held, and auto-step output continues.

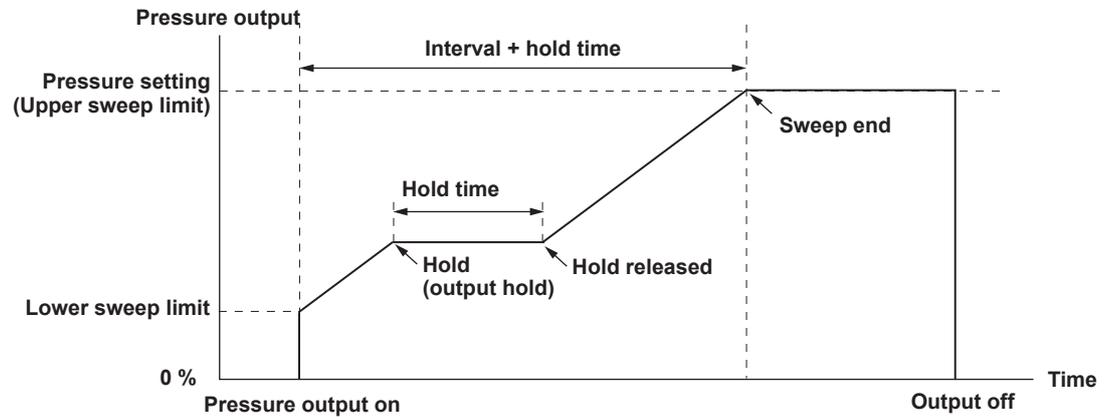
For sweep output, sweep output continues from the value at which the output was being held, with the same sweep direction and slope.

A pause by auto hold can also be released in the same way. For details on auto hold, see section 2.9.

Example of hold on/off operation for auto-step output (when $n = 1$ and $m = 4$)



Example of hold on/off operation for sweep output (when the lower limit is not 0 and the sweep direction is Up)



3.1 Setting the Output Monitor

This section explains how to measure and display the output pressure using the sensor in the pressure control unit.

Procedure

Setting the Output Monitor

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **Monitor** soft key.

| | | | | | |
|--|---------|-----------|----------|---------|------|
| | Trigger | IntegTime | Load Cap | Monitor | Next |
| | INT | 1500ms | Small | Off | 1/2 |

Setting monitor display format (Monitor)

3. The output monitor setting menu appears. Press the soft key for the display format you want to use.

Off: No monitor display

Pressure: Displays the pressure value as the monitor value

Percent: Displays the monitor value as a percentage of the pressure setpoint

| | | |
|-----|----------|-----------|
| | Monitor | Deviation |
| Off | Pressure | Percent |
| | | 1.00 |

4. The display format is set, and the monitor value appears on the screen.

| | | |
|-----------|-----------|------------|
| INT | LC.S | 2026/03/04 |
| | | 15:59:09 |
| 100.00 | | |
| Monitor | 10.00 | kPa |
| n/m 1 / 1 | | |
| Trigger | IntegTime | Load Cap |
| INT | 1500ms | Small |
| Monitor | Next | |
| Pressure | 1/2 | |

Setting allowable deviation (Deviation)

5. Press the **Monitor** soft key again to display the output monitor setting menu, and then press the **Deviation** soft key.

| | | |
|-----|----------|-----------|
| | Monitor | Deviation |
| Off | Pressure | Percent |
| | | 1.00 |

6. The allowable deviation input box appears. Use the arrow keys (**▲** and **▼**) to enter the allowable deviation (%) numerically.

| | |
|-----------------|-------|
| Deviation Value | 1.00% |
|-----------------|-------|

7. Press **ENTER** to confirm the value and return to the output monitor setting menu.

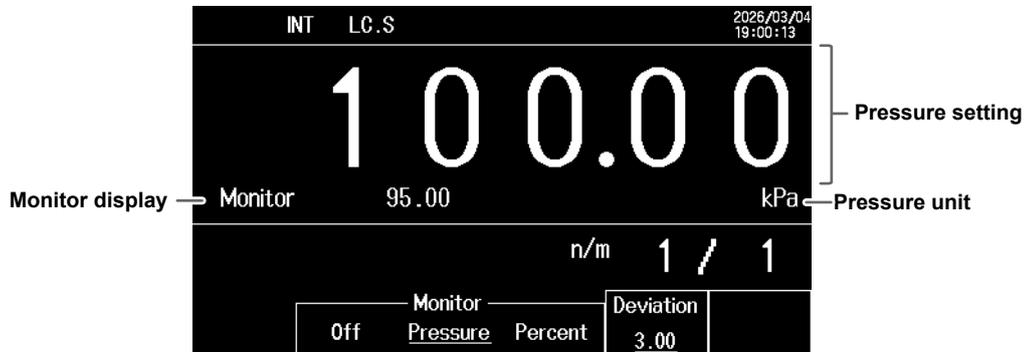
| | | |
|-----------------|-------|-------|
| Deviation Value | Enter | 3.00% |
|-----------------|-------|-------|

3.1 Setting the Output Monitor

8. The allowable deviation is set.



Explanation



Output monitor setting

Measures and displays the output pressure using the sensor in the pressure control unit.
Sets the display format and allowable deviation.

Pressure measurement range

| | -G01 model (10 kPa range) | -G03 model (200 kPa range) |
|--------------------------|-----------------------------|-----------------------------|
| Measurement range | -12.0000 kPa to 12.0000 kPa | -156.000 kPa to 240.000 kPa |
| Resolution | 0.0001 kPa | 0.001 kPa |

Output display format (Monitor)

- Off: No monitor display
- Pressure: Displays the pressure value measured by the sensor
- Percent: Displays the value as a percentage of the pressure setpoint

Default value: Off

Allowable deviation (Deviation)

Sets the allowable deviation (%) relative to the pressure setpoint.

Allowable deviation setting range: 0.01 % to 10 % of full scale (setting resolution: 0.01 %)

Default value: 1.00 %

Reference values

The reference values (upper limit and lower limit) are determined by the allowable deviation (%) relative to the pressure setpoint.

- Upper limit: pressure setpoint + allowable deviation
- Lower limit: pressure setpoint – allowable deviation

3.2 Setting Measurement Integration Time

This section explains how to set the measurement integration time for pressure measurement.

Procedure

Setting measurement integration time (Integration Time)

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **IntegTime** soft key.

| | | | | | |
|--|---------|-----------|----------|---------|------|
| | Trigger | IntegTime | Load Cap | Monitor | Next |
| | INT | 1500ms | Small | Off | 1/2 |

3. The measurement integration time menu appears. Press the soft key for the measurement integration time you want to use.

250ms, 1500ms, 2500ms, 4000ms

| | | | | | |
|--|------------------|--------|--------|--------|--|
| | Integration Time | | | | |
| | 250ms | 1500ms | 2500ms | 4000ms | |

4. The measurement integration time is set.

| | | | | | |
|--|---------|-----------|----------|---------|------|
| | Trigger | IntegTime | Load Cap | Monitor | Next |
| | INT | 2500ms | Small | Off | 1/2 |

Explanation

Measurement Integration Time (Integration Time)

Select from the following:

- 250 ms, 1500 ms, 2500 ms, 4000 ms

Default value: 1500 ms

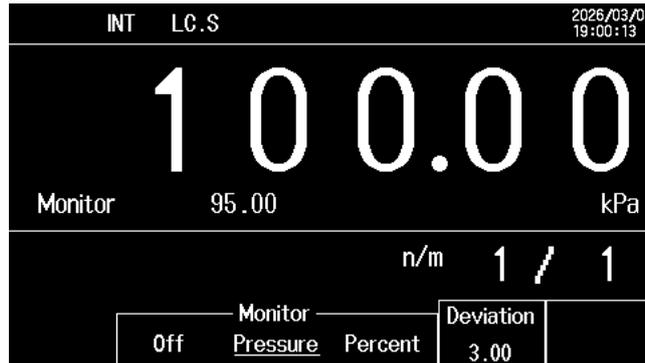
3.3 Setting the Output Stability Monitor

This section explains the function that compares the measured pressure value (output monitor value) with the pressure setpoint and notifies the stability status.

Procedure

Setting the Output Stability Monitor

Set the display format and allowable deviation for the output monitor according to section 3.1.



Explanation

Output stability monitor setting

This function compares the measured pressure value (output monitor value) with the pressure setpoint and notifies the stability status.

The display format and allowable deviation are set in the same way as for output monitor setting in section 3.1.

Stability status determination

The reference values (upper limit and lower limit) are determined by the allowable deviation relative to the pressure setpoint.

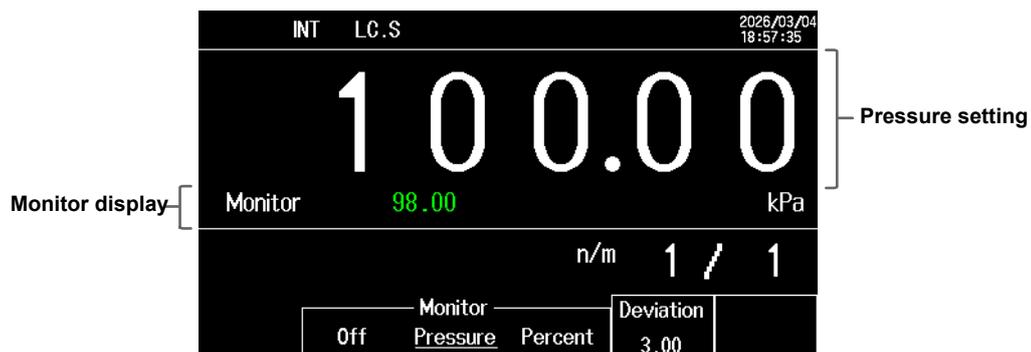
When the following condition is satisfied, the status is regarded as stable:

Lower limit \leq output monitor value \leq upper limit

Stability status indication

The stability status is indicated by the color of the output monitor display value. This is valid when the output monitor's display format is set to pressure.

- Stable: green
- Other: white



3.4 Setting D/A Output

This section explains how to output the output monitor value after D/A conversion to a voltage value.

Procedure

Setting D/A Output

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key and then the **Next 1/2** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **D/A** soft key.

| | | | | | |
|--|------|-----|----------|-----------|------|
| | Unit | D/A | Zero Set | Auto Hold | Next |
| | kPa | Off | On Off | On Off | 2/2 |

Setting D/A output on/off (D/A)

3. The D/A output setting menu appears. Pressing the **D/A** soft key toggles the setting between On and Off.

On: Outputs D/A

Off: Does not output D/A

| | | | | | |
|--|--------|-------|--|---------|--|
| | D/A | Range | | Scaling | |
| | On Off | 2V 5V | | | |

Setting D/A output range (Range)

4. In the D/A output setting menu, press the **Range** soft key to set the range.

2V: 2 V DC range

5V: 5 V DC range

| | | | | | |
|--|--------|-------|--|---------|--|
| | D/A | Range | | Scaling | |
| | On Off | 2V 5V | | | |

Explanation

D/A output

Outputs the output monitor value after D/A conversion to a voltage value from the monitor D/A output terminal.

Setting D/A output on/off (D/A)

Outputs the output monitor value set in section 3.1 after D/A conversion to a voltage value from the monitor D/A output terminal.

- On: Outputs D/A
- Off: Does not output D/A

Default value: Off

D/A output range (Range)

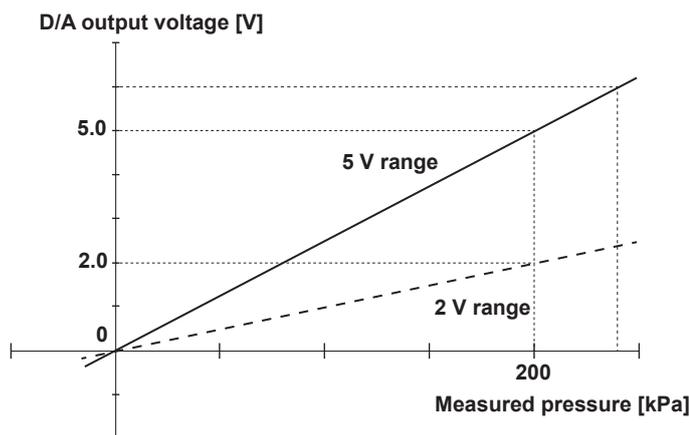
Two D/A output ranges are available.

- D/A output range: 2 V (2 V DC), 5 V (5 V DC)

Default value: 2 V

The pressure measurement range is linearly scaled to the D/A output range.

Relationship between measured pressure and d/a output voltage (for the 200 kPa model)



D/A output range

Output range: approximately $\pm 120\%$ of the range

D/A output resolution

Output resolution: 16 bit

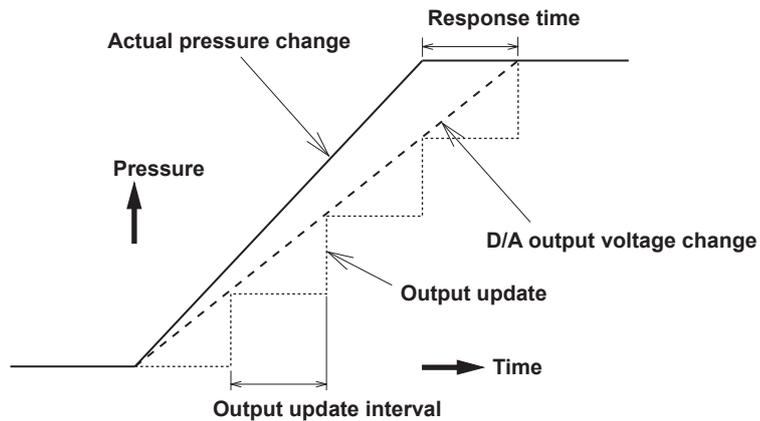
D/A output update interval

Output update interval: approximately 2 ms

Response time

Conforms to the integration time of the output monitor.

Relationship between pressure change and D/A output change



Monitor D/A output terminal (D/A OUTPUT)

The D/A-converted voltage is output from the monitor D/A output terminal.

| Item | Specification |
|------------------------|----------------------------|
| Output range | 2 V DC range, 5 V DC range |
| Output update interval | Approx. 2 ms |
| Terminal | BNC terminal |

For details on the monitor D/A output terminal, see section 4.3 of the Getting Started Guide.

3.5 Setting D/A Scaling

This section explains how to output any selected range within the pressure measurement range at the full scale of the D/A output.

Procedure

Setting D/A Output

1. Set D/A output on/off and the D/A output range according to section 3.4.

Setting D/A scaling (Scaling)

2. In the D/A output setting menu, press the **Scaling** soft key.

| | | | | | |
|--|--------|-------|--|---------|--|
| | D/A | Range | | Scaling | |
| | On Off | 2V 5V | | | |

3. The D/A scaling setting menu appears. Pressing the **Scaling** soft key toggles the setting between On and Off.

On: Enables D/A scaling

Off: Disables D/A scaling

| | | | | | |
|--|---------|---------|-----------------|--------------|--|
| | Scaling | Input | Two Point Value | Direct Value | |
| | On Off | Two Dir | | | |

Setting the scaling method (Input)

4. In the D/A scaling setting menu, press the **Input** soft key to set the scaling mode.

Two: Two-point mode

Dir: Direct input mode

If Two is selected, proceed to "Setting in two-point mode."

If Dir is selected, proceed to "Setting in direct input mode."

| | | | | | |
|--|---------|---------|-----------------|--------------|--|
| | Scaling | Input | Two Point Value | Direct Value | |
| | On Off | Two Dir | | | |

Setting in two-point mode (Two Point Value)

5. In the D/A scaling setting menu, press the **Two Point Value** soft key.

| | | | | | |
|--|---------|---------|-----------------|--------------|--|
| | Scaling | Input | Two Point Value | Direct Value | |
| | On Off | Two Dir | | | |

Setting span upper and lower limits (Span Upper, Span Lower)

6. The two-point mode setting menu appears. Press the **Span Upper** soft key.

| | | | | | |
|--|------------|------------|-------------|-------------|--|
| | Span Upper | Span Lower | Scale Upper | Scale Lower | |
|--|------------|------------|-------------|-------------|--|

7. The input box for Span Upper (span upper limit) appears. Use the arrow keys (▲, ▼, ◀, ▶) to enter Span Upper numerically.

| | |
|------------|---------|
| Span Upper | 200.000 |
|------------|---------|

8. Press **ENTER** to confirm the value and return to the two-point mode setting menu.

| | | |
|------------|-------|---------|
| Span Upper | Enter | 100.000 |
|------------|-------|---------|

9. In the two-point mode setting menu, as with Span Upper, press the **Span Lower** soft key and enter the value in the input box.



Setting scale upper and lower limits (Scale Upper, Scale Lower)

10. In the two-point mode setting menu, press the **Scale Upper** soft key.



11. The input box for Scale Upper (scale upper limit) appears. Use the arrow keys (▲, ▼, ◀, ▶) to enter Scale Upper numerically.



12. Press **ENTER** to confirm the value and return to the two-point mode setting menu.



13. In the two-point mode setting menu, as with Scale Upper, press the **Scale Lower** soft key and enter the value in the input box.



Setting in Direct Input Mode (Direct Value)

5. In the D/A scaling setting menu, press the **Direct Value** soft key.



6. The direct input mode setting menu appears. Press the **Gain** soft key.



7. The input box for Gain appears. Use the arrow keys (▲, ▼, ◀, ▶) to enter Gain numerically.



8. Press **ENTER** to confirm the value and return to the direct input mode setting menu.



9. In the direct input mode setting menu, press the **Offset** soft key.



10. The input box for Offset appears. Use the arrow keys (▲, ▼, ◀, ▶) to enter Offset numerically.



11. Press **ENTER** to confirm the value and return to the direct input mode setting menu.



3.5 Setting D/A Scaling

12. In the direct input mode setting menu, pressing the **Auto Offset** soft key instead of **Offset** sets the current measured pressure value (output monitor value) as the Offset.



Explanation

D/A scaling

Outputs any selected range within the output monitor pressure measurement range at the full scale of the D/A output range.

D/A scaling on/off setting (Scaling)

Sets whether any selected range in pressure measurement is output at the full scale of the D/A output set in section 3.4.

- On: Enables D/A scaling
- Off: Disables D/A scaling

Default value: Off

D/A Scaling Setting Method (Input)

There are two D/A scaling modes.

Select from the following two scaling modes:

- Two: Two-point mode
- Dir: Direct input mode

Default value: Two (two-point mode)

Two-point mode (Two Point Value)

Sets any selected range within the output monitor pressure measurement range as the span, and sets the upper and lower limits of the span (output monitor value) and the upper and lower limits of the scale (D/A output value) after D/A scaling conversion.

- Span Upper: Span upper limit
- Span Lower: Span lower limit
- Scale Upper: Scale upper limit
- Scale Lower: Scale lower limit

Span upper and lower limits (Span Upper and Span Lower)

Sets the upper and lower limits of the span before D/A scaling conversion.

The setting range and resolution for the span upper and lower limits depend on the pressure range and are the same as the setting range and resolution for pressure output.

Unit for span upper and lower limits: kPa (fixed)

| | -G01 model (10 kPa range) | -G03 model (200 kPa range) |
|---------------------------|---|---|
| Setting range | -10.0000 kPa to 10.0000 kPa | -200.000 kPa to 200.000 kPa |
| Setting resolution | 0.0001 kPa | 0.001 kPa |
| Default value | Lower limit: -10 kPa; upper limit: 10 kPa | Lower limit: -200 kPa; upper limit: 200 kPa |

Scale upper and lower limits (Scale Upper and Scale Lower)

Sets the scale value corresponding to the span upper limit and the scale value corresponding to the span lower limit.

The setting range for the scale upper and lower limits is the same as the set D/A output range.

Unit for scale upper/lower limits: V (fixed)

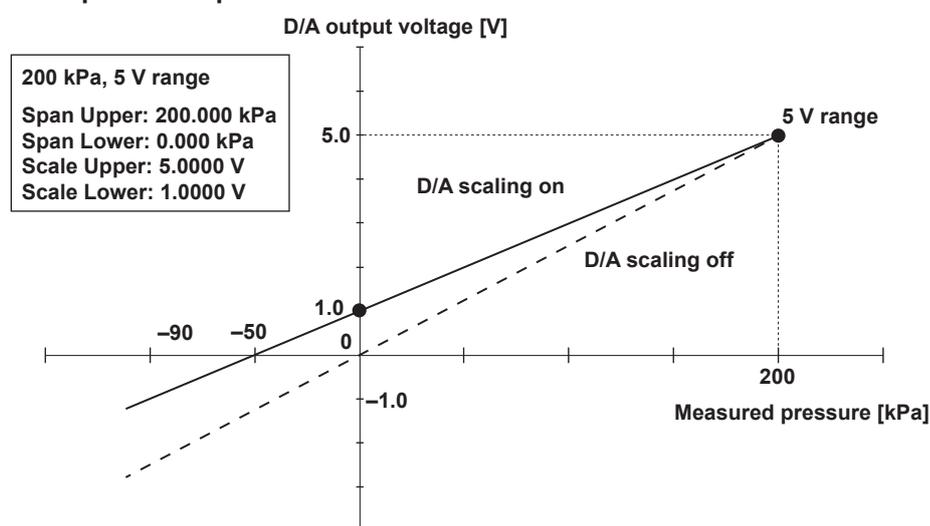
| | 2 V range | 5 V range |
|---------------------------|-------------------------------------|-------------------------------------|
| Setting range | -2.0000 V to 2.0000 V | -5.0000 V to 5.0000 V |
| Setting resolution | 0.0001 V | 0.0001 V |
| Default value | Lower limit: -2 V; upper limit: 2 V | Lower limit: -5 V; upper limit: 5 V |

Note

Set the upper and lower limits for both the span and scale so that the upper limit is greater than the lower limit.

Relationship between measured pressure and D/A output voltage in two-point mode (example)

Example of two-point mode



Direct input mode (Direct Value)

Directly sets the gain (Gain) and offset (Offset).

- Gain: Measured pressure value per 1 V of D/A output (kPa/V)
- Offset: Measured pressure value at 0 V D/A output (kPa)

Unit for gain: kPa/V (fixed)

Unit for offset: kPa (fixed)

Using Auto Offset also allows the current measured pressure value (display value) to be set as the offset.

| | -G01 model (10 kPa range) | -G03 model (200 kPa range) |
|----------------------------------|---------------------------|----------------------------|
| Gain setting resolution | 0.0001 kPa/V | 0.001 kPa/V |
| Default gain value | 5 kPa/V | 100 kPa/V |
| Offset setting resolution | 0.0001 kPa | 0.001 kPa |
| Default offset value | 0 kPa | 0 kPa |

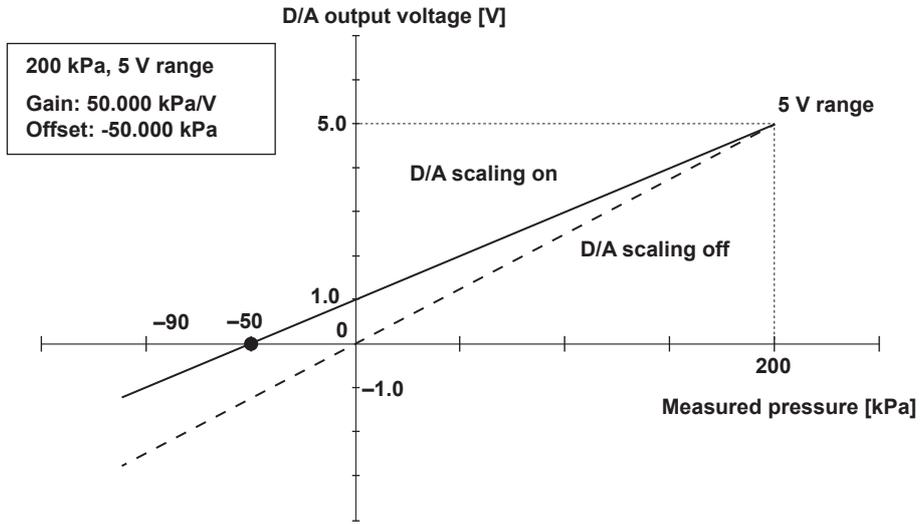
Note

The units of gain and offset are fixed to kPa/V and kPa, respectively.

3.5 Setting D/A Scaling

Relationship between measured pressure and D/A output voltage in direct input mode (example)

Example of direct input mode



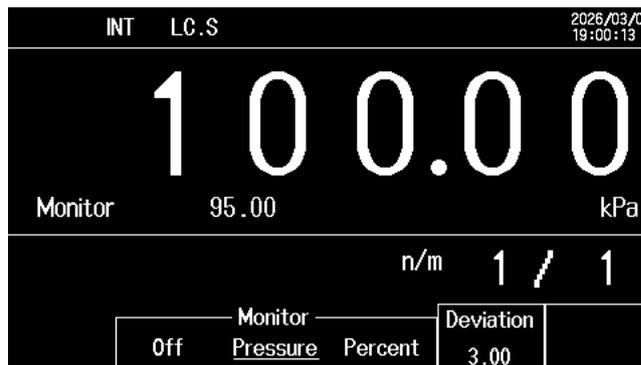
3.6 Setting the Comparator Output

This section explains how to compare the measured pressure value (output monitor value) with the reference value and output a signal from the comparator output terminal according to the comparison result.

Procedure

Setting the Comparator Output

Set the display format and allowable deviation for the output monitor according to section 3.1.



Explanation

Comparator output

Compares the measured pressure value (output monitor value) with the reference values (upper and lower limits) and outputs the comparison result as a signal.

Comparator output signals

The reference values (upper limit and lower limit) are determined by the allowable deviation relative to the pressure setpoint.

When the output monitor value is stable within the reference values, the COMP IN signal becomes HIGH.

| Name | Signal name | Description |
|-------------------|-------------|---|
| Comparator output | | Outputs the result of comparison with the upper and lower limits. |
| | COMP HI | HIGH: pressure value > upper limit LOW: pressure value ≤ upper limit |
| | COMP IN | HIGH: upper limit ≥ pressure value ≥ lower limit LOW: pressure value > upper limit or pressure value < lower limit |
| | COMP LO | HIGH: pressure value < lower limit LOW: pressure value ≥ lower limit |
| Control signal | BUSY | Indicates the timing when the comparator output changes (BUSY becomes HIGH when the COMP signal changes) |

Comparator output terminal (COMP/BUSY OUT)

The comparison result signals are output from the comparator output terminal.

| Item | Specification |
|---------------|--|
| Output signal | COMP HI/IN/LO, BUSY |
| Output level | HIGH: 3.5 V or more, LOW: 0.45 V or less |
| Output range | -0.3 V to 5.5 V |
| Terminal | Detachable terminal block |

For details on the comparator output terminal, see section 4.4 of the Getting Started Guide.

3.7 Setting the Trigger Function

This section explains how to set the trigger conditions for the output monitor.

Procedure

Setting the Trigger Function

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **Trigger** soft key.

| | | | | | |
|--|---------|-----------|----------|---------|------|
| | Trigger | IntegTime | Load Cap | Monitor | Next |
| | INT | 1500ms | Small | Off | 1/2 |

Setting the trigger mode (Trigger Mode)

3. The trigger setting menu appears. Press the soft key for the trigger mode you want to use.

Internal (INT): Internal trigger

External (EXT): External trigger

Sync (SYNC): Sync trigger

| | | | | | |
|--|--------------|----------|------|-------|--|
| | Trigger Mode | | | Delay | |
| | Internal | External | Sync | 0 | |

The setting status appears at the top of the screen.

Trigger mode

INT: Internal trigger
EXT: External trigger
SYNC: Sync trigger

| | | | | | |
|-----------|----------------|------------------------|-----------|-------|---------|
| EXT | LC.S | 2026/03/18 10:51:00 | | | |
| 100.00 | | | | | |
| Monitor | 98.00 | kPa | | | |
| n/m 1 / 1 | | | | | |
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |

Setting the trigger delay (Delay)

4. Press the **Trigger** soft key.

| | | | | | |
|--|---------|-----------|----------|---------|------|
| | Trigger | IntegTime | Load Cap | Monitor | Next |
| | EXT | 1500ms | Small | Off | 1/2 |

5. In the trigger setting menu, press the **Delay** soft key.

| | | | | | |
|--|--------------|----------|------|-------|--|
| | Trigger Mode | | | Delay | |
| | Internal | External | Sync | 0 | |

3.7 Setting the Trigger Function

- The input box for Trigger Delay appears. Use the arrow keys (▲, ▼, ◀, ▶) to enter trigger delay (ms) numerically.



- Press **ENTER** to confirm the value and return to the trigger setting menu.



Explanation

Trigger function

Sets the trigger conditions for pressure measurement (output monitor).

Note

This function is for pressure monitoring and not for pressure control.

Trigger mode

Select from the following:

- Internal trigger, external trigger, sync trigger

Default value: Internal trigger

Trigger source

- Internal trigger: Display update (update interval: 250 ms)
- External trigger: External input (TRIG IN/SYNC IN), communication command
- Sync trigger: External input (TRIG IN/SYNC IN)

Trigger delay time

Sets the time by which data acquisition for pressure measurement is delayed after an external trigger is received.

Setting range: 0 ms to 10000 ms (resolution: 1 ms)

Default value: 0 ms

Note

The trigger delay setting is valid only when the trigger mode is External trigger. For Internal trigger and Sync trigger, trigger delay is disabled.

Minimum trigger input interval

When generating continuous triggers for pressure measurement, use intervals equal to or greater than the minimum trigger input intervals in the table below. If continuous trigger input does not satisfy the conditions in the table below, the trigger is ignored. When generating continuous triggers using communication commands, add 100 ms or more to the values in the table below.

| Trigger mode | Measurement integration time | Minimum trigger input interval |
|------------------|------------------------------|---------------------------------------|
| External trigger | 250 ms | 262 ms + the specified trigger delay |
| | 1500 ms | 1520 ms + the specified trigger delay |
| | 2500 ms | 2520 ms + the specified trigger delay |
| | 4000 ms | 4020 ms + the specified trigger delay |
| Sync trigger | 250 ms | 250 ms |
| | 1500 ms | 250 ms |
| | 2500 ms | 250 ms |
| | 4000 ms | 250 ms |

For measurement integration time, see section 3.2.

External trigger/sync signal input terminal (TRIG IN/SYNC IN)

External triggers and sync triggers are input through the external trigger/sync signal input terminal.

| Item | Specification |
|----------------------------|---|
| Input level | HIGH: 2.5 V or more, LOW: 0.8 V or less |
| Input range | -0.3 V to 5.5 V |
| Effective input edge | Falling |
| Trigger signal pulse width | ≥ 10 ms |
| Terminal | BNC terminal |

For details on the external trigger/sync signal input terminal, see section 4.1 of the Getting Started Guide.

3.8 Setting the Synchronization Function

This section explains the following settings for connecting several (up to four) MC300 and MT300 units and synchronizing the display update timings.

- Wiring method
- Instrument configuration

For information on configuring the MT300, see to the MT300 manuals.

If all the MC300 and MT300 are to use the signal from an external device as the reference signal, to synchronize the display updating on the connected MC300 and MT300, the following parameters must be set to the same settings on all the connected MC300 and MT300.

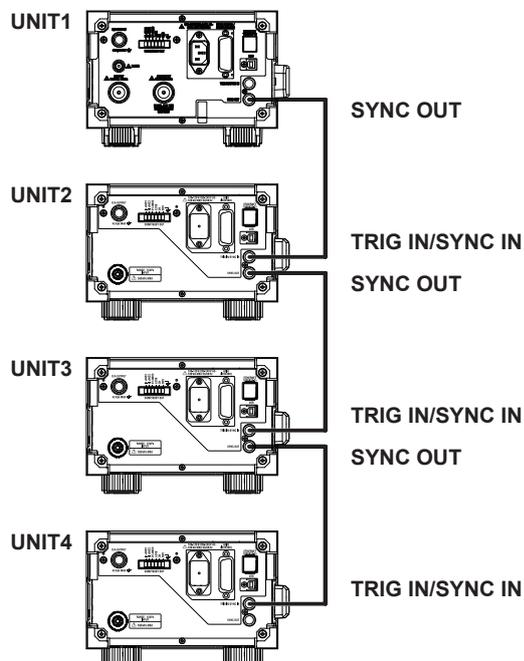
- Trigger delay
- Measurement integration time
- Measurement mode (only for MT300 models with the /F1 option)

Wiring Method

Synchronous Measurement Using the MC300/MT300 Sync Signal (SYNC OUT signal)

- Connect the SYNC OUT terminal of UNIT1 (MC300/MT300) to the TRIG IN/SYNC IN terminal of UNIT2 (MC300/MT300).
- Connect the SYNC OUT terminal of UNIT2 (MC300/MT300) to the TRIG IN/SYNC IN terminal of UNIT3 (MC300/MT300).
- Connect the SYNC OUT terminal of UNIT3 (MC300/MT300) to the TRIG IN/SYNC IN terminal of UNIT4 (MC300/MT300).

Example where UNIT1 is MC300 and UNIT2-4 are MT300

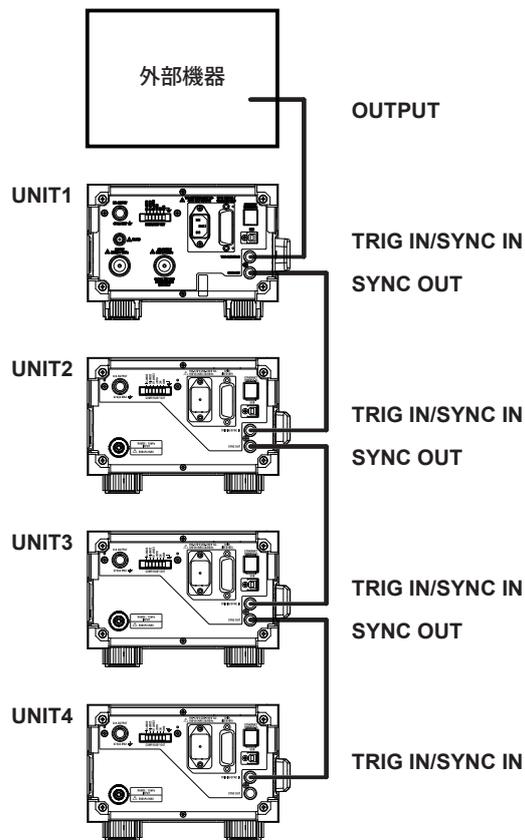


Synchronous Measurement with MC300/MT300 Using Signals from an External Device

Using the External Signal Input to MC300/MT300 (UNIT1) as the Reference Signal

- Connect the output signal line of the external device to the TRIG IN/SYNC IN terminal of UNIT1 (MC300/MT300).
- Connect the SYNC OUT terminal of UNIT1 (MC300/MT300) to the TRIG IN/SYNC IN terminal of UNIT2 (MC300/MT300).
- Connect the SYNC OUT terminal of UNIT2 (MC300/MT300) to the TRIG IN/SYNC IN terminal of UNIT3 (MC300/MT300).
- Connect the SYNC OUT terminal of UNIT3 (MC300/MT300) to the TRIG IN/SYNC IN terminal of UNIT4 (MC300/MT300).

Example where UNIT1 is MC300 and UNIT2-4 are MT300

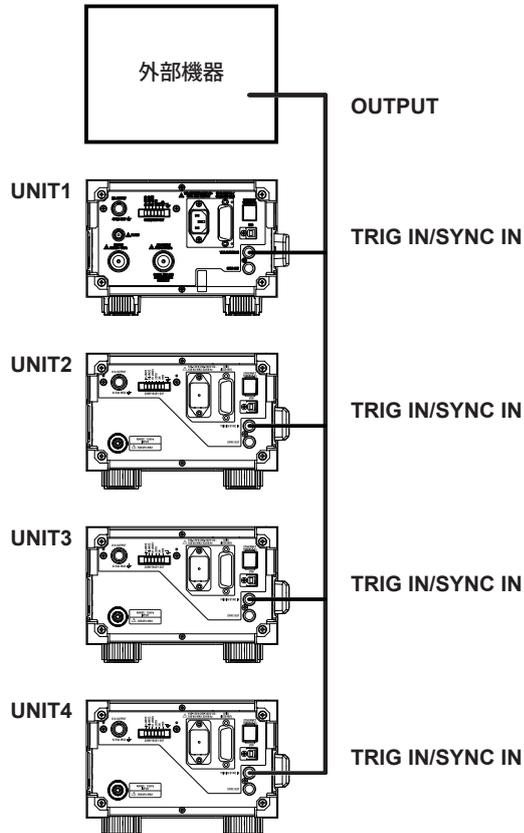


3.8 Setting the Synchronization Function

Using the Signal from an External Device As the Reference Signal On All MC300/MT300

Connect the output signal line of the external device to the TRIG IN/SYNC IN terminals of UNIT1 to UNIT4 (MC300/MT300).

Example where UNIT1 is MC300 and UNIT2-4 are MT300



Procedure

Setting the trigger mode of the instrument (Trigger Mode)

Set the trigger mode for each unit.

For MT300 settings, see to the MT300 manual.

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **Trigger** soft key.

| | | | | | |
|--|---------|-----------|----------|---------|------|
| | Trigger | IntegTime | Load Cap | Monitor | Next |
| | INT | 1500ms | Small | Off | 1/2 |

- The trigger setting menu appears. Press the trigger mode soft key dependign on your wiring method.

Internal: Internal trigger

External: External trigger

Sync: Sync trigger

| Trigger Mode | | | Delay |
|--------------|----------|------|-------|
| Internal | External | Sync | 0 |

| Wiring Method | UNIT1 | UNIT2 | UNIT3 | UNIT4 |
|--|------------------|------------------|------------------|------------------|
| Synchronous measurement using the MC300/MT300 sync signal (SYNC OUT signal) | Internal | Sync | Sync | Sync |
| Using the external signal input to MC300/MT300 (UNIT1) as the reference signal | External or Sync | Sync | Sync | Sync |
| Using the signal from an external device as the reference signal | External Sync | External Sync | External Sync | External Sync |

- The trigger mode is set. The set trigger mode appears at the top of the screen.

| | | | | |
|---------|------------|----------|---------|------|
| Trigger | Integ Time | Load Cap | Monitor | Next |
| SYNC | 1500ms | Small | Off | 1/2 |

Using the Signal from an External Device As the Reference Signal On All MC300/MT300

- Set the following parameters to the same settings on all connected MC300 and MT300. For the setting procedure, see the respective references. For MT300 settings, see to the MT300 manual

Trigger delay: See section 3.7.

Measurement integration time: See section 3.2.

Explanation

Synchronization

This function synchronizes the display update timing of up to four MC300 units (pressure controllers) and MT300 units (digital manometers) in a daisy-chain connection.

Note

This function is for pressure monitoring and not for pressure control.

External trigger/sync signal input terminal (TRIG IN/SYNC IN)

| Item | Specification |
|----------------------------|---|
| Input level | HIGH: 2.5 V or more, LOW: 0.8 V or less |
| Input range | -0.3 V to 5.5 V |
| Effective input edge | Falling |
| Trigger signal pulse width | ≥ 10 ms |
| Terminal | BNC terminal |

For details on the external trigger/sync signal input terminal, see section 4.1 of the Getting Started Guide.

Sync signal output terminal (SYNC OUT)

| Item | Specification |
|--------------|--|
| Output level | HIGH: 3.5 V or more, LOW: 0.45 V or less |
| Output range | -0.3 V to 5.5 V |
| Terminal | BNC terminal |

For details on the synchronization signal output terminal, see section 4.2 of the Getting Started Guide.

4.1 Storing Data

Explanation

Data stored in this instrument

The data and parameters stored in this instrument are shown in the table below.

You can initialize some data.

For default values (initial settings) and items that can be initialized, see appendix 1 of the Getting Started Guide (IM MC300-02EN).

| Name | Initialization | Storage area | Title |
|--|----------------|--------------|--|
| Factory default setup parameters (parameter block) | No | FLASH | Includes instrument-specific information. Set and stored at the factory. Includes the model name, serial number, unit type, option configuration, MAC address, shipping inspection date, and other information. |
| Adjustment data | No | FLASH | Set and stored at the factory. |
| System and communication setup data | No | FLASH | The system and communication settings are saved. |
| Measurement setup data ^{1, 2} | Yes | FLASH | Stores settings related to measurement data. |
| Output setup data ^{1, 2} | Yes | FLASH | Stores settings related to output operation. |
| Pressure adjustment data | No | MC SERVO CPU | Set and stored at the factory. |
| Zero calibration value data ^{2, 3} | Yes | MC SERVO CPU | Stores the latest zero CAL value. |
| Zero calibration value history data | No | MC SERVO CPU | Stores the history of zero CAL values. |

- 1 For details on initializing these setup data, see section 3.4 of the Getting Started Guide. The setup data can also be initialized using the communication command (*RST).
- 2 Output setup data, measurement setup data and zero calibration value data can also be initialized using the compatibility command (RC) via communication.
- 3 For details on initializing zero calibration value data, see section 3.5 of the Getting Started Guide. The zero calibration values can also be initialized using the communication command (:SENSe:ZERO:INITialize).

4.2 Initializing Data

Explanation

Data initialization

You can initialize some data.

- Initializing setup data (output setup data and measurement setup data)
- Initializing zero calibration value data

For default values (initial settings) and items that can be initialized, see appendix 1 of the Getting Started Guide (IM MC300-02EN).

Initializing setup data

For details on initializing setup data, see section 3.4 of the Getting Started Guide.

You can also initialize setup data using the communication command (*RST).

Initializing zero calibration value data

For details on initializing zero calibration value data, see section 3.5 of the Getting Started Guide.

You can also initialize zero calibration values using the communication command (:SENSe:ZERO:INITialize).

Note

In addition, output setup data, measurement setup data and zero calibration value data can be initialized using the compatibility command (RC) via communication.

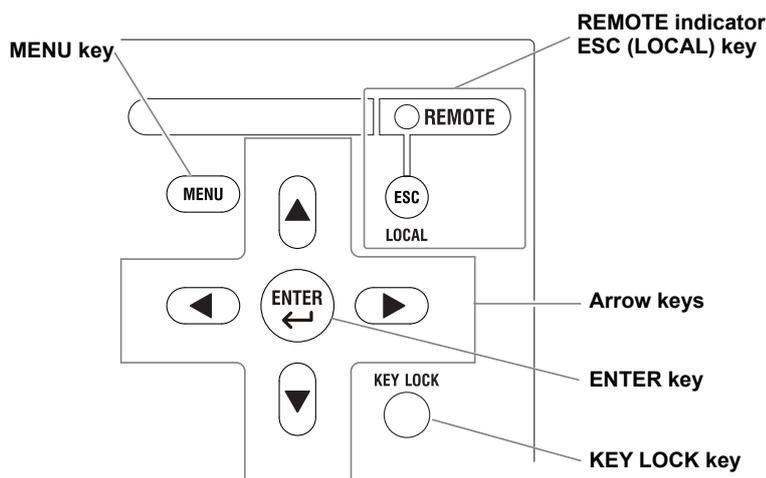
5.1 Locking the Keys (key lock)

This section explains how to lock the keys on the operation panel.

Procedure

Locking the keys (KEY LOCK)

1. Press **KEY LOCK**.



2. The Key Lock Mode menu appears. Press the soft key for the key lock mode you want to use.

Off: Does not lock key operation

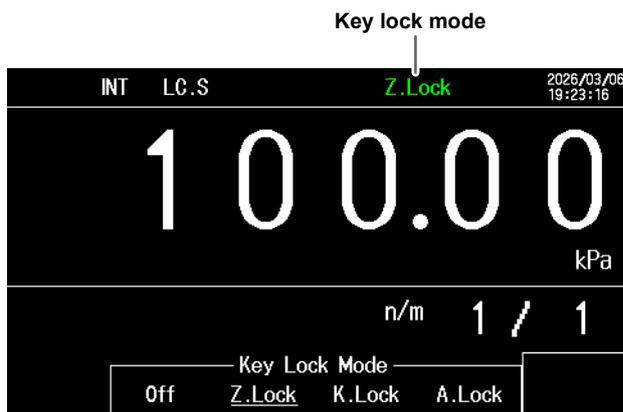
Z.Lock: Locks only ZERO CAL

K.Lock: Locks all keys except KEY LOCK, OUTPUT, and ALARM RESET

A.Lock: Locks all keys except KEY LOCK and ALARM RESET



3. When keys are locked, the lock status appears at the top of the screen.



4. To release key lock, press **KEY LOCK** again and then the **Off** soft key.

Explanation

Key lock function

Sets whether to lock the keys on the operation panel.

- Off: Does not lock key operation (key lock released)
- Z.LOCK: Locks only ZERO CAL
- K.LOCK: Locks all keys except KEY LOCK, OUTPUT, and ALARM RESET
- A.LOCK: Locks all keys except KEY LOCK and ALARM RESET

Default value: Off

Note

During remote connection, all keys except LOCAL are locked. During remote connection, the REMOTE indicator is lit.

Key lock status display

When panel keys are locked, the lock status appears at the top of the screen.

5.2 Displaying Zero Calibration History

This section explains how to display zero calibration history.

Procedure

Displaying zero calibration history (History)

1. Press **MENU** to display the menu screen. Press the **ZeroCal** soft key.

| | | | | | |
|--|-------------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|-------------------|---------|-----------|-------|---------|

2. The zero calibration menu appears. Press the **History** soft key.

| | | | | | |
|--|---------|--|--|--------------------|------|
| | History | | | Initialize Exec | Exec |
|--|---------|--|--|--------------------|------|

3. The zero calibration history appears.

| DATE | VALUE(kPa) | METHOD |
|---------------------|------------|------------|
| 2019/02/07 14:00:00 | 0.1300 | Exec |
| 2019/03/09 14:01:00 | 0.0000 | Initialize |
| 2019/04/11 14:02:00 | 0.1500 | Exec |
| 2019/05/13 14:03:00 | 0.1300 | Exec |
| 2019/06/15 14:04:00 | 0.1800 | Exec |
| 2019/07/17 14:05:00 | 0.0000 | Initialize |
| 2019/08/19 14:06:00 | 0.1900 | Exec |

| | | | | | |
|--|---------|--|--|--------------------|------|
| | History | | | Initialize Exec | Exec |
|--|---------|--|--|--------------------|------|

Explanation

Zero calibration history (History)

Displays the history of zero calibration values (zero CAL values).

The displayed items are date and time (DATE), zero calibration value (VALUE), and method (METHOD).

Date and time (DATE)

Indicates the date and time when zero calibration was executed or when the zero calibration value was initialized.

Zero calibration value (VALUE)

Indicates the correction amount when zero calibration was executed.

When the zero calibration value is initialized, the value becomes 0 kPa.

Unit: kPa

Method (METHOD)

Indicates how zero calibration was executed.

- Exec: Executing zero calibration
- Initialize: Initializing the zero calibration value

Note

- Up to 10 history records can be stored. When the number of stored records exceeds this limit, the oldest record is overwritten by the newest value.
- Zero calibration history cannot be deleted or initialized.

5.3 Changing the Error Message Language

This section explains how to select the language used for error messages.

Procedure

Changing the error message language (Language)

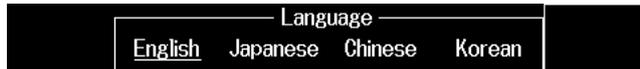
1. Press **MENU** to display the menu screen. Press the **Utility** soft key, the **Next 1/3** soft key, and then the **Next 2/3** soft key.



2. Press the **Language** soft key.



3. In the Language menu, press the soft key for the language to display.
English, Japanese, Chinese, Korean



Explanation

Error message language (Language)

You can select the display language for error messages. This setting applies only to error messages.

- English
- Japanese
- Chinese
- 6: Korean

Default value: English

Error messages

For error codes and error messages, see sections 5.2 and 5.3 of the Getting Started Guide.

5.4 Entering Text in User Memo

This section explains how to enter text in User Memo.

Procedure

Entering text in User Memo (User Memo)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key, the **Next 1/3** soft key, and then the **Next 2/3** soft key.



2. Press the **Maintenance** soft key.



3. From the Maintenance menu, press the **User Memo** soft key.



4. The input box for User Memo appears. Use the arrow keys (**▲**, **▼**, **◀**, **▶**) to enter the text. If text has already been set, it is displayed.

For the types of characters that can be entered and the input procedure, see section 3.2 of the Getting Started Guide.



5. Press **ENTER** to confirm the text and return to the previous menu.



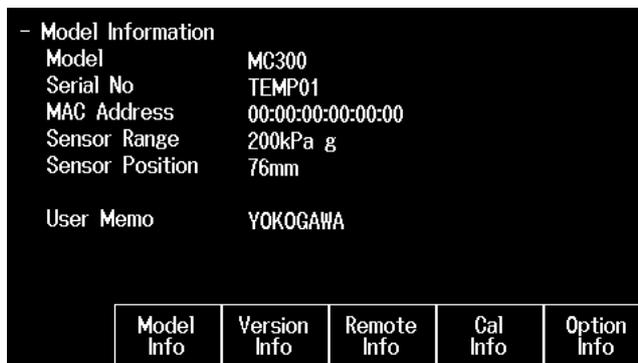
Explanation

Entering text in User Memo (User Memo)

You can set any text up to 15 characters.

Model information

The set text is displayed in User Memo in Model Info, which is one of the overview screens. For details, see section 5.4 of the Getting Started Guide.



5.5 Displaying Range Information

This section explains how to always display pressure range information on the screen.

Procedure

Displaying range information (RngInfo)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **Display** soft key.

| | | | | | |
|--|------------|---------|-----------|------------|----------|
| | Remote I/F | Display | Error Log | Initialize | Next 1/3 |
|--|------------|---------|-----------|------------|----------|

3. The Display setting menu appears. Pressing the **RngInfo** soft key toggles the setting between on and off.

On: Displays range information

Off: Does not display range information

| | | | | | |
|--|----------|----------------|----------------|--|--|
| | Bright 3 | RngInfo On Off | RngColor BLACK | | |
|--|----------|----------------|----------------|--|--|

4. When RngInfo is turned on, range information is fixed at the left edge of the menu screen.

| | | | | | |
|--------------|----------|----------------|----------------|--|--|
| 200kPa GAUGE | Bright 3 | RngInfo On Off | RngColor BLACK | | |
|--------------|----------|----------------|----------------|--|--|

Setting the display color for range information (RngColor)

5. In the Display setting menu, press the **RngColor** soft key.

| | | | | | |
|--------------|----------|----------------|----------------|--|--|
| 200kPa GAUGE | Bright 3 | RngInfo On Off | RngColor BLACK | | |
|--------------|----------|----------------|----------------|--|--|

6. The Range Information Color menu appears. Press the soft key for the display color you want to use.

Press the **Next 1/2** soft key to select from two screens of display colors (8 colors):

BLACK, RED, GREEN, BLUE, YELLOW, MAGENTA, CYAN, ORANGE

| | | | | | |
|--------------|-------------------------|-----|-------|------|----------|
| 200kPa GAUGE | Range Information Color | | | | Next 1/2 |
| | BLACK | RED | GREEN | BLUE | |

| | | | | | |
|--------------|-------------------------|---------|------|--------|----------|
| 200kPa GAUGE | Range Information Color | | | | Next 2/2 |
| | YELLOW | MAGENTA | CYAN | ORANGE | |

7. The range information changes to the selected display color.

| | | | | | |
|--------------|----------|----------------|----------------|--|--|
| 200kPa GAUGE | Bright 3 | RngInfo On Off | RngColor GREEN | | |
|--------------|----------|----------------|----------------|--|--|

Explanation

Setting range information display (RngInfo)

The pressure type and range are always displayed at the lower left of the screen.

- On: Displays range information
- Off: Does not display range information

Default value: Off

Displayed range information

The pressure type and range are displayed.

- -G01: 10 kPa GAUGE
- -G03: 200 kPa GAUGE

Range information display color (RngColor)

You can select from eight colors.

- BLACK, RED, GREEN, BLUE, YELLOW, MAGENTA, CYAN, ORANGE

Default value: BLACK

5.6 Setting Screen Brightness

This section explains how to set screen brightness.

Procedure

Setting screen brightness (Bright)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key.

| | | | | | |
|--|-------------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|-------------------|---------|-----------|-------|---------|

2. Press the **Display** soft key.

| | | | | | |
|--|---------------|---------|-----------|------------|-------------|
| | Remote I/F | Display | Error Log | Initialize | Next 1/3 |
|--|---------------|---------|-----------|------------|-------------|

3. Press the **Bright** soft key.

| | | | | | |
|--|-------------|-------------------|-------------------|--|--|
| | Bright 3 | RngInfo On Off | RngColor BLACK | | |
|--|-------------|-------------------|-------------------|--|--|

4. The Brightness menu appears. Press the soft key for the brightness level you want to use.
Brightness can be set to one of five levels, from 1 (dark) to 5 (bright).

| | | | | | |
|--|------------|---|---|---|---|
| | Brightness | | | | |
| | 1 | 2 | 3 | 4 | 5 |

Explanation

Screen brightness (Bright)

Brightness can be set to one of five levels.

- Five levels, from 1 (dark) to 5 (bright)

Default value: 3

5.7 Setting the Beep Sound

This section explains how to turn beep sound on and off.

Procedure

Setting beep sound (Beep)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key and then the **Next 1/3** soft key.

| | | | | | |
|--|-------------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|-------------------|---------|-----------|-------|---------|

2. Pressing the **Beep** soft key toggles the setting between on and off.

On: Sounds the beep

Off: Does not sound the beep

| | | | | | |
|--|----------------|--|----------|----------------|-------------|
| | Beep On Off | | Overview | Time Adjust | Next 2/3 |
|--|----------------|--|----------|----------------|-------------|

Explanation

Beep sound setting (Beep)

This section explains how to turn beep sound on and off. The volume cannot be changed.

- On: Sounds the beep
- Off: Does not sound the beep

Default value: Off

When the beep sounds

The beep sounds in the following cases:

- When you press a key
- When the output value reaches the pressure setpoint during auto-step output or sweep output.
- When an error is detected during power-on or during self-diagnosis (self-test) triggered by operation (Error codes 920 to 959)

For details, see section 5.2 in the Getting Started Guide.

Note

When an emergency equipment error (error codes 900 to 919) is detected, the beep sounds continuously regardless of the beep setting. For details, see section 5.2 in the Getting Started Guide.

5.8 Setting the Pressure Value to Zero When the Output Is Turned Off

This section explains how to set the pressure value to zero when the output is turned off.

Procedure

Setting the pressure value to zero when the output is turned off (Zero Set)

1. Press **MENU** to display the menu screen. Press the **Control Config** soft key and then the **Next 1/2** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Pressing the **Zero Set** soft key toggles the setting between On and Off.

On: Sets the pressure value to zero when the output is turned off

Off: Does not set the pressure value to zero when the output is turned off

| | | | | | |
|--|------|-----|----------|-----------|------|
| | Unit | D/A | Zero Set | Auto Hold | Next |
| | kPa | Off | On Off | On Off | 2/2 |

Explanation

Setting for zeroing the pressure value when the output is turned off (Zero Set)

- On: When the output is turned off, the pressure value is set to zero before the output is turned off
- Off: When the output is turned off, the output is turned off as is without setting the pressure value to zero

Default value: Off

Note

When the output is turned off, the solenoid valve turns off after the waiting time shown in the table below. The waiting time varies depending on the range and load capacity settings. For load capacity settings, see section 2.3.

| Range | Load capacity setting | | |
|---------------|-----------------------|--------|-------|
| | Small | Middle | Large |
| 10 kPa range | 10 s | 60 s | 120 s |
| 200 kPa range | 10 s | 40 s | 90 s |

5.9 Alarm Generation and Reset

This section explains when alarms occur and how to reset them.

Explanation

Alarm generation

An alarm occurs in the following cases. When an alarm occurs, a warning message appears on the screen, ALARM RESET lights, and output turns off.

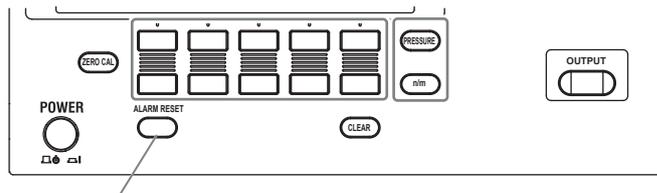
- If, during operation, the piping from the supply pressure source becomes disconnected and the supply pressure drops below the pressure setpoint, or if the supply pressure becomes excessive
- If, during pressure output, the piping to the device under test becomes disconnected
- If the connected load capacitance is excessive
- If the instrument hardware detects an abnormality

For details on warning messages and corrective actions, see section 5.2 of the Getting Start Guide.

Procedure

Resetting an Alarm (ALARM RESET)

1. If an alarm occurs, press **ALARM RESET** to reset it.



ALARM RESET key

Lights when an alarm occurs

However, for error codes 045, 046, and 047, follow the procedure below.

CAUTION

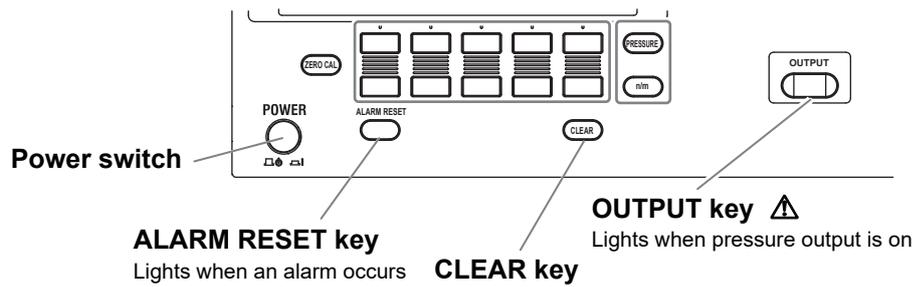
If the alarm is not reset according to the following procedure, pressing ALARM RESET and turning on the pressure output may cause pressure close to the supply pressure to be output. Be aware that excessive pressure may be applied to the connected device.

ATTENTION

Si l'alarme n'est pas réinitialisée selon la procédure suivante, appuyer sur le bouton RÉINITIALISATION ALARME et activer la sortie de pression peut entraîner une pression proche de la pression d'alimentation. Attention : une pression excessive peut être appliquée à l'appareil connecté.

5.9 Alarm Generation and Reset

1. Disconnect the tube (piping) from the pressure output port.
2. Seal the pressure output port.
3. Check the piping and settings of the supply pressure source, and remove the cause of the alarm.
4. Press **ALARM RESET**. Check that ALARM RESET turns off.
5. Use CLEAR to set the pressure setpoint to zero.
6. Press **OUTPUT** and keep output on for 10 s or longer.
7. Turn OUTPUT off, and then turn the power switch off.
8. Connect the tube (piping) to the pressure output port.
9. Turn on the power, and then press **OUTPUT**. Output resumes.



Note

If the alarm cannot be reset even after ALARM RESET is pressed, or if the alarm occurs repeatedly after being reset, service is required.

5.10 /MD Function (Option)

This section explains the functions of the /MD suffix code (option) for biomedical pressure measurement instruments.

Explanation

Display units for /MD (for biomedical pressure measurement instruments)

When the /MD option (for biomedical pressure measuring instruments) is added to the pressure unit suffix code -U1, the following display units are added to the display units for -U1. You cannot combine with -U2.

- mmHg, cmHg, mHg, mmH₂O, cmH₂O, mH₂O, mTorr, Torr

For details on setting pressure display units, see section 2.1.

6.1 GP-IB Interface Functions and Specifications

Depending on the selected suffix code of this instrument, either the GP-IB interface (suffix code -C01) or the RS-232 interface (suffix code -C02) is provided as the communication interface. This chapter explains the GP-IB interface.

GP-IB interface functions

Receive functions

- Except for turning the power switch on and off, the same settings can be made as by front panel key operation.
- Output requests can be accepted for pressure output values, setup parameters, status bytes, status, error codes, and other data.

Send functions

- Pressure output values, setup parameters, status bytes, status, error codes that have occurred, and other data can be output.

Note

Talk-only, listen-only, and controller capabilities are not available.

GP-IB interface specifications

| Item | Specification |
|--|--|
| Supported devices | National Instruments products <ul style="list-style-type: none"> • PCI-GPIB and PCI-GPIB+ • PCIe-GPIB and PCIe-GPIB+ • GPIB-USB-HS and GPIB-USB-HS + Driver NI-488.2M Version 2.8.1 and later |
| Electrical and mechanical specifications | Complies with IEEE St'd 488-1978 |
| Functional specifications | See the table below. |
| Protocol | Complies with IEEE St'd 488.2-1992 |
| Code | ISO (ASCII) codes |
| Mode | Addressable mode |
| Addresses | The address can be set in the range of 0 to 30. |
| Clearing remote mode | Clear remote mode by pressing ESC (LOCAL) key of this instrument except when Local Lockout is enabled from the controller. |

Functional specifications

| Function | Subset name | Description |
|----------------------|-------------|--|
| Source handshaking | SH1 | Full source handshaking capability |
| Acceptor handshaking | AH1 | Full acceptor handshaking capability |
| Talker | T6 | Basic talker capability, serial polling, and untalk on MLA (My Listen Address). No talk-only capability. |
| Listener | L4 | Basic listener capability and unlisten on MTA (My Talk Address). No listen-only capability |
| Service request | SR1 | Full service request capability |
| Remote local | RL1 | Full remote/local capability |
| Parallel polling | PP0 | No parallel polling capability |
| Device clear | DC1 | Full device clear capability |
| Device trigger | DT1 | Full device trigger capability |
| Controller | C0 | No controller capability |

Behavior when switching between remote and local modes

Switching from Local to Remote Mode

The instrument switches to remote mode when it is in local mode and receives a remote transition request from the PC.

- The REMOTE indicator lights.
- Key operations other than switching to local by pressing ESC (LOCAL) are disabled.
- Local mode settings are retained even when the instrument switches to remote mode.

Switching from remote to local mode

When the instrument is in remote mode and you press ESC (LOCAL) or when the instrument receives a local transition request from a PC, the instrument switches to local mode. However, this is invalid when Local Lockout is set by the controller.

- The REMOTE indicator turns off.
- Operations using the front panel keys are enabled.
- Remote mode settings are retained even when the instrument switches to local mode.

6.2 GP-IB Interface Connection

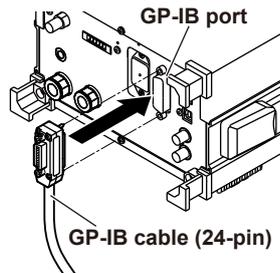
GP-IB Cable

The instrument is equipped with a IEEE St'd 488-1978 24-pin GP-IB connector.

Use GP-IB cables that complies with IEEE St'd 488-1978. Also, use a cable no longer than 2 m.

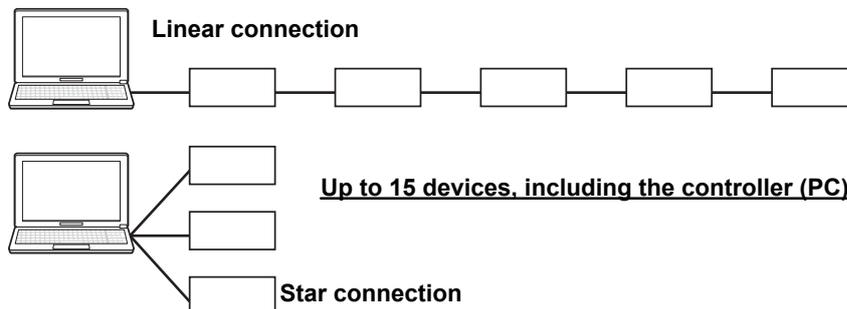
Connection procedure

Connect the GP-IB cable to the GP-IB connector on the rear panel of the instrument.



Notes on Connection

- Securely fasten the GP-IB cable connector screws.
- On the PC end, use a GP-IB board (or card) made by NI (National Instruments). For detailed specifications, see section 6.1.
- The instrument may not work properly if it is connected to the PC through converters (such as a GP-IB to USB converter). For more details, contact the place where you purchased the converter.
- Several cables can be used to connect multiple devices. However, a maximum of 15 devices, including the controller, can be connected on a single bus.
- When connecting multiple devices, assign a unique address to each device.
- Use cables that are 2 m or shorter in length to connect devices.
- Keep the total length of the cables under 20 m.
- When devices are communicating, have at least two-thirds of the devices on the bus turned on.
- To connect multiple devices, use a daisy-chain or star configuration. You can also mix these configurations. Loop configuration is not allowed.



CAUTION

Be sure to turn off the PC and the instrument before you connect or remove GP-IB cables. Otherwise, erroneous operation may result, or the internal circuitry may break.

ATTENTION

Veillez à éteindre le PC et l'instrument lorsque vous branchez ou débranchez les câbles GP-IB. Dans le cas contraire, un fonctionnement erroné pourrait en résulter ou le circuit interne pourrait se rompre.

6.3 Configuring the Instrument's GP-IB Settings

This section explains the settings for remote control using the GP-IB interface.

Procedure

Setting the GP-IB address (GPIB)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key.

| | | | | | |
|--|-------------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|-------------------|---------|-----------|-------|---------|

2. Press the **Remote I/F** soft key.

| | | | | | |
|--|---------------|---------|-----------|------------|-------------|
| | Remote I/F | Display | Error Log | Initialize | Next 1/3 |
|--|---------------|---------|-----------|------------|-------------|

3. The remote interface setting menu appears. Press the **GPIB** soft key.

| | | | | | |
|--|---------|------|----------|-----|------------|
| | CmdType | GPIB | Ethernet | USB | Terminator |
| | Nrm | 1 | | TMC | CR+LF |

4. The GP-IB address input box appears. Use the arrow keys (**▲**, **▼**, **◀**, **▶**) to enter the GP-IB address of this instrument.

| | | |
|--|-----------------|----------|
| | GPIB Address | 1 |
|--|-----------------|----------|

5. Press **ENTER** to confirm the value and return to the previous menu.

| | | | |
|--|-----------------|--------------|----------|
| | GPIB Address | Enter | 2 |
|--|-----------------|--------------|----------|

Setting the command type (CmdType)

6. In the remote interface setting menu, press the **CmdType** soft key.

| | | | | | |
|--|---------|------|----------|-----|------------|
| | CmdType | GPIB | Ethernet | USB | Terminator |
| | Nrm | 1 | | TMC | CR+LF |

7. The command setting menu appears. Press the soft key for the command type you want to use.

Nrm: Operates in standard command mode

Cmp: Operates in MC100-compatible command mode

| | | | | |
|--|---------|-----|--|--|
| | CmdType | | | |
| | Nrm | Cmp | | |

8. When you change the command type, restart the instrument.

Explanation

To use the GP-IB interface, set the GP-IB address and command type.

GP-IB address (GPIB)

Sets the GP-IB address of this instrument. Assign a unique address to the instrument.

Setting range: 0 to 30

Default value: 1

Command type (CmdType)

Sets the type of command to be used.

- Nrm: Operates in standard command mode
- Cmp: Operates in MC100-compatible command mode

Default value: Nrm

This instrument is compatible with the remote control commands for our earlier MC100 (standard pressure generator) model. In addition, general-purpose commands used by other manufacturers' products operate in standard command mode. Select the mode according to your operating environment. The command type setting takes effect when you restart the instrument.

To control the instrument using compatible commands, set the instrument to remote mode. The instrument can be controlled using compatible commands only in remote mode. When set to remote mode, the instrument is initialized.

Normal command mode (Nrm)

Complies with IEEE 488.2 (IEEE St'd 488.2-1992). The instrument operates on commands listed in chapter 11. The commands include general-purpose commands. General-purpose commands also operate in standard command mode.

MC100-compatible command mode (Cmp)

Operates with the commands used by the earlier MC100 model. The compatible command mode can be used only with the GP-IB, RS-232, or USB (CDC) interface. It cannot be used with the Ethernet or USB (TMC) interface. Also, standard commands are not recognized in compatible command mode. For details on MC100-compatible commands, see appendix 3. Because there are functional differences between the MC100 and MC300, operation may differ even with compatible commands.

Note

- Use only one of the following communication interfaces: GP-IB, RS-232, Ethernet, or USB. If commands are sent simultaneously through multiple communication interfaces, the commands will not be executed properly.
 - When the controller is communicating with the instrument or with other devices through GP-IB, do not change the address.
 - Each device that can be connected via GP-IB has a unique address within the GP-IB system. This address is used to distinguish between different devices. Therefore, assign a unique address to the instrument when connecting it to a PC or other device.
-

Viewing the setup parameters

You can also view the GP-IB interface setup parameters on the communication information (Remote Info) screen in the overview.

For details, see section 5.4 of the Getting Started Guide.

6.4 Responses to Interface Messages

Responses to interface messages

Responses to uni-line messages

- **IFC (Interface Clear)**
Clears the talker and listener functions. Stops data transmission if it is in progress.
- **REN (Remote Enable)**
Switches between the remote and local modes.

IDY (Identify) is not supported.

Responses to Multi-Line Messages (Address commands)

- **GTL (Go To Local)**
Switches the instrument to local mode.
- **SDC (Selected Device Clear)**
 - Clears the program message (command) being received and the output queue (see section 12.5).
 - Discards *OPC and *OPC? commands that are being executed.
 - Immediately aborts *WAI and COMMunicate:WAIT commands.

PPC (Parallel Poll Configure), TCT (Take Control), and GET (Group Execute Trigger) are not supported.

Responses to Multi-Line Messages (Universal commands)

- **LLO (Local Lockout)**
Prohibits switching to local mode through the use of the ESC (LOCAL) key on the front panel.
- **DCL (Device Clear)**
Performs the same operation as SDC.
- **SPE (Serial Poll Enable)**
Sets the talker function on all devices on the bus to serial polling mode. The controller will poll each device one by one.
- **SPD (Serial Poll Disable)**
Clears the serial polling mode of the talker function on all devices on the bus.

PPU (Parallel Poll Unconfigure) is not supported.

What Are Interface Messages?

Interface messages are commands that a controller transmits. They are also referred to as interface commands or bus commands. They are classified as follows:

Uni-line Messages

Uni-line messages are sent over a single control line. The following three types are available.

- IFC (Interface Clear)
- REN (Remote Enable)
- IDY (Identify)

6.4 Responses to Interface Messages

Multi-line messages

Multi-line messages are sent over eight data lines. They are grouped as follows:

- **Address command**

Some address commands are valid when a device is designated as a listener, and some are valid when it is designated as a talker. The following five commands are available.

Commands available to a device designated as a listener

- GTL (Go To Local)
- SDC (Selected Device Clear)
- PPC (Parallel Poll Configure)
- GET (Group Execute Trigger)

Commands available to a device designated as a talker

- TCT (Take Control)

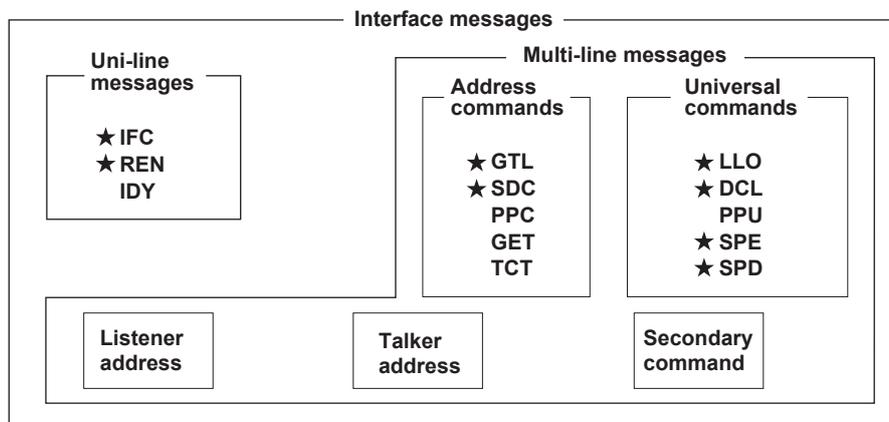
- **Universal commands**

Universal commands are available to all devices regardless of their listener or talker designation.

The following five commands are available.

- LLO (Local Lockout)
- DCL (Device Clear)
- PPU (Parallel Poll Unconfigure)
- SPE (Serial Poll Enable)
- SPD (Serial Poll Disable)

There are other interface messages: listener-address, talk-address, and secondary commands.



The instrument supports interface messages marked with an asterisk.

Note

Difference between SDC and DCL

Among multi-line messages, SDC messages are addressed commands that require designation of the talker and listener, whereas DCL messages are universal commands that do not require designation of the talker or listener. Therefore, SDC messages are directed at a particular instrument while DCL messages are directed at all instruments on the bus.

7.1 RS-232 Interface Functions and Specifications

Depending on the selected suffix code of this instrument, either the GP-IB interface (suffix code -C01) or the RS-232 interface (suffix code -C02) is provided as the communication interface. This chapter explains the RS-232 interface.

RS-232 interface functions

Receive functions

- Except for turning the power switch on and off, the same settings can be made as by front panel key operation.
- Output requests can be accepted for pressure output values, setup parameters, status bytes, status, error codes, and other data.

Send functions

- Pressure output values, setup parameters, status bytes, status, error codes that have occurred, and other data can be output.

RS-232 Interface Specifications

| Item | Specification |
|--|--|
| Electrical and mechanical specifications | EIA 232(RS-232) compliant |
| Connection method | Point to point |
| Transmission mode | Full duplex |
| Synchronization method | Asynchronous start-stop |
| Baud rate | 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200 bps |
| Start bit | 1 bit |
| Data length | 7 or 8 bits |
| Parity | Even, odd, no parity (none) |
| Stop bits | 1 or 2 bits |
| Hardware handshaking | CTS, RTS |
| Software handshaking | X-on, X-off |

Behavior when switching between remote and local modes

Switching from Local to Remote Mode

The instrument switches to remote mode when it is in local mode and receives a remote transition request from the PC.

- The REMOTE indicator lights.
- Panel key operations other than switching to local with ESC (LOCAL) become disabled.
- Local mode settings are retained even when the instrument switches to remote mode.

Switching from remote to local mode

When the instrument is in remote mode and you press ESC (LOCAL) or when the instrument receives a local transition request from a PC, the instrument switches to local mode. However, this is invalid when Local Lockout is set by the controller.

- The REMOTE indicator turns off.
- Operations using the panel keys are enabled.
- Remote mode settings are retained even when the instrument switches to local mode.

7.2 Connecting via the RS-232 Interface

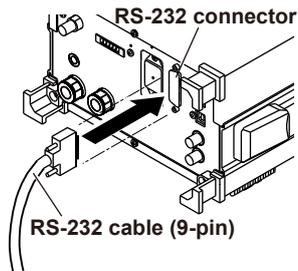
RS-232 (serial) cable

The RS-232 (serial) connector of this instrument is a 9-pin D-sub connector.

Use an interlink crossover cable as an RS-232 (serial) cable. Also, use a cable no longer than 2 m.

Connection procedure

Connect the RS-232 (serial) cable to the RS-232 connector on the rear panel of the instrument.



Notes on Connection

- Securely fasten the RS-232 cable connector screws.
- The instrument may not work properly if it is connected to the PC through converters. For more details, contact the place where you purchased the converter.

CAUTION

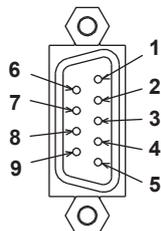
Be sure to turn off the PC and the instrument before you connect or remove RS-232 cables. Otherwise, erroneous operation may result, or the internal circuitry may break.

ATTENTION

Veillez à éteindre le PC et l'instrument lorsque vous branchez ou débranchez les câbles RS-232. Dans le cas contraire, un fonctionnement erroné pourrait en résulter ou le circuit interne pourrait se rompre.

Connector and Signal Names

9-pin connector pinout



RS-232 connector (9-pin)

Pin numbers and signal names

| Pin number (9-pin connector) | Signal name | Title |
|---------------------------------|----------------------|--|
| 2 | RD (Received Data) | Data received from the PC (input signal) |
| 3 | SD (Send Data) | Data sent to the PC (output signal) |
| 5 | SG (Signal Ground) | Signal ground |
| 7 | RS (Request to Send) | Handshaking for receiving data from the PC (output signal) |
| 8 | CS (Clear to Send) | Handshaking for sending data to the PC (input signal) |

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

RS-232-C Standard Signals and Their JIS and CCITT Abbreviations

| Pin number (9-pin connector) | Abbreviation | | | Name |
|---------------------------------|--------------|-------|-----|------------------|
| | 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 |

7.3 Configuring the Instrument's RS-232 Settings

This section explains the settings for remote control using the RS-232 interface.

Procedure

Setting the RS-232 interface (RS-232)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key.

| | | | | | |
|--|----------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|----------------|---------|-----------|-------|---------|

2. Press the **Remote I/F** soft key.

| | | | | | |
|--|------------|---------|-----------|------------|----------|
| | Remote I/F | Display | Error Log | Initialize | Next 1/3 |
|--|------------|---------|-----------|------------|----------|

3. The remote interface setting menu appears. Press the **RS-232** soft key.

| | | | | | |
|--|---------|--------|----------|-----|------------|
| | CmdType | RS-232 | Ethernet | USB | Terminator |
| | Nrm | | | TMC | CR+LF |

Setting the baud rate (Baud Rate)

4. The RS-232 setting menu appears. Press the **Baud Rate** soft key.

| | | | | | |
|--|-----------|-----------|--------|--------|----------|
| | Baud Rate | Handshake | Length | Parity | Stop Bit |
| | 115200 | OFF_OFF | 7 8 | NONE | 1 2 |

5. The baud rate setting menu appears. Press the soft key corresponding to the baud rate you want to use.

Press the **Next 1/3** and **Next 2/3** soft keys to select from nine settings on three screens.

1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200 (bps)

| | | | | | |
|--|-----------|------|------|------|----------|
| | Baud Rate | | | | Next 1/3 |
| | 1200 | 2400 | 4800 | 9600 | |

| | | | | | |
|--|-----------|-------|-------|-------|----------|
| | Baud Rate | | | | Next 2/3 |
| | 14400 | 19200 | 38400 | 57600 | |

| | | | | | |
|--|-----------|--|--|--|----------|
| | Baud Rate | | | | Next 3/3 |
| | 115200 | | | | |

Setting the handshaking (Handshake)

6. In the RS-232 setting menu in step 4, press the **Handshake** soft key.

| | | | | | |
|--|-----------|-----------|--------|--------|----------|
| | Baud Rate | Handshake | Length | Parity | Stop Bit |
| | 115200 | OFF_OFF | 7 8 | NONE | 1 2 |

7. The handshaking setting menu appears. Press the soft key corresponding to the handshaking you want to use.

OFF_OFF, XON_XON, CTS_RTS

| | | | | | |
|--|-----------|---------|---------|--|--|
| | Handshake | | | | |
| | OFF_OFF | XON_XON | CTS_RTS | | |

Setting the data length (Length)

8. Each time you press the **Length** soft key in the RS-232 setting menu in step 4, the data length (bit) setting changes.

7, 8 (bit)

| | Baud Rate | Handshake | Length | Parity | Stop Bit |
|--|-----------|-----------|--------|--------|----------|
| | 115200 | OFF_OFF | 7 8 | NONE | 1 2 |

Setting the parity (Parity)

9. In the RS-232 setting menu in step 4, press the **Parity** soft key.

| | Baud Rate | Handshake | Length | Parity | Stop Bit |
|--|-----------|-----------|--------|--------|----------|
| | 115200 | OFF_OFF | 7 8 | NONE | 1 2 |

10. The parity setting menu appears. Press the soft key corresponding to the parity you want to use.

NONE: No parity

EVEN: Even

ODD: Odd

| | | | Parity | | |
|--|--|--|--------|------|-----|
| | | | NONE | EVEN | ODD |

Setting the stop bit (Stop Bit)

11. Each time you press the **Stop Bit** soft key in the RS-232 setting menu in step 4, the stop bit (bit) setting changes.

1, 2 (bit)

| | Baud Rate | Handshake | Length | Parity | Stop Bit |
|--|-----------|-----------|--------|--------|----------|
| | 115200 | OFF_OFF | 7 8 | NONE | 1 2 |

Setting the command type (CmdType)

12. In the remote interface setting menu in step 3, press the **CmdType** soft key.

| | CmdType | RS-232 | Ethernet | USB | Terminator |
|--|---------|--------|----------|-----|------------|
| | Nrm | | | TMC | CR+LF |

13. The command setting menu appears. Press the soft key for the command type you want to use.

Nrm: Operates in standard command mode

Cmp: Operates in MC100-compatible command mode

| | | CmdType | | | |
|--|--|---------|-----|--|--|
| | | Nrm | Cmp | | |

14. When you change the command type, restart the instrument.

Explanation

To use the RS-232 interface, set the parameters and command type.

Parameter settings for the RS-232 interface

The setting ranges and default values for each parameter are as follows.

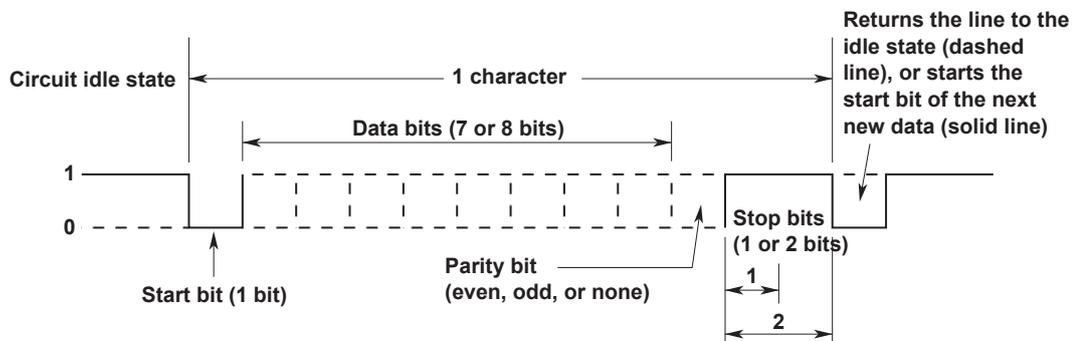
| Parameter | Setting range | Default |
|-------------|--|--------------|
| Baud rate | 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200 (bps) | 115200 (bps) |
| Handshaking | OFF_OFF, XON_XON, CTS_RTS | OFF_OFF |
| Data length | 7 bit, 8 bit | 8 bit |
| Parity | NONE (no parity), EVEN, ODD | NONE |
| Stop bit | 1 bit, 2 bit | 1 bit |

Relationship between handshaking and transmission/reception data control

| Handshaking | Outgoing data control (sending data to the PC) | Incoming data control (receiving data from the PC) |
|-------------|---|---|
| OFF_OFF | No handshaking | No handshaking |
| XON_XON | Software handshaking (transmission resumes when X-on is received; transmission stops when X-off is received) | Software handshaking (X-on is sent when space becomes available in the receive buffer; X-off is sent before the receive buffer becomes full) |
| CTS_RTS | Hardware handshaking (transmission resumes when CTS is True; transmission stops when CTS is False) | Hardware handshaking (RTS is set to True when space becomes available in the receive buffer; RTS is set to False before the receive buffer becomes full) |

Setting the data format

The RS-232 (serial) interface of this instrument communicates by start-stop synchronization. In start-stop synchronization, characters are transmitted one at a time. Each character consists of a start bit, data bits, a parity bit, and a stop bit.



Command type (CmdType)

This instrument is compatible with the remote control commands for our earlier MC100 (standard pressure generator) model. In addition, general-purpose commands used by other manufacturers' products operate in standard command mode. Select the mode according to your operating environment. The command type setting takes effect when you restart the instrument.

To control the instrument using compatible commands, set the instrument to remote mode. The instrument can be controlled using compatible commands only in remote mode. When set to remote mode, the instrument is initialized.

Normal command mode (Nrm)

Complies with IEEE 488.2 (IEEE St'd 488.2-1992). The instrument operates on commands listed in chapter 11. The commands include general-purpose commands. General-purpose commands also operate in standard command mode.

MC100-compatible command mode (Cmp)

Operates with the commands used by the earlier MC100 model. The compatible command mode can be used only with the GP-IB, RS-232, or USB (CDC) interface. It cannot be used with the Ethernet or USB (TMC) interface. Also, standard commands are not recognized in compatible command mode. For details on MC100-compatible commands, see appendix 3. Because there are functional differences between the MC100 and MC300, operation may differ even with compatible commands.

Note

- Use only one of the following communication interfaces: GP-IB, RS-232, Ethernet, or USB. If commands are sent simultaneously through multiple communication interfaces, the commands will not be executed properly.
 - If this instrument is communicating with a PC via RS-232 (serial), make sure that the port number is unique among the devices connected to the PC.
-

Viewing the setup parameters

You can also view the RS-232 interface setup parameters on the communication information (Remote Info) screen in the overview.

For details, see section 5.4 of the Getting Started Guide.

8.1 Ethernet Interface Functions and Specifications

Ethernet Interface Functions

Receive functions

- Except for turning the power switch on and off, the same settings can be made as by front panel key operation.
- Output requests can be accepted for pressure output values, setup parameters, status bytes, status, error codes, and other data.

Send functions

- Pressure output values, setup parameters, status bytes, status, error codes that have occurred, and other data can be output.

Ethernet interface specifications

| Item | Specification |
|--|--|
| Electrical and mechanical specifications | IEEE 802.3 compliant |
| Simultaneous connections | 3 |
| Transmission system | 100 BASE-TX, 10 BASE-T |
| Transfer rate | 100 Mbps max. |
| Communication protocol | TCP/IP |
| Supported services | DHCP, VXI-11 |
| Connector type | RJ-45 |
| System requirements: | A PC running the English or Japanese version of Windows 11 |

Behavior when switching between remote and local modes

Switching from Local to Remote Mode

The instrument switches to remote mode when it is in local mode and receives a remote transition request from the PC.

- The REMOTE indicator lights.
- Panel key operations other than switching to local with ESC (LOCAL) become disabled.
- Local mode settings are retained even when the instrument switches to remote mode.

Switching from remote to local mode

When the instrument is in remote mode and you press ESC (LOCAL) or when the instrument receives a local transition request from a PC, the instrument switches to local mode. However, this is invalid when Local Lockout is set by the controller.

- The REMOTE indicator turns off.
- Operations using the panel keys are enabled.
- Remote mode settings are retained even when the instrument switches to local mode.

8.2 Ethernet Interface Connection

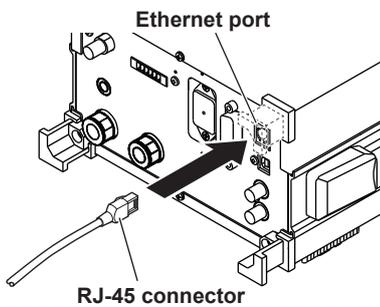
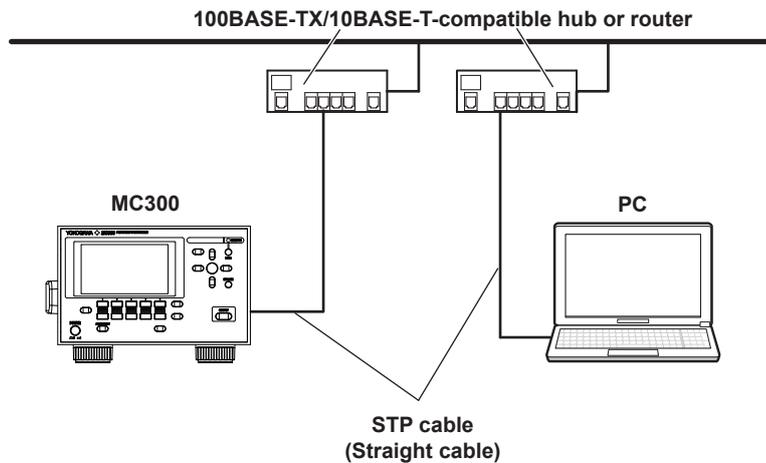
Ethernet cable

To connect the instrument to a PC through a hub or router, use straight cables. To directly connect the instrument to a PC (one-to-one connection), use a crossover cable.

Use a network cable that supports the data rate of your network.

Connection procedure

Connect an STP cable that is connected to a hub or other network device to the Ethernet port on the instrument's rear panel.



8.3 Configuring the Instrument's Ethernet Settings

This section explains the settings for remote control using the Ethernet interface.

Procedure

Setting the Ethernet interface (Ethernet)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key.

| | | | | | |
|--|-------------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|-------------------|---------|-----------|-------|---------|

2. Press the **Remote I/F** soft key.

| | | | | | |
|--|---------------|---------|-----------|------------|-------------|
| | Remote I/F | Display | Error Log | Initialize | Next 1/3 |
|--|---------------|---------|-----------|------------|-------------|

3. The remote interface setting menu appears. Press the **Ethernet** soft key.

| | | | | | |
|--|---------|------|----------|-----|------------|
| | CmdType | GPIB | Ethernet | USB | Terminator |
| | Nrm | 1 | | TMC | CR+LF |

Setting DHCP (DHCP)

4. The Ethernet setting menu appears. Press the **DHCP** soft key to set DHCP to On or Off.

On: Connect to a network supporting DHCP servers.

Off Set the IP Address, Subnet Mask, and Default Gateway

| | | | | | |
|--|--------|--|--|--|--|
| | DHCP | | | | |
| | On Off | | | | |

Setting the IP address, subnet mask, and default gateway (IP Address/Subnet mask/Default Gateway)

If DHCP is set to Off, set the IP address, subnet mask, and default gateway.

5. In the Ethernet setting menu, press the **DHCP** soft key to set DHCP to Off.

| | | | | | |
|--|--------|---------|--------|---------|--|
| | DHCP | IP | Subnet | Default | |
| | On Off | Address | mask | Gateway | |

Setting the IP address (IP Address)

6. In the Ethernet setting menu, press the **IP Address** soft key.

| | | | | | |
|--|--------|---------|--------|---------|--|
| | DHCP | IP | Subnet | Default | |
| | On Off | Address | mask | Gateway | |

7. The IP address input box appears. Use the arrow keys (**▲**, **▼**, **◀**, **▶**) to enter the IP address.

| | | | | |
|--|---------------|----------|----|----------|
| | IP Address | 192.168. | 0. | 1 |
|--|---------------|----------|----|----------|

8. Press **ENTER** to confirm the IP address and return to the previous menu.

| | | | | | |
|--|---------------|--------------|----------|----|----------|
| | IP Address | Enter | 192.168. | 0. | 2 |
|--|---------------|--------------|----------|----|----------|

8.3 Configuring the Instrument Ethernet Settings

Setting the subnet mask (Subnet mask)

9. Likewise, in the Ethernet setting menu, press the **Subnet mask** soft key.



10. The subnet mask input box appears. Use the arrow (▲, ▼, ◀, and ▶) keys to enter the value, and then press **ENTER**.



Setting the default gateway (Default Gateway)

11. Likewise, in the Ethernet setting menu, press the **Default Gateway** soft key.



12. The default gateway input box appears. Use the arrow (▲, ▼, ◀, and ▶) keys to enter the value, and then press **ENTER**.



Setting the command type (CmdType)

13. In the remote interface setting menu in step 3, press the **CmdType** soft key.



14. The command setting menu appears. Press the **Nrm** soft key for the command type (Command Type). Cmp (MC100-compatible command mode) does not work with the Ethernet interface.

Nrm: Operates in standard command mode



15. When you change the command type, restart the instrument.

Explanation

To use the Ethernet interface function, configure the DHCP, TCP/IP, and command type settings.

DHCP

DHCP is a protocol that temporarily allocates necessary information to a device so that it can connect to the Internet.

On: If you are connecting the instrument to a network with a DHCP server, you can turn on the DHCP setting. In this case, when you connect the instrument to the network, an IP address is assigned automatically. You do not need to set the IP address.

Off: If you set DHCP to off, set the appropriate IP address, subnet mask, and default gateway for your network.

Default value: On

IP Address, Subnet Mask, and Default Gateway (IP Address/Subnet mask/Default Gateway)

Set the values according to the network you are connecting to. For details on the network, check with your network administrator.

Default

IP address: 192.168.0.1
Subnet mask: 255.255.255.0
Default gateway: 0.0.0.0

Command type (CmdType)

With the Ethernet interface, only normal commands (Nrm) can be used. MC100-compatible command mode (Cmp) cannot be used. If MC100-compatible command mode (Cmp) has been set for another interface, change it to normal command mode (Nrm). If you change the setting, restart this instrument. Also, on this instrument, general-purpose commands used by other manufacturers' products operate in normal command mode.

Nrm: Operates in standard command mode

Default value: Nrm

Normal command mode (Nrm)

Complies with IEEE 488.2 (IEEE St'd 488.2-1992). The instrument operates on commands listed in chapter 11. The commands include general-purpose commands. General-purpose commands also operate in standard command mode.

MC100-compatible command mode (Cmp)

Operates with the commands used by the earlier MC100 model. The compatible command mode can be used only with the GP-IB, RS-232, or USB (CDC) interface. It cannot be used with the Ethernet or USB (TMC) interface.

Note

Use only one of the following communication interfaces: GP-IB, RS-232, Ethernet, or USB. If commands are sent simultaneously through multiple communication interfaces, the commands will not be executed properly.

Viewing the setup parameters

You can also view the Ethernet interface setup parameters on the communication information (Remote Info) screen in the overview.

For details, see section 5.4 of the Getting Started Guide.

9.1 USB Interface Functions and Specifications

USB Interface Functions

Receive functions

- Except for turning the power switch on and off, the same settings can be made as by front panel key operation.
- Output requests can be accepted for pressure output values, setup parameters, status bytes, status, error codes, and other data.

Send functions

- Pressure output values, setup parameters, status bytes, status, error codes that have occurred, and other data can be output.

USB interface specifications

| Item | Specification |
|--|--|
| Number of ports | 1 |
| Connector | USB type B (receptacle) |
| Electrical and mechanical specifications | USB 2.0 compliant |
| Supported transfer mode | HS (High Speed; 480 Mbps) and FS (Full Speed; 12 Mbps) |
| Supported protocols | USB-FUNCTION interface USBTMC-USB488 (USB Test and Measurement Class Ver.1.0) Virtual COM port CDC (Communication Device Class) |
| System requirements: | A PC running the English or Japanese version of Windows 11 |

Note

This instrument does not have a USB storage function.

Behavior when switching between remote and local modes

Switching from Local to Remote Mode

The instrument switches to remote mode when it is in local mode and receives a remote transition request from the PC.

- The REMOTE indicator lights.
- Panel key operations other than switching to local with ESC (LOCAL) become disabled.
- Local mode settings are retained even when the instrument switches to remote mode.

Switching from remote to local mode

When the instrument is in remote mode and you press ESC (LOCAL) or when the instrument receives a local transition request from a PC, the instrument switches to local mode. However, this is invalid when Local Lockout is set by the controller.

- The REMOTE indicator turns off.
- Operations using the panel keys are enabled.
- Remote mode settings are retained even when the instrument switches to local mode.

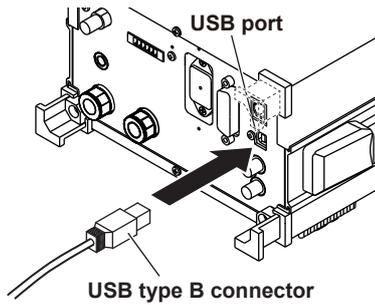
9.2 Connecting via the USB Interface

USB cable

Use a USB cable that meets the specifications of this instrument.

Connection procedure

Connect the USB cable to the USB port on the rear panel of the instrument.



Notes on Connection

- Do not connect a device other than a controller (e.g., PC) to the USB port.
- Before connecting a PC to the USB port, ground the PC to the same electrical potential as the instrument.
- If you are connecting multiple devices by using a USB hub, connect the instrument to the USB hub port that is closest to the port that the controller is connected to.
- Be sure to insert the USB cable connectors firmly into the USB ports.
- Do not connect or remove USB cables from the time when the instrument is turned on until operation becomes available (approximately 20 to 30 seconds). Doing so may damage the instrument.

9.3 Configuring the Instrument's USB Settings

This section explains the settings for remote control using the USB interface.

Procedure

Setting the USB interface (USB)

1. Press **MENU** to display the menu screen. Press the **Utility** soft key.

| | | | | | |
|--|-------------------|---------|-----------|-------|---------|
| | Control Config | ZeroCal | Auto Step | Sweep | Utility |
|--|-------------------|---------|-----------|-------|---------|

2. Press the **Remote I/F** soft key.

| | | | | | |
|--|---------------|---------|-----------|------------|-------------|
| | Remote I/F | Display | Error Log | Initialize | Next 1/3 |
|--|---------------|---------|-----------|------------|-------------|

3. The remote interface setting menu appears. Press the **USB** soft key.

| | | | | | |
|--|---------|------|----------|-----|------------|
| | CmdType | GPIB | Ethernet | USB | Terminator |
| | Nrm | 1 | | TMC | CR+LF |

Setting the USB function (USB Function)

4. In the USB function setting menu, press the soft key for the USB function you want to use.

TMC: Uses the TMC protocol

CDC: Uses the CDC protocol

| | | | | | |
|--|--|--|--------------|-----|--|
| | | | USB Function | | |
| | | | TMC | CDC | |

Setting the terminator (Terminator)

When the USB function is set to CDC, set the terminator.

5. In the USB function setting menu, press the **CDC** soft key.

| | | | | | |
|--|--|--|--------------|-----|--|
| | | | USB Function | | |
| | | | TMC | CDC | |

6. In the remote interface setting menu, press the **Terminator** soft key.

| | | | | | |
|--|---------|------|----------|-----|------------|
| | CmdType | GPIB | Ethernet | USB | Terminator |
| | Nrm | 1 | | CDC | CR+LF |

7. In the terminator setting menu, press the soft key for the terminator you want to use.

CR: Carriage return

LF: Linefeed

CR+LF: Carriage return + linefeed

| | | | | | |
|--|--|--|------------|----|-------|
| | | | Terminator | | |
| | | | CR | LF | CR+LF |

Setting the command type (CmdType)

8. In the remote interface setting menu in step 3, press the **CmdType** soft key.



9. The command setting menu appears. Press the soft key for the command type you want to use.

Nrm: Operates in standard command mode

Cmp: Operates in MC100-compatible command mode



10. When you change the command type, restart the instrument.

Explanation

This section explains the settings for remote control using the USB interface.

To use the USB interface function, configure the USB function and command type settings.

USB function (USB Function)

Set the USB protocol for remote control using communication commands.

- TMC: USB (TMC protocol). Only normal commands (Nrm) can be used.
- CDC: USB (CDC protocol). Normal commands (Nrm) and compatible commands (Cmp) can be used.

Default value: TMC

Note

This instrument does not have a USB storage function.

Installing the driver

To use the TMC and CDC USB functions, the following drivers (files) are required on the PC side. Download the files from the library page or product page on our website, or contact your nearest YOKOGAWA dealer.

For the installation procedure, see the manual included with the downloaded files.

- TMC (Test & Measurement Class):
Our USB TMC driver (YTUSB) is required.
Do not use USB TMC drivers (or software) supplied by other companies.
- CDC (Communication Device Class):
If the system definition file for our products (YKCDC system definition file) is installed, MC Series appears under Ports in Device Manager, making it easier to identify the instrument.
Because the standard Windows USB driver is used, installation of a dedicated USB driver is not required.

YOKOGAWA Website

<https://tmi.yokogawa.com/jp/library/documents-downloads/software/usb-drivers/>

Product name: MC300

Applicable drivers: YTUSB USB driver, YKCDC USB driver

Terminator (Terminator)

If you set the USB communication function to CDC, specify the terminator for sending data.

When TMC is selected, this setting is ignored.

- CR: Carriage return
- LF: Linefeed
- CR+LF: Carriage return + linefeed

Default value: CR+LF

Command type (CmdType)

Sets the type of command to be used.

When USB (TMC protocol) is selected, only normal commands (Nrm) can be used. MC100-compatible commands (Cmp) cannot be used.

| | Nrm (normal command mode) | Cmp (MC100-compatible command mode) |
|---------------------|------------------------------|--|
| USB (TMC protocol). | Yes | No |
| USB (CDC protocol). | Yes | Yes |

- Nrm: Operates in standard command mode
- Cmp: Operates in MC100-compatible command mode

Default value: Nrm

This instrument is compatible with the remote control commands for our earlier MC100 (standard pressure generator) model. In addition, general-purpose commands used by other manufacturers' products operate in standard command mode. Select the mode according to your operating environment. The command type setting takes effect when you restart the instrument.

To control this instrument remotely in Cmp (MC100-compatible command mode), set this instrument to remote mode. The instrument can be controlled using compatible commands only in remote mode. When set to remote mode, the instrument is initialized.

Normal command mode (Nrm)

Complies with IEEE 488.2 (IEEE St'd 488.2-1992). The instrument operates on commands listed in chapter 11. The commands include general-purpose commands. General-purpose commands also operate in standard command mode.

MC100-compatible command mode (Cmp)

Operates with the commands used by the earlier MC100 model. The compatible command mode can be used only with the GP-IB, RS-232, or USB (CDC) interface. It cannot be used with the Ethernet or USB (TMC) interface. Also, standard commands are not recognized in compatible command mode.

For details on MC100-compatible commands, see appendix 3. Because there are functional differences between the MC100 and MC300, operation may differ even with compatible commands.

Note

Use only one of the following communication interfaces: GP-IB, RS-232, Ethernet, or USB. If commands are sent simultaneously through multiple communication interfaces, the commands will not be executed properly.

Viewing the setup parameters

You can also view the USB interface setup parameters on the communication information (Remote Info) screen in the overview.

For details, see section 5.4 of the Getting Started Guide.

10.1 Message

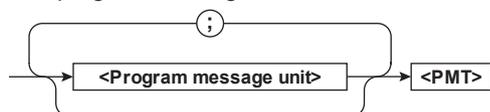
Messages

Messages are used to exchange information between the controller and the instrument. Messages that are sent from the controller to the instrument are called program messages, and messages that are sent from the instrument back to the controller are called response messages.

If a program message contains a command that requests a response (a query), the instrument returns a response message upon receiving the program message. The instrument returns a single response message in response to a single program message.

Program Messages

The program message format is shown below.



<Program message unit>

A program message consists of one or more program message units. Each program message unit corresponds to one command. The instrument executes the commands in the order that they are received.

Separate each program message unit with a semicolon.

For details on the program message syntax, see the next section.

Example `:SYSTem:CLOCK:DATE "2019/11/01";`
 TIME "00:00:00" Unit Unit

<PMT>

This is a program message terminator. The following three types are available.

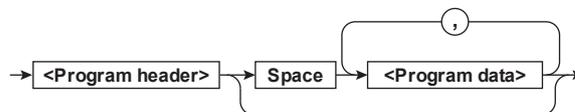
NL (new line): Same as LF (line feed). ASCII code "0AH."

^END: The END message as defined in IEEE 488.1. (The data byte that is sent with the END message is the last data of the program message.)

NL^END: NL with an END message attached. (NL is not included in the program message.)

Program Message Unit Syntax

The program message unit syntax is shown below.



<Program header>

The program header indicates the command type. For details, see section 10.2.

<Program data>

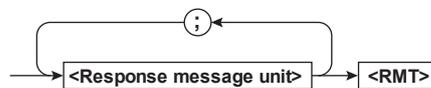
Attach program data if there are conditions that are required to execute a command. Separate the program data from the header with a space (ASCII code 20H). If there are multiple sets of program data, separate each set with a comma.

For details, see section 10.4.

Example `:SYSTem:CLOCK:DATE "2019/11/01"<PMT>`
 Header Data

Response Messages

The response message syntax is shown below.



<Response Message Unit>

A response message consists of one or more response message units. Each unit corresponds to one response.

Separate each response message unit with a semicolon.

For details on the response message syntax, see the next page.

Example `:SYSTEM:CLOCK:DATE "2019/11/01";`
 TIME "00:00:00" Unit 1 Unit 2

<RMT>

RMT is a response message terminator. It is NL^END.

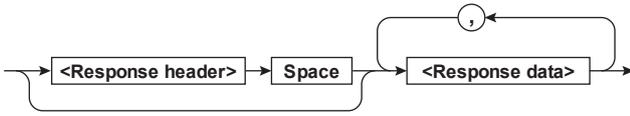
Note

If the virtual COM port is selected, you can use the `:SYSTem:COMMunicate:USB: TERMinator` command to set the terminator.

10.1 Messages

Response Message Unit Syntax

The response message unit syntax is shown below.



<Response header>

A response header sometimes precedes the response data. Separate the data from the header with a space. For details, see section 10.3.

<Response data>

Response data contains the content of the response. If there are multiple sets of response data, separate each set with a comma. For details, see section 10.3.

Example

```
100.00E-03<RMT>
  Data
:MEASURE:PRESSURE 1.0E+00<RMT>
  Header      Data
```

If there are multiple queries in a program message, responses are returned in the same order that the queries were received in. In most cases, a single query returns a single response message unit, but there are a few queries that return multiple units. The first response message unit always corresponds to the first query, but the *n*th response unit may not necessarily correspond to the *n*th query. Therefore, if you want to make sure that every response is retrieved, divide the program messages into individual messages.

Notes on Sending and Receiving Messages

- If the controller sends a program message that does not contain a query, the controller can send the next program message at any time.
- If the controller sends a program message that contains a query, the controller must finish receiving the response message before it can send the next program message. If the controller sends the next program message before receiving the response message in its entirety, an error will occur. A response message that is not received in its entirety will be discarded.
- If the controller tries to receive a response message when there is none, an error will occur. If the controller tries to receive a response message before the transmission of the program message is complete, an error will occur.

- If the controller sends a program message containing multiple message units, but the message contains incomplete units, the instrument will try to execute the ones that are believed to be complete. However, these attempts may not always be successful. In addition, if such a message contains queries, the instrument may not necessarily return responses.

Deadlock

The instrument can store at least 1024 bytes of messages in its transmit and receive buffers (the number of available bytes varies depending on the operating conditions). If both the transmit and receive buffers become full at the same time, the instrument will not be able to continue operation. This condition is called a deadlock. If this happens, you can resume operation by discarding response messages. Deadlock will not occur if the program message (including the <PMT>) is kept below 1024 bytes. Program messages that do not contain queries never cause deadlocks.

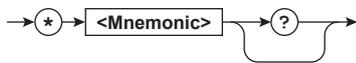
10.2 Commands

Commands

There are three types of commands (program headers) that a controller may send to the instrument. The commands differ in their program header formats.

Common command header

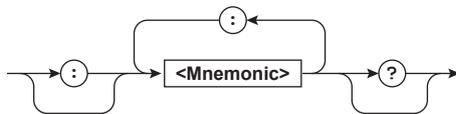
Commands that are defined in IEEE 488.2-1992 are called common commands. The header format of a common command is shown below. Be sure to include an asterisk (*) at the beginning of a common command.



Common command example *CLS

Compound Header

Other commands that are specific to the instrument are classified and arranged in a hierarchy according to their functions. The compound header syntax is shown below. Be sure to use a colon to specify a lower hierarchical level.



Simple Header

These commands are functionally independent and are not contained within a hierarchy. The format of a simple header is shown below.



Note

A <mnemonic> is an alphanumeric character string.

Concatenating commands

• Command Groups

A command group is a group of commands that have common compound headers arranged in a hierarchy. A command group may contain sub-groups.

Example System (date and time) group (partial)

```
:SYSTem:CLOCK?  
:SYSTem:CLOCK:DATE  
:SYSTem:CLOCK:TIME
```

• Concatenating Commands of the Same Group

The instrument stores the hierarchical level of the command that is currently being executed and processes the next command on the assumption that it belongs to the same level. Therefore, the common header section can be omitted for commands that belong to the same group.

Example :SYSTem:CLOCK:DATE "2019/11/01";
TIME "00:00:00"<PMT>

• Concatenating Commands of Different Groups

If the subsequent command does not belong to the same group, place a colon in front of the header (this colon cannot be omitted).

Example :SYSTem:CLOCK:DATE "2019/11/01";:
SYSTem:BEEP ON<PMT>

• When Concatenating Simple Headers

If a simple header follows another command, place a colon in front of the simple header (this colon cannot be omitted).

• Concatenating Common Commands

Common commands that are defined in IEEE 488.2-1992 are independent of hierarchy. A colon is not needed before a common command.

Example :SYSTem:CLOCK:DATE "2019/11/01";
*CLS;:SYSTem:CLOCK:TIME "00:00:00"
<PMT>

• Separating Commands with <PMT>

If you separate two commands with a terminator, two program messages will be sent. Therefore, the common header must be specified for each command even when commands belonging to the same command group are being concatenated.

Example :SYSTem:CLOCK:DATE "2019/11/01"
<PMT>;SYSTem:CLOCK:TIME "00:00:00"
<PMT>

10.2 Commands

Upper-level query

An upper-level query is a query that is made by appending a question mark to a command higher in the group. The controller can receive all of the settings in a group collectively by executing a highest-level query. Some upper-level queries of a group, which may be comprised of more than three hierarchical levels, can cause the instrument to transmit all the lower level settings.

Example :SYSTem?<PMT>
-> :SYSTEM:BEEPER 0;CALIBRATION:
DATE:USER:PRESSURE "0000/00/00";
DA "2025/08/06";
:SYSTEM:USER:MEMO "";
:SYSTEM:CLOCK:DATE "2026/03/10";
TIME "15:10:20";
:SYSTEM:DISPLAY:STATE 1;BRIGHTNESS 5;
:SYSTEM:KLOCK OFF;LANGUAGE ENGLISH;
COMMUNICATE:TYPE NORMAL;GPIB:ADDRESS 1;
:SYSTEM:COMMUNICATE:ETHERNET:DHCP 1;
IP "0.0.0.0";MASK "255.255.255.255";
GATEWAY "0.0.0.0";
MACADDRESS "00:00:64:80:96:88";
:SYSTEM:COMMUNICATE:USB:FUNCTION TMC;
TERMINATOR CRLF<RMT>

The response to an upper-level query can be sent back to the instrument as a program message. This enables the settings that were present when the upper-level query was made to be reproduced later on. However, some upper-level queries do not return setup parameters that are not currently in use. Exercise caution because not all of a group's information is necessarily returned in a response.

Header Interpretation Rules

The instrument interprets the header that it receives according to the rules below.

- Mnemonics are not case sensitive.
Example "SOURce" can also be written as "source" or "SOURCE."
- The lower-case characters can be omitted.
Example "SOURce" can also be written as "SOURc" or "SOUR."
- The question mark at the end of a header indicates that it is a query. You cannot omit the question mark.
Example The shortest abbreviation for "SYSTem?" is "SYST?".
- Parts of commands and parameters enclosed in square brackets ([]) can be omitted.
Example :SOURce[:PRESSure]:MANual:LEVel 1.0 can also be written as "SOURce:MANual:LEVel 1.0."

However, the last section enclosed in brackets cannot be omitted in an upper-level query.

Example "SYSTem?" and "SYSTem:COMMunicate?" are different queries.

10.3 Response

Response

When the controller sends a query with a question mark, the instrument returns a response message to the query. The instrument returns response messages in one of the following two forms.

- **Response consisting of a header and data**
Responses that can be used as program messages without any changes are returned with command headers attached.

```
Example :SYSTem:CLOCK:DATE?<PMT>
->
:SYSTEM:CLOCK:DATE "2019/11/01"
<RMT>
```

- **Response only consisting of data**
Responses that cannot be used as program messages unless changes are made (query-only commands) are returned without headers. However, there are query-only commands whose responses the instrument will attach headers to.

```
Example :MEASure:PRESSure?<PMT>
-> 50.000<RMT>
```

Receiving responses without headers

You can configure the instrument so that even responses that have both headers and data are returned without headers. Use the `COMMunicate:HEADer` command for this purpose.

Abbreviated Form

The instrument normally returns response headers with the lower-case section removed. You can configure the instrument so that full headers are returned. Use the `COMMunicate:VERBoSe` command for this purpose.

The sections enclosed in square brackets ([]) are also omitted in the abbreviated form.

10.4 Data

Data

Data contains conditions and values that are written after the header. A space separates the data from the header. Data is grouped as follows:

| Data | Meaning |
|--------------------|---|
| <Decimal> | A value expressed in decimal notation |
| <Voltage><Current> | A physical value |
| <Time> | Example Set the D/A range -> :OUTPut:DA:RANGe 5V |
| <Register> | A register value expressed as binary, octal, decimal, or hexadecimal Example Extended event register value -> :STATUS:EESE #HFE |
| <Character Data> | Predefined character string (mnemonic). Select from the available strings in braces. Example Select unit -> :SENSe:UNIT {PA HPA KPA MPA MBAR BAR ATM} |
| <Boolean> | Indicates on and off. Specify ON, OFF, or a value. Example Response to a query -> :COMMUNICATE:HEADER ON |
| <String Data> | User-defined string Example Set Ethernet IP address -> :SYSTem:COMMunicate:ETHernet:IP "192.168.0.1" |
| <Block Data> | Data that contains 8-bit values |

<Decimal>

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

| Symbol | Meaning | Example |
|--------|---------------------------------|----------------------|
| <NR1> | Integer | 125 -1 +1000 |
| <NR2> | Fixed-point number | 125.0 -.90 +001. |
| <NR3> | Floating-point number | 125.0E+0 -9E-1 +.1E4 |
| <NRf> | Any of the forms <NR1> to <NR3> | |

- The instrument can receive decimal values that are sent from the controller in any of the forms <NR1> to <NR3>. This is expressed as <NRf>.
- The instrument returns a response to the controller in one of the forms from <NR1> to <NR3> depending on the query. The same form is used regardless of the size of the value.
- For the <NR3> form, the plus sign after the "E" can be omitted. You cannot omit the minus sign.
- If a value outside the setting range is specified, an error (222: Data out of range.) occurs.
- If a value has more significant digits than are available, the value will be rounded.

<Voltage>, <Current>, and <Time>

<Voltage>, <Current>, and <Time> indicate decimal values that have physical significance. A <Multiplier> or <Unit> can be attached to the <NRf> form that was described earlier. Use one of the following syntaxes.

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

• <Multiplier>

Multipliers that you can use are indicated in the following table.

| Symbol | Word | Multiplier |
|--------|-------|-------------------|
| 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 | Milli | 10 ⁻³ |
| U | Micro | 10 ⁻⁶ |
| N | Nano | 10 ⁻⁹ |
| P | Pico | 10 ⁻¹² |
| F | Femto | 10 ⁻¹⁵ |

• <Unit>

Units that you can use are indicated in the following table.

| Symbol | Word | Meaning |
|--------|--------|---------|
| V | Volt | Voltage |
| A | Ampere | Current |
| S | Second | Time |

- <Multiplier> and <Unit> are not case sensitive.
- "U" is used to indicate micro ("μ").
- "MA" is used for Mega to distinguish it from Milli. However, "MA" is interpreted as milliamperere for current.
- If both <Multiplier> and <Unit> are omitted, the default unit is returned.

<Register>

<Register> indicates an integer, and can be expressed in hexadecimal, octal, or binary as well as a decimal number. This is used when each bit of the value has a particular meaning. Use one of the following syntaxes.

| Syntax | Example |
|---|----------|
| <Nrf> | 1 |
| #H<Hexadecimal value made up of the digits 0 to 9 and A to F> | #H0F |
| #Q<Octal value made up of the digits 0 to 7> | #Q777 |
| #B<Binary value made up of the digits 0 and 1> | #B001100 |

- <Register> is not case sensitive.
- Response messages are always expressed in the <NR1> form.

<Character Data>

<Character data> is a predefined character string (mnemonics). It is mainly used to indicate options and is chosen from the character strings given in { }. The data interpretation rules are the same as those described in "Header interpretation rules" in section 10.2.

| Syntax | Example |
|--------------------------|----------|
| {INTernal EXTernal SYNC} | INTernal |

- As with the header, the COMMunicate:VERBoSe command can be used to select whether response messages are returned in the full form or in the abbreviated form.
- The COMMunicate:HEADer setting does not affect <Character data>.

<Boolean>

<Boolean> is data that indicates ON or OFF. Use one of the following syntaxes.

| Syntax | Example |
|----------------|-------------------------|
| {ON OFF <Nrf>} | ON OFF 1 0 |

- When expressed in the <Nrf> form, "OFF" is selected if the rounded integer value is 0, and ON is selected for all other cases.
- A response message is always returned with a 1 if the value is ON and with a 0 if the value is OFF.

<String Data>

<String data> is not a predefined character string like <character data>. It can be any character string. The character string must be enclosed in single quotation marks (') or double quotation marks (").

| Syntax | Example |
|---------------|------------------------|
| <String Data> | 'ABC' "IEEE488.2-1992" |

- If a character string contains a double quotation mark ("), the double quotation mark is expressed as two consecutive quotation marks ("). This rule also applies to single quotation marks.
- A response message is always enclosed in double quotation marks (").
- <String data> is any character string. Therefore, the instrument assumes that the remaining program message units are part of the character string if no closing single (') or double quotation mark (") is encountered. As a result, no error is detected if a quotation mark is omitted.

<Block Data>

<Block data> is any 8-bit data. It is only used in response messages on the instrument. The syntax is as follows:

| Syntax | Example |
|--|---------------------|
| #N<N-digit decimal number><Data byte sequence> | #6000010ABCDEFGHJIJ |

- **#N**
Indicates that the data is <Block data>. N indicates the number of succeeding data bytes (digits) in ASCII code.
- **<N-digit decimal number>**
Indicates the number of data bytes.
Example 000010 = 10 bytes
- **<Data byte sequence>**
The actual data.
Example ABCDEFGHJIJ
- Data is comprised of 8-bit values (0 to 255). This means that the ASCII code "0AH," which stands for "NL," can also be included in the data. Hence, care must be taken when programming the controller.

10.5 Synchronization with the Controller

Overlap commands and sequential commands

There are two types of commands: overlap and sequential.

An overlap command is a command that allows operation initiated by the next command to start before operation initiated by the previously sent command is completed.

With sequential commands, the execution of the next command is held until the execution of the previous command is finished (even if multiple commands are sent consecutively).

All commands of this instrument are sequential commands. However, even when sequential commands are used, there are times when it is necessary to achieve synchronization to properly query the measured data. For example, if you want to query the most recent numeric data each time that the measured data is updated, you can attempt to do this by sending the `:MEASure:PRESSure?` command with some arbitrary timing. However, because the Instrument returns the current measured data regardless of whether the measured data has been updated since the previous query, this method may return data that is the same as the previous data. If this happens, you must use the following method to synchronize with the end of measured data updating.

• Using the `STATus:CONDition?` Query

`STATus:CONDition?` is used to query for the contents of the condition register (see section 12.4). You can determine whether the measured data is being updated by reading bit 0 of the condition register. If bit 0 of the condition register is 1, the measured data is being updated. If it is 0, the measured data can be queried.

However, in the case of this instrument, it is difficult to determine the updating of measured data with `STATus:CONDition?` because the period during which bit 0 of the condition register remains at 1 is very short.

• Using the Extended Event Register

The changes in the condition register can be reflected in the extended event register (section 12.4).

```
Example :STATus:FILTer1 FALL;:STATus:
        EESE 1;EESR?;*SRE 8<PMT>
        (Read the response to :STATus:EESR?)
        Loop
        (Wait for a service request)
        :MEASure:PRESSure?<PMT>
        (Read the response to
        :MEASure:PRESSure?)
        :STATus:EESR?<PMT>
        (Read the response to STATus:EESR?)
        (Return to Loop)
```

The `STATus:FILTer1 FALL` command sets the transition filter so that bit 0 in the extended event (`FILTer1`) is set to 1 when bit 0 in the condition register changes from 1 to 0, in other words when the updating of measured data is finished.

The `STATus:EESE 1` command is used to only change the status byte based on bit 0 in the extended event register.

The `:STATus:EESR?` command is used to clear the extended event register.

The `*SRE 8` command is used to generate service requests based only on the changes in the extended event register bits.

The `:MEASure:PRESSure?` command is not executed until a service request is generated.

- **Using the COMMunicate:WAIT Command**

The COMMunicate:WAIT command is used to wait for a specific event to occur.

```
Example :STATus:FILTer1 FALL;:STATus:
        EESR?<PMT>
        (Read the response to STATus:EESR?)
        Loop
        :COMMunicate:WAIT 1<PMT>
        :MEASure:PRESSure?<PMT>
        (Read the response to
        :MEASure:PRESSure?)
        :STATus:EESR?<PMT>
        (Read the response to STATus:EESR?)
        (Return to Loop)
```

For a description of :STATus:FILTer1 FALL and :STATus:EESR?, see the previous section about the extended event register.

The COMMunicate:WAIT 1 command specifies that the program will wait for bit 0 (RUN) in the extended event register to be set to 1.

:MEASure:PRESSure? is not executed until bit 0 in the extended event register becomes 1.

11.1 List of Commands

| Command | Function | Page |
|--|---|-------|
| CALibration Group | | |
| :CALibration[:PRESSure]:ZERO:AUTO | Executes or queries zero calibration. | 11-5 |
| COMMunicate Group | | |
| :COMMunicate? | Queries all communication settings. | 11-6 |
| :COMMunicate:HEADer | Sets or queries whether headers are attached to query responses. | 11-6 |
| :COMMunicate:LOCKout | Sets or queries the local lockout state. | 11-6 |
| :COMMunicate:REMOte | Sets or queries whether the instrument is in remote or local mode. | 11-6 |
| :COMMunicate:VERBose | Sets or queries whether the response to a query is returned fully spelled out or in its abbreviated form. | 11-6 |
| :COMMunicate:WAIT | Waits for a specified extended event to occur. | 11-6 |
| :COMMunicate:WAIT? | Creates the response that is returned when a specified extended event occurs. | 11-6 |
| MEASure Group | | |
| :MEASure? | Queries all the settings of the measurement data. | 11-7 |
| :MEASure:OFFSet:MONitor? | Queries the judgment result of the deviation between the pressure setpoint and the measured pressure value. | 11-7 |
| :MEASure:OFFSet:PERCent? | Queries the percentage. | 11-7 |
| :MEASure:PRESSure? | Queries the measured pressure. | 11-7 |
| OUTPut Group | | |
| :OUTPut:ALARm:RESet:EXECute | Executes alarm reset. | 11-8 |
| :OUTPut:DA? | Queries all settings related to the DA output. | 11-8 |
| :OUTPut:DA:RANGe | Sets or queries the DA range. | 11-8 |
| :OUTPut:DA:SCALing? | Queries all settings related to the DA scaling. | 11-8 |
| :OUTPut:DA:SCALing:INPut | Sets or queries the parameter mode used for DA scaling. | 11-8 |
| :OUTPut:DA:SCALing:PARAmeter? | Queries all DA scaling parameter settings. | 11-8 |
| :OUTPut:DA:SCALing:PARAmeter:AUTO:OFFSet | Assigns the measured pressure value to the DA scaling offset. | 11-8 |
| :OUTPut:DA:SCALing:PARAmeter:GAIN | Sets or queries the DA scaling gain. | 11-9 |
| :OUTPut:DA:SCALing:PARAmeter:OFFSet | Sets or queries the DA scaling offset. | 11-9 |
| :OUTPut:DA:SCALing:PARAmeter:SCALE? | Queries all scale value settings for DA scaling. | 11-9 |
| :OUTPut:DA:SCALing:PARAmeter:SCALE:LOWer | Sets or queries the lower scaling limit for DA scaling. | 11-9 |
| :OUTPut:DA:SCALing:PARAmeter:SCALE:UPPer | Sets or queries the upper scaling limit for DA scaling. | 11-9 |
| :OUTPut:DA:SCALing:PARAmeter:SPAN? | Queries all span value settings for DA scaling. | 11-9 |
| :OUTPut:DA:SCALing:PARAmeter:SPAN:LOWer | Sets or queries the lower span limit for DA scaling. | 11-10 |
| :OUTPut:DA:SCALing:PARAmeter:SPAN:UPPer | Sets or queries the upper span limit for DA scaling. | 11-10 |
| :OUTPut:DA:SCALing:STATe | Sets or queries the DA scaling on/off status. | 11-10 |
| :OUTPut:DA:STATe | Sets or queries the on/off status of the DA function. | 11-10 |
| :OUTPut:STATe | Sets or queries the output's on/off state. | 11-10 |
| :OUTPut:ZERO:SETTing | Sets or queries whether pressure zero setting at output OFF is enabled or disabled. | 11-10 |
| SENSE Group | | |
| :SENSE:ITIME | Sets or queries the measurement integration time. | 11-11 |
| :SENSE:OFFSet? | Queries all the settings of the offset monitor. | 11-11 |

11.1 List of Commands

| Command | Function | Page |
|-------------------------|--|-------|
| :SENSe:OFFSet:DEVIation | Sets or queries the allowable deviation | 11-11 |
| :SENSe:OFFSet:MONitor | Sets or queries the monitor display. | 11-11 |
| :SENSe[:PRESSure]? | Queries the measured pressure. | 11-11 |
| :SENSe:TRIGger? | Queries all the settings of the measurement trigger. | 11-11 |
| :SENSe:TRIGger:DELay | Sets or queries the measurement trigger delay. | 11-11 |
| :SENSe:TRIGger:MODE | Sets or queries the measurement trigger mode. | 11-11 |
| :SENSe:UNIT | Sets or queries the pressure unit. | 11-12 |
| :SENSe:ZERO:EXECute | Executes zero calibration. | 11-12 |
| :SENSe:ZERO:HISTory? | Queries the zero CAL history. | 11-12 |
| :SENSe:ZERO:INITialize | Initializes the zero CAL value. | 11-12 |

SOURce Group

| | | |
|--|--|-------|
| :SOURce[:PRESSure]:AUTOhold | Sets or queries whether auto-hold for sweep or auto step is enabled or disabled. | 11-13 |
| :SOURce[:PRESSure]:CAPacity | Sets or queries the load capacitance. | 11-13 |
| :SOURce[:PRESSure]:DIVider? | Queries all settings related to divided output. | 11-13 |
| :SOURce[:PRESSure]:DIVider:DENOminator | Sets or queries the denominator for divided output. | 11-13 |
| :SOURce[:PRESSure]:DIVider:NUMerator | Sets or queries the numerator for divided output. | 11-13 |
| :SOURce[:PRESSure]:FUNCTion | Sets or queries the pressure output mode. | 11-13 |
| :SOURce[:PRESSure]:HOLD | Sets or queries whether hold for sweep or auto step is enabled or disabled. | 11-13 |
| :SOURce[:PRESSure][:LEVel][:IMMediate][:AMPLitude] | Sets or queries the pressure setpoint. | 11-13 |
| :SOURce[:PRESSure]:MANual:LEVel | Sets or queries the pressure setting. | 11-14 |
| :SOURce[:PRESSure]:REPeat | Sets or queries repetition for sweep or auto step. | 11-14 |
| :SOURce[:PRESSure]:STEP? | Queries all auto-step settings. | 11-14 |
| :SOURce[:PRESSure]:STEP:COUNT? | Queries the current repeat count for auto step. | 11-14 |
| :SOURce[:PRESSure]:STEP:INTerv al | Sets or queries the interval time for auto step. | 11-14 |
| :SOURce[:PRESSure]:SWEep? | Queries all sweep settings. | 11-14 |
| :SOURce[:PRESSure]:SWEep:COUNT? | Queries the current repeat count for sweep. | 11-14 |
| :SOURce[:PRESSure]:SWEep:DIRect ion | Sets or queries the sweep direction. | 11-14 |
| :SOURce[:PRESSure]:SWEep:INTerv al | Sets or queries the interval time for sweep. | 11-14 |
| :SOURce[:PRESSure]:SWEep:LOWer | Sets or queries the lower sweep limit. | 11-14 |

STATus Group

| | | |
|---------------------------------------|--|-------|
| :STATus? | Queries all the settings of the communication status function. | 11-15 |
| :STATus:CONDition? | Queries the contents of the condition register. | 11-15 |
| :STATus:EESe | Sets or queries the extended event enable register. | 11-15 |
| :STATus:EESR? | Queries the contents of the extended event register and clears the register. | 11-15 |
| :STATus:ERRor? | Queries the error code and message of the last error that has occurred (top of the error queue). | 11-15 |
| :STATus:FILTer<x> | Sets or queries the transition filter. | 11-15 |
| :STATus:OPERation:PRESSure:CONDition? | Queries the contents of the condition register. | 11-15 |
| :STATus:OPERation:PRESSure:ENABle | Sets or queries the transition register. | 11-15 |
| :STATus:OPERation:PRESSure[:EVEnt]? | Queries the contents of the event register. | 11-15 |
| :STATus:QENable | Sets or queries whether messages other than errors will be stored to the error queue. | 11-15 |
| :STATus:QEMessage | Sets or queries whether message information will be attached to the response to the STATus:ERRor? query. | 11-16 |

SYSTem Group

| | | |
|-------------------------------------|--|-------|
| :SYSTem? | Queries all system settings. | 11-17 |
| :SYSTem:BEEPer | Sets or queries the beep sound on/off state. | 11-17 |
| :SYSTem:CALibration:DATE:LATest:DA? | Queries the manufacturer calibration date or the user calibration date for D/A output, whichever is most recent. | 11-17 |

11.1 List of Commands

| Command | Function | Page |
|---|--|-------|
| :SYSTEM:CALibration:DATE:LATest :PRESSure? | Queries the manufacturer calibration date or the user calibration date for pressure, whichever is most recent. | 11-17 |
| :SYSTEM:CALibration:DATE:USER? | Queries all the settings of the user calibration date. | 11-17 |
| :SYSTEM:CALibration:DATE:USER: DA | Sets or queries the user calibration date for D/A output. | 11-17 |
| :SYSTEM:CALibration:DATE:USER:P RESSure | Sets or queries the user calibration date for pressure. | 11-17 |
| :SYSTEM:CALibration:DATE:YOKoga wa:DA? | Queries the manufacturer calibration date for D/A output. | 11-18 |
| :SYSTEM:CALibration:DATE:YOKoga wa:PRESSure? | Queries the manufacturer calibration date for pressure. | 11-18 |
| :SYSTEM:CLOCK? | Queries all date/time settings. | 11-18 |
| :SYSTEM:CLOCK:DATE | Sets or queries the date. | 11-18 |
| :SYSTEM:CLOCK:TIME | Sets or queries the time. | 11-18 |
| :SYSTEM:COMMunicate? | Queries all communication settings. | 11-18 |
| :SYSTEM:COMMunicate:ETHernet? | Queries all Ethernet communication settings. | 11-18 |
| :SYSTEM:COMMunicate:ETHernet:DH CP | Sets or queries the Ethernet DHCP on/off state. | 11-18 |
| :SYSTEM:COMMunicate:ETHernet:IP | Sets or queries the Ethernet IP address. | 11-18 |
| :SYSTEM:COMMunicate:ETHernet:MA Caddress? | Sets or queries the Ethernet MAC address. | 11-18 |
| :SYSTEM:COMMunicate:ETHernet:MA SK | Sets or queries the Ethernet subnet mask. | 11-18 |
| :SYSTEM:COMMunicate:GPIB? | Queries all GP-IB communication settings. | 11-19 |
| :SYSTEM:COMMunicate:GPIB:ADDRe ss | Sets or queries the GP-IB address. | 11-19 |
| :SYSTEM:COMMunicate:GPIB:SELF:A DDress | Sets or queries the GP-IB address. | 11-19 |
| :SYSTEM:COMMunicate:ETHernet:GA Teway | Sets or queries the Ethernet default gateway. | 11-19 |
| :SYSTEM:COMMunicate:SERial? | Queries all serial communication settings. | 11-19 |
| :SYSTEM:COMMunicate:SERial:BAUD rate | Sets or queries the baud rate for serial communication. | 11-19 |
| :SYSTEM:COMMunicate:SERial:BITS | Sets or queries the data length for serial communication. | 11-19 |
| :SYSTEM:COMMunicate:SERial:CONT rol:BAUD | Sets or queries the baud rate for serial communication. | 11-19 |
| :SYSTEM:COMMunicate:SERial:CONT rol:PARity | Sets or queries the parity for serial communication. | 11-20 |
| :SYSTEM:COMMunicate:SERial:CONT rol:XONXoff | Sets or queries the handshaking for serial communication. | 11-20 |
| :SYSTEM:COMMunicate:SERial:HAND shake | Sets or queries the handshaking for serial communication. | 11-20 |
| :SYSTEM:COMMunicate:SERial:PARi ty | Sets or queries the parity bit for serial communication. | 11-20 |
| :SYSTEM:COMMunicate:SERial:SBI Ts | Sets or queries the stop bit for serial communication. | 11-20 |
| :SYSTEM:COMMunicate:SERial:TERM inator | Sets or queries the terminator used for serial transmission. | 11-20 |
| :SYSTEM:COMMunicate:TYPE | Sets or queries the command type. | 11-21 |
| :SYSTEM:COMMunicate:USB? | Queries all USB communication settings. | 11-21 |
| :SYSTEM:COMMunicate:USB:FUNCTi on | Sets or queries the USB function selection (USB-TMC/USB-CDC). | 11-21 |
| :SYSTEM:COMMunicate:USB:TERMin ator | Sets or queries the terminator used to send data from this instrument when a virtual COM port is selected. | 11-21 |
| :SYSTEM:DISPlay? | Queries all screen settings. | 11-21 |
| :SYSTEM:DISPlay:BRIGhtness | Sets or queries the screen brightness. | 11-21 |
| :SYSTEM:DISPlay:RANGe:COLor | Sets or queries the display color of the range information. | 11-21 |
| :SYSTEM:DISPlay:RANGe[:STATe] | Sets or queries the on/off state of the range information. | 11-21 |
| :SYSTEM:ERRor? | Queries the errors. | 11-21 |
| :SYSTEM:KLOCK | Sets or queries the key lock. | 11-22 |
| :SYSTEM:LANGuage | Sets or queries the language of error dialog messages. | 11-22 |
| :SYSTEM:PRESSure? | Queries all pressure settings. | 11-22 |
| :SYSTEM:PRESSure:POSition? | Queries the sensor position. | 11-22 |
| :SYSTEM:PRESSure:RANGe? | Queries the pressure range. | 11-22 |

11.1 List of Commands

| Command | Function | Page |
|------------------------|--|-------|
| :SYSTem:PRESSure:TYPE? | Queries the pressure type. | 11-22 |
| :SYSTem:USER:MEMO | Sets or queries the user notes. | 11-22 |
| :SYSTem:REBoot | Restarts the instrument when the specified time elapses. | 11-22 |

UNIT Group

| | | |
|------------------|------------------------------------|-------|
| :UNIT[:PRESSure] | Sets or queries the pressure unit. | 11-23 |
|------------------|------------------------------------|-------|

Common Command Group

| | | |
|-------|--|-------|
| *CLS | Clears the standard event register, extended event register, and error queue. | 11-24 |
| *ESE | Sets or queries the standard event enable register. | 11-24 |
| *ESR? | Queries and clears the standard event register. | 11-24 |
| *IDN? | Queries the instrument model. | 11-24 |
| *OPC | Sets bit 0 (the OPC bit) of the standard event register to 1 upon the completion of the specified overlap command. | 11-24 |
| *OPC? | Returns ASCII code 1 when the specified overlap command is completed. | 11-24 |
| *OPT? | Queries the installed options. | 11-24 |
| *RST | Initializes settings. | 11-24 |
| *SRE | Sets or queries the service request enable register value. | 11-25 |
| *STB? | Queries the Status Byte Register value. | 11-25 |
| *TRG | Generates an external trigger. | 11-25 |
| *TST? | Performs a self-test and queries the result. | 11-25 |
| *WAI | Holds the execution of the subsequent command until the specified overlap command is completed. | 11-25 |

11.2 CALibration Group

The commands in this group deal with calibration.

The front panel key that corresponds to the commands in this group is ZERO CAL. The ZeroCal soft key also corresponds to the commands.

:CALibration[:PRESSure]:ZERO:AUTO

Function Executes or queries zero calibration.

Syntax :CALibration[:PRESSure]:ZERO:
AUTO <Boolean>

ON|1: Execute zero calibration

OFF|0: Stop zero calibration

Description See also :SENSe:ZERO:EXECute.

11.3 COMMunicate Group

The commands in this group deal with communications.

There are no front panel keys that correspond to the commands in this group.

:COMMunicate?

Function Queries all communication settings.

Syntax :COMMunicate?

:COMMunicate:HEADer

Function Sets or queries whether headers are attached to query responses.

Syntax :COMMunicate:HEADer <Boolean>
:COMMunicate:HEADer?

ON|1: Headers are attached.

OFF|0: Headers are not attached.

Example :COMMUNICATE:HEAD ON
:COMMUNICATE:HEAD?
-> :COMMUNICATE:HEADER 1

:COMMunicate:LOCKout

Function Sets or queries the local lockout state.

Syntax :COMMunicate:LOCKout <Boolean>
:COMMunicate:LOCKout?

ON|1: Local local lockout

OFF|0: Local local lockout released

Example :COMMUNICATE:LOCK ON
:COMMUNICATE:LOCK?
-> :COMMUNICATE:LOCKOUT 1

Description When a virtual COM port is in use, the instrument is artificially placed in a GP-IB local lockout mode.

:COMMunicate:REMOte

Function Sets or queries whether the instrument is in remote or local mode.

Syntax :COMMunicate:REMOte <Boolean>
:COMMunicate:REMOte?

ON|1: Remote

OFF|0: Local

Example :COMMUNICATE:REMOTE ON
:COMMUNICATE:REMOTE?
-> :COMMUNICATE:REMOTE 1

Description When a virtual COM port is in use, the instrument is artificially placed in a GP-IB remote mode.

:COMMunicate:VERBose

Function Sets or queries whether the response to a query is returned fully spelled out or in its abbreviated form.

Syntax :COMMunicate:VERBose <Boolean>
:COMMunicate:VERBose?

ON|1: Returned fully spelled out

OFF|0: Returned in abbreviated form

Example :COMMUNICATE:VERBOSE ON
:COMMUNICATE:VERBOSE?
-> :COMMUNICATE:VERBOSE 1

Description Example of a response fully spelled out

:COMMUNICATE:VERBOSE 1

Example of a response in abbreviated form

:COMM:VERB 0

:COMMunicate:WAIT

Function Waits for a specified extended event to occur.

Syntax :COMMunicate:WAIT <Register>
<Register> = 0 to 65535

Example :COMMUNICATE:WAIT #H0008

Description For details on how to use the

:COMMunicate:WAIT command to synchronize the instrument, see section 10.5.

For details on the extended event register, see "Status Reports."

:COMMunicate:WAIT?

Function Creates the response that is returned when a specified extended event occurs.

Syntax :COMMunicate:WAIT? <Register>
<Register> = 0 to 65535

Example :COMMUNICATE:WAIT? 65535 -> 1

Description For details on the extended event register, see "Status Reports."

11.4 MEASure Group

The commands in this group deal with pressure measurement output.
There are no front panel keys that correspond to the commands in this group.

:MEASure?

Function Queries all the settings of the measurement data.
Syntax :MEASure?

:MEASure:OFFSet:MONitor?

Function Queries the judgment result of the deviation between the pressure setpoint and the measured pressure value.

Syntax :MEASure:OFFSet:MONitor?

Example :MEASURE:OFFSET:MONITOR?
-> :MEASURE:OFFSET:MONITOR 2

Description

- The decimal value for each bit is returned. For example, when the judgment result is IN, the returned value is 2.
- The bit assignments of the deviation judgment result are as follows.

| Bit No | Name | Description |
|--------|------|--|
| 0 | HI | Set to 1 when the deviation judgment result is HI. |
| 1 | IN | Set to 1 when the deviation judgment result is IN. |
| 2 | LOW | Set to 1 when the deviation judgment result is LO. |
| 3 | - | Always zero |
| 4 | - | Always zero |
| 5 | - | Always zero |
| 6 | - | Always zero |
| 7 | - | Always zero |

:MEASure:OFFSet:PERCent?

Function Queries the percentage.
Syntax :MEASure:OFFSet:PERCent?
Example :MEASURE:OFFSET:PERCENT?

-> :MEASURE:OFFSET:PERCENT 99.98

Description

- Returns 9.90E+37 for positive overrange or positive overflow. Returns -9.90E+37 for negative overrange or negative overflow.
- Returns 9.91E+37 if there is no data.
- Has the same function as the :SENSe[:PRESsure]? command.

:MEASure:PRESSure?

Function Queries the measured pressure.
Syntax :MEASure:PRESSure?
The range and resolution depend on the pressure unit.

Example :MEASURE:PRESSURE?
-> :MEASURE:PRESSURE 9.90E+37

Description

- Returns 9.90E+37 for positive overrange or positive overflow. Returns -9.90E+37 for negative overrange or negative overflow.
- Returns 9.91E+37 if there is no data.
- Has the same function as the :SENSe[:PRESsure]? command.

11.5 OUTPut Group

The commands in this group deal with monitor D/A output and pressure output.

The front panel keys that correspond to the commands in this group are OUTPUT and ALARM RESET. The commands also correspond to the D/A soft key.

:OUTPut:ALARm:RESet:EXECute

Function Executes alarm reset.
Syntax :OUTPut:ALARm:RESet:EXECute
Example :OUTPUT:ALARM:RESET:EXECUTE
Description Alarm reset cannot be executed except when an alarm has occurred. An execution error occurs, and "053: Attempted to perform an operation not allowed in the instrument's current mode" is generated.

:OUTPut:DA?

Function Queries all settings related to the DA output.
Syntax :OUTPut:DA?

:OUTPut:DA:RANGe

Function Sets or queries the DA range.
Syntax :OUTPut:DA:RANGe <Voltage>
:OUTPut:DA:RANGe?
<Voltage> = 2, 5 (V)
Example :OUTPut:DA:RANGe 2
• When <Voltage> is 2 V
:OUTPut:DA:RANGe?
-> :OUTPut:DA:RANGe 2.0E+00
• When <Voltage> is 5 V
:OUTPut:DA:RANGe?
-> :OUTPut:DA:RANGe 5.0E+00

:OUTPut:DA:SCALing?

Function Queries all settings related to the DA scaling.
Syntax :OUTPut:DA:SCALing?

:OUTPut:DA:SCALing:INPut

Function Sets or queries the parameter mode used for DA scaling.
Syntax :OUTPut:DA:SCALing:INPut {TWO|DIRECT}
:OUTPut:DA:SCALing:INPut?
TWO: Two-point mode
DIRECT: Direct input mode
Example :OUTPUT:DA:SCALING:INPUT TWO
:OUTPUT:DA:SCALING:INPUT?
-> :OUTPUT:DA:SCALING:INPUT TWO

:OUTPut:DA:SCALing:PARAmeter?

Function Queries all DA scaling parameter settings.
Syntax :OUTPut:DA:SCALing:PARAmeter?

:OUTPut:DA:SCALing:PARAmeter:AUTO:OFFSet

Function Assigns the measured pressure value to the DA scaling offset.
Syntax :OUTPut:DA:SCALing:PARAmeter:AUTO:OFFSet
Example :OUTPUT:DA:SCALING:PARAMETER:AUTO:OFFSET
Description • Automatic offset adjustment cannot be performed when the measured pressure value is outside the setting range. An execution error occurs, and "053: Attempted to perform an operation not allowed in the instrument's current mode" is generated. Automatic offset adjustment cannot be performed when the measured pressure value is overrange or overflow. An execution error will occur, and a "056: Overrange or overflow occurred in the measured pressure value" error will occur.
• The unit is fixed to kPa.

:OUTPut:DA:SCALing:PARAmeter:GAIN

Function Sets or queries the DA scaling gain.

Syntax :OUTPut:DA:SCALing:PARAmeter:
GAIN <NRf>
:OUTPut:DA:SCALing:PARAmeter:GAIN?
<NRf> = Setting range and resolution depend
on the setting range and resolution of the DA
scaling gain.

Example :OUTPUT:DA:SCALING:PARAMETER:
GAIN 40.000
:OUTPUT:DA:SCALING:PARAMETER:GAIN?
-> :OUTPUT:DA:SCALING:PARAMETER:
GAIN 40.000E+00

Description

- If a value outside the setting range is specified, a "222:Data out of range" error will occur.
- The unit is fixed to kPa.

:OUTPut:DA:SCALing:PARAmeter:OFFSet

Function Sets or queries the DA scaling offset.

Syntax :OUTPut:DA:SCALing:PARAmeter:
OFFSet <NRf>
:OUTPut:DA:SCALing:PARAmeter:OFFSet?
<NRf> = Setting range and resolution depend
on the setting range and resolution of the DA
scaling offset.

Example :OUTPUT:DA:SCALING:PARAMETER:
OFFSET 0.000
:OUTPUT:DA:SCALING:PARAMETER:OFFSET?
-> :OUTPUT:DA:SCALING:PARAMETER:
OFFSET 0.000E+00

Description

- If a value outside the setting range is specified, a "222:Data out of range" error will occur.
- The unit is fixed to kPa.

:OUTPut:DA:SCALing:PARAmeter:SCALE?

Function Queries all scale value settings for DA scaling.

Syntax :OUTPut:DA:SCALing:PARAmeter:SCALE?

:OUTPut:DA:SCALing:PARAmeter:SCALE:LOWer

Function Sets or queries the lower scaling limit for DA scaling.

Syntax :OUTPut:DA:SCALing:PARAmeter:SCALE:
LOWer <Voltage>
:OUTPut:DA:SCALing:PARAmeter:SCALE:
LOWer?
<Voltage> = Setting range and resolution
depend on the setting range and resolution of
the scale value of DA scaling.

Example :OUTPUT:DA:SCALING:PARAMETER:SCALE:
LOWER -5.0000V
:OUTPUT:DA:SCALING:PARAMETER:SCALE:
LOWER?
-> :OUTPUT:DA:SCALING:PARAMETER:
SCALE:LOWER -5.0000

Description If a value outside the setting range is specified, a
"222:Data out of range" error will occur.

:OUTPut:DA:SCALing:PARAmeter:SCALE:UPPer

Function Sets or queries the upper scaling limit for DA scaling.

Syntax :OUTPut:DA:SCALing:PARAmeter:SCALE:
UPPPer <Voltage>
:OUTPut:DA:SCALing:PARAmeter:SCALE:
UPPPer?
<Voltage> = Setting range and resolution
depend on the setting range and resolution of
the scale value of DA scaling.

Example :OUTPUT:DA:SCALING:PARAMETER:SCALE:
UPPER 5.0000V
:OUTPUT:DA:SCALING:PARAMETER:SCALE:
UPPER?
-> :OUTPUT:DA:SCALING:PARAMETER:
SCALE:UPPER 5.0000

Description If a value outside the setting range is specified, a
"222:Data out of range" error will occur.

:OUTPut:DA:SCALing:PARAmeter:SPAN?

Function Queries all span value settings for DA scaling.

Syntax :OUTPut:DA:SCALing:PARAmeter:SPAN?

11.5 OUTPut Group

:OUTPut:DA:SCALing:PARAmeter:SPAN:LOWer

Function Sets or queries the lower span limit for DA scaling.

Syntax :OUTPut:DA:SCALing:PARAmeter:SPAN:LOWer <NRf>
:OUTPut:DA:SCALing:PARAmeter:SPAN:LOWer?
<NRf> = Setting range and resolution depend on the setting range and resolution of the span value of DA scaling.

Example :OUTPUT:DA:SCALING:PARAMETER:SPAN:LOWER -200.000
:OUTPUT:DA:SCALING:PARAMETER:SPAN:LOWER?
-> :OUTPUT:DA:SCALING:PARAMETER:SPAN:LOWER -200.000E+00

Description

- If a value outside the setting range is specified, a "222:Data out of range" error will occur.
- The unit is fixed to kPa.

:OUTPut:DA:SCALing:PARAmeter:SPAN:UPPer

Function Sets or queries the upper span limit for DA scaling.

Syntax :OUTPut:DA:SCALing:PARAmeter:SPAN:UPPer <NRf>
:OUTPut:DA:SCALing:PARAmeter:SPAN:UPPer?
<NRf> = Setting range and resolution depend on the setting range and resolution of the span value of DA scaling.

Example :OUTPUT:DA:SCALING:PARAMETER:SPAN:UPPER 200.000
:OUTPUT:DA:SCALING:PARAMETER:SPAN:UPPER?
-> :OUTPUT:DA:SCALING:PARAMETER:SPAN:UPPER 200.000E+00

Description

- If a value outside the setting range is specified, a "222:Data out of range" error will occur.
- The unit is fixed to kPa.

:OUTPut:DA:SCALing:STATe

Function Sets or queries the DA scaling on/off status.

Syntax :OUTPut:DA:SCALing:STATe <Boolean>
:OUTPut:DA:SCALing:STATe?
ON|1: DA scaling on
OFF|0: DA scaling off

Example :OUTPUT:DA:SCALING:STATE ON
:OUTPUT:DA:SCALING:STATE?
-> :OUTPUT:DA:SCALING:STATE 1

:OUTPut:DA:STATe

Function Sets or queries the on/off status of the DA function.

Syntax :OUTPut:DA:STATe <Boolean>
:OUTPut:DA:STATe?
ON|1: DA on
OFF|0: DA off

Example :OUTPUT:DA:STATE ON
:OUTPUT:DA:STATE?
-> :OUTPUT:DA:STATE 1

:OUTPut:STATe

Function Sets or queries the output's on/off state.

Syntax :OUTPut:STATe <Boolean>
:OUTPut:STATe?
ON|1: Output on
OFF|0: Output off

Example :OUTPUT:STATE ON
:OUTPUT:STATE? -> :OUTPUT:STATE 1

:OUTPut:ZERO:SETTing

Function Sets or queries whether pressure zero setting at output OFF is enabled or disabled.

Syntax :OUTPut:ZERO:SETTing <Boolean>
:OUTPut:ZERO:SETTing?
ON|1: Pressure zero setting at output OFF enabled
OFF|0: Pressure zero setting at output OFF disabled

Example :OUTPUT:ZERO:SETTING ON
:OUTPUT:ZERO:SETTING?
-> :OUTPUT:ZERO:SETTING 1

11.6 SENSE Group

The commands in this group deal with the measurement settings.

The front panel key that corresponds to the commands in this group is ZERO CAL. The commands also correspond to the Trigger, IntegTime, Unit, and Monitor soft keys.

:SENSE:ITIME

Function Sets or queries the measurement integration time.

Syntax :SENSE:ITIME <Time>
:SENSE:ITIME?

<Time> = 0.25, 1.5, 2.5, 4 (s)

Example :SENSE:ITIME 0.25S
The following is an example for when <Time> is 250 ms.
:SENSE:ITIME?
-> :SENSE:ITIME 250.0E-03

:SENSE:OFFSet?

Function Queries all the settings of the offset monitor.

Syntax :SENSE:OFFSet?

:SENSE:OFFSet:DEVIation

Function Sets or queries the allowable deviation

Syntax :SENSE:OFFSet:DEVIation <NRf>
:SENSE:OFFSet:DEVIation?

<NRf> = 0.01 to 10.00

Example :SENSE:OFFSET:DEVIATION 0.1
:SENSE:OFFSET:DEVIATION?
-> :SENSE:OFFSET:DEVIATION 0.1

:SENSE:OFFSet:MONitor

Function Sets or queries the monitor display.

Syntax :SENSE:OFFSet:MONitor {OFF|PRESSure|PERCent}
:SENSE:OFFSet:MONitor?

OFF: Monitor display off
PRESSure: Pressure measurement display
PERCent: Percentage display

Example :SENSE:OFFSET:MONITOR PRESSURE
:SENSE:OFFSET:MONITOR?
-> :SENSE:OFFSET:MONITOR PRESSURE

:SENSE[:PRESSure]?

Function Queries the measured pressure.

Syntax :SENSE[:PRESSure]?

Description See also :MEASure:PRESSure?.

:SENSE:TRIGger?

Function Queries all the settings of the measurement trigger.

Syntax :SENSE:TRIGger?

:SENSE:TRIGger:DElay

Function Sets or queries the measurement trigger delay.

Syntax :SENSE:TRIGger:DElay <Time>
:SENSE:TRIGger:DElay?

<Time> = 0ms to 10s (1 ms resolution)

Example :SENSE:TRIGGER:DELAY 100MS
:SENSE:TRIGGER:DELAY?
-> :SENSE:TRIGGER:DEL 0.100

:SENSE:TRIGger:MODE

Function Sets or queries the measurement trigger mode.

Syntax :SENSE:TRIGger:MODE {INTernal|EXTernal|SYNC}
:SENSE:TRIGger:MODE?

INTernal: Internal
EXTernal: External
SYNC: Sync

Example :SENSE:TRIGGER:MODE INTERNAL
:SENSE:TRIGGER:MODE?
-> :SENSE:TRIGGER:MODE EXTERNAL

11.6 SENSE Group

:SENSe:UNIT

Function Sets or queries the pressure unit.

Syntax • For -U1

```
:SENSe:UNIT {PA|HPA|KPA|MPA|MBAR|
BAR|ATM}|
```

• For -U2

```
:SENSe:UNIT {PA|HPA|KPA|MPA|MBAR|
BAR|ATM|MMHG|INHG|GFCM2|KGFCM2|TORR|
PSI|MMH2O4|MMH2O20|FTH2O4|FTH2O20|
INH2O4|INH2O20}
```

• For -U1/MD

```
:SENSe:UNIT {PA|HPA|KPA|MPA|MBAR|
BAR|ATM|MMHG|CMHG|MHG|MMH2O|CMH2O|
MH2O|MTORR|TORR}
```

```
PA: Pa
HPA: hPa
KPA: kPa
MPA: MPa
MBAR: mbar
BAR: bar
ATM: atm
MMHG: mmHg
INHG: inHg
GFCM2: gf/cm2
KGFCM2: kgf/cm2
TORR: Torr
PSI: psi
MMH2O4: mmH2O@4°C
MMH2O20: mmH2O@20°C
FTH2O4: ftH2O@4°C
FTH2O20: ftH2O@20°C
INH2O4: inH2O@4°C
INH2O20: inH2O@20°C
CMHG: cmHg
MHG: mHg
MMH2O: mmH2O
CMH2O: cmH2O
MH2O: mH2O
MTORR: mTorr
```

Example :SENSe:UNIT KPA
:SENSe:UNIT? -> :SENSe:UNIT KPA

Description Has the same function as the :UNIT[:PRESsure] command.

:SENSe:ZERO:EXECute

Function Executes zero calibration.

Syntax :SENSe:ZERO:EXECute

Example :SENSe:ZERO:EXECUTE

Description • If Z.Lock is enabled or the output is on, a "053: Attempted to perform an operation not allowed in the instruments current mode" error will occur.

• If the measured pressure is overrange or overflow, a "056: Overrange or overflow occurred in the measured pressure value" error will occur.

• Has the same function as the :CALibration[:PRESsure]:ZERO:AUTO command.

:SENSe:ZERO:HISTory?

Function Queries the zero CAL history.

Syntax :SENSe:ZERO:HISTory?

```
Response <String>
"<Date>, 0.00000, <Zero CAL value>,
<Method>;<Date>, 0, <Zero CAL value>,
<Method>; "
```

<Date> = yyyy/mm/dd
<Zero CAL value> = Measured pressure converted into kPa
<Method> = Exec or Initialize

Example :SENSe:ZERO:HISTory?
-> :SENSe:ZERO:HISTory "2019/09/12|
14:48:06,0.0000,0.0015,EXEC;
2019/08/22 12:25:10,0.0000,0.0000,
INITIALIZE"

Description If there is no history, "NONE" is returned.

:SENSe:ZERO:INITialize

Function Initializes the zero CAL value.

Syntax :SENSe:ZERO:INITialize

Example :SENSe:ZERO:INITIALIZE

Description If Z.Lock is enabled or the output is on, a "053: Attempted to perform an operation not allowed in the instruments current mode" error will occur.

11.7 SOURce Group

The commands in this group deal with divided output, auto-step output, and sweep output.

The front panel keys that correspond to the commands in this group are PRESSURE and n/m and soft keys.

:SOURce[:PRESSure]:AUTOhold

Function Sets or queries whether auto-hold for sweep or auto step is enabled or disabled.

Syntax :SOURce[:PRESSure]:
AUTOhold <Boolean>
:SOURce[:PRESSure]:AUTOhold?
ON|1: Auto hold on
OFF|0: Auto hold off

Example :SOURCE:AUTOHOLD ON
:SOURCE:AUTOHOLD?
-> :SOURCE:AUTOHOLD 1

:SOURce[:PRESSure]:CAPacity

Function Sets or queries the load capacitance.

Syntax :SOURce[:PRESSure]:CAPacity {SMALL|
MIDDLE|LARGE}
:SOURce[:PRESSure]:CAPacity?
SMALL: 0 to 100 cm³
MIDDLE: 100 to 500 cm³
LARGE: 500 to 1000 cm³

Example :SOURCE:CAPACITY MIDDLE
:SOURCE:CAPACITY?
-> :SOURCE:CAPACITY MIDDLE

:SOURce[:PRESSure]:DIVider?

Function Queries all settings related to divided output.

Syntax :SOURce:DIVider?

:SOURce[:PRESSure]:DIVider:DENominator

Function Sets or queries the denominator for divided output.

Syntax :SOURce[:PRESSure]:DIVider:
DENominator <NR1>
:SOURce[:PRESSure]:DIVider:
DENominator?
<NR1> = 1 to 25

Example :SOURCE:DIVIDER:DENOMINATOR 2
:SOURCE:DIVIDER:DENOMINATOR?
-> :SOURCE:DIVIDER:DENOMINATOR 2

Description If a value outside the setting range is specified, a "222:Data out of range" error will occur.

:SOURce[:PRESSure]:DIVider:NUMerator

Function Sets or queries the numerator for divided output.

Syntax :SOURce[:PRESSure]:DIVider:
NUMerator <NR1>
:SOURce[:PRESSure]:DIVider:
NUMerator?
<NR1> = 0 to 25

Example :SOURCE:DIVIDER:NUMERATOR 2
:SOURCE:DIVIDER:NUMERATOR?
-> :SOURCE:DIVIDER:NUMERATOR 2

Description If a value outside the setting range is specified or a value greater than the denominator is specified, a "222:Data out of range" error will occur.

:SOURce[:PRESSure]:FUNction

Function Sets or queries the pressure output mode.

Syntax :SOURce[:PRESSure]:FUNction {MANual|
STEP|SWEep}
:SOURce[:PRESSure]:FUNction?
MANual: Divided output (normal output)
STEP: Auto step
SWEep: Sweep

Example :SOURCE:FUNCTION MANUAL
:SOURCE:FUNCTION?
-> :SOURCE:FUNCTION MANUAL

:SOURce[:PRESSure]:HOLD

Function Sets or queries whether hold for sweep or auto step is enabled or disabled.

Syntax :SOURce[:PRESSure]:HOLD <Boolean>
:SOURce[:PRESSure]:HOLD?
ON|1: Hold on
OFF|0: Hold off

Example :SOURCE:HOLD ON
:SOURCE:HOLD? -> :SOURCE:HOLD 1

Description If auto step or sweep is not started, a "053: Attempted to perform an operation not allowed in the instrument's current mode" error will occur.

:SOURce[:PRESSure][:LEVel][:IMMediate] [:AMPLitude]

Function Sets or queries the pressure setpoint.

Syntax :SOURce[:PRESSure][:LEVel][:IMMediate]
[:AMPLitude] <NRF>
:SOURce[:PRESSure][:LEVel][:IMMediate]
[:AMPLitude]?

Description See also :SOURce[:PRESSure]:MANual:LEVel.

11.7 SOURce Group

:SOURce[:PRESSure]:MANual:LEVel

Function Sets or queries the pressure setting.
Syntax :SOURce[:PRESSure]:MANual:LEVel <NRf>
:SOURce[:PRESSure]:MANual:LEVel?
<NRf> = The setting range and resolution depend on the pressure source (display) range.

Example :SOURCE:MANUAL:LEVEL 20.000E+00
:SOURCE:MANUAL:LEVEL?
-> :SOURCE:MANUAL:LEVEL 20.000E+00

Description Has the same function as the :SOURce[:PRESSure][:LEVel][:IMMediate][:AMPLitude] command.

:SOURce[:PRESSure]:REPeat

Function Sets or queries repetition for sweep or auto step.
Syntax :SOURce[:PRESSure]:REPeat <Boolean>
:SOURce[:PRESSure]:REPeat?
ON|1: Repetition on
OFF|0: Repetition off

Example :SOURCE:REPEAT ON
:SOURCE:REPEAT? -> :SOURCE:REPEAT 1

:SOURce[:PRESSure]:STEP?

Function Queries all auto-step settings.
Syntax :SOURce:STEP?

:SOURce[:PRESSure]:STEP:COUNT?

Function Queries the current repeat count for auto step.
Syntax :SOURce[:PRESSure]:STEP:COUNT?
Example :SOURCE:STEP:COUNT?
-> :SOURCE:STEP:COUNT 10

:SOURce[:PRESSure]:STEP:INTERval

Function Sets or queries the interval time for auto step.
Syntax :SOURce[:PRESSure]:STEP:INTERval <Time>
:SOURce[:PRESSure]:STEP:INTERval?
<Time> = 10 to 600 (5 s resolution)

Example :SOURCE:STEP:INTERVAL 10S
:SOURCE:STEP:INTERVAL?
-> :SOURCE:STEP:INTERVAL 10

:SOURce[:PRESSure]:SWEep?

Function Queries all sweep settings.
Syntax :SOURce:SWEep?

:SOURce[:PRESSure]:SWEep:COUNT?

Function Queries the current repeat count for sweep.
Syntax :SOURce[:PRESSure]:SWEep:COUNT?
Example :SOURce:STEP:COUNT?
-> :SOURce:SWEep:COUNT 10

:SOURce[:PRESSure]:SWEep:DIRection

Function Sets or queries the sweep direction.
Syntax :SOURce[:PRESSure]:SWEep:DIRection {UP|DOWN}
:SOURce[:PRESSure]:SWEep:DIRection?
UP: Increasing direction
DOWN: Decreasing direction

Example :SOURCE:SWEEP:DIRECTION UP
:SOURCE:SWEEP:DIRECTION?
-> :SOURCE:SWEEP:DIRECTION UP

:SOURce[:PRESSure]:SWEep:INTERval

Function Sets or queries the interval time for sweep.
Syntax :SOURce[:PRESSure]:SWEep:INTERval <Time>
:SOURce[:PRESSure]:SWEep:INTERval?
<Time> = 15 to 600 (5 s resolution)
Example :SOURCE:SWEEP:INTERVAL 15S
:SOURCE:SWEEP:INTERVAL?
-> :SOURCE:SWEEP:INTERVAL 15

:SOURce[:PRESSure]:SWEep:LOWer

Function Sets or queries the lower sweep limit.
Syntax :SOURce[:PRESSure]:SWEep:LOWer <NRf>
:SOURce[:PRESSure]:SWEep:LOWer?
<NRf> = The setting range and resolution depend on the pressure source (display) range.

Example :SOURCE:SWEEP:LOWER 20.000E+00
:SOURCE:SWEEP:LOWER?
-> :SOURCE:SWEEP:LOWER 20.000E+00

Description If a value outside the setting range is specified, a "222:Data out of range" error will occur.

11.8 STATUS Group

The commands in this group are used to make settings and queries related to the communication status function. There are no front panel keys that correspond to the commands in this group. For information about status reports, see chapter 12.

:STATUS?

Function Queries all the settings of the communication status function.
Syntax :STATUS?

:STATUS:CONDition?

Function Queries the contents of the condition register.
Syntax :STATUS:CONDition?
Example :STATUS:COND? -> :STATUS:CONDITION 16
Description • For information about the condition register, see “Status Reports.”
• Has the same function as the :STATUS:OPERation:PRESSure:CONDition? command.

:STATUS:EESE

Function Sets or queries the extended event enable register.
Syntax :STATUS:EESE <Register>
:STATUS:EESE?
<Register> = 0 to 65635
Example :STATUS:EESE #H7659
:STATUS:EESE? -> :STATUS:EESE 30297
Description For information about the extended event enable register, see “Status Reports.”

:STATUS:EESR?

Function Queries the contents of the extended event register and clears the register.
Syntax :STATUS:EESR?
Example :STATUS:EESR? -> :STATUS:EESR 1
Description • For information about the extended event register, see “Status Reports.”
• Has the same function as the :STATUS:OPERation:PRESSure[:EVENT]? command.

:STATUS:ERRor?

Function Queries the error code and message of the last error that has occurred (top of the error queue).
Syntax :STATUS:ERRor?
Example :STATUS:ERR?
-> 113, "Undefined header"
Description Has the same function as the :SYSTEM:ERRor? command.

:STATUS:FILTer<x>

Function Sets or queries the transition filter.
Syntax :STATUS:FILTer<x> {BOTH|FALL|RISE|NEVer}
:STATUS:FILTer<x>?
<x> = 1 to 16
Example :STATUS:FILT2 RISE
:STATUS:FILT2?
-> :STATUS:FILTER2 RISE
Description • Set how each bit in the condition register must change to trigger the setting of an event. If you specify RISE, a change from 0 to 1 triggers the setting of an event.
• For information about the transition filter, see “Status Reports.”
• Has the same function as the :STATUS:OPERation:PRESSure:CONDition? command.

:STATUS:OPERation:PRESSure:CONDition?

Function Queries the contents of the condition register.
Syntax :STATUS:OPERation:PRESSure:CONDition?
Description See also :STATUS:CONDition?.

:STATUS:OPERation:PRESSure:ENABle

Function Sets or queries the transition register.
Syntax :STATUS:OPERation:PRESSure:ENABle <Register>
<Register> = 0 to 32767
Description See also :STATUS:FILTer<x>.

:STATUS:OPERation:PRESSure[:EVENT]?

Function Queries the contents of the event register.
Syntax :STATUS:OPERation:PRESSure[:EVENT]?
Description See also :STATUS:EESR?.

:STATUS:QENable

Function Sets or queries whether messages other than errors will be stored to the error queue.
Syntax :STATUS:QENable <Boolean>
:STATUS:QENable?
Example :STATUS:QENABLE ON
:STATUS:QENABLE? -> :STATUS:QENABLE 1

11.8 STATus Group

:STATus:QMESsage

Function Sets or queries whether message information will be attached to the response to the STATus:ERRor? query.

Syntax :STATus:QMESsage <Boolean>
:STATus:QMESsage?

Example :STATUS:QMESsage OFF
:STATUS:QMESsage?
-> :STATUS:QMESsage 0

11.9 SYSTEM Group

The commands in this group deal with the instrument settings.

There are no front panel keys that correspond to the commands in this group.

:SYSTEM?

Function Queries all system settings.

Syntax :SYSTEM?

:SYSTEM:BEEPer

Function Sets or queries the beep sound on/off state.

Syntax :SYSTEM:BEEPer <Boolean>
:SYSTEM:BEEPer?

Example :SYST:BEEPER ON
:SYST:BEEPER? -> :SYSTEM:BEEPER 1

:SYSTEM:CALibration:DATE:LATEST:DA?

Function Queries the manufacturer calibration date or the user calibration date for D/A output, whichever is most recent.

Syntax :SYSTEM:CALibration:DATE:LATEST:DA?
<String1> = "YYYY/MM/DD"
(YYYY = year, MM = month, DD = day)
<String2> = Text
color,{YOKOGAWA|USER|NONE}

Example :SYSTEM:CALIBRATION:DATE:LATEST:DA?
-> :SYSTEM:CALIBRATION:DATE:LATEST:DA
"2018/11/15",YOKOGAWA

Description If there is no manufacturer calibration date or user calibration date, "0000/00/00", NONE is returned.

:SYSTEM:CALibration:DATE:LATEST:PRESSure?

Function Queries the manufacturer calibration date or the user calibration date for pressure, whichever is most recent.

Syntax :SYSTEM:CALibration:DATE:LATEST:
PRESSure?
<String1> = "YYYY/MM/DD"
(YYYY = year, MM = month, DD = day)
<String2> = Text
color,{YOKOGAWA|USER|NONE}

Example :SYSTEM:CALIBRATION:DATE:LATEST:
PRESSURE?
-> :SYSTEM:CALIBRATION:DATE:LATEST:
PRESSURE "2018/11/15",YOKOGAWA

Description If there is no manufacturer calibration date or user calibration date, "0000/00/00", NONE is returned.

:SYSTEM:CALibration:DATE:USER?

Function Queries all the settings of the user calibration date.

Syntax :SYSTEM:CALibration:DATE:USER?
<String> = "2018/01/01":

User calibration date for pressure

Example :SYSTEM:CALIBRATION:DATE:USER?
-> :SYSTEM:CALIBRATION:DATE:
USER "2018/11/15"

Description For options that are not installed, "0000/00/00" is returned.

:SYSTEM:CALibration:DATE:USER:DA

Function Sets or queries the user calibration date for D/A output.

Syntax :SYSTEM:CALibration:DATE:USER:
DA <String>
:SYSTEM:CALibration:DATE:USER:DA?
<String> = "YYYY/MM/DD"
(YYYY = year, MM = month, DD = day)

Example :SYSTEM:CALIBRATION:DATE:USER:
DA "2019/01/21"
:SYSTEM:CALIBRATION:DATE:USER:DA?
-> :SYSTEM:CALIBRATION:DATE:USER:
DA "2019/01/21"

:SYSTEM:CALibration:DATE:USER:PRESSure

Function Sets or queries the user calibration date for pressure.

Syntax :SYSTEM:CALibration:DATE:USER:
PRESSure <String>
:SYSTEM:CALibration:DATE:USER:PRESSu
re?
<String> = "YYYY/MM/DD"
(YYYY = year, MM = month, DD = day)

Example :SYSTEM:CALIBRATION:DATE:USER:
PRESSURE "2019/01/21"
:SYSTEM:CALIBRATION:DATE:USER:
PRESSURE?
-> :SYSTEM:CALIBRATION:DATE:USER:
PRESSURE "2019/01/21"

11.9 SYSTem Group

:SYSTem:CALibration:DATE:YOKogawa:DA?

Function Queries the manufacturer calibration date for D/A output.

Syntax :SYSTem:CALibration:DATE:YOKogawa:DA?
<String> = "YYYY/MM/DD"
(YYYY = year, MM = month, DD = day)

Example :SYSTEM:CALIBRATION:DATE:YOKOGAWA:DA?
-> :SYSTEM:CALIBRATION:DATE:
YOKOGAWA:DA "2018/11/15"

:SYSTem:CALibration:DATE:YOKogawa:PRESSure?

Function Queries the manufacturer calibration date for pressure.

Syntax :SYSTem:CALibration:DATE:YOKogawa:PRE
SSure?
<String> = "YYYY/MM/DD"
(YYYY = year, MM = month, DD = day)

Example :SYSTEM:CALIBRATION:DATE:YOKOGAWA:
PRESSURE?
-> :SYSTEM:CALIBRATION:DATE:
YOKOGAWA:PRESSURE "2018/11/15"

:SYSTem:CLOCK?

Function Queries all date/time settings.

Syntax :SYSTem:CLOCK?

:SYSTem:CLOCK:DATE

Function Sets or queries the date.

Syntax :SYSTem:CLOCK:DATE <String>
:SYSTem:CLOCK:DATE?
<String> = "YYYY/MM/DD"

Example :SYST:CLOCK:DATE "2018/11/19"
:SYST:CLOCK:DATE?
-> :SYSTEM:CLOCK:DATE "2018/11/19"

:SYSTem:CLOCK:TIME

Function Sets or queries the time.

Syntax :SYSTem:CLOCK:TIME <String>
:SYSTem:CLOCK:TIME?
<String> = "HH:MM:SS"

Example :SYST:CLOCK:TIME "13:45:00"
:SYST:CLOCK:TIME?
-> :SYSTEM:CLOCK:TIME "13:45:03"

:SYSTem:COMMunicate?

Function Queries all communication settings.

Syntax :SYSTem:COMMunicate?

:SYSTem:COMMunicate:ETHernet?

Function Queries all Ethernet communication settings.

Syntax :SYSTem:COMMunicate:ETHernet?

:SYSTem:COMMunicate:ETHernet:DHCP

Function Sets or queries the Ethernet DHCP on/off state.

Syntax :SYSTem:COMMunicate:ETHernet:
DHCP <Boolean>
:SYSTem:COMMunicate:ETHernet:DHCP?

Example :SYSTEM:COMMUNICATE:ETHERNET:DHCP ON
:SYSTEM:COMMUNICATE:ETHERNET:DHCP?
->:SYSTEM:COMMUNICATE:ETHERNET:
DHCP 1

:SYSTem:COMMunicate:ETHernet:IP

Function Sets or queries the Ethernet IP address.

Syntax :SYSTem:COMMunicate:ETHernet:
IP <String>
:SYSTem:COMMunicate:ETHernet:IP?

<String> = "x.x.x.x" where x is a value between 0
and 255
Example :SYSTEM:COMMUNICATE:ETHERNET:
IP "192.168.0.100"
:SYSTEM:COMMUNICATE:ETHERNET:IP?
-> :SYSTEM:COMMUNICATE:ETHERNET:
IP "192.168.0.1"

:SYSTem:COMMunicate:ETHernet:MACaddre ss?

Function Sets or queries the Ethernet MAC address.

Syntax :SYSTem:COMMunicate:ETHernet:
MACaddress?
<String> = "00:00:64:xx:xx:xx"

where xx is a value between 0 and FF
Example :SYSTEM:COMMUNICATE:ETHERNET:
MACADDRESS
:SYSTEM:COMMUNICATE:ETHERNET:
MACADDRESS?
-> :SYSTEM:COMMUNICATE:ETHERNET:
MAC "00:00:64:XX:XX:XX"

:SYSTem:COMMunicate:ETHernet:MASK

Function Sets or queries the Ethernet subnet mask.

Syntax :SYSTem:COMMunicate:ETHernet:
MASK <String>
:SYSTem:COMMunicate:ETHernet:MASK?

<String> = "x.x.x.x" where x is a value between 0
and 255
Example :SYSTEM:COMMUNICATE:ETHERNET:
MASK "255.255.255.0"
:SYSTEM:COMMUNICATE:ETHERNET:MASK?
->:SYSTEM:COMMUNICATE:ETHERNET:
MASK "255.255.255.0"

:SYSTEM:COMMunicate:GPIB?

Function Queries all GP-IB communication settings.

Syntax :SYSTEM:COMMunicate:GPIB?

Description If a setting or query is attempted when the GP-IB interface option (-C01) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.

:SYSTEM:COMMunicate:GPIB:ADDRESS

Function Sets or queries the GP-IB address.

Syntax :SYSTEM:COMMunicate:GPIB:

ADDRESS <NRf>

:SYSTEM:COMMunicate:GPIB:ADDRESS?

<NRf> = 0 to 30 (resolution: 1), GP-IB address

Example :SYSTEM:COMMunicate:GPIB:ADDRESS 1

:SYSTEM:COMMunicate:GPIB:ADDRESS?

->:SYSTEM:COMMunicate:GPIB:ADDRESS 1

Description • If a setting or query is attempted when the GP-IB interface option (-C01) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.

- Has the same function as the :SYSTEM:COMMunicate:GPIB:SELF:ADDRESS command.

:SYSTEM:COMMunicate:GPIB:SELF:ADDRESS

Function Sets or queries the GP-IB address.

Syntax :SYSTEM:COMMunicate:GPIB:SELF:

ADDRESS <NRf>

:SYSTEM:COMMunicate:GPIB:SELF:

ADDRESS?

<NRf> = 0 to 30 (resolution: 1), GP-IB address

Description See also :SYSTEM:COMMunicate:GPIB:ADDRESS.

:SYSTEM:COMMunicate:ETHERnet:GATEway

Function Sets or queries the Ethernet default gateway.

Syntax :SYSTEM:COMMunicate:ETHERnet:

GATEway <String>

:SYSTEM:COMMunicate:ETHERnet:

GATEway?

<String> = "x.x.x.x" where x is a value between 0 and 255

Example :SYSTEM:COMMunicate:ETHERNET:

GATEWAY "192.168.0.1"

:SYSTEM:COMMunicate:ETHERNET:

GATEWAY?

-> :SYSTEM:COMMunicate:ETHERNET:

GATEWAY "192.168.0.1"

:SYSTEM:COMMunicate:SERial?

Function Queries all serial communication settings.

Syntax :SYSTEM:COMMunicate:SERial?

Description If a setting or query is attempted when the RS-232 interface option (-C02) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.

:SYSTEM:COMMunicate:SERial:BAUDrate

Function Sets or queries the baud rate for serial communication.

Syntax :SYSTEM:COMMunicate:SERial:

BAUDrate <NRf>

:SYSTEM:COMMunicate:SERial:BAUDrate?

<NRf> = 1200, 2400, 4800, 9600, 14400,

19200, 38400, 57600, 115200

Example :SYSTEM:COMMunicate:SERial:

BAUDRATE 1200

:SYSTEM:COMMunicate:SERial:BAUDRATE?

->:SYSTEM:COMMunicate:SERial:

BAUDRATE 1200

Description • If a setting or query is attempted when the RS-232 interface option (-C02) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.

- Has the same function as the :SYSTEM:COMMunicate:SERial:CONTROL:BAUD command.

:SYSTEM:COMMunicate:SERial:BITS

Function Sets or queries the data length for serial communication.

Syntax :SYSTEM:COMMunicate:SERial:

BITS <NR1>

:SYSTEM:COMMunicate:SERial:BITS?

<NR1> = 7, 8

Example :SYSTEM:COMMunicate:SERial:BITS 7

:SYSTEM:COMMunicate:SERial:BITS?

->:SYSTEM:COMMunicate:SERial:BITS 7

Description If a setting or query is attempted when the RS-232 interface option (-C02) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.

:SYSTEM:COMMunicate:SERial:CONTROL:BAUD

Function Sets or queries the baud rate for serial communication.

Syntax :SYSTEM:COMMunicate:SERial:CONTROL:

BAUD <NRf>

:SYSTEM:COMMunicate:SERial:CONTROL:

BAUD?

Description See also :SYSTEM:COMMunicate:SERial:BAUDrate.

11.9 SYSTem Group

:SYSTem:COMMunicate:SERial:CONTRol:PARity

Function Sets or queries the parity for serial communication.

Syntax :SYSTem:COMMunicate:SERial:CONTRol:PARity {EVEN|ODD|NONE}
:SYSTem:COMMunicate:SERial:CONTRol:PARity?

Description See also :SYSTem:COMMunicate:SERial:PARity.

:SYSTem:COMMunicate:SERial:CONTRol:XONXoff

Function Sets or queries the handshaking for serial communication.

Syntax :SYSTem:COMMunicate:SERial:CONTRol:XONXoff <NR1>
:SYSTem:COMMunicate:SERial:CONTRol:XONXoff?

Description See also :SYSTem:COMMunicate:SERial:HANDshake.

:SYSTem:COMMunicate:SERial:HANDshake

Function Sets or queries the handshaking for serial communication.

Syntax :SYSTem:COMMunicate:SERial:HANDshake <NR1>
:SYSTem:COMMunicate:SERial:HANDshake? <NR1> = 0 to 3
0: OFF_OFF
1: XON_XON
2: CTS_RTS

Example :SYSTEM:COMMUNICATE:SERIAL:HANDSHAKE 0
:SYSTEM:COMMUNICATE:SERIAL:HANDSHAKE?
->:SYSTEM:COMMUNICATE:SERIAL:HANDSHAKE 0

Description • If a setting or query is attempted when the RS-232 interface option (-C02) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.
• Has the same function as the :SYSTem:COMMunicate:SERial:CONTRol:XONXoff command.

:SYSTem:COMMunicate:SERial:PARity

Function Sets or queries the parity bit for serial communication.

Syntax :SYSTem:COMMunicate:SERial:PARity {EVEN|ODD|NONE}
:SYSTem:COMMunicate:SERial:PARity?
EVEN: Even
ODD: Odd
None: None

Example :SYSTEM:COMMUNICATE:SERIAL:PARITY EVEN
:SYSTEM:COMMUNICATE:SERIAL:PARITY?
->:SYSTEM:COMMUNICATE:SERIAL:PARITY EVEN

Description • If a setting or query is attempted when the RS-232 interface option (-C02) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.
• Has the same function as the :SYSTem:COMMunicate:SERial:CONTRol:PARity command.

:SYSTem:COMMunicate:SERial:SBITs

Function Sets or queries the stop bit for serial communication.

Syntax :SYSTem:COMMunicate:SERial:SBITs <NR1>
:SYSTem:COMMunicate:SERial:SBITs? <NR1> = 1, 2

Example :SYSTEM:COMMUNICATE:SERIAL:SBITS 1
:SYSTEM:COMMUNICATE:SERIAL:SBITS?
->:SYSTEM:COMMUNICATE:SERIAL:SBITS 1

Description If a setting or query is attempted when the RS-232 interface option (-C02) is not installed, a "241: Hardware missing" error will occur. However, it is omitted for upper-level queries.

:SYSTem:COMMunicate:SERial:TERMinator

Function Sets or queries the terminator used for serial transmission.

Syntax :SYSTem:COMMunicate:SERial:TERMinator {CR|LF|CRLF}
:SYSTem:COMMunicate:SERial:TERMinator?

Example :SYSTEM:COMMUNICATE:SERIAL:TERMINATOR CRLF
:SYSTEM:COMMUNICATE:SERIAL:TERMINATOR?
->:SYSTEM:COMMUNICATE:SERIAL:TERMINATOR CRLF

:SYStem:COMMunicate:TYPE

Function Sets or queries the command type.
 Syntax :SYStem:COMMunicate:TYPE {NORMal|COMPAtible}
 :SYStem:COMMunicate:TYPE?
 NORMal: Normal commands (488.2 format)
 COMPAtible: Compatible commands (MC100 type)
 Example :SYStem:COMMunicate:TYPE COMP
 :SYStem:COMMunicate:TYPE?
 -> :SYStem:COMMunicate:TYPE COMPAtible

:SYStem:COMMunicate:USB?

Function Queries all USB communication settings.
 Syntax :SYStem:COMMunicate:USB?

:SYStem:COMMunicate:USB:FUNctioN

Function Sets or queries the USB function selection (USB-TMC/USB-CDC).
 Syntax :SYStem:COMMunicate:USB:FUNctioN {TMC|CDC}
 :SYStem:COMMunicate:USB:FUNctioN?
 TMC: USB-TMC command control function
 CDC: Command control using a virtual COM port
 Example :SYStem:COMMunicate:USB:FUNctioN CDC
 :SYStem:COMMunicate:USB:FUNctioN?
 -> :SYStem:COMMunicate:USB:FUNctioN CDC

:SYStem:COMMunicate:USB:TERMinator

Function Sets or queries the terminator used to send data from this instrument when a virtual COM port is selected.
 Syntax :SYStem:COMMunicate:USB:TERMinator {CR|LF|CRLF}
 :SYStem:COMMunicate:USB:TERMinator?
 Example :SYStem:COMMunicate:USB:TERMinator CRLF
 :SYStem:COMMunicate:USB:TERMinator?
 -> :SYStem:COMMunicate:USB:TERMinator CRLF

:SYStem:DISPlay?

Function Queries all screen settings.
 Syntax :SYStem:DISPlay?

:SYStem:DISPlay:BRIGhtness

Function Sets or queries the screen brightness.
 Syntax :SYStem:DISPlay:BRIGhtness <NRf>
 :SYStem:DISPlay:BRIGhtness?
 <NRf> = 1 to 5
 1 (darkest), 5 (brightest)
 Example :SYStem:DISPlay:BRIGhtness 5
 :SYStem:DISPlay:BRIGhtness?
 -> :SYStem:DISPlay:BRIGhtness 5
 Description Backlight brightness is darkest when set to 1 and brightest when set to 5.

:SYStem:DISPlay:RANGe:COLor

Function Sets or queries the display color of the range information.
 Syntax :SYStem:DISPlay:RANGe:COLor {BLACk|RED|GREen|BLUE|YELLow|MAGenta|CYAN|ORANGe}
 :SYStem:DISPlay:RANGe:COLor?
 BLACk
 RED
 GREen
 BLUE
 YELLow
 MAGenta
 CYAN
 ORANGe
 Example :SYStem:DISPlay:RANGe:COLor RED
 :SYStem:DISPlay:RANGe:COLor?
 -> :SYStem:DISPlay:RANGe:COLor? RED

:SYStem:DISPlay:RANGe[:STATe]

Function Sets or queries the on/off state of the range information.
 Syntax :SYStem:DISPlay:RANGe[:STATe] <Boolean>
 :SYStem:DISPlay:RANGe[:STATe]?
 ON|1: On
 OFF|0: Off
 Example :SYStem:DISPlay:RANGe ON
 :SYStem:DISPlay:RANGe:STATe?
 -> :SYStem:DISPlay:RANGe? 1

:SYStem:ERRor?

Function Queries the errors.
 Syntax :SYStem:ERRor?
 Description See also :STATus:ERRor.

11.9 SYSTem Group

:SYSTem:KLOCK

Function Sets or queries the key lock.

Syntax :SYSTem:KLOCK {OFF|ZLOCK|KLOCK|ALOCK}
:SYSTem:KLOCK?
OFF: Unlocked
ZLOCK: Only ZERO CAL unlocked
KLOCK: All keys except KEY LOCK, OUTPUT, and ALARM RESET locked
ALOCK: All keys except KEY LOCK and ALARM RESET locked

Example :SYSTEM:KLOCK KLOCK
:SYSTEM:KLOCK?
-> :SYSTEM:KLOCK? KLOCK

:SYSTem:LANGUage

Function Sets or queries the language of error dialog messages.

Syntax :SYSTem:LANGUage {ENGLish|JAPANese|CHINese|KORean}
:SYSTem:LANGUage?
ENGLish
JAPANese
CHINese
KORean

Example :SYSTEM:LANGUAGE ENGLISH
:SYSTEM:LANGUAGE?
-> :SYSTEM:LANGUAGE ENGLISH

:SYSTem:PRESSure?

Function Queries all pressure settings.

Syntax :SYSTem:PRESSure?

:SYSTem:PRESSure:POSition?

Function Queries the sensor position.

Syntax SYSTem:PRESSure:POSition?

Example :SYSTEM:PRESSURE:POSITION?
-> :SYSTEM:PRESSURE:POSITION 64

:SYSTem:PRESSure:RANGe?

Function Queries the pressure range.

Syntax SYSTem:PRESSure:RANGe?
10E+03: 10 kPa range
200E+03: 200 kPa range

Example :SYSTEM:PRESSURE:RANGE?
-> :SYSTEM:PRESSURE:RANGE 10E+03

:SYSTem:PRESSure:TYPE?

Function Queries the pressure type.

Syntax SYSTem:PRESSure:TYPE?
GAUGe: Gauge pressure

Example :SYSTEM:PRESSURE:TYPE?
-> :SYSTEM:PRESSURE:TYPE GAUGE

:SYSTem:USER:MEMO

Function Sets or queries the user notes.

Syntax :SYSTem:USER:MEMO <String>
:SYSTem:USER:MEMO?
<String> = Up to 15 characters
0 to 9, a to z, A to Z, space, @, -, /

Example :SYSTEM:USER:MEMO "ABCDE0123ABS/-"
:SYSTEM:USER:MEMO?
-> :SYSTEM:USER:MEMO "ABCDE0123ABS/-"

:SYSTem:REBoot

Function Restarts the instrument when the specified time elapses.

Syntax :SYSTem:REBoot <NR1>
<NR1> = 0 s to 60 s (resolution: 1 s). Time until the instrument restarts (s)

Example :SYSTEM:REBOOT 3

11.10 UNIT Group

The commands in this group deal with units.

There are no front panel keys that correspond to the commands in this group. The commands correspond to the Unit soft key.

:UNIT[:PRESSure]

Function Sets or queries the pressure unit.

Syntax • For -U1

```
:UNIT[:PRESSure] {PA|HPA|KPA|MPA|  
MBAR|BAR|ATM|}
```

• For -U2

```
:UNIT[:PRESSure] {PA|HPA|KPA|MPA|  
MBAR|BAR|ATM|MMHG|INHG|GFCM2|KGFCM2|  
TORR|PSI|MMH2O4|MMH2O20|FTH2O4|  
FTH2O20|INH2O4|INH2O20}
```

| | |
|----------|-------------------------|
| PA: | Pa |
| HPA: | hPa |
| KPA: | kPa |
| MPA: | MPa |
| MBAR: | mbar |
| BAR: | bar |
| ATM: | atm |
| MMHG: | mmHg |
| INHG: | inHg |
| GFCM2: | gf/cm ² |
| KGFCM2: | kgf/cm ² |
| TORR: | Torr |
| PSI: | psi |
| MMH2O4: | mmH ₂ O@4°C |
| MMH2O20: | mmH ₂ O@20°C |
| FTH2O4: | ftH ₂ O@4°C |
| FTH2O20: | ftH ₂ O@20°C |
| INH2O4: | inH ₂ O@4°C |
| INH2O20: | inH ₂ O@20°C |

Description See also :SENSe:UNIT.

11.11 Common Command Group

The commands in this group are defined in IEEE 488.2-1992 and are independent from the instrument's individual functions.

There are no front panel keys that correspond to the commands in this group.

*CLS

Function Clears the standard event register, extended event register, and error queue.

Syntax *CLS

Example *CLS

Description

- If the *CLS command is located immediately after the program message terminator, the output queue is also cleared.
- For details on registers and queues, see "Status Reports."

*ESE

Function Sets or queries the standard event enable register.

Syntax *ESE <NRf>

*ESE?
<NRf> = 0 to 255

Example *ESE 251

*ESE? -> 251

Description

- Specify the value as a sum of the values of each bit in decimal format. For example, specifying *ESE 251 will cause the standard event register to be set to 11111011. In this case, bit 2 of the standard event register is disabled. This means that bit 5 (ESB) of the status byte register is not set to 1, even if a query error occurs.
- The default value is *ESE 0 (all bits disabled).
- A query using *ESE? will not clear the contents of the standard event enable register.
- For details on the standard event enable register, see "Status Reports."

*ESR?

Function Queries and clears the standard event register.

Syntax *ESR?

Example *ESR? -> 32

Description

- Specify the value as a sum of the values of each bit in decimal format. For example, specifying *ESE 251 will cause the standard event register to be set to 11111011. In this case, bit 2 of the standard event register is disabled. This means that bit 5 (ESB) of the status byte register is not set to 1, even if a query error occurs.
- The default value is *ESE 0 (all bits disabled).
- A query using *ESE? will not clear the contents of the standard event enable register.
- For details on the standard event enable register, see "Status Reports."

*IDN?

Function Queries the instrument model.

Syntax *IDN?

Example *IDN? -> "YOKOGAWA,MC300,0,1.01"

Description This command returns a string in the following format: <Manufacturer>, <Model>, <Serial no.>, <Firmware version>. For details on the model, see "Checking the Package Contents."

*OPC

Function Sets bit 0 (the OPC bit) of the standard event register to 1 upon the completion of the specified overlap command.

Syntax *OPC

Example *OPC

Description This instrument does not have overlap commands. The OPC bit is always set to 1.

*OPC?

Function Returns ASCII code 1 when the specified overlap command is completed.

Syntax *OPC?

Example *OPC? -> 1

Description This instrument does not support overlap commands. 1 is always returned.

*OPT?

Function Queries the installed options.

Syntax *OPT?

Example *OPT?MD

Description

- The command returns whether options are available.
- Returns whether the <unit function for biomedical pressure measuring instruments> is available.
- Unit function for biomedical pressure measuring instruments: MD
- The *OPT? query must be the last query of a program message. An error occurs if there is a query after this query.

*RST

Function Initializes settings.

Syntax *RST

Example *RST

Description

- All settings except communication settings are reset to their factory default values.
- For details on initialization, see the Getting Started Guide (IM MC300-02EN).

***SRE**

Function Sets or queries the service request enable register value.

Syntax *SRE <NRf>

*SRE?

<NRf> = 0 to 255

Example *SRE 239

*SRE?

-> 175 (because the bit 6, MSS, setting is ignored)

Description

- Specify the value as a sum of the values of each bit in decimal format. For example, specifying *SRE 239 will cause the standard enable register to be set to 11101111. In this case, bit 4 of the service request enable register is disabled. This means that bit 4 (MAV) of the status byte register is not set to 1, even if the output queue is not empty. Bit 6 (MSS) of the status byte register is the MSS bit itself and is therefore ignored.
- The default value is *SRE 0 (all bits disabled).
- A query using *SRE? will not clear the contents of the service request enable register.
- For details on the service request enable register, see "Status Reports."

***STB?**

Function Queries the Status Byte Register value.

Syntax *STB?

Example *STB? -> 4

Description

- A sum of the values of each bit is returned as a decimal value. Because the register is read without executing serial polling, bit 6 is an MSS bit, not an RQS bit. For example, if a value of 4 is returned, this indicates that the status byte register is set to 00000100. This means that the error queue is not empty (in other words, an error occurred).
- A query using *STB? will not clear the contents of the status byte register.
- For details on the status byte register, see "Status Reports."

***TRG**

Function Generates an external trigger.

Syntax *TRG

Example *TRG

Description A multi-line message GET (Group Execute Trigger) also performs the same operation.

***TST?**

Function Performs a self-test and queries the result.

Syntax *TST?

Example *TST? ->0

Description

- For details on the self-test, see the Getting Started Guide (IM MC300-02EN).
- This command returns 0 if the self-test is successful and 1 otherwise. It takes approximately 20 seconds for the test to complete. When receiving a response from the instrument, set the timeout to a relatively large value.

***WAI**

Function Holds the execution of the subsequent command until the specified overlap command is completed.

Syntax *WAI

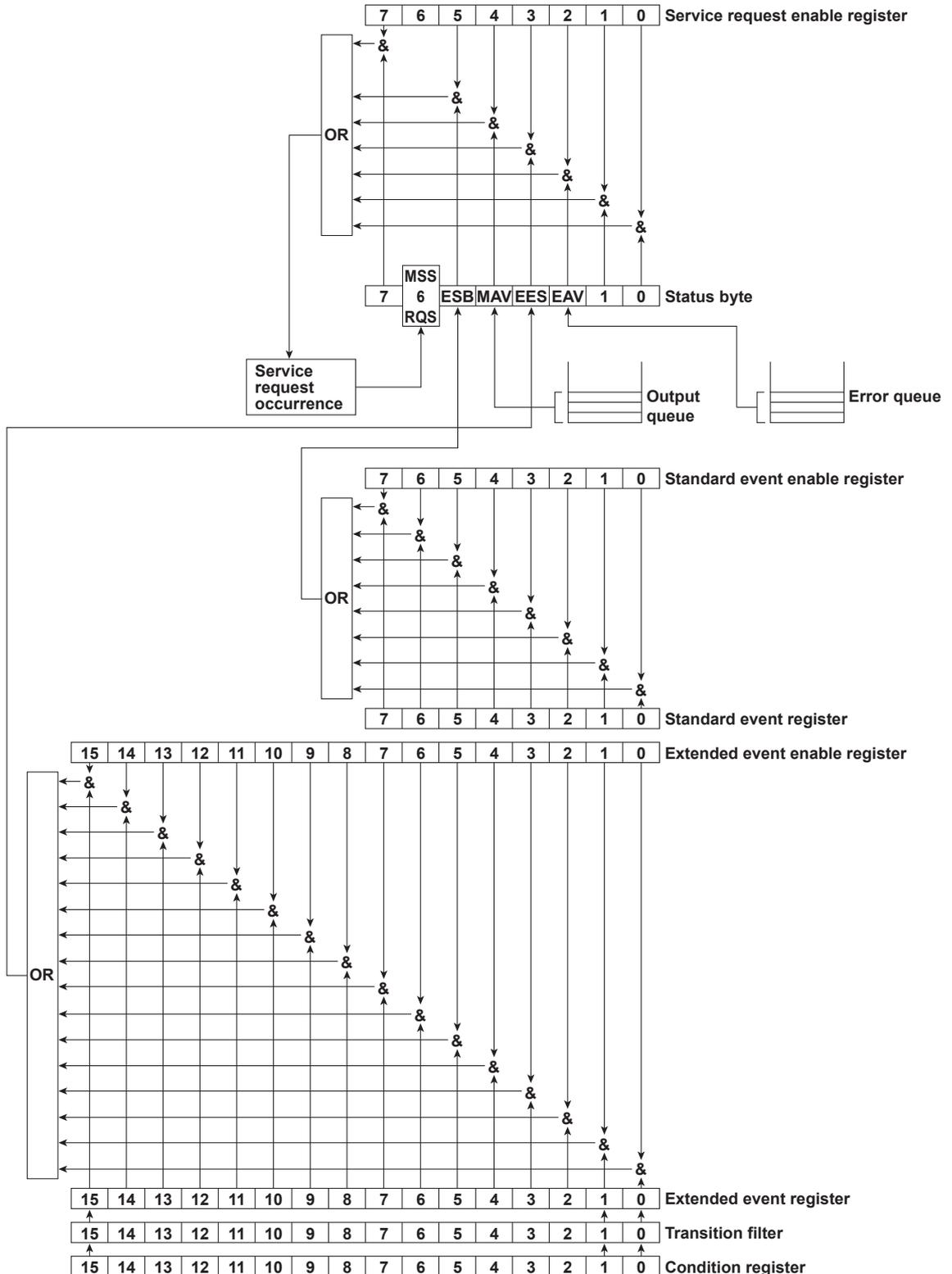
Example *WAI

Description This instrument does not have overlap commands. This command will be ignored.

12.1 About Status Reports

Status reports

The figure below shows the format of status reports that are read by serial polling. This status report format is an extended version of the status report format defined in IEEE 488.2-1992.



Overview of registers and queues

| Name | Function | Write | Read |
|---------------------------------|--|------------------|-----------------------------------|
| Status byte | – | – | Serial polling (RQS), *STB? (MSS) |
| Service request enable register | Status byte mask | *SRE | *SRE? |
| Standard event register | Indicates device status changes | – | *ESR? |
| Standard event enable register | Standard event register mask | *ESE | *ESE? |
| Extended event register | Indicates device status changes | – | STATUS:EESR? |
| Extended event enable register | Extended event register mask | STATUS:EESE | STATUS:EESE? |
| Condition register | Current device status | – | STATUS:CONDition? |
| Transition filter | Conditions that change the extended event register | STATUS:FILTer<x> | STATUS:FILTer<x>? |
| Output queue | Stores response messages for queries | Query commands | |
| Error queue | Stores error numbers and messages | – | STATUS:ERRor? |

Registers and queues that affect the status byte

The following registers affect the status byte bits.

| Register | Affected status byte bit |
|-------------------------|----------------------------|
| Standard event register | Sets bit 5 (ESB) to 1 or 0 |
| Output queue | Sets bit 4 (MAV) to 1 or 0 |
| Extended event register | Sets bit 3 (EES) to 1 or 0 |
| Error queue | Sets bit 2 (EAV) to 1 or 0 |

Enable registers

The following registers are used to mask a bit so that the bit will not affect the status byte even when it is set to 1.

| Masked register | Mask register |
|-------------------------|---------------------------------|
| Status byte | Service request enable register |
| Standard event register | Standard event enable register |
| Extended event register | Extended event enable register |

Reading and writing to registers

For example, use the *ESE command to set the standard event enable register bits to 1 and 0. You can use the *ESE? command to query whether the standard event enable register bits are ones or zeros. For details on these commands, see chapter 11.

12.2 Status Byte

Status byte



- **Bits 0, 1, and 7**
Not used (always 0)
- **Bit 2 EAV (Error Available)**
This bit is 1 when the error queue is not empty. In other words, this bit is set to 1 when an error occurs. See section 12.5.
- **Bit 3 EES (Extend Event Summary Bit)**
This bit is set to 1 when the logical AND of the extended event register and the extended event enable register is not 0. In other words, this bit is set to 1 when a certain event takes place inside the instrument. See section 12.4.
- **Bit 4 MAV (Message Available)**
Set to 1 when the output queue is not empty. In other words, this bit is set to 1 when there is data to be transmitted in response to a query. See section 12.5.
- **Bit 5 ESB (Event Summary Bit)**
This bit is set to 1 when the logical AND of the standard event register and the standard event enable register is not 0. In other words, this bit is set to 1 when a certain event takes place inside the instrument. See section 12.3.
- **Bit 6 RQS (Request Service)/MSS (Master Status Summary)**
Set to 1 when the logical AND of the status byte excluding bit 6 and the service request enable register is not 0. In other words, this bit is set to 1 when the instrument requests service from the controller.
RQS is set to 1 when the MSS bit changes from 0 to 1 and is cleared when serial polling is carried out or when the MSS bit changes to 0.

Bit masking

To mask a bit in the status byte so that it does not cause an SRQ, set the corresponding bit of the service request enable register to 0.

For example, to mask bit 2 (EAV) so that service is not requested when an error occurs, set bit 2 of the service request enable register to 0. Do this using the `*SRE` command. To query whether each bit of the service request enable register is 1 or 0, use `*SRE?`. For details on the `*SRE` command, see chapter 11.

Status byte operation

A service request is issued when bit 6 in the status byte becomes 1. Bit 6 is set to 1 when any other bit becomes 1 (when the corresponding bit of the service request enable register is also set to 1). For example, if an event occurs and the logical OR of a standard event register bit and its corresponding enable register bit is 1, then bit 5 (ESB) is set to 1. At this point, if bit 5 of the service request enable register is 1, bit 6 (MSS) is set to 1, and the instrument requests service from the controller.

You can check what type of event occurred by reading the contents of the status byte.

Reading the status byte

There are two ways to read the contents of the status byte.

- ***STB? query**
Bit 6 functions as MSS when a query is made using `*STB?`. This causes the MSS to be read. This query does not cause any of the status byte bits to be cleared after the status byte is read.
- **Serial polling**
Serial polling causes bit 6 to function as an RQS bit. This causes the RQS to be read. After the status byte is read, only the RQS bit is cleared. You cannot read the MSS bit when serial polling is used.

Clearing the status byte

There is no way to clear all the bits in the status byte. The bits that are cleared for each operation are shown below.

- ***STB? query**
None of the bits are cleared.
- **Serial polling**
Only the RQS bit is cleared.
- **When a *CLS command is received**
When a `*CLS` command is received, the status byte itself is not cleared, but the contents of the standard event register, which affects the bits in the status byte, are cleared. As a result, the corresponding status byte bits are cleared. Because the output queue is not cleared with a `*CLS` command, bit 4 (MAV) in the status byte is not affected. However, the output queue will be cleared if the `*CLS` command is received just after a program message terminator.

12.3 Standard Event Register

Standard event register

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PON | URQ | CME | EXE | DDE | QYE | RQC | OPC |

- **Bit 7 PON (Power ON)**
This bit is 1 when the instrument is turned on.
- **Bit 6 URQ (User Request)**
Not used (always 0)
- **Bit 5 CME (Command Error)**
This bit is set to 1 when there is a command syntax error.

Example Command names are misspelled, or character data that is not one of the available options has been received.
- **Bit 4 EXE (Execution Error)**
This bit is set to 1 when the command syntax is correct, but the command cannot be executed in the current state.

Example A command whose parameter is outside the allowable range was received.
- **Bit 3 DDE (Device Error)**
This bit is set to 1 when a command cannot be executed for instrument's internal reasons other than a command syntax error or command execution error.
- **Bit 2 QYE (Query Error)**
This bit is set to 1 when a query command is received, but the output queue is empty or the data is lost.

Example There is no response data, or data is lost due to an overflow in the output queue.
- **Bit 1 RQC (Request Control)**
Not used (always 0)
- **Bit 0 OPC (Operation Complete)**
This bit is set to 1 upon the completion of the operation designated by the *OPC command (see chapter 11).

Bit masking

To mask a certain bit of the standard event register so that it does not cause bit 5 (ESB) in the status byte to change, set the corresponding bit of the standard event enable register to 0.

For example, to mask bit 2 (QYE) so that ESB will not be set to 1 even if a query error occurs, set bit 2 of the standard event enable register to 0. Do this using the *ESE command. To query whether each bit of the standard event enable register is 1 or 0, use *ESE?. For details on the *ESE command, see chapter 11.

Standard event register operation

The standard event register indicates eight types of events that occur inside the instrument. When one of the bits in this register becomes 1 (and the corresponding bit of the standard event enable register is also 1), bit 5 (ESB) in the status byte is set to 1.

Example

1. A query error occurred.
2. Bit 2 (QYE) is set to 1.
3. When bit 2 of the standard event enable register is 1, bit 5 (ESB) in the status byte was set to 1.

You can also check what type of event occurred in the instrument by reading the contents of the standard event register.

Reading the standard event register

You can use the *ESR? command to read the contents of the standard event register. The register is cleared after it is read.

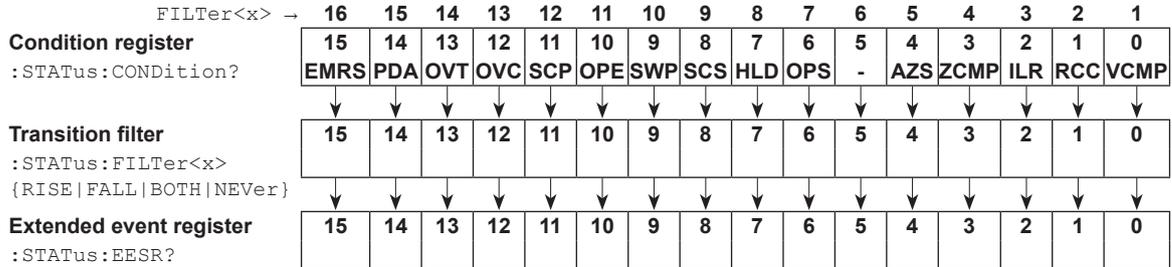
Clearing the standard event register

The standard event register is cleared in the following three cases.

- When the contents of the standard event register are read using the *ESR command.
- When a *CLS command is received.
- When the instrument is restarted.

12.4 Extended Event Register

The extended event register receives information about changes in the condition register, which indicates the instrument's internal condition. The information is the result of edge detection performed by the transition filter.



The condition register bits are described in the table below.

| Bit No. | Name | Title |
|---------|--|--|
| 0 | VCMP (Vent Complete) ¹ | Vent complete |
| 1 | RCC (Range Change Complete) ¹ | Range change complete |
| 2 | ILR (In Limit Reached) | In-limit reached |
| 3 | ZCMP (Zero Complete) | Zero complete |
| 4 | AZS (Auto-zero Started) ¹ | Auto-zero started |
| 5 | - | Reserved |
| 6 | OPS (Output State) | Set to 1 while the output is on |
| 7 | HLD (Hold) | Set to 1 during hold. |
| 8 | SCS (Switch Contacts Changed State) ¹ | Switch contacts changed state |
| 9 | SWP (Sweep) | Set to 1 during sweep or auto step. |
| 10 | OPE (Output Enable) | Set to 1 when the output can be turned on, 0 otherwise |
| 11 | SCP (Source Changed) | Set to 1 while the output signal of the voltage output signal is in transition |
| 12 | OVC (Over Current) | Motor overcurrent |
| 13 | OVT (Over Travel) | Motor overtravel |
| 14 | PDA (Pressure Deviation Anomaly) | Abnormal pressure deviation |
| 15 | EMRS (Emergency Status) ² | Set to 1 while there is a device error |

1 Supports general-purpose commands. Always returns 0.

2 Abnormal internal power supply

The transition filter parameters detect changes in the specified condition register bits (numeric suffixes 1 to 16) and overwrite the extended event register in the following ways.

| | |
|-------|---|
| RISE | The specified extended event register bit is set to 1 when the corresponding condition register bit changes from 0 to 1. |
| FALL | The specified extended event register bit is set to 1 when the corresponding condition register bit changes from 1 to 0. |
| BOTH | The specified extended event register bit is set to 1 when the corresponding condition register bit changes from 0 to 1 or from 1 to 0. |
| NEVer | Always zero. |

12.5 Output and Error Queues

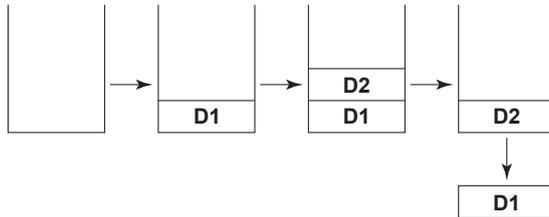
Output queue

The output queue stores query response messages. For example, when `*IDN?` is sent to query the model, the response message is stored in the output queue until it is read.

As shown below, error messages are stored in order and read from the oldest message first. The output queue is cleared in the following cases.

- When a new message is received from the controller.
- When a deadlock occurs (see section 12.1).
- When a device clear command (DCL or SDC) is received.
- When the instrument is restarted.

The `*CLS` command does not clear the output queue. You can determine whether or not the output queue is empty by checking bit 4 (MAV) in the status byte.



Error queue

When an error occurs, the error queue stores the error number and message. For example, if the instrument receives an incorrect program message from the controller, the error number (113) and the error message (“Undefined header”) are stored in the error queue when the instrument displays the error message.

You can use the `:STATus:ERRor?` query to read the contents of the error queue. Like the output queue, the messages in the error queue are read from the oldest one first.

If the error queue overflows, the last message is replaced with the following message: 350, “Queue overflow.”

The error queue is cleared in the following cases.

- When a `*CLS` command is received.
- When the instrument is restarted.

You can determine whether or not the error queue is empty by checking bit 2 (EAV) in the status byte.

Appendix 1 Principle of Operation

The MC300 pressure controller is a pressure servo system composed of a pressure control section that uses a needle-valve servo valve and our proprietary silicon resonant sensor, together with a pressure setting section. This system has also been adopted in previous models and has a proven track record.

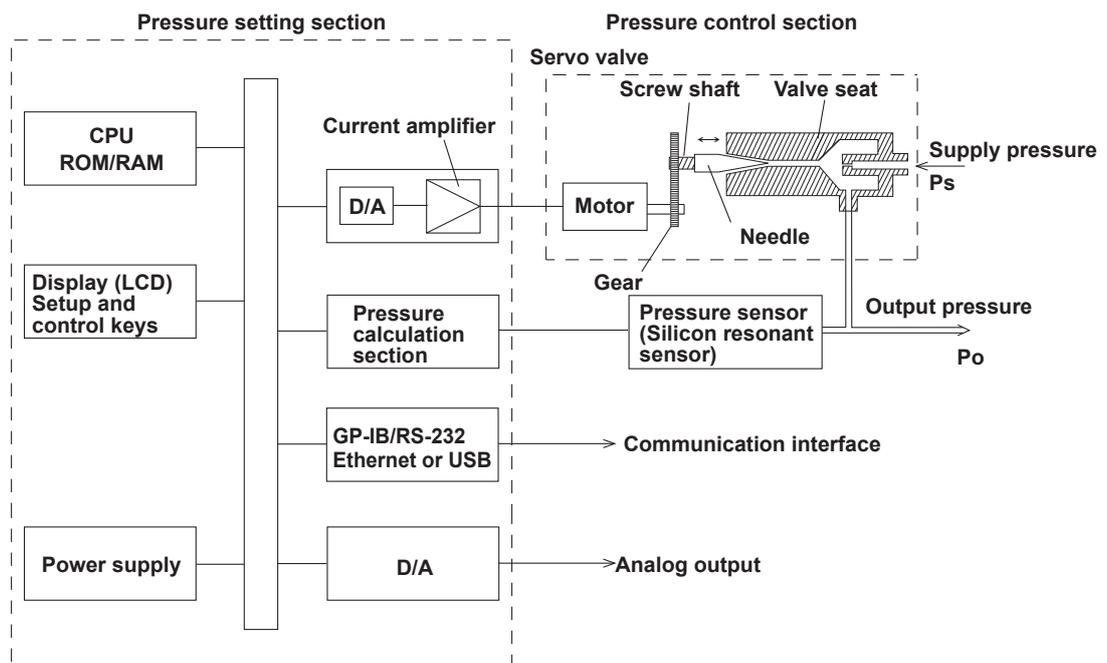
The pressure setting section performs control calculations based on the pressure value set by the operation keys or communication commands and the pressure value calculated by the pressure calculation section, and then calculates the command value for the motor. This value is converted into an electrical signal by the D/A converter, and the motor is driven through the current amplifier.

The servo valve in the pressure control section consists of a drive mechanism made up of the needle, valve seat, motor, gears, and other components. Part of the air at the supply pressure P_s is discharged through the gap between the needle and the valve seat. The motor rotation is reduced by the gears and transmitted to the screw shaft. When the screw shaft rotates, the needle moves in the direction indicated by the arrow, changing the cross-sectional area through which air is discharged between the needle and the valve seat, thereby controlling and outputting the output air pressure P_o . Because this drive mechanism does not involve high-speed opening and closing operation, it provides stable long-term operation.

Part of the output air pressure enters the pressure sensor (silicon resonant sensor) and is input to the pressure calculation section.

In this control loop, when the output pressure is higher than the set pressure, the pressure setting section rotates the motor in the direction that increases the air discharge cross-sectional area of the needle valve so that the output pressure decreases. Conversely, when the output pressure is lower than the set pressure, it rotates the motor in the direction that decreases the air discharge cross-sectional area so that the output pressure increases. By continuously adjusting the position of the needle in this way, smooth control is achieved so that the deviation between the set pressure and the output pressure becomes zero.

As a result, highly accurate and stable output air pressure corresponding to the set pressure value is obtained.



Appendix 2 About the IEEE 488.2-1992 Standard

This instrument's GP-IB interface conforms to the IEEE 488.2-1992 standard. This standard specifies that the following 23 items be stated in the document. This section describes these items.

- (1) **Of the IEEE 488.1 interface functions, the subsets that are supported**
See section 7.1, "GP-IB Interface Functions and Specifications."
- (2) **The operation of the device when it is assigned an address outside the 0 to 30 range.**
The address of this instrument cannot be set to an address outside the 0 to 30 range.
- (3) **Reaction of the device when the user changes the address**
The address change is detected when the user presses UTILITY -> Remote I/F -> GPIB and sets the address. The new address is valid until the next time it is changed.
- (4) **Device settings at power-on. The commands that can be used at power-on.**
As a basic rule, the previous settings (the settings that were in use when the instrument was turned off) are used.
There are no limitations on the commands that can be used at power-on.
- (5) **Message exchange options**
 - (a) **Input buffer size**
1024 bytes
 - (b) **Queries that return multiple response messages**
See the example of the commands in chapter 11.
 - (c) **Queries that create response data when the command syntax is being analyzed**
All queries create response data when the command syntax is analyzed.
 - (d) **Queries that create response data during reception**
There are no queries of which the response data are created upon receiving a send request from the controller.
 - (e) **Commands that have parameters that restrict one another**
See the example of the commands in chapter 11.
- (6) **Items that are included in the functional or composite header elements constituting a command**
See chapters 10 and 11.
- (7) **Buffer sizes that affect block data transmission**
When block data is being transmitted, the output queue is expanded to match the size of the data that is being transmitted.
- (8) **A list of program data elements that can be used in equations and their nesting limitations**
Equations cannot be used.
- (9) **Syntax of the responses to queries**
See the example of the commands in chapter 11.
- (10) **Communication between devices that do not follow the response syntax**
Not supported.
- (11) **Size of the response data block**
0 to 220009 bytes
- (12) **A list of supported common commands**
See section 11.10, "Common Command Group."
- (13) **Device condition after a successful calibration**
*CAL is not supported.
- (14) **The maximum length of block data that can be used for the *DDT trigger macro definition**
Not supported.
- (15) **The maximum length of the macro label for defining macros, the maximum length of block data that can be used for the macro definition, and the process when recursion is used in macro definitions**
Macro functions are not supported.
- (16) **Reply to the *IDN? query**
See section 11.10, "Common Command Group."
- (17) **Size of storage area for protected user data for PUD and *PUD?**
*PUD and *PUD? are not supported.
- (18) **The length of the *RDT and *RDT? resource names**
*RDT and *RDT? are not supported.
- (19) **The change in the status due to *RST, *LRN?, *RCL, and *SAV**
*RST
See section 11.10, "Common Command Group."
*LRN?, *RCL, *SAV
These common commands are not supported.
- (20) **The extent of the self-test using the *TST? command**
See section 11.10, "Common Command Group."
- (21) **The structure of the extended return status**
See chapter 12.
- (22) **Whether each command is processed in an overlapped manner or sequentially**
See section 10.5, "Synchronization with the Controller" and chapter 11.
- (23) **The description of the execution of each command**
See the functions of the commands given in chapter 11.

Appendix 3 MC100-Compatible Commands

The MC300 can use the communication commands of the earlier MC100 model (compatible commands).

Because there are functional differences between the MC100 and MC300, operation may differ depending on the command.

List of commands

For details on each command, see “Command Explanation” in the following pages.

| Command | Function | Page |
|--|--|-------|
| MC100 common commands | | |
| AR | Resets the alarm if an alarm is activated. | App-4 |
| AS | Sets the interval for auto-step execution. | App-4 |
| BP | Sets beep sound on and off. | App-4 |
| D | Sets n/m for divided output. | App-4 |
| DD | Decreases the n or m value for divided output. | App-4 |
| DL | Sets the output data terminator. | App-4 |
| DR | Sets the monitor output range. | App-4 |
| DU | Increases the n or m value for divided output. | App-4 |
| DW | Decreases the specified digit of the pressure setpoint by 1. | App-5 |
| E/<GET> | Generates a trigger. | App-5 |
| H | Sets or queries whether to add a header to communication output measurement data. | App-5 |
| HD | Turns the hold function on or off. | App-5 |
| LV | Sets the load capacitance. | App-5 |
| M | Turns the repeat function on or off. | App-5 |
| MS | Sets the factors that generate a status byte interrupt. Interrupts are generated for the specified factors. | App-5 |
| O | Turns on or off the pressure output. | App-5 |
| OC | Outputs the current status. | App-5 |
| OD | Outputs the data of the set pressure setpoint. | App-5 |
| OS | Outputs the current panel setup parameters. | App-6 |
| RC | Initializes all MC300 setup parameters except communication settings. | App-6 |
| RU | Sets the auto-step and sweep function settings and stop control. | App-6 |
| S | Sets the pressure output value. | App-6 |
| SW | Sets the interval for sweep execution. | App-6 |
| UN | Selects the display unit for the output pressure. | App-6 |
| UP | Increases the pressure setpoint one digit at a time. | App-6 |
| ZA | Performs zero calibration. | App-6 |
| Command for serial communication only (USB CDC, RS-232) | | |
| <ESC>S | Outputs the status byte. | App-6 |
| <ESC>R | Enables remote control via serial communication. When the instrument enters remote mode, the panel keys are disabled. | App-7 |
| <ESC>L | Returns the instrument from serial remote control mode to local mode. When the instrument enters local mode, operation from the panel key switch is enabled. | App-7 |
| <ESC>C | Resets the panel setup parameters of the instrument to the same state as when the power is turned on. | App-7 |

Command explanation

This section explains the function, syntax, and example of the communication commands that are available on the legacy model instrument MC100, which can also be used on the MC300.

However, the functions that operate and restrictions may be different.

Note

MC100-compatible commands can be used when the communication interface is GP-IB or serial (RS-232 or USB-CDC). They are not supported for USB-TMC or Ethernet.

MC100 common commands

AR

Function Resets the alarm if an alarm is activated.
 Syntax AR<terminator>
 Example AR

AS

Function Sets the interval for auto-step execution.
 Syntax ASm<terminator>
 m is the interval time.
 m=10 to 600 (s), resolution of m: 5
 Example AS100

BP

Function Sets beep sound on and off.
 Syntax Bpm<terminator>
 m is on/off of the beep sound.
 m = 0, 1
 0: Beep sound off
 1: Beep sound on
 Example BP1

D

Function Sets n/m for divided output.
 Syntax Dn/m<terminator>
 m=1 to 25 (denominator of divider ratio)
 n=0 to 25 (numerator of divider ratio)
 Example D1/2
 Description Execution is triggered by Trigger E/<GET>.

DD

Function Decreases the n or m value for divided output.
 Syntax DDm<terminator>
 m is used to select n or m.
 m = 0, 1
 0: Decreases the n value.
 1: Decreases the m value.
 Example DD0
 Description Execution is triggered by Trigger E/<GET>.

DL

Function Sets the output data terminator.
 Syntax DLm<terminator>
 m = 0 to 2

| | GP-IB | Serial |
|----|-----------|--------|
| 0: | CR/LF/EOI | CR/LF |
| 1: | LF | LF |
| 2: | EOI | CR |

Example DL0

DR

Function Sets the monitor output range.
 Syntax DRm<terminator>
 m is the monitor output range.
 m = 0 to 2
 0: OFF
 1: 2V/Full Scale
 2: 5V/Full Scale

Because the D/A output range of the MC300 is 2 V or 5 V, the 10 mV range available on the MC100 is not provided. Therefore, if m = 0 (10 mV) is set, D/A output will be turned off. (The range will be set to 2 V.)

Example DR1

Description When compatibility mode is selected, parameter 0 is selected. The relationship between the parameters, D/A output, and range is shown in the table below.

| Parameter (m) | D/A output | Range |
|---------------|------------|-------|
| 0 | OFF | 2V |
| 1 | ON | 2V |
| 2 | ON | 5V |

DU

Function Increases the n or m value for divided output.
 Syntax DUm<terminator>
 m is used to select n or m.
 m = 0, 1
 0: Increases the n value.
 1: Increases the m value.

Example DU0

Description Execution is triggered by Trigger E/<GET>.

DW

Function Decreases the specified digit of the pressure setpoint by 1.

Syntax DWm<terminator>
 m is the digit.
 m = 0 to 4
 0: Decreases the ones digit by 1.
 1: Decreases the tens digit by 1.
 2: Decreases the hundreds digit by 1.
 3: Decreases the thousands digit by 1.
 4: Decreases the ten-thousands digit by 1.

Example DW2

Description Execution is triggered by Trigger E/<GET>.

E/<GET>

Function Generates a trigger.

Syntax E<terminator>
 <GET>

Example E/<GET>

Description <GET> is valid only for GP-IB.

H

Function Sets or queries whether to add a header to communication output measurement data.

Syntax Hm<terminator>
 m is the header.
 m = 0, 1
 0: No header
 1: Header included

Example H1

HD

Function Turns the hold function on or off.

Syntax HDm<terminator>
 m is the hold function.
 m = 0, 1
 0: Hold off
 1: Hold on

Example HD1

LV

Function Sets the load capacitance.

Syntax LVm<terminator>
 m is the load capacitance.
 m = 0 to 2
 0: Small (0 to 100 cm³)
 1: Middle (100 to 500 cm³)
 2: Large (500 to 1000 cm³)

Example LV0

M

Function Turns the repeat function on or off.

Syntax Mm<terminator>
 m is the repeat operation setting.
 m = 0, 1
 0: Repeats operation
 1: Does not repeat operation

Example M0

MS

Function Sets the factors that generate a status byte interrupt. Interrupts are generated for the specified factors.

Syntax MSm<terminator>
 m=0 to 29

Example MS1

Description For details on the status byte, see "Status byte format (for the <ESC>S command)" on page App-8.

O

Function Turns on or off the pressure output.

Syntax Om<terminator>
 m = 0, 1
 0: Output off
 1: Output on

Example O1

Description Execution is triggered by Trigger E/<GET>.

OC

Function Outputs the current status.

Syntax OC<terminator> (data: 0 to 127)

Example OC

Description • For details on the output format of setup parameters, see "Format for status output" on page App-9.
 • The output value is the decimal representation of an 8-bit binary value.

OD

Function Outputs the data of the set pressure setpoint.

Syntax OD<terminator>

Example OD

Description For details on the output format of output data, see "Output format for output value data" on page App-8.

Appendix 3 MC100-Compatible Commands

OS

Function Outputs the current panel setup parameters.

Syntax OS<terminator>

Example OS

Description For details on the output format of setup parameters, see "Output format for setup parameters" on page App-9.

RC

Function Initializes all MC300 setup parameters except communication settings.

Syntax RC<terminator>

RU

Function Sets the auto-step and sweep function settings and stop control.

Syntax RUm<terminator>

m is the function setting.

m = 0 to 3

0: Clear

1: Auto-step setting

2: Sweep up setting

3: Sweep down setting

Example RU1

Description

- RU0: Equivalent to setting the pressure output mode to divided output (normal output).
- RU1: Equivalent to setting the pressure output mode to auto-step output.
- RU2: Equivalent to setting the pressure output mode to sweep output and the sweep direction to Up.
- RU3: Equivalent to setting the pressure output mode to sweep output and the sweep direction to Down.

S

Function Sets the pressure output value.

Syntax Sm<terminator>

m is the pressure value.

m = -0.12 to 12.000 (for the 10 kPa range)

m = -2.4 to 240.00 (for the 200 kPa range)

Example S10.500

Description

- Execution is triggered by Trigger E/<GET>.
- Setup data is in floating point format.

SW

Function Sets the interval for sweep execution.

Syntax SWm<terminator>

m is the interval time.

m=15 to 600 (s), resolution of m: 5

Example SW200

UN

Function Selects the display unit for the output pressure.

Syntax UNm<terminator>

m is the unit.

m = 2: kPa

Example UN2

Description

- Fixed at kPa.
- The unit cannot be changed during auto step or sweep.

UP

Function Increases the pressure setpoint one digit at a time.

Syntax UPm<terminator>

m is the digit.

m = 0 to 4

0: Increases the ones digit by 1.

1: Increases the ones digit by 10.

2: Increases the ones digit by 100.

3: Increases the ones digit by 1000.

4: Increases the ones digit by 10000.

Example UP2

Description Execution is triggered by Trigger E/<GET>.

ZA

Function Performs zero calibration.

Syntax ZA<terminator>

Example ZA

Command for serial communication only (USB CDC, RS-232)

Commands that use the <ESC> code can also be used with this instrument.

<ESC>S

Function Outputs the status byte.

Syntax <ESC>S<terminator>

Example <ESC>S<terminator>

Description When this instrument receives the <ESC> code (1BH) and then the S command, it outputs the status byte.

<ESC>R

Function Enables remote control via serial communication. When the instrument enters remote mode, the panel keys are disabled.

Syntax <ESC>R<terminator>

Example <ESC>R<terminator>

Description When this instrument receives the <ESC> code (1BH) and then the R command, it switches to remote mode and no longer accepts panel keys. To cancel remote mode, send the <ESC>L command or press ESC (LOCAL).

<ESC>L

Function Returns the instrument from serial remote control mode to local mode. When the instrument enters local mode, operation from the panel key switch is enabled.

Syntax <ESC>L<terminator>

Example <ESC>L<terminator>

Description If this instrument receives the <ESC> code (1BH) and then the L command when the instrument is in remote mode, it returns to local mode.

<ESC>C

Function Resets the panel setup parameters of the instrument to the same state as when the power is turned on.

Syntax <ESC>C<terminator>

Example <ESC>C<terminator>

Description When the instrument receives the <ESC> code (1BH) and then receives this C command, the panel setup parameters in the instrument are initialized.

Communication format for MC100-compatible commands

Status byte format (for the <ESC>S command)

| bit8 | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 |
|-----------|-----------------|-------|---------------------------|--------------------------|--------------|-----------|------------------------|
| DIO8 | DIO7 | DIO6 | DIO5 | DIO4 | DIO3 | DIO2 | DIO1 |
| 0 (fixed) | Service request | Error | Auto step, sweep complete | Abnormal supply pressure | Syntax error | 0 (fixed) | Output change complete |

bit8: Fixed at 0

bit7: Service request. Set to 1 when at least one of bits 6, 5, 4, 3, and 1 is 1.

bit6: Set to 1 when either a syntax error or an abnormal supply pressure occurs.

bit5: Set to 1 when auto-step or sweep is complete.

bit4: Set to 1 when an abnormal supply pressure occurs.

bit3: Set to 1 when a syntax error occurs.

bit2: Fixed at 0

bit1: Set to 1 when output change is complete.

Note

When a load capacitance is connected to the output side, the pressure output lags behind the bit1 output-change completion signal.

Output format for output value data

Structure of individual data items

Each data item consists of a header (4 bytes), data (up to 13 bytes), and a terminator.

| Header | Data | Terminator |
|--------|------|------------|
|--------|------|------------|

Header

The header consists of 4 bytes (h1 to h4).

| h1 | h2 | h3 | h4 |
|----|----|----|----|
|----|----|----|----|

h1: Supply pressure status

N: Normal

E: Abnormal supply pressure (overpressure)

e: Abnormal supply pressure (underpressure)

h2: Output pressure status

M: Output stable

H: Output is higher than the setpoint

L: Output is lower than the setpoint

h3 to h4: Output pressure unit

kg: kgf/cm²

Pa: kPa

HO: mmH₂O

Hg: mmHg

ps: psi

iO: inH₂O

ig: inHg

Data

The data consists of 13 bytes (d1 to d13).

| d1 | d2 | d3 | d4 | d5 | d6 | d7 | d8 | d9 | d10 | d11 | d12 | d13 |
|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|

The data consists of up to 13 bytes (d1 to d13). The numeric portion is left-justified, and unnecessary digits are omitted.

- d1 to d7: Up to 6 digits + decimal point
- d8: , (comma)
- d9 to d10: Divided output numerator (n), up to 2 digits
0 to m (divided output denominator)
- d11: / (slash)
- d12 to d13: Divided output denominator (m), up to 2 digits
1 to 20

Terminator

- CRLF (+EOI)
- LF
- EOI

Note

When a load capacitance is connected to the output side, the pressure output lags behind the output stable signal.

Format for status output

| bit8 | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 |
|-----------|----------------------------------|------------------|---------------|-----------------|--|-------------------|-----------------------|
| 0 (fixed) | Calibration function in progress | Hold in progress | Output on/off | Output changing | Previous communication command error information | Sweep in progress | Auto-step in progress |

- bit8: Fixed at 0
- bit7: Set to 1 while the calibration function (zero calibration) is in progress.
- bit6: Set to 1 while hold is in progress.
- bit5: Set to 1 when output is on.
- bit4: Set to 1 while the output is stabilizing after the output value is changed with output on, or after output is changed from off to on.
- bit3: Set to 1 when an error occurs in a communication command other than <GET>.
- bit2: Set to 1 while sweep is in progress.
- bit1: Set to 1 while auto-step is in progress.

Note

When a load capacitance is connected to the output side, the pressure output lags behind the bit 4 output change signal.

Output format for setup parameters

- Line 1: Model, software version number
- Line 2: Unit, pressure setpoint, divided output setting
- Line 3: Auto-step interval, sweep interval, repeat function setting
- Line 4: END (output complete)

Output Example

```
MDLMC300REV1.01 CRLF
UN2S20.000D1/1 CRLF
AS10SW15M1 CRLF
END CRLF
```

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