PAPERLESS RECORDER
Model: VR144E-G16

USERS MANUAL

MG CO., LTD. www.mgco.jp
5-2-55 Minamitsumori, Nishinari-ku, Osaka 557-0063 JAPAN

Table of Contents

1. Introduction

Thank you for choosing us.
Before use, check the following information.

1.1 Before use…

This product is for use in general industrial environments, therefore may not be suitable for applications which require higher level of safety (e.g. safety or accident prevention systems) or of reliability (e.g. vehicle control or combustion control systems).
For safety, installation and maintenance of this product must be conducted by qualified personnel.

■PACKAGE INCLUDES:

Paperless recorder (body + mounting bracket × 2 pcs.*1 + watertight packing*1)....(1)
When power input is MR2 or BR2:

- AC adapter.....(1)
- AC code.....(1)
- Ferrite core (ZCAT 2132-1130 TDK).....(1)
- Ferrite core (ZCAT 1325-0530A TDK).....(1)

*1: Not included for desktop type.

■MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■SD CARD

To store the data, prepare an SD card. (For the specified SD card, refer to 7.2.6 SD card.)

1.2 Corresponding versions

This Users Manual corresponds to the following versions of our products.

■DEVICE VERSION

This User Manual corresponds to the versions in the following table.

- For instructions on confirming the version of the Paperless Recorder (model: VR144E-G16), refer to 4.3.10.15 Information.
- For instructions on confirming the version of the Configurator Software (model: VR144CFG), refer to 2.3.3 Confirming the version.
- For instructions on confirming the version of the TR30 Viewer Software (model: TRViewer), refer to the TRViewer Users Manual (EM-8633).

MODEL	VERSION
VR144E-G16	1.0.x
VR144CFG	1.0.x
TRViewer	1.6.21 or later

1.3 Precautions

■CONFORMITY WITH EU DIRECTIVES

- The included AC adapter is suitable for Pollution Degree 2 and Installation Category II (transient voltage 2500V). Use the included AC adapter for safety.
- Altitude up to 2000 meters.
- The equipment must be mounted inside a panel. (excluding desktop type)
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this device when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures* to ensure the CE conformity.

  * For example, installation of noise filters and clamp filters for the power source, input and output connected to the device, etc.

■POWER INPUT RATING & OPERATIONAL RANGE

- Locate the power input rating marked on the product and confirm its operational range as indicated below:

  100V AC rating: 100V ±10%, ≤ 15 VA

  100 – 240V AC rating: 85 – 264V, 47 – 66Hz,

  ≤ 15 VA at 100 V

  ≤ 20 VA at 200 V

  ≤ 22 VA at 240 V

  24V DC rating: 24V ±10%, ≤ 240 mA
- Supplying any level of power other than specified above can damage the device or the power source.
- Power supply start-up characteristics must reach within 5 seconds to the operational voltage range of the device.
- Power cables and signal I/O cables for the device must be located separately.
- Power cables, signal I/O cables and communication cables for the device should not be bundled together.
- To increase noise resistance of the power input wires, twist the strands before connecting.

■AC ADAPTER

- The use of AC adapter other than the included one may cause malfunctions.

■GENERAL PRECAUTIONS

- Before you remove the device or mount it, turn off the power supply and I/O signals for safety.
- Before you remove the terminal block or mount it, turn off the power supply and input signal for safety.
- Do not disassemble or modify the device in any way. Doing so may result in a fire or an electrical shock.
- Do not block the device's ventilation openings or use it in areas where heat accumulates.
- Additionally, do not store or use it under high-temperature conditions.
- Do not use this device in an environment where flammable/corrosive gases are present.
- Do not store or use this device in locations subject to direct sunlight, or where excessive dust, dirt or metal particles are present.
- This device is a precision instrument. Do not store or use it where large shocks or excessive vibration can occur.
- Do not store or use this device in environments subject to chemical evaporation (such as that of organic solvents), or where there are chemicals and/or acids present in the environment.
- Do not use paint thinner or organic solvents to clean this device.
- Observe the environmental conditions when using this device.
- Wait at least 15 seconds before turning on the power supply after it was turned off.

■ENVIRONMENT

- Indoor use.
- This device is designed to be mounted on a vertical panel. It is not suitable for a slanted or a horizontal panel surface.
- When heavy dust or metal particles are present in the air, install the device inside proper housing with sufficient ventilation.
- Do not install the device where it is subjected to continuous vibration. Do not subject the device to physical impact.
- Environmental temperature must be within -10 to +55°C (14 to 131°F) with relative humidity within 10 to 90% RH in order to ensure adequate life span and operation.

■GROUNDING

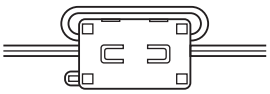
- Be sure to determine in advance the most stable grounding point in the environment and earth the device's FE terminal and that of connected devices to it in order to protect the devices from dielectric breakdown.
- Grounding is also effective to eliminate noise that could cause errors in the device's operation.

■WIRING

- Wrong connection may damage the device.
- Do not connect cables to moving parts or pull them tightly.
- Noise entering through the analog signal cables may cause irregular measurement values, degradation of overall accuracy, and malfunction of the product. We recommend that you would conduct wiring to the device with the following points of caution.
- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■FERRITE CORE

- Twist the power cables 1 turn around the ferrite core at near the device as shown below.



■SD CARD

- Do not turn off the power supply to the device or reset it during data recording or history recording. The SD card may be destroyed.
- Observe the described procedure when you need to replace the SD card during recording.
- Confirm the sides and the connector position of the SD card when inserting one to the card slot.
- Do not touch the metal terminal with your hands or metallic tools.
- SD cards have a life span. Back up your important data.

■LCD PANEL

- The LCD panel's liquid contains an irritant. If the panel is damaged and the liquid contacts your skin, rinse immediately the contact area with running water for at least 15 minutes. If the liquid gets in your eyes, rinse immediately your eyes with running water for at least 15 minutes and consult a doctor.
- The following phenomena are LCD characteristics, and NOT a product defect:
  - LCD screen may show uneven brightness depending upon displayed images or contrast settings.
  - The LCD screen pixels may contain minute black-and-white-colored spots.
  - The color displayed on the LCD screen may appear different when seen from outside the specified viewing angle.
  - When the same image is displayed on the screen for a long time period, an afterimage may appear when the image is changed. If this happens, turn off the device and wait for a while before restarting it.
- To prevent an afterimage:
  - Set the screensaver when you plan to display the same image for a long time period.
  - Plan to change the screen image periodically so that the same image does not remain for the long time period.
- The LCD surface is covered with a protective film at the factory shipment. Remove it once the device is installed.

■DO NOT APPLY OVERRANGE INPUT

- Do not apply voltages beyond the maximum input range to prevent failure.

■INTERNAL CLOCK

- The internal clock data is stored in memory powered by a backup battery while the device is without external power supply.
- The data will be reset to its default status when the battery is used up while the device is left without power supply for a long time period. The clock adjustment will be necessary once the power is restored.
- Once the power is restored, the device starts recharging the battery. It will be full in approximately in 36 to 48 hours.
- Battery backup: approx. 2 months

■AND ....

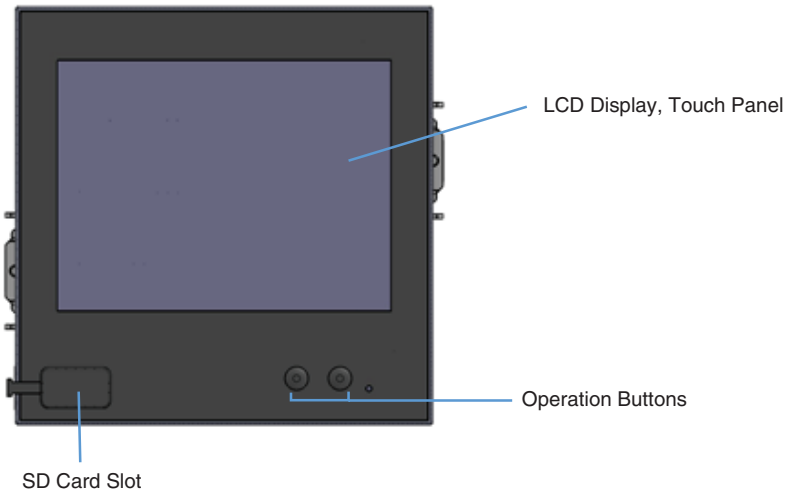
- We recommend use of an UPS to supply power backups.
- The device is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

1.4 Explanation about the terms

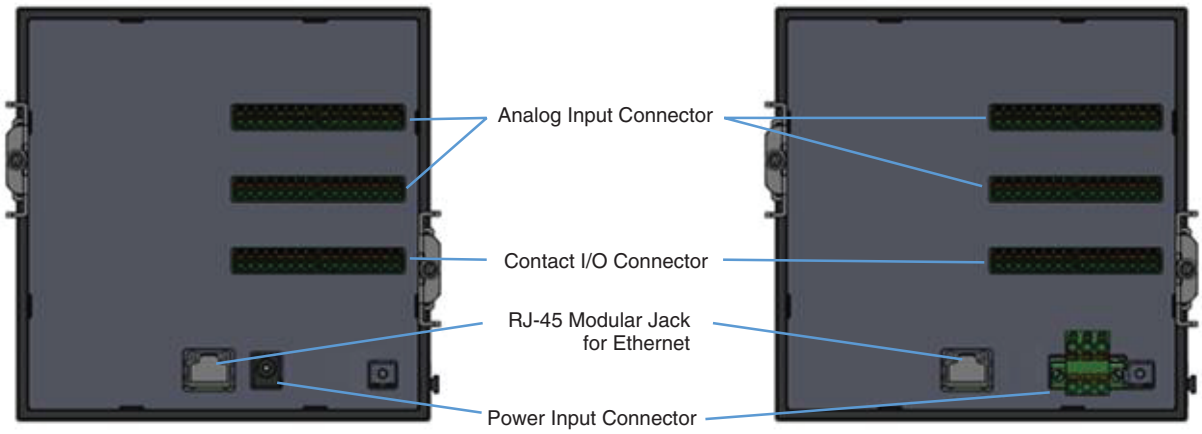
Term	Explanation
Channel CH	2 types of input channels and 1 type of output channel are defined in a device. The I/O signals are in the form of fully encoded digital data. AI : Analog input (16 bit signed integer, unsigned integer) DI : Discrete input (1 bit) OI : Operational input (32 bit floating point) DO : Discrete output (1 bit)
Pen	Pen is used in trend data. To record waveform of I/O value or to record the trend data to a file, the channels need to be assigned to pens.
Zone transition	In case of AI and OI, the total zone in which input values can be obtained can be divided into maximum of 5 zones. The change of the zone caused by a change of the input value is called zone transition. In case of DI and DO, this can only be ON/OFF, and hence a change of the input signal is equivalent to the zone transition.
Event	Event indicates the information that [There has been a zone transition].
Trend data	Trend data includes the following. - The history of trend graph at the point of each timing for the respective channels assigned to pens. - The history of events in channels where the trend graph recording is enabled. - The history of comments.
Event log data	Event log data includes event log, system log and communication log. Event log : Data of events listed in chronological order of occurrence. System log : Data of the internal system activities listed in chronological order. Communication log: Data of communication results listed in chronological order.
Historical trend	Historical trend indicates the past trend data saved in an SD card.
Sampling rate	The time cycles used for acquiring I/O values for logging by the VR144E-G16; fixed at 100 msec.
Storing rate	The time cycles used for recording I/O values for logging data. Data acquired at the sampling rate are operated and stored at the storing rate.
Mail template	Specific combinations of subject, body and mail recipients can be predefined and stored. Each set is identified by the mail template number.
Tap	Tapping means the action of selecting an item. Touch lightly and release an item with a finger on the LCD display which functions as a touch panel.
Internal memory	Internal memory indicates the area where trend data and event log data are written. It is composed of 64 divided blocks per recording data file unit and functions as a ring buffer. A ring buffer means that, after writing data to the last block, it returns to the first block to continue writing data.
Memory block	A memory block is a division of internal memory into 64 parts per file. Recorded data is written to a memory block, and when it reaches a specified time or number of samples, the writing operation transitions to the next memory block. Simultaneously, the recorded data in the memory block is transferred to an SD card and saved as a file.

1.5 Component identification

■ FRONT VIEW



■ REAR VIEW



■LCD DISPLAY, TOUCH PANEL

The color display showing multiple display screens. Various settings are configured by touching the screen.

■CONTROL BUTTONS

MENU operation and REC operation (displaying the dialogs) are possible.

■SD CARD SLOT

Remove the watertight cap and insert an SD card.
Be sure to firmly attach the cap after replacing the card.

■CONNECTORS

For details, refer to the Instruction Manual (EM-7063-A) attached to the VR144E-G16.

1.6 Main functions of the VR144E-G16

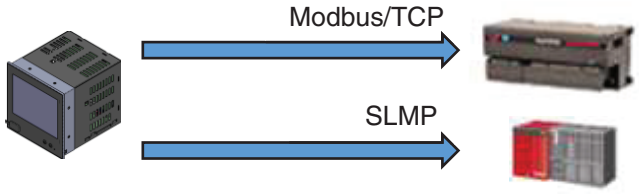
The VR144E-G16 is a paperless recorder featuring a color LCD display.
The VR144E-G16 has the following main functions.

■BUILT-IN I/O

The VR144E-G16 has built-in I/Os of 16-point AI, 2-point DI, and 2-point DO, for direct input and output.

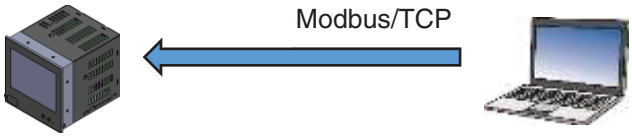
■MODBUS/TCP & SLMP CLIENT

It is possible to expand I/O by connecting with remote I/O of MG Co., Ltd. that is compatible with Modbus/TCP.
It is also possible to expand I/O by connecting with the SLMP-compatible CPU unit of Mitsubishi programmable-controller MELSEC.
Moreover, the recorder can handle data from measuring points in multiple locations.



■MODBUS/TCP SERVER

I/O data can be monitored by remote SCADA.



■GRAPHIC PANEL

Two views can be created by the user.

■COLOR LCD DISPLAY, TOUCH PANEL

Specified content can be displayed and operated such as trend data, event logs data, etc.

■TREND DATA STORING

The trend graph, event and comment can be stored to an SD card at the specified time intervals.
The data stored in the SD card can be displayed on TR30 Viewer Software (model: TRViewer).

■LOGGING

The event logs, system logs and communication logs can be stored to an SD card.

■E-MAIL REPORTING

E-mail reporting function is available at event occurrence or at the specified time.

■FTP CLIENT/SERVER

Trend data or log data stored in the SD card can be uploaded to an FTP server.
Also, reading/deleting trend data or log data in the SD card by an FTP client is available.

2. Installation

2.1 Preparations

Prepare the following items other than the paperless recorder (model: VR144E-G16).

- PC
- LAN cable
- SD card (Refer to 7.2.6 SD card for recommended SD card.)
- VR144E-G16 Configurator Software (Model: VR144CFG) *1
- Viewer Software (Model: TRViewer) *1
- Remote I/O and/or SLMP-compatible PLC *2

Note 1) The software program can be downloaded from our website.
Note 2) Prepare in case of connecting via Modbus/TCP or SLMP.

2.2 Wiring

Connect the cables corresponding to the power supply connector, analog input connector and contact I/O connector of the paperless recorder (model: VR144E-G16).
For details, refer to the Instruction Manual (EM-7063-A) attached to the VR144E-G16.

2.3 Preparing the configurator software

Install the Configurator Software (model: VR144CFG) on the PC in order to configure the setting for the VR144E-G16.

2.3.1 Installation

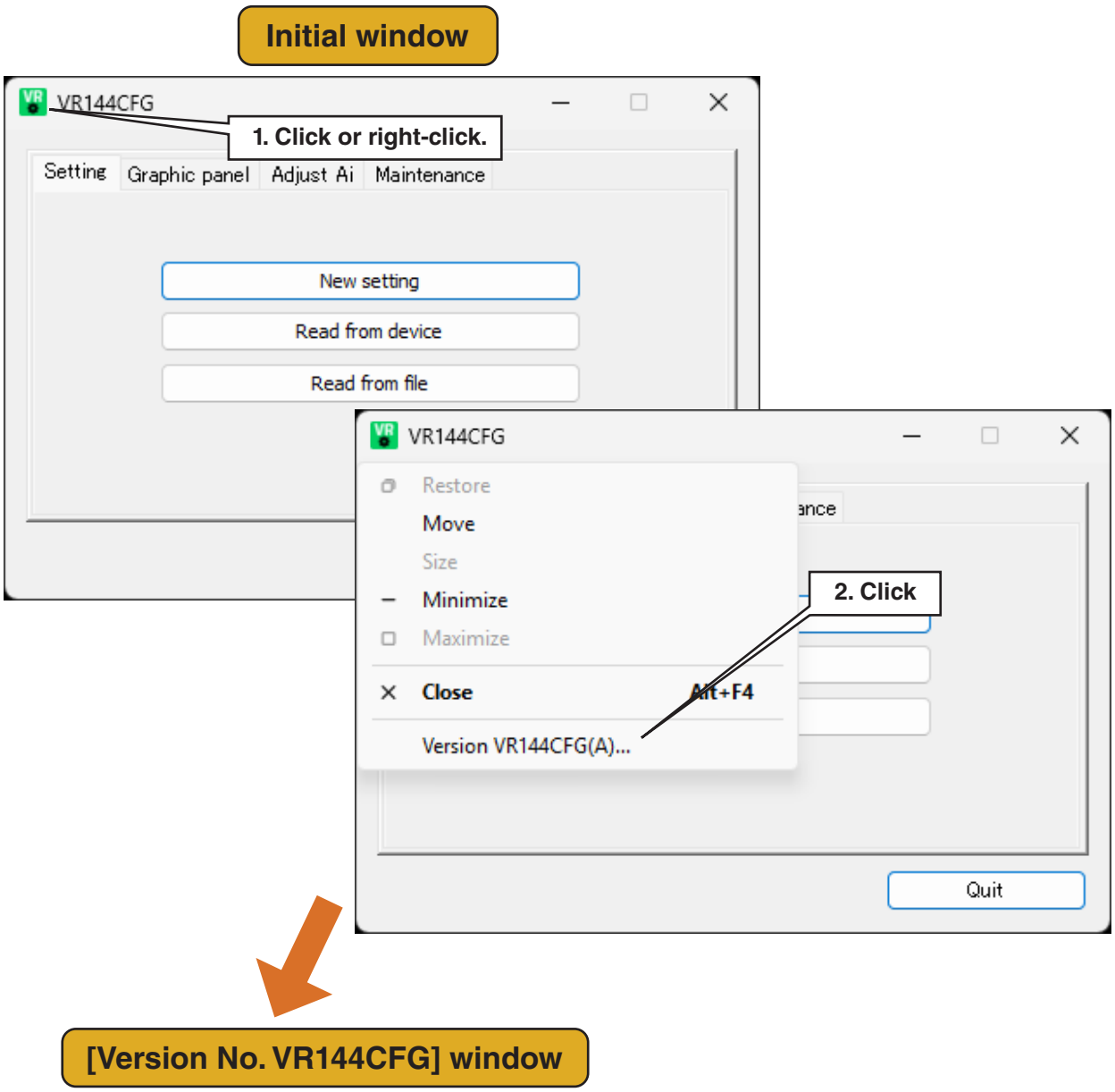
Download VR144CFG from our website, and complete the installation simply by extracting it into any folder.
Create a shortcut to VR144CFG.exe on the desktop if necessary.

2.3.2 Startup

Connect the RJ-45 modular jack for Ethernet to the PC using LAN cable.
Start up VR144CFG, and then perform settings and maintenance of the VR144E-G16.
For details on VR144CFG, refer to 3. Setting.

2.3.3 Confirming the version

For confirming the version of VR144CFG, refer to the following procedure.

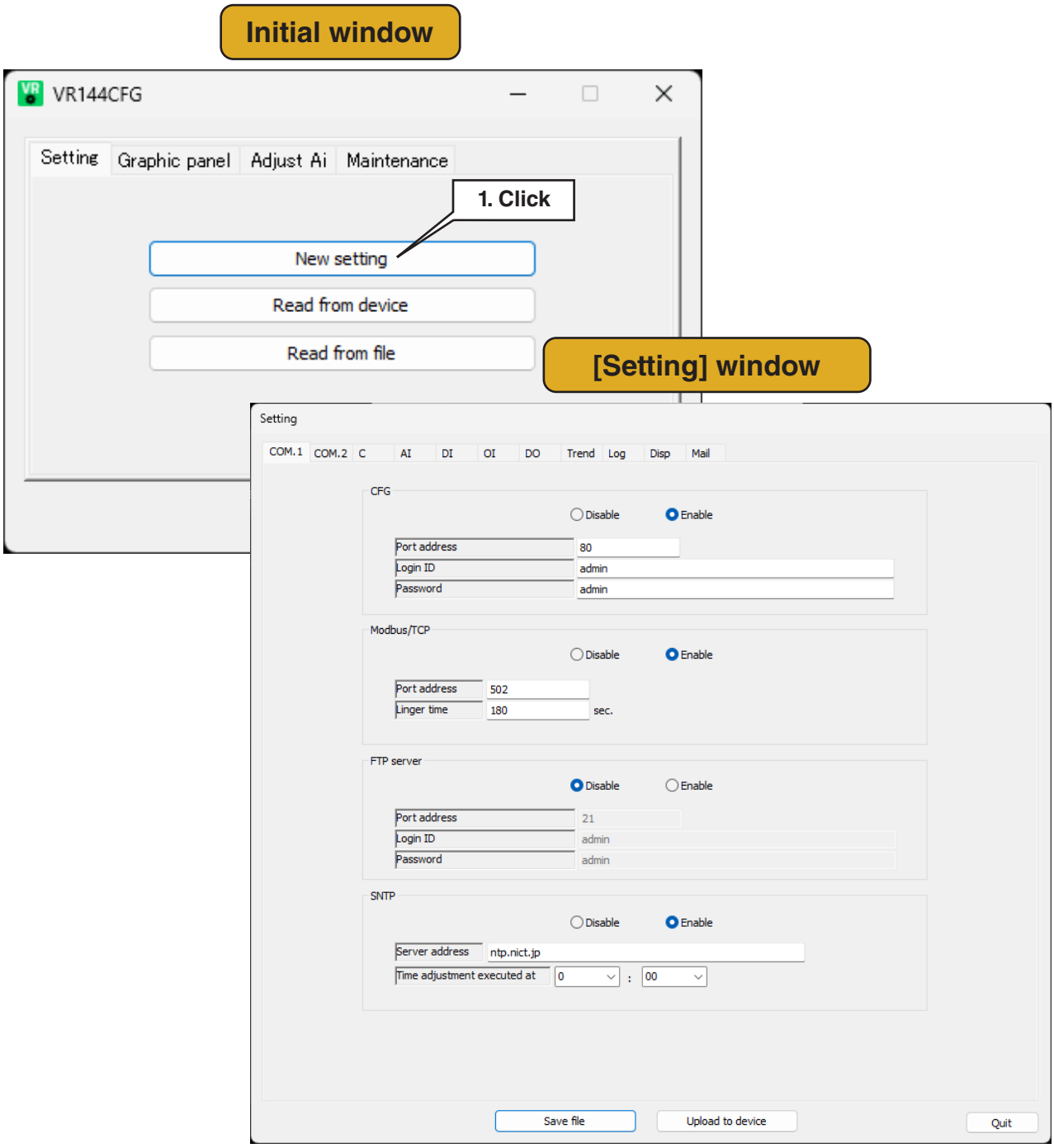


2.3.4 VR144E-G16 setting

There are multiple ways to configure the recorder as explained in the following sections.
For details, refer to the 3. Setting.

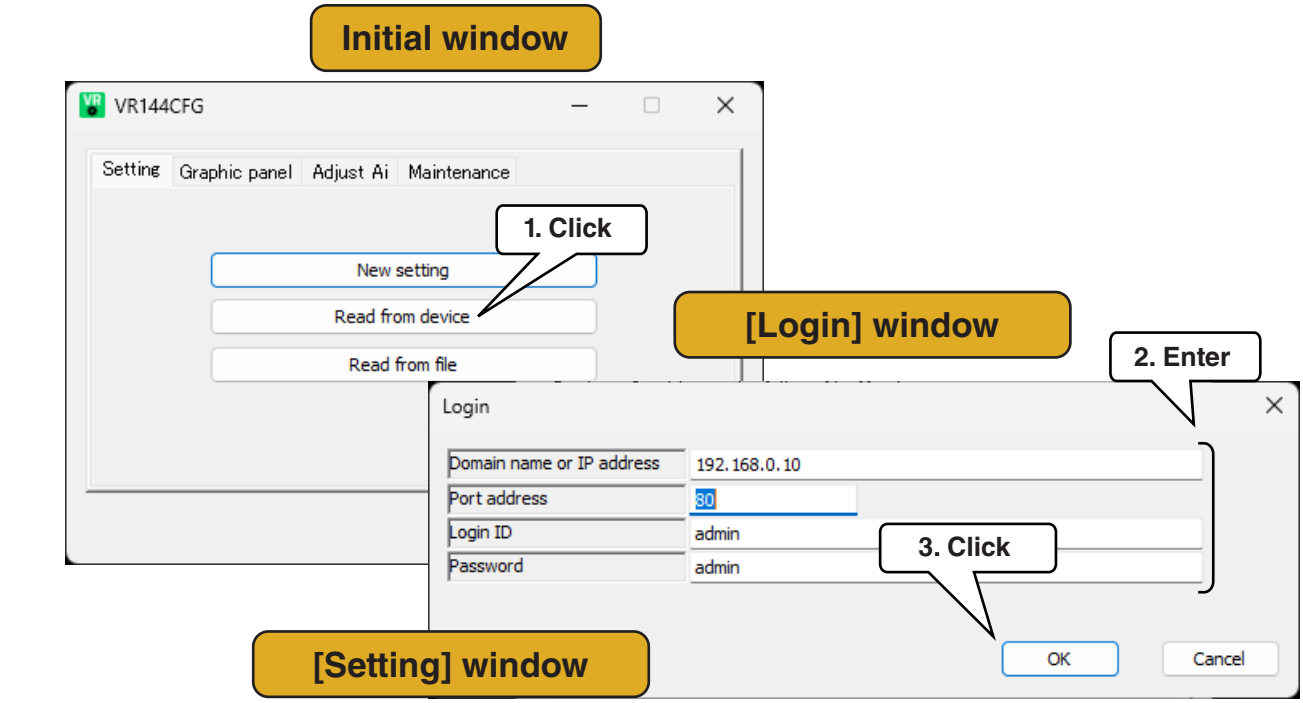
2.3.4.1 New setting

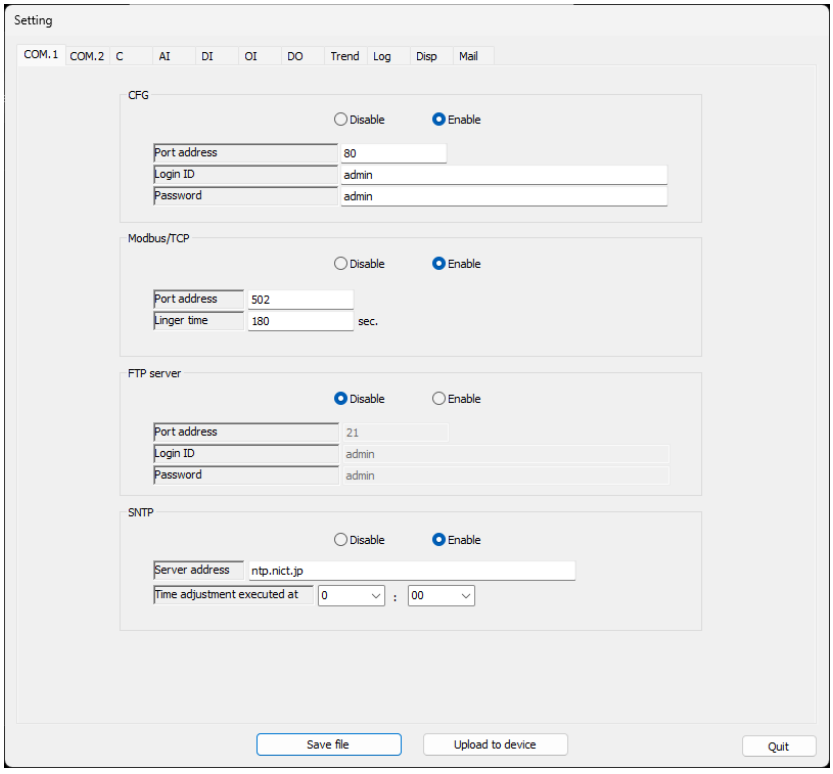
Click [New setting] button to configure a new setting for the VR144E-G16.
The new setting values are displayed on [Setting] window. Various settings can be performed on [Setting] window.



2.3.4.2 Reading from device

Click [Read from device] button to read and change the values set in the VR144E-G16.
Refer to the following table for the default values of [Login] window.
The imported setting values are reflected on [Setting] window. Various settings and changes can be performed on [Setting] window.



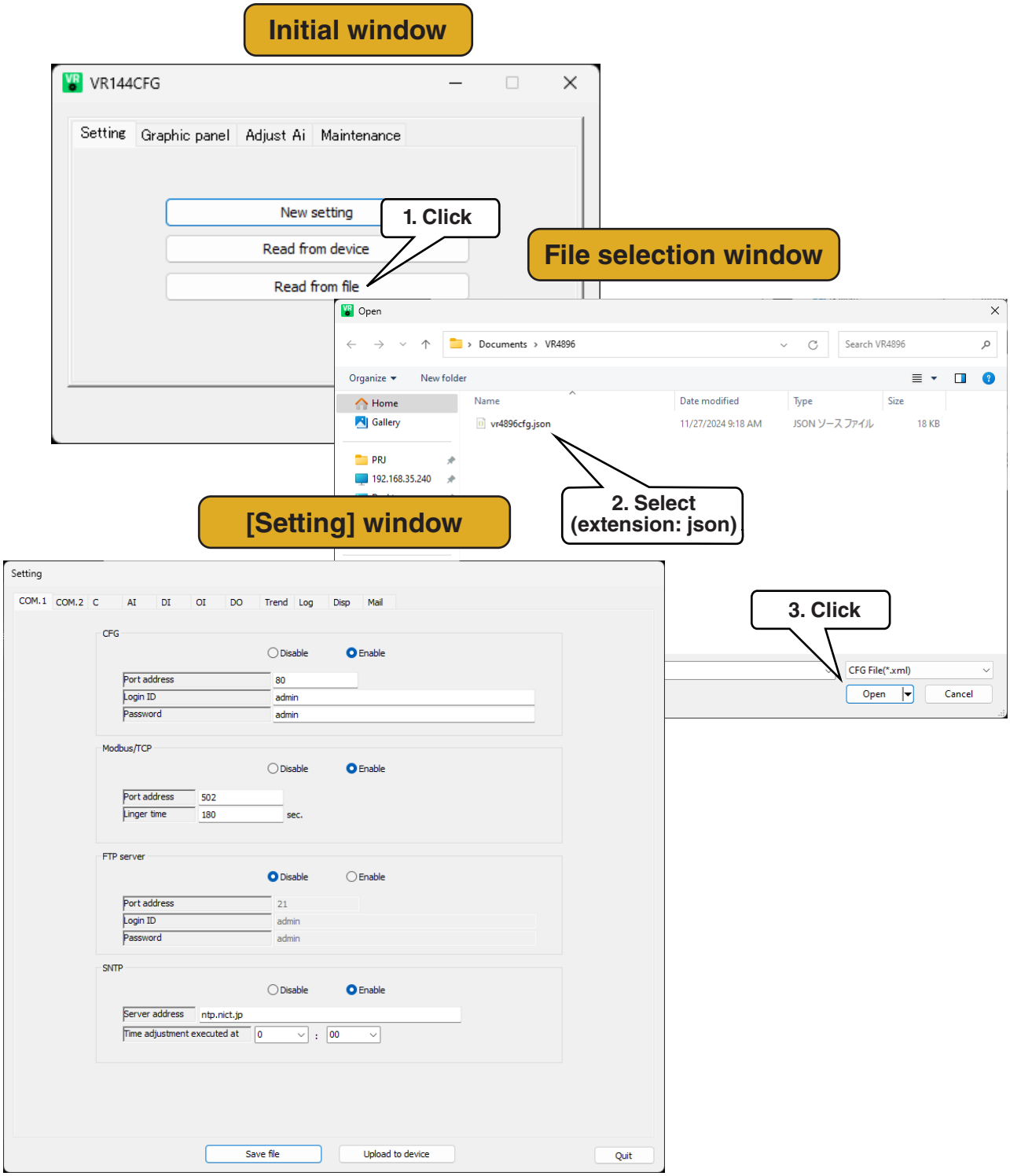


Default value on [Login] window

Parameter	Default
Domain name or IP address	192.168.0.10 ➔ Changeable in 4.3.10.7 Network setting.
Port address	80 ➔ Changeable in 3.2 Communication setting.
Login ID	admin ➔ Changeable in 3.2 Communication setting.
Password	admin ➔ Changeable in 3.2 Communication setting.

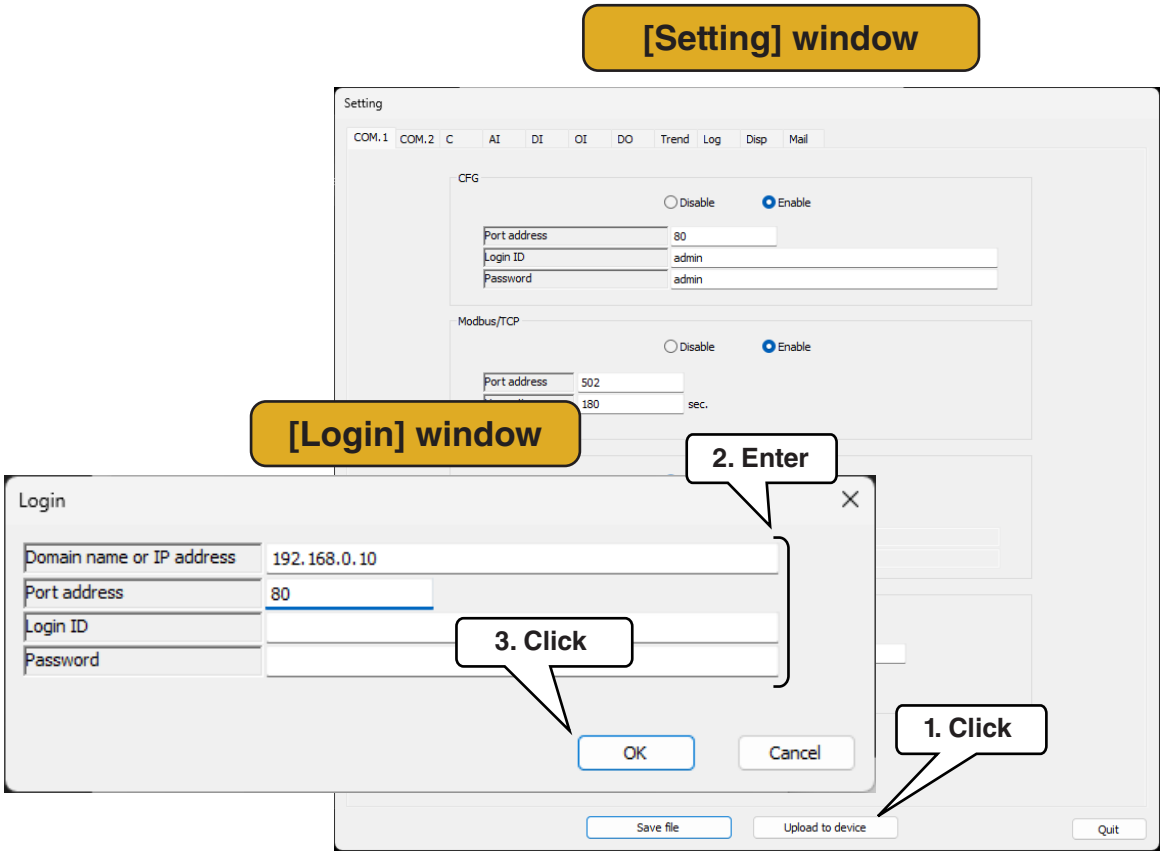
2.3.4.3 Reading from file

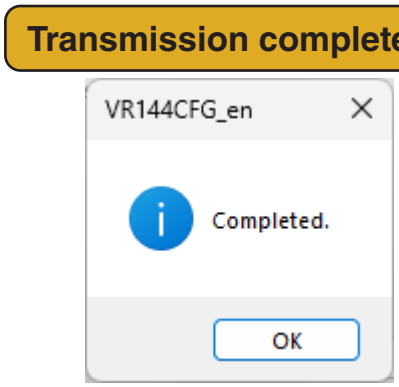
Click [Read from file] button to read out any setting file for the VR144E-G16 saved in the PC.
File selection window appears. Select the file to be read (extension: json).
The imported setting values are reflected on [Setting] window. Various settings and changes can be performed on [Setting] window.



2.3.5 Transmitting the setting to the device

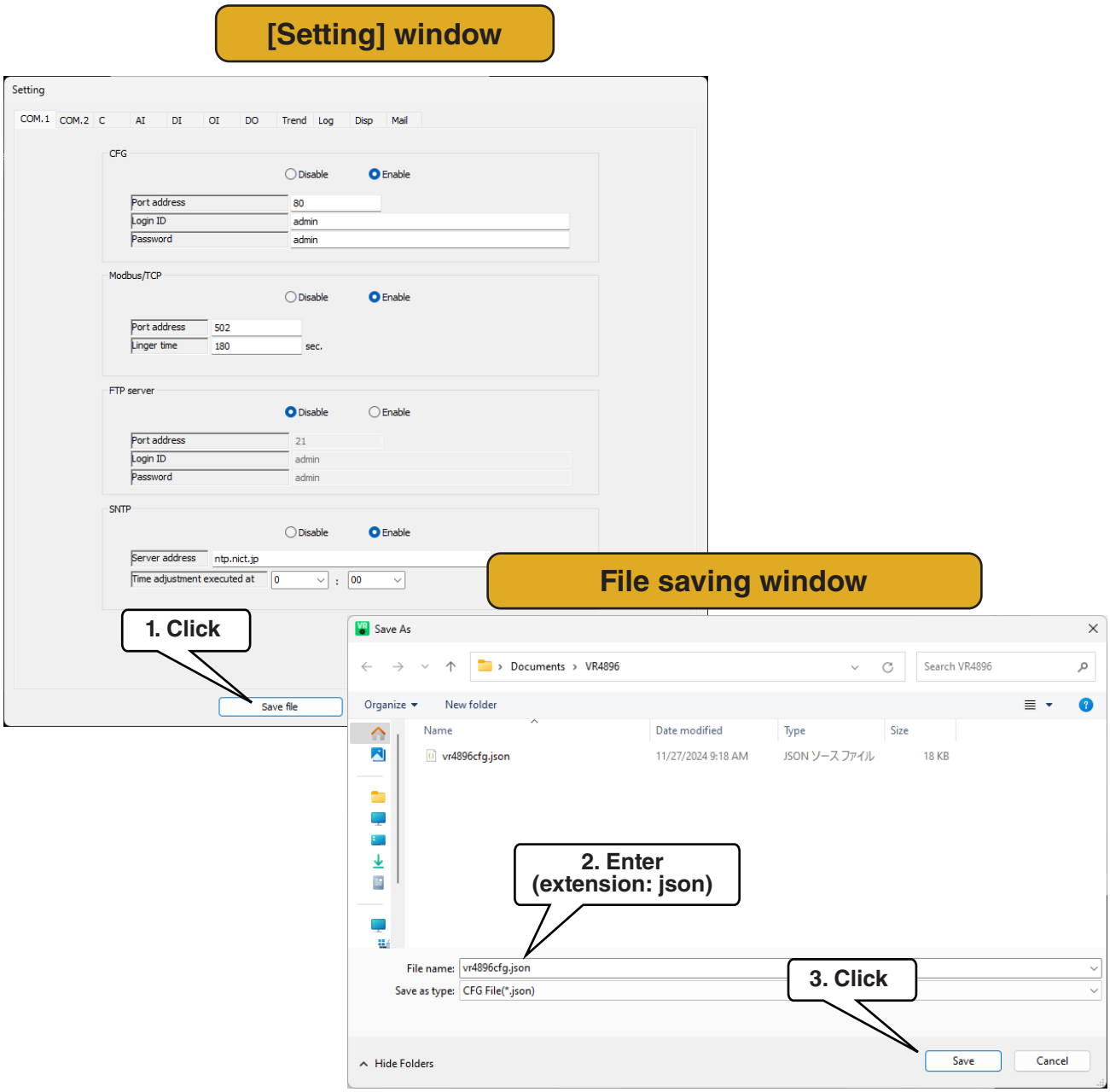
After completing the settings, click [Upload to device] button to transmit the settings to the device.
On completing transmission, [Completed] message appears.
(For [Login] window, refer to 2.3.4.2 Reading from device.)





2.3.6 Saving the setting to file

After completing the settings, click [Save file] button to save the settings to the PC.



3. Setting

3.1 Setting flow

Before starting recording or reporting with the VR144E-G16, configure the settings according to the following procedure using the Configurator Software (model: VR144CFG).

After turning on the device,
connecting to the Configurator Software. ➔ 2.3.4 VR144E-G16 setting

▼

Communication setting ➔ 3.2 Communication setting

▼

Connection setting ➔ 3.3 Connection setting

▼

I/O setting ➔ 3.4 I/O setting

▼

Trend/log setting ➔ 3.5 Trend setting, 3.6 Log setting

▼

Display setting ➔ 3.7 Display setting

▼

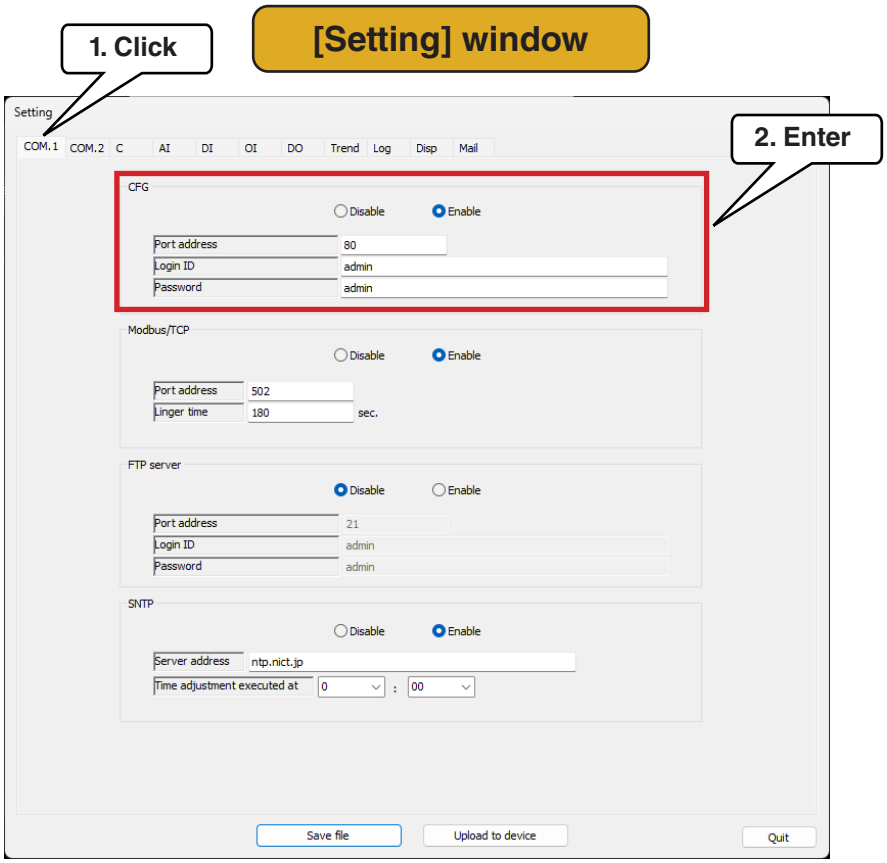
E-mail reporting setting ➔ 3.8 E-mail reporting setting

3.2 Communication setting

Configure various communication settings with the VR144E-G16.

3.2.1 CFG

Configure the connection settings between the VR144E-G16 and VR144CFG.
Click [COM.1] tab and set parameters according to the table below.



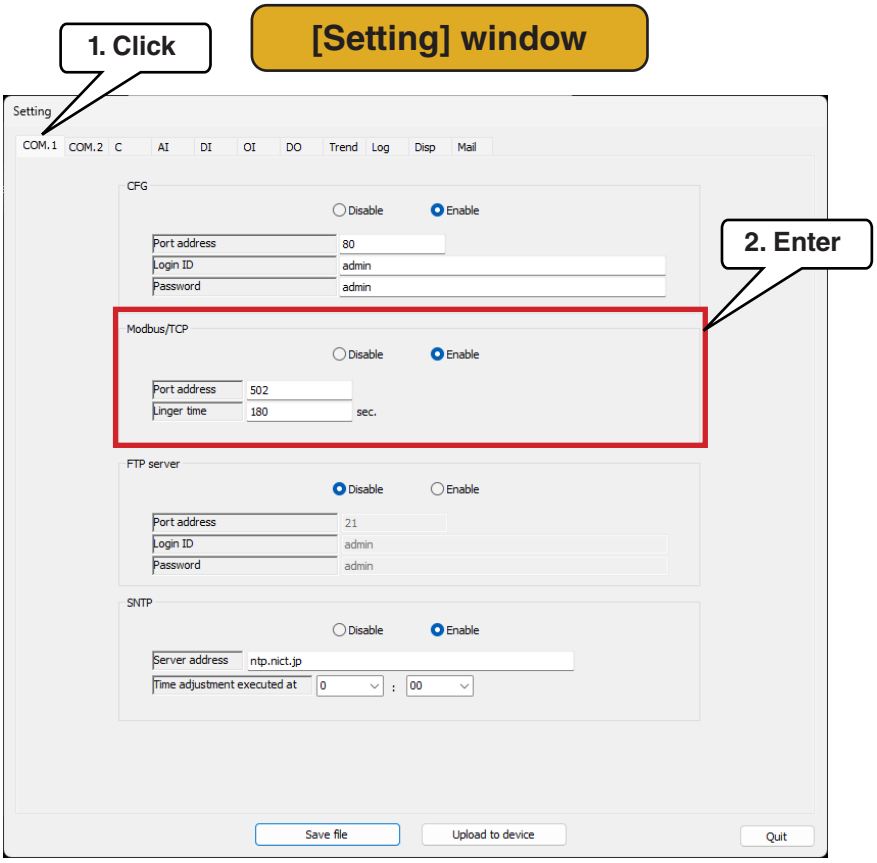
Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of using CFG function.
Port address	Set the port address within 1 to 65535.
Login ID	Set login ID within 32 characters. (alphanumeric characters and "_")
Password	Set password within 32 characters. (alphanumeric characters and "_")

CAUTION

Disabling CFG will disable communication between the VR144CFG and the VR144E-G16.

3.2.2 Modbus/TCP (server)

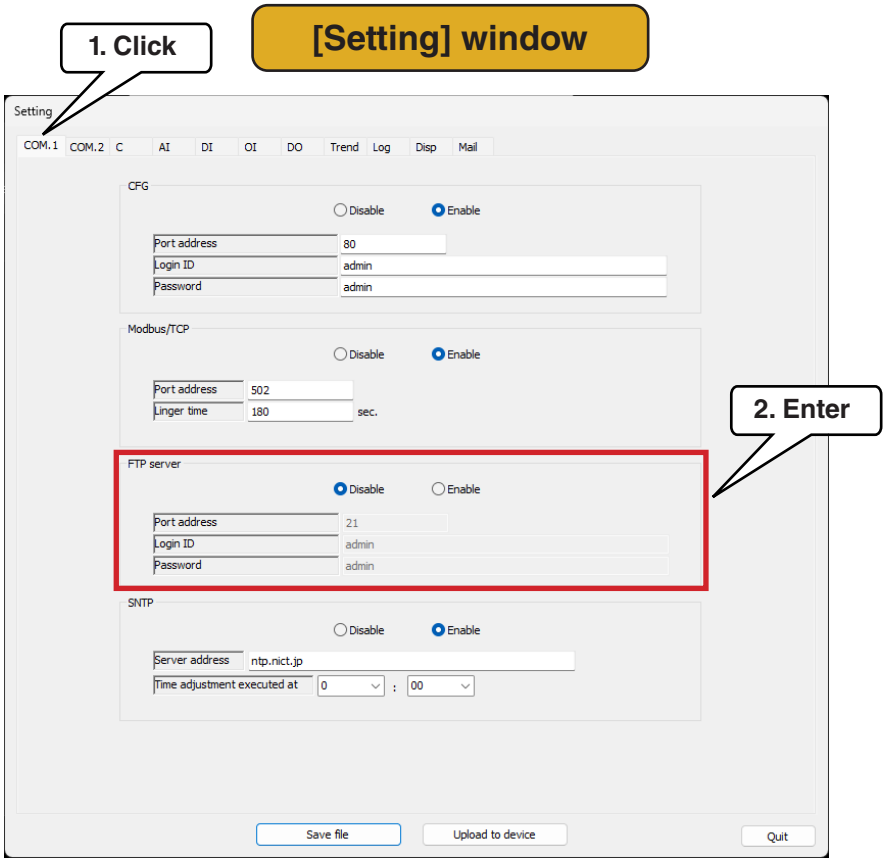
Configure the Modbus/TCP server settings for the VR144E-G16.
Click [COM.1] tab and set parameters according to the table below.



Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of using Modbus/TCP server function.
Port address	Set the port address of Modbus/TCP within 1 to 65535.
Linger time	Set the time until communication timeout within 1 to 600 (sec.)

3.2.3 FTP server

Configure the FTP server settings for the VR144E-G16.
Click [COM.1] tab and set parameters according to the table below.



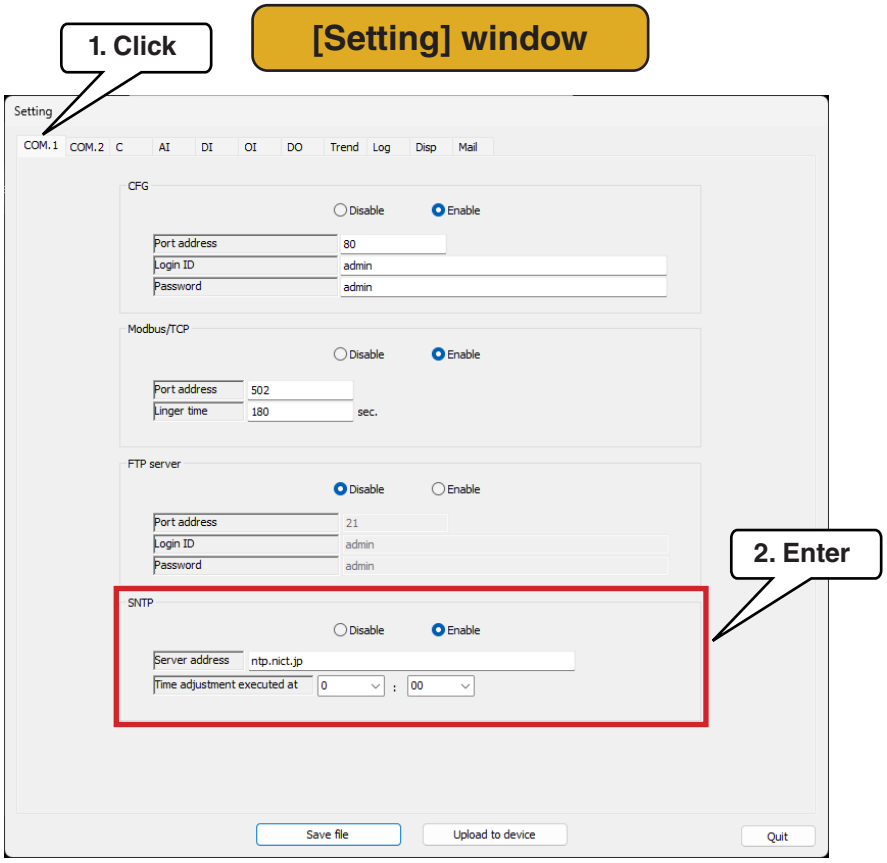
Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of using FTP server function.
Port address	Set the port address of FTP server within 1 to 65535.
Login ID	Set the login ID within 32 characters. (alphanumeric characters and "_")
Password	Set the password within 32 characters. (alphanumeric characters and "_")

NOTE

Port address 45967 to 45970 are used for PASV.

3.2.4 SNTP

Configure the SNTP server settings for the VR144E-G16.
Click [COM.1] tab and set parameters according to the table below.

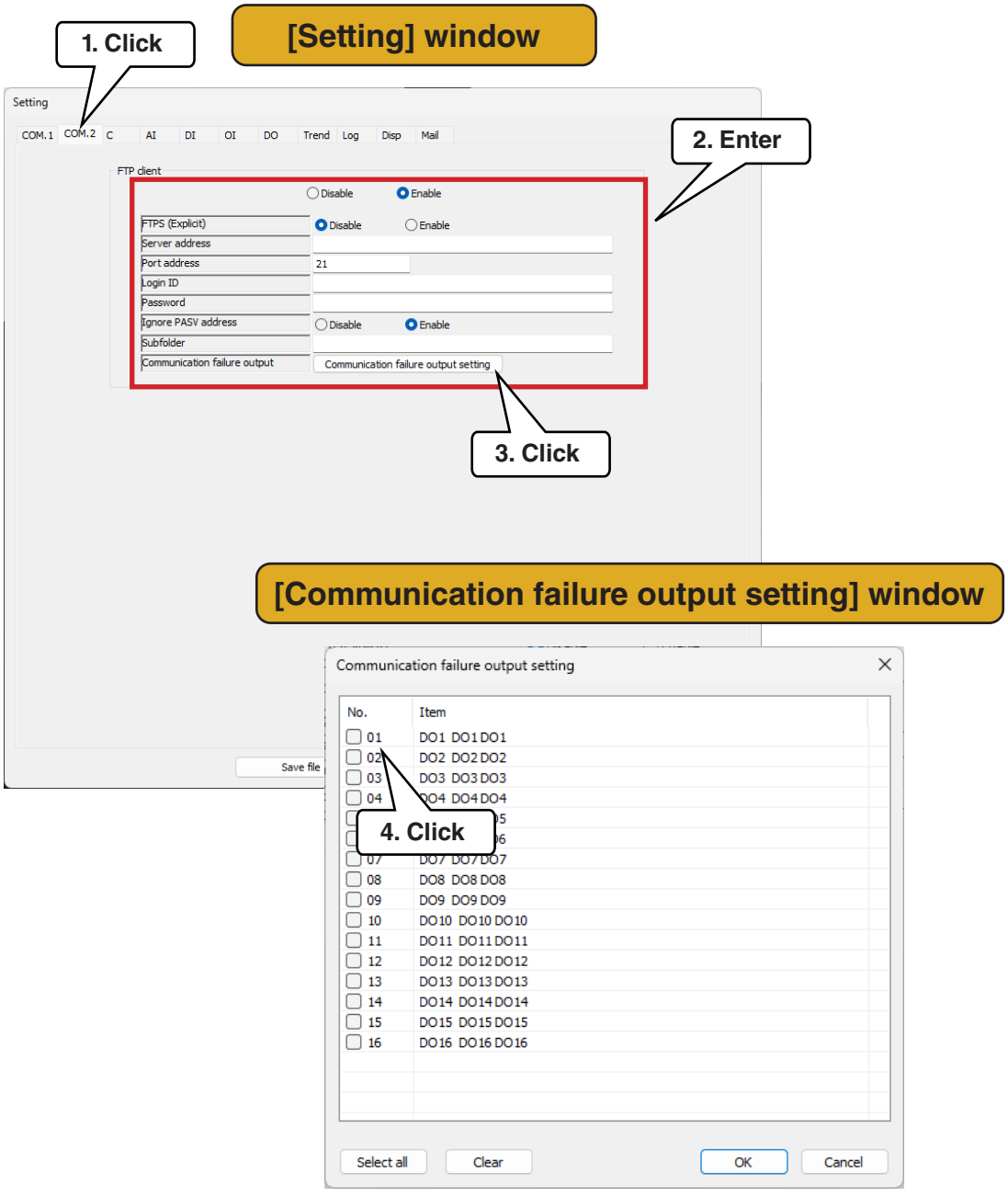


Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of using SNTP client function.
Server address	Set the SNTP server address within 32 characters
Time adjustment executed at	Set the time when time adjustment will be performed. (0:00 to 23:59)

3.2.5 FTP client

Configure the FTP client settings for the VR144E-G16.

1. Click [COM.2] tab and enter the parameters according to the table below.
2. Click [Communication failure output setting] button to configure DO processing setting in case of communication failure. Click [Select all] or [Clear] button to enable batch setting.
   When selecting the checkbox, DO is output in case of communication failure.



Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of using FTP client function.
FTPS (Explicit)	Set [Disable] or [Enable]. Set [Enable] in case of connecting in Explicit mode.
Server address	Set the FTP server address. (within 64 characters)
Port address	Set the port address of the FTP server within 1 to 65535.
Login ID	Set the login ID. (within 32 characters)
Password	Set the password. (within 32 characters)
Ignore PASV address	Set [Disable] or [Enable]. Set [Enable] in case of ignoring the IP address returned by the PASV command.
Subfolder	Set the subfolder. (within 64 characters)

3.3 Connection setting

Configure connection settings between the VR144E-G16 and remote I/O or SLMP-compatible devices.
Eight connections can be set. (C1 to C8)

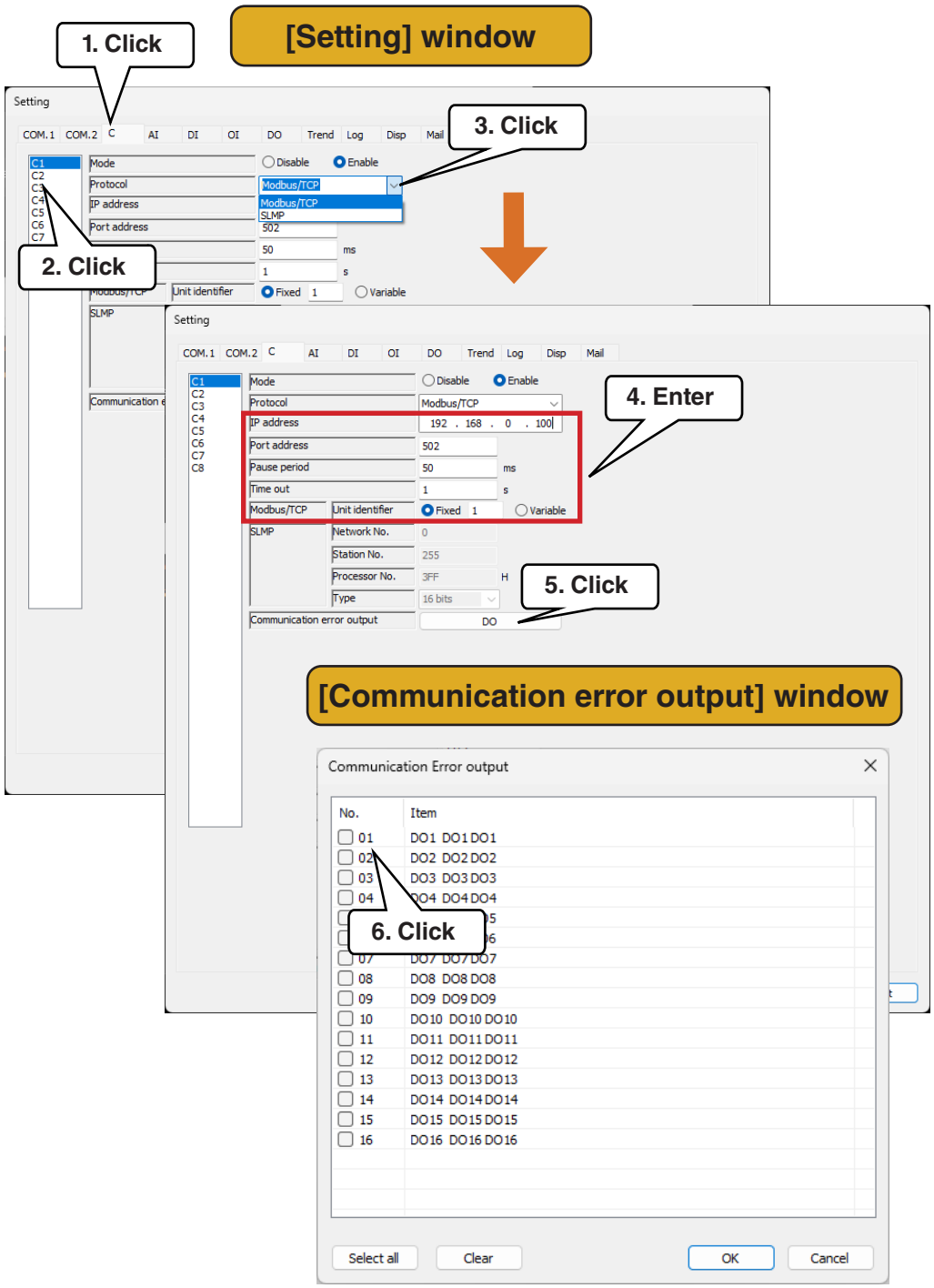
3.3.1 Connection setting

When communicating with remote I/O or SLMP-compatible device, set the IP address of each device per connection.

3.3.1.1 Modbus/TCP connection

Configure the Modbus/TCP connection (client) setting.

1. Click [C] tab.
2. Click the connection to be set to display the current settings.
3. Click the protocol drop-down list and select [Modbus/TCP].
4. Set parameters according to the table on the next page.
5. Click [DO] button to configure DO processing setting in case of communication failure. Click [Select all] or [Clear] button to enable batch setting.
   When the checkbox is selected, DO is output in case of communication failure.

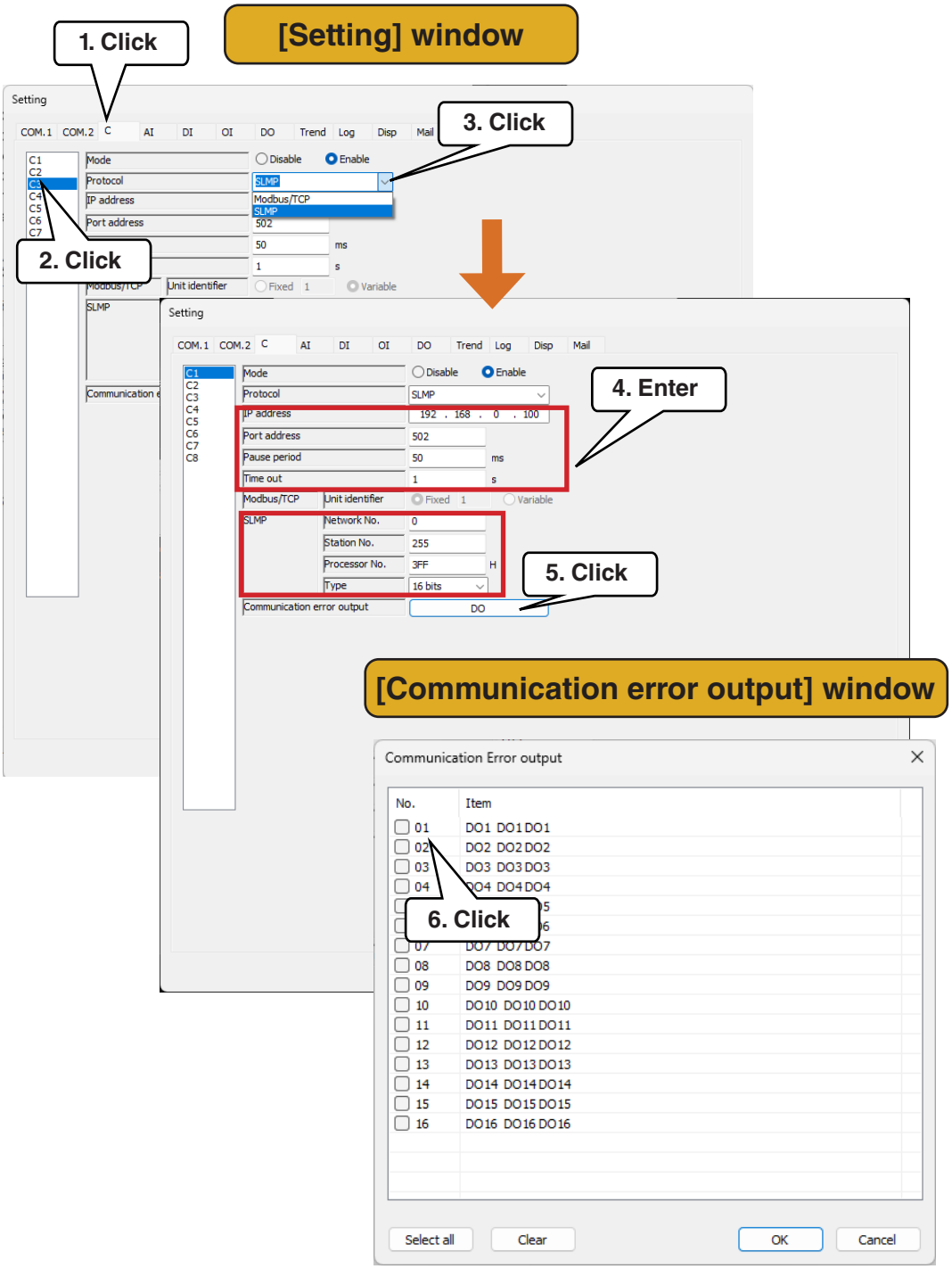


Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of communicating with remote I/O or SLMP-compatible device.
Protocol	Select [Modbus/TCP] or [SLMP].
IP address	Set the IP address of the connection destination. (0.0.0.0 to 255.255.255.255)
Port address	Set the port address within 1 to 65535.
Pause period	Set the communication interval with the connection destination by the millisecond. (50 to 30000)
Time out	Set the time until communication timeout with the connection destination by the millisecond. (1 to 60)
Modbus/TCP Unit identifier	Select [Fixed] or [Variable]. Select [Variable] when multiple nodes are used in 1 connection. In case of [Fixed], set in the range of 0 to 255.

3.3.1.2 SLMP connection

Configure the SLMP connection (client) setting.

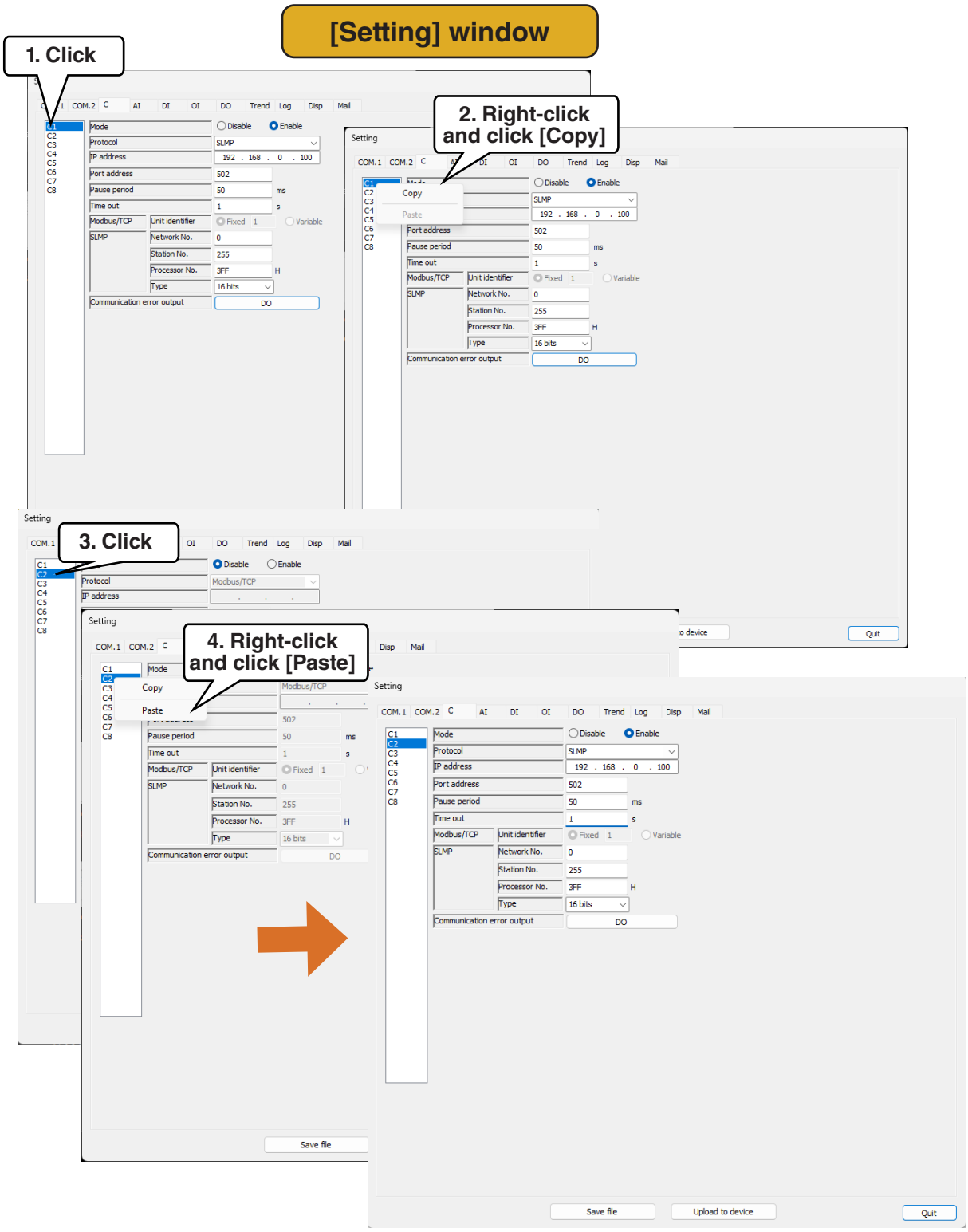
1. Click [C] tab.
2. Click the connection to be set to display the current settings.
3. Click the protocol drop-down list and select [SLMP].
4. Set parameters according to the table below.
5. Click [DO] button to configure DO processing setting in case of communication failure. Click [Select all] or [Clear] button to enable batch setting.
   When selecting the checkbox, DO is output in case of communication failure.



Parameter	Description
Disable/Enable	Set [Disable] or [Enable]. Set [Enable] in case of communicating with remote I/O or SLMP-compatible device.
Protocol	Select [Modbus/TCP] or [SLMP].
IP address	Set the IP address of the connection destination. (0.0.0.0 to 255.255.255.255)
Port address	Set the port address within 1 to 65535.
Pause period	Set the communication interval with the connection destination by the millisecond. (50 to 30000)
Time out	Set the time until communication timeout with the connection destination by the millisecond. (1 to 60)
SLMP Network No.	Set the SLMP Network No. within 0 to 255.
SLMP Station No.	Set the SLMP Station No. within 1 to 255.
SLMP Processor No.	Set the SLMP Processor No. within 0x0000 to 0xFFFF.
SLMP Type	Select [16 bits] or [32 bits].

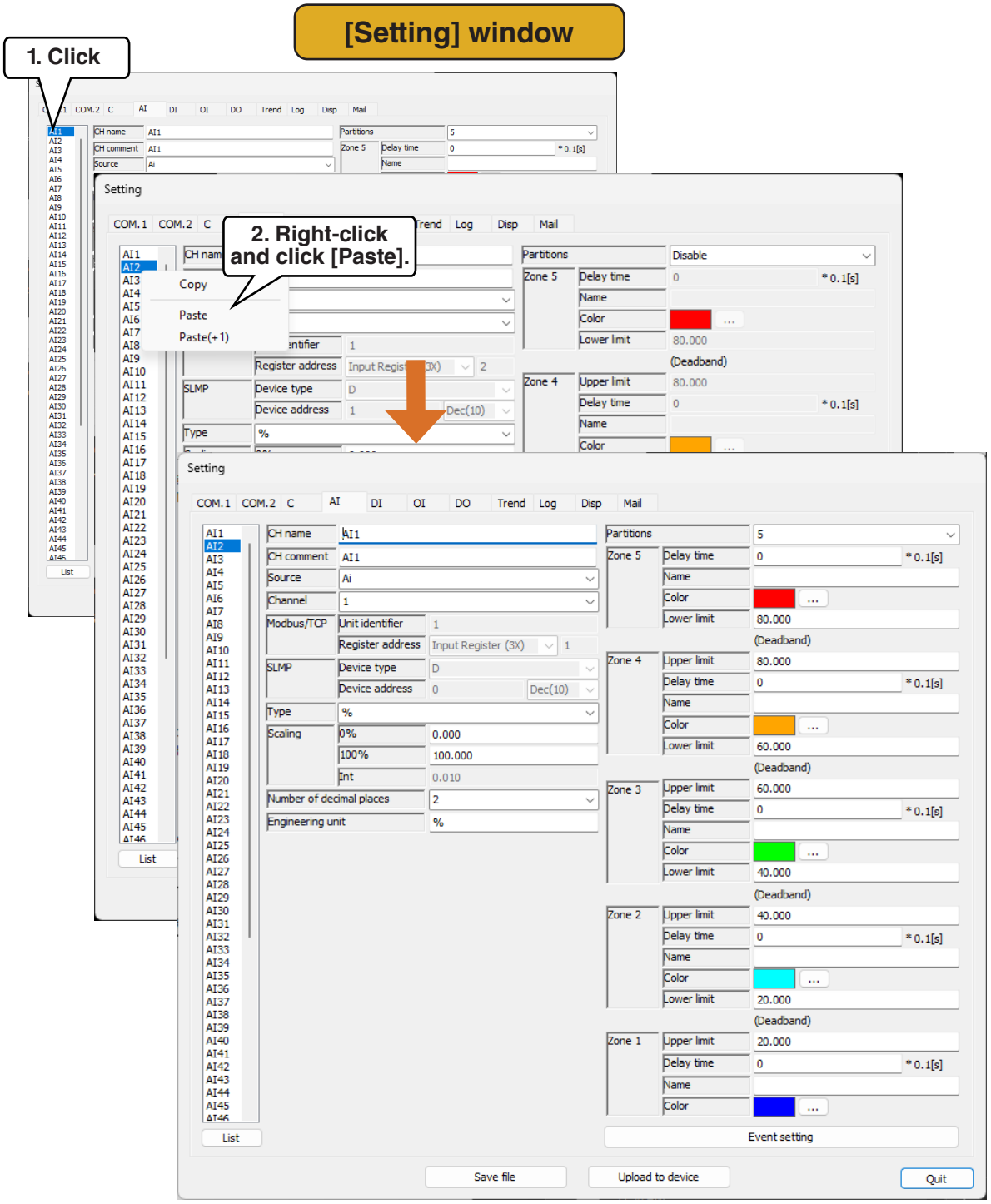
3.3.2 Copying the connection setting

It is possible to copy the connection settings configured on [Setting] window and to modify only the necessary parameters.



3.3.2.1 Pasting

Copied I/O settings can be pasted. The procedure is common to each I/O setting window.
Pasting is possible only in the same I/O tab.



3.3.3 SLMP-compatible device

Up to eight SLMP-compatible devices can be connected to one VR144E-G16.
Assign separate IP addresses to SLMP-compatible devices (C1 to C8) that are different from the VR144E-G16.

■SLMP-COMPATIBLE DEVICES THAT CAN BE CONNECTED

- MELSEC iQ-R Series CPU units (Mitsubishi Electric)
- MELSEC iQ-F Series CPU units (Mitsubishi Electric)
- MELSEC Q Series CPU units (Mitsubishi Electric)

(Tested and verified)
- R04CPU
- FX5U-32M
- Q03UDECPU

■CONNECTING WITH SLMP-COMPATIBLE DEVICE

The VR144E-G16 can be connected to SLMP-compatible devices via TCP/IP over Ethernet.
Register the SLMP device on the Ethernet device setting window and set as follows:

- Communication data code: Binary
- Communication method: SLMP
- Protocol: TCP
- IP address: IP address specified in the connection setting of the VR144E-G16
- Port address: Port address specified in the connection setting of the VR144E-G16

NOTE

Refer to the Users Manual of each product for the setting of the SLMP-compatible device.

3.4 I/O setting

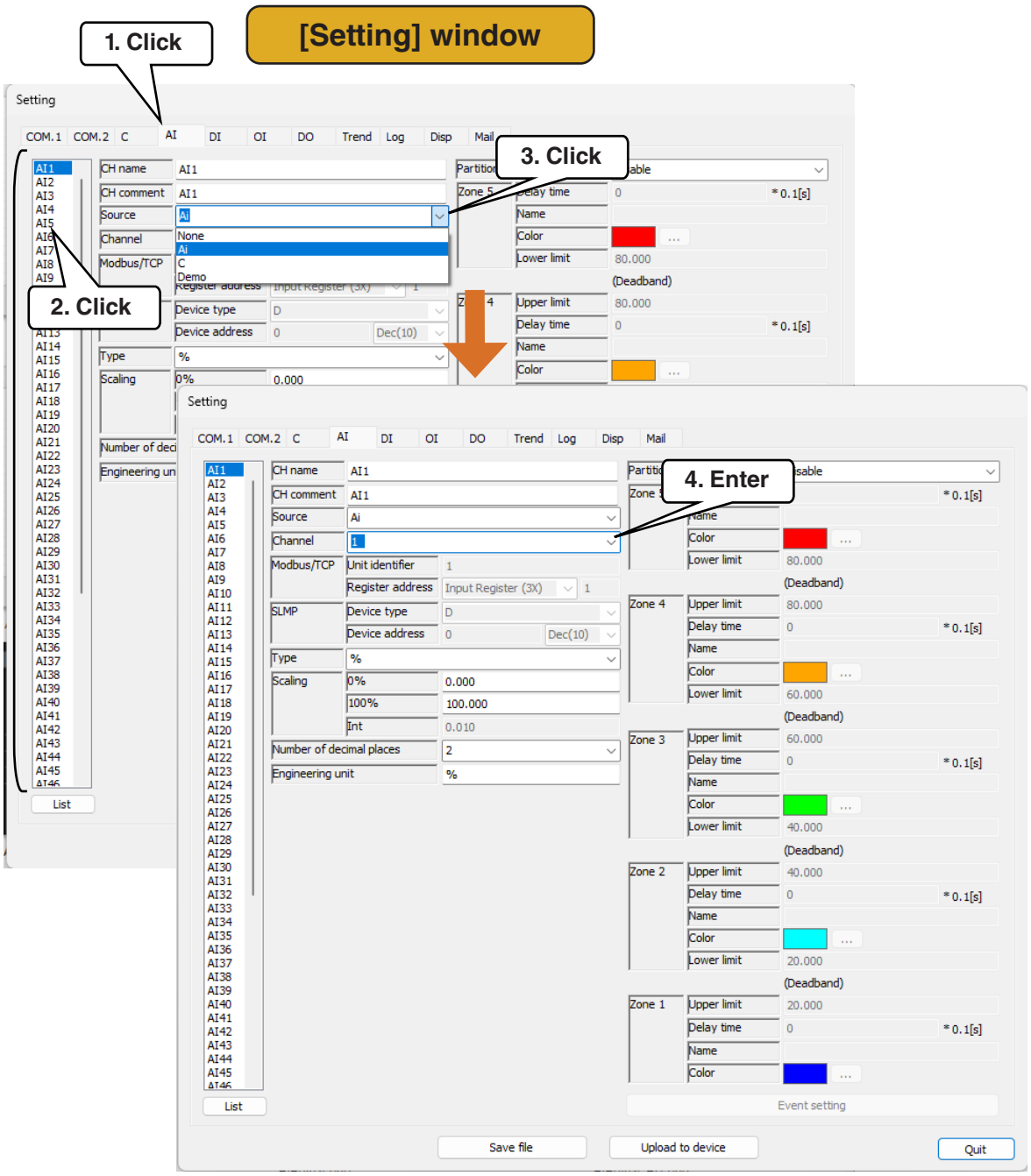
Configure I/O signal settings with the VR144E-G16.
It is possible to assign remote I/O and SLMP-compatible device in addition to the built-in I/O.

3.4.1 Analog input (AI)

Analog input signals can be monitored for maximum of 64 points (AI1 to AI64) using the VR144E-G16.
Assign the analog input from built-in I/O, remote I/O or SLMP-compatible device to the VR144E-G16 according to the following procedure.

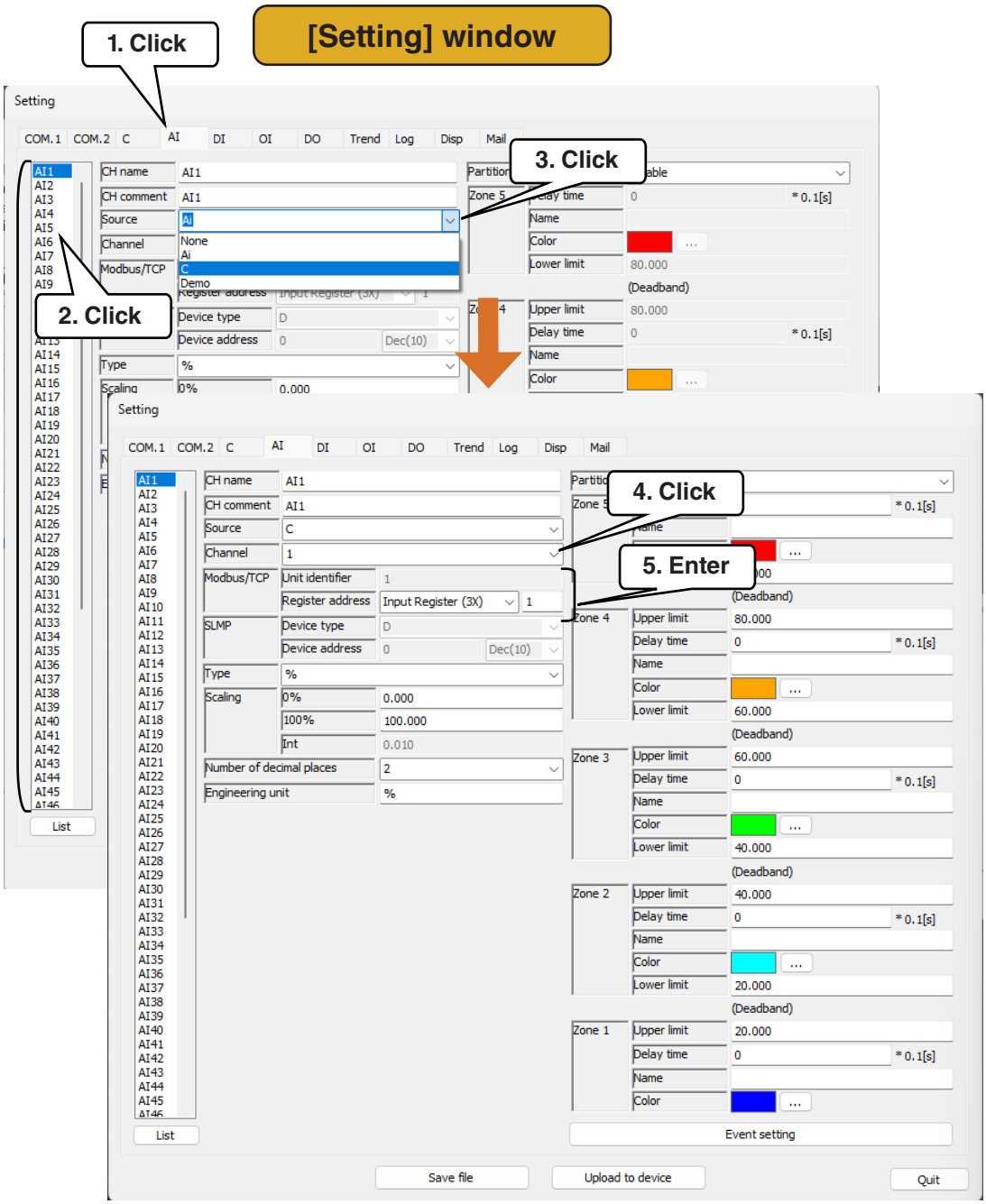
3.4.1.1 Assignment analog input to built-in I/O

1. Click [AI] tab.
2. Click the channel to be set to display the current settings.
3. Click the source drop-down list and select [Ai].
4. Set the channel of built-in Ai.



3.4.1.2 Assignment analog input to remote I/O

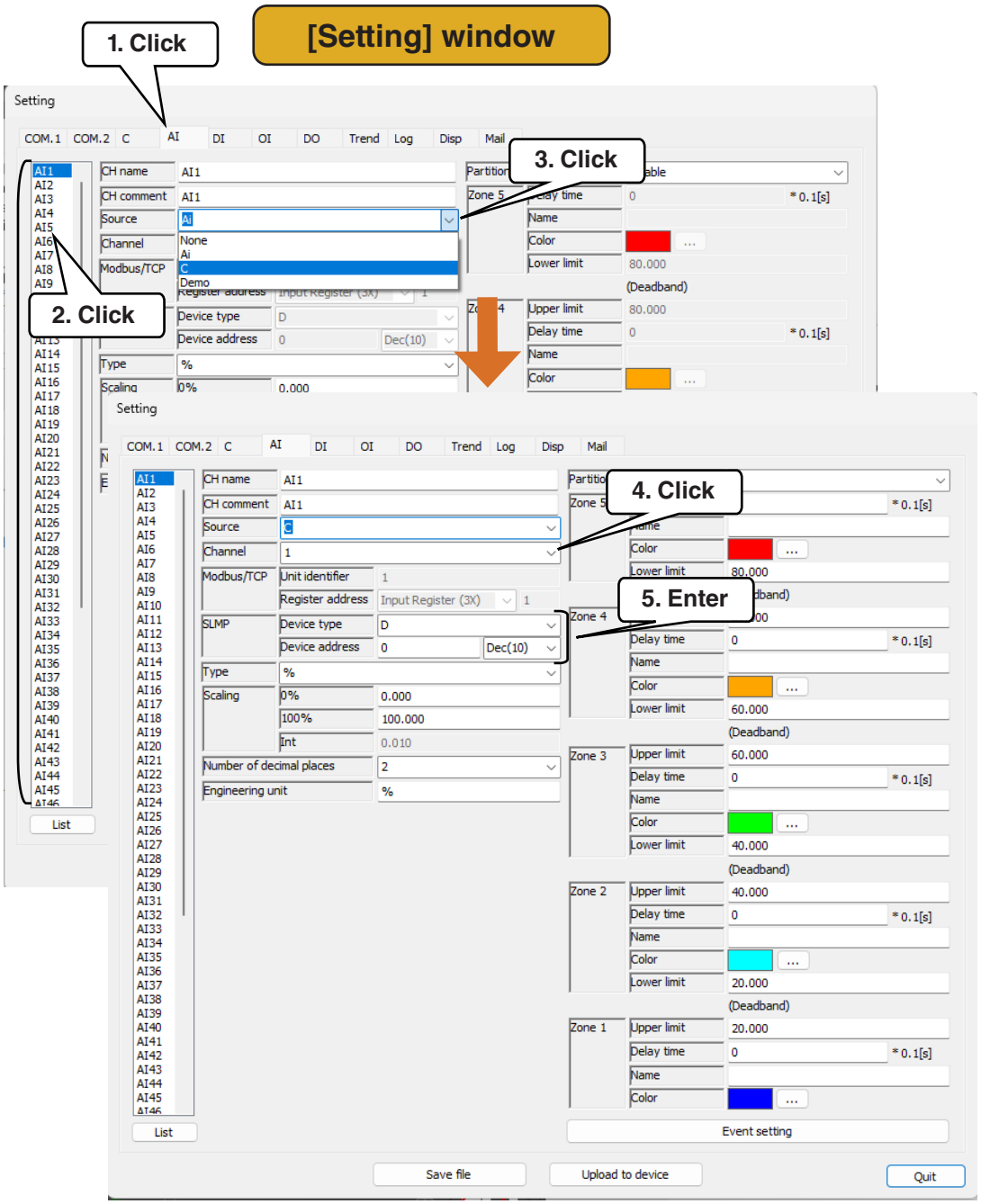
1. Click [AI] tab.
2. Click the channel to be set to display the current settings.
3. Click the source drop-down list and select [C].
4. Set the channel for connection setting. In case that the selected connection channel is Modbus/TCP, the following window appears and assigning remote I/O becomes possible. ➔ 3.3.1.1 Modbus/TCP connection
5. Set parameters according to the table below.



Parameter	Description
Modbus/TCP Unit identifier	In case that the unit identifier of the selected channel is [Variable], set the unit identifier number in the range of 0 to 255. ➔ 3.3.1.1 Modbus/TCP connection
Modbus/TCP Register address	Select [Input Register (3X)] or [Holding Register (4X)]. Set the register address in the range of 0 to 65536.

3.4.1.3 Assignment analog input to SLMP-compatible device

1. Click [AI] tab.
2. Click the channel to be set to display the current settings.
3. Click the source drop-down list and select [C].
4. Set the channel for connection setting. In case that the selected connection channel is SLMP, the following window appears and assigning SLMP becomes possible. ➔ 3.3.1.2 SLMP connection
5. Set parameters according to the table below.

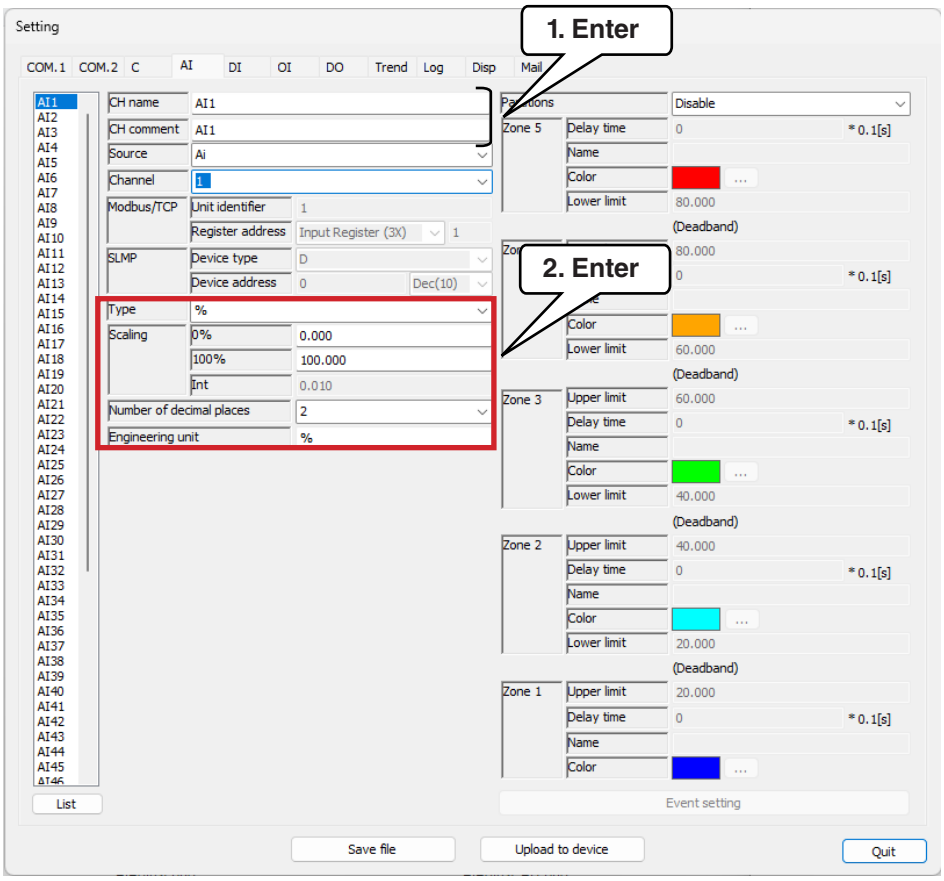


Parameter	Description
Device type	Select the device type of the SLMP-compatible device to be connected.
Device address	Enter the address of the SLMP-compatible device to be connected. (Dec(10): 0 to 4294967295, Hex(16): 0x00000000 to 0xFFFFFFFF, Oct(8): 0 to 037777777777)

3.4.1.4 Basic setting (AI)

After completing the assignment, configure the following basic setting.

[Setting] window

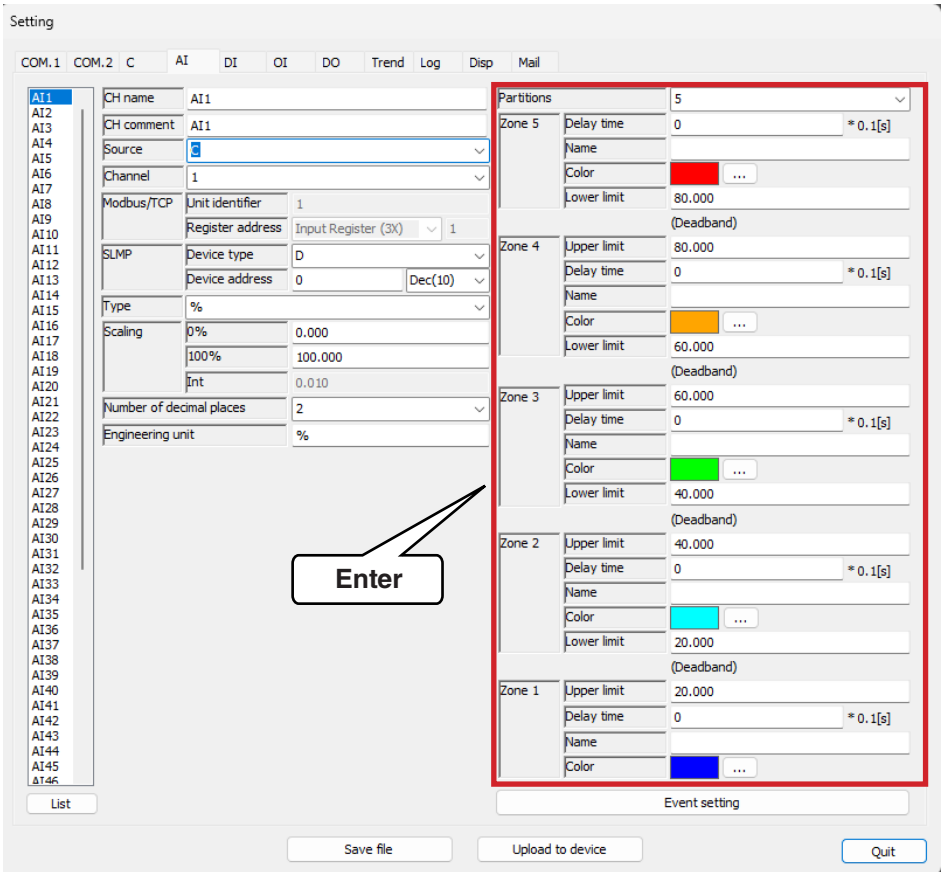


Parameter	Description
CH name	Set the channel name within 16 characters.
CH comment	Set the comment for the channel within 16 characters such as the tag name, etc.
Type	Select the data type from the following 3 types. • % %×100 format data (-500 to 10500) (equivalent to the voltage/current data of remote I/O) • Int Signed 16 bit integer format data (-32768 to 32767) (equivalent to the temperature data of remote I/O) • Uint Unsigned 16 bit integer format data (0 to 65535)
Scaling	• If the data type is [%] Set the actual corresponding values at 0% and 100% respectively as numeric values. • If the data type is [Int] or [Uint] Set the multiplication factor in order to convert the data to its actual value. For example, if the temperature data is the actual value × 10, enter [0.1].
Number of decimal places	Set the number of digits after the decimal point for the values displayed on the trend data, etc. Set from 0, 1, 2 and 3.
Engineering unit	Set the engineering unit corresponding to the actual value set in the [Scaling]. Set within 8 characters.

3.4.1.5 Zone setting (AI)

Configure zone setting corresponding to the input values. Up to 5 zones can be set, and deadbands can also be set between zones.

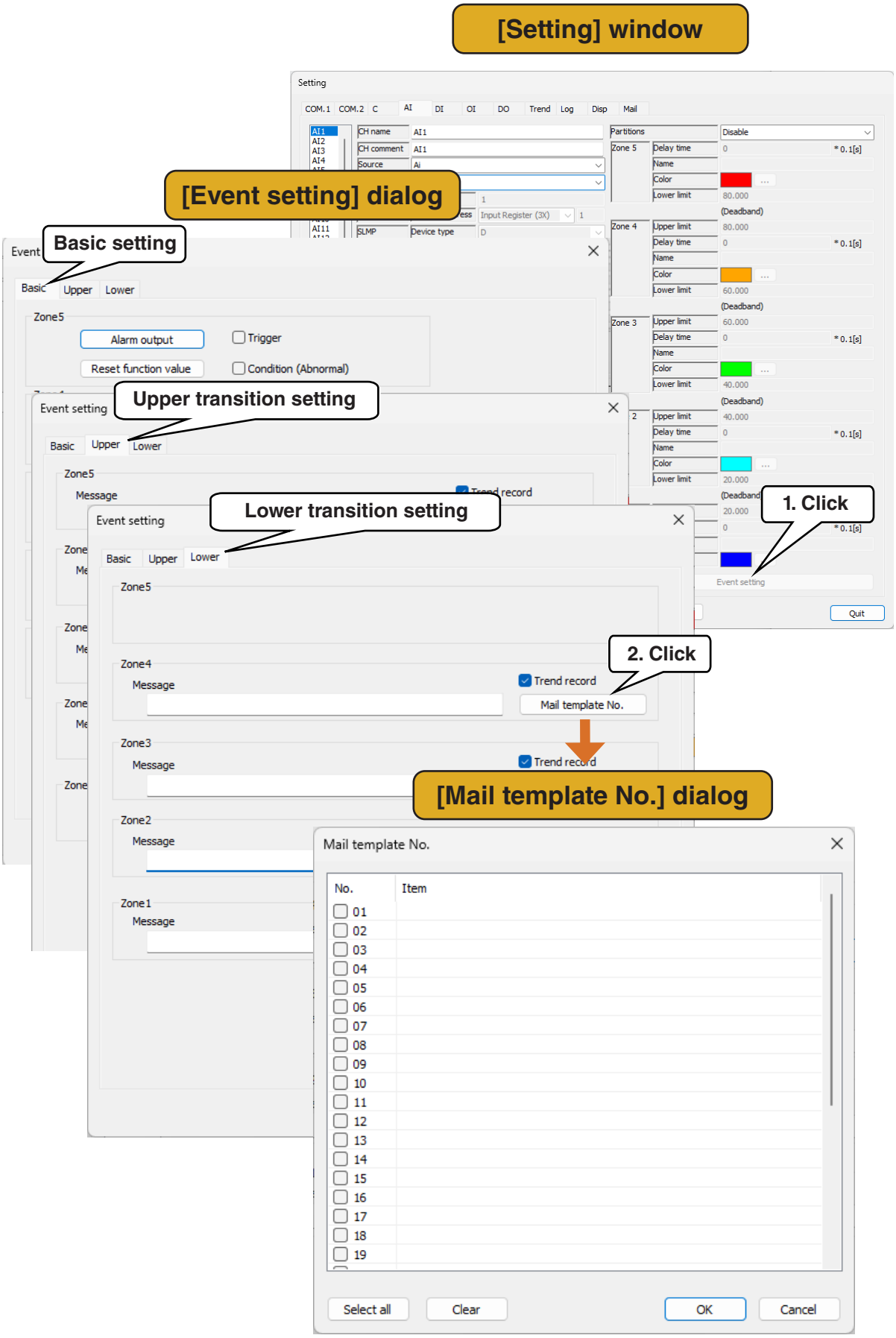
[Setting] window



Parameter	Description
Partitions	Set the number of zones to be used. Select from Disable / 2 / 3 / 4 / 5.
Name	Set the name for each zone within 16 characters.
Color	Set the color to represent each zone which will be displayed on the trend data.
Delay time	Set the time required for the transition from another zones to the corresponding zone to be confirmed in the range of 0.0 to 99.9 (sec.). When zone 1 is set to five seconds: The transition to zone 1 is confirmed five seconds after the input value changes in the state of zone 2 and becomes less than or equal to the upper limit of zone 1. It remains in zone 2 until five seconds have elapsed.
Upper limit : : : Lower limit	Set the upper and lower limit value for zones with actual values. Set as the upper limit > lower limit. • When the deadband is set When the deadband is set between zone 1 and zone 2, set the values so that the deadband is between the upper limit of zone 1 and the lower limit of zone 2. The zone transitions when the value is above the lower limit of zone 2 or below the upper limit of zone 1. Set similarly for the other zones as well. • When the deadband is not set When the deadband is not set between zone 1 and zone 2, set the same value for the upper limit of zone 1 and the lower limit of zone 2. The zone transitions when the value exceeds the upper limit of zone 1 or reaches the lower limit of zone 2. Set similarly for the other zones as well.

3.4.1.6 Event setting (AI)

An event occurs when transitting to the zone which has been set in the zone setting.



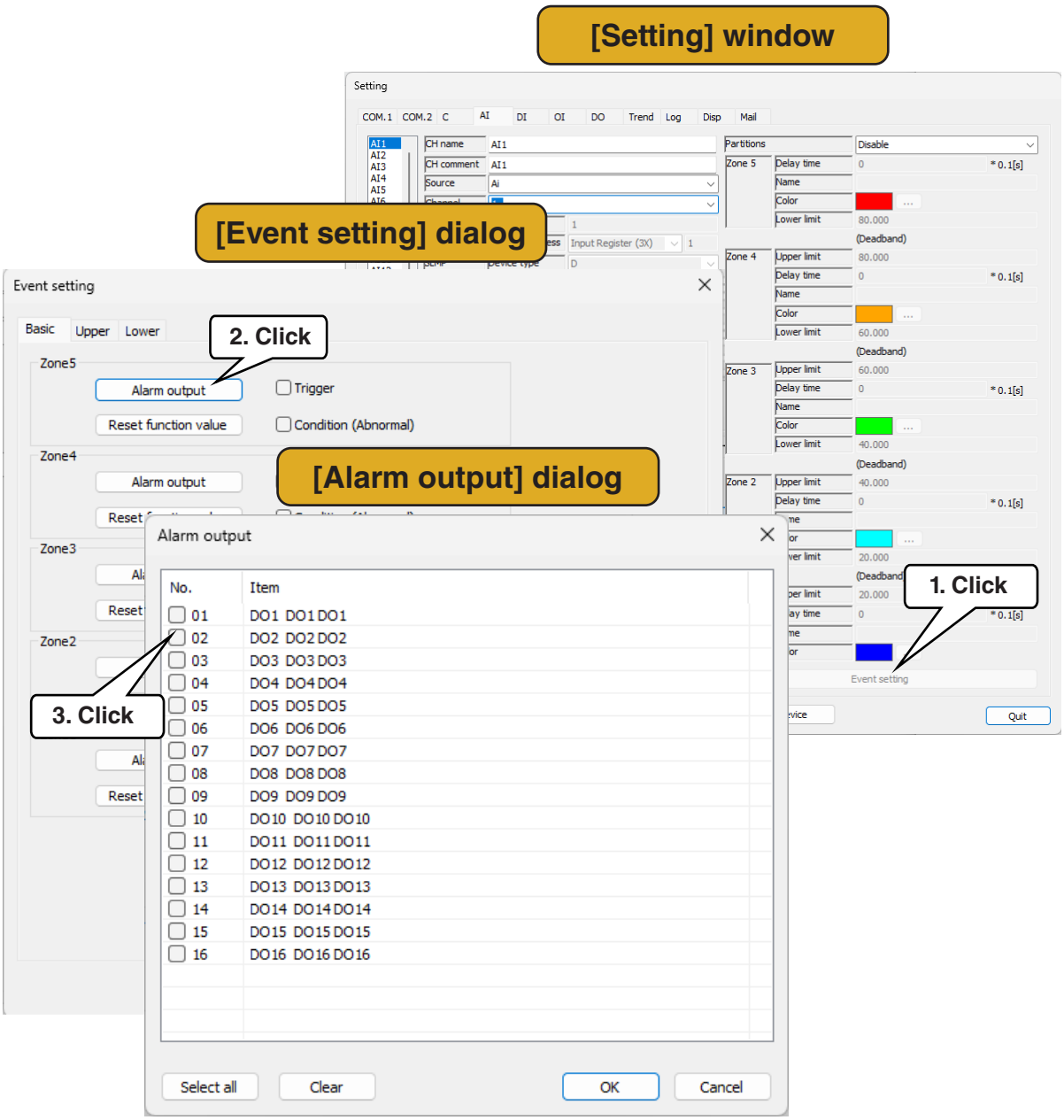
1. Click [Event setting] button on [Setting] window (AI) to display [Event setting] dialog. In case that the partitions is [Disable], [Event setting] button is disabled.
2. Set parameters according to the table below. Click [OK] button to go back to [Setting] window.
3. Click [Mail template No.] button to display [Mail template No.] dialog. An e-mail is sent according to the selected template when the input value changes and enters the corresponding zone.

Parameter	Description
Trigger	Set whether or not to perform trigger recording when the input value changes and enters the corresponding zone. Select the checkbox when performing the trigger recording. ➔ 3.5.1.3 Trigger recording
Condition (Abnormal)	Set whether or not to return from the screen saver when an event occurs.
Message	Set the message when an event occurs within 32 characters.
Trend record	Set whether or not to record a message to the trend when an event occurs. Select the checkbox when recording the message.

3.4.1.7 Alarm output setting (AI)

A specified DO can be turned ON for each zone.

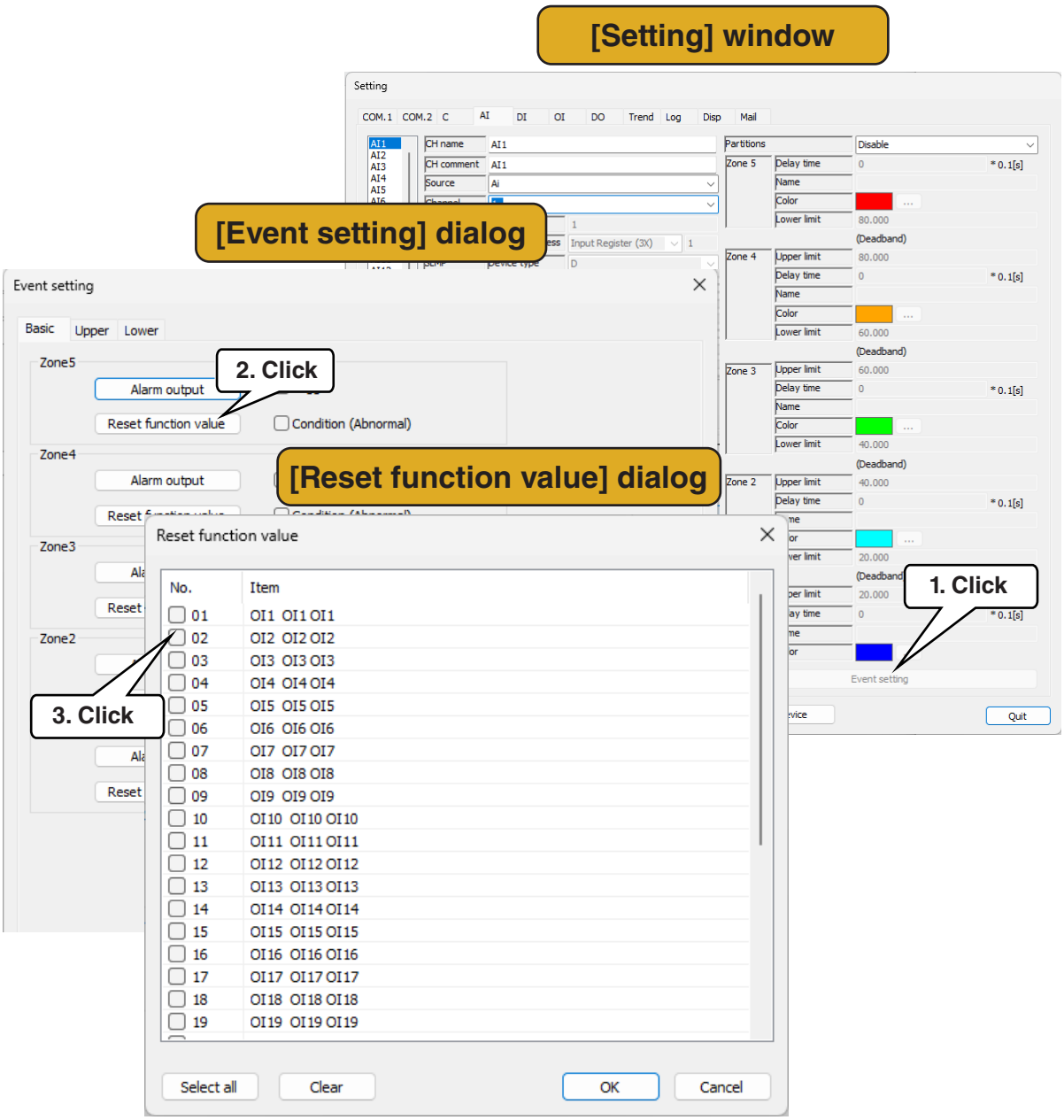
1. Click [Event setting] button on [Setting] window (AI) to display [Event setting] dialog. Click [Alarm output] button of the specified zone to display [Alarm output] dialog.
2. Select the checkbox of the DO channel to be set and click [OK].



3.4.1.8 Reset function value setting (AI)

The function value of the specified OI can be reset when zone transition occurs.

1. Click [Event setting] button on [Setting] window (AI) to display [Event setting] dialog. Click [Reset function value] button of the specified zone to display [Reset function value] dialog.
2. Select the checkbox of the OI channel to be set and click [OK].



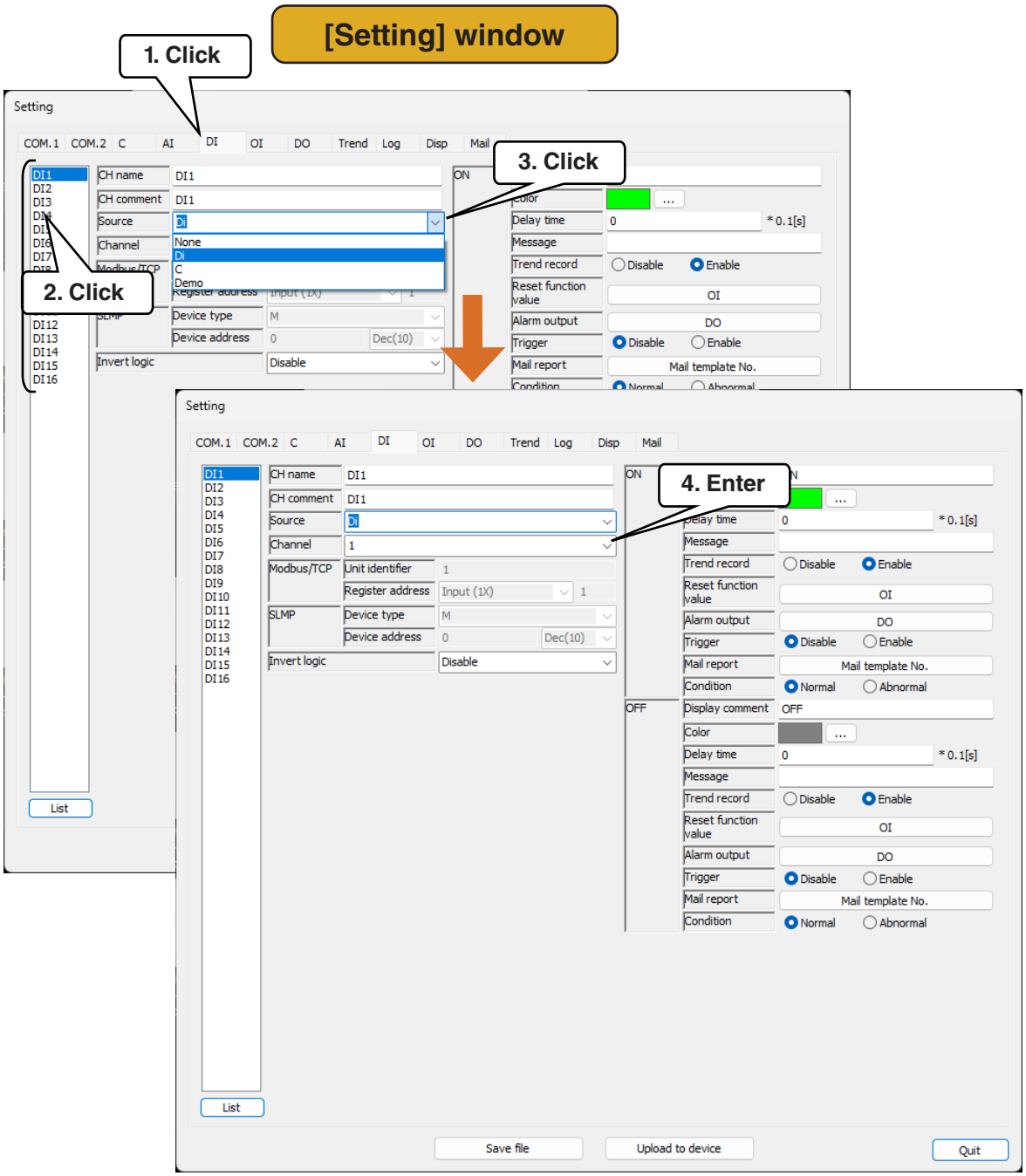
Follow the above procedure to set all the channels.
The channel setting configured on [Analog input (AI)] window can also be copied to other channels and only the required parameters can be modified.
➔ 3.4.5 Copying the I/O setting

3.4.2 Discrete input (DI)

Discrete input signals can be monitored for maximum of 16 points (DI1 to DI16) using the VR144E-G16. Assign the discrete input from built-in I/O, remote I/O or SLMP-compatible device to the VR144E-G16 according to the following procedure.

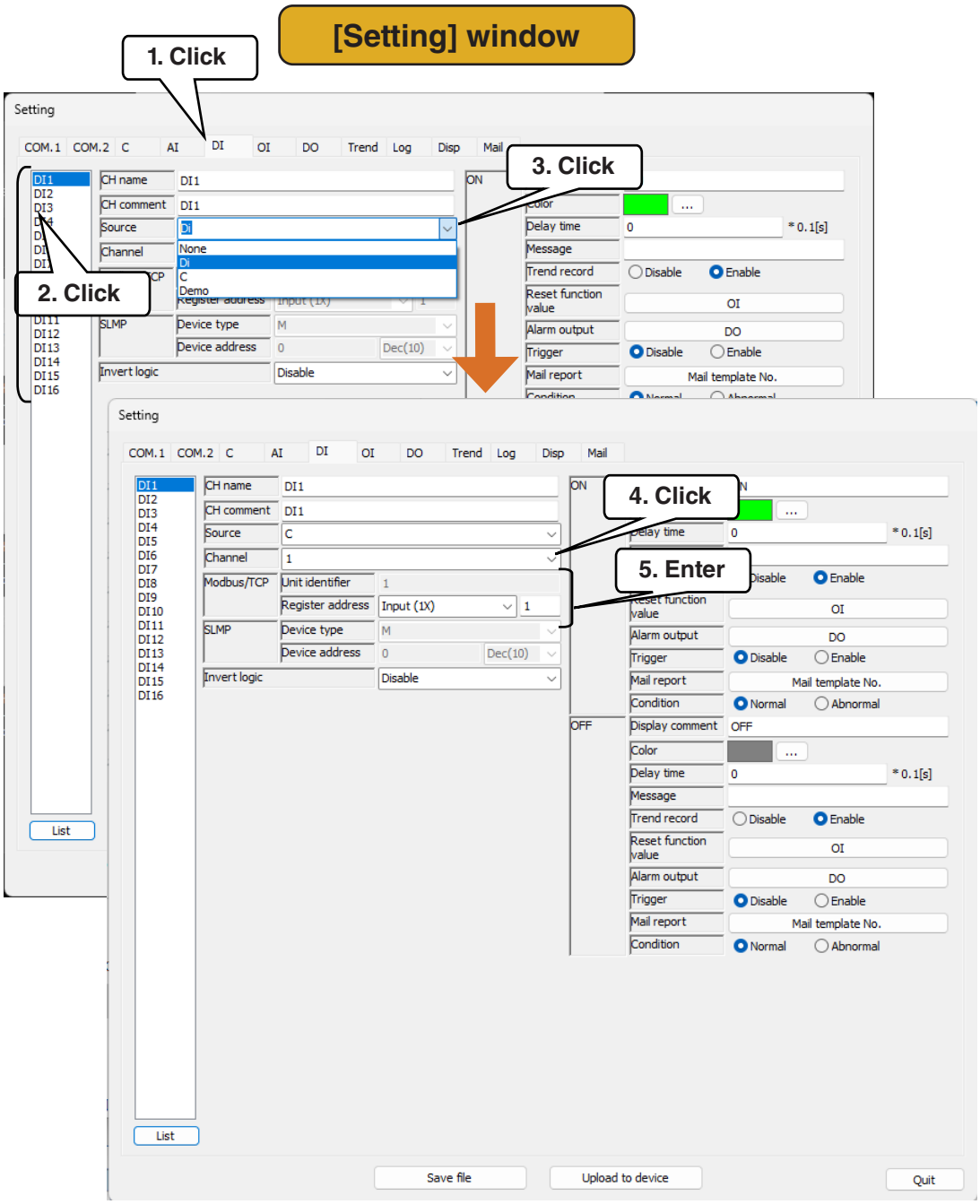
3.4.2.1 Assignment discrete input to built-in I/O

1. Click [DI] tab.
2. Click the channel to be set to display the current settings.
3. Click the source drop-down list and select [Di].
4. Set the channel of built-in Di.



3.4.2.2 Assignment discrete input to remote I/O

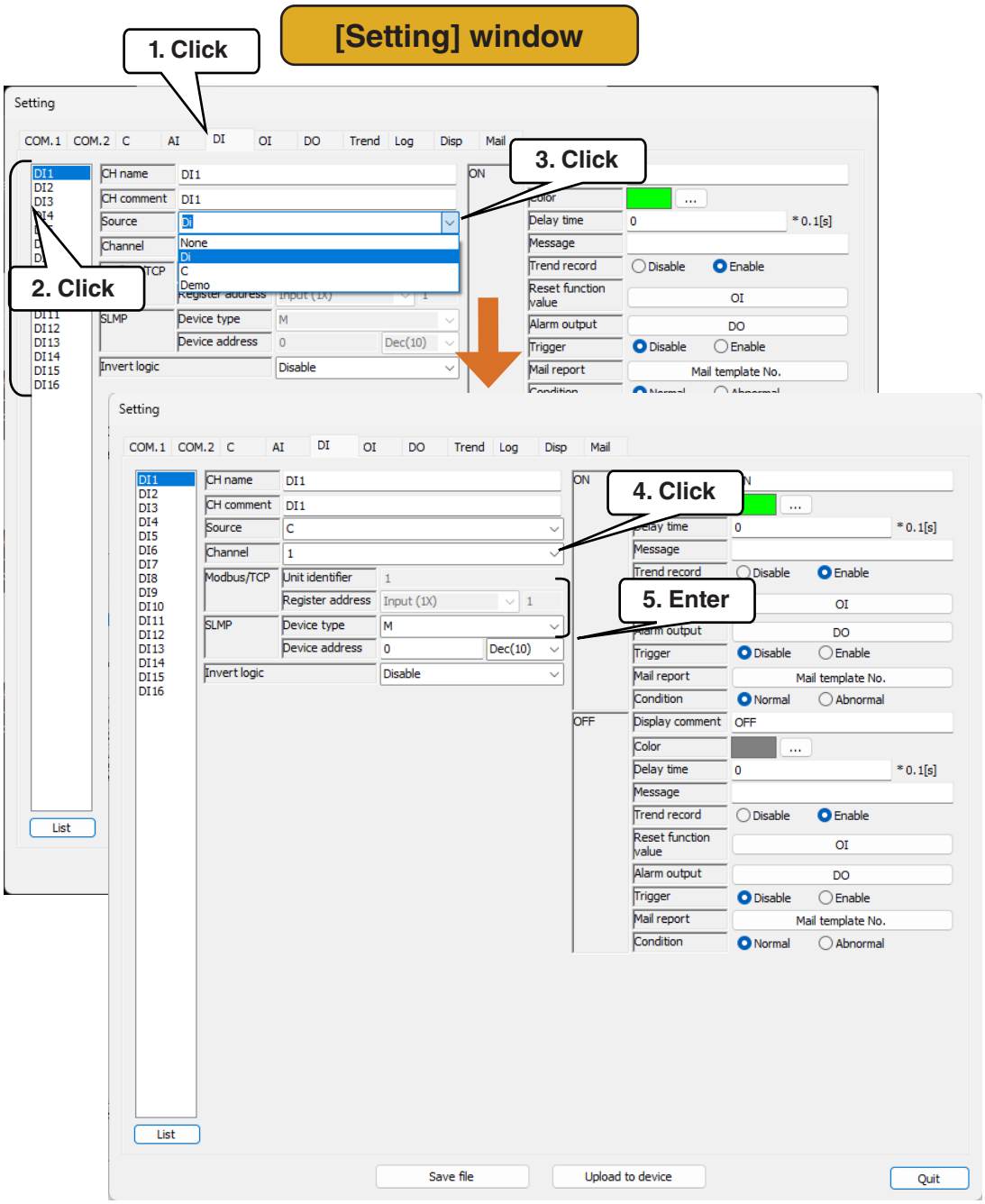
1. Click [DI] tab.
2. Click the channel to be set to display the current settings.
3. Click the source drop-down list and select [C].
4. Set the channel for connection setting. In case that the selected connection channel is Modbus/TCP, the following window appears and assigning remote I/O becomes possible. ➔ 3.3.1.1 Modbus/TCP connection
5. Set parameters according to the table below.



Parameter	Description
Modbus/TCP Unit identifier	In case that the unit identifier of the selected channel is variable, set the unit identifier number in the range of 0 to 255. ➔ 3.3.1.1 Modbus/TCP connection
Modbus/TCP Register address	Select [Input (1X)] or [Coil (0X)]. Set the register address in the range of 1 to 65536.

3.4.2.3 Assignment discrete input to SLMP-compatible device

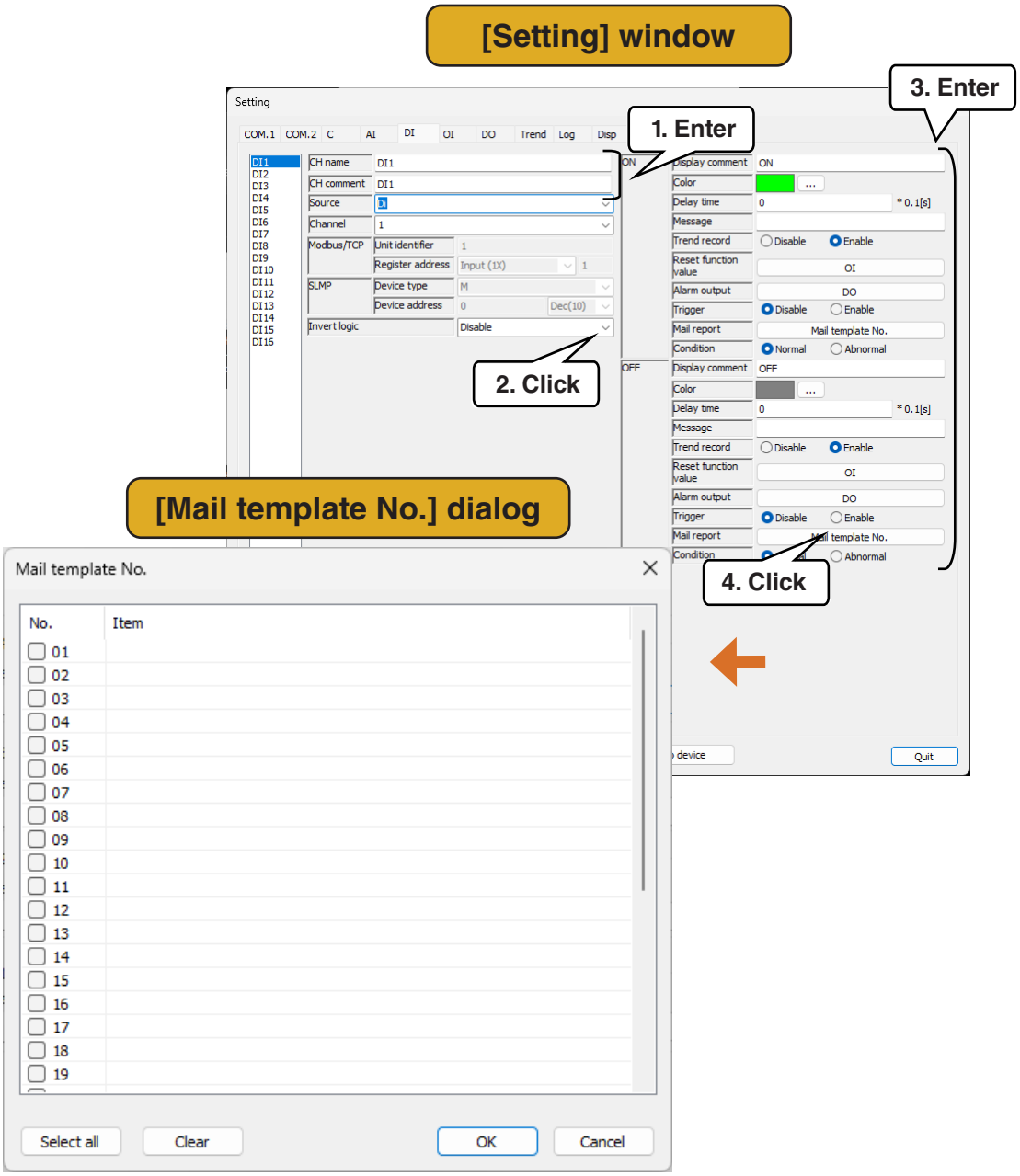
1. Click [DI] tab.
2. Click the channel to be set to display the current settings.
3. Click the source drop-down list and select [C].
4. Set the channel for connection setting. In case that the selected connection channel is SLMP, the following window appears and assigning SLMP becomes possible. ➔ 3.3.1.2 SLMP connection
5. Set parameters according to the table below.



Parameter	Description
Device type	Select the device type of the SLMP-compatible device to be connected.
Device address	Enter the address of the SLMP-compatible device to be connected. (Dec(10): 0 to 4294967295, Hex(16): 0x00000000 to 0xFFFFFFFF, Oct(8): 0 to 037777777777)

3.4.2.4 Basic setting (DI)

After completing the assignment, configure the following basic setting.



1. Configure the basic setting.

Parameter	Description
CH name	Set the channel name within 16 characters.
CH comment	Set the comment for the channel within 16 characters such as the tag name, etc.
Invert logic	If the ON/OFF of the input signal and the ON/OFF of the application signal are the reverse of each other, select [Enable].

2. Set ON and OFF respectively.

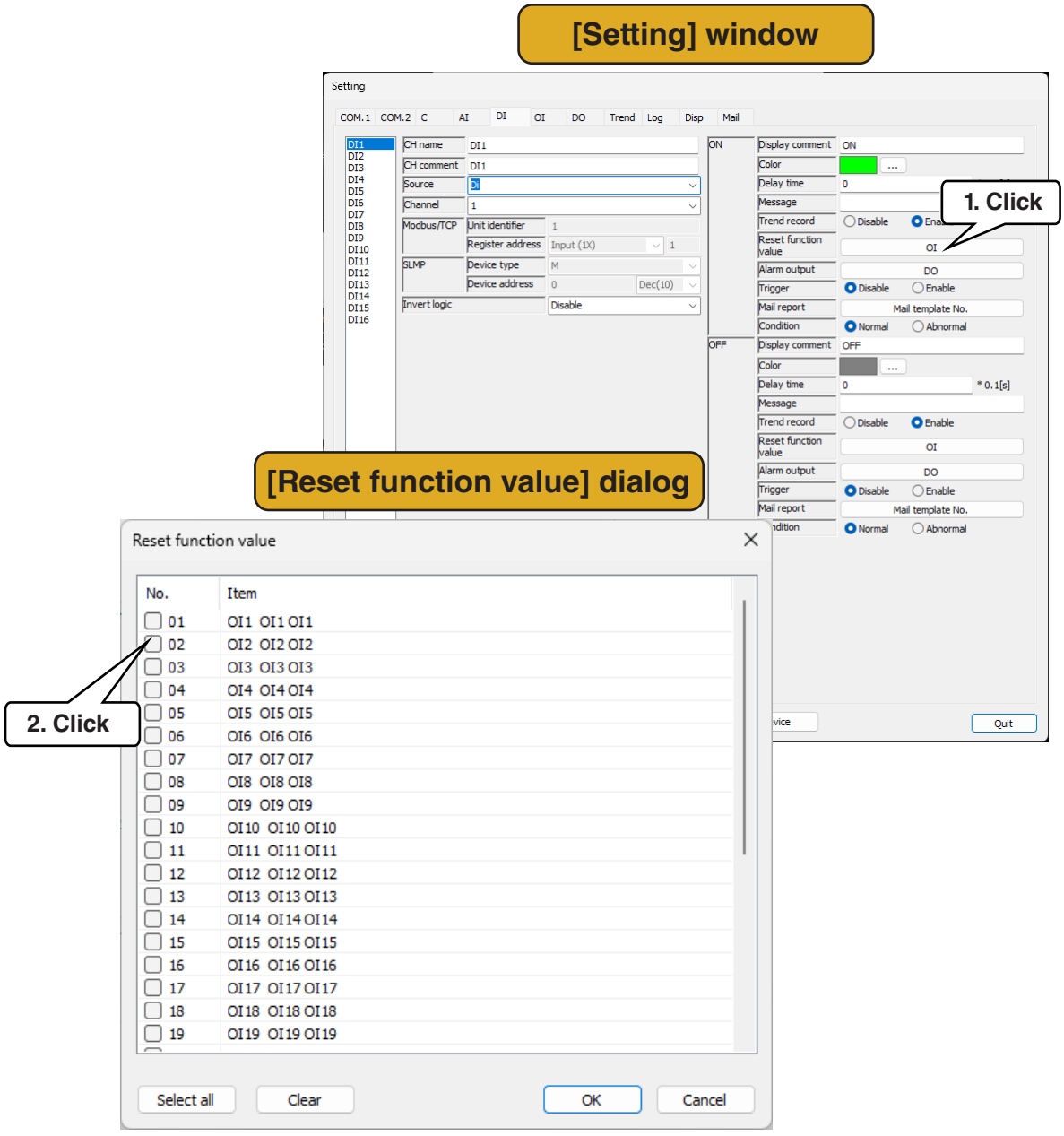
Parameter	Description
Display comment	Set the comment corresponding to ON and OFF respectively within 8 characters.
Color	Set the color which represents the status displayed on the trend data for ON and OFF respectively.
Delay time	Set the delay time for ON and OFF respectively within the range of 0.0 to 99.9 seconds.
Message	Set the message to be displayed when an event occurs within 32 characters.
Trend record	Set whether or not to record a message in trend when an event occurs. Select the checkbox when recording the message.
Trigger	Set whether or not to perform trigger recording when the input value changes and enters the corresponding zone. Select the checkbox when performing the trigger recording. ➔ 3.5.1.3 Trigger recording
Condition	Set whether or not to return from the screen saver when an event occurs. Select [Abnormal] in order to return from the screen saver.

3. Click [Mail template No.] button to display [Mail template No.] dialog. A mail is sent according to the selected template when the input value changes and enters the corresponding zone.

3.4.2.5 Reset function value setting (DI)

The function of the specified OI can be reset by turning DI ON ➔ OFF and OFF ➔ ON.

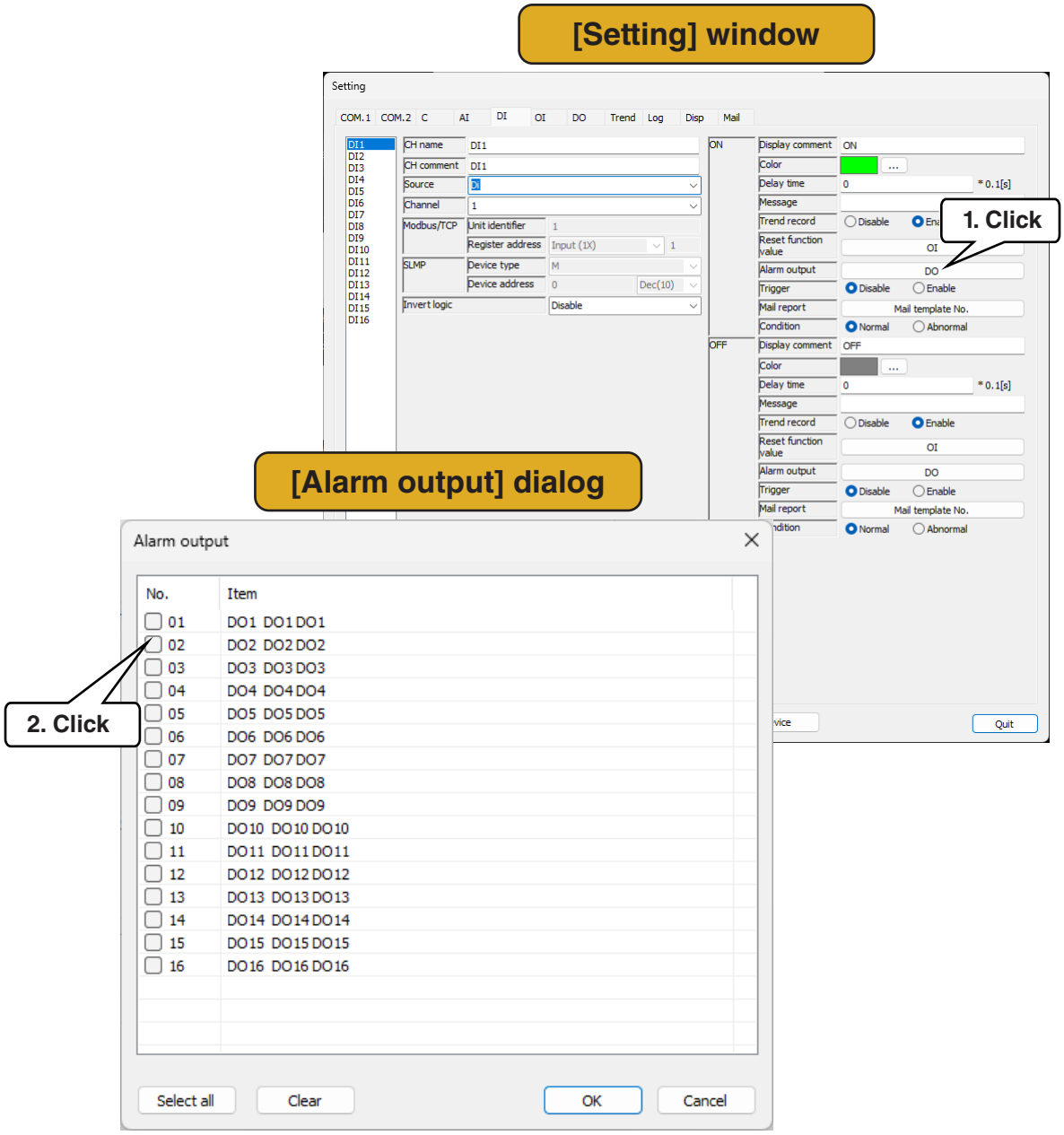
1. Click [OI] button to display [Reset function value] dialog.
2. Select the checkbox of the OI channel to be set and click [OK].



3.4.2.6 Alarm output setting (DI)

A specified DO can be turned ON by turning DI ON ➔ OFF and OFF ➔ ON.

1. Click [DO] button to display [Alarm output] dialog.
2. Select the checkbox of the DO channel to be set and click [OK].



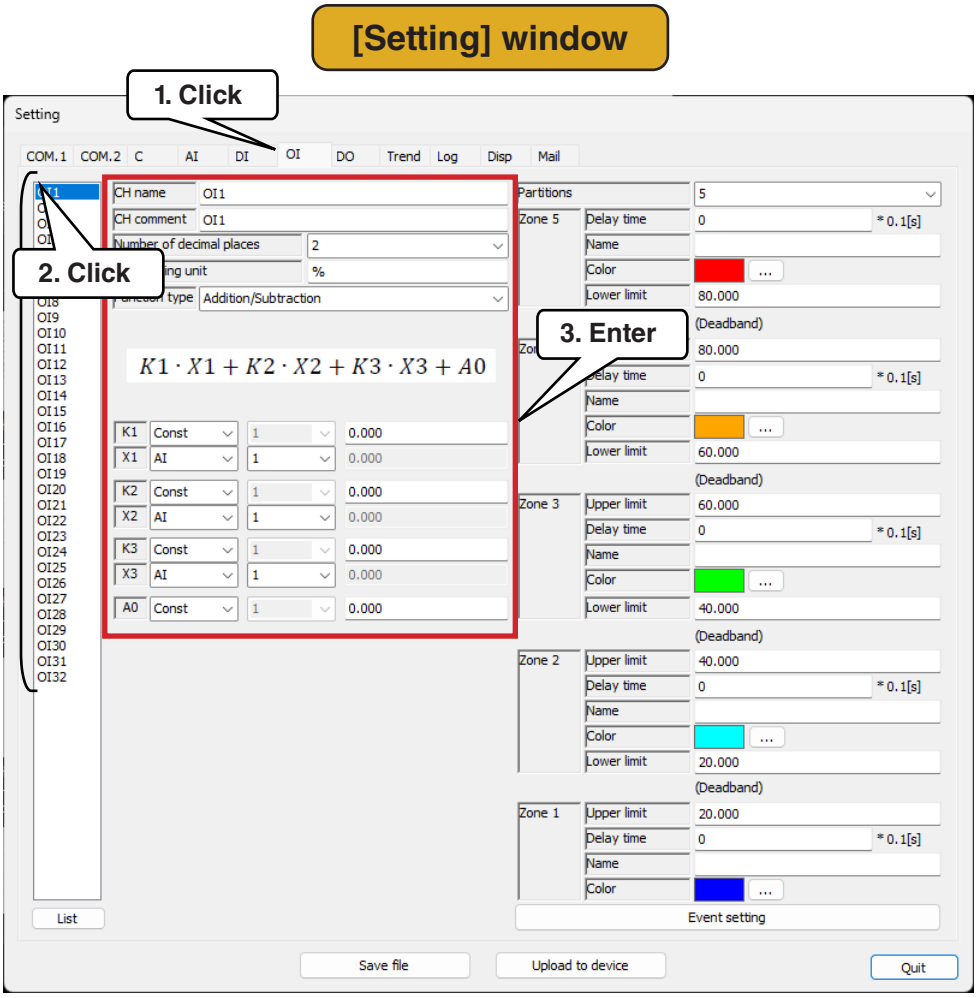
Follow the above procedure to set all the channels.
The channel setting configured on [Discrete input (DI)] window can also be copied to other channels and only the required parameters can be modified.
➔ 3.4.5 Copying the I/O setting

3.4.3 Operational input (OI)

Configure the operational input (OI) setting. There are 32 operational input channels (OI1 to OI32).
The operation is performed starting from OI1.

3.4.3.1 Basic setting (OI)

1. Click [OI] tab.
2. Click the channel to be set to display the current setting.
3. Configure the basic setting. Set the parameters according to the table below, .



Parameter	Description
CH name	Set the channel name within 16 characters.
CH comment	Set the comment for the channel within 16 characters such as the tag name, etc.
Number of decimal places	Set the number of digits after the decimal point for the data displayed on the trend data, etc. Set in the range of 0 to 3.
Engineering unit	Set the engineering unit within 8 characters.
Function type	Select from the following: Unused / Addition/Subtraction / Multiplication / Division / Extraction of square root / Moving average / First order lag / exp / Common logarithm / Natural logarithm / Peak hold (maximum) / Peak hold (minimum) / Power / Analog integration / F-value operation / antilogarithm / Scaling / Time.

Operation specifications

Parameter	Expression	Parameter
Addition/ Subtraction	K1X1+K2X2+ K3X3+A0	K1, K2, K3, A0, X1, X2, X3: *1
Multiplication	(K1X1+A1)(K2X2+A2)+A0	K1, K2, A0, A1, A2, X1, X2: *1
Division	(K1X1+A1)/(K2X2+A2)+A0	K1, K2, A0, A1, A2, X1, X2: *1
Extraction of square root	$10K1\sqrt{X1}$	K1, X1: *1
Moving average	$\frac{\sum_{n=0}^{N-1} x_n}{N}$	X1: *1 N: Moving average value (4/8/16/32/64) RST: Initialization
First order lag	$G(s) = \frac{K}{1+Ts}$	G: *1 T: Time constant (0 to 100 seconds) K: Gain (Constant) RST: Reset
exp	e^{x1_n}	X1: *1
Common logarithm	logX1	X1: *1
Natural logarithm	lnX1	X1: *1
Peak hold (Maximum)	MAX(X1)	X1: *1 RST: Initialization (MAX=X1) Note: The value before the power removed is held in case of power failure.
Peak hold (Minimum)	MIN(X1)	X1: *1 RST: Initialization (MAX=X1) Note: The value before the power removed is held in case of power failure.
Analog integration	$\sum_{n=0}^{N} x_n$	X1: *2 K1: Integration rate K2: Unit (M/H/D) K3: Dropout (0.000 to 105.000%) RST: Initialization Note: The value before the power removed is held in case of power failure.
Power	$X1^{K1}$	X1, K1: *1
F-value operation	$\sum 10^{\frac{X1-K1}{K2}}$	X1: *1 K1: Reference temperature (°C) K2: Z-value (Positive real number) RST: Initialization
Antilogarithm	10^{X1}	X1: *1
Scaling	K3+(K4-K3)*(X1-K1)/(K2-K1)	X1: *1 K1: Zero (Input) *3 K2: Span (Input) *3 K3: Zero (Output) *3 K4: Span (Output) *3
Time	MM/DD hh:mm:ss	K1: 0: month, 1: day, 2: hour, 3: minute, 4: second, 5: day of week Day of week: 0: Sunday, 1: Monday, 2: Tuesday, 3: Wednesday, 4: Thursday, 5: Friday, 6: Saturday

Note 1) Constants (Const), AI, AI zone, DI or OI can be set.
DI: ON ➔ 1.0, OFF ➔ 0.0
AI zone: Specified AI current value is operated as numeric value to determine which zone it is in. Current value zone 1 to 5 can be operated as 1.0 to 5.0. If the partitions is set to [Disable], operation is performed with 0. ➔ 3.4.1.5 Zone setting (AI)
Note 2) AI, AI zone, DI or OI can be set. The value is same as note 1.
Note 3) The same value cannot be set for zero and span.

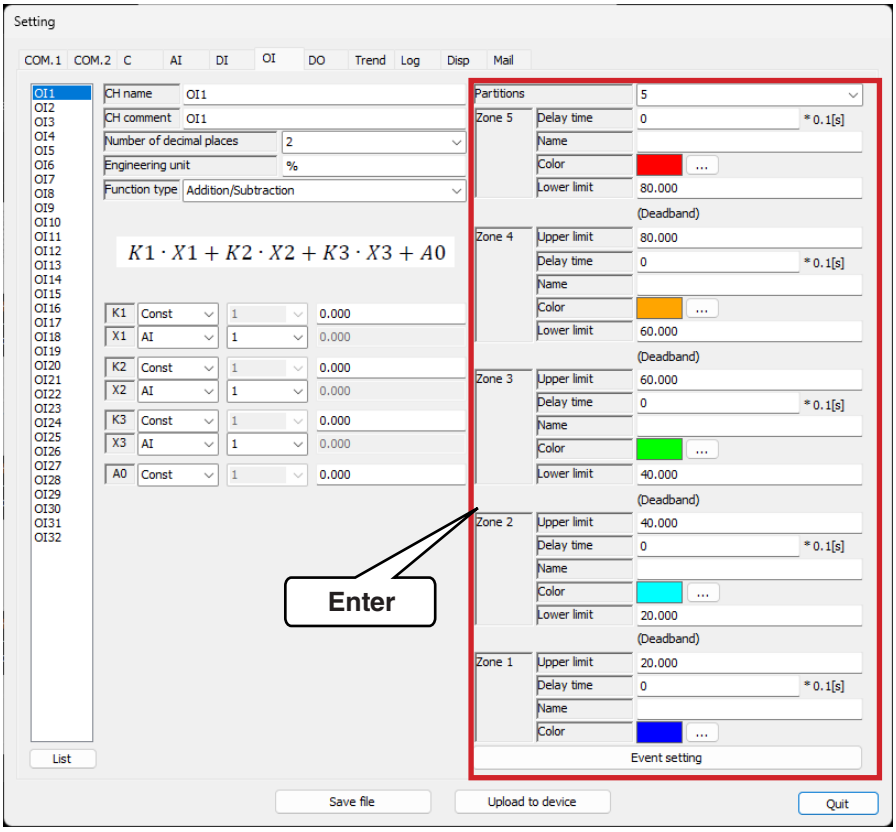
E.g.: Analog integration

This is an example of capturing flow rate using voltage.
Assume 1V corresponds to 0 m³/h and 5V corresponds to 30 m³/h.
When performing analog integration, input should be in the range of 0 to 100.
In advance, scale 0 to 5V to 0 to 100% in AI or perform scaling with operation.
Since the unit is m³/h, set the time unit to "hour."
If the integration rate is set to 30, the integrated value becomes 15 when 50% continues for 30 minutes, and the integrated value becomes 30 when 100% continues for 1 hour.

3.4.3.2 Zone setting (OI)

Configure zone setting corresponding to the input values. Up to 5 zones can be set, and deadbands can also be set between zones.

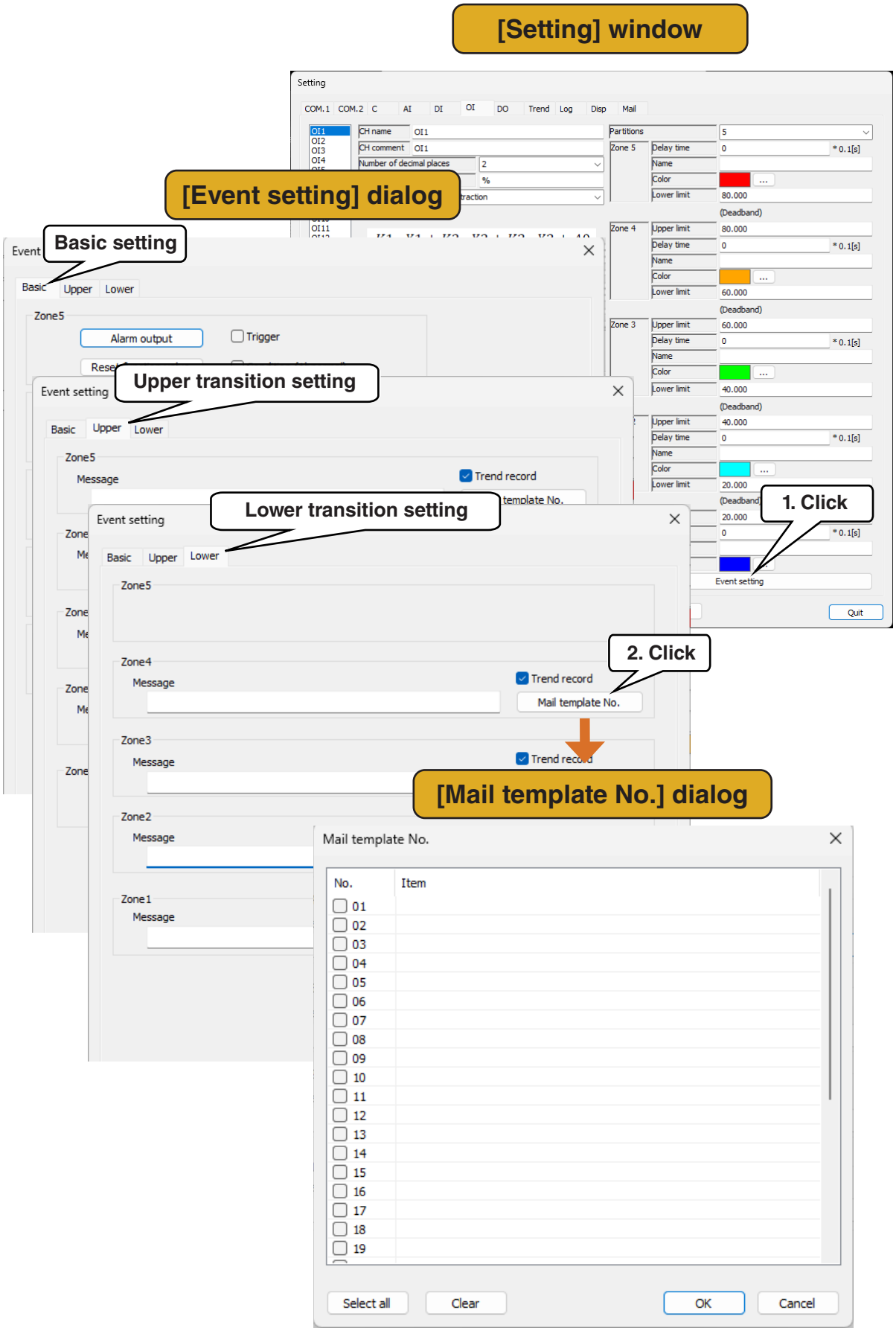
[Setting] window



Parameter	Description
Partitions	Set the number of zones to be used. Select from Disable / 2 / 3 / 4 / 5.
Name	Set the name within 16 characters for each zone.
Color	Set the color to represents each zone which will be displayed on the trend data.
Delay time	Set the time required for the transition from another zones to the corresponding zone to be confirmed in the range of 0.0 to 99.9 (sec.). When zone 1 is set to five seconds: The transition to zone 1 is confirmed five seconds after the input value changes in the state of zone 2 and becomes less than or equal to the upper limit of zone 1. It remains in zone 2 until five seconds have elapsed.
Upper limit : : : Lower limit	Set the upper and lower limit value for zones with actual values. Set as the upper limit > lower limit. • When the deadband is set When the deadband is set between zone 1 and zone 2, set the values so that the deadband is between the upper limit of zone 1 and the lower limit of zone 2. Set similarly for the other zones as well. • When the deadband is not set When the deadband is not set between zone 1 and zone 2, set the same value for the upper limit of zone 1 and the lower limit of zone 2. Set similarly for the other zones as well.

3.4.3.3 Event setting (OI)

An event occurs when transitting to the zone set in the zone setting.



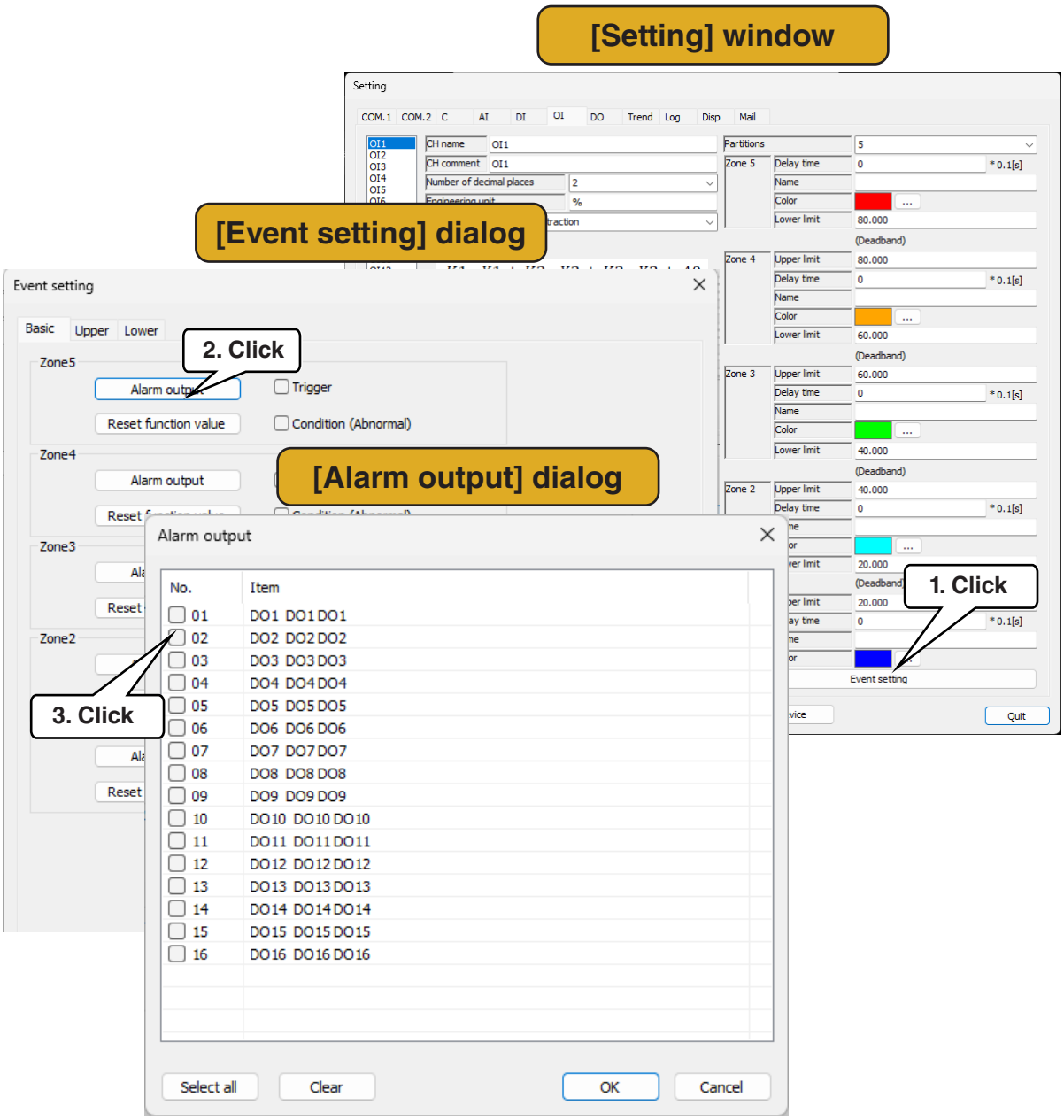
1. Click [Event setting] button on [Setting] window (OI) to display [Event setting] dialog. In case that the partitions is [Disable], [Event setting] button is disabled.
2. Set parameters according to the table below. Click [OK] button to go back to [Setting] window.
3. Click [Mail template No.] button to display [Mail template No.] dialog. A mail is sent according to the selected template when the input value changes and enters the corresponding zone.

Parameter	Description
Trigger	Set whether or not to perform trigger recording when the input value changes and enters the corresponding zone. Select the checkbox when performing the trigger recording. ➔ 3.5.1.3 Trigger recording
Condition (Abnormal)	Set whether or not to return from the screen saver when an event occurs.
Message	Set the message when an event occurs within 32 characters.
Trend record	Set whether or not to record a message in trend when an event occurs. Select the checkbox when recording the message.

3.4.3.4 Alarm output setting (OI)

A specified DO can be turned ON for each zone.

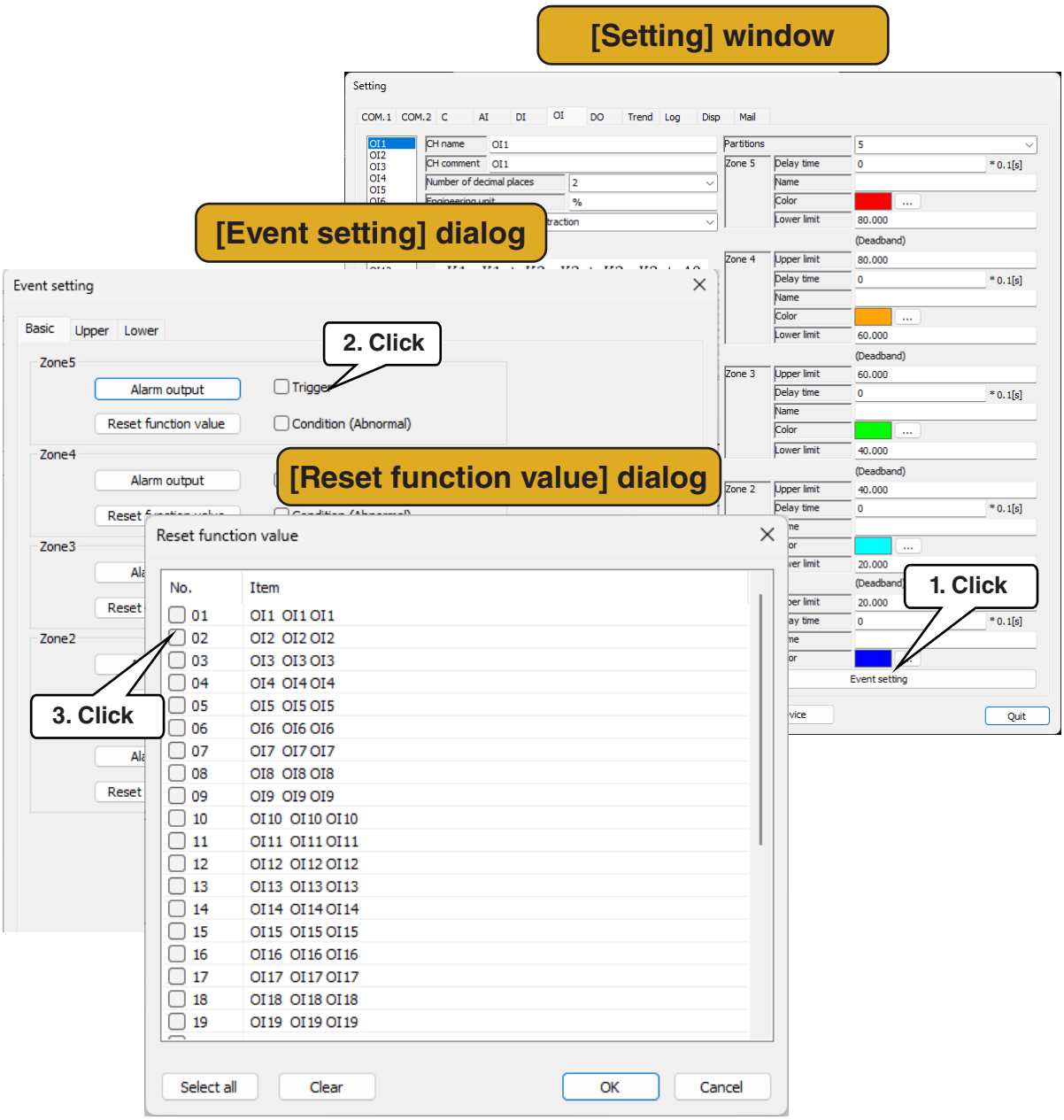
1. Click [Event setting] button on [Setting] window (OI) to display [Event setting] dialog. Click [Alarm output] button of the specified zone to display [Alarm output] dialog.
2. Select the checkbox of the DO channel to be set and click [OK].



3.4.3.5 Reset function value setting (OI)

A specified OI can be reset when zone transition occurs.

1. Click [Event setting] button on [Setting] window (OI) to display [Event setting] dialog. Click [Reset function value] button of the specified zone to display [Reset function value] dialog.
2. Select the checkbox of the OI channel to be set and click [OK].



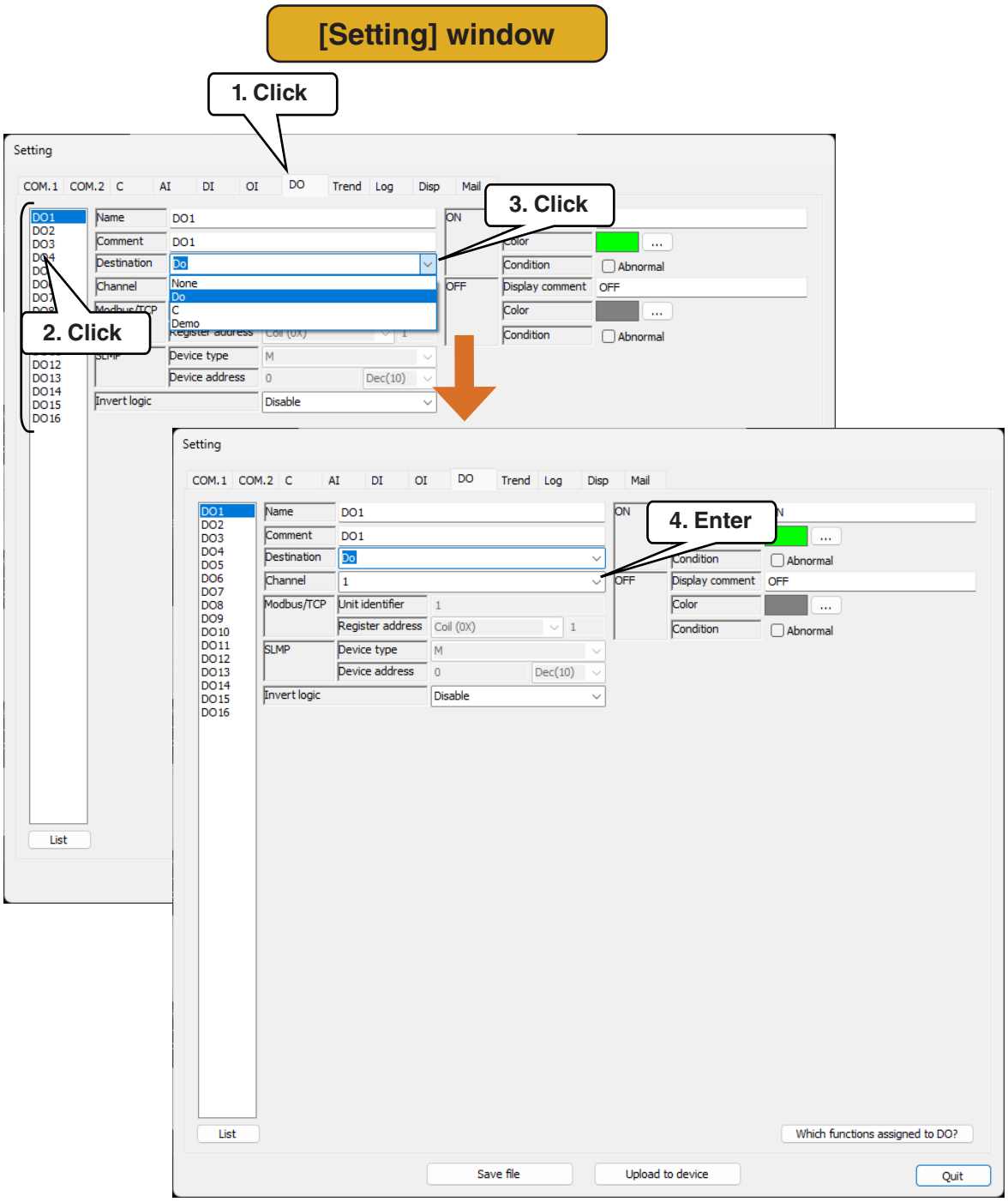
Follow the above procedure to set all the channels.
The channel setting configured on [Operational input (OI)] window can also be copied to other channels and only the required parameters can be modified.
➔ 3.4.5 Copying the I/O setting

3.4.4 Discrete output (DO)

Discrete output signals can be monitored for maximum of 16 points (DO1 and DO16).
Assign the discrete output from built-in I/O, remote I/O or SLMP-compatible device to the VR144E-G16 according to the following procedure.

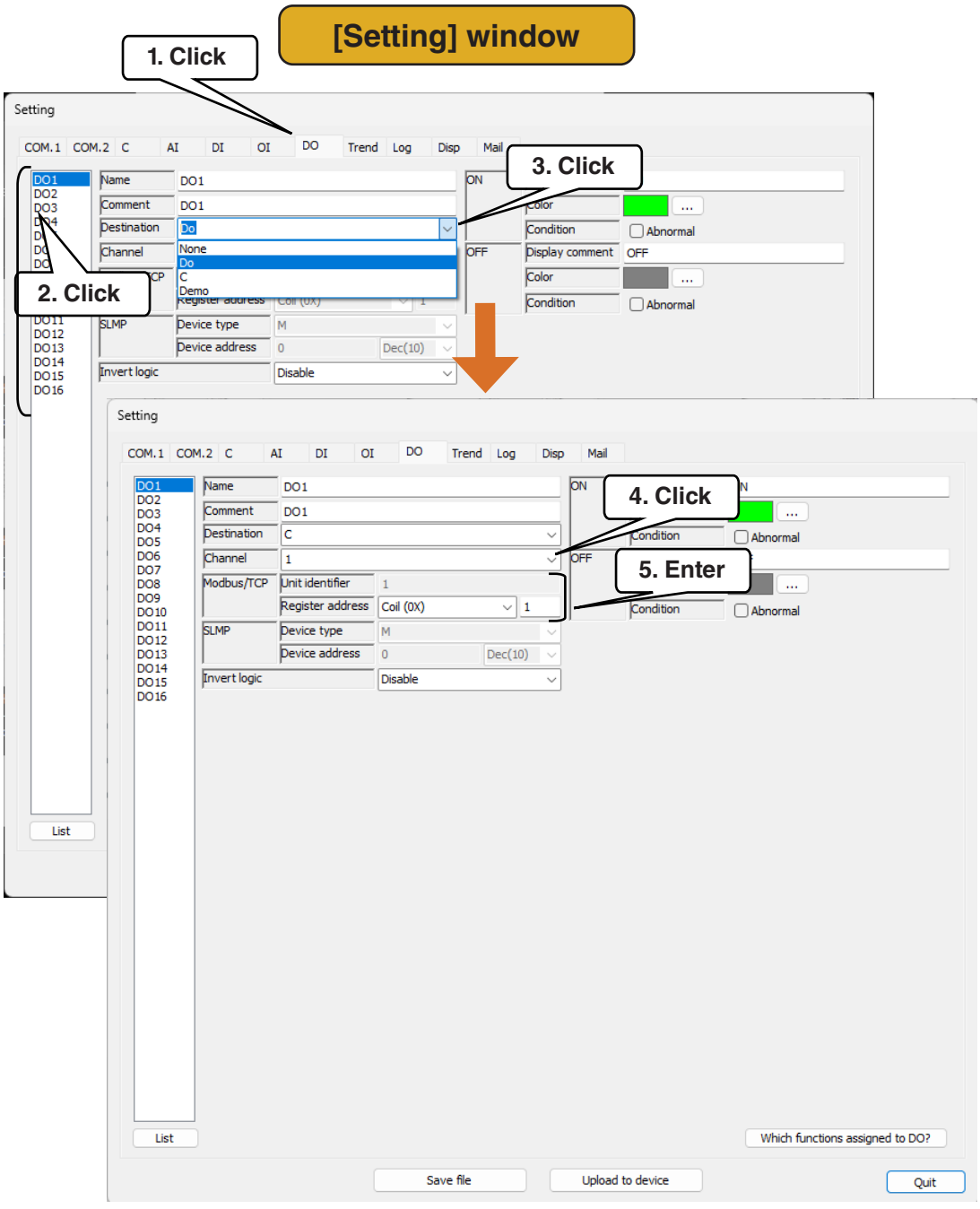
3.4.4.1 Assignment discrete output to built-in I/O

1. Click [DO] tab.
2. Click the channel to be set to display the current settings.
3. Click the destination drop-down list and select [Do].
4. Set the channel of built-in Do.



3.4.4.2 Assignment discrete output to remote I/O

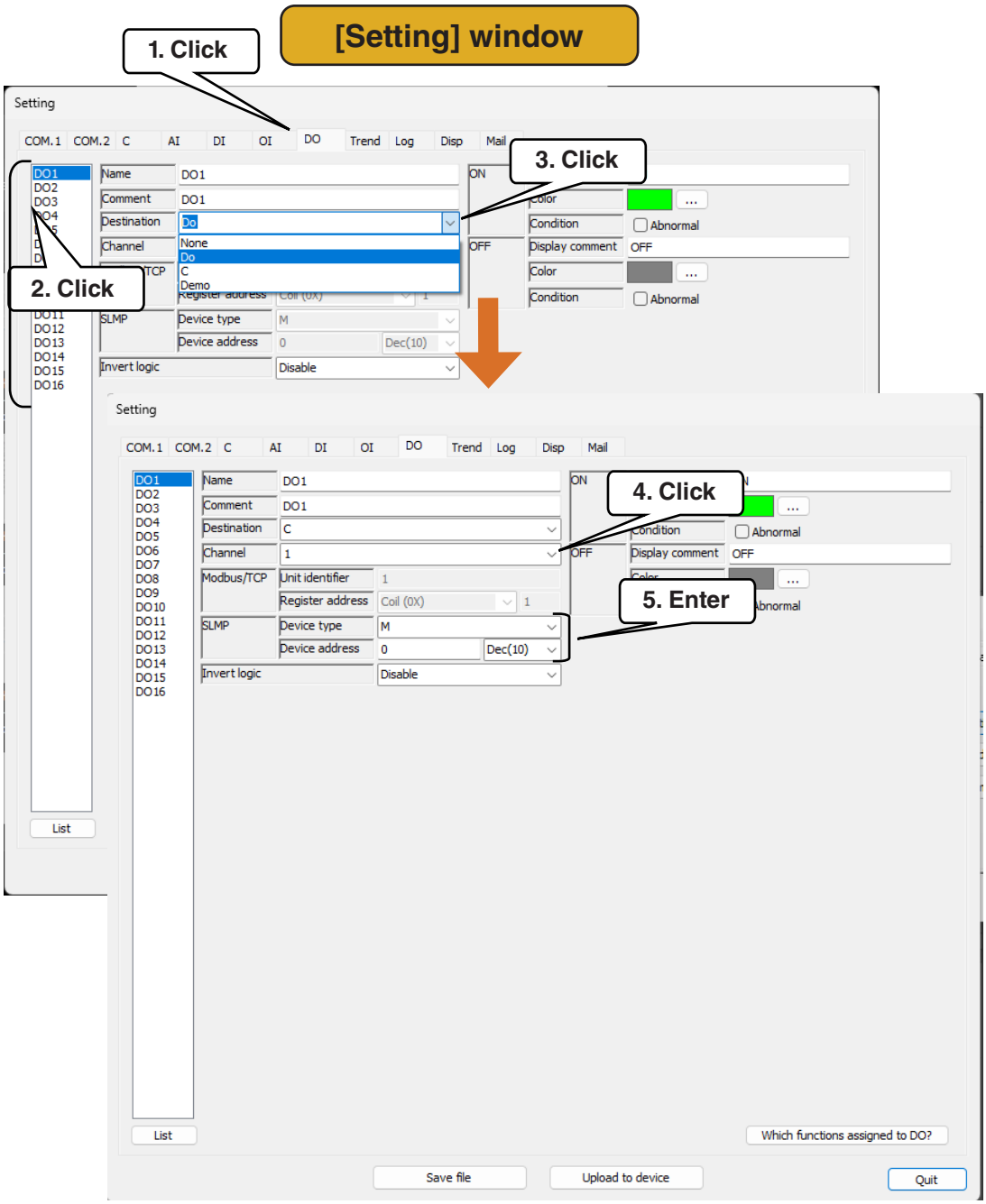
1. Click [DO] tab.
2. Click the channel to be set to display the current settings.
3. Click the destination drop-down list and select [C].
4. Set the channel for connection setting. In case that the selected connection channel is Modbus/TCP, the following window appears and assigning remote I/O becomes possible. ➔ 3.3.1.1 Modbus/TCP connection
5. Set parameters according to the table below.



Parameter	Description
Modbus/TCP Unit identifier	In case that the unit identifier of the selected channel is variable, set in the range of 0 to 255. ➔ 3.3.1.1 Modbus/TCP connection
Modbus/TCP Register address	Select [Coil (0X)]. Set the register address in the range of 1 to 65536.

3.4.4.3 Assignment discrete output to SLMP-compatible device

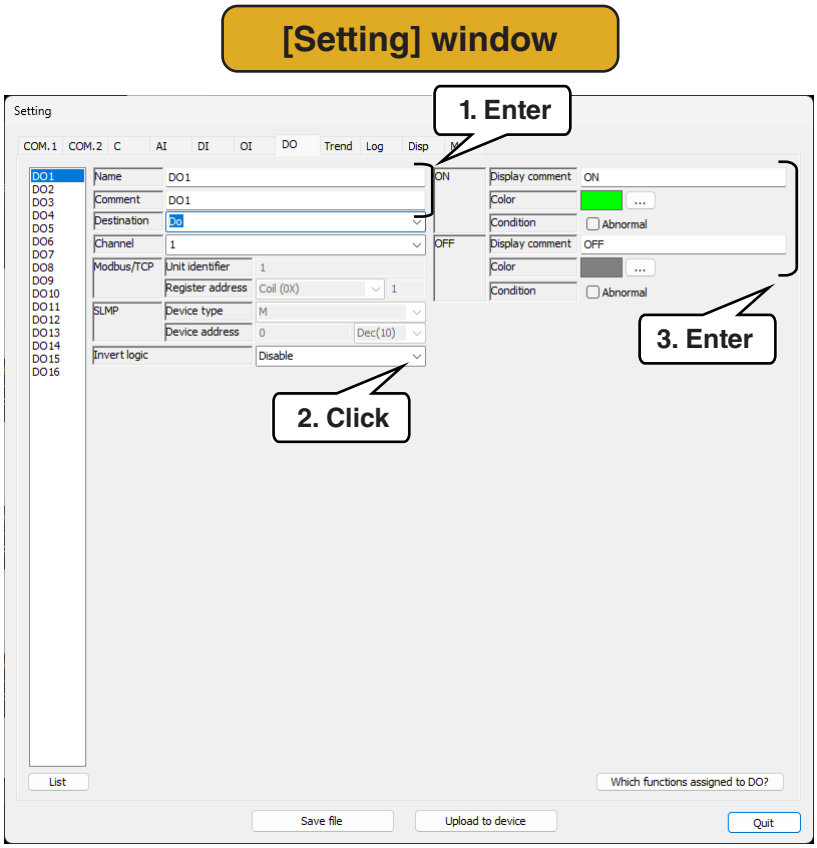
1. Click [DO] tab.
2. Click the channel to be set to display the current settings.
3. Click the destination drop-down list and select [C].
4. Set the channel for connection setting. In case that the selected connection channel is SLMP, the following window appears and assigning SLMP becomes possible. ➔ 3.3.1.2 SLMP connection
5. Set parameters according to the table below.



Parameter	Description
Device type	Select the device type of the SLMP-compatible device to be connected.
Device address	Enter the address of the SLMP-compatible device to be connected. (Dec(10): 0 to 4294967295, Hex(16): 0x00000000 to 0xFFFFFFFF, Oct(8): 0 to 037777777777)

3.4.4.4 Basic setting (DO)

After completing the assignment, configure the following basic setting.



1. Configure the basic setting.

Parameter	Description
Name	Set the channel name within 16 characters.
Comment	Set the comment for the channel within 16 characters such as the tag name, etc.
Invert logic	If the ON/OFF of the output signal and the ON/OFF of the application signal are the reverse of each other, select [Enable].

2. Set ON and OFF respectively.

Parameter	Description
Display comment	Set the comment corresponding to ON and OFF respectively within 8 characters.
Color	Set the color which represents the status displayed on the trend data for ON and OFF respectively.

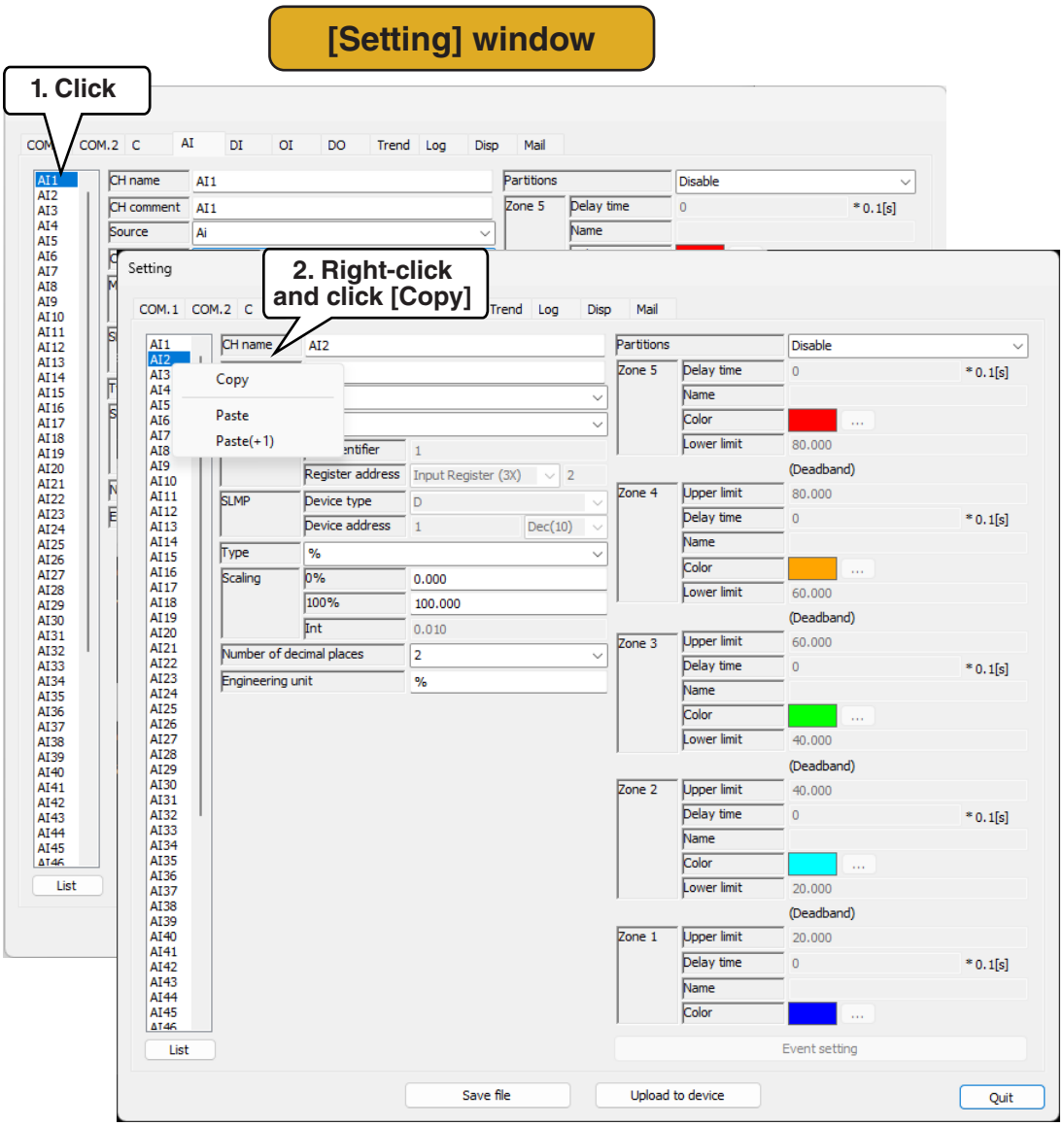
Follow the above procedure to set all the channels.
The channel setting configured on [Discrete Output (DO)] window can also be copied to other channels and only the required parameters can be modified. ➔ 3.4.5 Copying the I/O setting

3.4.5 Copying the I/O setting

The channel setting configured on each I/O setting window can also be copied to other channels and only the required parameters can be modified.

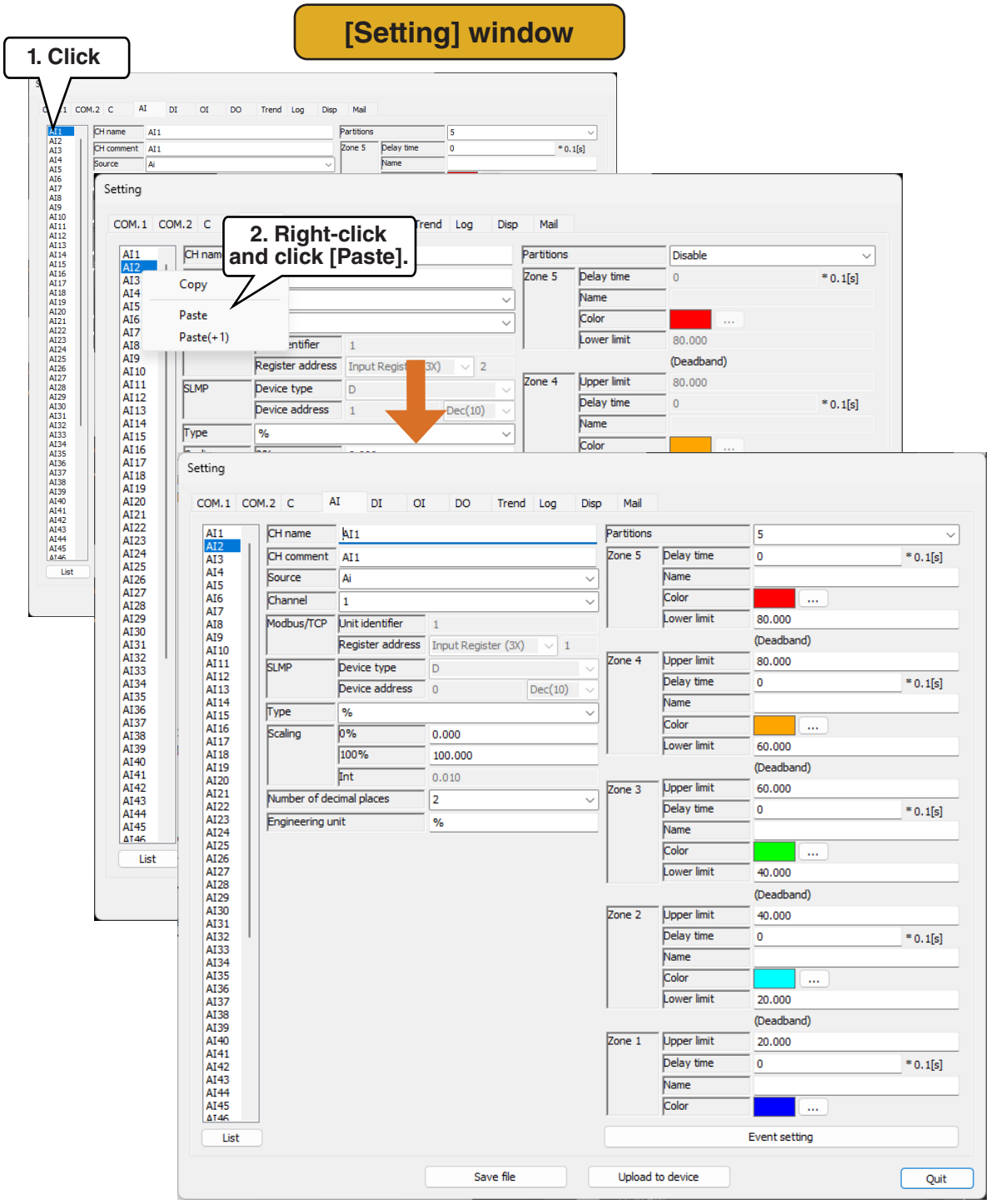
3.4.5.1 Copying

The procedure is common to each I/O setting window.



3.4.5.2 Pasting

Copied I/O settings can be pasted. The pasting procedure is common to each I/O setting window.
Pasting is possible only in the same I/O tab.



3.4.5.3 Pasting (+1)

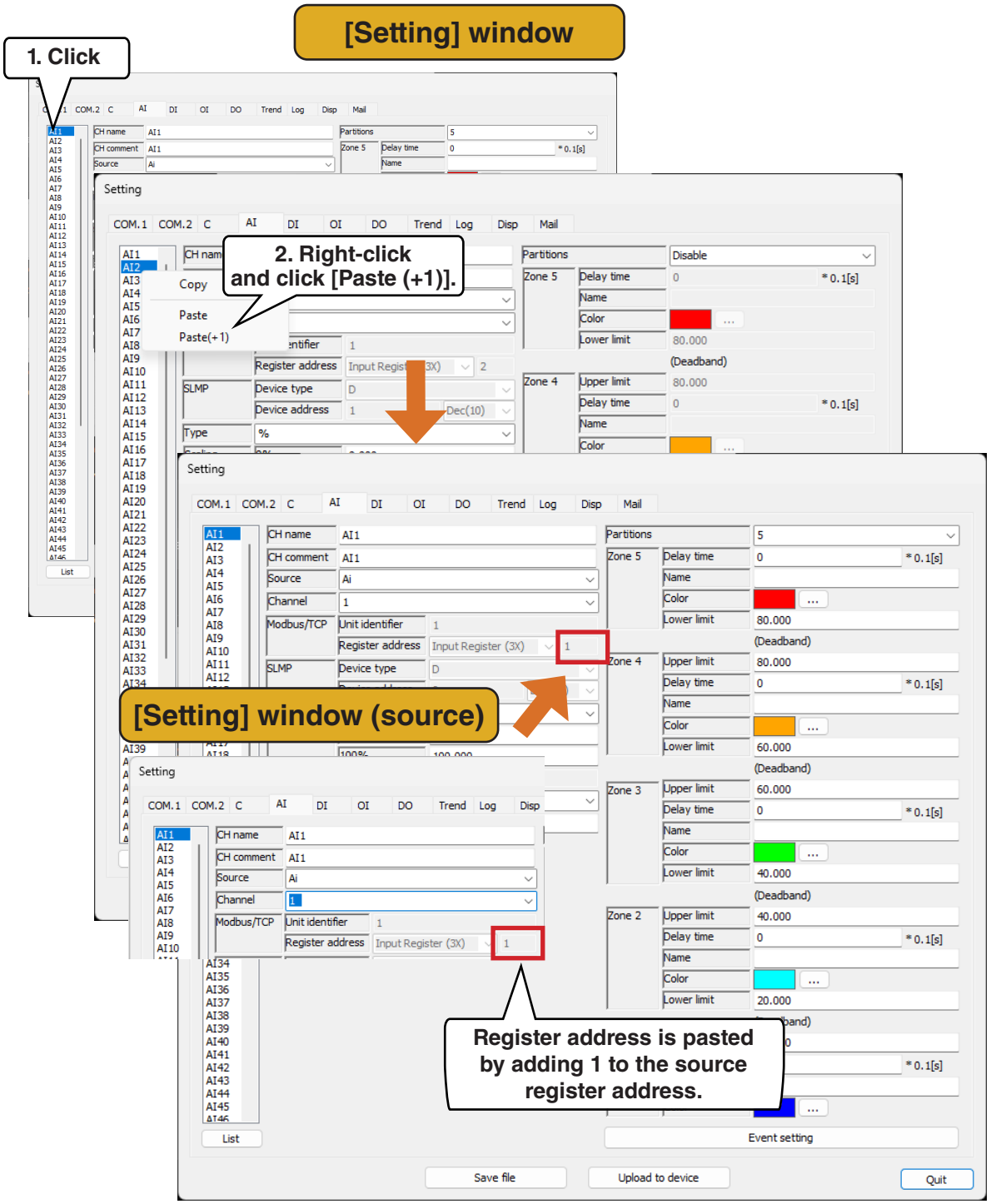
Copied I/O settings can be pasted.

[Paste (+1)] is useful when copying and pasting the channels assigned from remote I/O or SLMP-compatible device.

In case that the channel is assigned from built-in I/O, the procedure is same as normal pasting.

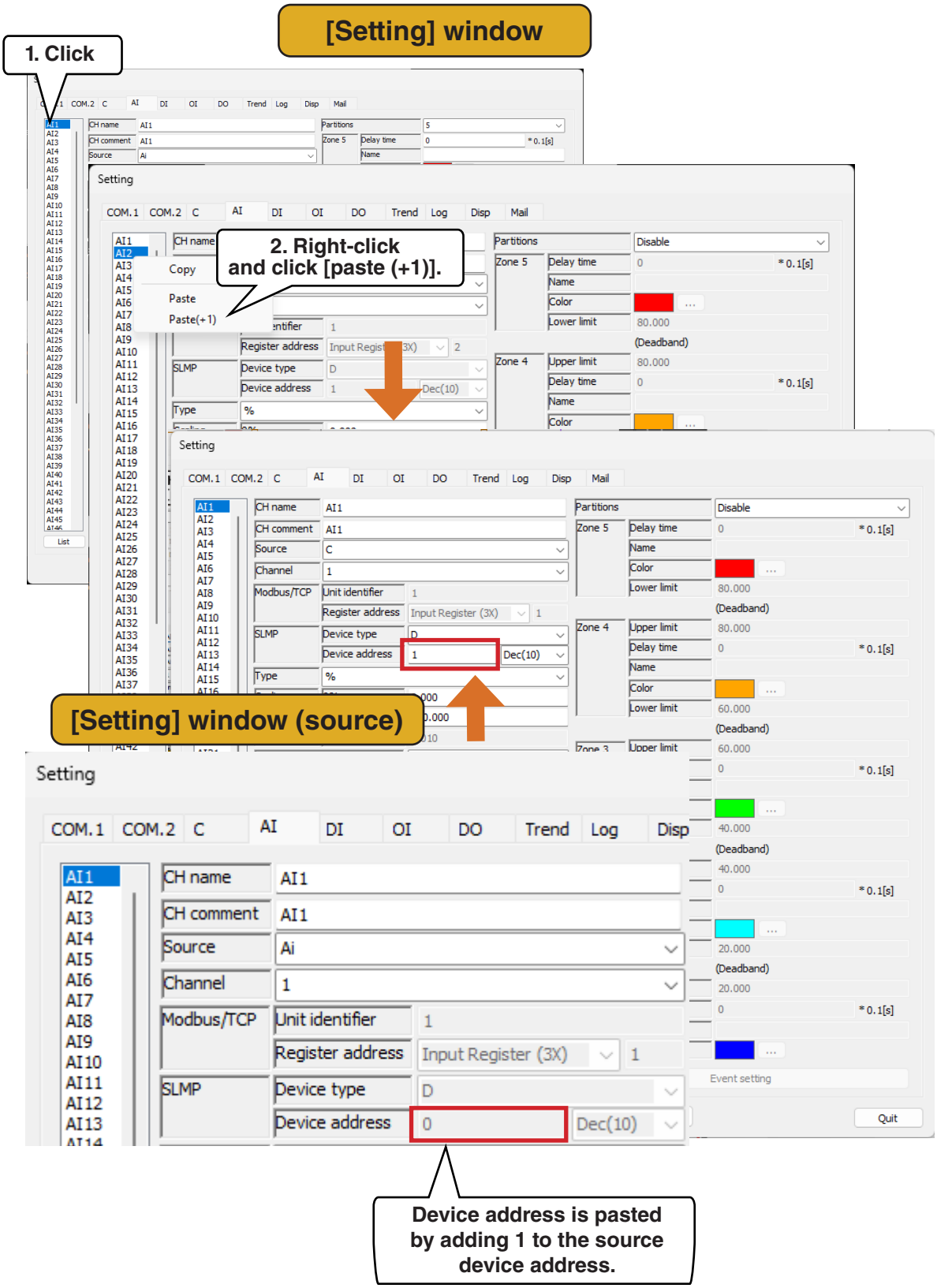
(1) Remote I/O

Register address is pasted by adding 1 to the source register.



(2) SLMP

Device address is pasted by adding 1 to the source device address.



3.5 Trend setting

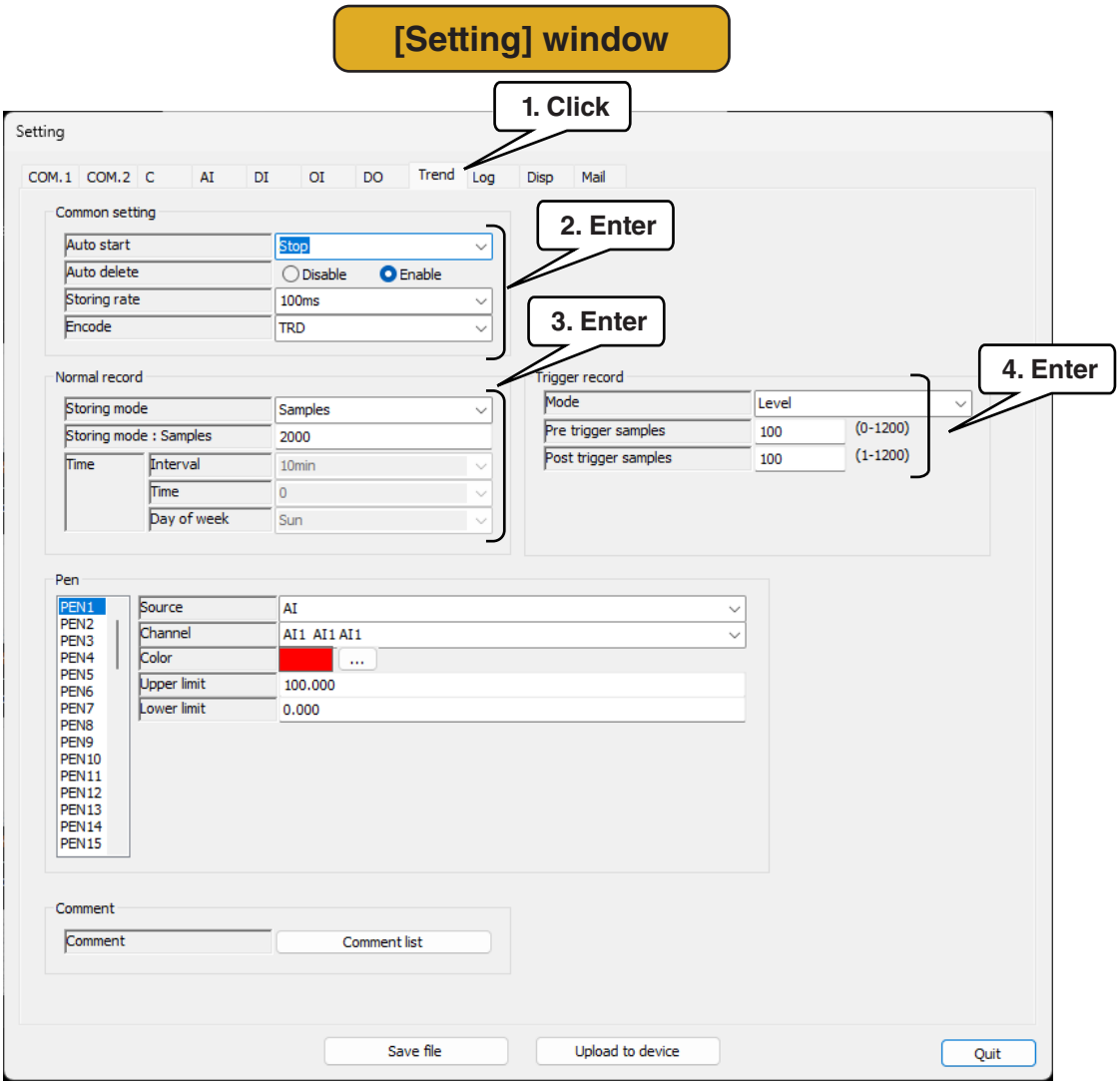
Assign any channel set in I/O (AI, DI, OI, DO) to pen and set the pen's waveform to be recorded and displayed.

3.5.1 Basic setting

Configure the setting to record pen's waveform to a trend file.
When recording pen's waveform, event data and comment data occurred during the recording period are saved to the same file.

3.5.1.1 Recording setting

Set the recording conditions of the trend.



1. Configure the common setting. Set parameters according to the table below.

Parameter	Description
Auto start	Select from Stop / Normal recording / Trigger recording.
Auto delete	Select [Enable] to delete trend files automatically when the free space on the SD card falls below 100 MB.
Storing rate	Select from 100 ms / 500 ms / 1 sec. / 2 sec. / 5 sec. / 10 sec. / 1 min. / 2 min. / 5 min. / 10 min. / 30 min. / 1 hour.
Encode	Select the file saving format from TRD / CSV (UTF-8) / CSV (Shift-JIS).

2. Configure the settings for normal recording. Set parameters according to the table below.

Parameter	Description
Storing mode	Select from Samples / Time.
Storing mode: Samples	When [Samples] is selected in the storing mode, the number of samples can be set. Set in the range of 1000 to 50000.
Time	When [Time] is selected in the storing mode, the storing interval can be set. The selectable storing interval depends on the storing rate. Refer to the table below. - When [1 day] is selected for the storing interval, set [Time] from 0 to 23 (hour). - When [1 week] is selected for the storing interval, set [Time] and [Day of week]. Select from 0 to 23 (hour) and Sun / Mon / Tue / Wed / Thu / Fri / Sat. - When [1 month] is selected for the storing interval, set [Time] from 0 to 23 (hour).

Correspondence table of storing rate and storing interval (X: selectable)

Storing interval / Storing rate	10 min.	30 min.	1 hour	6 hours	12 hours	1 day	1 week	1 month
100 ms	X	X	X	–	–	–	–	–
500 ms	–	X	X	X	–	–	–	–
1 sec.	–	–	X	X	X	–	–	–
2 sec.	–	–	X	X	X	X	–	–
5 sec.	–	–	–	X	X	X	–	–
10 sec.	–	–	–	X	X	X	–	–
1 min.	–	–	–	–	–	X	X	–
2 min.	–	–	–	–	–	X	X	–
5 min.	–	–	–	–	–	X	X	X
10 min.	–	–	–	–	–	X	X	X
30 min.	–	–	–	–	–	X	X	X
1 hour	–	–	–	–	–	–	X	X

3. Configure the settings for trigger recording. Set parameters according to the table below.

Parameter	Description
Mode	Select from Level / Edge.
Pre trigger samples	Set in the range of 0 to 1200.
Post trigger samples	Set in the range of 1 to 1200.

3.5.1.2 Normal recording

When the normal recording is set in [Auto start], trend recording starts upon VR144E-G16 startup.

(1) Storing mode: Samples

When samples is set in [Storing mode], the memory block transitions to the next block after reaching a specified number of samples.

Simultaneously, the recorded data in the memory block is transferred to an SD card and saved as a file.

(2) Storing mode: Time

The memory block transitions to the next block at a specified time.

However, if the number of recorded data samples reaches 50 000 per channel before the specified time, the memory block will transition.

Simultaneously, the recorded data in the memory block is transferred to an SD card and saved as a file.

For storing timing, refer to the table below.

Storing interval	Storing timing
10 min.	0, 10, 20, 30, 40, 50 minutes and 0 second every hour
30 min.	0, 30 minutes and 0 second every hour
1 hour	0 minute and 0 second every hour
6 hours	0, 6, 12, 18 hours, 0 minute and 0 second
12 hours	0, 12 hours, 0 minute and 0 second
1 day	0 minute and 0 second of the hour set in [Time]
1 week	0 minute and 0 second of the hour set in [Time] on the day of the week set in [Day of week]
1 month	0 minute and 0 second of the hour set in [Time] on the first day of every month.

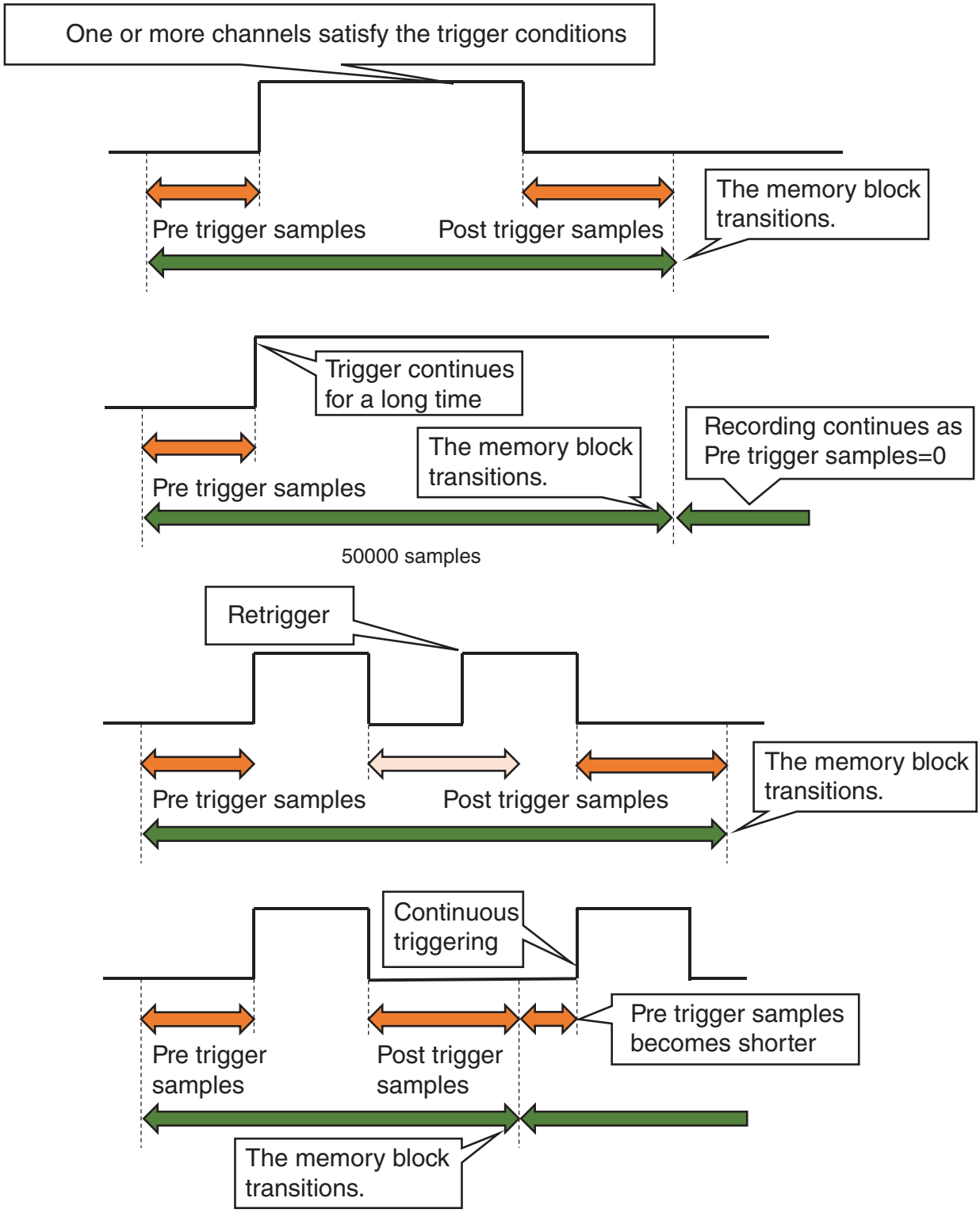
3.5.1.3 Trigger recording

When trigger recording is set in [Auto Start], trigger conditions are set for each channel of AI, DI, and OI. The memory block transitions handling the number of samples including [Pre trigger samples] and [Post trigger samples] as a single data.

Simultaneously, the recorded data in the memory block is transferred to an SD card and saved as a file.

(1) Mode: Level

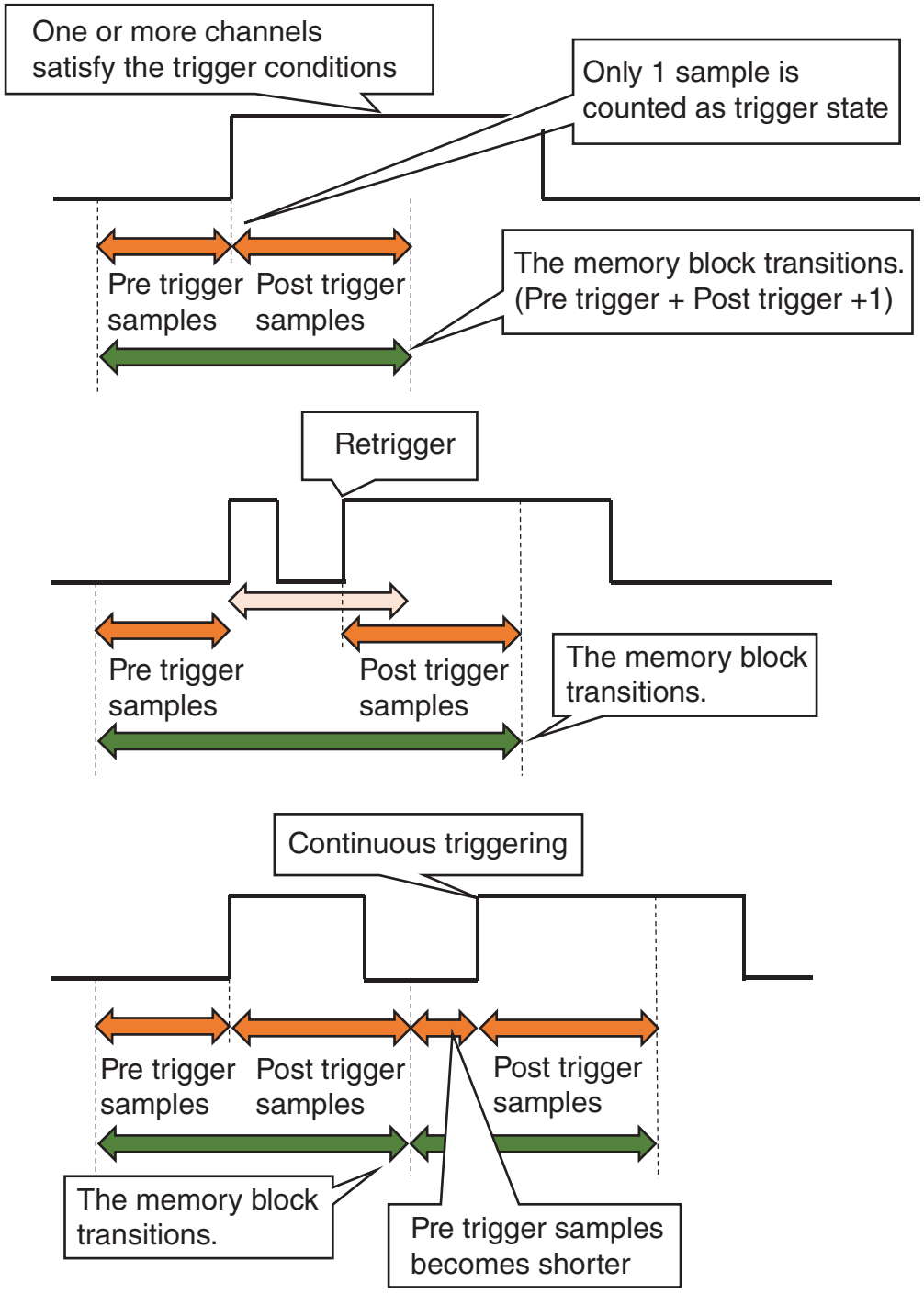
When the level is set in [Mode] of the trigger recording, the trend is recorded as long as one or more of the AI, DI, or OI channels with trigger settings satisfy the trigger conditions. The number of samples to be recorded in the memory block should be set in [Pre trigger samples] and [Post trigger samples]. The data sample interval depends on the storing rate in [Common]. For details, refer to the following.



(2) Mode: Edge

When the edge is set in [Mode] of the trigger recording, trend are recorded with reference to the change point where one or more channels satisfy the trigger conditions from the non-trigger state (inverting trigger state) of all channels among AI, DI, and OI channels configured trigger setting.

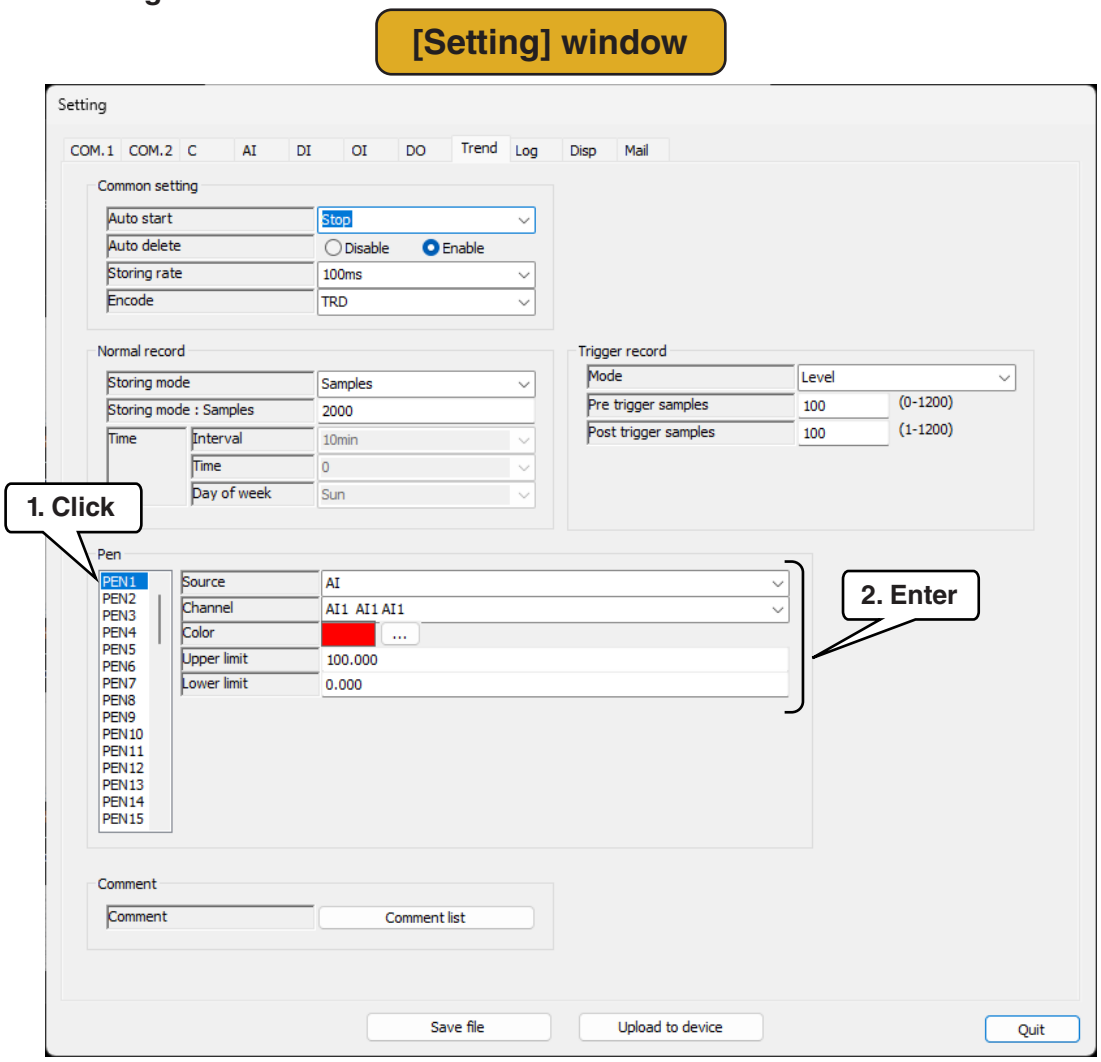
"One or more channels satisfy the trigger conditions" means that the triggers are set to zones corresponding to any of the input values among AI1 to 16, DI1 to 2, or OI1 to 32. The number of samples to be recorded in the memory block should be set in [Pre trigger samples] and [Post trigger samples]. The data sample interval depends on the storing rate in [Common]. For details, refer to the following.



3.5.2 Pen setting

Assign pens to record to trend files and to display on the trend graph.

3.5.2.1 Pen setting



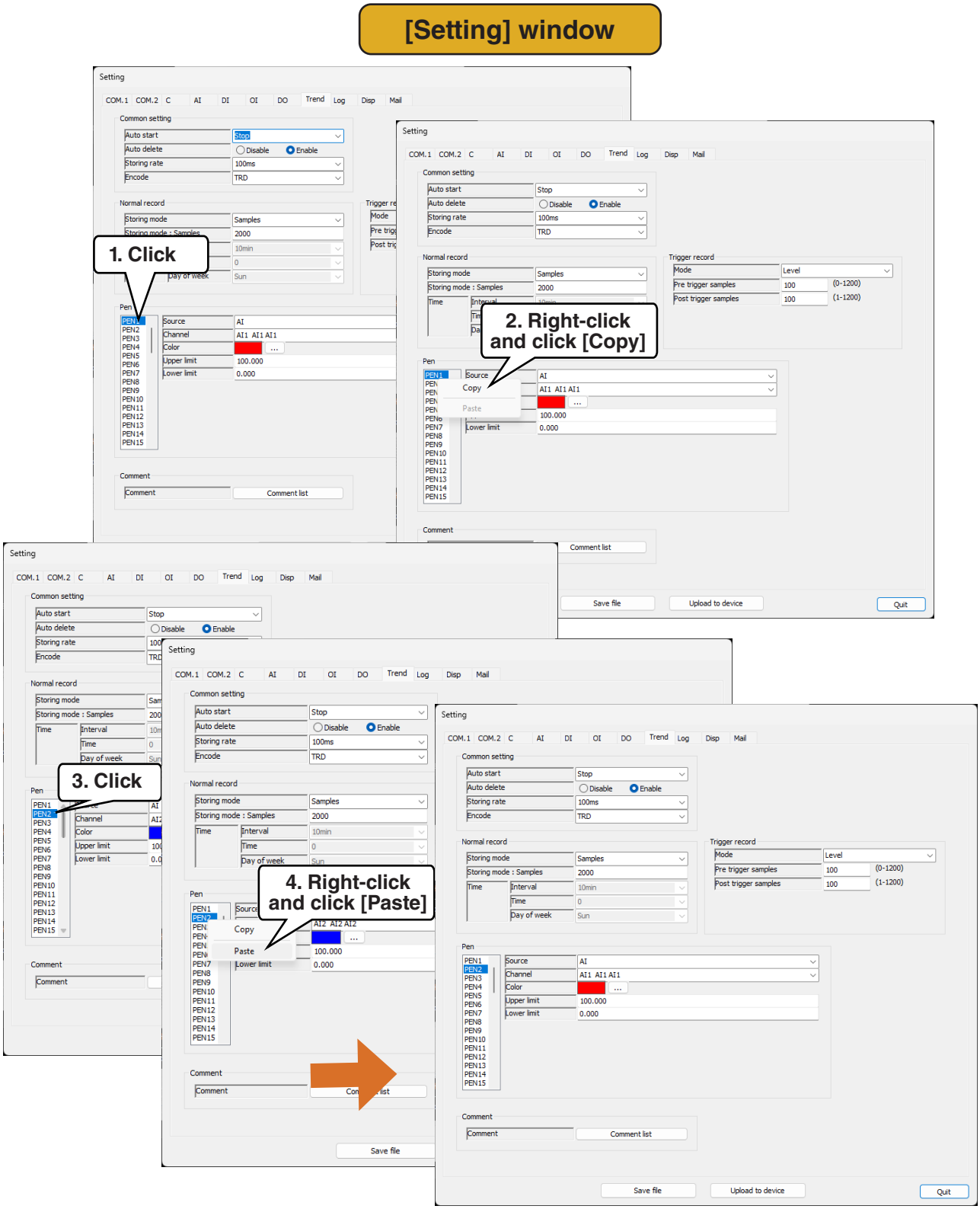
1. Select the pen to be set to display the current settings of the selected pen.
2. Assign the pen. Set the pen according to the table below.

Parameter	Description
Source	Select the source to be assigned. Select from None / AI / DI / OI / DO.
Channel	Set the channel to be assigned. Select from the list of I/O channel selected in the source.
Color	Set the pen color.
Upper limit	Set the scaling value of 100% in the trend graph.
Lower limit	Set the scaling value of 0% in the trend graph.

3. Follow the above procedure to set all the pens. The pen setting already configured can also be copied to other pens and only the required parameters can be modified.

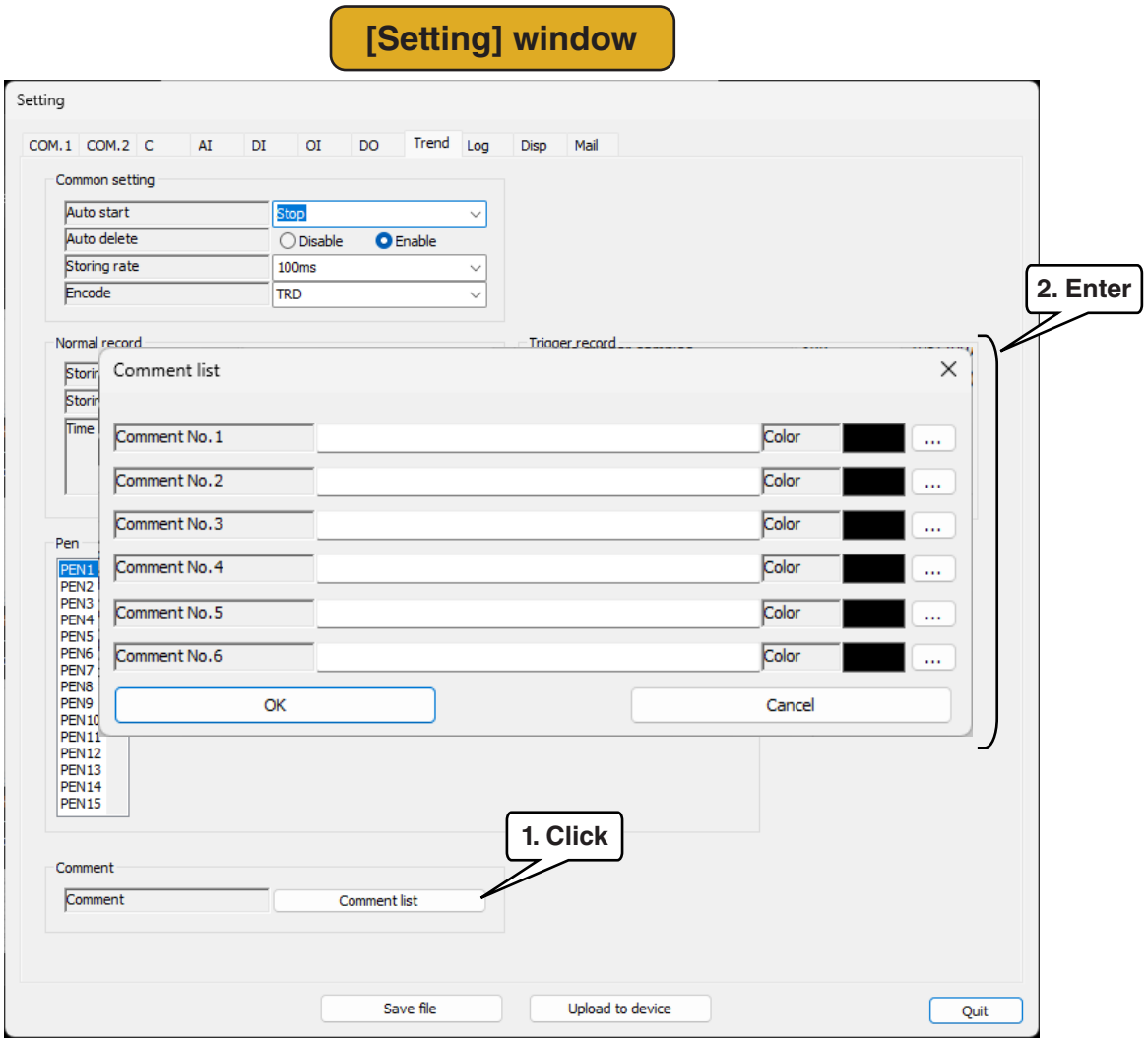
3.5.2.2 Copying pen setting

The pen setting configured on [Trend setting] window can also be copied to other pens and only the required parameters can be modified.



3.5.3 Comment setting

Configure the comment setting registered to the trend graph.

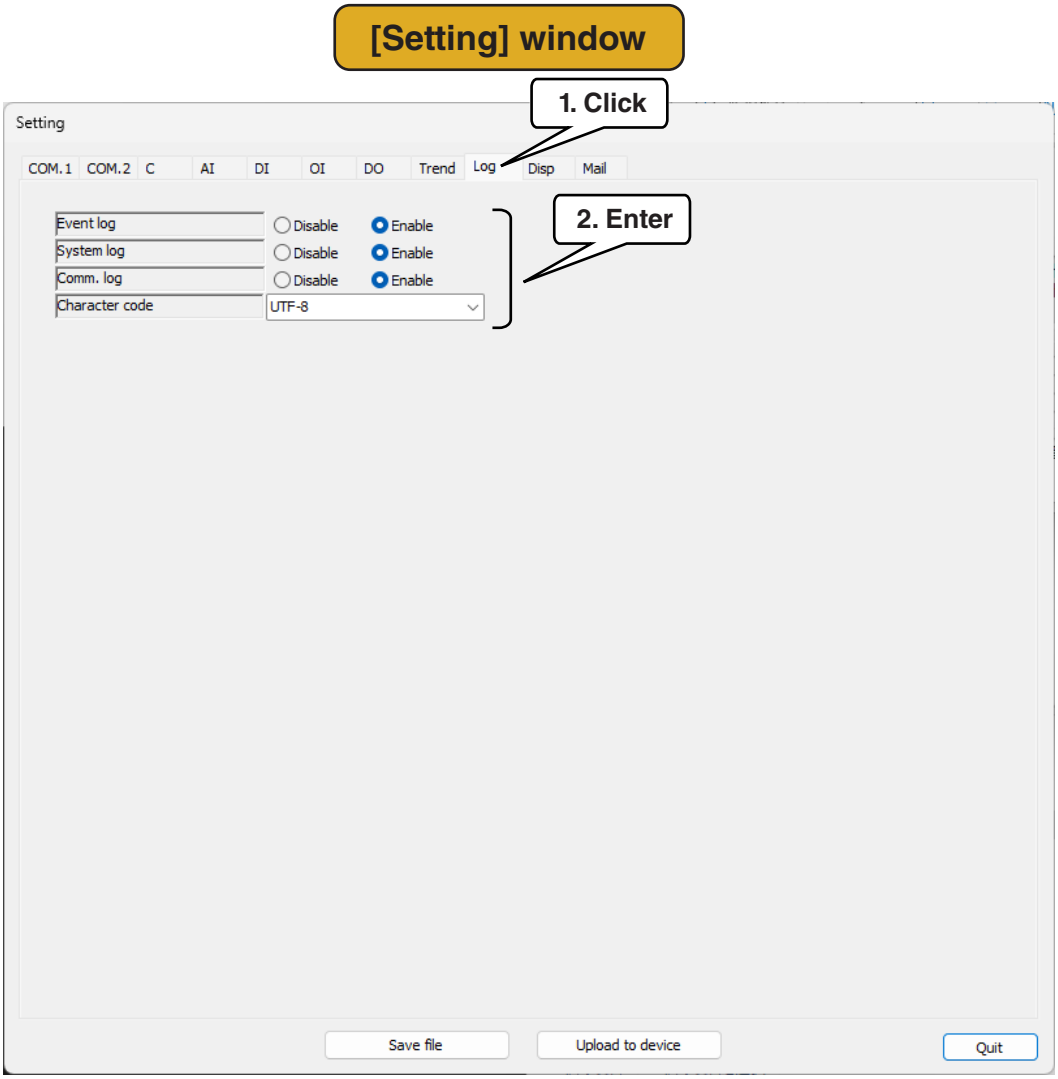


Set parameters according to the table below.

Parameter	Description
Comment No. 1, 2	Set the comments within 32 characters.
Color	Set the comment color.

3.6 Log setting

Configure log file setting stored to an SD card.



Set parameters according to the table below.

Parameter	Description
Event log	Select [Disable] in case of not storing event log files to the SD card.
System log	Select [Disable] in case of not storing system log files to the SD card.
Comm. log	Select [Disable] in case of not storing communication log files to the SD card.
Character code	Choose either UTF-8 or Shift-JIS character code used to save log files.

3.7 Display setting

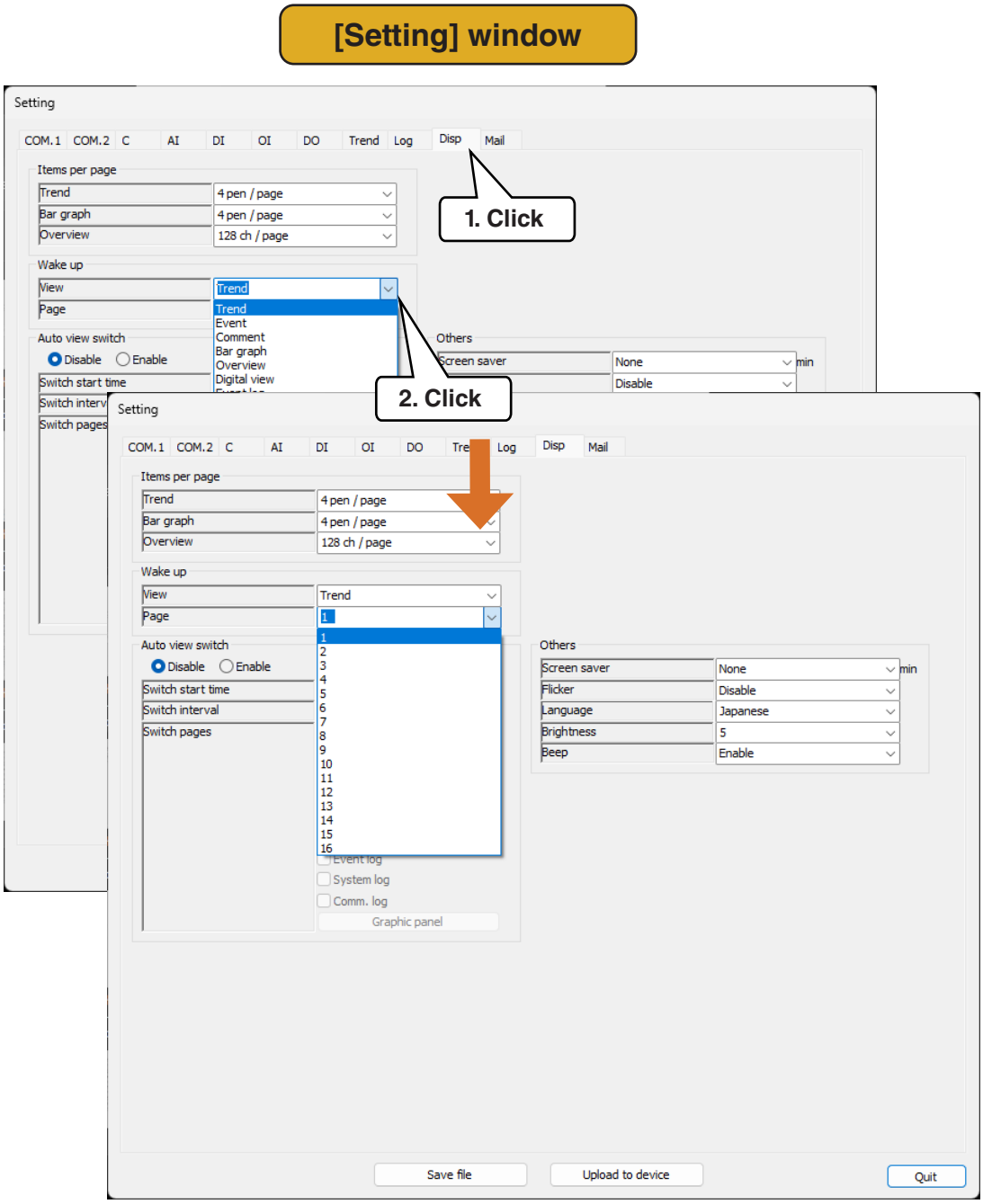
Configure the display setting of VR144E-G16.

3.7.1 Wake up screen setting

Configure the display setting when the VR144E-G16 is turned on.

3.7.1.1 Setting the trend screen to the wake up screen

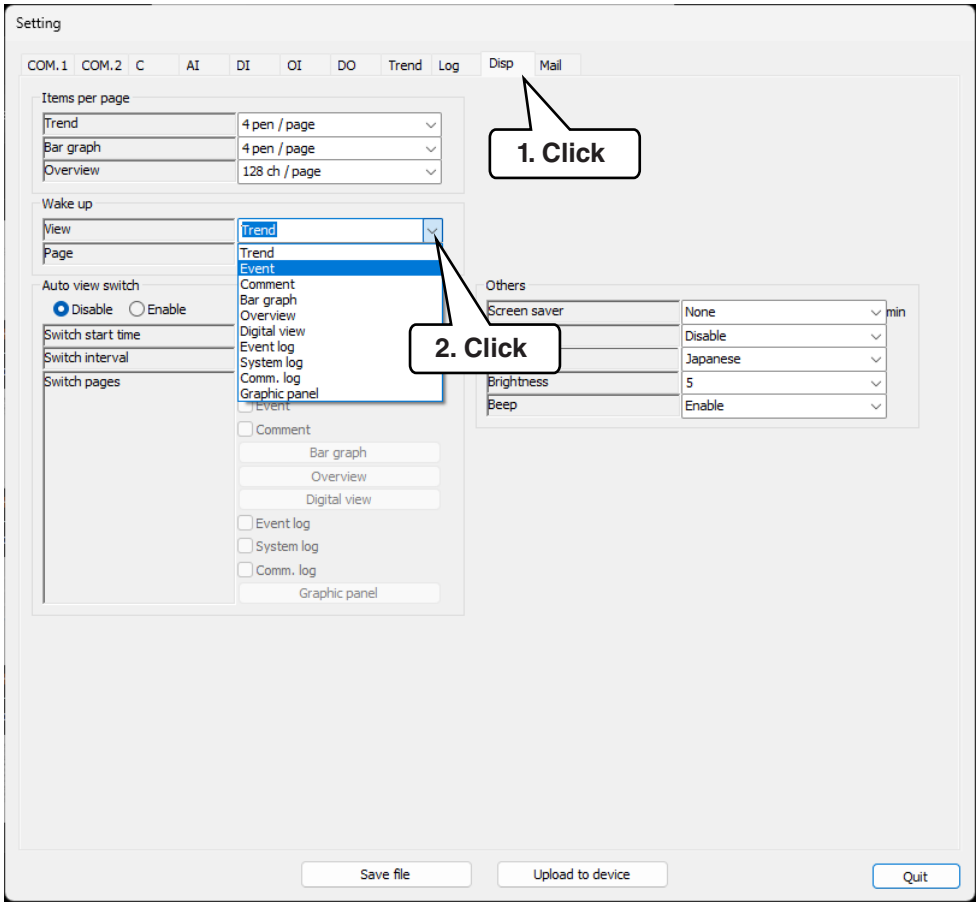
1. Click [Disp] tab.
2. Click view drop-down list and select [Trend].
3. Click page drop-down list and select from [1] to [16].
4. The pen assigned to [Items per page] (4 pen / 8 pen) is displayed.
   ➔ 3.5.2.1 Pen setting



3.7.1.2 Setting the event screen to the wake up screen

1. Click [Disp] tab.
2. Click view drop-down list and select [Event].
3. The summary of the latest 40 events for which checkboxes of [trend record] are selected or for which trend record is set to [Enable] is displayed.
   ➔ 3.4.1.6 Event setting (AI), 3.4.1.4 Basic setting (AI), 3.4.3.3 Event setting (OI)

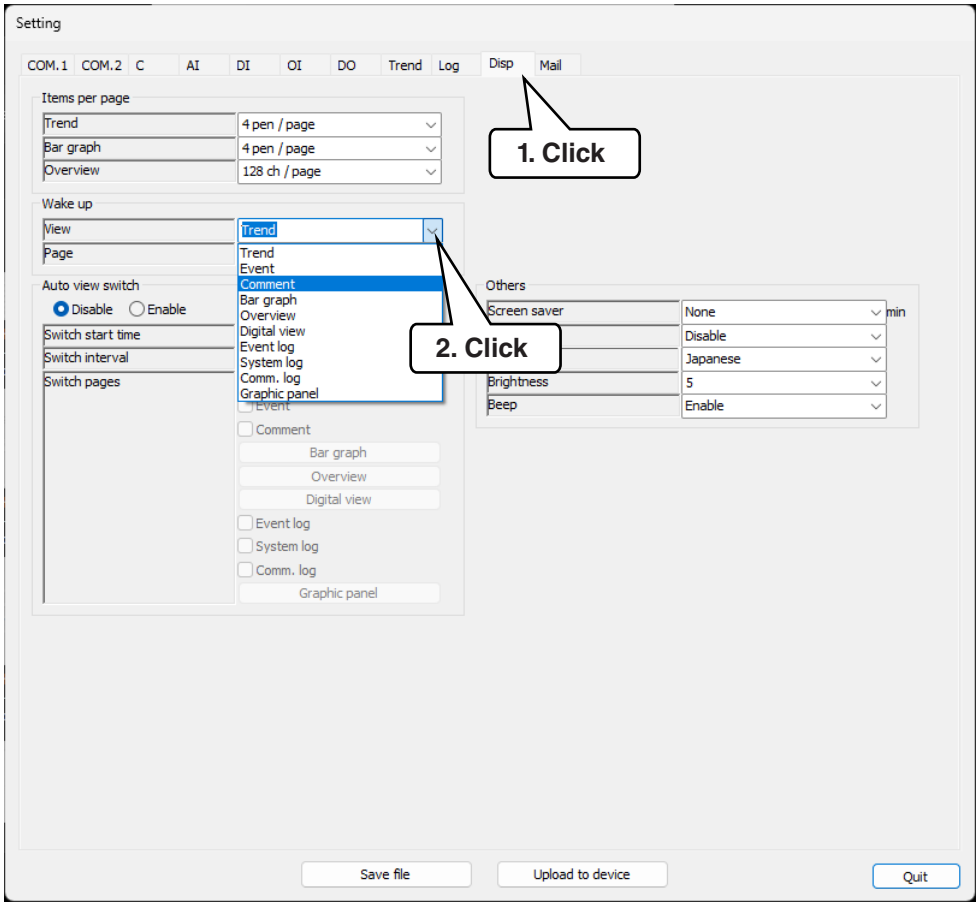
[Setting] window



3.7.1.3 Setting the comment screen to the wake up screen

1. Click [Disp] tab.
2. Click view drop-down list and select [Comment].
3. The summary of the latest 40 comments is displayed on the wake up screen.

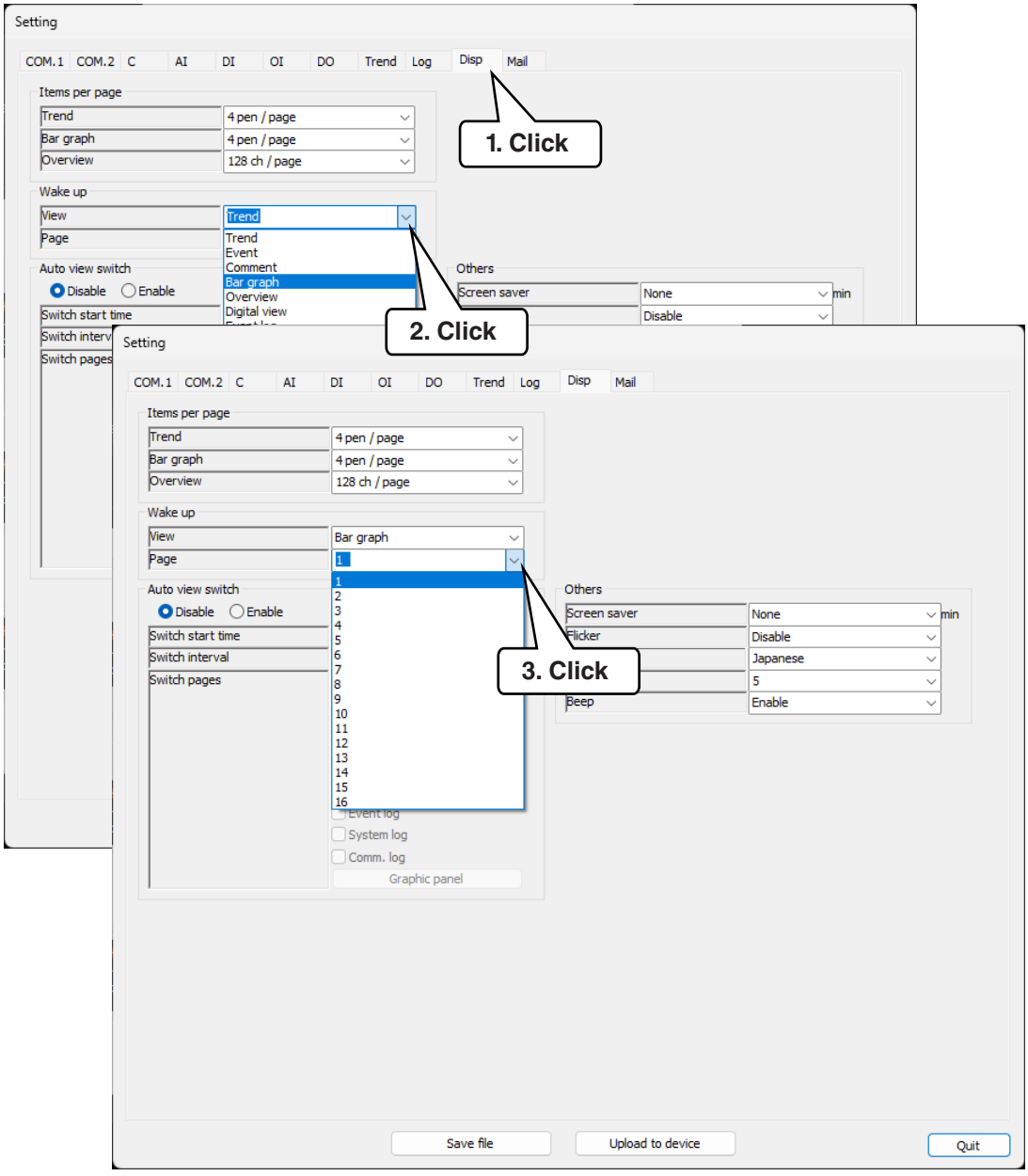
[Setting] window



3.7.1.4 Setting the Bargraph screen to the wake up screen

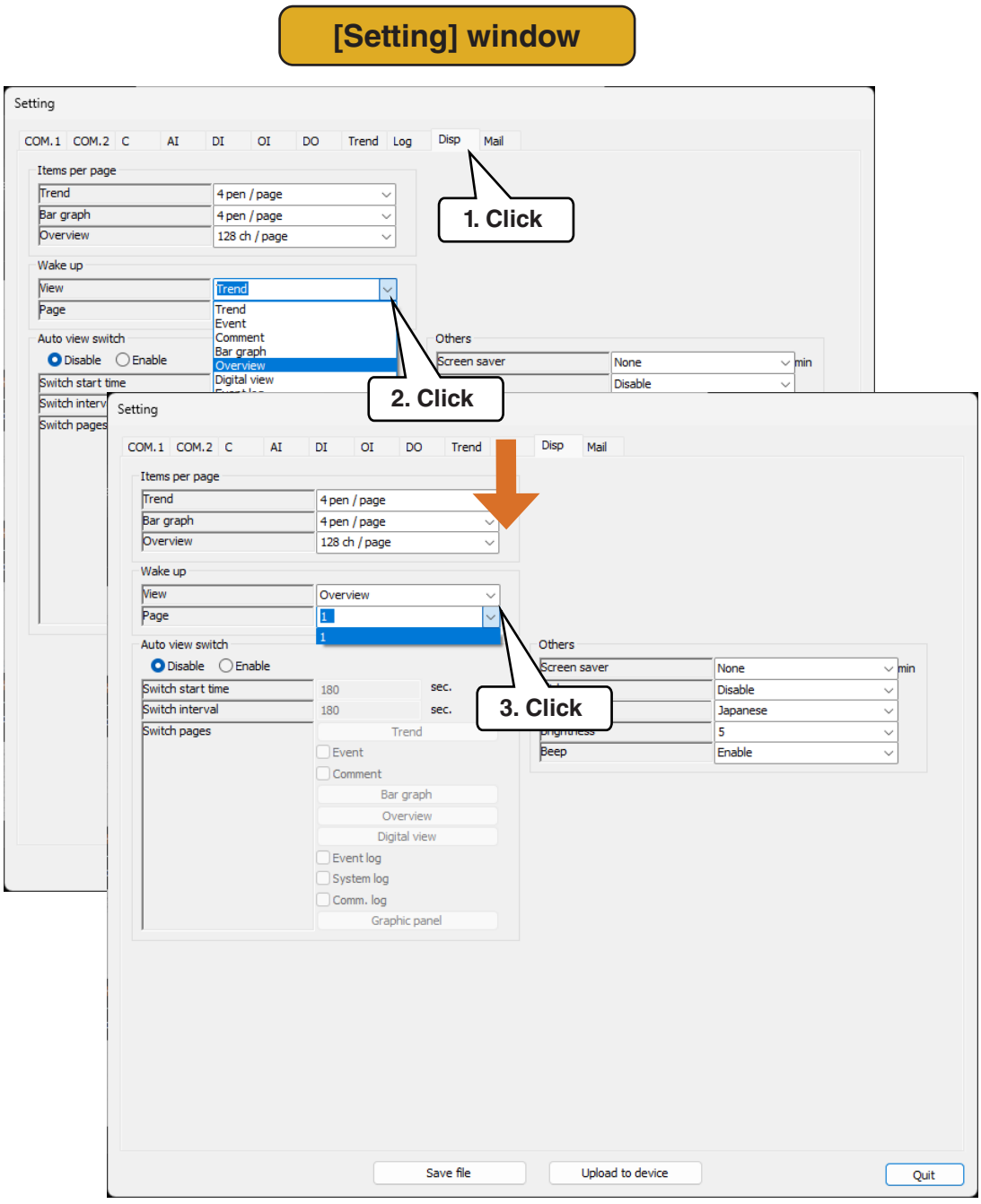
1. Click [Disp] tab.
2. Click view drop-down list and select [Bar graph].
3. Click page drop-down list and select from [1] to [16].
4. The pen assigned to [Items per page] (4 pen / 8 pen) is displayed.

[Setting] window



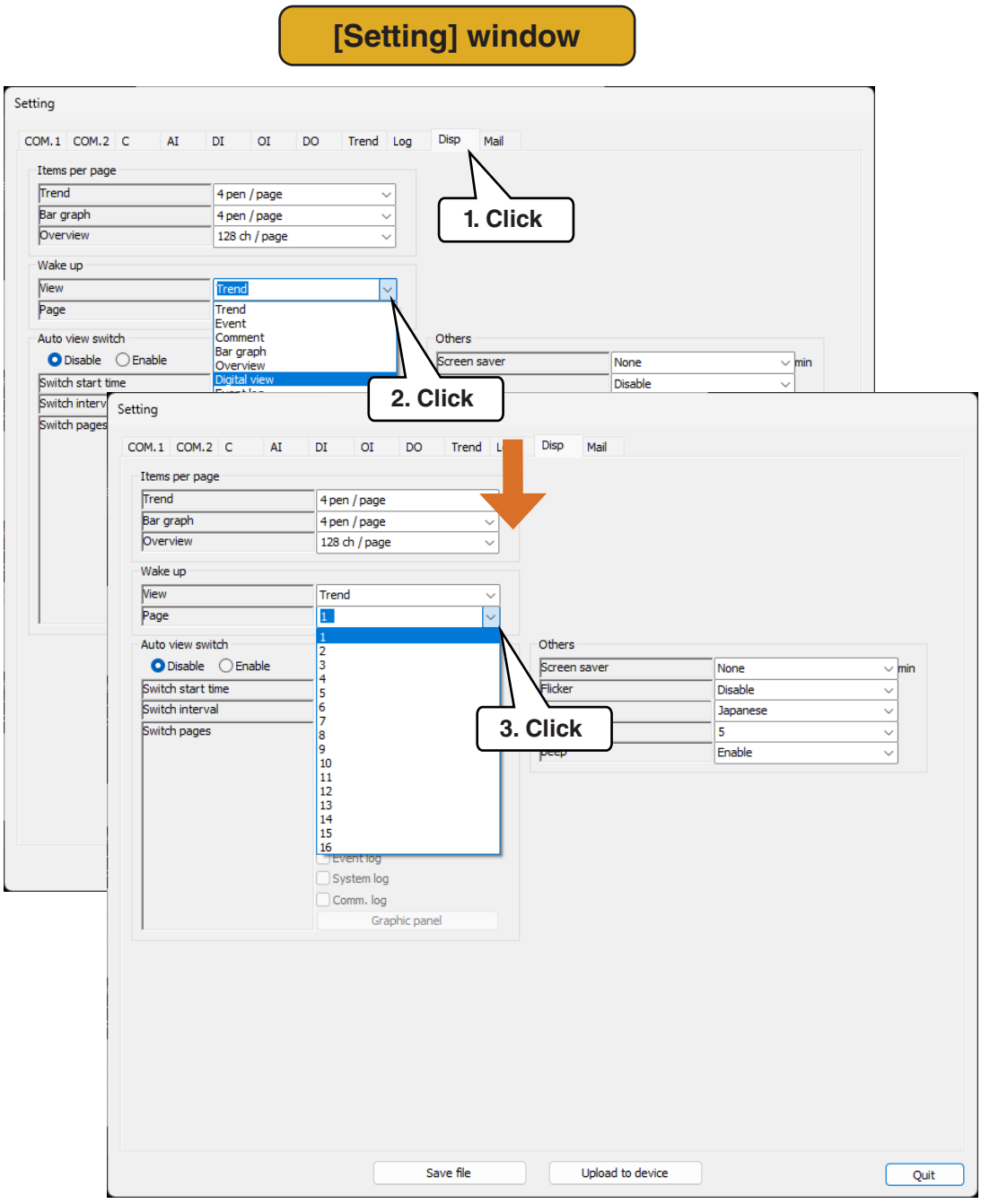
3.7.1.5 Setting the overview screen to the wake up screen

1. Click [Disp] tab.
2. Click view drop-down list and select [Overview].
3. Click page drop-down list and select [1].
4. The pens assigned to channels in [Items per page] (16 ch / 32 ch / 64 ch / 128 ch) are displayed.



3.7.1.6 Setting the digital view screen to the wake up screen

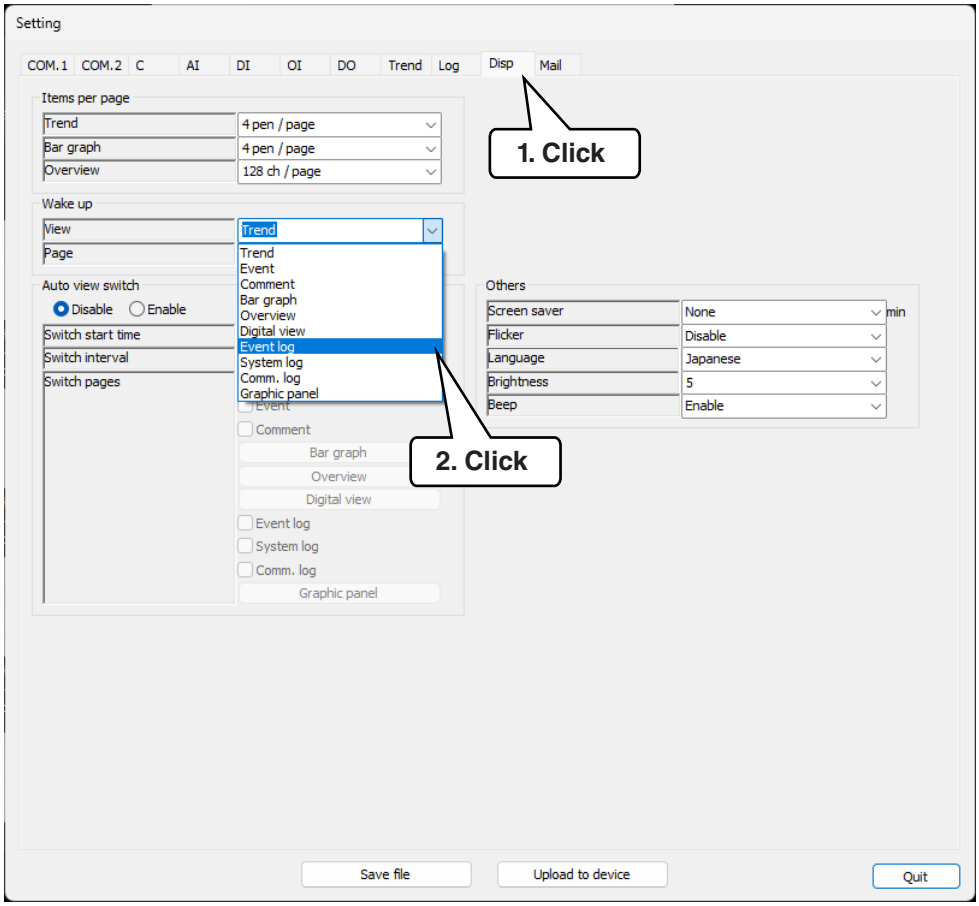
1. Click [Disp] tab.
2. Click view drop-down list and select [Digital view].
3. Click page drop-down list and select from 1 to 16.
4. The pens assigned to 8 channels per page are displayed.



3.7.1.7 Setting the event log screen to the wake up screen

1. Click [Disp] tab.
2. Click view drop-down list and select [Event log].
3. The latest 40 event logs are displayed.

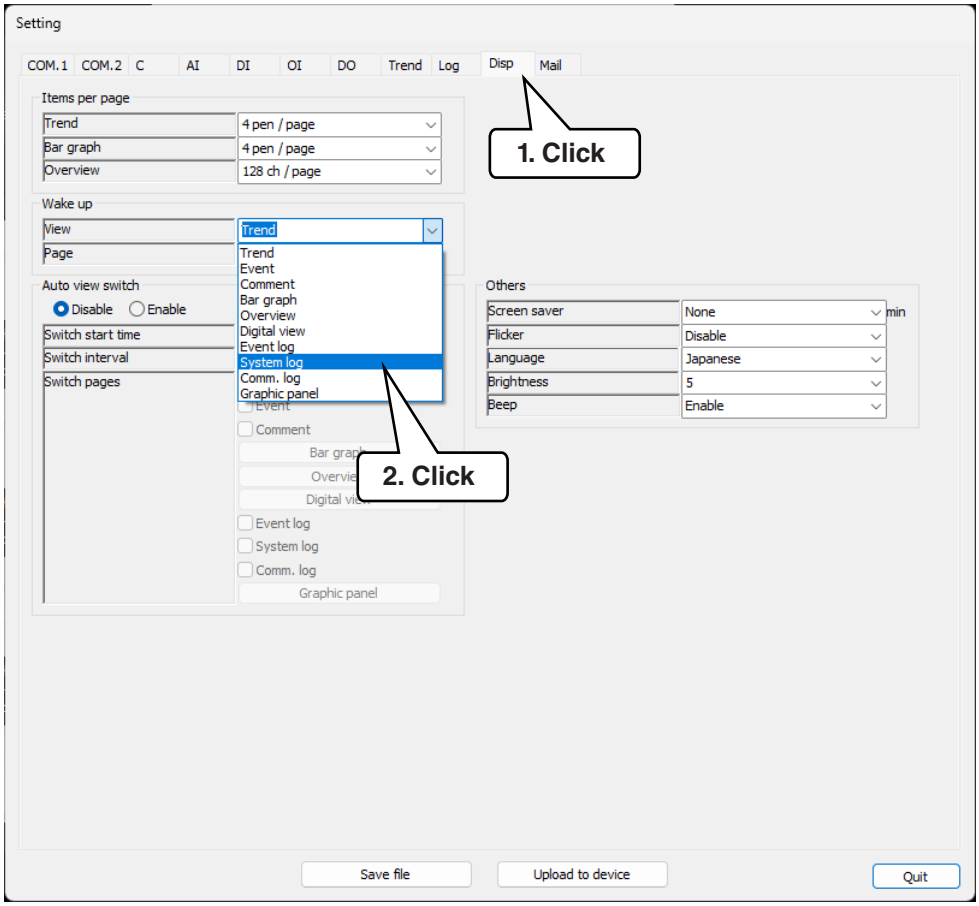
[Setting] window



3.7.1.8 Setting the system log screen to the wake up screen

1. Click [Disp] tab.
2. Click view drop-down list and select [System log].
3. The latest 40 system logs are displayed.

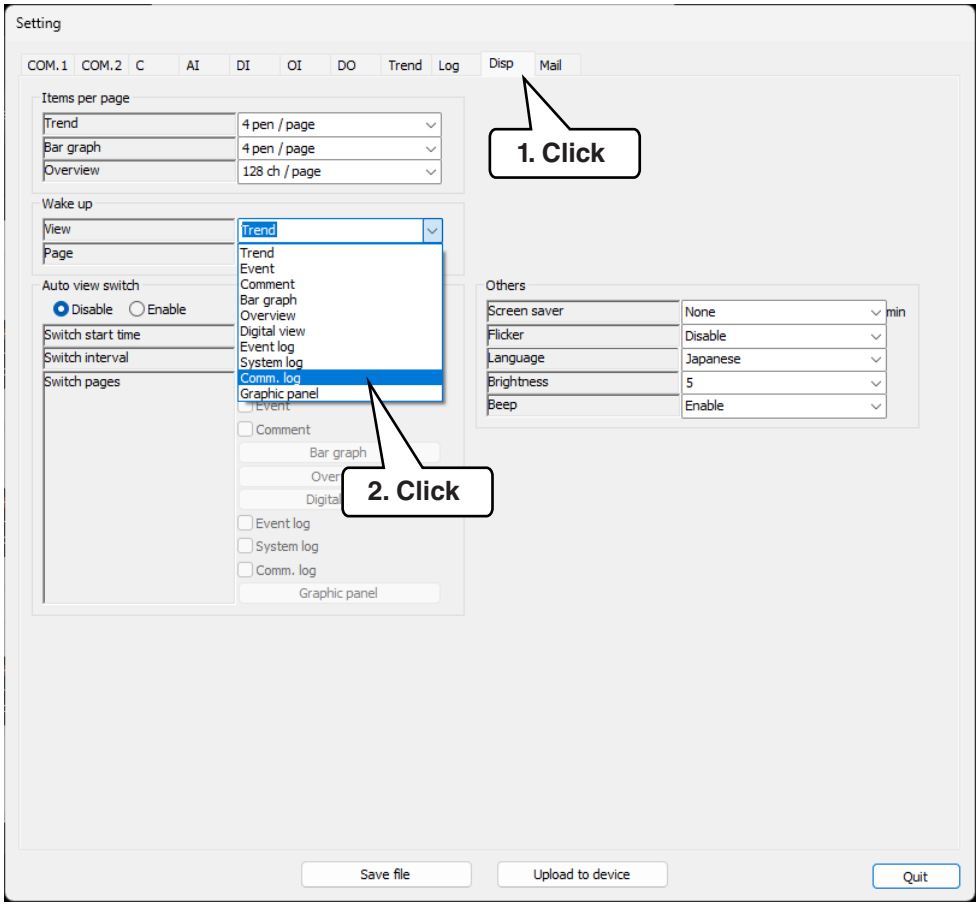
[Setting] window



3.7.1.9 Setting the communication log screen to the wake up screen

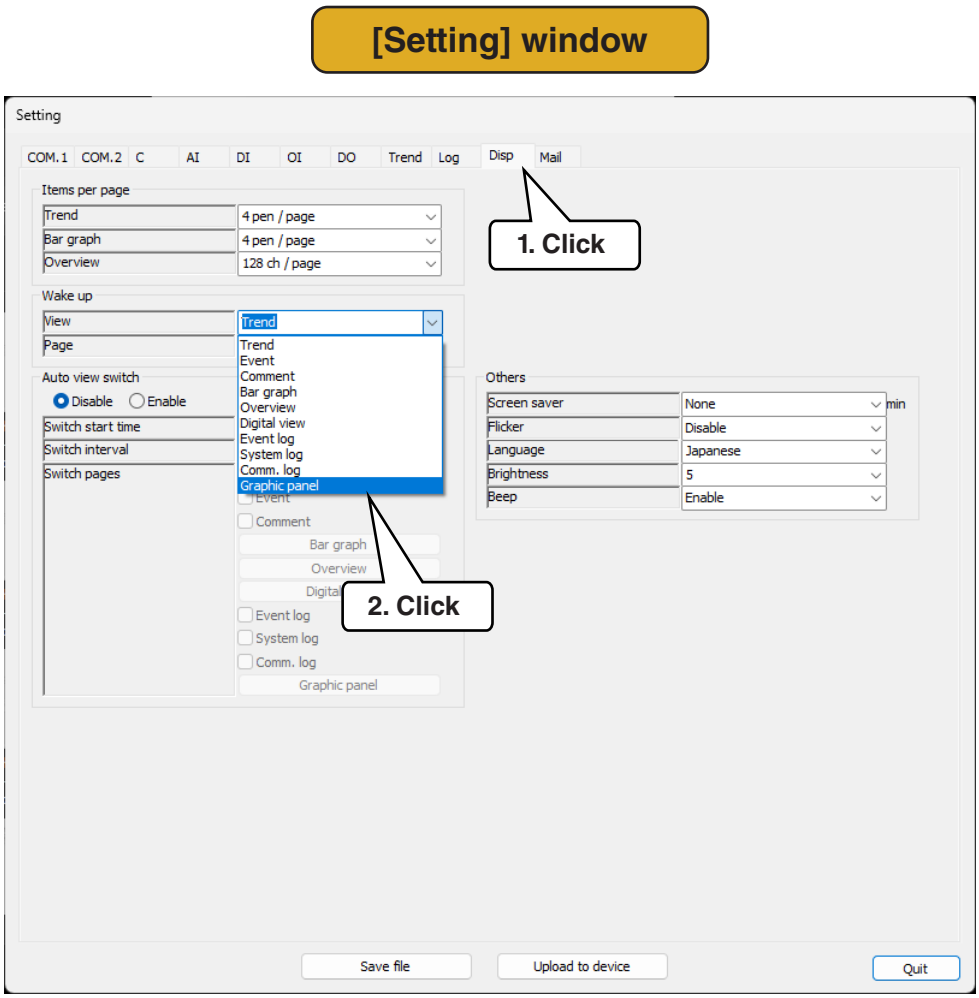
1. Click [Disp] tab.
2. Click view drop-down list and select [Comm. log].
3. The latest 40 communication logs are displayed.

[Setting] window



3.7.1.10 Setting the graphic panel screen to the wake up screen

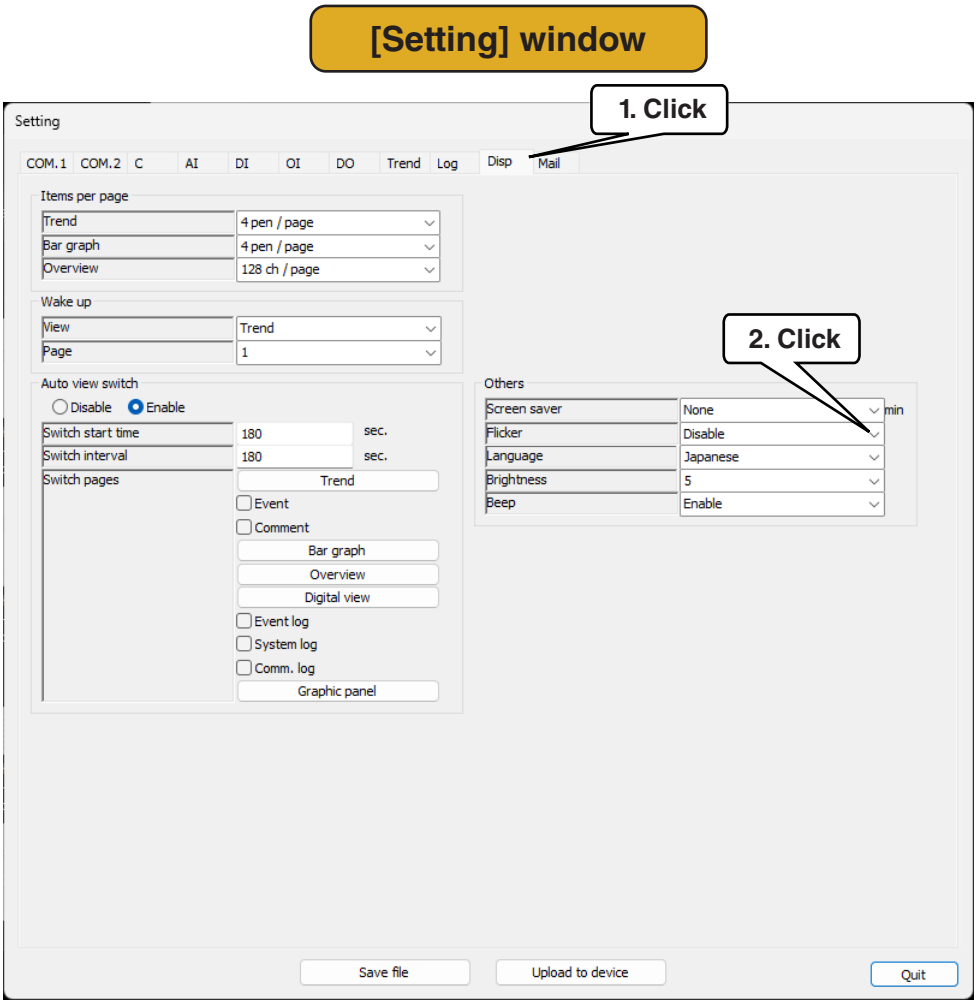
1. Click [Disp] tab.
2. Click view drop-down list and select [Graphic panel].
3. Click page drop-down list and select [1] or [2].
4. The selected graphic panel is displayed.



3.7.2 Digital view setting

Set the parameters to be displayed in flicker mode when the VR144E-G16 screen is in digital view or in overview.

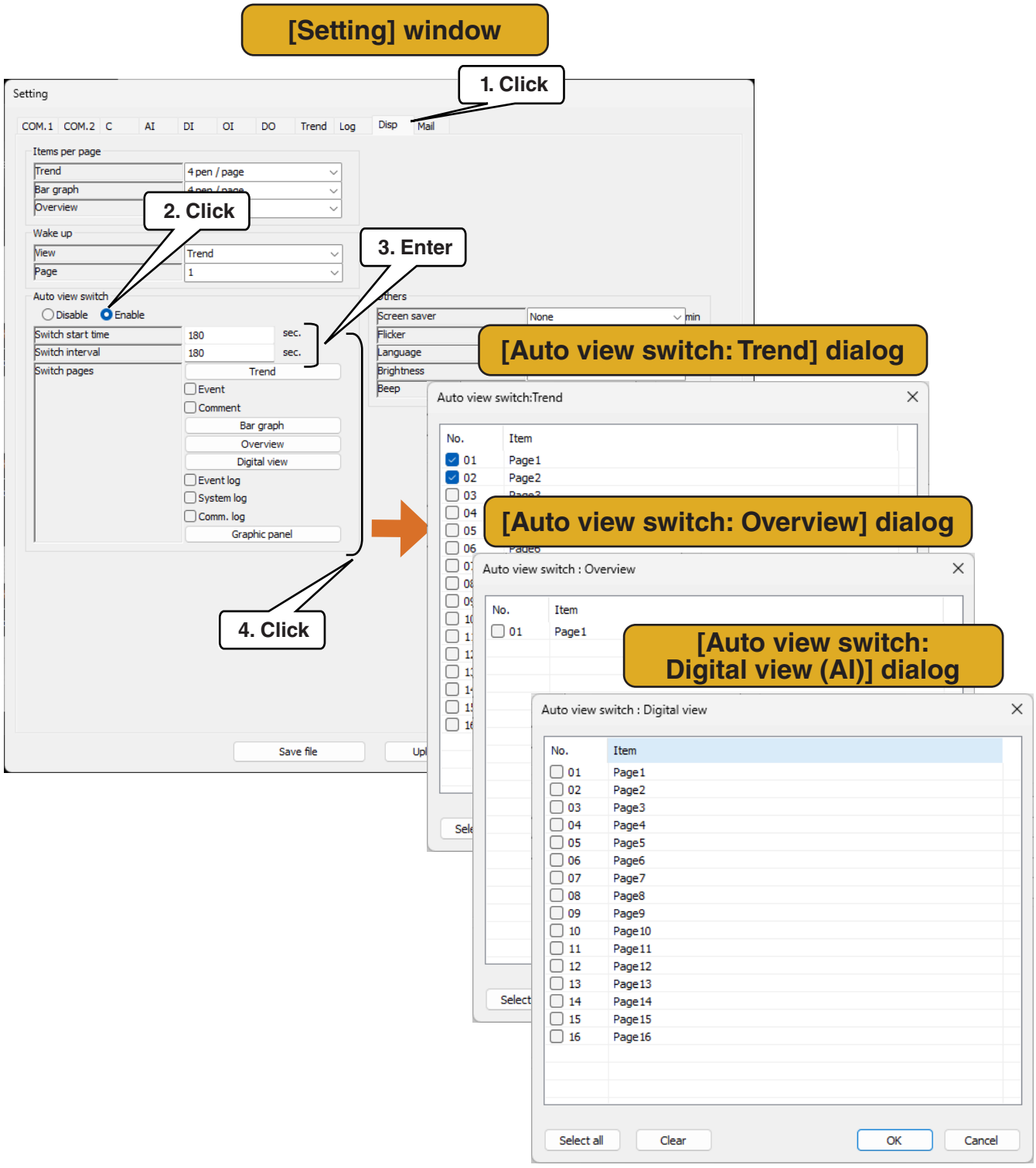
1. Click [Disp] tab.
2. Click the flicker drop-down list and select [Enable].
3. When the value is within the zone where [Condition (abnormal)] is selected in the event setting of [AI] or [OI] tab, the display will be in flicker mode. When it goes out of the zone, the display returns to normal mode.



3.7.3 Auto view switch setting

Configure the auto view switch setting for the VR144E-G16.

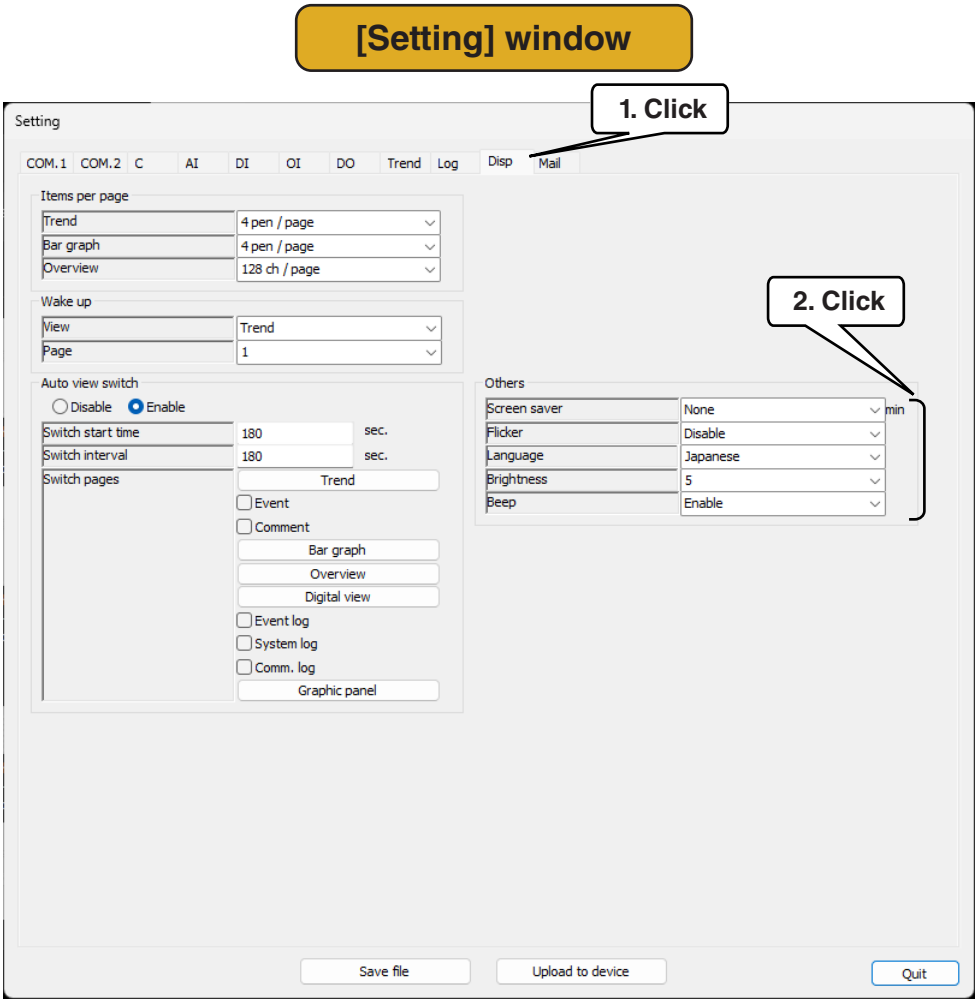
1. When enabling auto view switch, select [Enable] in [Auto view switch].
2. Set parameters according to the table on the next page.
3. Configure the settings for the screen to be targeted for auto view switch.
   Select checkboxes of the parameter to be targeted for auto view switch.
4. Regarding [Trend], [Bargraph], [Overview], [Digital view] and [Graphic panel], select a corresponding page.



Parameter	Description
Switch start time	Set the switch start time. If the VR144E-G16 is not operated for a period exceeding the switch start time, the view switches automatically. Set in the range of 10 to 180 (sec.).
Switch interval	Set the interval for auto view switch. After the switch interval time elapses, transition to the screen set as the target for auto view switch is performed automatically. Set in the range of 3 to 180 (sec.).

3.7.4 Other settings

Configure the screen, screen saver, flicker, language and brightness of the VR144E-G16.
Set parameters according to the table below.



Parameter	Description
Screen saver	Set the time until the screen saver activates. The screen saver activates if the VR144E-G16 is not operated for the set time. Set it disable or within 1 to 10 minutes.
Flicker	Set the flicker mode when the VR144E-G16 screen is in digital view, overview screen, or graphic panel screen. Select [Enable] or [Disable]. When the value is within the zone where [Condition (abnormal)] is selected in the event setting of [AI] or [OI] tab, the display will be in flicker mode. When it goes out of the zone, the display returns to normal mode.
Language	Set the language displayed on the VR144E-G16 Select English or Japanese.
Brightness	Set the brightness of the LCD panel of VR144E-G16. Set within 1 (dark) to 5 (bright).
Beep	Set whether or not to emit a sound when the touch panel is tapped. Select [Enable] or [Disable].

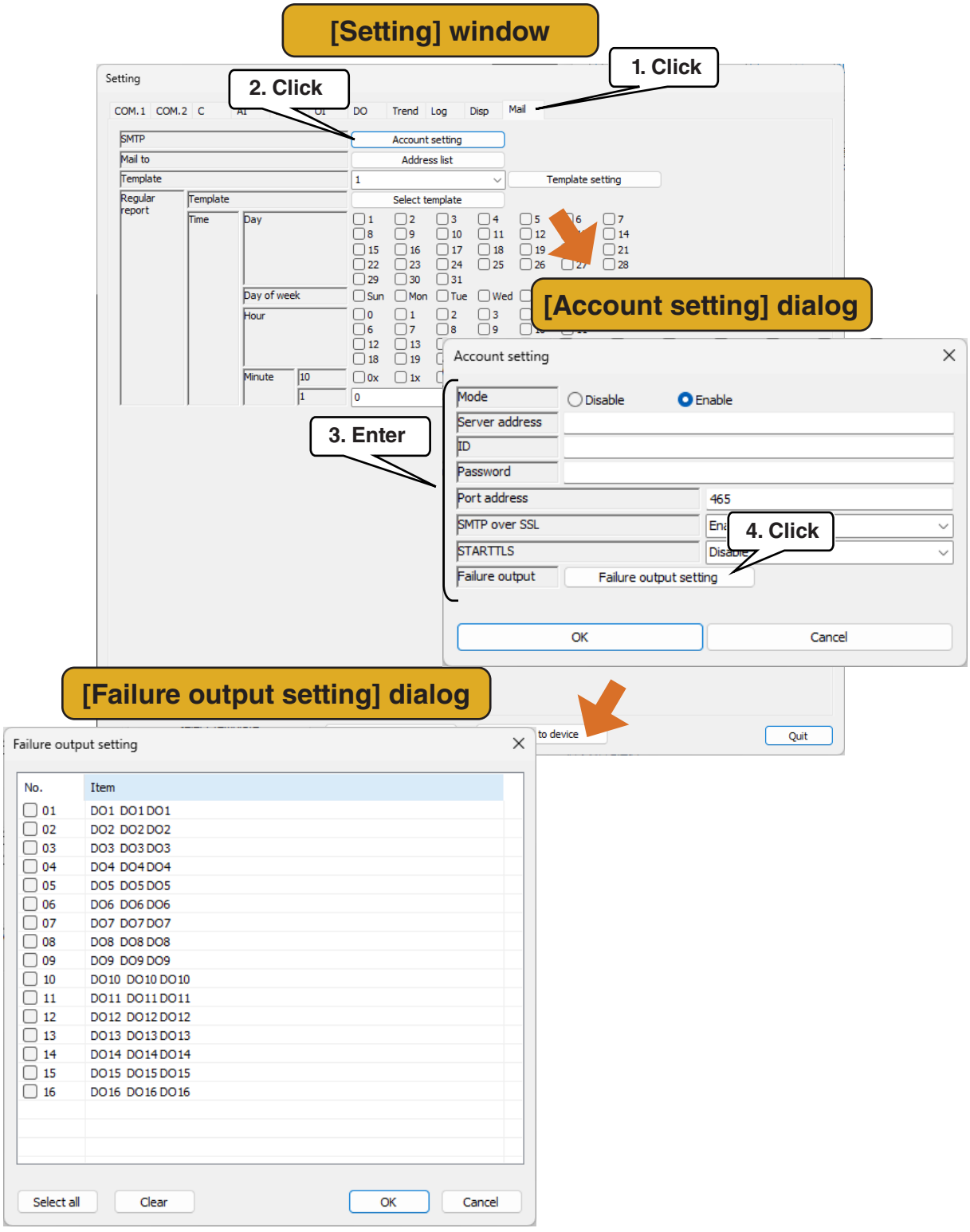
3.8 E-mail reporting setting

Configure e-mail reporting setting with the SMTP authentication.

3.8.1 Account setting

Configure the account for sending e-mails.

1. Click [Account setting] button to display [Account setting] dialog.
2. Set parameters according to the table below.
3. Click [Failure output setting] button to display [Failure output setting] dialog.
   Select the checkbox in case of outputting DO when sending an e-mail fails.



Parameter	Description
Mode	Select [Disable] or [Enable].
Server address	Set the mail server address within 64 characters.
ID	Set the ID (e-mail account name) within 64 characters.
Password	Set the password within 64 characters.
Port address	Set the port address of the server.
SMTP over SSL	Set the encrypted communication. Select [Enable] to use it.
STARTTLS	Select [Disable] or [Enable] only when SMTP over SSL is [Enable].

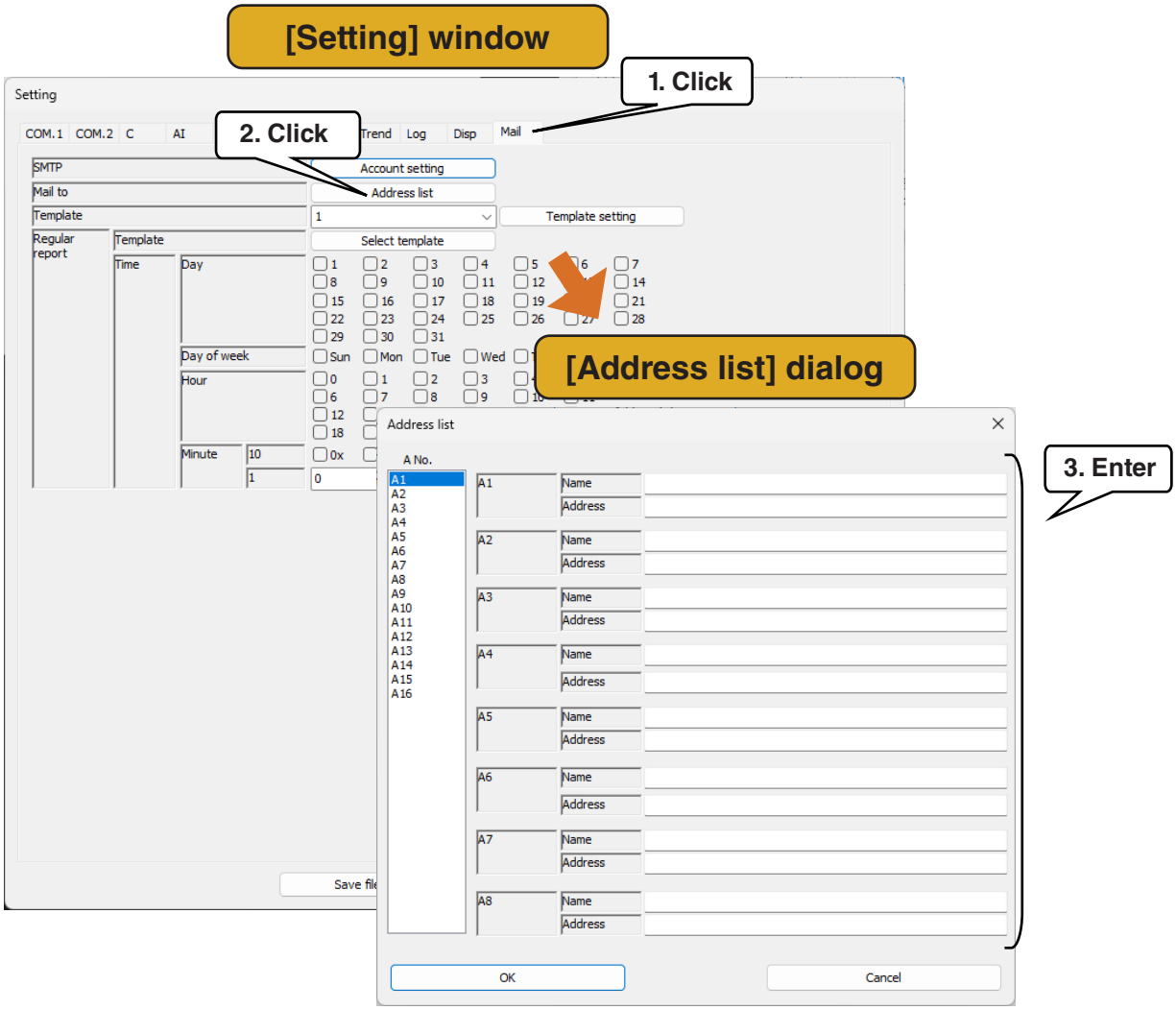
CAUTION

- Mail receiving is not available for VR144E-G16.
- SMTP over SSL authentication is intended only for encryption. Therefore the certification issued by mail server is not verified.
- It is not guaranteed that this function can connect to all mail servers.
- For mail service, there are many kind of restrictions varying by each company. Also change of function or authentication may be carried out. Therefore according to these changes of restriction or function, check the mail communication on a regular basis and perform adequate operational administrative.

3.8.2 Recipient address setting

Configure the e-mail recipient address. Up to 16 addresses A1 to A16 can be set.

1. Click [Mail] tab.
2. Click [Address list] button to display [Address list] dialog.
3. Set parameters according to the table below.

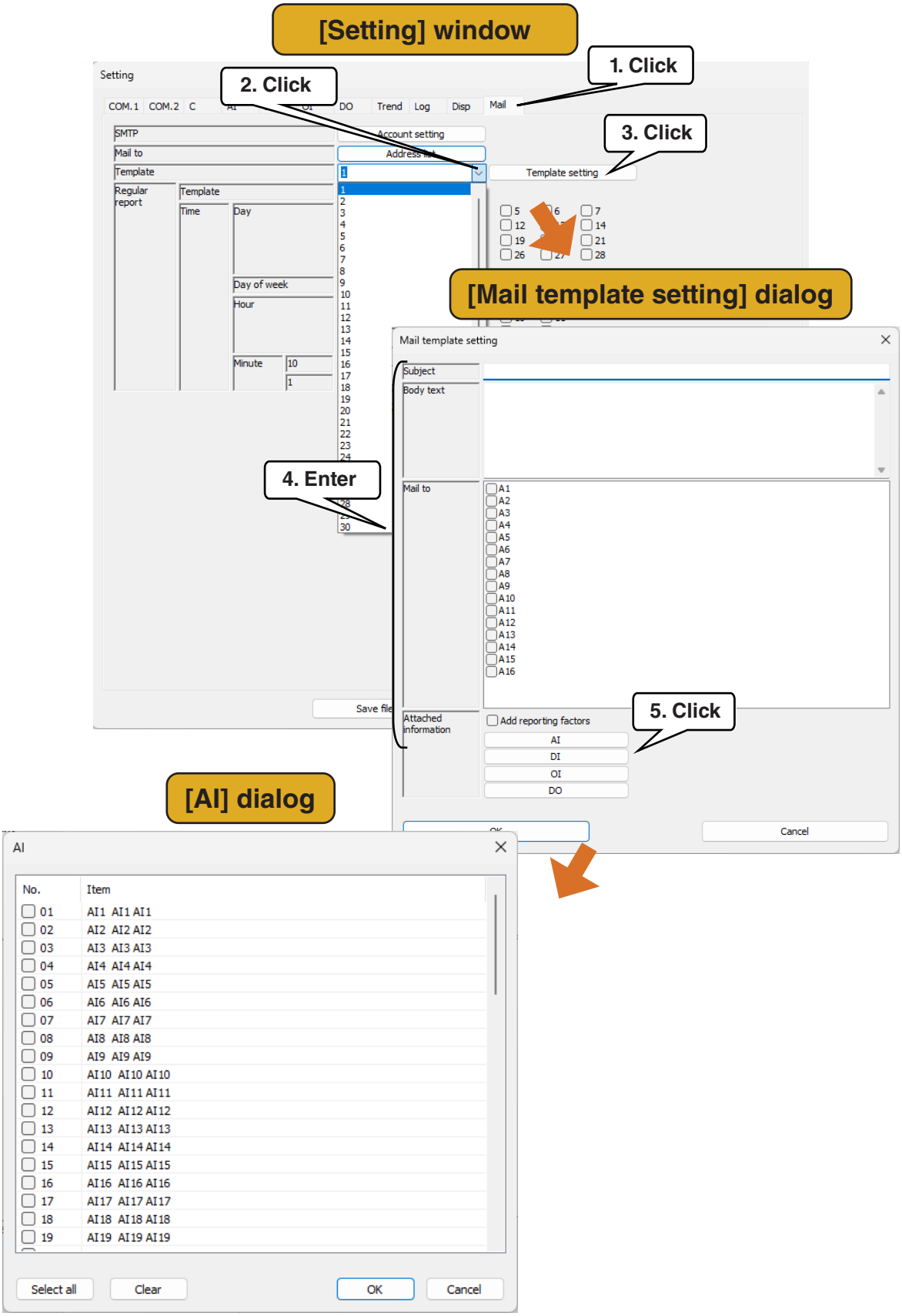


Parameter	Description
Name	Set within 16 characters.
Address	Set the e-mail recipient address within 64 characters.

3.8.3 Template setting

Configure the mail template setting. Up to 32 templates can be set.
1. Click template drop-down list and select a template to be set.
2. Click [Template setting] button to display [Mail template setting] dialog.
3. Click [AI], [DI], [OI] or [DO] button to set the I/O information attached to the body text.
4. Set parameters according to the table below.

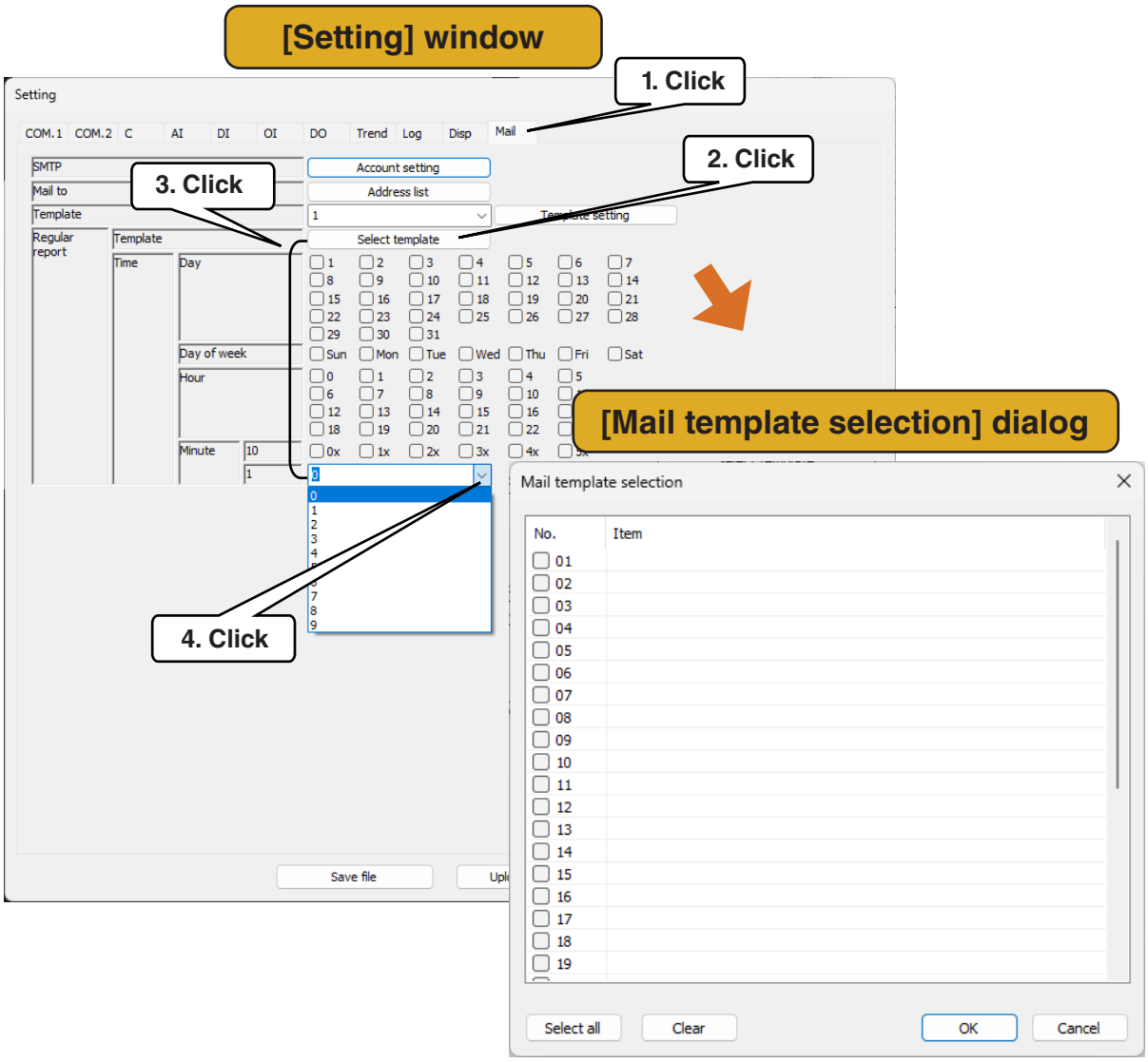
Parameter	Description
Subject	Set the subject of e-mail within 32 characters.
Body text	Set the body text of e-mail within 128 characters.
Mail to	Select the checkbox of the addresses specified for e-mail recipient.
Attached information Add reporting factors	Select the checkbox when adding reporting factors at the end of the body text.


[Setting] window
1. Click
2. Click
3. Click
4. Enter
5. Click
[Mail template setting] dialog
[AI] dialog
Setting
COM.1
COM.2
C
DO
Trend
Log
Disp
Mail
SMTP
Account setting
Mail to
Address list
Template
Template setting
Regular report
Time
Day
Day of week
Hour
Minute
Save file
Mail template setting
Subject
Body text
Mail to
Attached information
Add reporting factors
AI
DI
OI
DO
Cancel
AI
No.
Item
Select all
Clear
OK
Cancel

3.8.4 Regular reporting setting

Configure the regular reporting setting.

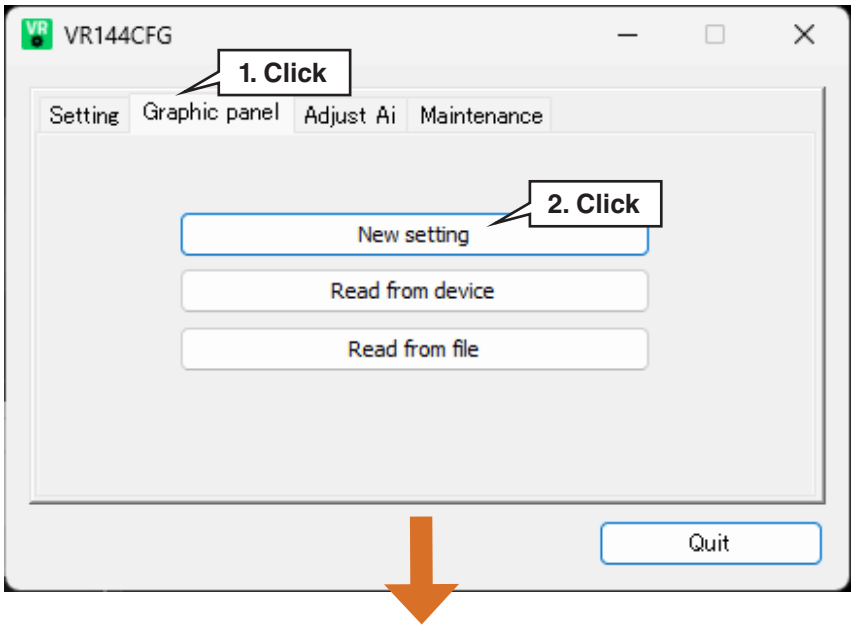
1. Click [Select template] button to display [Mail template selection] dialog.
   Select the template to be used for regular reporting.
2. Enter the day and time for regular reporting. Multiple items can be selected for each parameter.
   An e-mail will be sent on the selected day and time of the week.



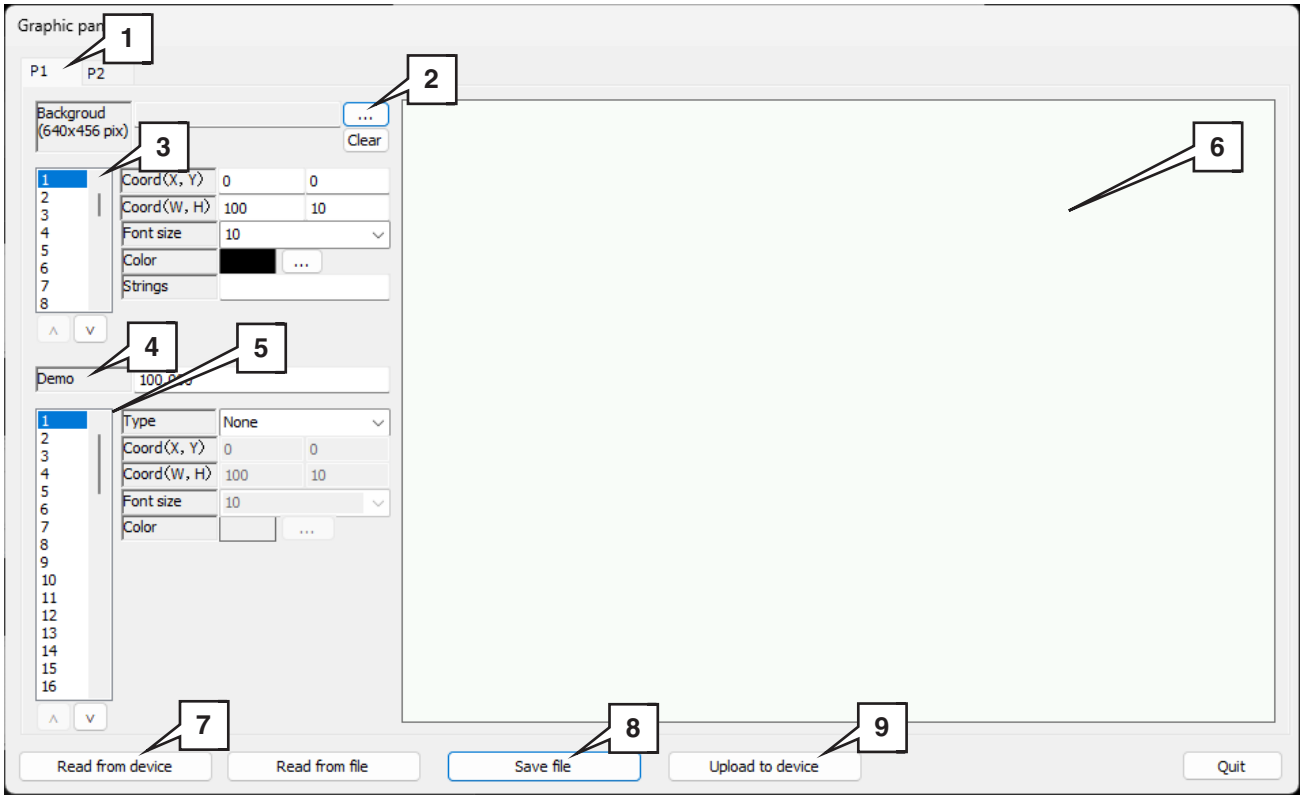
3.9 Graphic panel

The views can be freely created within the area excluding the header by specifying a background and parts.

Setting window



Graphic panel dialog



No.	Item	Description
1	Tab	P1 and P2 are switched.
2	Background image	[…]: The background image is selected. The selected image is displayed in the drawing area. The image is trimmed starting from the top left corner. [Clear]: The background image is deleted. The background turns white after deleting the image.
3	Text part	· The number of text parts is 32. The text part is drawn starting from the 1st one, so 32nd one is drawn at the foreground. · If there is not a text part, it is not drawn. · [▲]/[▼]: The part order is switched. · Copying and pasting is possible by right-clicking. · If the width of the text string is longer than the area, it wraps for display. If the height of the text string is longer than the area, it is cut for display.
4	Simulation input	· When an actual value is entered, it is reflected in the drawing of the parts. · Regarding DI and DO, the value is determined as 0 or otherwise. - Regarding AI and OI, the zone is determined based on the set values.
5	Part	· The number of parts is 64. The part is drawn starting from the 1st one, so 64th one is drawn at the foreground. · If the part type is none, it is not drawn. When the part type is not none, the drawing depends on the settings. · [▲]/[▼]: The part order is switched. · Copying and pasting is possible by right-clicking. · If the width of the text string is longer than the area, it wraps for display. If the height of the text string is longer than the area, it is cut for display. · The parts do not flicker in the drawing area.
6	Drawing area	· The default background is white. · The parts are displayed in the drawing area after they are enabled. · The part being edited is highlighted with a border. (Background part: light green. Part: pink) · Clicking an area without parts removes the highlight from the parts. · Clicking a part highlights it and enter editing mode. (It does not switch in case of an error) · Parts can be moved by dragging them. · Clicking again while highlighted switches the highlight to the part below. · When the stacked parts are double-clicked, the stacking order of the background part and the part are switched.
7	Read from device Read from file	The setting values are read from the device or a file. The read setting values are reflected in the drawing.
8	Save file	The setting values are saved to a file. (extension: rom)
9	Upload to device	The setting values are sent to the device.

Part name	Parameter	Description
Background	BMP (640 x 456 pix)	1 per page Select an image for the background.
Text part	Coord (X, Y): The top left coord is specified. Coord (W, H): The width and height are specified. Font size: Select 10, 12, 16, 24 or 32. Color: The text color is specified. Strings: Up to 16 characters are specified.	32 per page Set the fixed text parts for the background.
Image part	Refer to the table on the next page.	64 per page

Part type	Parameter	Description
None	No part	No part
Data	• Coord X: Horizontal position Y: Vertical position W: Width of the part G: Height of the part • Font size Select 10, 12, 16, 24 or 32. • Color The text color is specified. • Source - AI: The input value of AI channel is displayed. - DI: The input value of DI channel is displayed. - OI: The input value of OI channel is displayed. - DO: The output value of DO channel is displayed. - AI_Zone: The zone name of AI channel is displayed. - OI_Zone: The zone name of OI channel is displayed. • Channel The data in the specified number of channel selected in [Source] is displayed. • Align - Left: left-aligned - Right: right-aligned - Center: center-aligned	AI, DI, DO: The data is displayed when the part type is not None. OI: The data is displayed regardless of the part type. AI_Zone: The data is displayed when the part type is not None and when the zone is enabled. OI_Zone: The data is displayed when the zone is enabled.
Bargraph	• Coord X: Horizontal position Y: Vertical position W: Width of the part G: Height of the part • Font size Select 10, 12, 16, 24 or 32. • Color The bargraph color when the number of zone is 0 is specified. • Source AI: The bargraph of AI channel is displayed. • Channel The data in the specified number of channel selected in [Source] is displayed. • Orientation - Horizontal: Left to right - Vertical: bottom to top	The data is displayed when the part type is not None. 0 to 100 % is displayed when the percent display is specified. Int and Uint is displayed as 100 %.
LED	• Coord X: Horizontal position Y: Vertical position W: Width of the part G: Height of the part • Color The color when the number of zone is 0 is specified. • Source - AI: The zone color of AI channel is displayed. - DI: The zone color of DI channel is displayed. - OI: The zone color of OI channel is displayed. - DO: The zone color of DO channel is displayed. • Channel The data in the specified number of channel selected in [Source] is displayed.	AI, DI, DO: The data is displayed when the part type is not None. OI: The data is displayed regardless of the part type. * Flicker setting is applied.

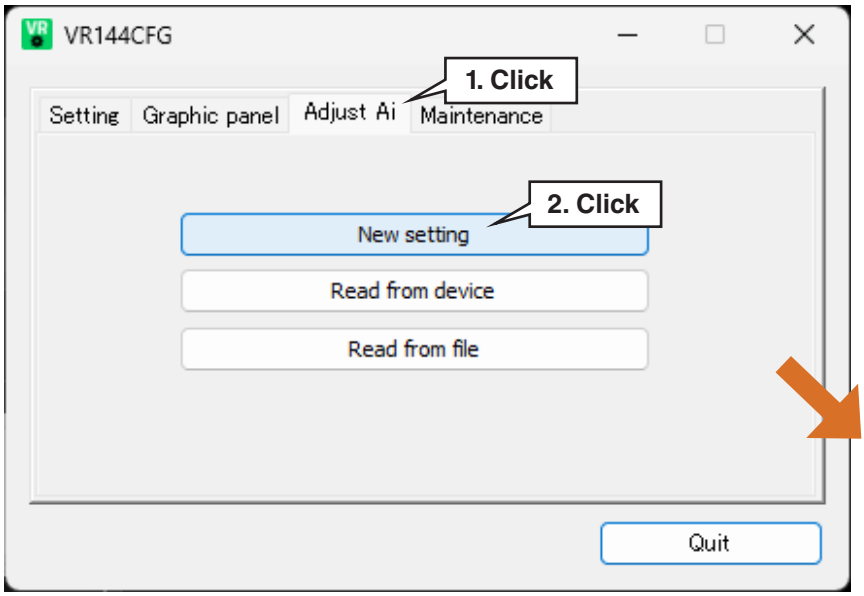
Text	• Coord X: Horizontal position Y: Vertical position W: Width of the part G: Height of the part • Color The text color is specified. • Source - AI: The text specified in AI channel is displayed. - DI: The text specified in DI channel is displayed. - OI: The text specified in OI channel is displayed. - DO: The text specified in DO channel is displayed. • Channel The data in the specified number of channel selected in [Source] is displayed. • Type - CH: Channel - CH name: Channel name is displayed. - CH comment: Channel comment is displayed. - Engineering unit - Zone name: Zone name specified in [Zone number] is displayed. - Zone upper limit: The upper limit of the zone specified in [Zone number] is displayed. - Zone lower limit: The lower limit of the zone specified in [Zone number] is displayed. - Display comment: The comment of the zone specified in [Zone number] is displayed. • Zone number The zone number to be displayed in [Channel] is specified. • Align - Left: left-aligned - Right: right-aligned - Center: center-aligned	AI: - CH, CH name, CH comment: They are displayed regardless of the part type. - Engineering unit: It is displayed when the part type is not None. - Zone name, Zone upper/lower limit: They are displayed when the part type is not None and when the zone is enabled. DI, DO: - CH, CH name, CH comment: They are displayed regardless of the part type. - Display comment: It is not displayed when the part type is None. OI: - CH, CH name, CH comment, Engineering unit: They are displayed regardless of the part type. - Zone name, Zone upper/lower limit: They are displayed when the zone is enabled.

3.10 Adjusting Ai

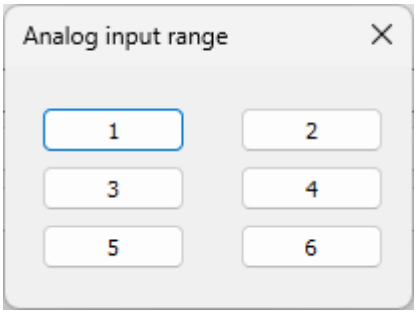
Follow the procedure below in order to adjust Ai value.

1. Select the analog input range by referring to the option code of the device.
2. Adjust the Ai value. Click [List] to check the list of adjusted values.
3. The setting values can be saved in a file. The file extension is json.
4. The setting values can be uploaded to the device.
   An error occurs if an uploaded setting value is out of the selected analog input range.

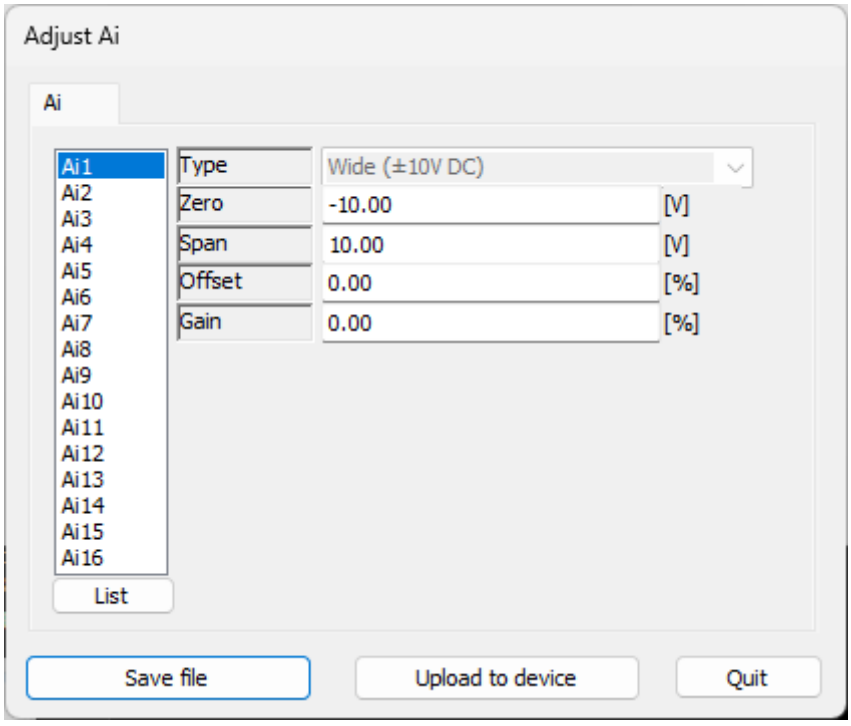
Setting window



Range selecting window



Adjust Ai window

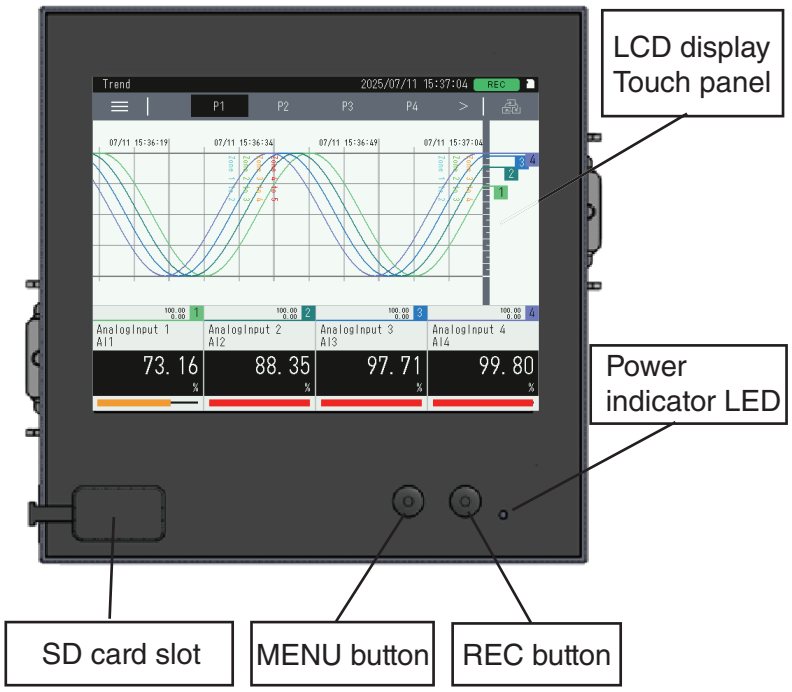


4. VR144E-G16 operation

This chapter describes the details of the VR144E-G16 screen and how to operate it.

4.1 Component identification

The following illustration shows the component identification of the VR144E-G16.

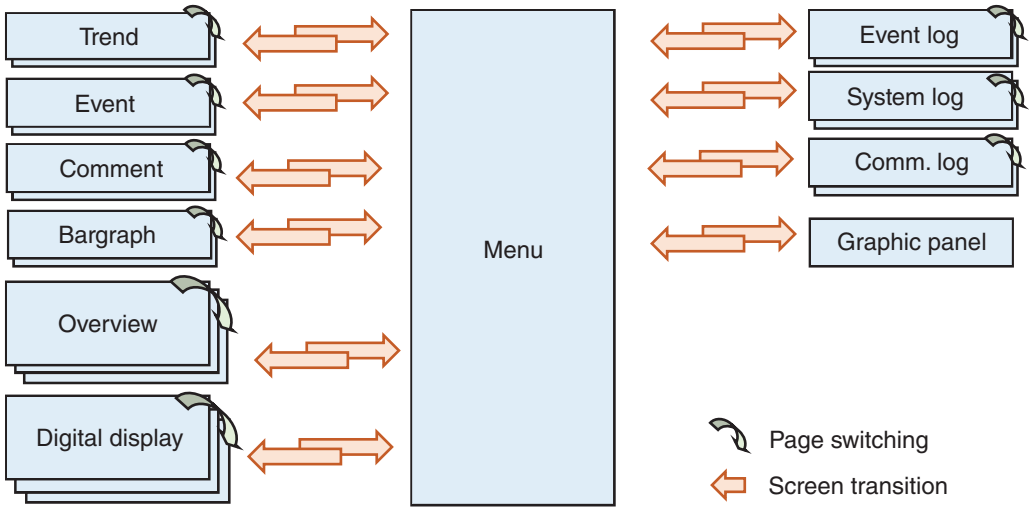


Refer to the following table regarding the button operation.

Button	Operation	Reference
REC	[Record] dialog appears. [Eject SD], [Normal record], [Trigger record] or [Stop record] is selectable.	
Hold down REC	Normal recording is started or stopped. (If trigger recording is in progress, it switches to normal recording.)	3.5.1.1 Recording setting
MENU	Menu is displayed.	
Hold down MENU	Key lock is set or released.	

4.2 Wake up screen

After turning on the power of VR144E-G16, one of the following is displayed:
Trend screen, event screen, comment screen, overview screen, digital view screen, event log screen, system log screen, comm. log screen, or graphic panel screen.
The screen to be displayed can be set with the Configurator Software (Model: VR144CFG).
➔ 3.7.1 Wake up screen setting, 4.3.10.6 User setting



4.2.1 Power-up screen

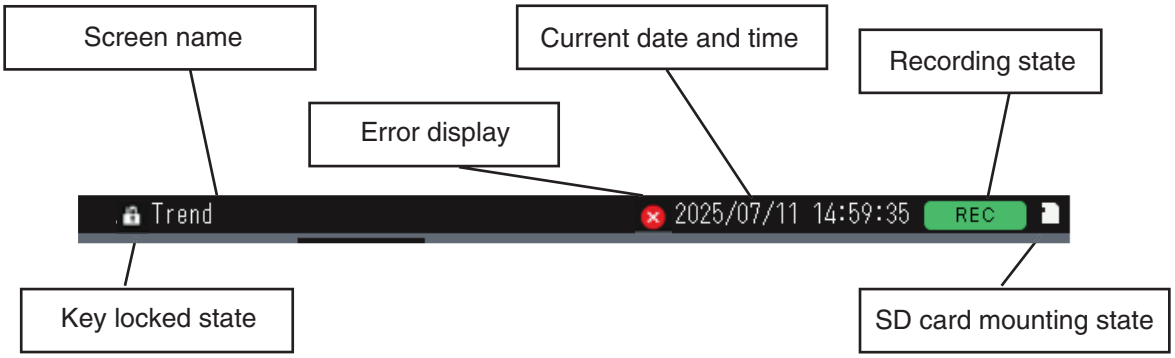
For the period from turning on the device until the configured wake up screen (3.7.1 Wake up screen setting, 4.3.10.6 User setting) is displayed, the following message appears at the lower right corner of the screen. The message is deleted when the waiting state is released, and then the wake up screen appears.

Message	Description
progress (DHCP / IP address)	Waiting for obtaining DHCP IP
progress (SNTP)	Waiting for initial SNTP processing
progress (I/O)	Waiting for initial I/O communication processing
progress (SD)	Waiting for recognizing SD card
progress (REC)	Waiting for starting the recording process

4.2.2 Common area for each screen

4.2.2.1 Header

Header is the common area for all screens.



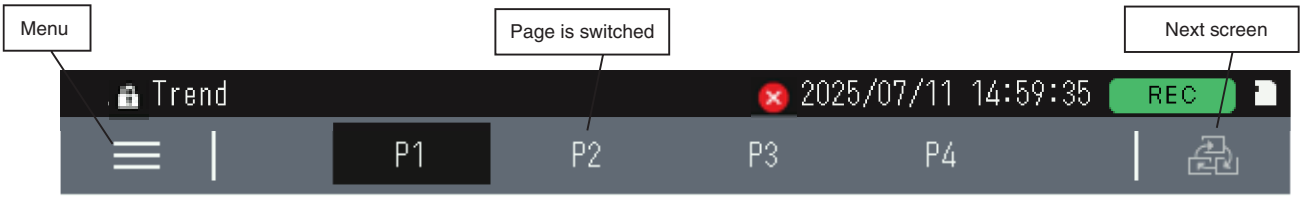
Item	Description
Key lock	The icon indicates key lock state.
Screen name	The name of the currently displayed screen is displayed.
Error display	The icon indicates that the following errors occur. - Built-in I/O abnormality - Modbus/TCP or SLMP communication error - Recording abnormality - Log abnormality - SD card abnormality
Current date and time	The date and time are displayed. Refer to 5.1.1 Date/Time for the setting.
Recording state	The icons indicate recording state. Refer to the table below.
SD card mounting state	The icon indicates SD card mounting state.

Recording state

Item	Description	Display
Stop recording	Recording stops.	REC OFF (white)
Normal recording	Recording is in progress.	REC ON (green)
	SD card mounting is released.	REC Blinking
Trigger recording	The device is waiting for trigger. (Pre trigger is in progress.)	Trigger REC Blinking
	Recording is in progress. (Trigger or post trigger is in progress.)	Trigger REC ON (green)
	SD card mounting is released.	Trigger REC Blinking

4.2.2.2 Sub header (page)

Sub header (page) is displayed on trend screen, event screen, comment screen, bargraph, overview screen, digital view screen, and each log screen.



Item	Description
☰ / <	☰: Menu is displayed. <: The display returns to the main screen.
Switching page	Tap a page number to switch to the corresponding page. < and > buttons on the side switch the page number in the sub header.
To next screen	The display transits to the next screen. The transition order is as follows: trend ➔ event ➔ comment ➔ bargraph ➔ overview ➔ digital view ➔ event log ➔ system log ➔ comm. log

4.2.2.3 Sub header (transition)

Sub header (transition) is displayed when the number of pages is not fixed, such as maintenance settings.

Item	Description
☰ / <	☰: Menu is displayed. <: The display returns to the main screen.
Switching page	< and > buttons on the side switch pages.

4.2.2.4 Auto view switching

The display switches automatically to the specified screen if there is no operation for a certain period of time.

Item	Description
Time	Start switching time: 10 to 180 sec. / OFF Switching interval: 3 to 180 sec.
Conditions for stopping	- When there is tapping or button operation (even if the screen is locked) - When the screen saver is active - During displaying the menu or maintenance screen.

4.2.2.5 Screen saver

Back light is turned off if there is no operation for a certain period of time.

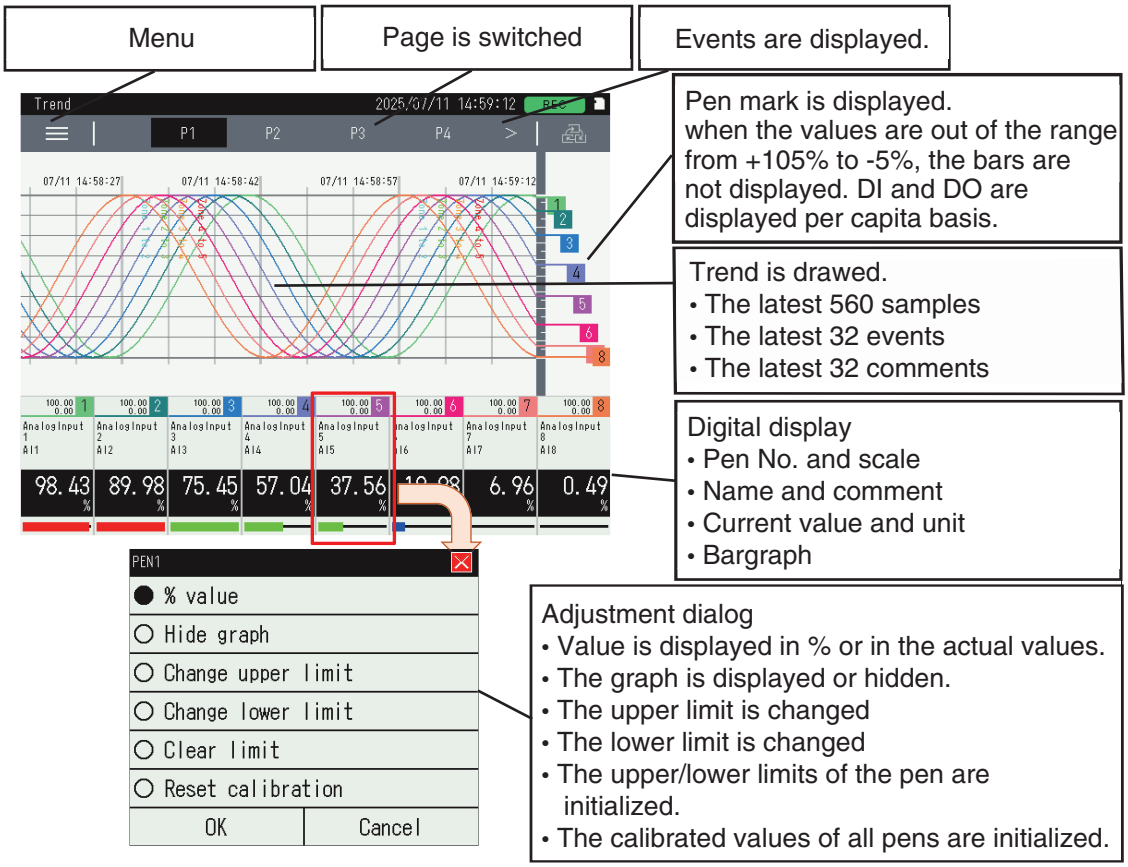
Item	Description
Screen saver standby time	1 to 10 min. / OFF
Conditions for returning from screen saver	- When there is tapping or button operation (even if the screen is locked) - When input is in the area specified as abnormal or when it passes through the area. - When the error icon is displayed - When settings are written from VR144CFG

4.2.3 Trend screen

4.2.3.1 Trend graph

The number of displayed trend graphs (4 pen/page or 8 pen/page) is configurable in the display settings.

1. [PEN1] to [PEN64] configured in the pen settings are displayed. ➔ 3.5.2 Pen setting
2. Tap page switching buttons ([P1] etc.) to switch pages.
3. When the graphs are tapped during recording, triggering or post triggering, the screen switches to historical trend starting from the latest value at the time of tapping.

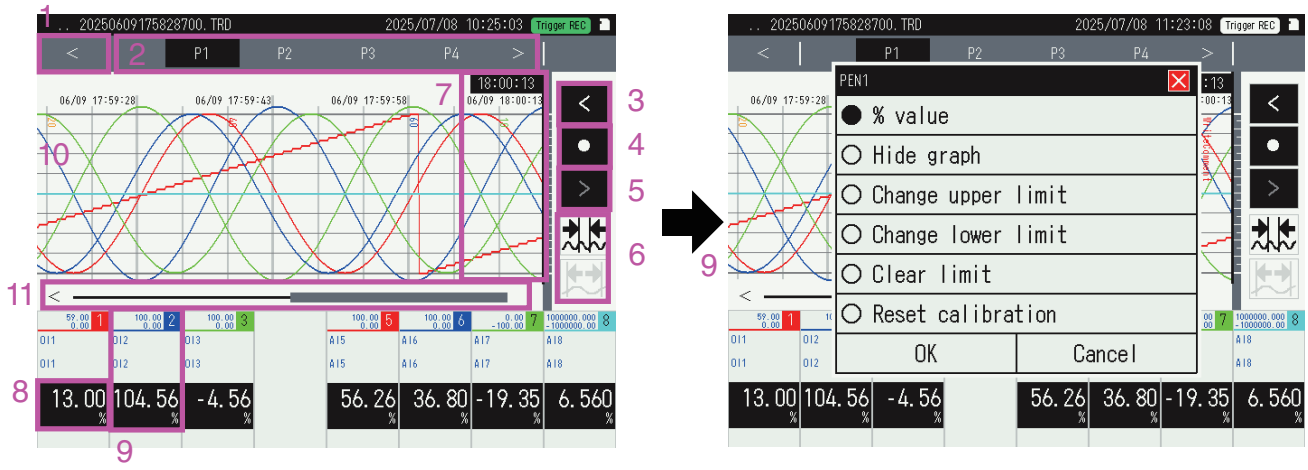


4. Refer to the table below for each displayed item.

Item	Description	Reference
Name	The name set in the I/O setting is displayed.	AI: 3.4.1.4 Basic setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.1 Basic setting (OI) DO: 3.4.4.4 Basic setting (DO)
Pen color	The trend graph is drawn using the color set in the trend setting and pen setting.	3.5.2 Pen setting
Current value	Analog Input (AI): Displays with actual values. Discrete Input (DI): Displays the current state with display comment (ON) and display comment (OFF). Operational input (OI): Displays the operation result. Discrete Output (DO): Displays the current state with display comment (ON) and display comment (OFF).	AI: 3.4.1.4 Basic setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.1 Basic setting (OI) DO: 3.4.4.4 Basic setting (DO)
Upper limit Lower limit	The upper/lower limit set in the trend setting and pen setting is displayed . Trend graphs are plotted within the range.	3.5.2 Pen setting

4.2.3.2 Historical trend

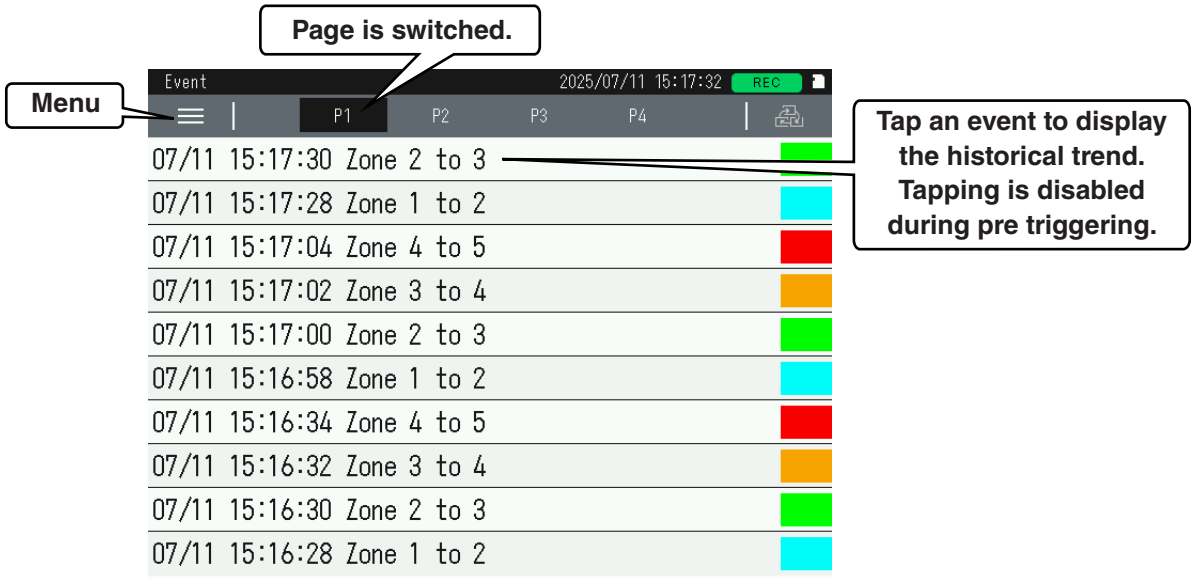
When the trend graphs are tapped, the screen switches to historical trend starting from the latest value at the time of tapping.
Adjustment values are displayed same as on the trend graph.
The adjustment values are initialized when the screen returns from historical trend to the trend graph.



No.	Item	Description
1	Back	Used to return to the display method selection screen.
2	Selecting pen	Used to change the displayed pen.
3	Changing cursor position	Used to move the cursor position by 1dev.
4	Initial position	Used to go back to the initial position.
5	Changing cursor position	Used to move the cursor position by 1dev.
6	Changing zoom factor	Used to change the zoom factor starting from the cursor position. (×1, ×1/2, ×1/5, ×1/10)
7	Cursor	The digital value at the specified position is displayed.
8	Digital value	The digital value at the cursor position is displayed.
9	Digital display	Name, comment and pen scale set in the pen setting are displayed. Tap here to display adjustment dialog. - Select % display or actual value display. (when the selected value is AI and %.) - Select whether to show or hide the graph. - Changing upper value (Changing upper value (%) when display is in %) - Changing lower value (Changing lower value (%) when display is in %) - Initializing upper/lower value: The selected pen is initialized. - Initializing adjustment value: All pens are initialized.
10	Graph	The cursor moves to the tapped position.
11	Scroll bar	The display jumps to the tapped position. Touch [<] or [>] button to move the display by 130 div.

4.2.4 Event screen

The summary of the latest 40 events registered in the trend graph is displayed.
The latest events appear on the top.
When a memory block switches to new one, the data in the new memory block is displayed.

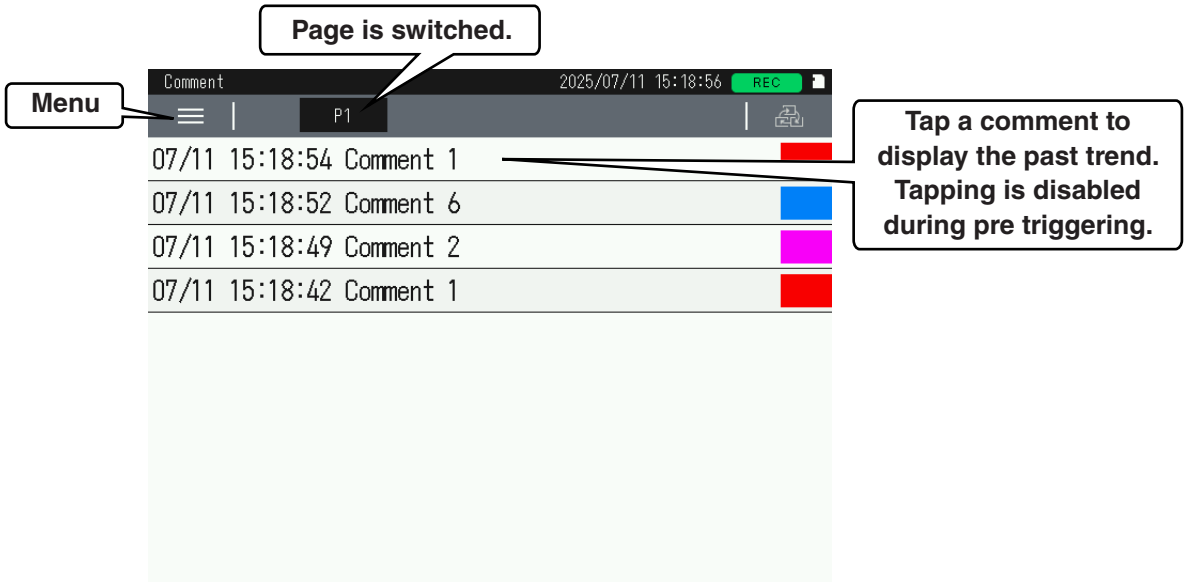


1. Tap page switching buttons ([P1] etc.) to switch pages.
2. When the events are tapped during recording, triggering or post triggering, historical trend is shown with the tapped event on the rightmost position of the graph.
3. Refer to the table below for displayed items.

Item	Description	Reference
Event occurrence time	The time when the events occurred is displayed.	
Message	Analog Input (AI): Displays the message set in the event setting. Discrete Input (DI): Displays the message set in ON and OFF respectively. Operational input (OI): Displays the message set in the event setting. Discrete Output (DO): Displays the message set in ON and OFF respectively.	AI: 3.4.1.6 Event setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.3 Event setting (OI) DO: 3.4.4.4 Basic setting (DO)
Display color	Analog Input (AI): Displays the color set in zone setting 1 to 5. Discrete Input (DI): Displays the color set in ON and OFF. Operational input (OI): Displays the color set in zone setting 1 to 5. Discrete Output (DO): Displays the color set in ON and OFF.	AI: 3.4.1.5 Zone setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.2 Zone setting (OI) DO: 3.4.4.4 Basic setting (DO)

4.2.5 Comment screen

The summary of the latest 40 comments registered in the trend graph is displayed.
The latest comments appear on the top.
When a memory block switches to new one, the data in the new memory block is displayed.



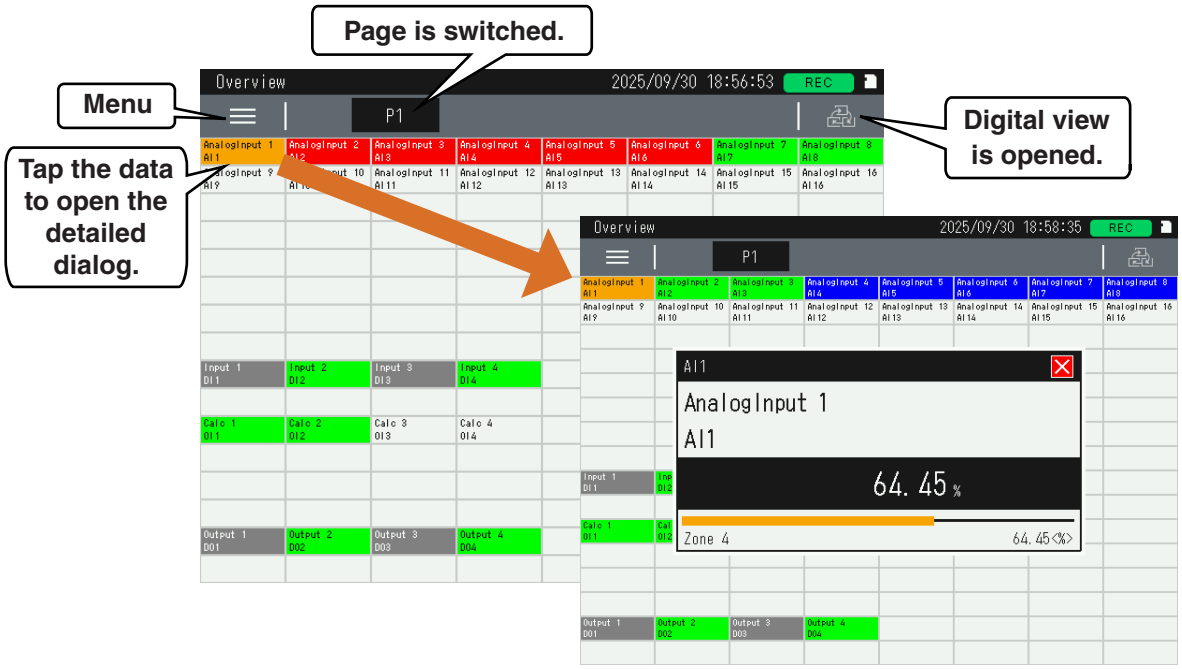
1. Tap page switching buttons ([P1] etc.) to switch pages.
2. When the comments are tapped during recording, triggering or post triggering, historical trend is shown with the tapped comment on the rightmost position of the graph.
3. Refer to the table below for displayed items.

Item	Description	Reference
Comment recorded time	The time when the comments were recorded is displayed.	
Comment	The comment set in the trend setting is displayed.	3.5.3 Comment setting
Display color	The color set in the trend setting is displayed.	3.5.3 Comment setting

4. Refer to 4.3.3 Trend selection screen for how to record the comment.

4.2.6 Overview screen

Follow the procedure below in order to display the latest data of each channel.
The number of displayed channels per screen can be selected from 16, 32, 64 or 128.

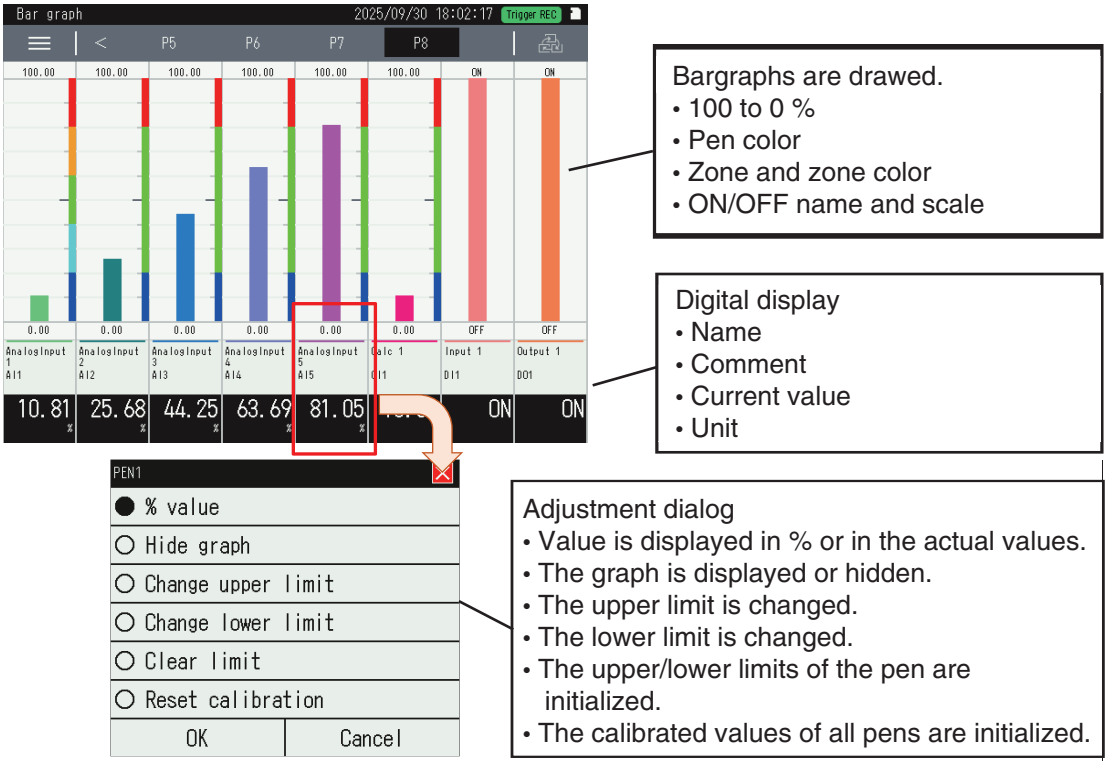


1. Tap page switching buttons ([P1] etc.) to switch pages. Each set of 16 channels ("AI1 to AI16", "DI1, DI2, OI1, OI2", and "OI3, OI4, DO1, DO2") is displayed on 1 screen.
2. Tap a channel to open detailed dialog.
3. Refer to the table below for displayed items.

Item	Description	Reference
Name	The name set in I/O setting is displayed. (If the name is 10 characters or more, it is abbreviated.)	AI: 3.4.1.4 Basic setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.1 Basic setting (OI) DO: 3.4.4.4 Basic setting (DO)
Simple bargraph	The I/O values in a simple bargraph is displayed.	
Color	The color of simple bargraph is as follows. Analog Input (AI): Displays the color set in zone setting 1 to 5. Discrete Input (DI): Displays the color set in ON and OFF. Operational input (OI): Displays the color set in zone setting 1 to 5. Discrete Output (DO): Displays the color set in ON and OFF.	AI: 3.4.1.5 Zone setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.2 Zone setting (OI) DO: 3.4.4.4 Basic setting (DO)

4.2.7 Bargraph screen

The latest I/O values of channels assigned to pens are displayed.
The settings are same as trend screen.

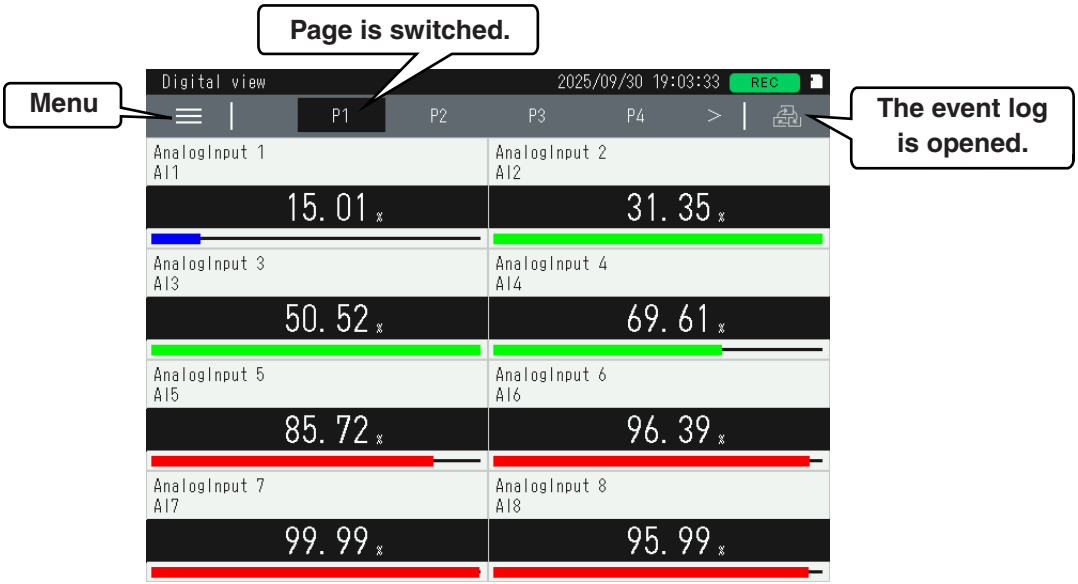


1. Tap page switching buttons ([P1] etc.) to switch pages.
   The channels switch in the order of AI, DI, OI, DO from the smaller number.
2. Refer to the table below for displayed items.

Item	Description	Reference
Name	The name set in I/O setting is displayed.	AI: 3.4.1.4 Basic setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.1 Basic setting (OI) DO: 3.4.4.4 Basic setting (DO)
Current value	The latest I/O values are displayed as numerical value for analog data (AI, OI) and as comment for discrete data (DI, DO).	DI: 3.4.2.4 Basic setting (DI) DO: 3.4.4.4 Basic setting (DO)
Engineering unit	The engineering unit set in I/O setting (AI, OI) is displayed.	AI: 3.4.1.4 Basic setting (AI) OI: 3.4.3.1 Basic setting (OI)
Color	The color of simple bargraph is as follows. Analog Input (AI): Displays the color set in zone setting 1 to 5. Discrete Input (DI): Displays the color set in ON and OFF. Operational input (OI): Displays the color set in zone setting 1 to 5. Discrete Output (DO): Displays the color set in ON and OFF.	AI: 3.4.1.5 Zone setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.2 Zone setting (OI) DO: 3.4.4.4 Basic setting (DO)

4.2.8 Digital view screen

The latest data of channels are displayed.

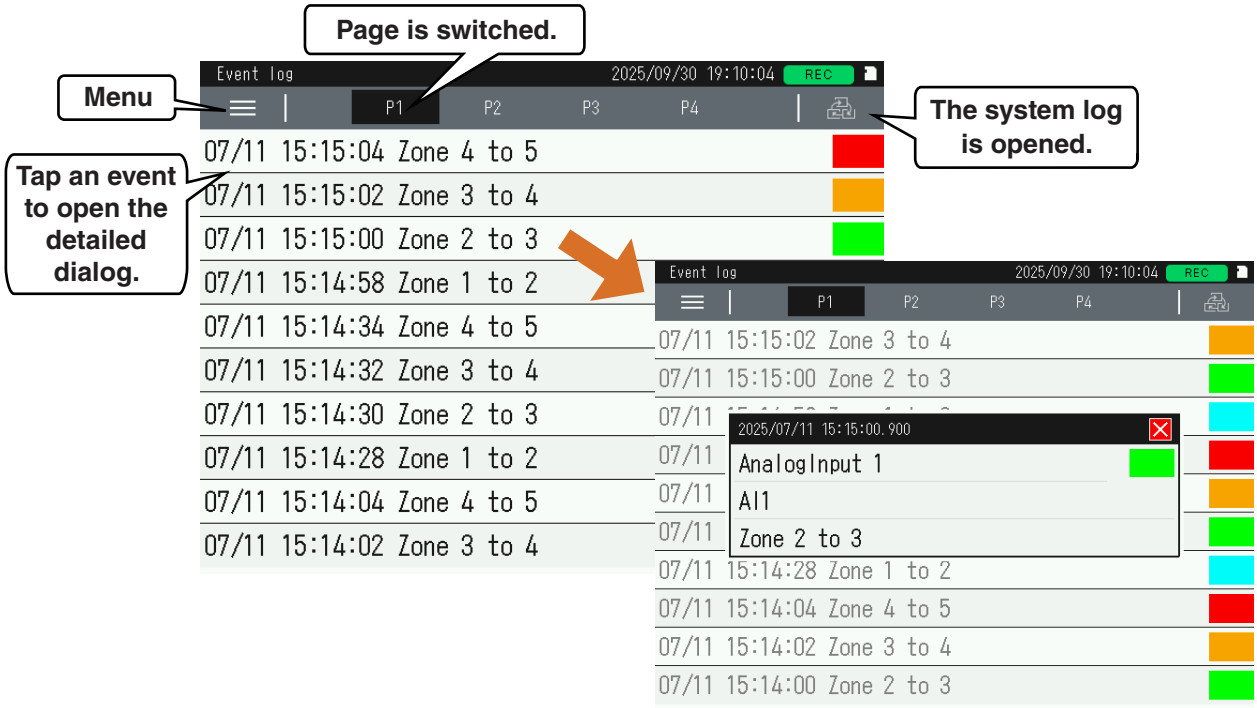


1. Tap page switching buttons ([P1] etc.) to switch pages.
   The channels switch in the order of AI, DI, OI, DO from the smaller number.
2. Refer to the table below for displayed items.

Displayed item	Description	Reference
Name	The name set in I/O setting is displayed.	AI: 3.4.1.4 Basic setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.1 Basic setting (OI) DO: 3.4.4.4 Basic setting (DO)
Current value	The I/O values are displayed as numerical value for analog data (AI, OI) and as comment for discrete data (DI, DO).	DI: 3.4.2.4 Basic setting (DI) DO: 3.4.4.4 Basic setting (DO)
Engineering unit	The engineering unit set in I/O setting (AI, OI) is displayed.	AI: 3.4.1.4 Basic setting (AI) OI: 3.4.3.1 Basic setting (OI)
Simple bargraph	The latest I/O values in a simple bargraph are displayed.	
Zone name	Analog Input (AI): The name set in zone setting 1 to 5 is displayed. Operational input (OI): The name set in zone setting 1 to 5 is displayed.	AI: 3.4.1.5 Zone setting (AI) OI: 3.4.3.2 Zone setting (OI)
Color	The color of simple bargraph is as follows. Analog Input (AI): Displays the color set in zone setting 1 to 5. Discrete Input (DI): Displays the color set in ON and OFF. Operational input (OI): Displays the color set in zone setting 1 to 5. Discrete Output (DO): Displays the color set in ON and OFF.	AI: 3.4.1.5 Zone setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.2 Zone setting (OI) DO: 3.4.4.4 Basic setting (DO)

4.2.9 Event log screen

Regardless of whether event log recording is enabled or disabled, the latest 40 event logs are displayed.

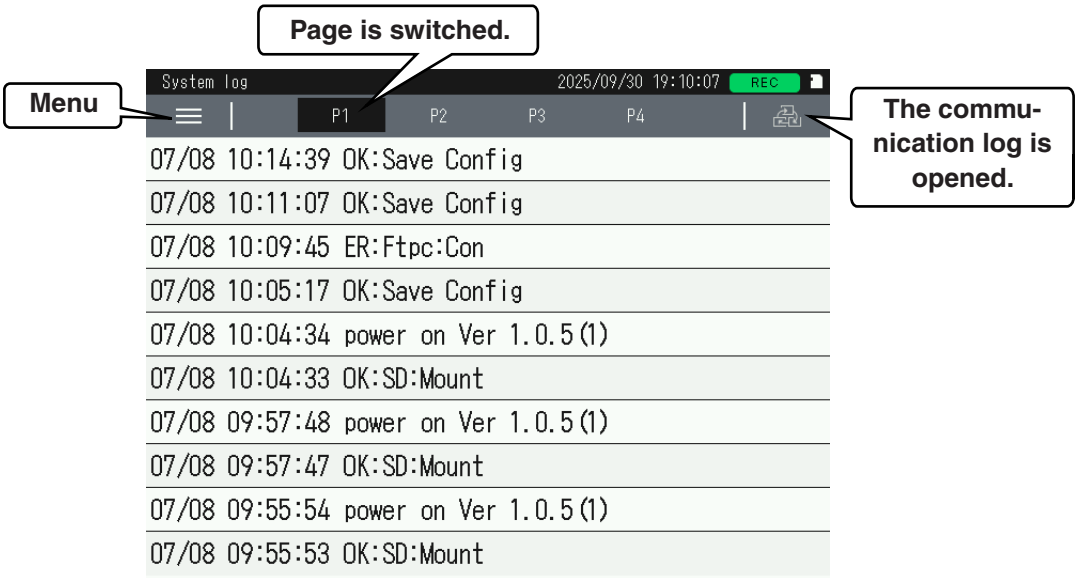


1. Tap page switching buttons ([P1] etc.) to switch pages.
   Tap an event to display the details of the selected event.
   Event logs are grayed out during displaying the details.
2. Refer to the table below for displayed items.

Displayed item	Description	Reference
Name Comment	The name and the comment set in I/O setting is displayed.	AI: 3.4.1.4 Basic setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.1 Basic setting (OI) DO: 3.4.4.4 Basic setting (DO)
Message	Analog Input (AI): Displays the message set in the event setting. Discrete Input (DI): Displays the message set in ON and OFF Operational input (OI): Displays the message set in the event setting. Discrete Output (DO): Displays the message set in ON and OFF.	AI: 3.4.1.6 Event setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.3 Event setting (OI) DO: 3.4.4.4 Basic setting (DO)
Color	Analog Input (AI): Displays the color set in zone setting 1 to 5. Discrete Input (DI): Displays the color set in ON and OFF. Operational input (OI): Displays the color set in zone setting 1 to 5. Discrete Output (DO): Displays the color set in ON and OFF.	AI: 3.4.1.5 Zone setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.2 Zone setting (OI) DO: 3.4.4.4 Basic setting (DO)

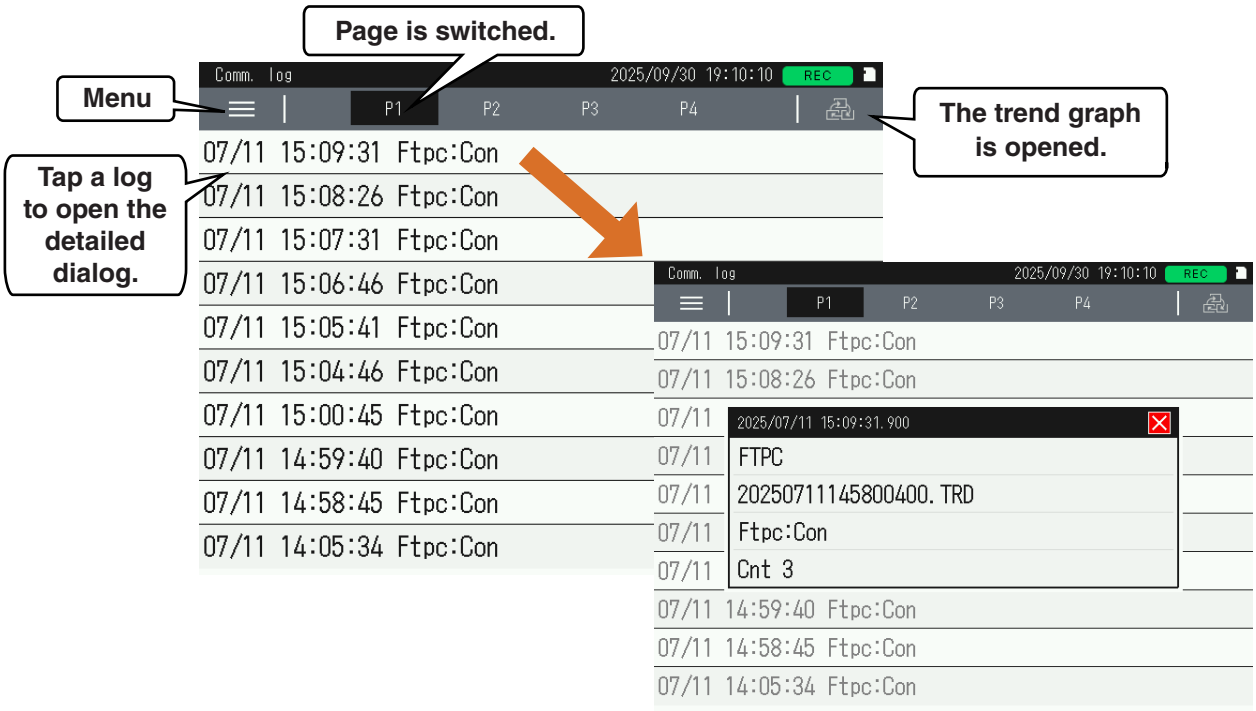
4.2.10 System log screen

Regardless of whether system log recording is enabled or disabled, the latest 40 system logs are displayed. The latest ones appear on the top. For the log details, refer to 5.1.3 System log.
Tap page switching buttons ([P1] etc.) to switch pages.



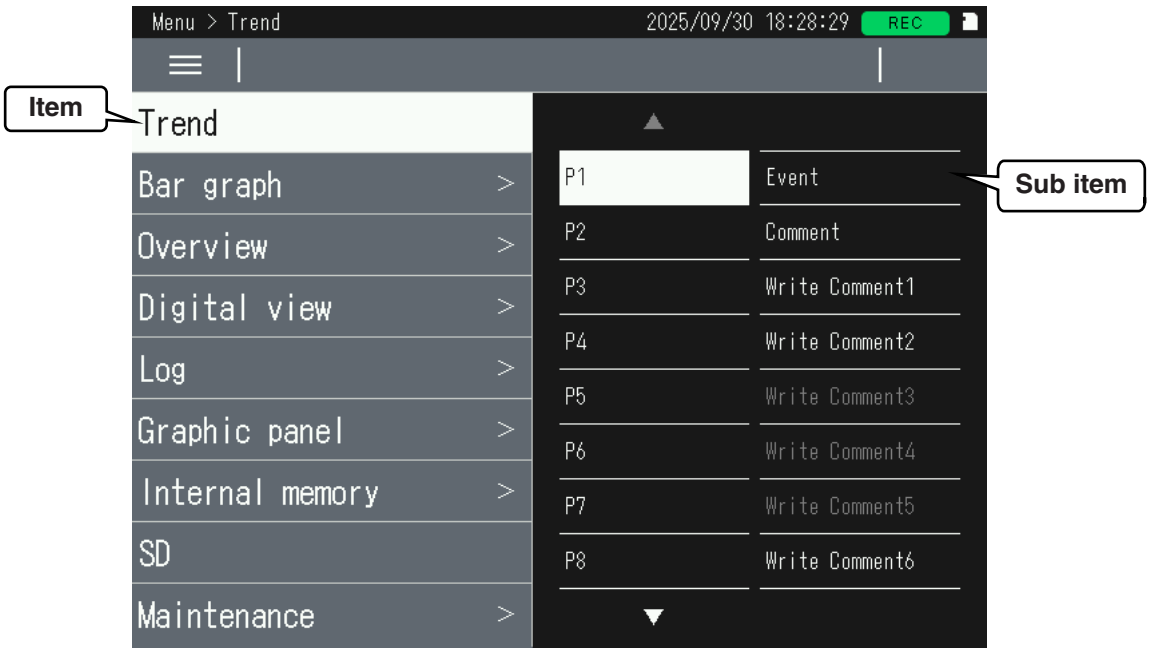
4.2.11 Communication log screen

Regardless of whether communication log recording is enabled or disabled, the latest 40 logs about SNTP, e-mail reporting, success/failure of FTP client are displayed.
For the log details, refer to 5.1.4 Communication log.
Tap page switching buttons ([P1] etc.) to switch pages.



4.3 Configuration of the menu screen

Tap [☰] button at the top left of the screen to open the menu.

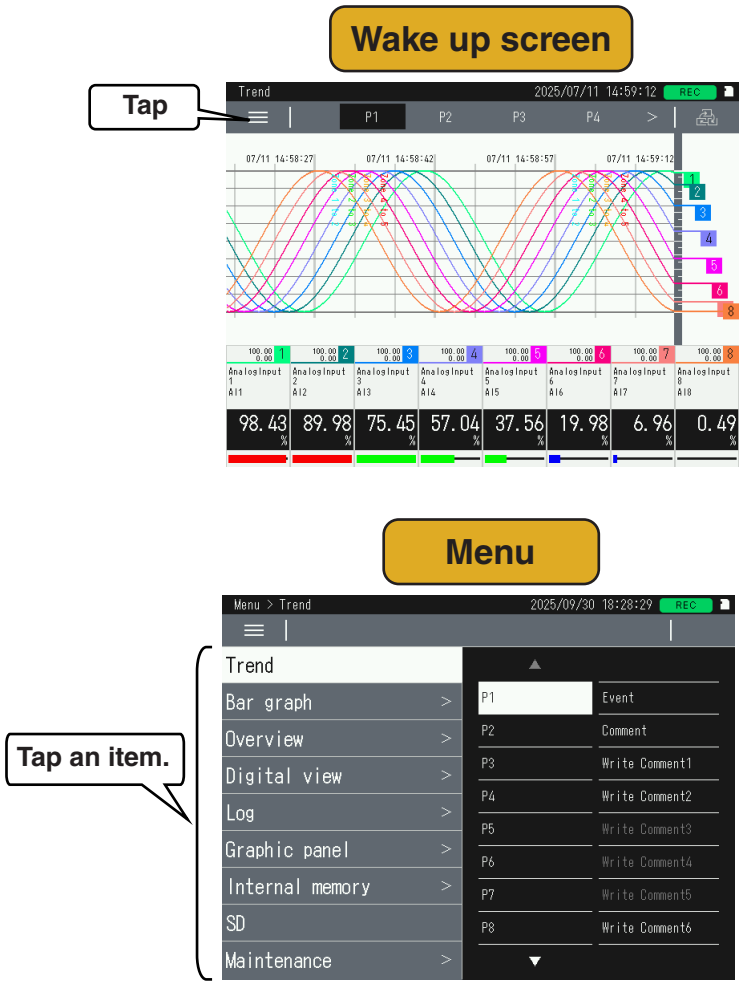


4.3.1 Configuration and hierarchy of the menu

Item	Sub item	Explanation
Trend	P1 to P16	The screen moves to trend graph screen.
	Event	The screen moves to event summary screen.
	Comment	The screen moves to comment summary screen.
	Write Comment 1 to 16	The screen moves to comment summary screen after registering comments.
Bargraph	P1 –	The screen moves to bargraph screen.
Overview	P1 –	The screen moves to overview screen.
Digital view	P1 –	The screen moves to digital view screen.
Log	Event log	The screen moves to event log screen. (The latest 40 logs are displayed.)
	System log	The screen moves to system log screen. (The latest 40 logs are displayed.)
	Comm. log	The screen moves to comm. log screen. (The latest 40 logs are displayed.)
Graphic panel	P1, P2	The screen moves to graphic panel.
Internal memory	Trend	Trend in the internal memory is displayed.
	Event log	Event logs in the internal memory are displayed.
	System log	System logs in the internal memory are displayed.
	Comm. log	Comm. logs in the internal memory are displayed.
	Clear trend	Memory block transfers to new memory block.
	Initialize trend	Memory block is initialized. (Data in the memory block is deleted.)
	Clear event logs	Memory block transfers to new memory block.
	Initialize event logs	Memory block is initialized. (Data in the memory block is deleted.)
	Clear system logs	Memory block transfers to new memory block.
	Initialize system logs	Memory block is initialized. (Data in the memory block is deleted.)
	Clear comm. logs	Memory block transfers to new memory block.
	Initialize comm. logs	Memory block is initialized. (Data in the memory block is deleted.)
SD	–	The screen moves to TRD file selecting screen.
Maintenance	Read/Save setting	User setting and network setting in the SD card are read/saved.
	User setting	Zone, trend, log, display, CFG, Modbus/TCP server and FTP server can be set.
	Network setting	Time zone, DHCP, IP address, subnet mask, default gateway and DNS can be set.
	Reset	Operational input (OI) is reset.
	Mail report	E-mail reporting test and clearing e-mail queue are performed.
	FTP client	FTP client test and clearing FTP queue are performed.
	Adjustment	The screen moves to adjustment screen for analog input.
	Time adjust	The screen moves to time adjustment screen.
	Reboot	The screen moves to reboot screen.
	FW update	The screen moves to firmware updating screen.
	Information	The screen moves to device information screen.
	Disk usage	The screen moves to the screen showing the usage state of the SD card.
	Language	Language can be selected from Japanese or English.

4.3.2 Common area for each screen

The common area for each screen is as follows.



4.3.2.1 Move

Tap [☰] button at the top left of the screen to open the menu.

4.3.2.2 Select

Tap an item on the menu. Tap [>] button to display sub items.

4.3.2.3 Confirm

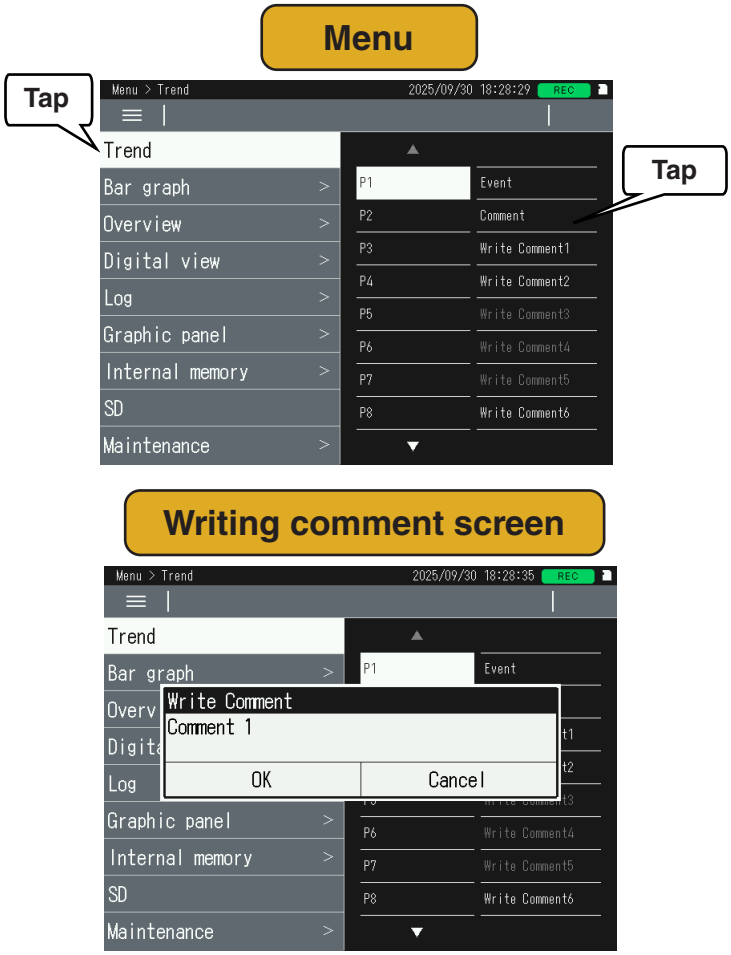
Tap a sub item. Tap ▲ and ▼ buttons to move upward or downward.

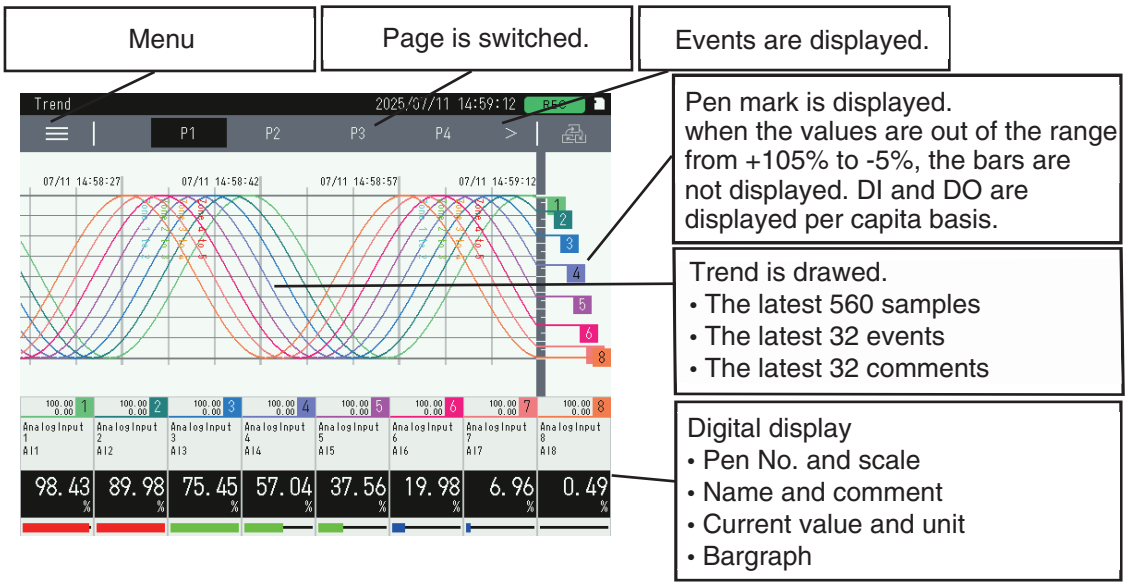
4.3.2.4 Cancel

Tap [☰] button at the top left of the screen to return to the previous screen.

4.3.3 Trend selection screen

Select the trend screen. The selected trend screen is displayed.
It is also possible to write comments.

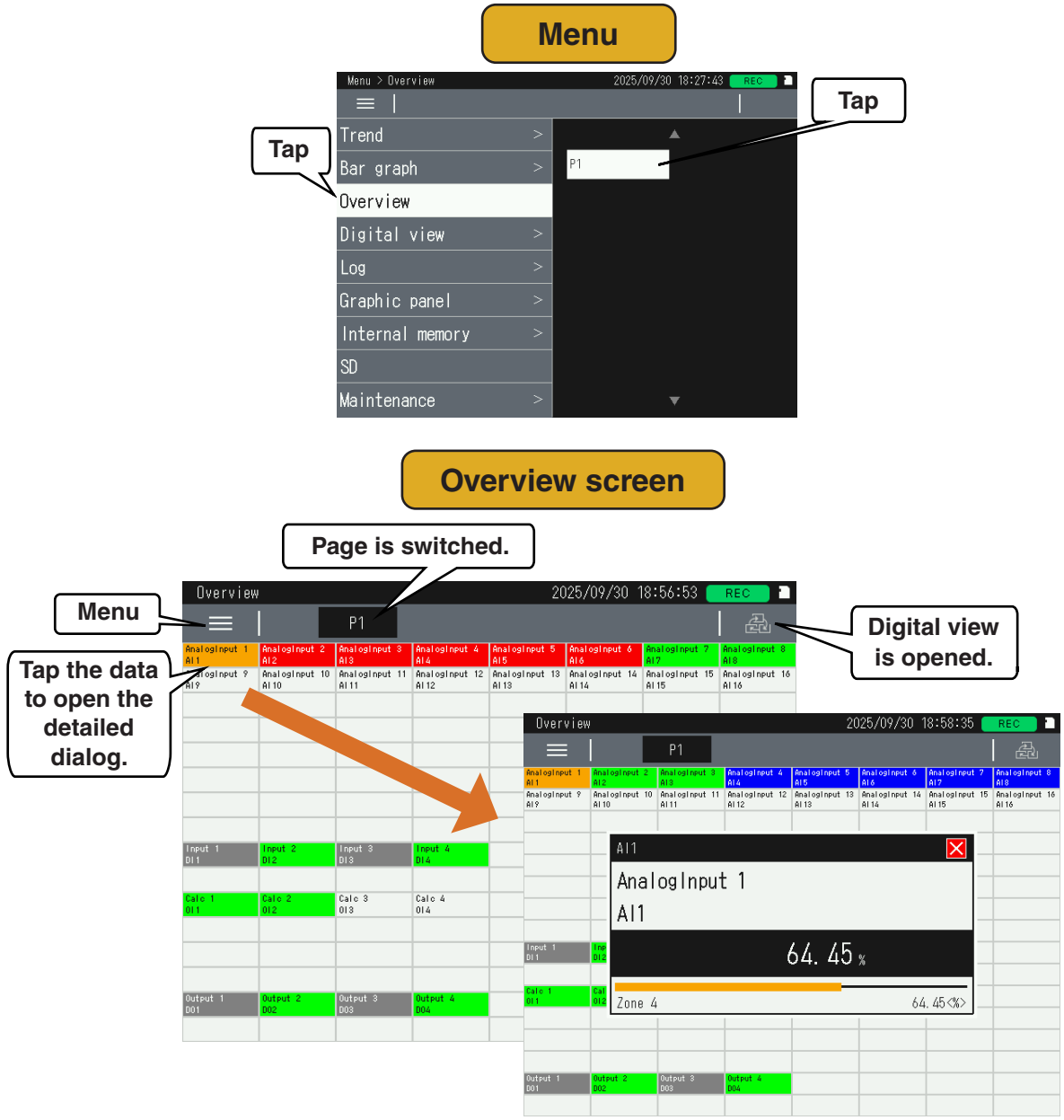




1. Tap [Trend] on the menu screen.
2. Tap the screen to be displayed. (P1 to P8, Event or Comment)
   The selected screen appears.
   ➔ 4.2.3 Trend screen, 4.2.4 Event screen, 4.2.5 Comment screen
3. When writing comments, select [Write Comment x].
   Comments are written in the trend at the moment of confirming. ➔ 3.5.3 Comment setting
4. When the graphs are tapped during recording, triggering or post triggering, the screen switches to historical trend starting from the latest value at the time of tapping.

4.3.4 Overview selection screen

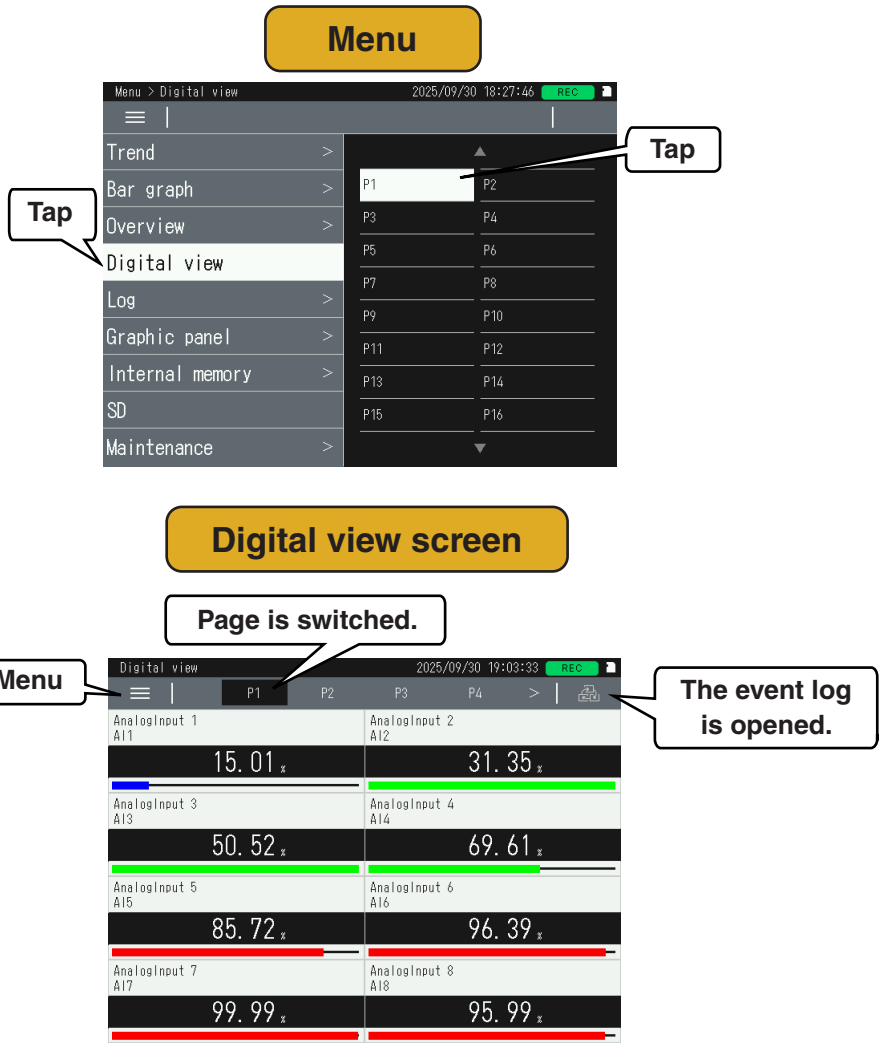
The latest data of channels are displayed.
The number of displayed channels per screen can be selected from 16, 32, 64 or 128.



1. Tap [Overview] on the menu screen.
2. Tap [P1]. The detailed dialog appears by tapping the data.
   ➔ 4.2.6 Overview screen

4.3.5 Digital view selection screen

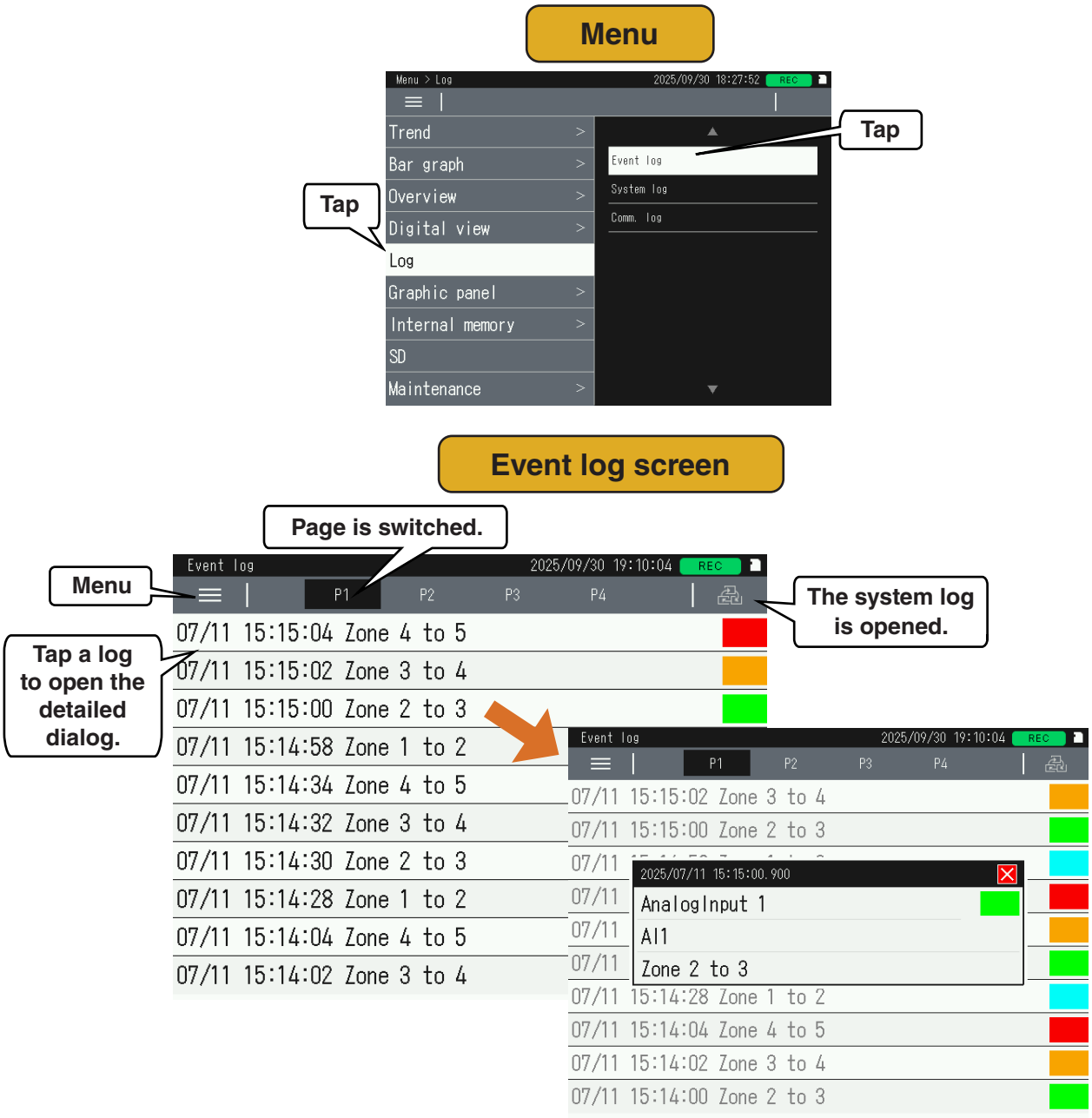
The latest data of channels are displayed.



1. Tap [Digital view] on the menu screen.
2. Tap a page from [P1] to [P16]. The digital view screen of the selected channel appears.
   ➔ 4.2.8 Digital view screen

4.3.6 Log selection screen

Regardless of whether event log recording is enabled or disabled, the latest logs are displayed.



1. Tap [Log] on the menu screen.
2. Tap [Event log], [System log] or [Comm. log]. The list of selected log appears.
   Tap a log to display the details of the selected log.
   Logs are grayed out during displaying the details.
   ➔ 4.2.9 Event log screen, 4.2.10 System log screen, 4.2.11 Communication log screen

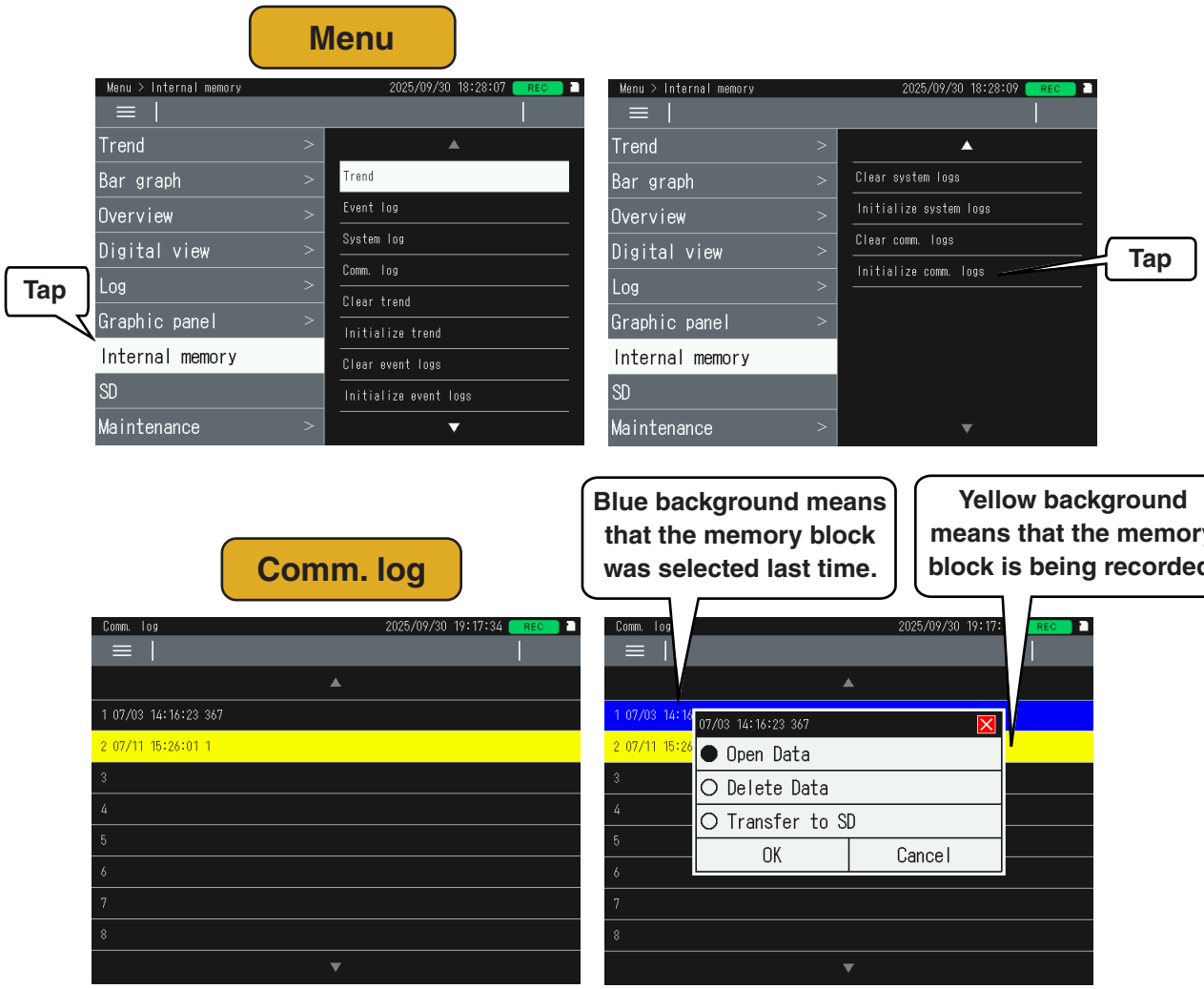
4.3.7 Graphic panel

A screen created by combining a background and parts is displayed.

1. Tap [Graphic panel] on the menu screen.
2. Tap [P1] or [P2] to display the graphic panel.
3. Press [MENU] button to return to the menu screen.

4.3.8 Internal memory

The following operations are possible by the memory block recorded in internal memory:
Displaying/deleting trend data and log data, transferring the data to SD card, transferring memory block to new one, clearing trend data and log data, initializing trend data and log data.



1. Tap [Internal memory] on the menu screen.
2. Select from [Trend], [Event log], [System log], [Comm. log], [Clear trend], [Initialize trend], [Clear event logs], [Initialize event logs], [Clear system logs], [Initialize system logs], [Clear comm. logs] and [Initialize comm. logs]. Move upward and downward by tapping ▲ and ▼ buttons.
3. When [Trend], [Event log], [System log] or [Comm. log] is selected, select [Open Data], [Delete Data], [Transfer to SD] or [New memory block]. Refer to the table below for details.
4. Execute by tapping [OK].

State	Parameter	Description
The data has been recorded. (blue background)	Open Data	The data in the selected memory block is displayed. The detailed screen appears.
	Delete Data	The data in the selected memory block is deleted.
	Transfer to SD	The data in the selected memory block is transferred to an SD card and stored.
The data is being recorded. (yellow background)	Open Data	The data in the selected memory block is displayed. The detailed screen appears.
	New memory block	The selected memory block transfers to a new memory block. An error occurs if recording is not in progress.

4.3.9 SD card

Trend graph, event logs and comment logs are displayed by selecting a file in the specified directory of SD card.

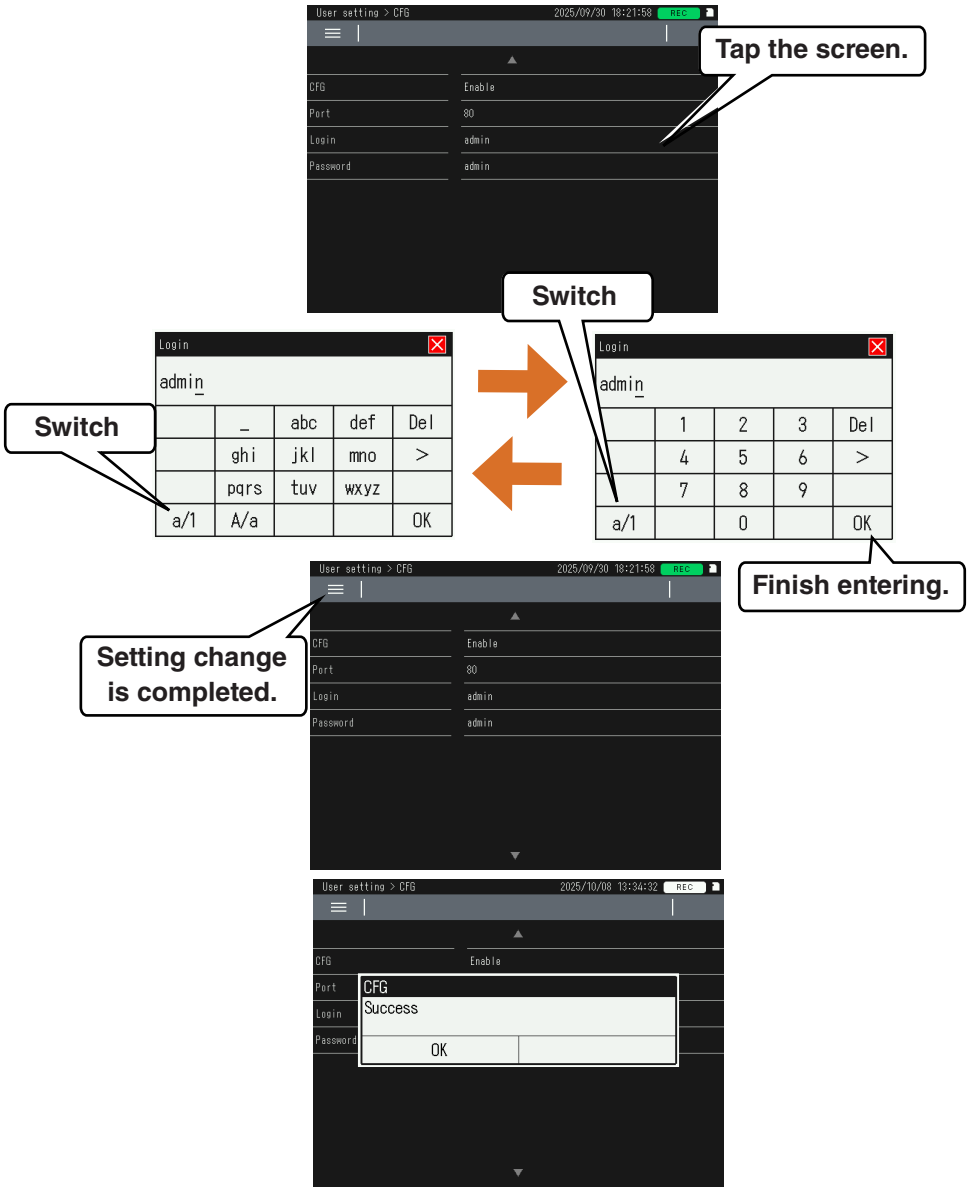
1. Tap [SD] on the menu screen.
   Tap a trend file on SD screen.
   Trend files are saved in a hierarchy of year, month, and day. ➔ 6.6 Folder structure
   Tap ▲ button to display previous eight files. Tap ▼ button to display next eight files.
2. After selecting a trend file, select [Trend Graph], [Event] or [Comment].
3. Select [Trend Graph] to display historical trend.
4. Select [Event] to display the event logs.
   Tap an event to display historical trend at the moment of recording the event.
5. Select [Comment] to display the comment logs.
   Tap a comment to display historical trend at the moment of recording the comment.
6. Tap [<] at the top left of the screen to return to the previous screen.

4.3.10 Maintenance screen

This section describes how to operate on the maintenance screen.

4.3.10.1 Common

Some settings of the VR144E-G16 can be modified on the maintenance screen.
Setting changes can be performed in the procedure below.



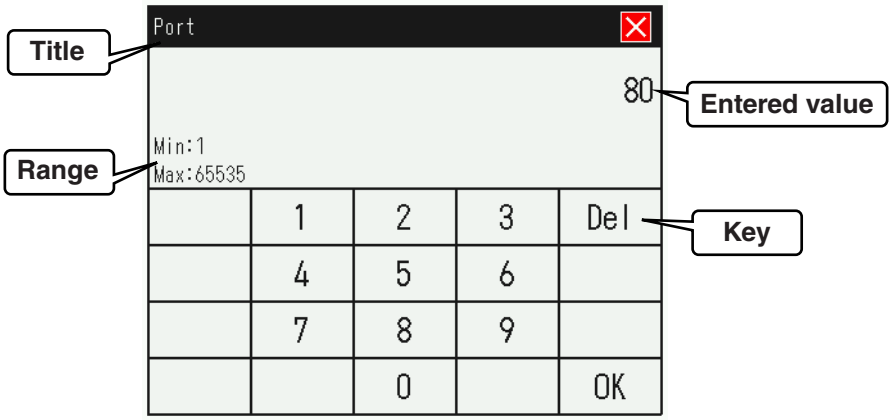
1. Select a parameter to be changed by tapping the screen.
2. Keypad appears when entering a value. The keypad differs depending on the value to be changed.
   Keypad can be switched by tapping [a/1] and [A/a] buttons. A cursor appears under the digit to be changed.
   Move the cursor position with [<] and [>] buttons. Change the value by entering keys.
   Tap [OK] to finish entering keys.
3. Tap [☰] to open a dialog. Tap [OK] to save the setting change.

4.3.10.2 Individual operation

This section describes about the dialogs displayed when setting values are changed on the maintenance screen.

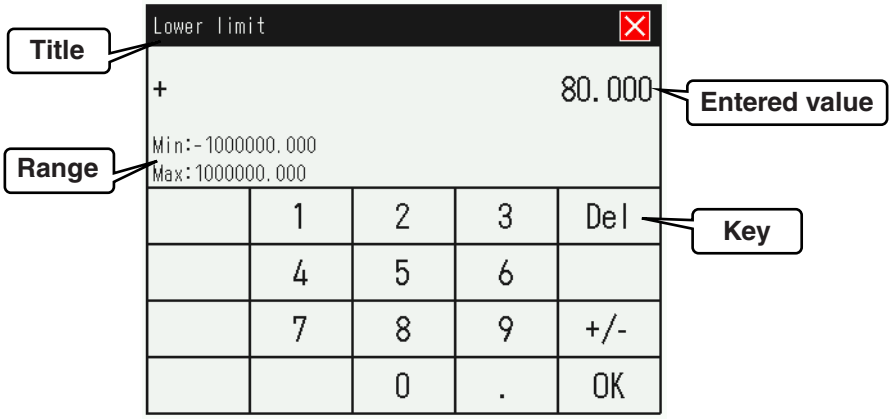
• Numeric input dialog (integer)

An integer value is set. The background turns yellow when the value is out of the setting range.



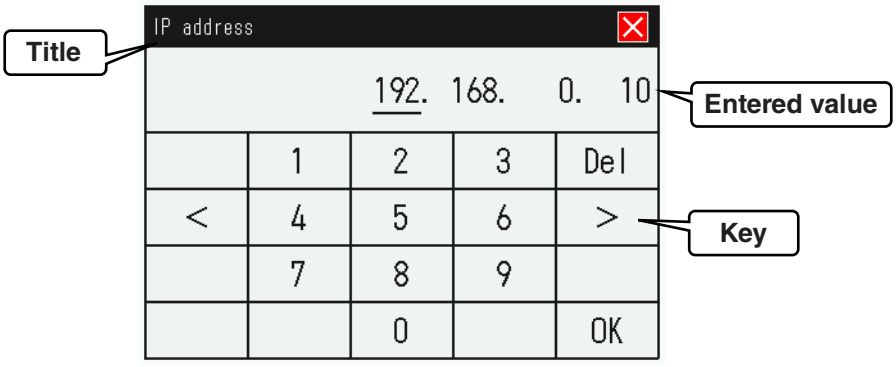
• Numeric input dialog (decimal)

A value including decimal places is set. The background turns yellow when the value is out of the setting range.



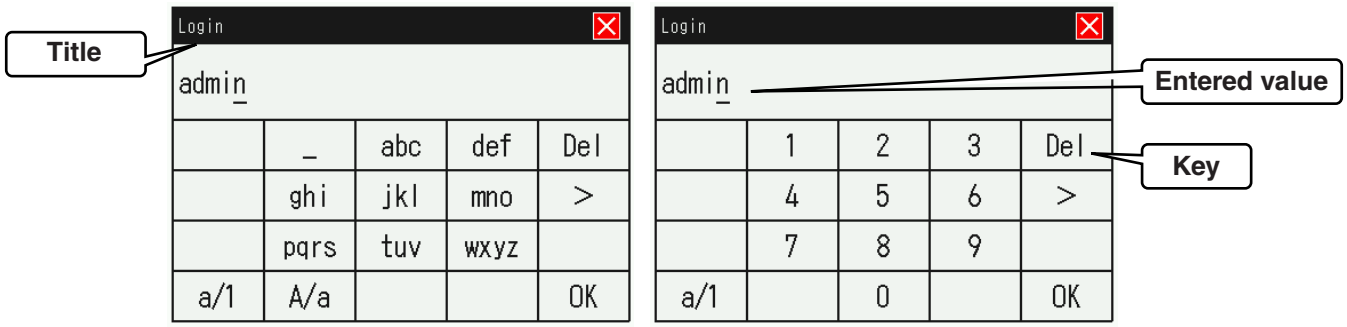
• IP dialog

IP address or Subnet mask etc. is set. The background turns yellow when the value is invalid.



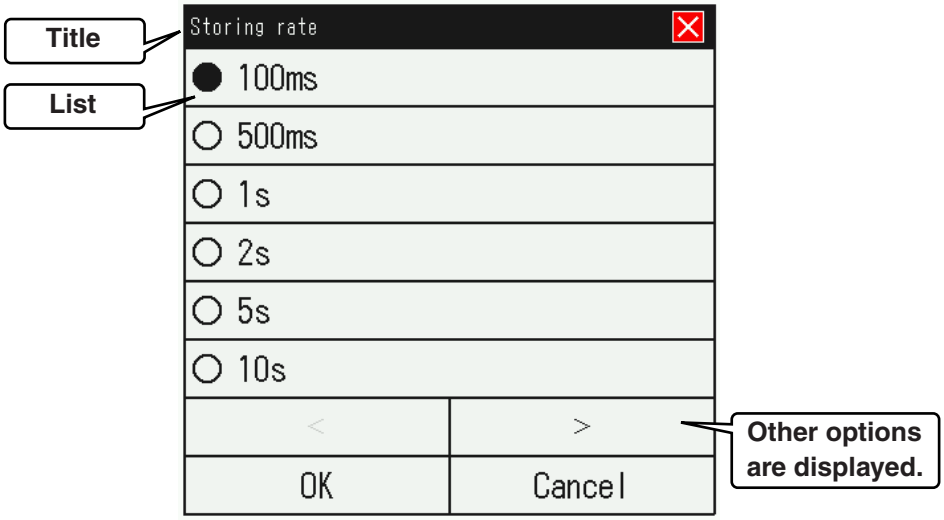
• ID input dialog

The login ID or the password etc. is set.



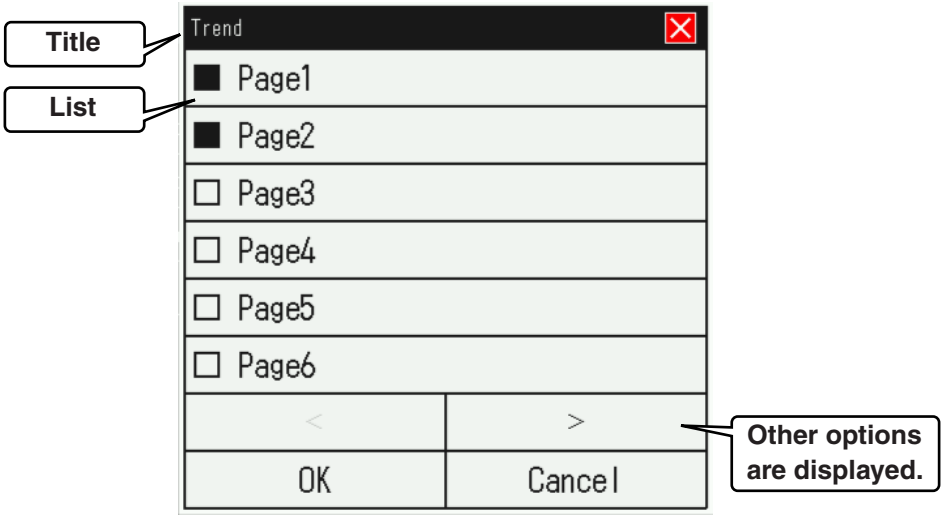
• List selection dialog

A white circle changes to a black circle by tapping a parameter.



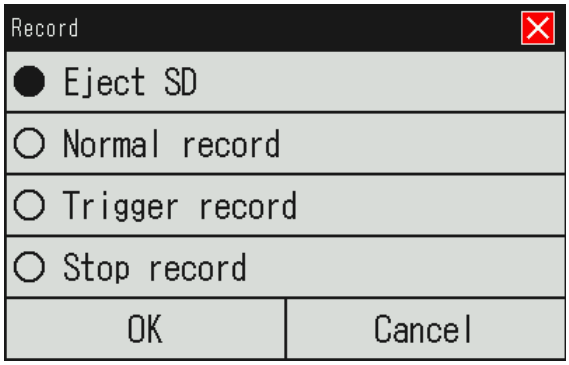
• Checkbox dialog

A white checkbox changes to a black box by tapping a parameter. (Multiple checkboxes can be selected.)



4.3.10.3 Record dialog

This section describes about the dialog displayed when [REC] button is pressed or the recording icon is tapped.



1. Press [REC] button or tap the recording icon on any screen.
   The selected parameter is displayed with the black circle.
   After selecting a parameter, confirm with [OK] button or cancel with [Cancel] button.

2. Before inserting or removing an SD card from the VR144E-G64, select [Eject SD] and confirm.
   Insert or remove the SD card after changing to icon which means to release mounting.

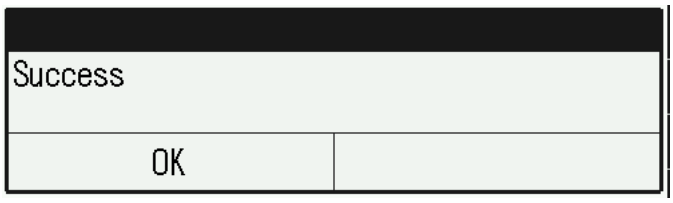
3. After selecting [Normal record] and confirming with [OK] button, normal recording of the trend starts. When recording starts, REC icon turns on. The recorded content is based on the settings in the configurator software.
   ➔ 3.5.1 Basic setting, 3.5.2 Pen setting

4. After selecting [Trigger record] and confirming with [OK] button, trigger recording of the trend starts. When recording starts, Trigger REC icon turns on. The recorded content is based on the settings in the configurator software.
   ➔ 3.5.1 Basic setting, 3.5.2 Pen setting

5. Select [Stop record] and confirm with [OK] button to stop normal recording or trigger recording.

4.3.10.4 Popup

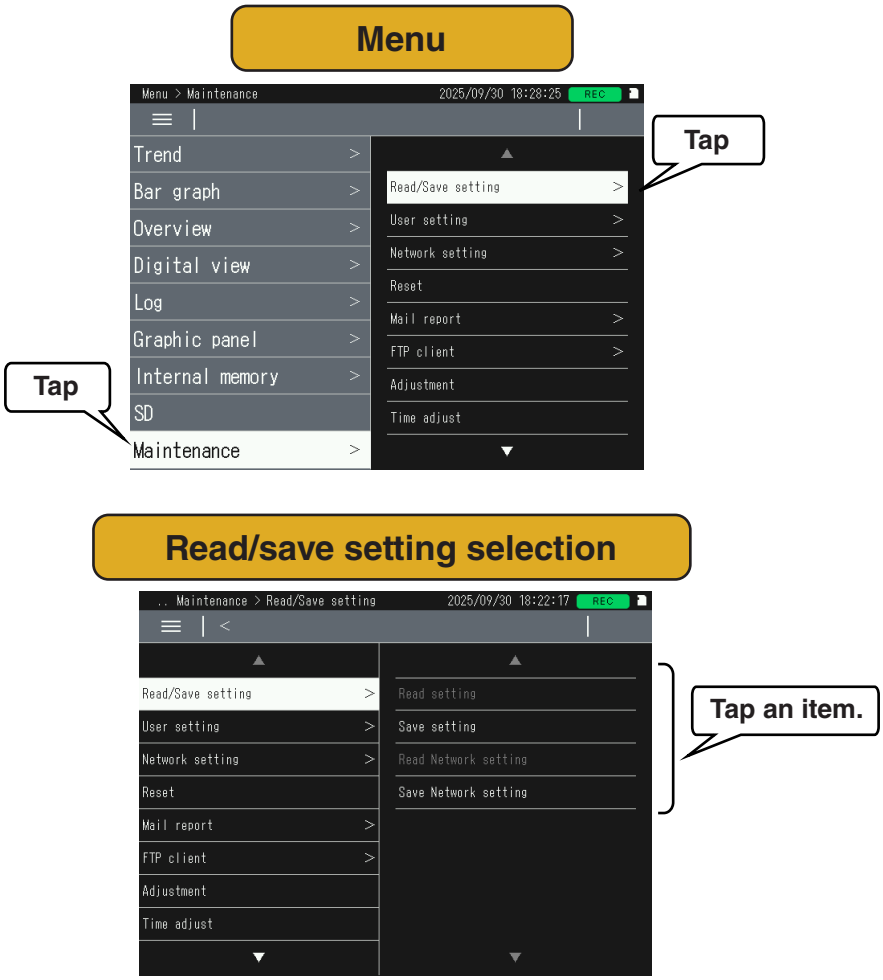
The popup appears when an error occurs or some operation such as setting change is recommended.
The background turns red when an error occurs.
Tapping other buttons is disabled until the popup is closed.



Confirm with [OK] button to close the dialog.

4.3.10.5 Reading/saving setting

Follow the procedure below in order to read or save the device settings or the network setting stored in an SD card.



1. Tap [Maintenance] on the menu screen.
2. Tap [Read/Save setting].
3. Select a parameter to be read or saved.
   For the file name and the saving destination, refer to the table below. ➔ 6.6 Folder structure
   The contents of "vr144cfg.json" is the settings saved to the file with the configurator software.
   ➔ 2.3.6 Saving the setting to file
   The contents of "vr144net.json" is the settings saved to the file with the configurator software.
4. Tap [OK] to perform reading or writing the setting.
5. If the reading operation is performed but the corresponding file does not exist, or if the writing operation is performed but is failed in writing to the corresponding file, an error message appears.

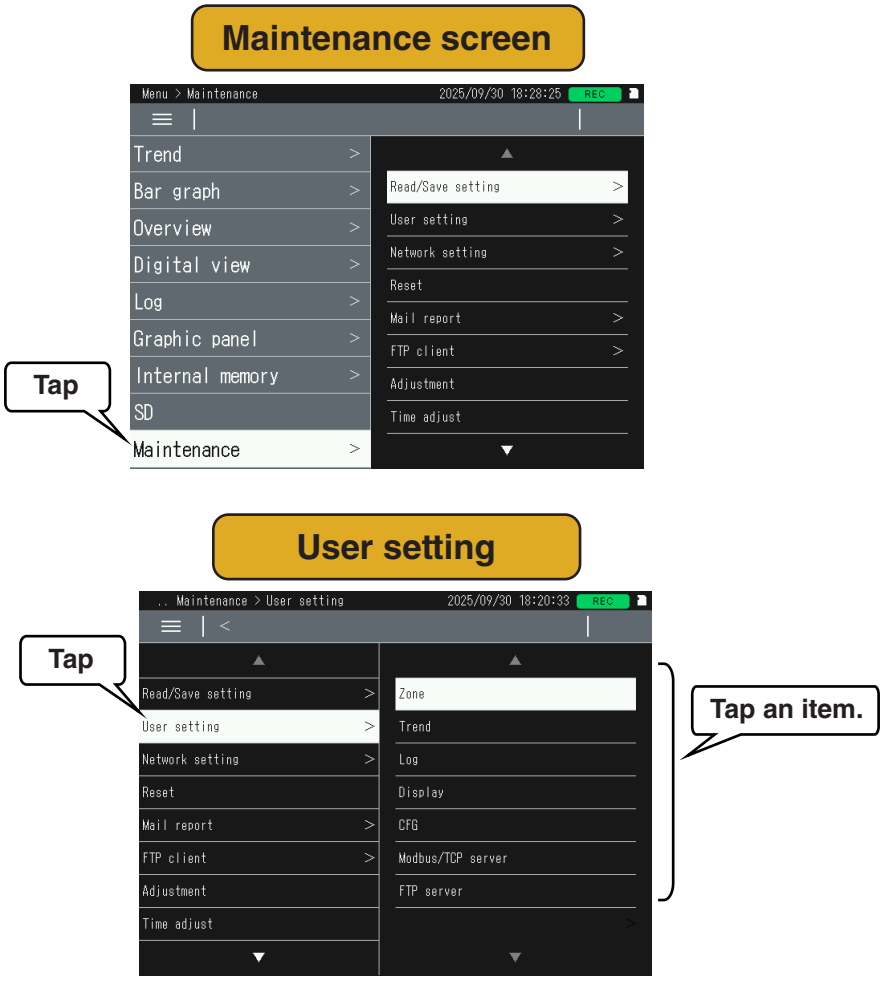
Button	File name	Saving destination
Read setting	vr144cfg.json	The setting file in the base folder is exported to the device. The contents are reflected to the device.
Save setting	vr144cfg.json	The setting file is saved to the base folder.
Read Network setting	vr144net.json	The setting file in the base folder is exported to the device. The contents are reflected to the device.
Save Network setting	vr144net.json	The setting file is saved to the base folder.

CAUTION

Do not edit "vr144cfg.json" or "vr144net.json" with a text editor or similar tools.

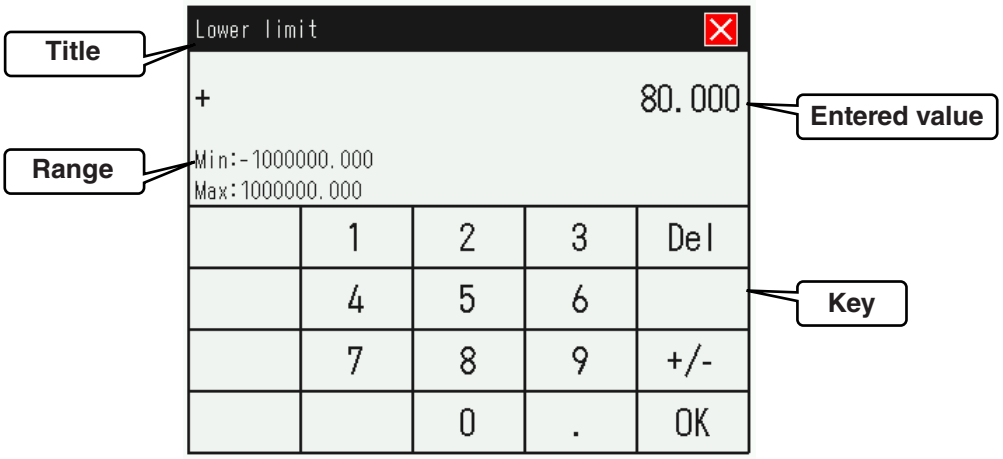
4.3.10.6 User setting

Follow the procedure below in order to configure the settings of zone, trend, log, display, CFG, Modbus/TCP server, and FTP server.



1. Tap [Maintenance] on the menu screen.
2. Tap [User setting].
3. Select a parameter to be set.
4. For the parameters and the selectable options, refer to the table on the next page.
5. Select the parameter to be changed with ▲ and ▼ buttons.
6. A keypad appears when entering a value. A cursor appears under the digit to be changed.
   Change the cursor position with [<] and [>] buttons and change the value.
   Close the keypad by tapping [OK].
7. When a dialog appears, tap [OK] to save the setting change.

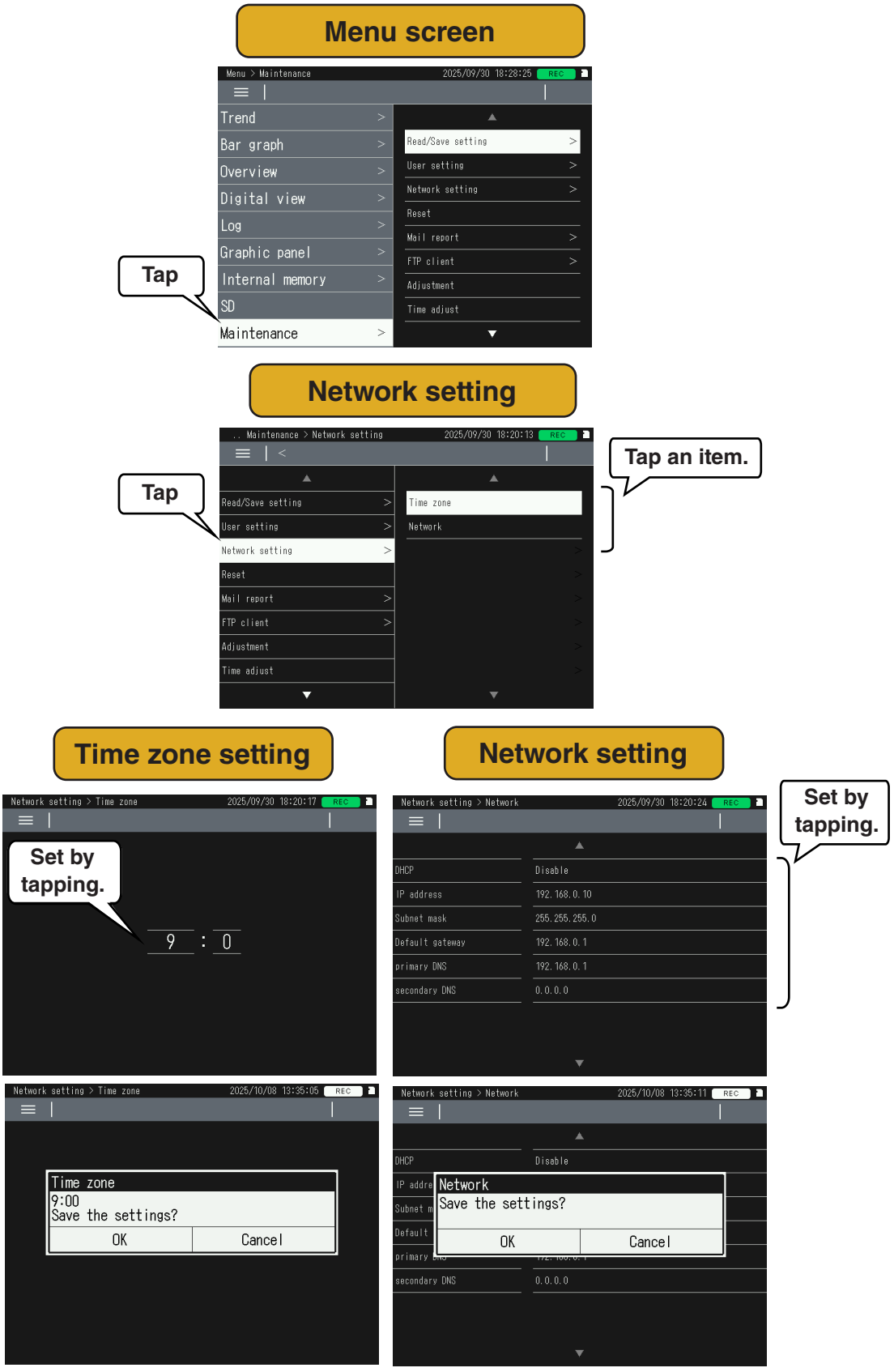
Parameter	Selectable option	Reference
Zone	AI, DI, OI: AIx: CH name, CH comment (AIx in case of None) DIx: CH name, CH comment (DIx in case of None) OIx: CH name, CH comment AIx, OIx: Delay time, Upper limit, Lower limit, Trigger, Condition DIx: Delay time, Trigger, Condition	Set after selecting a channel. The detail is same as the following. AI: 3.4.1.5 Zone setting (AI) 3.4.1.6 Event setting (AI) DI: 3.4.2.4 Basic setting (DI) OI: 3.4.3.2 Zone setting (OI) 3.4.3.3 Event setting (OI)
Trend	Common setting: Auto start, Auto delete, Storing rate, Encode Normal recording: Storing mode, Storing mode: Samples, Storing interval, Time, Day of week Trigger recording: Trigger mode, Pre trigger, Post trigger PEN: PEN 1 to 64, Upper limit, Lower limit	Set after selecting PEN 1 to 16. The detail is same as the following. Basic: 3.5.1 Basic setting PEN: 3.5.2 Pen setting
Log	Enable or disable event log, system log or comm. log.	The detail is same as the following. 3.6 Log setting
Display	Number of displayed items (trend, bargraph, overview) Wake up (wake up screen and page), Screen saver, Flicker, Beep, Brightness, Auto view switch (Switch start time, Switch interval, Switch pages)	The detail is same as the following. Wake up: 3.7.1 Wake up screen setting Flicker: 3.7.2 Digital view setting Screen saver, Brightness: 3.7.4 Other settings
CFG	Enable/Disable, Port No., Login name, Password	The detail is same as the following. 3.2.1 CFG
Modbus/ TCP server	Enable/Disable, Port No., Linger timer	The detail is same as the following. 3.2.2 Modbus/TCP (server)
FTP server	Enable/Disable, Port No., Login name, Password	The detail is same as the following. 3.2.3 FTP server



Parameter	Description
Title	The name of the parameter to be changed is displayed.
Entered value	The current value is displayed. The background turns yellow when the value is out of the setting range.
Range	The valid range is displayed.
Key	☒ : The setting is cancelled and the dialog is closed. Del : The last digit is deleted. +/- : The plus value and the minus value are switched. OK : The entered value is confirmed. The button is disabled when an error occurs.

4.3.10.7 Network setting

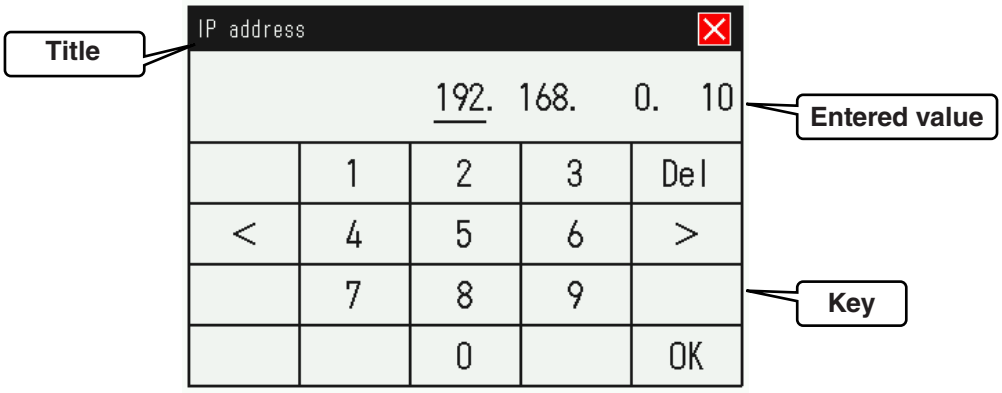
Follow the procedure below in order to configure the settings of time zone and network for the device.



1. Tap [Maintenance] on the menu screen.
2. Tap [Network setting].
3. Select an parameter to be set.
4. For the parameters and the selectable items, refer to the table below.

Parameter	Selectable item	Reference
Time zone	± hh:mm	
Network	DHCP, IP address, Subnet mask, Default gateway, primary DNS, secondary DNS	DHCP: Enable/Disable Setting range (0.0.0.0 to 255.255.255.255)

5. Setting change can be performed by tapping the buttons.
6. Keypad appears when entering a value.
   A cursor appears under the digit to be changed.
   Move the cursor position with [<] and [>] buttons. Change the value by entering keys.
   Tap [OK] to finish entering keys.
7. When a dialog appears, tap [OK] to save the setting change.



Parameter	Description
Title	The name of the parameter to be changed is displayed.
Entered value	The current value is displayed. The background turns yellow when the value is invalid.
Key	☒ : The setting is cancelled and the dialog is closed. Del : The last digit is deleted. <, > : The cursor position is moved. OK : The entered value is confirmed. The button is disabled when an error occurs.

CAUTION

To enable the settings, it is necessary to turn off and then turn on the device or to reboot it.

4.3.10.8 Reset

Follow the procedure below in order to reset operational input (OI) for analog accumulation.

1. Tap [Maintenance] on the menu screen.
2. Tap [Reset].
3. Select an OI to be reset by tapping ▲ and ▼ buttons.
4. When a dialog appears, tap [OK] to execute.

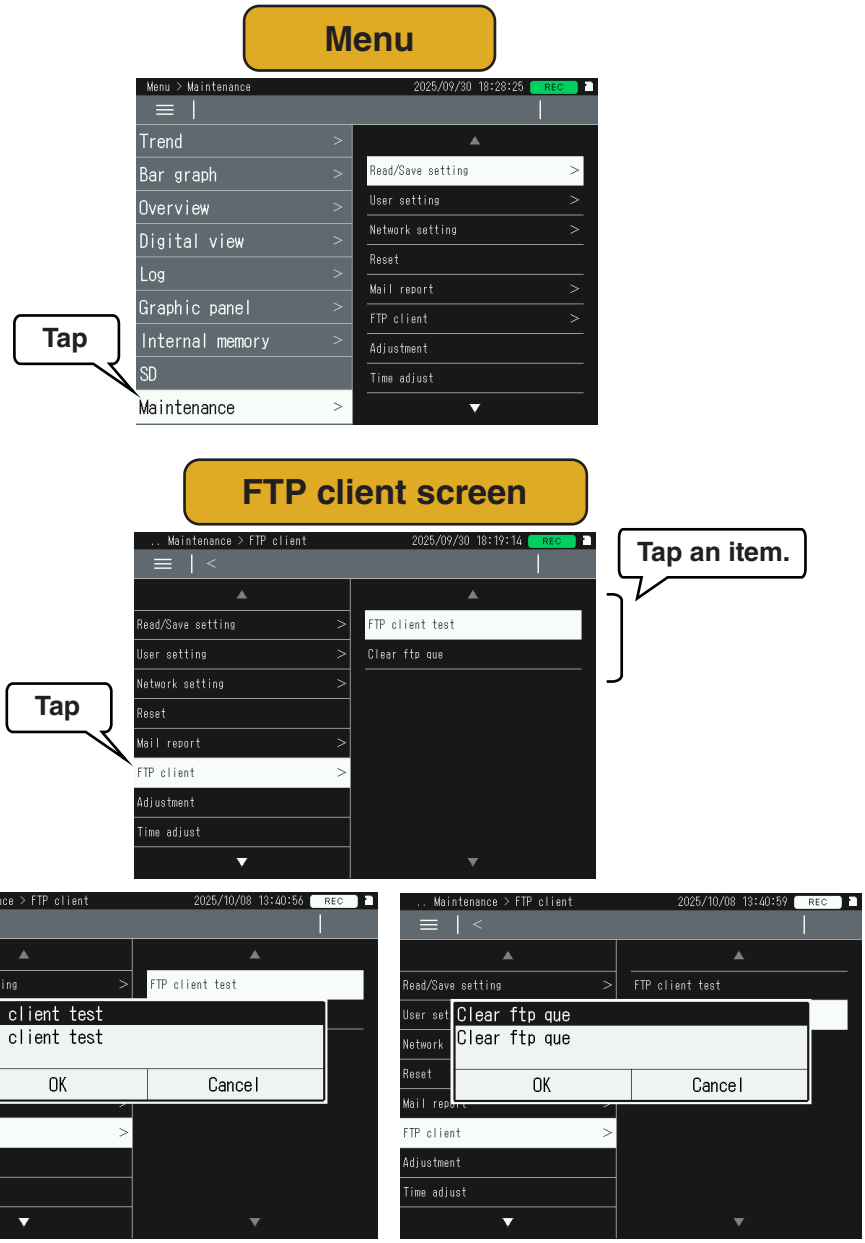
4.3.10.9 E-mail report

Follow the procedure below in order to perform e-mail reporting test.

1. Tap [Maintenance] on the menu screen.
2. Tap [Mail report].
3. If performing an e-mail reporting test, select a recipient address with ▲ and ▼ buttons.
4. Select [Clear mail que] when deleting the transmission queue.
5. When a dialog appears, tap [OK] to execute.

4.3.10.10 FTP client

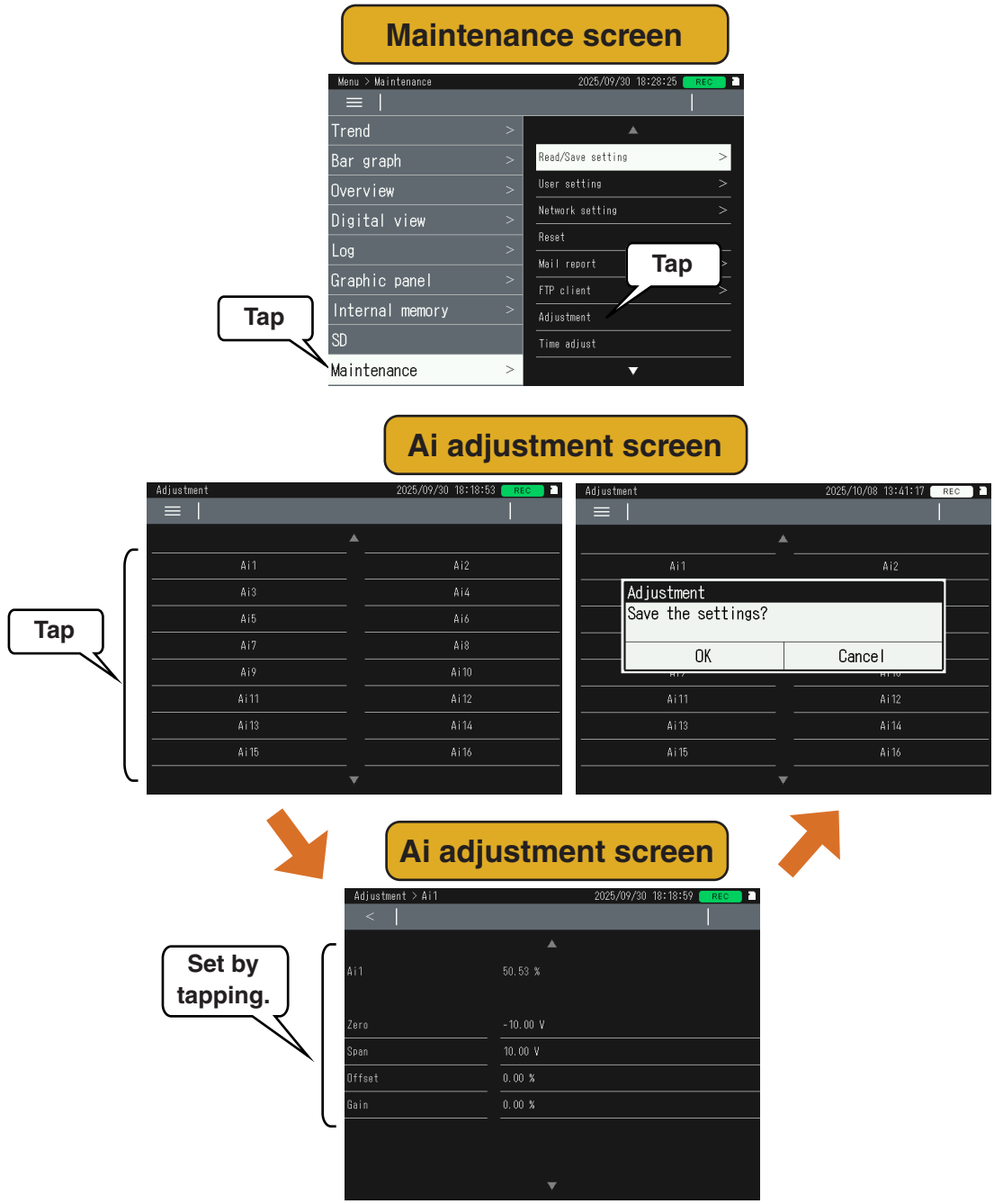
Follow the procedure below in order to perform FTP client test.



1. Tap [Maintenance] on the menu screen.
2. Tap [FTP client].
3. If performing an FTP client test, select [FTP client test].
4. Select [Clear ftp que] when clearing the transmission queue.
5. When a dialog appears, tap [OK] to execute.

4.3.10.11 Ai adjustment

Follow the procedure below in order to adjust I/O values.

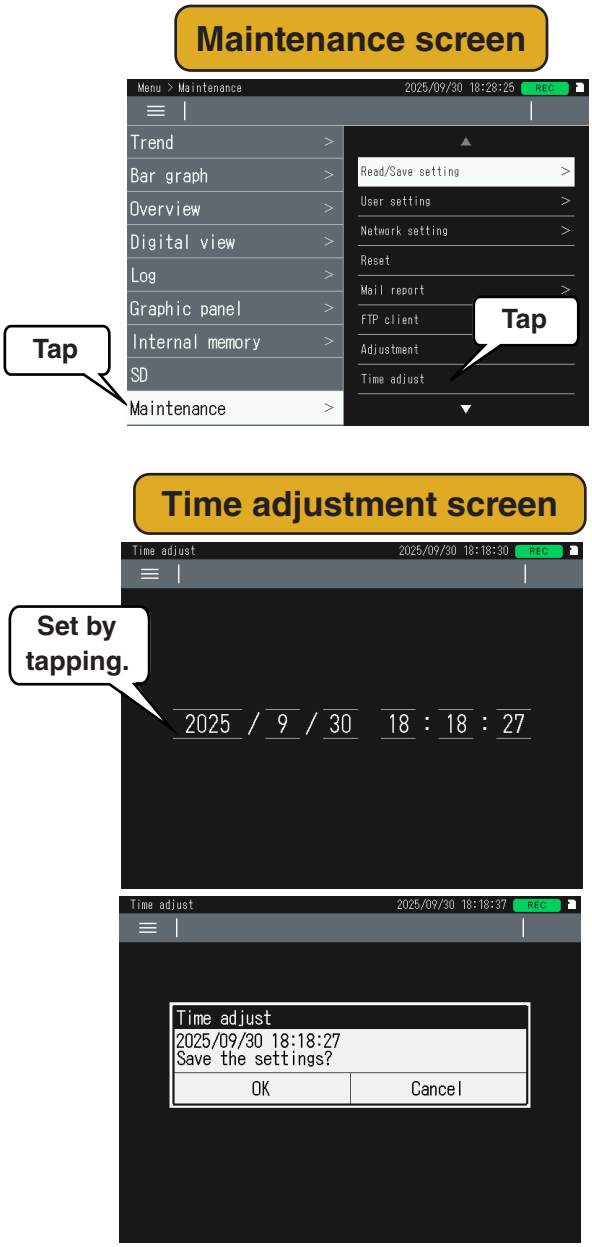


1. Tap [Maintenance] on the menu screen.
2. Tap [Adjustment].
3. Select an channel to be adjusted. Refer to the table below for the parameters and the configurable items.
4. Tap [<] button to go back to [Adjustment] screen. Tap [☰] to display a dialog. When [OK] is tapped, the setting change is saved.

Parameter	Configurable item	Reference
Ai Adjustment	The current values are displayed in %. Zero, span, offset and gain can be set.	Adjustment range Zero / Span : Depends on the analog input specification. • -10 to +10 V (minimum range 1.6 V) • -800 to +800 mV (minimum range 160 mV) • -80 to +80 mV (minimum range 20 mV) Offset / Gain: -5.00 to +5.00 (%)

4.3.10.12 Time adjust

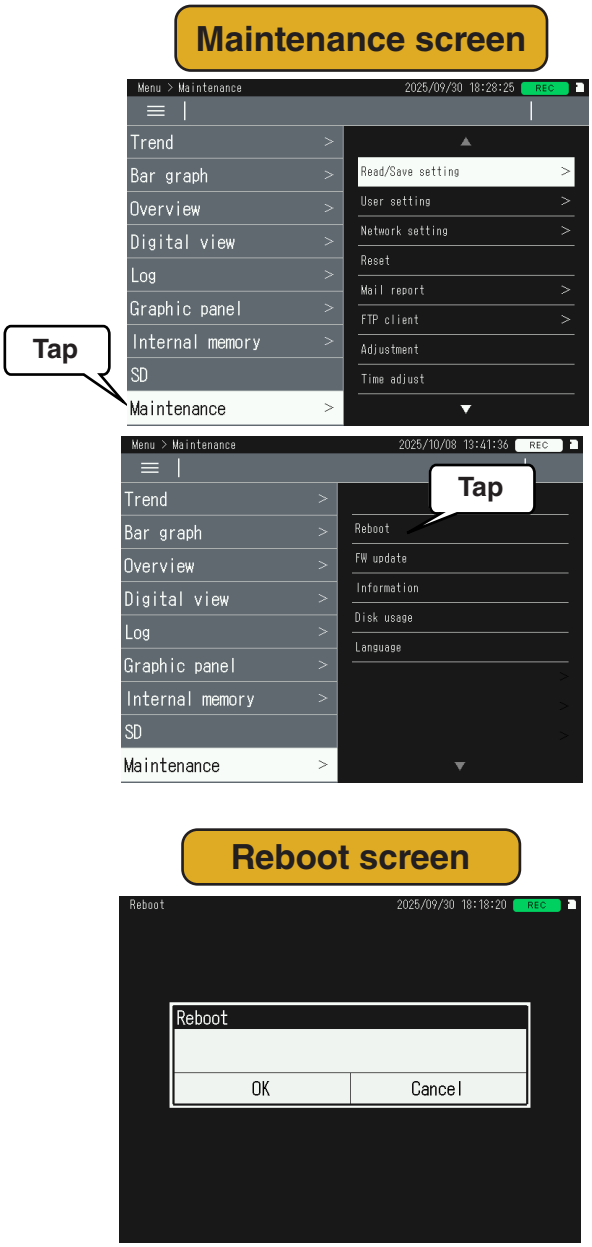
Follow the procedure below in order to set the local time used for trend recording or system logs.



1. Tap [Maintenance] on the menu screen.
2. Tap [Time adjust].
3. Change the time on [Time adjust] screen.
4. When a dialog appears, tap [OK] to save the setting change.

4.3.10.13 Reboot

Follow the procedure below in order to reboot the device.



1. Tap [Maintenance] on the menu screen.
2. Tap [Reboot].
3. When a dialog appears, tap [OK] to reboot the device.

4.3.10.14 FW update

The firmware version is displayed. Refer to our website regarding how to update the firmware.

1. Tap [Maintenance] on the menu screen.
2. Tap [FW update].

4.3.10.15 Information

Follow the procedure below in order to display the device information.

1. Tap [Maintenance] on the menu screen.
2. Tap [Information].
3. The device information is displayed.
   For the displayed items, refer to the table below.

Displayed item	Description	Reference
Version	The firmware version in the VR144E-G16 is displayed.	
IP address Subnet mask Default Gateway primary DNS secondary DNS	IP address, Subnet mask, Default Gateway, primary DNS and secondary DNS are displayed.	Changeable in 4.3.10.7 Network setting.
Mac address	Mac address is displayed.	
Serial	The number to be managed by MG CO., LTD. is displayed.	

4.3.10.16 Disk usage

Follow the procedure below in order to display the usage state of the SD card placed in the device.

1. Tap [Maintenance] on the menu screen.
2. Tap [Disk usage].

4.3.10.17 Language

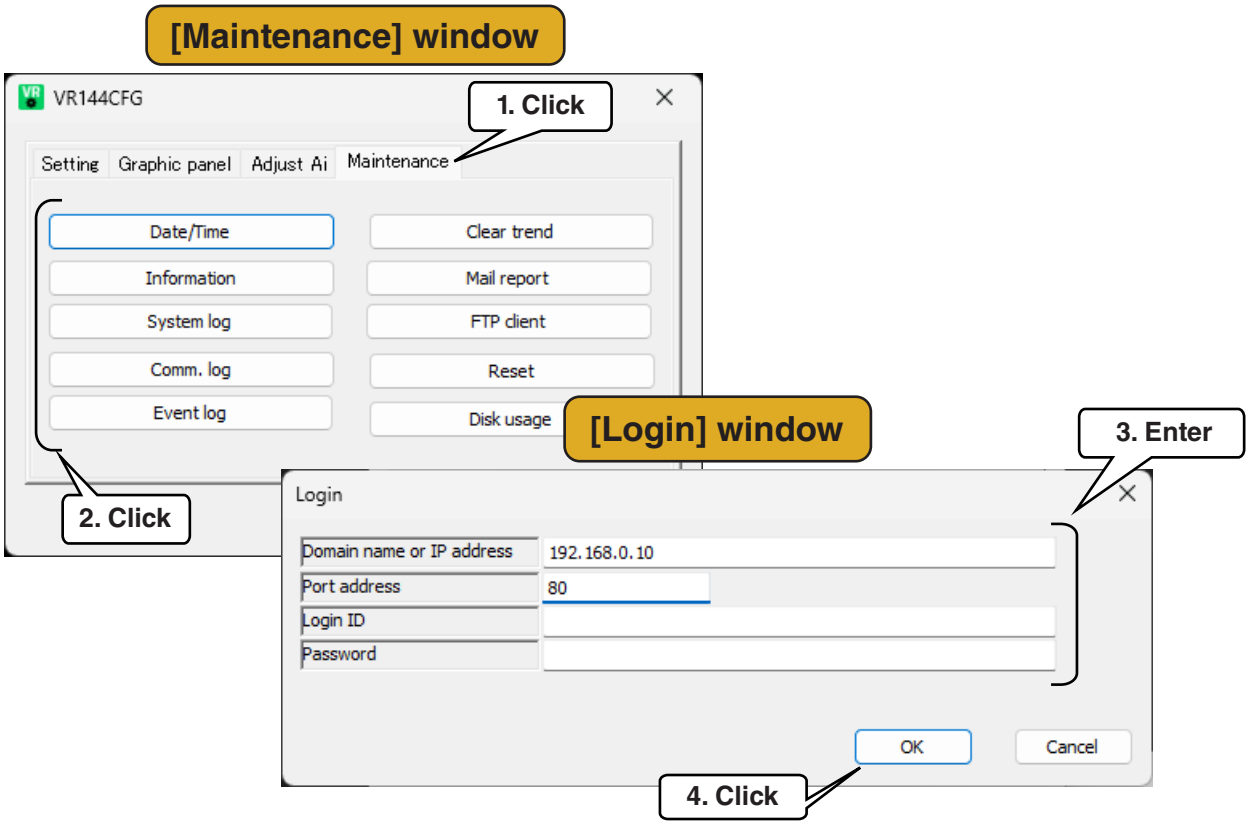
Follow the procedure below in order to configure the language setting displayed on the device.

1. Tap [Maintenance] on the menu screen.
2. Tap [Language].
3. Select the language to be displayed.
4. Tap [OK] to save the setting change.

5. Maintenance

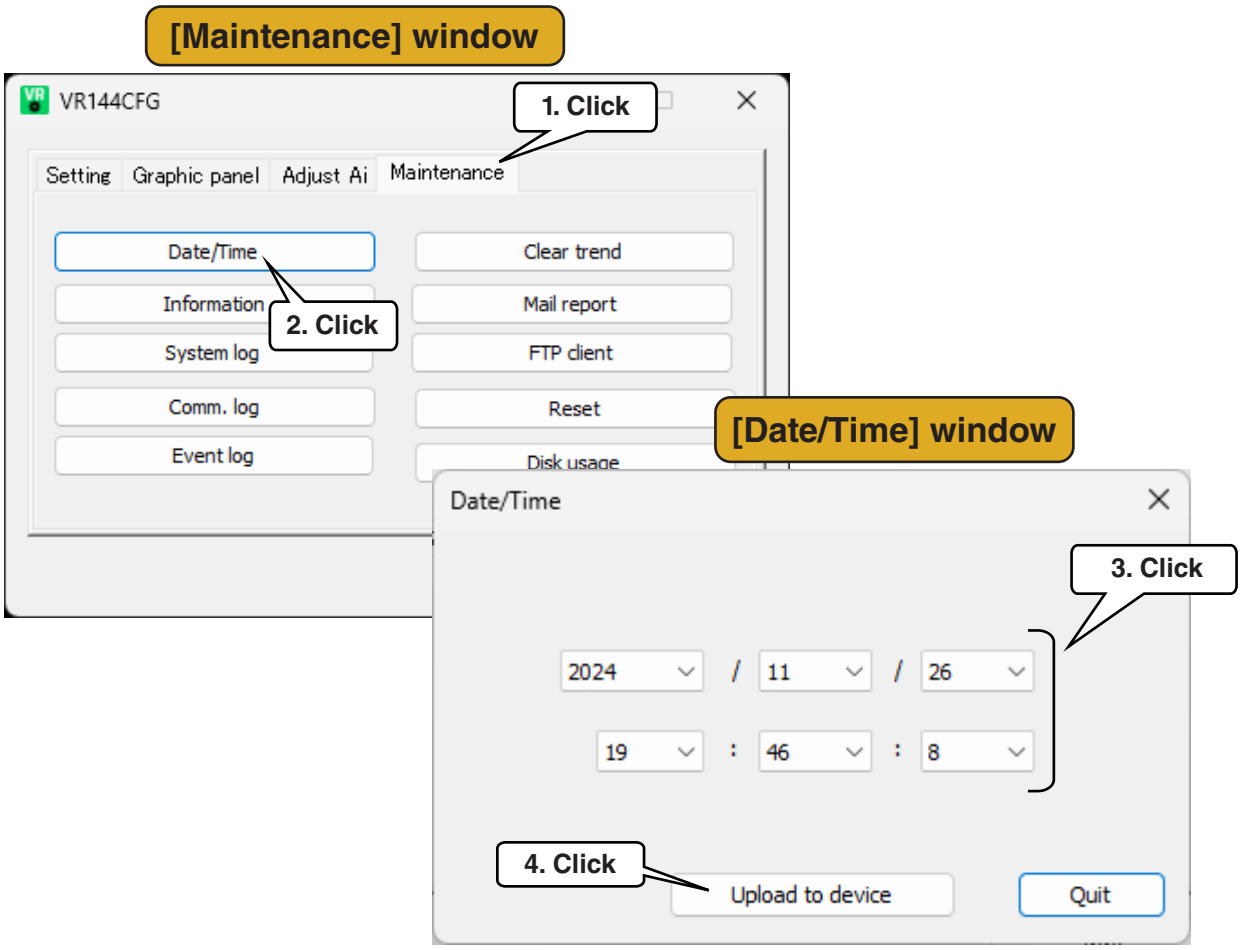
5.1 Maintenance from VR144CFG

From [Maintenance] window, maintenance on the VR144E-G16 can be performed.
1. After starting up VR144CFG, click [Maintenance] tab to display [Maintenance] window.
2. Click the parameter to be performed to display [Login] window.
3. Enter the login information and click [OK]. The window for the maintenance to be performed appears.



5.1.1 Date/Time

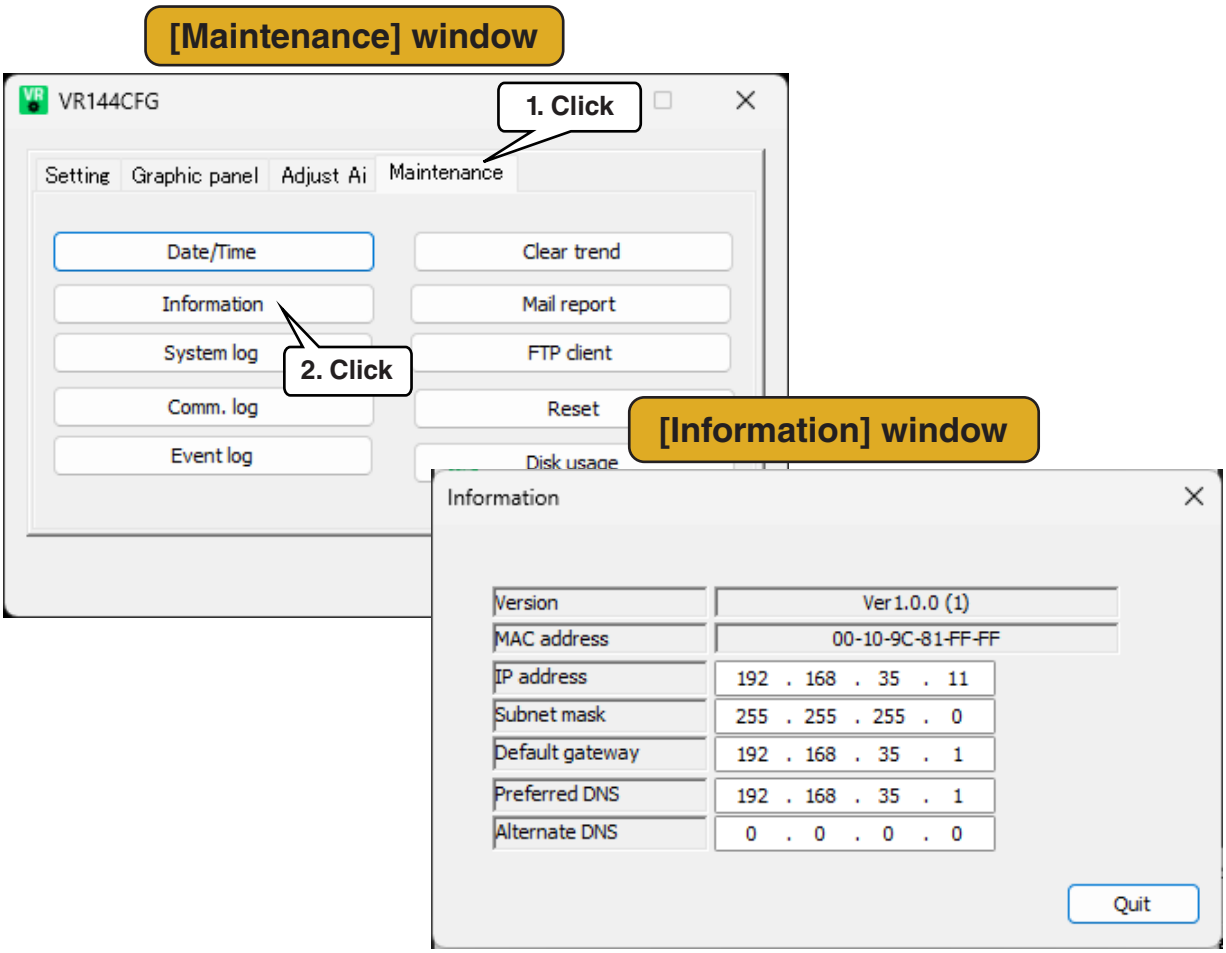
Set the local time used to the trend recording and the system logs.



1. Click [Maintenance] tab.
2. Click [Date/Time] button. After logging in, [Date/Time] window appears.
3. Click the date and time drop-down list to select the date and time, and click [Upload to device] button to apply the settings.

5.1.2 Information

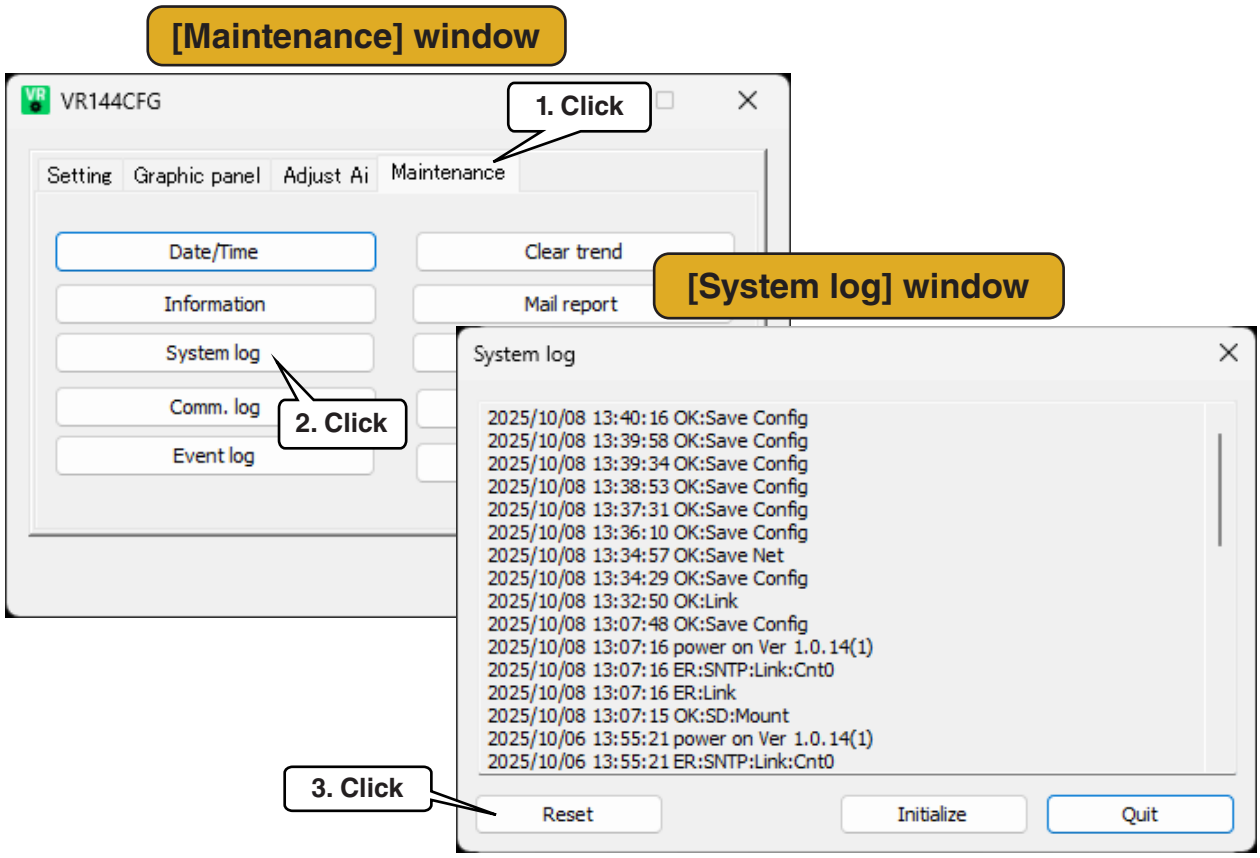
Follow the procedure below in order to display the device information.



1. Click [Maintenance] tab.
2. Click [Information] button. After logging in, [Information] window appears.

5.1.3 System log

Follow the procedure below in order to display the list of system logs.



1. Click [Maintenance] tab.
2. Click [System log] button. After logging in, [System log] window appears.
3. Click [Reset] button to clear the system logs.
   Click [Initialize] button to initialize the system logs.
4. For system log messages, refer to the table below. (Partial list)

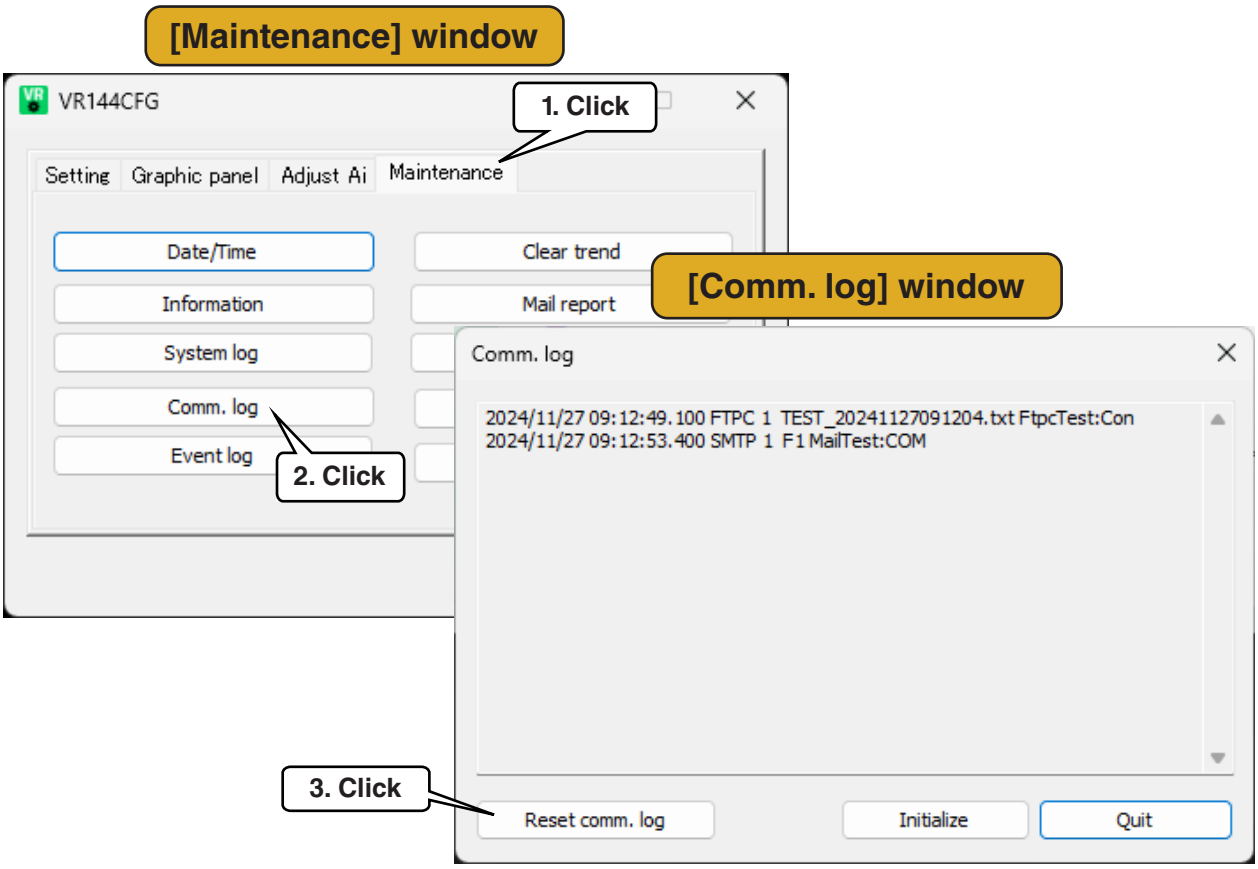
Message	Meaning
power on Verxx	Power supply ON (xxx: version)
OK:SNTP	Succeeded in time synchronization of SNTP.
OK:AdjustTime	Time is adjusted.
OK:Save Config	Setting is updated.
OK:Save Net	Network setting is updated (Rebooting is required).

CAUTION

- In case of trouble, our service personnel may review the system log contents for analysis.
- The system log messages contain many proprietary internal processes, so individual log details are not provided.

5.1.4 Communication log

Follow the procedure below in order to display the list of communication logs.



1. Click [Maintenance] tab.
2. Click [Comm. log] button. After logging in, [Comm. log] window appears.
3. Click [Reset comm. log] button to clear the communication logs.
   Click [Initialize] button to initialize the communication logs.
4. For communication log messages, refer to the table below. (Partial list)

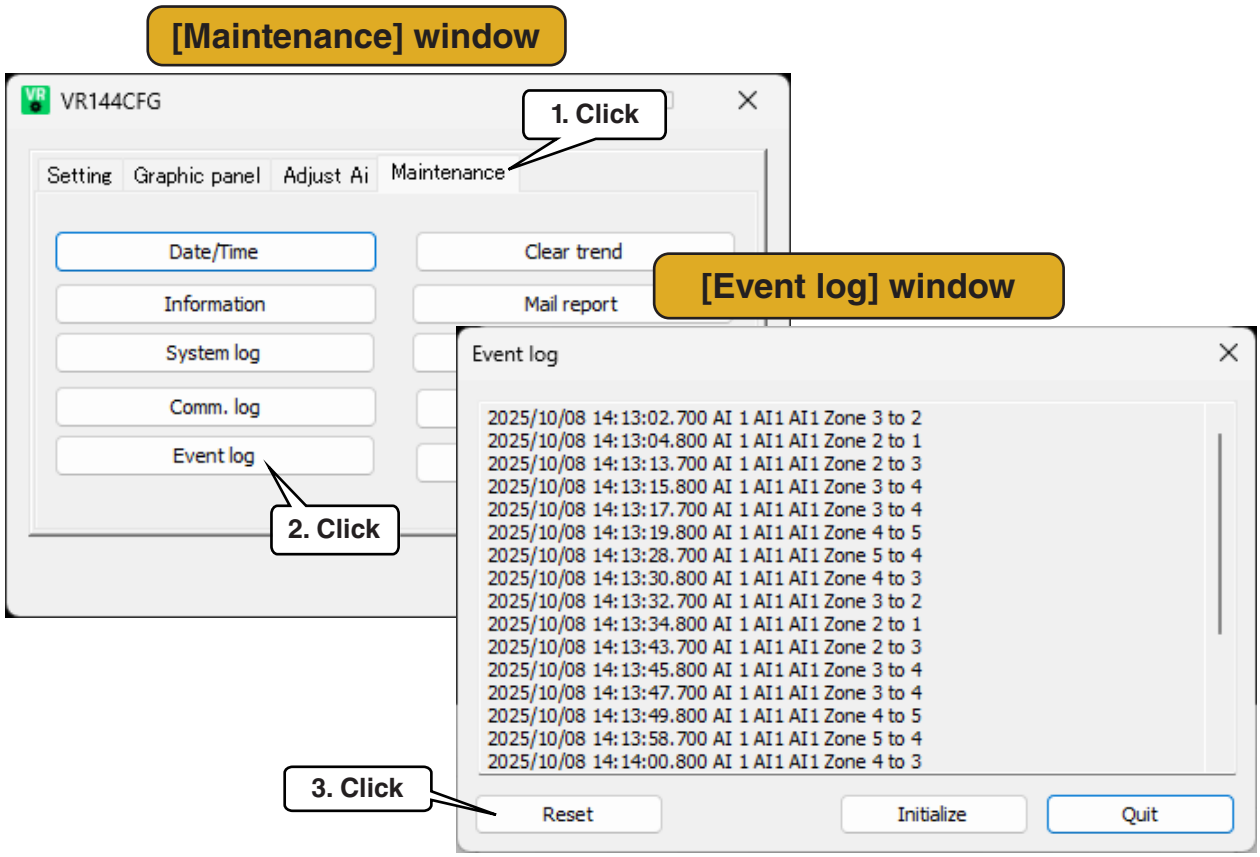
Message	Meaning
FTPC,1,CLOG.txt,Success	Succeeded in the transfer of CLOG.txt.
SMTP,1,F1,Regular	Succeeded in the regular reporting of Form1.

CAUTION

- The communication log contains proprietary content related to internal processing and various messages from different companies providing mail services, so individual log details are not provided.

5.1.5 Event log

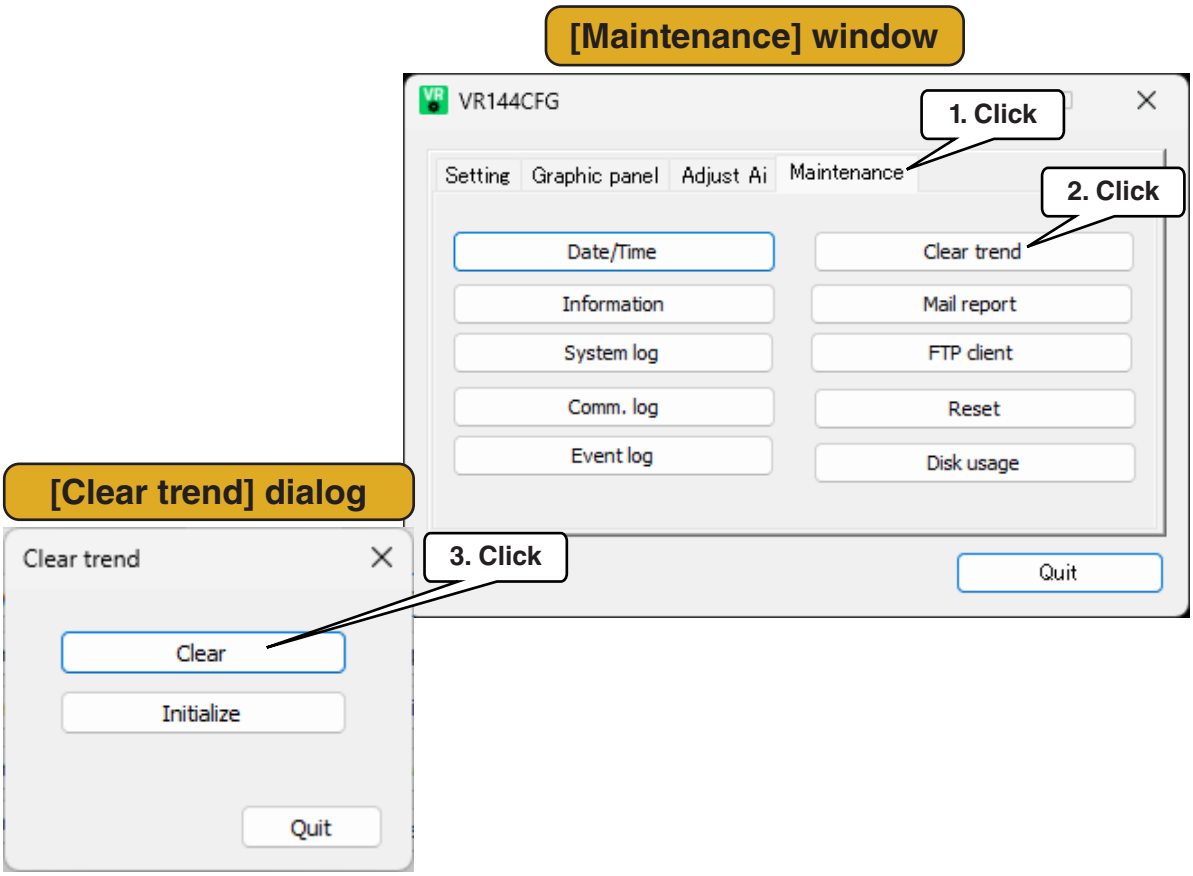
Follow the procedure below in order to display the list of event logs.



1. Click [Maintenance] tab.
2. Click [Event. log] button. After logging in, [Event log] window appears.
3. Click [Reset] button to clear the event logs.
   Click [Initialize] button to initialize the event logs.

5.1.6 Clear trend

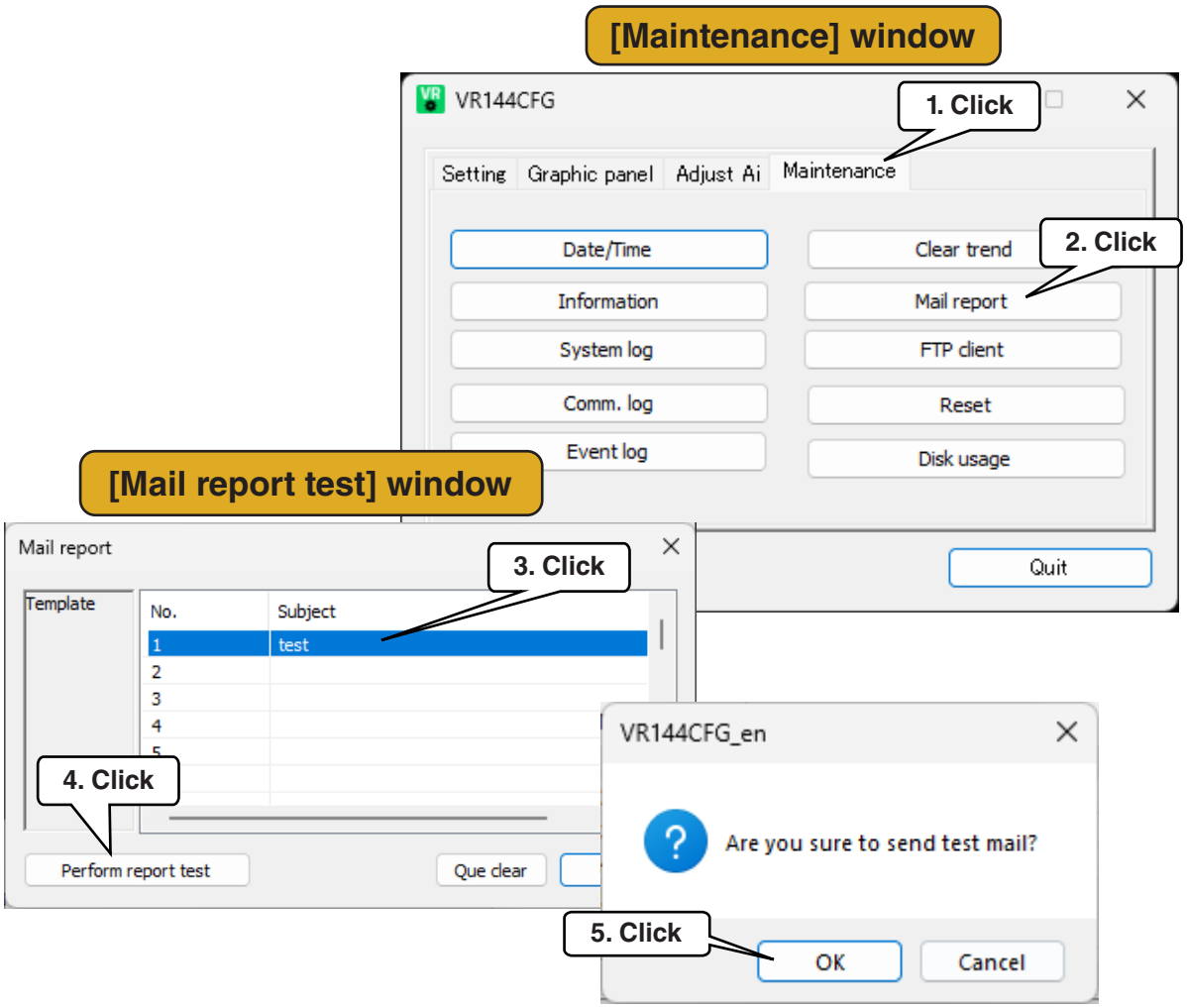
Follow the procedure below in order to clear the trend.



1. Click [Maintenance] tab.
2. Click [Clear trend] button. [Clear trend] dialog appears.
3. Click [Clear] button to clear the trend. Click [Initialize] button to initialize the trend.
4. After clicking [Clear] or [Initialize] button, the confirmation dialog appears.
5. Click [OK] button. After logging in, the result of clearing/initializing trend appears.

5.1.7 E-mail reporting test

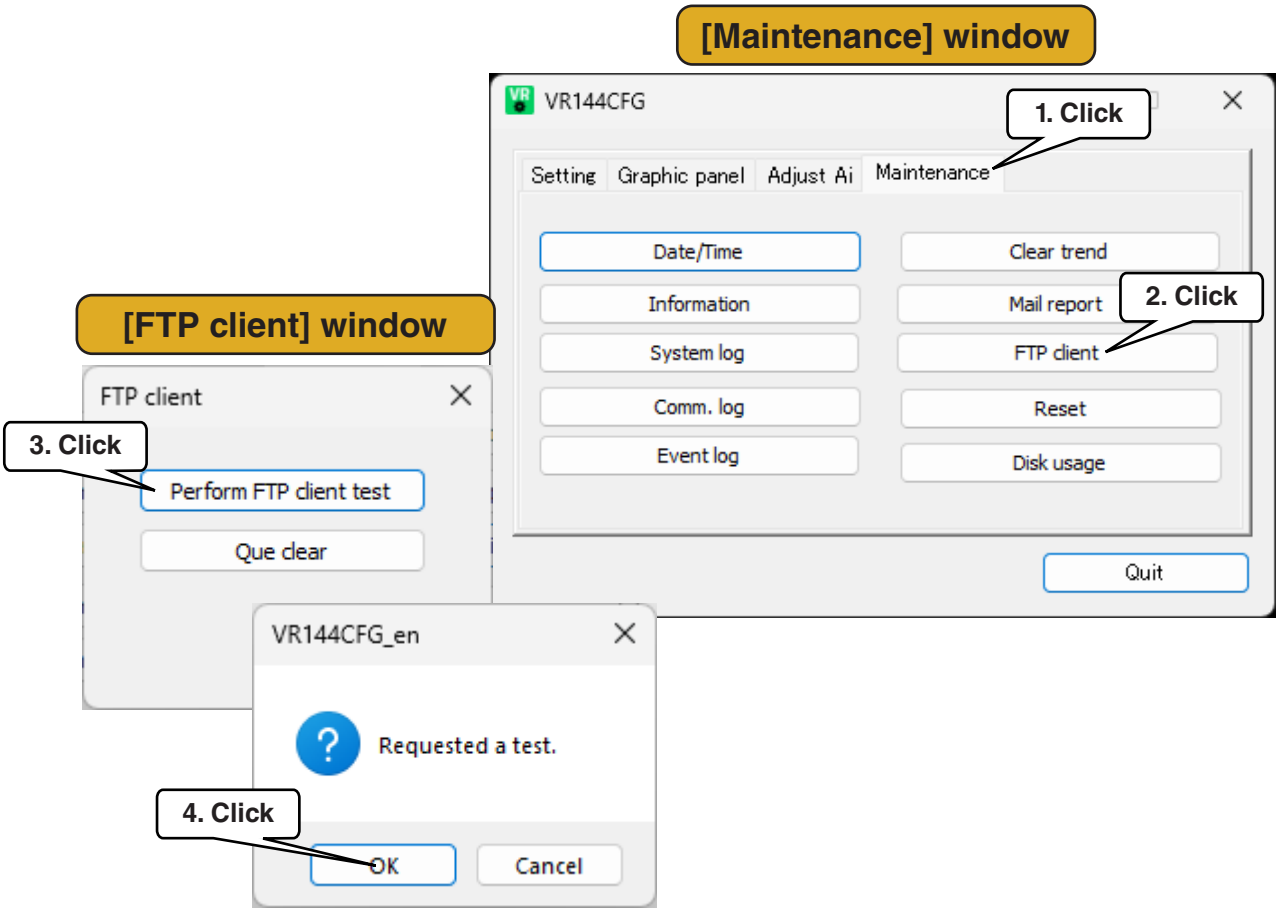
Perform e-mail reporting test.



1. Click [Maintenance] tab.
2. Click [Mail report] button. After logging in, [Mail report] window appears.
3. Click [Perform report test] button to perform a report test.
   Click [Que clear] button to clear the transmission queue.
4. Click the template to perform the e-mail reporting test. ➔ 3.8.3 Template setting
5. Click [Perform report test] button. Then, the confirmation dialog appears.
6. Click [OK] button to perform the e-mail reporting test.

5.1.8 FTP client test

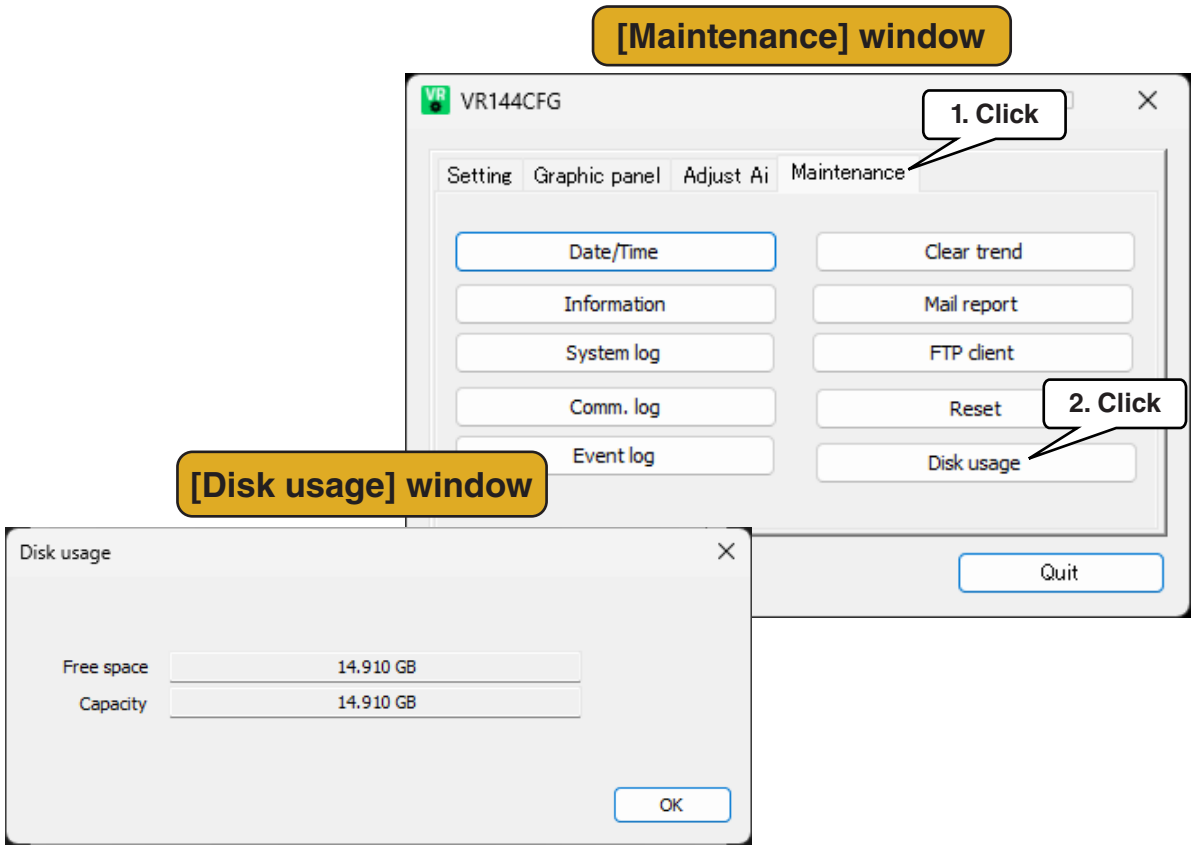
Perform FTP client test.



1. Click [Maintenance] tab.
2. Click [FTP client] button. After logging in, the [FTP client] window appears.
3. Click [Perform FTP client test] button to perform a FTP client test.
   Click [Que clear] button to clear the transmission queue.
4. When [Perform FTP client test] button is clicked, the confirmation dialog appears.
5. Click [OK] button. The FTP client test is performed.

5.1.9 Disk usage

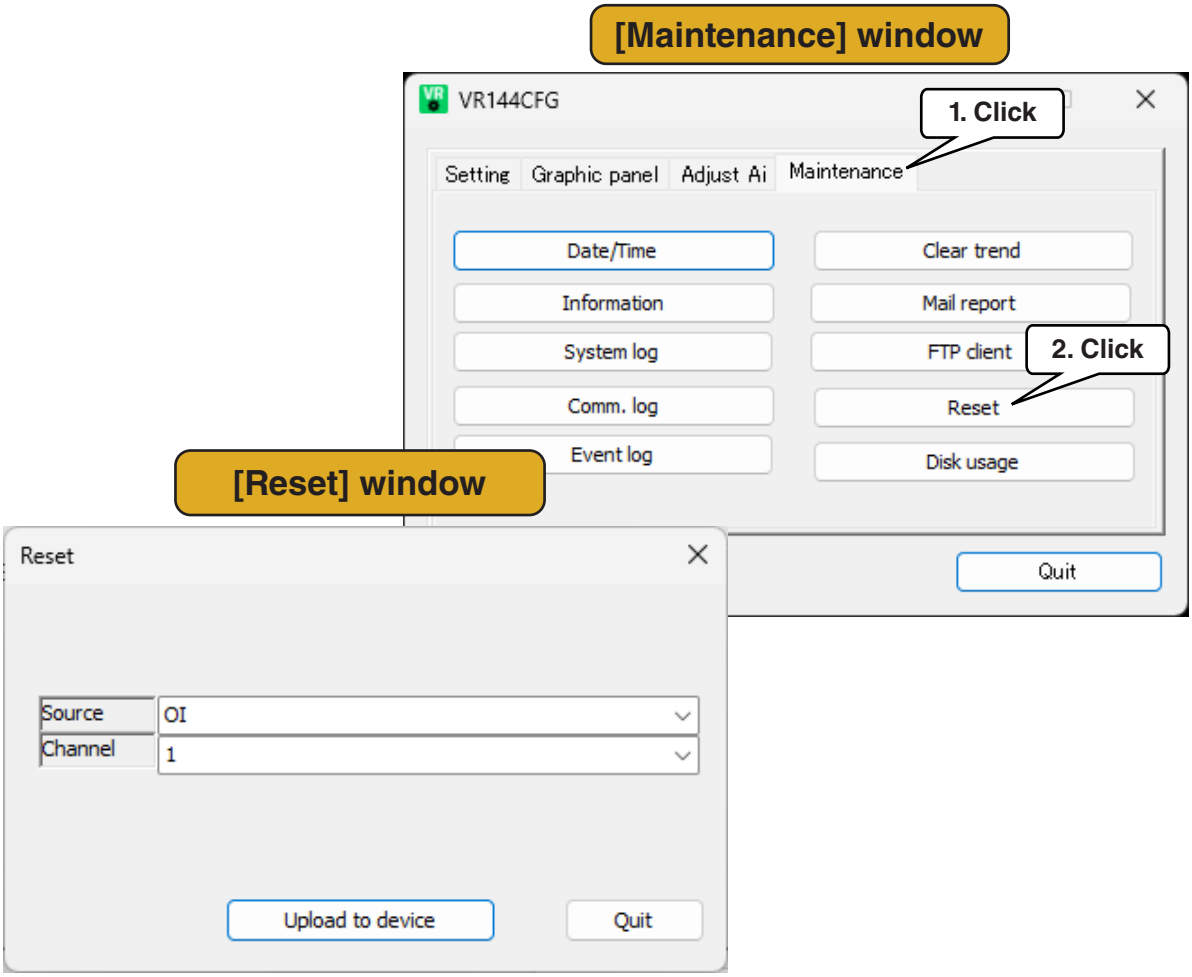
Follow the procedure below in order to display the disk usage.



1. Click [Maintenance] tab.
2. Click [Disk usage] button. After logging in, [Disk usage] window appears.

5.1.10 Reset

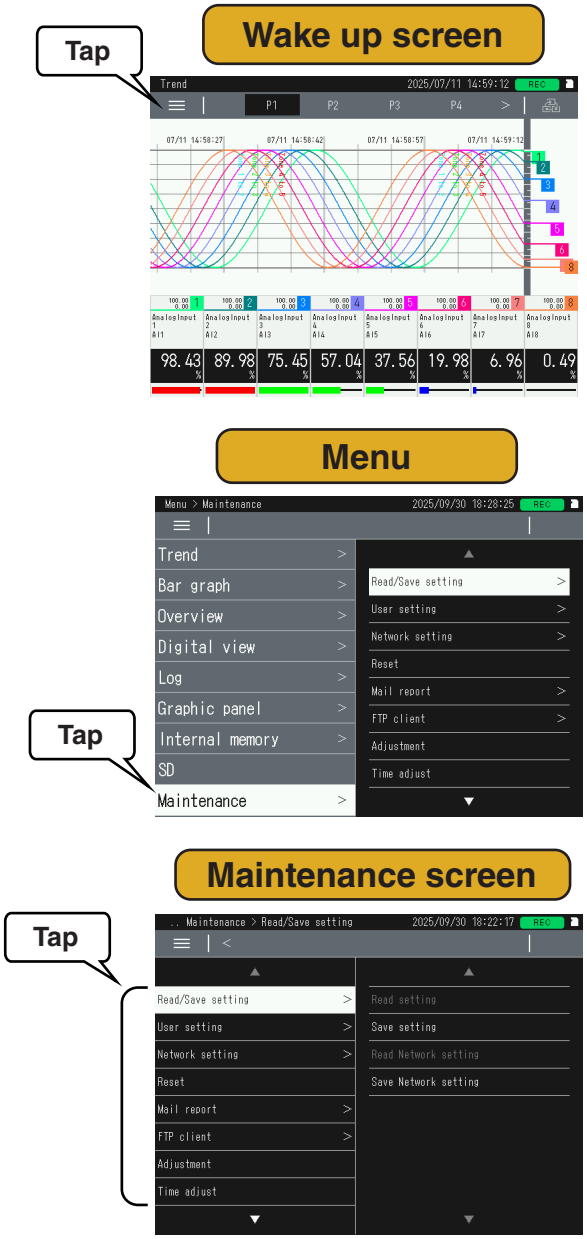
Follow the procedure below in order to reset the OI values.
Refer to 3.4.3 Operational input (OI) regarding OI type that can be reset.



1. Click [Maintenance] tab.
2. Click [Reset] button. The confirmation dialog appears.
3. Select a channel from 1 to 32.
4. Click [Upload to device] button. After logging in, resetting operation is performed.

5.2 Maintenance from VR144E-G16

Maintenance can be performed on the device screen.



For details, refer to 4.3.10 Maintenance screen.

6. Recorded data

The trend data and event log data are written to the internal memory of the device.
The internal memory is composed of divided memory blocks and functions as a ring buffer.
Recorded data is written to a memory block, and when it reaches a specified time or number of samplings, the writing operation transitions to the next memory block.
Simultaneously, the recorded data in the memory block is transferred to an SD card and saved as a file.

6.1 General specification

The working directory is "MG\VR144" under the SD card. The recording data transferred from a memory block is saved as a file. The data size of a memory block is as follows.

Item	Description
Trend data	Data size: max. 50 000 samples, the number of memory blocks: 64
System log	Data size: 1 000 logs The number of memory blocks: 8
Event log	
Communication log	

The conditions for transferring the recording data are as shown in the table below.
The recorded data files are registered in the transmission queue. ➔ 3.2.5 FTP client
It is also possible to download the recorded data files from the FTP server. ➔ 3.2.3 FTP server

Item	Description
Trend data	When the conditions set in the normal recording or the trigger recording are met. ➔ 3.5.1 Basic setting At the time of the device startup. When the SD card is inserted. When the setting is changed.
System log	When the data size exceeds 1000 logs. When the year is changed. When the recording state is changed. When the encode is changed.
Event log	
Communication log	

Refer to the following for operations during inserting or removing SD card, during power failure retention and during power startup.

Item	Description
Inserting or removing SD card	When removing SD card: When a memory block transitions, the recorded data in the memory block is transferred to an SD card and saved as a file. When inserting SD card: When a memory block transitions, the recorded data in the memory block is transferred to an SD card and saved as a file. In case of storing failure due to removing SD card: Storing failure is registered in the system log. Trend recording stops. In case of storing failure during inserting SD card: Storing failure is registered in the system log. Trend recording stops.
Power failure retention	The recording data is written to the internal memory.
At the time of power startup	In case that recording was in progress before the power is removed, the recorded data is transferred to an SD card and saved as a file simultaneously with the memory block transition.

6.2 Trend data

The trend data is recorded according to the settings in the configurator software or in the device.
➔ 3.5 Trend setting
Either binary format (extension: TRD) or CSV file can be selected for the recording file format of the trend data.
Refer to the table below for the specifications of the trend data recording file.

Item	Description
Recorded content	- Binary format (extension: TRD): Setting information, trend data - CSV file: Trend data, event data, comment data
Storing rate	100 msec, 500 msec, 1 sec., 2 sec., 5 sec., 10 sec., 1 min., 2 min., 5 min., 10 min., 30 min., 1 hour
Memory block	64
Data size (per file)	Max. 50,000 samples (per memory block)
Data size (total)	Depending on the capacity of the SD card
Timing of finalizing data	The data is finalized when the trend is finalized or when the power is turned on. When recording was in progress before the power is removed, the memory block is finalized and transitions to the next block. Simultaneously, the data in the memory block is transferred to an SD card and saved as a file.
Data error	The previous value (initial value: 0) is recorded. Data errors occur in the following cases: - When a communication error occurs with I/O - When I/O is out of the input range - During I/O communication errors - SD card writing failure
Recording capacity (per file)	- Trend data: 50,000 samples × the number of pens - Event data: 3,000 events - Comment data: 1,000 comments

When recording trends, note the following limitations.

Item	Description
Number of events	Up to 64 events can be recorded per sample. Up to 16 events can be recorded per 100 msec. If the maximum number of the internal memory is exceeded, a new event is written starting from the beginning.
Number of comments	Up to 4 comments can be recorded per sample. If the maximum number of the internal memory is exceeded, a new comment is written starting from the beginning.

If the time is corrected during trend data recording, the time is corrected at regular intervals for a fixed period of time to ensure time continuity. If file names are duplicate due to changes of time or regional settings, the later file is effective.

Corrected range	Process
Within 0 to -10 sec.	The storing rate is extended until the corrected current time catches up with the time in the process of trend data recording. After catching up, the storing rate is restored.
Within 0 to 10 sec.	The data for missing storing rate is complemented. In addition, the storing rate is shortened until the time in the process of trend data recording catches up with the corrected current time. After catching up, the storing rate is restored.
Other than those above	The time change is applied immediately and is not equalized.

6.2.1 Trend data (TRD)

Refer to the table below for the detail of the trend file. Refer to 6.6 Folder structure for the folder structure.

Item	Description
Data format	TRD Binary Format (Extension: TRD)
Encode	UTF-8
Recording folder	Determined by the time of initial sampling after the recording (normal recording / trigger ON) started. Saved in the "TREND\YYYY\MM\DD" folder. YYYY: 4-digit year, e.g., 2024 MM: 2-digit month, e.g., 08 DD: 2-digit day, e.g., 20
File name	Files are named with the year, month, day, hour, minute, second, and millisecond (YYYYMMDDhhmmss///) of the initial sampling after the recording (normal recording / trigger ON) started. When the sampling number is reached, the file is transferred to an SD card and saved as a file. (Example: For August 20, 2024, at 10:30:10.500, the file would be named 20240820103010500.TRD.)
Data view	- The trend data being recorded can be viewed on the device screen. ➔ 4.2.3 Trend screen - Any data in the recording folder can be selected and displayed on the device screen. It is possible to jump to the target trend position from the event summary screen or comment summary screen. (If there are no events, only the latest will be displayed) ➔ 4.3.9 SD card - Any data in the recording folder can be downloaded from FTP server. - Data can be viewed with the waveform viewer software for TR30 (model: TRViewer). TRViewer can be downloaded from our website.

6.2.2 Trend data (CSV)

Refer to the table below for the detail of the trend file.

6.2.2.1 Saving format

Refer to 6.6 Folder structure for the folder structure.

Item	Description
Data format	CSV Format (Extension: CSV)
Encode	Shift-JIS / UTF-8
Recording folder	Determined by the time of initial sampling after the recording (normal recording / trigger ON) started. Saved in the "TREND\YYYY\MM\DD" folder. YYYY: 4-digit year, e.g., 2024 MM: 2-digit month, e.g., 08 DD: 2-digit day, e.g., 20
File name	Files are named with the year, month, day, hour, minute, second_file type of the initial sampling after the recording (normal recording / trigger ON) started. When the sampling number is reached, the data is transferred to an SD card and saved as a file. Trend: YYYYMMDDhhmmss_T.CSV Event: YYYYMMDDhhmmss_E.CSV Comment: YYYYMMDDhhmmss_C.CSV (Example: For August 20, 2024, at 10:30:10.500, the file would be named 20240820103010_T.CSV, 20240820103010_E.CSV, 20240820103010_C.CSV)
Data view	- Trend data being recorded can be viewed on the device screen. ➔ 4.2.3 Trend screen - Any data in the recording folder can be selected and displayed on the device screen. - Any data in the recording folder can be downloaded from FTP server.

6.2.2.2 Recording format

(1) Trend data

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13
Row 1													
Row 2													
Row 3													
Row 4	Number of pens	4											
Row 5	Storing rate	100ms											
Row 6	Number of sam-pling	50000											
Row 7													
Row 8		PEN	Display color	I/O type	CH	CH name	Displayed comment (ON)	Displayed comment (OFF)	Scaling (0%)	Scaling (100%)	Scal-ing	Num-ber of decimal places	Engi-neering unit
Row 9		1	0xFF0000	AI	1	AI1			0.000	100.000		3	kW
Row 10		2	0x0000FF	AI	2	AI2					0.010	2	mA
Row 11		5	0x00FF00	DI	1	DI1	ON	OFF					
Row 12		9	0x00FFFF	PI	1	PI01					1.000	1	kW/h
Row 13													
Row 14		Date	Time	Mili-sec-ond	AI01	AI02	DI01	PI01	OI01	DO01			
Row 15					AI01	AI02	DI01	PI01	OI01	DO01			
Row 16		2024/8/20	13:00:00	0	9.920	15.30	ON	20.1	4500.00	OFF			
Row 17		2024/8/20	13:00:00	100	10.020	15.50	ON	21.5	4600.00	OFF			
Row 18		2024/8/20	13:00:00	200	10.800	15.45	ON	22.3	4630.00	OFF			
:		:	:	:	:	:	:	:	:	:	:	:	:
•••		2024/8/20	13:09:59	900	12.000	15.05	STOP	36.2	5330.00	ON			
•••	…	…	…	…	…	…	…	…	…	…	…	…	…

(2) Event data

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Row 1									
Row 2									
Row 3									
Row 4	Number of events	3000							
Row 5									
Row 6		Date	Time	Milisecond	CH name	CH comment	Event	Event no.	Status
Row 7		2024/8/20	13:01:00	200	AI01	AI01	AI1 AREA2	1	0xFF0000
:	:	:	:	:	:	:	:	:	:
…		2024/8/20	13:08:10	500	AI01	AI01	AI1 AREA3	1	0x00FF00
…	…	…	…	…	…	…	…	…	…

(3) Comment data

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Row 1						
Row 2						
Row 3						
Row 4	Number of comments	1000				
Row 5						
Row 6		Date	Time	Milisecond	Message	Display color
Row 7		2024/8/20	13:04:00	700	COMMENT 1	0x0000FF
Row 8		2024/8/20	13:08:10	500	COMMENT 2	0x00FF00
…	…	…	…	…	…	…

6.3 System log

Refer to the table below for the specifications of the system log recording files.
When system log recording is disabled, system logs are not saved. ➔ 3.6 Log setting

Item	Description
Data format	Text format (Extension: txt)
Encode	ASCII
Recording folder	Determined by the time when an initial system log file is registered. Saved in the "LOG\YYYY\MM\DD" folder. YYYY: 4-digit year, e.g., 2024 MM: 2-digit month, e.g., 08 DD: 2-digit day, e.g., 20
Recorded content	Each row is recorded as "YYYY/MM/DD hh:mm:ss Message". Refer to 5.1.3 System log for the details on the messages.
File name	Files are named with the year, month, day, hour, minute, second, and S (YYYYMMDDhhmmssS.txt) of the initial registering for each memory block and stored to the SD card. (Example: For August 20, 2024, at 10:30:10, the file would be named 20240820103010S.txt.)
Data size	1000 logs
Memory block	8
Finalizing data	- When the data size exceeds 1000 logs. - When the year is changed. - When the recording state is changed. - When the encode is changed.
Data view	- Regardless of whether system logs are recorded or not, the latest 40 system logs can be viewed on the device. - Any log data in the recording folder can be selected and displayed on the device screen. - Any data in the recording folder can be downloaded from FTP server.

6.4 Event log

Refer to the table below for the specifications of the event log recording files.
When event log recording is disabled, event logs are not saved. ➔ 3.6 Log setting

Item	Description
Data format	Text format (Extension: txt)
Encode	UTF-8 / Shift-JIS
Recording folder	Determined by the confirmed time of the recorded data. Saved in the "EVENT\YYYY\MM\DD" folder. YYYY: 4-digit year, e.g., 2024 MM: 2-digit month, e.g., 08 DD: 2-digit day, e.g., 20
Recorded content	Each row is recorded as "YYYY/MM/DD hh:mm:ss CH,Name,Comment,Msg". CH: Channel information (AI1-AI4, DI1, DI2, OI1-OI4, DO1, DI2) Name: The name set in channel Comment: The comment set in channel (AI: 3.4.1.4 Basic setting (AI), DI: 3.4.2.4 Basic setting (DI), OI: 3.4.3.1 Basic setting (OI), DO: 3.4.4.4 Basic setting (DO)) Message: The message at zone transition (AI: 3.4.1.5 Zone setting (AI), DI: 3.4.2.4 Basic setting (DI), OI: 3.4.3.2 Zone setting (OI), DO: 3.4.4.4 Basic setting (DO))
File name	Files are named with the confirmed year, month, day, hour, minute, second, and E of the recorded data (YYYYMMDDhhmmssE.txt) and stored to the SD card. (Example: For August 20, 2024, at 10:30:10, the file would be named 20240820103010E.txt.)
Data size	1000 logs
Memory block	8
Finalizing data	- When the data size exceeds 1000 logs. - When the year is changed. - When the recording state is changed. - When the encode is changed.
Data view	- Regardless of whether event logs are recorded or not, the latest 40 event logs can be viewed on the device. - Any log data in the recording folder can be selected and displayed on the device screen. - Any data in the recording folder can be downloaded from FTP server.

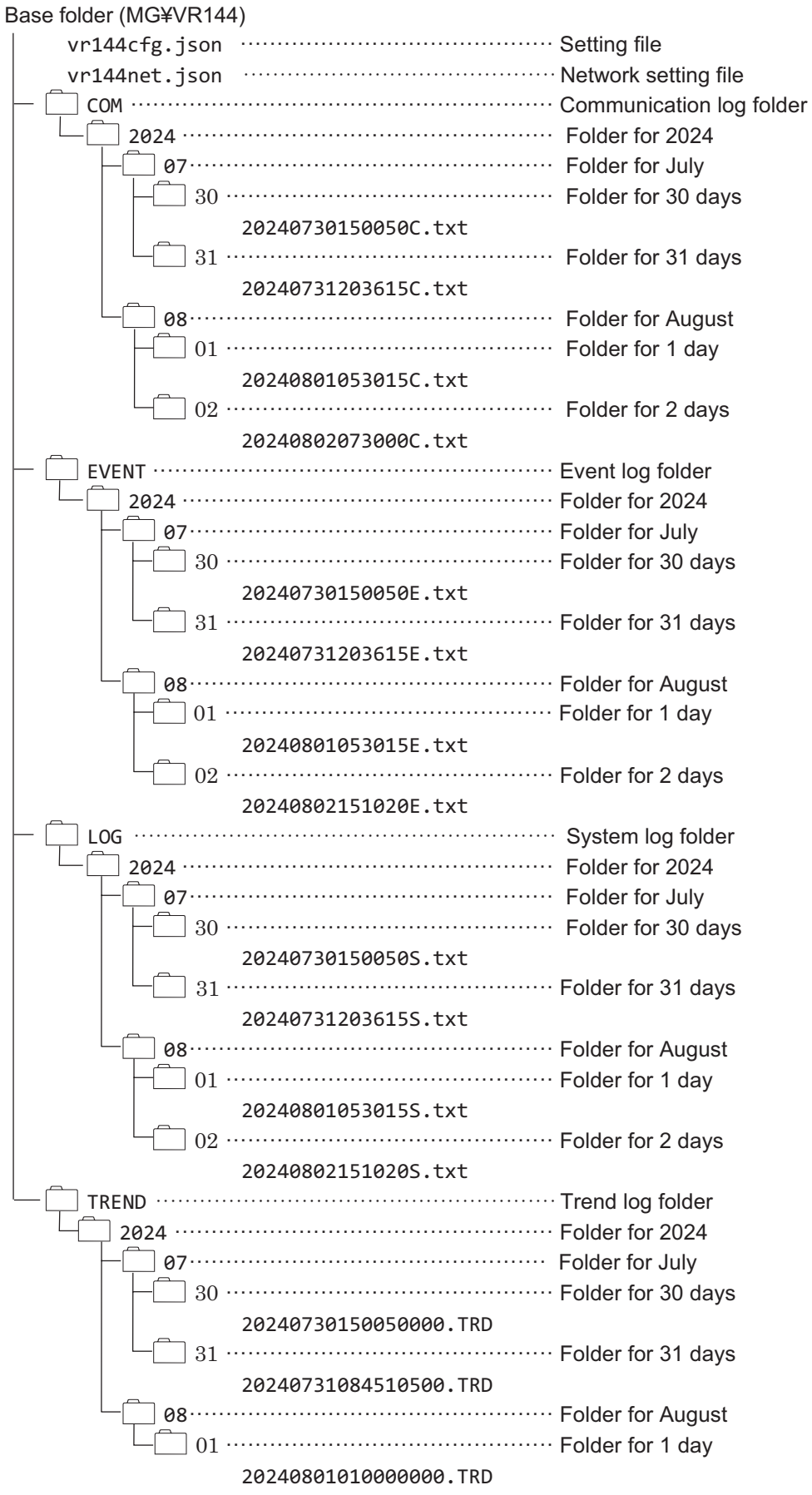
6.5 Communication log

Refer to the table below for the specifications of the communication log recording files.
When communication log recording is disabled, communication logs are not saved.
➔ 3.6 Log setting

Item	Description
Data format	Text format (Extension: txt)
Encode	ASCII
Recording folder	Determined by the confirmed time of the recorded data. Saved in the "COM\YYYY\MM\DD" folder. YYYY: 4-digit year, e.g., 2024 MM: 2-digit month, e.g., 08 DD: 2-digit day, e.g., 20
Recorded content	Each row is recorded as "YYYY/MM/DD hh:mm:ss Type, Count,Form/File,Msg". Type: SMTP/FTPC Count: Number of transmission trials 1 to 3 Form/File: Forms or files to be sent Msg: Success or failure factors Example: FTPC,1,CLOG.txt,Success ➔ Succeeded in transferring CLOG.txt SMTP,1,F1,Reguluar ➔ Succeeded in regular reporting of Form1
File name	Files are named with the confirmed year, month, day, hour, minute, second, and C of the recorded data (YYYYMMDDhhmmssC.txt) and stored to the SD card. (Example: For August 20, 2024, at 10:30:10, the file would be named 20240820103010C.txt.)
Data size	1000 logs
Memory block	8
Finalizing data	- When the data size exceeds 1000 logs. - When the year is changed. - When the recording state is changed. - When the encode is changed.
Data view	- Regardless of whether communication logs are recorded or not, the latest 40 communication logs can be viewed on the device. - Any log data in the recording folder can be selected and displayed on the device screen. - Any data in the recording folder can be downloaded from FTP server.

6.6 Folder structure

Each file is stored in the base folder "MG¥VR144" in the SD card.
The folder structure is as shown on the next page. Year, month, and day folders are automatically created as the number of saved files increases.


Base folder (MG¥VR144)
vr144cfg.json ····· Setting file
vr144net.json ····· Network setting file
COM ····· Communication log folder
2024 ····· Folder for 2024
07 ····· Folder for July
30 ····· Folder for 30 days
20240730150050C.txt
31 ····· Folder for 31 days
20240731203615C.txt
08 ····· Folder for August
01 ····· Folder for 1 day
20240801053015C.txt
02 ····· Folder for 2 days
20240802073000C.txt
EVENT ····· Event log folder
2024 ····· Folder for 2024
07 ····· Folder for July
30 ····· Folder for 30 days
20240730150050E.txt
31 ····· Folder for 31 days
20240731203615E.txt
08 ····· Folder for August
01 ····· Folder for 1 day
20240801053015E.txt
02 ····· Folder for 2 days
20240802151020E.txt
LOG ····· System log folder
2024 ····· Folder for 2024
07 ····· Folder for July
30 ····· Folder for 30 days
20240730150050S.txt
31 ····· Folder for 31 days
20240731203615S.txt
08 ····· Folder for August
01 ····· Folder for 1 day
20240801053015S.txt
02 ····· Folder for 2 days
20240802151020S.txt
TREND ····· Trend log folder
2024 ····· Folder for 2024
07 ····· Folder for July
30 ····· Folder for 30 days
20240730150050000.TRD
31 ····· Folder for 31 days
20240731084510500.TRD
08 ····· Folder for August
01 ····· Folder for 1 day
20240801010000000.TRD

7. Appendix

7.1 Troubleshooting

Also refer to the “Frequently Asked Questions (FAQ)” from our website.

7.1.1 SD card

Problem faced	Checks to be done	Method of handling
Unable to record log data in the SD card.	Has the SD card been inserted? (Is the SD card mounted?) ➔ 4.2.2 Common area for each screen	Insert an SD card specified by us. ➔ 7.2.6 SD card
	Is the RECORD lamp ON? ➔4.2.2 Common area for each screen	Tap [REC] or [REC Trigger] on the device.
	Is there space available for storage on the SD card?	Check for space availability, and delete unnecessary data in the SD card. ➔ 4.3.10.16 Disk usage, 5.1.9 Disk usage

7.1.2 VR144CFG

Problem faced	Checks to be done	Method of handling
Unable to communicate between VR144E-G16 and VR144CFG.	Is the IP address correct?	Check the IP address on the screen of the VR144E-G16. ➔ 4.3.10.7 Network setting
	Has the LAN cable come out of the HUB?	Connect the LAN cable securely.
	Is the IP address overlapping with another device?	Check the IP address.
	Has the same network address been specified in the VR144E-G16 and in the PC?	Check the IP address. Issue the ping command from the PC and check whether there is a response. [Example] VR144E-G16 : 192.168.0.1 PC : 192.168.0.2 Subnet mask: 255.255.255.0
	Have firewall or proxy server setting been configured on the PC?	Check the contents of the firewall and proxy server setting with the network administrator.
	Is there a problem in the terminal or PC being used?	Use a different terminal or PC.
	Is the login name and the password correct?	Check the login name and password on the screen of the VR144E-G16. ➔ 4.3.10.6 User setting

7.1.3 E-mail reporting

Problem faced	Checks to be done	Method of handling
Unable to send e-mails from the VR144E-G16.	Have you connected to the Internet?	Check that it is possible to connect to the Internet from the PC.
	Have the IP address and default gateway of the VR144E-G16 been correctly set?	Check the settings of the IP address and default gateway of the VR144E-G16. ➔ 4.3.10.7 Network setting
	Is the recipient's e-mail address correct?	Check the recipient's e-mail address. Pay attention to differences such as between "_" and "-".
	Are the mail-related settings correct? - E-mail account - SMTP server IP address or domain name - POP3 server IP address or domain name - E-mail password	Check the mail-related settings sent by the provider. Also, confirm that it is possible to send e-mails to the recipient's address from e-mail software of your PC.
	Is the e-mail address correctly registered in the template?	Check the template settings.
	Does the e-mail server of the provider require authentication when sending e-mails? (e.g., SMTP authentication, SSL)	Verify the authentication method required by the provider and configure the e-mail settings accordingly. ➔ 3.8 E-mail reporting setting
	If case of POP before SMTP authentication, have you opened the specified router port number?	Manually set the number specified in the router's NAT settings. (refer to the instruction manual of the router)
	Does the provider's e-mail service have a spam prevention function?	Are the mail-related settings correct? - E-mail account - SMTP server IP address or domain name - POP3 server IP address or domain name - E-mail password

7.1.4 Modbus/TCP (client)

Problem faced	Checks to be done	Method of handling
Unable to connect from the Modbus client to the VR144E-G16.	Has the Modbus/TCP server function enabled?	Enable the Modbus/TCP server function. ➔ 3.2.2 Modbus/TCP (server)
Unable to read the data.	Are the channel register type and address correct?	Check the register type and address. ➔ 7.2.4 Modbus/TCP server
Unable to connect via the router.	Has the port number 502 used by Modbus/TCP on the router opened?	Manually set the IP address and port number 502 of the VR144E-G16 in the router's NAT settings. (refer to the instruction manual of the router)

7.1.5 Modbus/TCP (server)

Problem faced	Checks to be done	Method of handling
Unable to connect to the Modbus server device from the VR144E-G16.	Is the LAN cable disconnected or has it come out from the HUB?	Connect the LAN cable securely. Check the connection lamp on the HUB.
	Is the IP address of the VR144E-G16 correct?	Check the IP address. ➔ 4.3.10.7 Network setting, 4.3.10.6 User setting
	Has the same network address been specified in the VR144E-G16 and in Modbus server device?	Check the network address. [Example] VR144E-G16: 192.168.0.1 Slave: 192.168.0.2 Subnet mask: 255.255.255.0
	Is the IP address of the server device same as the one registered in VR144CFG?	Check the IP address. ➔ 3.3.1 Connection setting
	Has the IP address been set for the server device?	Set the IP address for the server device. And, when using a remote I/O provided by us, disconnect and restart the power supply after setting the IP address. (refer to Users Manual of the respective remote I/O for how to set the IP address)
	Is the server function enabled on the SLMP-compatible device?	Enable the server function on the SLMP-compatible device.

7.1.6 FTP server

Problem faced	Checks to be done	Method of handling
Unable to make an FTP connection to the VR144E-G16.	Have the setting of the FTP server function for the VR144E-G16 been enabled?	Set the mode in the FTP server setting in VR144CFG as [Enable]. ➔ 3.2.3 FTP server,
	Are the IP address, Login ID and the password for the VR144E-G16 correct?	Check the IP address.
		Check the Login ID and password set in VR144CFG. ➔ 3.2.3 FTP server
	Is it possible to login to the VR144E-G16 from an FTP client such as a PC?	Check whether a DOS command can be used to login to the VR144E-G16.
Unable to perform maintenance of files in the VR144E-G16 from the FTP client.	Is the FTP client software being used specified in this User Manual?	Use an FTP client whose working has been confirmed. ➔ 7.2.1 FTP server

7.1.7 FTP client

Problem faced	Checks to be done	Method of handling
Unable to connect to the FTP server.	Are the FTP server settings correct?	Check the settings on the FTP server.
	Is it possible to login to the FTP server set to the VR144E-G16 as transfer destination from FTP client such as a PC?	Verify if it is possible to log in to the FTP server using DOS commands, etc.
Unable to transfer trend data and each log files from the VR144E-G16.	Are the FTP server address, login, password, and destination folder name correct?	Check the login name and password for the FTP server. ➔ 3.2.5 FTP client
	Is the subfolder to transfer specfied?	Check the subfolder name on the FTP server. ➔ 3.2.5 FTP client
	Does VR144E-G16 regularly transmit to the FTP server?	Check the transmission status. ➔ 4.2.11 Communication log screen, 5.1.4 Communication log

7.2 Reference documents

7.2.1 FTP server

FTP server function is performed as follows.

Item	Description
FTP client	OS: Windows 10, Windows 11 Application (Verified operation environment): FFFTP
Maximum number of connections	1
Port address	For FTP connection: can be changed (initial value: 21) For passive: 45967 to 45970
Connection	PASV only (port mode is not available)
Access limitation	Login ID and password only
Operation	- Display of the list of directories and files - File download (only 1 file) - File download (Multiple files) - File deletion (1 file/multiple files) - Directory deletion (Including the files stored in the directory)

7.2.2 FTP client

FTP client function is performed as follows.

Item	Description
Port address	Variable (default: 21)
Connection	PASV only (port mode is not available)
Target	Finalized files (trend, logs)
File name	Same as the files saved in an SD card
Sub folder	Sub folder can be set.
Queuing	Up to 8 files Files are recorded in system logs when the queue is full.
PASV	PASV port: 45967 to 45970 It is possible to set whether the address returned by the PASV command is ignored or not. (mandatory if a port number other than 21 is specified).
Power failure retention	None
Retransmission	3 times (including the initial attempt) The first retry will continue 10 seconds later, and the second retry will continue 20 seconds later.
Test transmission	A test file is created in the working directory and transmitted. It is deleted after the test transmission. Test transmission is not a target of retransmission.
Transmission failure	When transmission fails, the transmission failure output is turned ON. When transmission is successful or when FTP client-related settings are changed, the transmission failure output is turned OFF. The same applies during test transmissions.
Time stamp	Local time
Log	Recorded in the communication log including retransmissions.

7.2.3 SLMP client

7.2.3.1 Request message

Header	Subheader	Request destination station network number	Request destination station number	Request destination unit I/O number	Request destination multidrop station number	Request data length	Monitoring timer	Request data	Footer

Parameter	Description
Header	Automatically added
Subheader	Fixed at 0x5000
Request destination station network number	Network No. specified in the VR144CFG I/O connection setting
Request destination station number	Station No. specified in the VR144CFG I/O connection setting
Request destination unit I/O number	Processor No. specified in the VR144CFG I/O connection setting
Request destination multidrop station number	Fixed at 0
Request data length	Automatically added
Monitoring timer	SLMP Timeout specified in the VR144CFG connection setting
Request data	Automatically generated by the device specified by the VR144CFG
Footer	Automatically added

7.2.3.2 SLMP command list

The commands and subcommands used to read the data from an SLMP device are as follows.

AI

Type	Device	Device code	Command	Subcommand
16bits	Data register (D)	00A8H	0403H	0000H
	Special register (SD)	00A9H	0403H	0000H
	File register (R) -- Block switching method	00AFH	0403H	0000H
	File register (ZR) -- Serial number access methos	00B0H	0403H	0000H
	Link register (W)	00B4H	0403H	0000H
	Link special register (SW)	00B5H	0403H	0000H
	Timer, Current value (TN)	00C2H	0403H	0000H
	Counter, Current value (CN)	00C5H	0403H	0000H
	Retentive timer, Current value (STN)	00C8H	0403H	0000H
	Index register (Z)	00CCH	0403H	0000H
	Module refresh register (RD)	002CH	0403H	0000H
32bits	Data register (D)	00A8H	0403H	0002H
	Special register (SD)	00A9H	0403H	0002H
	File register (R) -- Block switching method	00AFH	0403H	0002H
	File register (ZR) -- Serial number access methos	00B0H	0403H	0002H
	Link register (W)	00B4H	0403H	0002H
	Link special register (SW)	00B5H	0403H	0002H
	Timer, Current value (TN)	00C2H	0403H	0002H
	Counter, Current value (CN)	00C5H	0403H	0002H
	Retentive timer, Current value (STN)	00C8H	0403H	0002H
	Index register (Z)	00CCH	0403H	0002H
	Module refresh register (RD)	002CH	0403H	0002H

DI (1/2)

Type	Device	Device code	Command	Subcommand
16bits	Internal relay (M)	0090H	0403H	0000H
	Special relay (SM)	0091H	0403H	0000H
	Latch relay (L)	0092H	0403H	0000H
	Annunciator (F)	0093H	0403H	0000H
	Edge relay (V)	0094H	0403H	0000H
	Step relay (S)	0098H	0403H	0000H
	Input (X)	009CH	0403H	0000H
	Output (Y)	009DH	0403H	0000H
	Link relay (B)	00A0H	0403H	0000H
	Link special relay (SB)	00A1H	0403H	0000H
	Timer, Coil (TC)	00C0H	0401H	0001H
	Timer, Contact (TS)	00C1H	0401H	0001H
	Counter, Coil (CC)	00C3H	0401H	0001H
	Counter, Contact (CS)	00C4H	0401H	0001H
	Retentive timer, Coil (STC)	00C6H	0401H	0001H
	Retentive timer, Contact (STS)	00C7H	0401H	0001H
	Long timer, Coil (LTC)	0050H	0403H	0000H
	Long timer, Contact (LTS)	0051H	0403H	0000H
	Long counter, Coil (LCC)	0054H	0403H	0000H
	Long counter, Contact (LCS)	0055H	0403H	0000H
	Long retentive timer, Coil (LSTC)	0058H	0403H	0000H
	Long retentive timer, Contact (LSTS)	0059H	0403H	0000H

DI (2/2)

Type	Device	Device code	Command	Subcommand
32bits	Internal relay (M)	0090H	0403H	0002H
	Special relay (SM)	0091H	0403H	0002H
	Latch relay (L)	0092H	0403H	0002H
	Annunciator (F)	0093H	0403H	0002H
	Edge relay (V)	0094H	0403H	0002H
	Step relay (S)	0098H	0403H	0002H
	Input (X)	009CH	0403H	0002H
	Output (Y)	009DH	0403H	0002H
	Link relay (B)	00A0H	0403H	0002H
	Link special relay (SB)	00A1H	0403H	0002H
	Timer, Coil (TC)	00C0H	0401H	0003H
	Timer, Contact (TS)	00C1H	0401H	0003H
	Counter, Coil (CC)	00C3H	0401H	0003H
	Counter, Contact (CS)	00C4H	0401H	0003H
	Retentive timer, Coil (STC)	00C6H	0401H	0003H
	Retentive timer, Contact (STS)	00C7H	0401H	0003H
	Long timer, Coil (LTC)	0050H	0401H	0002H
	Long timer, Contact (LTS)	0051H	0401H	0002H
	Long counter, Coil (LCC)	0054H	0401H	0003H
	Long counter, Contact (LCS)	0055H	0401H	0003H
	Long retentive timer, Coil (LSTC)	0058H	0401H	0002H
	Long retentive timer, Contact (LSTS)	0059H	0401H	0002H

DO (1/2)

Type	Device	Device code	Command	Subcommand
16bits	Internal relay (M)	0090H	1402H	0001H
	Special relay (SM)	0091H	1402H	0001H
	Latch relay (L)	0092H	1402H	0001H
	Annunciator (F)	0093H	1402H	0001H
	Edge relay (V)	0094H	1402H	0001H
	Step relay (S)	0098H	1402H	0001H
	Input (X)	009CH	1402H	0001H
	Output (Y)	009DH	1402H	0001H
	Link relay (B)	00A0H	1402H	0001H
	Link special relay (SB)	00A1H	1402H	0001H
	Timer, Coil (TC)	00C0H	1402H	0001H
	Timer, Contact (TS)	00C1H	1402H	0001H
	Counter, Coil (CC)	00C3H	1402H	0001H
	Counter, Contact (CS)	00C4H	1402H	0001H
	Retentive timer, Coil (STC)	00C6H	1402H	0001H
	Retentive timer, Contact (STS)	00C7H	1402H	0001H
	Long timer, Coil (LTC)	0050H	1402H	0001H
	Long timer, Contact (LTS)	0051H	1402H	0001H
	Long counter, Coil (LCC)	0054H	1402H	0001H
	Long counter, Contact (LCS)	0055H	1402H	0001H
	Long retentive timer, Coil (LSTC)	0058H	1402H	0001H
	Long retentive timer, Contact (LSTS)	0059H	1402H	0001H

DO (2/2)

Type	Device	Device code	Command	Subcommand
16bits	Internal relay (M)	0090H	1402H	0003H
	Special relay (SM)	0091H	1402H	0003H
	Latch relay (L)	0092H	1402H	0003H
	Annunciator (F)	0093H	1402H	0003H
	Edge relay (V)	0094H	1402H	0003H
	Step relay (S)	0098H	1402H	0003H
	Input (X)	009CH	1402H	0003H
	Output (Y)	009DH	1402H	0003H
	Link relay (B)	00A0H	1402H	0003H
	Link special relay (SB)	00A1H	1402H	0003H
	Timer, Coil (TC)	00C0H	1402H	0003H
	Timer, Contact (TS)	00C1H	1402H	0003H
	Counter, Coil (CC)	00C3H	1402H	0003H
	Counter, Contact (CS)	00C4H	1402H	0003H
	Retentive timer, Coil (STC)	00C6H	1402H	0003H
	Retentive timer, Contact (STS)	00C7H	1402H	0003H
	Long timer, Coil (LTC)	0050H	1402H	0003H
	Long timer, Contact (LTS)	0051H	1402H	0003H
	Long counter, Coil (LCC)	0054H	1402H	0003H
	Long counter, Contact (LCS)	0055H	1402H	0003H
	Long retentive timer, Coil (LSTC)	0058H	1402H	0003H
	Long retentive timer, Contact (LSTS)	0059H	1402H	0003H

7.2.4 Modbus/TCP server

7.2.4.1 General specification

Item	Description
Protocol	Modbus/TCP
Port address	Variable (Initial value: 502)
Number of simultaneous connections	Up to 2
Connectable device	SCADALINXpro / DL30 series / TR30 series / DL8 series / JC-IO / VR series / GM30 / RGP30

7.2.4.2 Register map

0X

Register	Channel
1 to 16	DO1 to 16

1X

Register	Channel
1 to 16	DI1 to 16

3X

Register	Channel
0001 to 0064	AI1 to 64
1001 to 1064	OI1 to 32 Addresses with smaller numbers are low.

7.2.4.3 Modbus commands

■ **Data and control functions**

CODE	NAME		
01	Read Coil Status	Yes	Digital Output from the slave
02	Read Input Status	Yes	Status of digital Inputs to the slave
03	Read Holding Registers		General purpose register within the slave
04	Read Input Registers	Yes	Collected data from the field by the slave
05	Force Single Coil		Digital output from the slave
06	Preset Single Register		General purpose register within the slave
07	Read Exception Status		
08	Diagnostics		
09	Program 484		
10	Poll 484		
11	Fetch Comm. Event Counter		
12	Fetch Comm. Event Log		
13	Program Controller		
14	Poll Controller		
15	Force Multiple Coils		Digital output from the slave
16	Preset Multiple Registers		General purpose register within the slave
17	Report Slave ID		
18	Program 884/M84		
19	Reset Comm. Link		
20	Read General Reference		
21	Write General Reference		
22	Mask Write 4X Register		
23	Read/Write 4X Registers		
24	Read FIFO Queue		

■ **Exception code**

CODE	NAME		
01	Illegal Function	Yes	Function code is not allowable for the slave
02	Illegal Data Address	Yes	Address is not available within the slave
03	Illegal Value		
04	Slave Device Failure		
05	Acknowledge		
06	Slave Device Busy		
07	Negative Acknowledge		
08	Memory Parity Error		

■ **Diagnostic subfunctions**

CODE	NAME		
00	Return Query Data		
01	Restart Comm. Option		
02	Return Diagnostic Register		
03	Change Input Delimiter Character		
04	Force Slave to Listen Only Mode		

7.2.4.4 Data range

When the VR144E-G16 is used as a Modbus/TCP slave, the data range that respond to the Modbus master and data written from the Modbus master is as follows.

Item	Description
AI	• When the data type is [%] (0 to 10000; voltage/current data of remote I/O): -500 to 10500 • When the data type is [Int] (signed integer): Signed 16 bit integer (-32768 to 32767) • When the data type is [Uint]: Unsigned 16 bit integer (0 to 65535)
DI	0: OFF, 1: ON
OI	32 bit single precision floating point
DO	0: OFF, 1: ON

7.2.5 E-mail reporting

Event reporting and regular reporting are sent as follows.

Item	Description
Port address	Variable (default: 465)
Reported contents	- Subject: up to 32 characters - Body text: up to 128 characters - Reporting source: attached at the end of the body text Abnormality reporting: [Report Factor: message] Regular reporting: [Report Factor: Regular] Test reporting: [Report Factor: Test] - Channel information: attached at the end of the body text AI, DI, OI or DO can be selected. (abnormality reporting and reguler reporting only)
Address	16 (only "To:")
Template	32
Encryption communication	TLS1.2
Queuing	Up to 32 files Files are recorded in system logs when the queue is full.
Power failure retention	None
Retransmission	3 times (including the initial attempt) The first retry will continue 10 seconds later, and the second retry will continue 20 seconds later.
Test transmission	Test transmission is not a target of retransmission.
Transmission failure	When transmission fails, the transmission failure output is turned ON. When transmission is successful or when SMTP-related settings are changed, the transmission failure output is turned OFF. The same applies during test transmissions.

7.2.6 SD card

7.2.6.1 SD card basic specifications

Item	Description
Type	microSD
Format	FAT32

7.2.6.2 Specified SD card type

Manufacturer	Model	Capacity
Hagiwara Solutions	MSDB-016GS(V01SLS	16 GB

Available for purchase from us. Consult us.

7.2.6.3 SD card formatter

When formatting SD card, use a dedicated software “SD Card Formatter”.
“SD Card Formatter” is downloadable at SD Association’s web site.

https://www.sdcard.org

CAUTION

Do not use a formatter other than the one provided by the SD Association for the SD card.

7.2.6.4 Auto deleting function

The oldest files can be automatically deleted by enabling the auto deleting function when the remaining space of the SD card is less than 100 MB. ➔ 3.5.1 Basic setting
The conditions for deletion are as follows.

- The data older than 4 years are deleted.
- An SD card error is triggered if the files cannot be deleted.
- The oldest files are deleted when the remaining space of the SD card is less than 100 MB.
  The oldest day, month, year folder(s) are deleted until the SD card recovers more than 100 MB of free space.
  An SD card error is triggered if the free space is still less than 100 MB after deletion.
  The SD card recovers from error when the free space exceeds 100 MB after deleting the files.
  Regarding system log, event log and communication log, the oldest files are deleted when the files are exported after memory blocks are finalized.

7.3 Version history

7.3.1 VR144E-G16

7.3.1.1 Ver1.0

- Initial issue

8. License

Below are the licenses for the functions used in VR144E-G16 and VR144CFG.

8.1 License

Software	Function	License
zlib	Compressing and decompressing data	zlib/libpng
Jansson	JSON parser	MIT License

This software incorporates Jansson (https://github.com/akheron/jansson).
This Jansson is distributed under the MIT License.

Copyright (c) 2009-2020 Petri Lehtinen <petri@digip.org>

Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.