Instruction Manual

Inverter Support Software

VFD Doesa-Loader

IDEC CORPORATION

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Preface

This instruction manual describes how to use the inverter support software VFD Doesa-Loader. This instruction manual does not cover the handling of inverters. For information on the handling of inverters, refer to instruction manuals or user's manuals.

Note

- If you use a folder name or file name that contains environment-dependent characters created in a Windows that differs from the language specifications of your Windows, you may not be able to read or write the file. Use folder and file names that do not contain environment-dependent characters.
- If the settings shown below are set in the Windows of use, the characters may protrude.
  - ・When the size of text or the like is set to a size larger than specified in the [Display] setting of the control panel.
  - ・In the Windows10, when the size of text or the like is set to a size larger than the specified size in [Settings]→[System]→[Display] settings.
- Some of the views may be in languages or fonts that depend on your Windows preferences.
- If you do not install language packs Microsoft.NET Framework Ver. 4.5 or higher, some of the displayed languages may become English.
- The resolution of the monitor is recommended to be 1920 × 1080 or more. Below that, the operability may deteriorate.
- Example screens shown in this manual might differ from actual displaying screen by the software version or specifications change.

■ Safety Precautions

Prior to the use (including connection, wiring, operation, maintenance, inspection, etc.), be sure to read this instruction manual as well as the "RS-485 Communication User's Manual", instruction manuals and user's manuals, as needed, to gain an understanding of how to handle the product and ensure correct use of related devices. Incorrect handling may hinder normal operation or result in inverter failure or shortening of product life.
Use your devices after ensuring a thorough understanding of device knowledge, safety information, and all related precautions.
Safety precautions contained in this instruction manual have been categorized as follows.

⚠WARNING	Failure to heed the information indicated by this symbol may result in death or serious injury.
⚠CAUTION	Failure to heed the information indicated by this symbol may result in minor or light injury and/or substantial property damage.

Failure to heed the information contained under the CAUTION title may also result in serious consequences.
All items indicate important content and therefore must be observed.

Wiring

⚠WARNING
• Before wiring the RS-485 ports and connecting the cables, ensure that the power is off (the switch is open). **Failure to observe this could result in electric shock.**

⚠CAUTION
• Before connecting wires to the RJ-45 connectors on the inverter (such as the RJ-45 connector for keypad connection, the RS-485 communication card's RJ-45 connector, and the inverter's RJ-45 connector for RS-485 communication), check the wiring of the devices to be connected. Refer to the " RS-485 Communication User's Manual" for details. **Failure to observe this could result in a failure.**

Operating Precautions

⚠WARNING
• Carefully note that resetting the alarm with the operation command on causes the inverter to start unexpectedly as soon as the alarm is cleared. **Failure to observe this could result in an accident.**

⚠WARNING
• If the loader goes down or is forcibly terminated during the operation with the test drive screen open, it will be impossible to stop the inverter operation with the loader. If this is the case, stop the inverter by doing one of the following: **Failure to observe this could result in an accident.** <How to stop the inverter when the loader goes down or is forcibly terminated> 1) If an emergency stop switch is available, use the switch to stop the inverter. 2) Turn off the inverter power. 3) Turn off the inverter operation command and switch the inverter from "remote command mode" to "local command mode". More specifically, do one of the following: - Turn off the terminal to which the "LE" command is assigned. - Zero the data for the link function for support (function code: y99). - Zero the data for the link function (function code H30). • Do not remove the RS-485 cable, USB cable, or keypad during the operation with the test drive screen open. Doing so would be dangerous because it would be impossible to stop the inverter operation with the loader. **Failure to observe this could result in an accident.**

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Chapter 1

Before Use

This chapter provides an overview of the inverter support loader software VFD Doesa-Loader (hereinafter referred as "the Loader"), descriptions about preparations before using the Loader, and procedures for installation and uninstallation.

1.1. Overview

1.1.1. Features

- The Loader is a software that supports remote operation of our inverters from a personal computer (hereinafter referred as "the PC") using the RS-485 communication port and the USB connection (including the connection via the Keypad), and is designed to operate on the Windows operating system (hereinafter referred as "the OS").
- The Loader facilitates simple operation to set or manage function codes of the inverter.

	[Function code] Can be used to read or write, edit, compare, initialize, save, or print the parameters (function code setting data) that set the inverter operations.
	[Operation monitor] Can be used to check the status of the external I/O (I/O monitor), the Loader information or maintenance information (system monitor), alarm occurrence information (alarm monitor), or information such as the current frequency (operation monitor).
	[Customizable logic] Can be used to extend the inverter functionality and to customize for the user interface.
	[Real-time trace] Can be used to monitor operation conditions in the form of continuous waveform information with the maximum of four analog channels and the maximum of eight digital channels (to the maximum total of eight channels).
	[Historical trace] Can be used to monitor inverter operation conditions in the form of waveform information in a sampling time that is shorter than the realtime trace. (The number of samplings is limited.)
	[Test run] Can be used to manipulate the frequency command or operation command on the Loader screen to test run the inverter.
	[Communication setting] Can be used to make communication settings between the PC and the inverter or with the remote keypad with USB.

1.1.2. Loader Functions by VF1A Series Inverter Model

This section lists functions that can be used by each VF1A series inverter.

Table 1-1 Correspondence between VF1A Series Inverter Models and Loader Functions

Function			VF1A series Inverter
	[Function code window]		◎
	[Customizable logic function code window]		◎
	[Operation monitor]		◎
	[Customizable logic]		◎
	[Real-time trace]		◎
	[Historical trace]		◎
	[Test run]		◎
	[Communication setting]	RS-485 (Loader (Doesa))	◎
		USB (via VF1A-PH1)	◎
	Remote keypad with USB (VF1A-PH1) Copy function		◎ *1

◎: Supported, ○: Supported with restrictions, ×: Not supported

*1 Supported by the VF1A-PH1 remote keypad with USB (ROM version 1600 or later).

The following table shows the Loader functions that can be used when accessing the keypad memory from the Loader.

Table 1-2 Correspondence between the Keypad and Loader Functions

Function			Keypad
			VF1A-PH1
	[Function code window]		○ *1
	[Operation monitor]		◎
	[Customizable logic]		○ *2
	[Real-time trace]		×
	[Historical trace]		×
	[Test run]		×
	[Communication setting]	USB (Data in Keypad)	◎

◎: Supported, ○: Supported with restrictions, ×: Not supported

*1 Auto tuning cannot be used.

*2 Start/stop and monitoring functions of the customizable logic cannot be used.

1.1.3. Product Warranty

Limitation of liability	IDEC CORPORATION accepts no responsibility for any losses (this includes, but is not restricted to lost profits, suspension of business, loss of business information, or other financial loss) arising from the use, or inability to use this software or its documentation.

1.1.4. Menu Command and Operation Button Notation

Menu commands and operation buttons for each screen are expressed as follows in this user's manual.
For example, [Open…] is abbreviated as [Open] ("…" is omitted).

However, square brackets [ ] are omitted, and bold font is used in chapter and section titles, as well as in captions.

1.2. Connecting Inverters to the PC

1.2.1. Connection Methods

This section describes basic connection methods. Connection methods are different depending on the type of inverters to be connected. Check the relevant instruction manuals for the inverters and use the correct connection method.

Number of connections	PC side	Inverter side	Connection Methods	Reference section
1:n (n = 1,2,..., 32)	USB	RS-485 (Note 3)	Connection via the USB/RS-485 converter (Note 1)	1.2.2.1
	COM port (RS-232C)	RS-485 (Note 3)	Connection via the RS-232C/ RS-485 converter (Note 1)	
1:1	USB	Remote keypad with USB (Note 2)	Connection using the USB cable. If the keypad cannot be attached to the inverter, connect the keypad to the inverter using the LAN cable.	1.2.3.1. [1]

Note 1: When using the RJ-45 connector, use a branch adapter for multi-drop connection from the second inverter onward.

Note 2: This connection is possible only for inverters that support the remote keypad with USB. For information on the keypad support details, refer to "1.1.2. Table 1-1 Correspondence between VF1A Series Inverter Models and Loader Functions" or catalogs of relevant inverters.

Note 3: Inverter models with different RS-485 communication protocols cannot be placed in the same network for communication. For the RS-485 communication protocol by model, refer to "1.1.2. Table 1-1 Correspondence between VF1A Series Inverter Models and Loader Functions" or catalogs of relevant inverters.

Note

1) For information on the RS-232C/RS-485 converter and USB/RS-485 converter, refer to "1.2.2.2. Devices Required for RS-485 Connection".
2) When connecting inverters with the LAN cable using the RJ-45 connector, refer to "1.2.2.2. [2] Cables" and "1.2.2.2. [4] Branch Adapter for Multi-drop Connection".
3) If the RS-485(RJ-45 connector) is commonly used with the keypad connection connector for the inverter, the keypad must be removed from the inverter.
4) To minimize the effects of noise, avoid wiring in the same bundled cable as for the power supply and, instead, wire in a separate line. (Refer to "1.2.2.3. Noise Countermeasures for RS-485 Communication".)

Note 5) It is not possible to use the Loader with a PLC or other host devices at the same time. Before using the Loader, disconnect the connection cables to other host devices.

6) For configuring the multi-drop connection, assign different station addresses to inverters to be connected.

⚠WARNING

- Be sure to turn off the power to the inverters and related devices before wiring or making RS-485.
  Failure to observe this could result in electric shock.

⚠WARNING

- **Do not connect** the LAN terminal of the PC directly with the RJ-45 connector of the inverter using the LAN cable.
  The RJ-45 connector of the inverter is not for LAN communication.
  The voltage level and pin arrangement are different from those of the LAN terminal of the PC.
  A trouble such as a power short-circuit or signal line collision may occur and may damage the product.
  Failure to observe this could result in a product failure.

⚠CAUTION

- When connecting cables to the RJ-45 connectors on the inverter (RJ-45 connector for connecting to the keypad, RJ-45 connector for connecting to the RS-485 communication card, and RJ-45 connector for the inverter's RS-485 communication), be sure to check the wiring of the devices to be connected. For details, refer to the "RS-485 Communication User's Manual".
  Failure to observe this could result in a product failure.

1.2.2. RS-485 Communication Port Connection

1.2.2.1. Basic Connection Drawings

[1] Multi-drop Connection Using the RJ-45 Connectors

The following diagram shows an example of multi-drop connection using RJ-45 connectors.

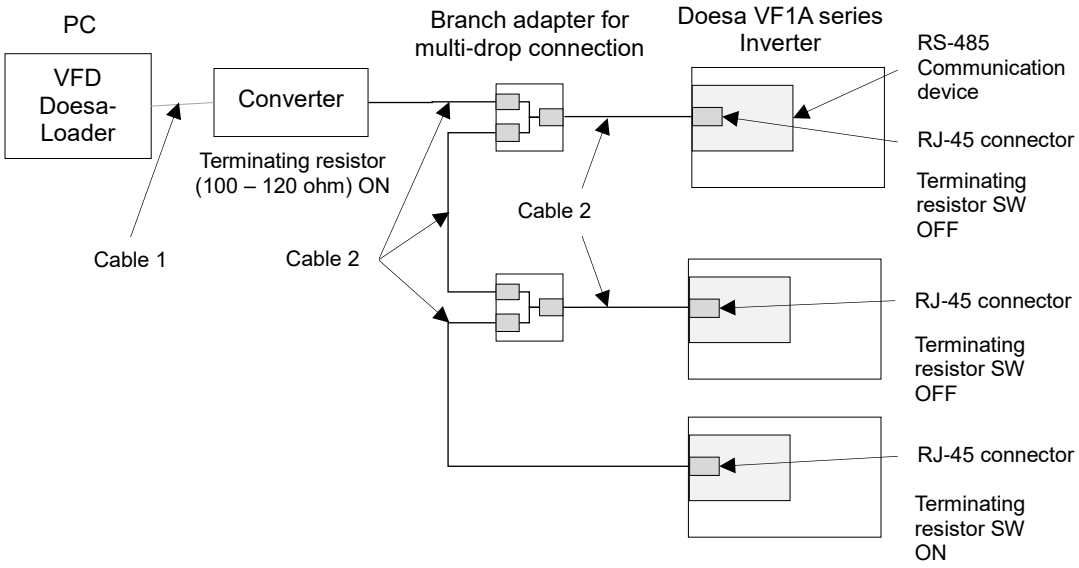


Figure 1-1 RS-485 Connection Diagram (RJ-45 connector Connection)

The following devices are used for the connection. For information on recommended devices, refer to "1.2.2.2. Devices Required for RS-485 Connection".

Devices used	Description
Converter	PCs are not normally equipped with RS-485 ports. Therefore, an RS-232C/RS-485 converter or USB/RS-485 converter is required. To connect to the RJ-45 connector of the inverter, a converter equipped with the RJ-45 connector is required on the RS-485 port side.
Cable 1	Follow the specifications of the converter.
Cable 2	Use commercially available LAN cable (straight).
Branch adapter for multi-drop connection	The branch adapter is convenient to use when using the cable with RJ-45 connector for the multi-drop connection. The branch adapter is not necessary for the inverter equipped with the RJ-45 connector for functional extension.

⚠WARNING

- The power supply (1, 2, 7, and 8 pins) for the keypad is connected to the RJ-45 connector for the RS-485 communication (communication port 1). When connecting to other devices, be careful not to connect to pins assigned to the power supply. Connect **only pin 4 and pin 5.**
- **Do not connect** the LAN terminal of the PC directly with the RJ-45 connector of the inverter using the LAN cable.

  Failure to observe this could result in a product failure.

For information on RS-485 communication settings, refer to the following.
Inverter side: 1.5.1. Setting Function Codes Related to Communication on the Inverter Side
Loader side: 1.5.5. Communication Setting and Connection Setting for the Loader

For information on the inverter's terminating resistor switch, refer to the instruction manuals or the RS-485 Communication User's Manual.

Note

- For the selection of connection devices to prevent damage or malfunction in the control PCB caused by an external noise and to eliminate the influence of the common mode noise, be sure to refer to "1.2.2.2. Devices Required for RS-485 Connection".
- The maximum wiring length must be 500 m in total.

[2] Multi-drop Connection Using Terminal Blocks

The following diagram shows an example of multi-drop connection using terminal blocks.

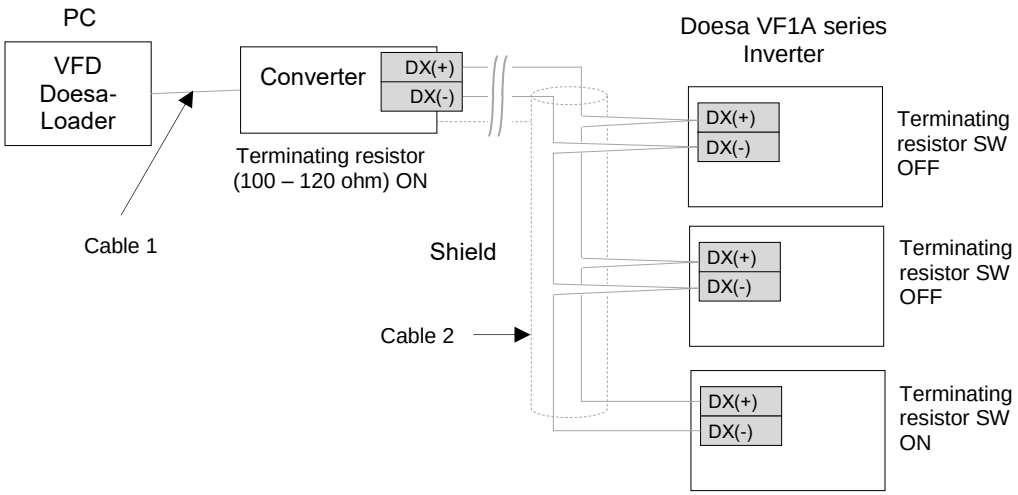


Figure 1-2 RS-485 Connection Diagram (Terminal Block Connection)

The following devices are used for the connection. For information on recommended devices, refer to "1.2.2.2. Devices Required for RS-485 Connection".

Devices used	Description
Converter	PCs are not normally equipped with RS-485 ports. Therefore, an RS-232C/RS-485 converter or USB/RS-485 converter is required. To connect to the terminal block of the inverter, a converter equipped with the terminal block is required on the RS-485 port side.
Cable 1	Follow the specifications of the converter.
Cable 2	Use a shielded twisted-pair cable for long distance transmission.

For information on RS-485 communication settings, refer to the following.

Inverter side: 1.5.1. Setting Function Codes Related to Communication on the Inverter Side

Loader side: 1.5.5. Communication Setting and Connection Setting for the Loader

Note

- For the selection of connection devices to prevent damage or malfunction in the control PCB caused by an external noise and to eliminate the influence of the common mode noise, be sure to refer to "1.2.2.2. Devices Required for RS-485 Connection".
- The maximum wiring length must be 500 m in total.

1.2.2.2. Devices Required for RS-485 Connection

This section describes about the devices required when connecting to a PC with non RS-485 interface.

[1] Converter

PCs are not normally equipped with RS-485 ports. Therefore, an RS-232C/RS-485 converter or USB/RS-485 converter is required. Always use a converter that meets the recommended specifications shown below in order to ensure correct use. Note that the software may not function properly if a converter other than those recommended is used.

Recommended converter specifications

Transmission/receipt switching method:	Automatic switching through monitoring transmission data at the PC side (RS-232C)
Isolation:	Must be dielectrically isolated from the RS-485 side.
Fail-safe:	Must be equipped with a fail-safe function (*).
Other requirement:	Must have excellent noise resistance properties.

* The fail-safe function is a function capable of ensuring that the RS-485 receiver output is logic high even when the RS-485 receiver input is open or shorted or when all the RS-485 drivers are inactive.

Recommended converters

Manufacturer:	System Sacom Industry Corp.
Model:	KS-485PTI (RS-232C/RS-485 converter) USB-485I RJ-45-T4P (USB/RS-485 converter)

Transmission/receipt switching method

RS-485 communication involves half-duplex operation (two-wire system), and therefore converters require a function for switching between transmission and receipt. There are the following two switching methods.

(1) Automatic switching through monitoring transmission data

(2) Switching with RS-232C flow control signals (RTS or DTR) from the PC

The VFD Doesa-Loader does not support the above switching method (2). Therefore, use the converter with the above switching method (1).

[2] Cables (for RJ-45 connector connection)

The connection cable specifications are set as follows to ensure reliable connection.

	Specifications
Common specifications	10BASE-T/100BASE-TX straight cables (commercially available LAN cable) that satisfies the US ANSI/TIA/EIA-568A Category 5 standard.

When connecting to the keypad, use an 8-conductor straight cable. Use commercially available LAN cable (20 m or less).

Recommended LAN cable

Manufacturer: Sanwa Supply Inc.
Model: KB-10T5-01K (1 m)
KB-STP-01K (1 m shield cable: possible to conform to the EMC Directive)

Note

- The power supply (1, 2, 7, and 8 pins) for the keypad is connected to the RJ-45 connector for the RS-485 communication (communication port 1). When connecting to other devices, be careful not to connect to pins assigned to the power supply. Connect **only pin 4 and pin 5.**

[3] Cables (using terminal blocks)

Use a shielded twisted-pair cable for long distance transmission with the wire gauge of AWG 16 to AWG 26 to ensure reliable connection.

Recommended cable

Manufacturer: Furukawa Electric Co., Ltd.
Model: AWM 2789 Long-distance connection cable

[4] Branch Adapter for Multi-drop Connection

The RJ-45 connectors are used as communication connectors. When configuring a multi-drop connection using the standard LAN cable, a branch adapter for the RJ-45 connector is required.

Manufacturer: SK KOHKI CO., LTD.
Model: MS8-BA-JJJ

1.2.2.3. Noise Countermeasures for RS-485 Communication

Depending on the operating environment, the system may malfunction due to noise generated by the inverter. To prevent such malfunction, countermeasures can be taken by separating wiring lines, using shielded cables, isolating the power supply, or adding an inductance. As an example, addition of an inductance is shown below.

Addition of an inductance

Form an inductance component in the circuit to generate a high-impedance state against the high frequency noise by inserting a choke coil in series with the signal circuit or by passing the wiring through the ferrite core.

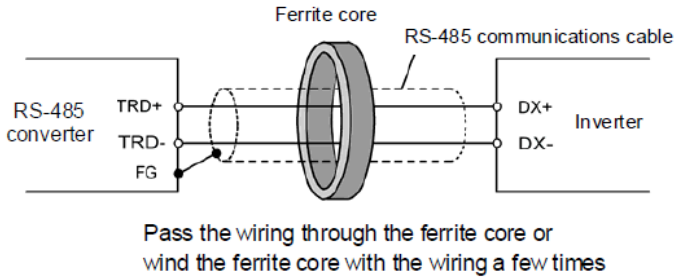


Figure 1-3 Addition of an Inductance

1.2.3. USB Communication Port Connection

1.2.3.1. Basic Connection Drawings

[1] Connection with the Inverter via the remote keypad with USB

The following section describes a connection of the PC with the inverter via the remote keypad with USB. Connect the keypad to the keypad coupling connector on the inverter with a communication cable. Be careful with the connector. If it is connected to any connector or port other than the keypad coupling connector, no communication will be possible.

Inverters with removable keypad that support the remote keypad with USB

The keypad mounted on the inverter as standard must be removed.

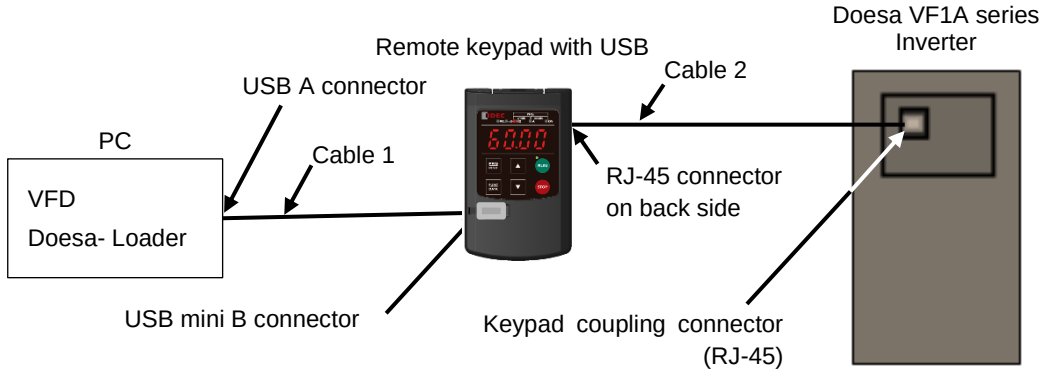


Figure 1-4 USB Connection Diagram (Connection with the Inverter via Remote keypad with USB (1))

Devices used	Description
Remote keypad with USB	For the inverter models that support the remote keypad with USB as an optional item, the keypad needs to be purchased separately.
Cable 1	Use a commercially available USB cable (mini B connector).
Cable 2	Use a commercially available LAN cable (straight).

For information on USB communication settings, refer to the following.
Inverter side: 1.5.1. Setting Function Codes Related to Communication on the Inverter Side
Loader side: 1.5.5. Communication Setting and Connection Setting for the Loader

On the Loader side, select [Data in Inverter (via VF1A-PH1)] for the USB connection under [Port] on the [Communication setting] window.

Note
- This connection is possible only for inverters that support the remote keypad with USB. For information on the keypad support detail, refer to "1.1.2. Table 1-1 Correspondence between VF1A Series Inverter Models and Loader Functions" or catalogs of relevant inverters.
- Be sure to connect the remote keypad with USB to the keypad coupling connector on the inverter.
  For example, the keypad coupling connector for the VF1A is available only on the RS-485 communication port 1. Therefore, if the keypad is connected to the RS-485 communication port 2, no communication is possible.

- A USB driver must be installed on your PC. For information on the installation methods, refer to "1.4.1.5. Checking the USB Driver".
- When connecting the inverter to the PC Loader via the USB communication port, use 1:1 connection. (Do not use the USB hub.)

1.2.3.2. USB Specifications

[1] USB Specifications for the remote keypad with USB

Table 1-3 USB Specifications for the VF1A-PH1

Specifications	Conforming to USB1.1
Transfer speed	12 Mbps
Wire length	5 m max.
Connector	USB Mini-B connector
Power supply	When connected to the inverter: Self power When connected to the PC: Bus power

1.3. Connection between the PC and the Keypad with USB

1.3.1. Memory Function of the keypad

The remote keypad with USB (VF1A-PH1) can be used as a temporary memory medium. Retrieve the inverter operation condition data into the keypad, remove the keypad, and, at a location such as an office other than the work site, connect the keypad to the PC with the Loader installed. Using the Loader, the retrieved function code data can be edited, set, or monitored. The settings edited using the Loader can be retrieved into the keypad and, at the work site, the data can be written into the inverter from the keypad.

Even if the inverter does not support the USB communication via the keypad (see 1.2.3.1. Basic Connection Drawings [1]), the keypad can be used as a temporary memory medium as long as the inverter support the copy function of the remote keypad.

1.3.2. Connection between the PC and the keypad

The following section describes a connection between the PC and the remote keypad with USB when using the keypad as a temporary memory medium.

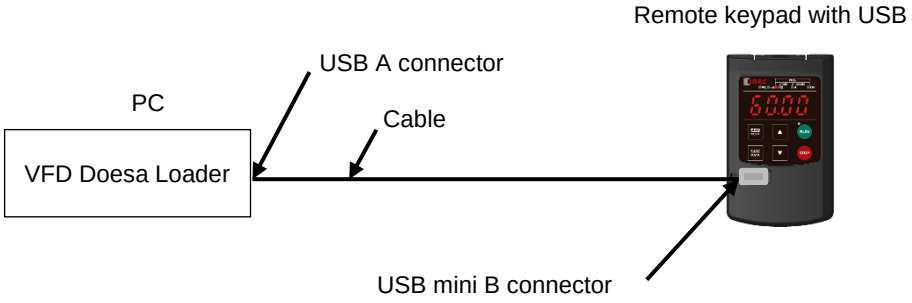


Figure 1-5 Connection Diagram between the PC and the keypad

Devices used	Description
Remote keypad with USB	For the inverter models that support the remote keypad with USB as an optional item, the keypad needs to be purchased separately.
Cable	Use a commercially available USB cable (mini B connector).

For information on USB communication settings, refer to "1.5.5. Communication Setting and Connection Setting for the Loader".
There is no function for communication setting on the keypad side.
On the Loader side, select [Data in Keypad] for the USB connection under [Port] on the [Communication setting] window.

Note
- A USB driver must be installed on your PC. For information on the installation methods, refer to "1.4.1.5. Checking the USB Driver".
- When connecting the inverter to the PC Loader via the USB communication port, use 1:1 connection. (Do not use the USB hub.)

1.3.3. Connection between the keypad and the Inverter

The following section describes a connection between the remote keypad with USB and the inverter when using the keypad as a temporary memory medium.

Use the copy function of the keypad to retrieve the data from the inverter into the keypad and to write the function code setting data into the inverter from the keypad. For information on the copy function, refer to the instruction manuals.

Inverters with removable keypad that support the remote keypad with USB

The keypad mounted on the inverter as standard must be removed.

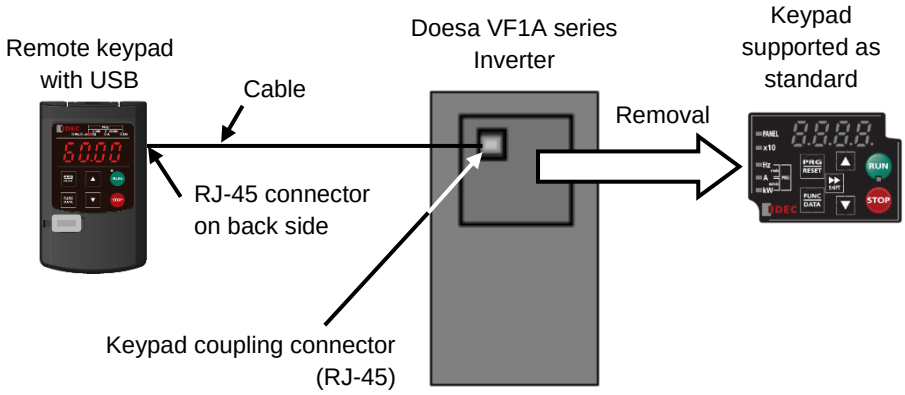


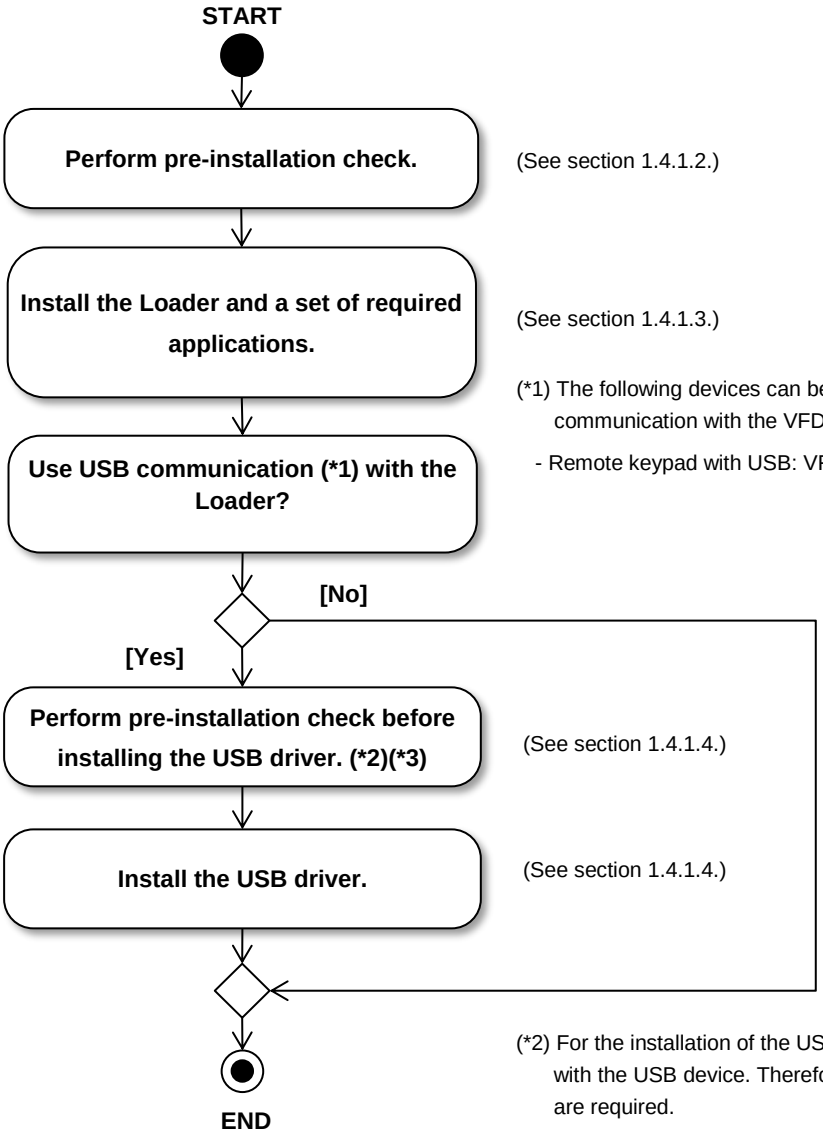
Figure 1-6 Connection Diagram between the keypad and the Inverter (1)
(Connection Using a Communication Cable)

1.4. Installation and Uninstallation

1.4.1. Installation Methods

1.4.1.1. Flowchart of Installation Procedures

Perform installation according to the following procedure.



(*2) For the installation of the USB driver, connect the PC with the USB device. Therefore, the following devices are required.

- USB device
  (Remote keypad with USB: VF1A-PH1)
- USB cable
  (Used for connecting the PC with the USB device)

(*3) The VFD Doesa-Loader and the Message Manager must be closed.

1.4.1.2. Perform Pre-installation Check.

Perform the following tasks prior to installation.

Task	Description
Checking Windows version	Make sure that the version is one of the following. Windows 8.1 (32-bit/64-bit) Windows 10 (32-bit/64-bit)
Exiting running applications	Exit any applications that are currently running.

Note • For installing the Loader, use an account authorized to install this software.

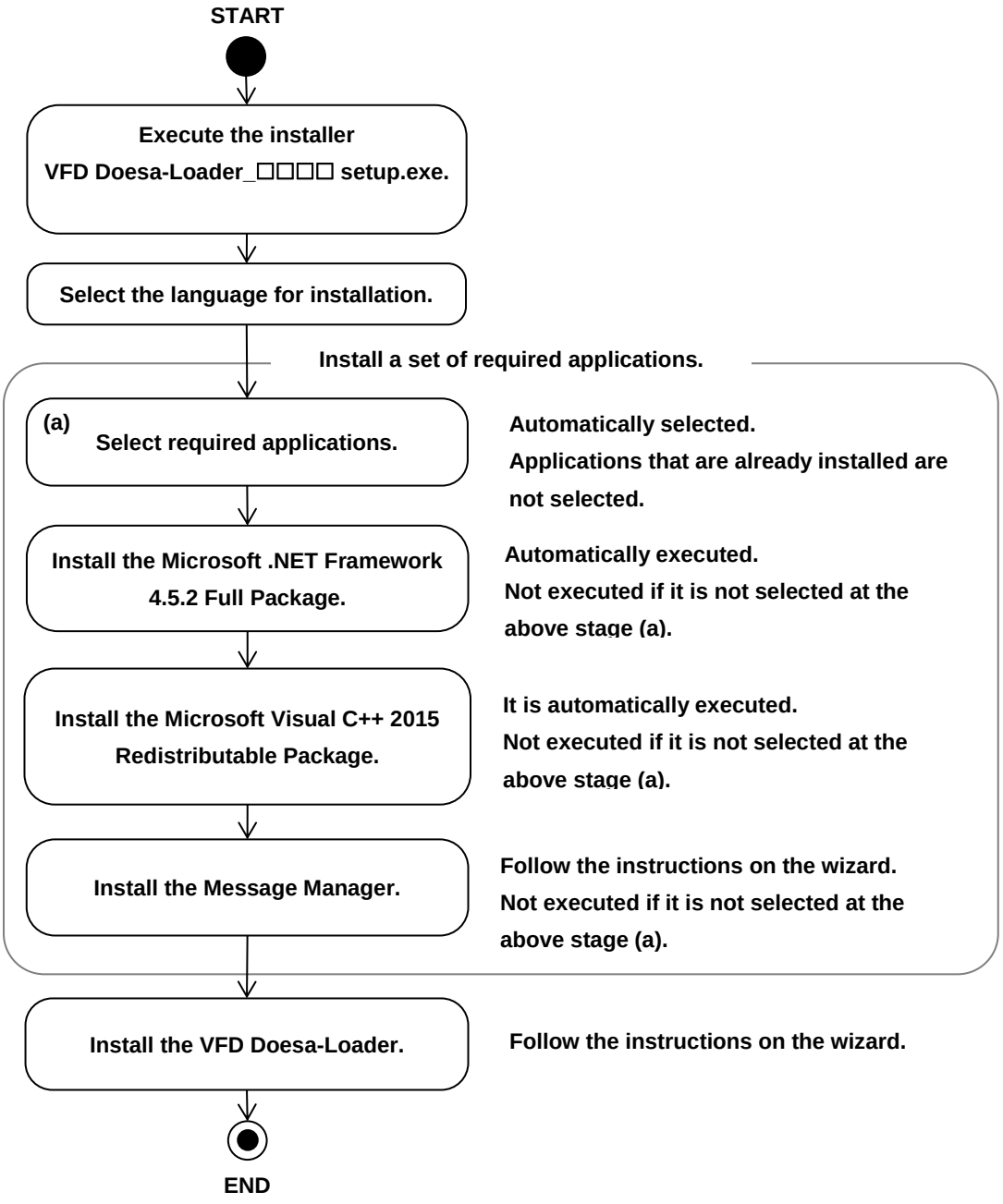
1.4.1.3. The Loader Installation Procedure

This application requires the following applications.

At the time of installation, these applications are installed as required. Follow the instructions on the screen to install them.

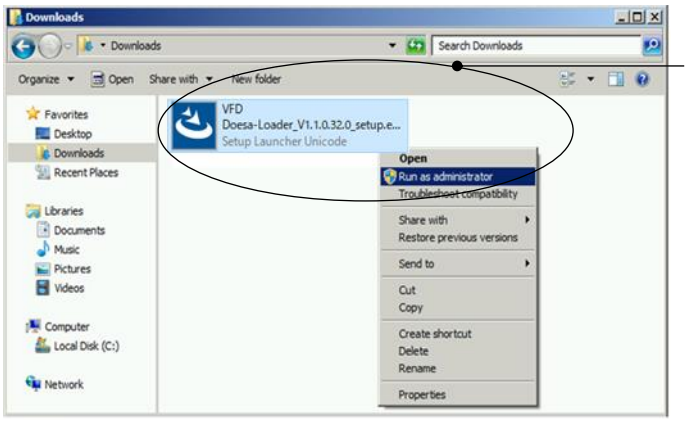
1	Microsoft .NET Framework 4.5.2 Full
2	Microsoft Visual C++ 2015 Redistributable Package
3	Message Manager (MsgMgr USB Setup)

The following section describes the Loader installation procedure.



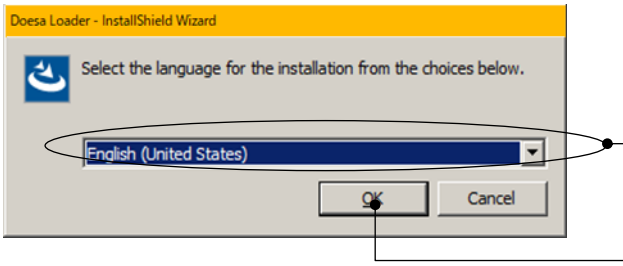
Install the Loader according to the instructions on the wizard.

The following shows installation procedures in English.



Right-click

[VFD Doesa-Loader_□□□□_setup.exe] and select [Run as administrator] from the right-click menu that appears.
The setup will automatically run the installation wizard.



Select the language, either [Japanese] or [English], to be used in the installation.

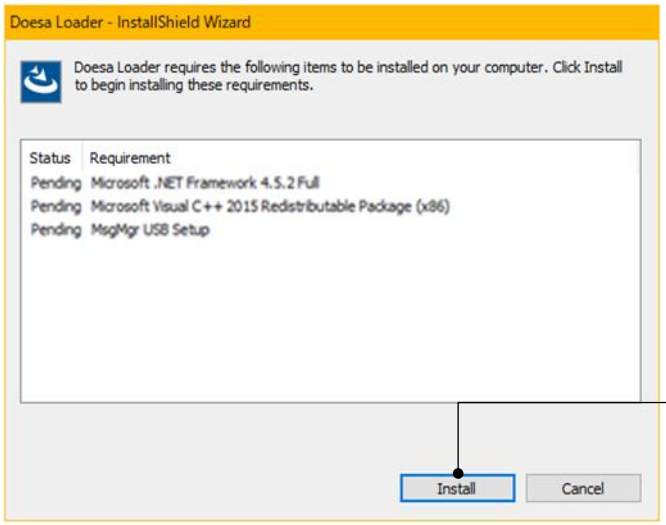
The selected language affects registration items of the start menu.

Select [English] here.

Click [OK].

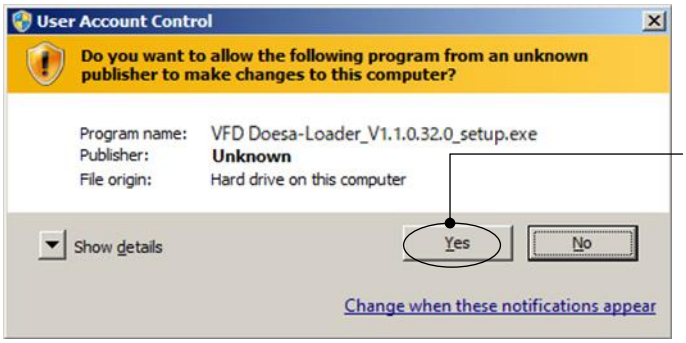
[1] Installation of Required Software

If all the required softwares have already been installed, the following screen does not appear. Proceed to [[3] Installation of the].

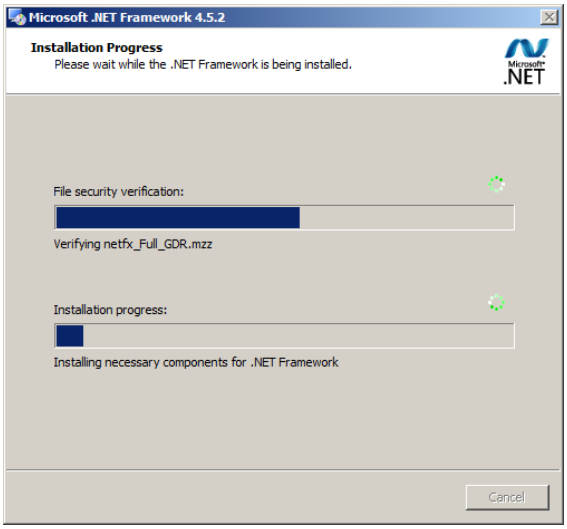


A list of required softwares is displayed.

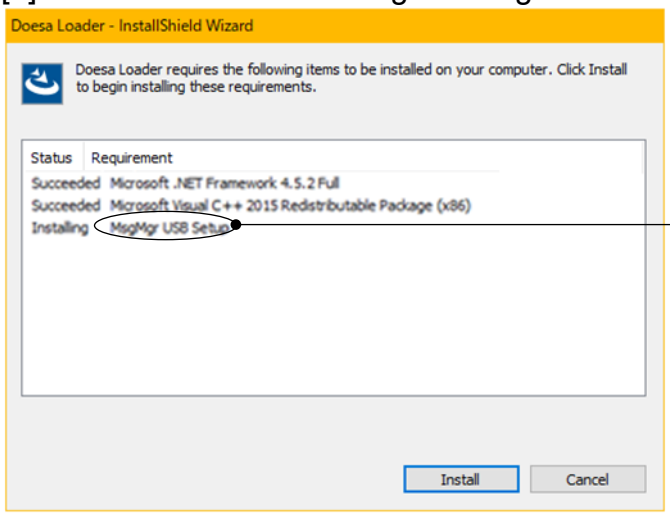
Click [Install].



When the screen on the left is displayed, click [Yes].



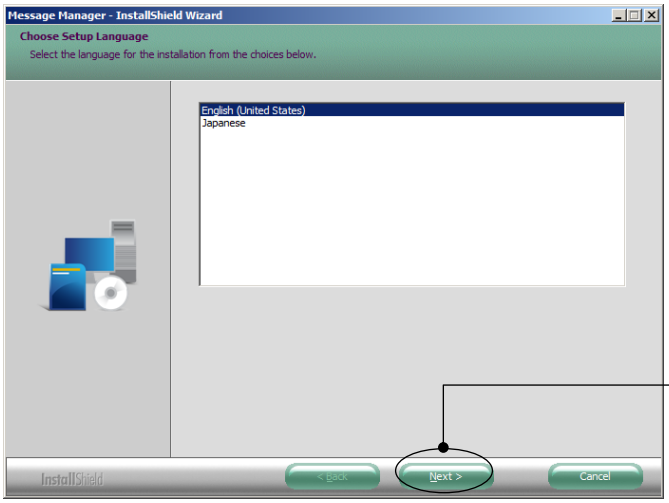
[2] Installation of the Message Manager



If "MsgMgr USB Setup" is displayed on the screen shown to the left after clicking [VFD Doesa-Loader_□□□□ setup.exe], the Message Manager will be installed.

If "MsgMgr USB Setup" is not displayed, it means that the Message Manager has already been installed.

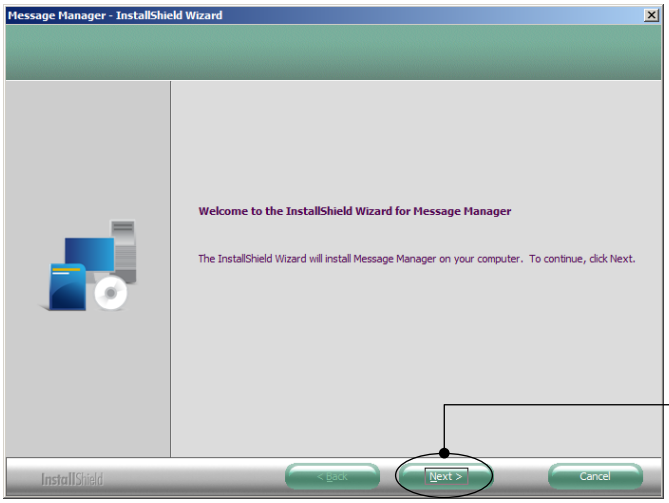
If the Message Manager has already been installed, the following screen does not appear. Proceed to [[3] Installation of the].



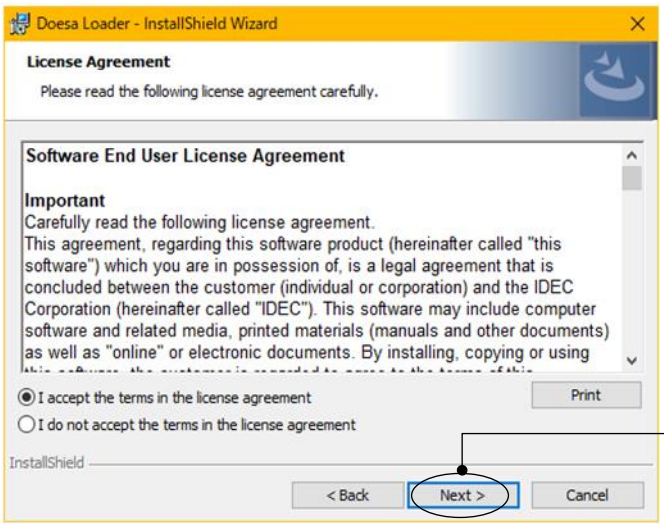
First, select the language to be used in the installation of the Message Manager.

Select [English] here.

Click [Next].



Click [Next].



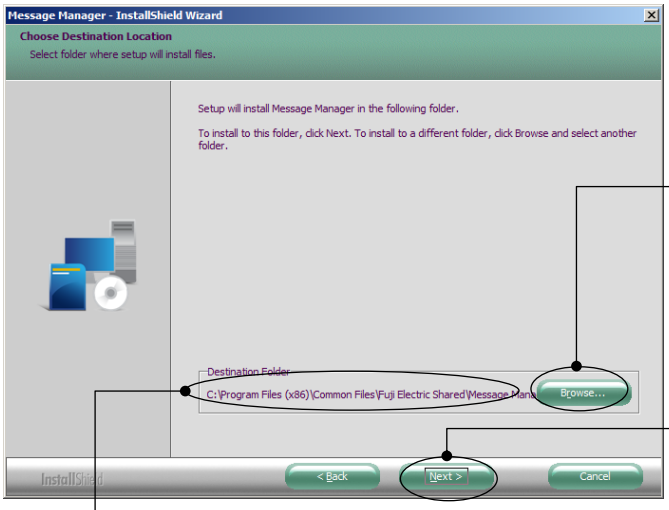
Carefully read the Software End User License Agreement.

To view the full text of the contract agreement:

Press the [Page Down] key or [Page Up] key.

You can also use the scroll bar to view the whole page.

If you agree to the terms of the agreement, click [Yes].

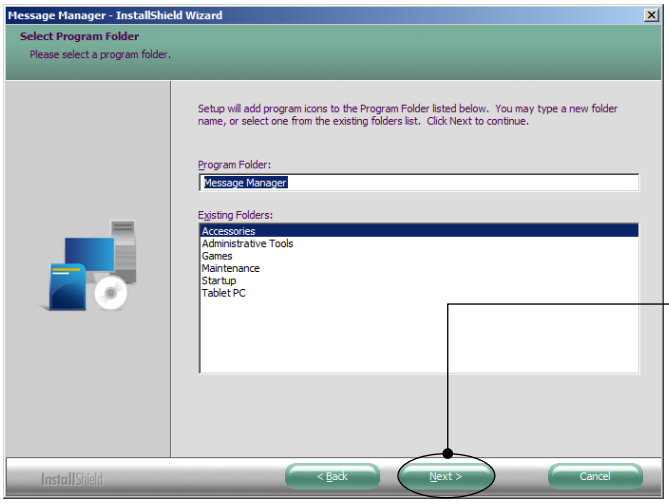


Select a destination folder.

To install in a different folder, click the [Browse] button and select another destination folder.

When the above selection is finished, click [Next].

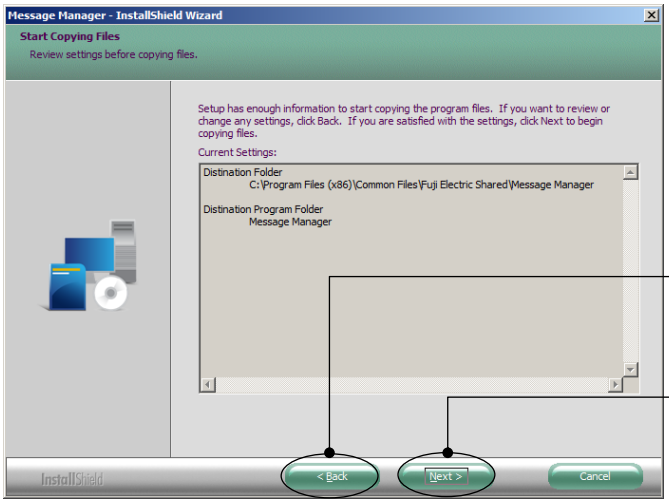
The default folder for the 32-bit OS is C:¥Program Files¥Common Files¥Fuji Electric Shared¥Message Manager.
Here,“C:” is a drive letter for the disk or partition where the Windows is installed. If the Windows is installed in a different drive, substitute a drive letter for that drive.
With the 64-bit OS, "Program Files" in the above address string is replaced with "Program Files (x86)".



Set up a program folder.

The default folder name is "Message Manager".

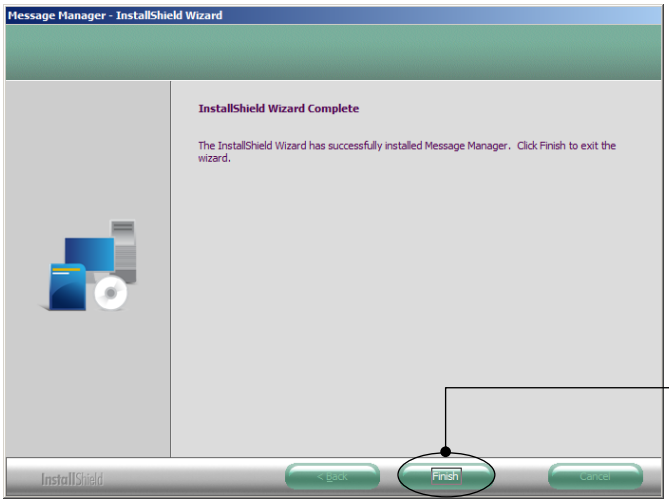
When the setup is finished, click [Next].



A confirmation screen is displayed.

If a change is required, click [Back] to return to the previous screen.

If no change is required, click [Next].

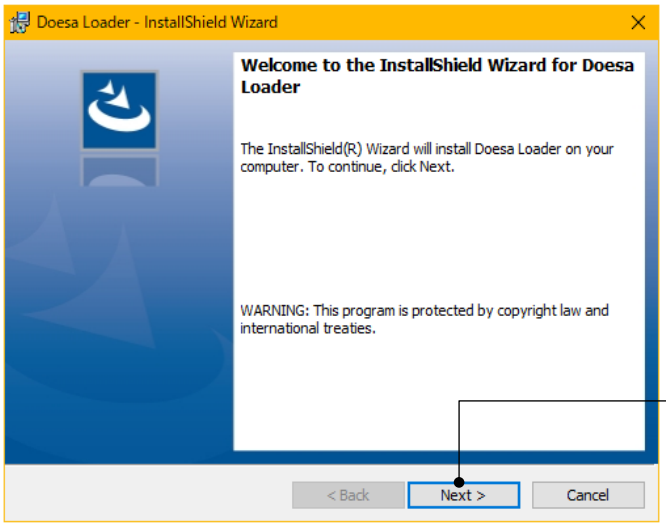


When the installation of the Message Manager is finished, the screen shown to the left is displayed.

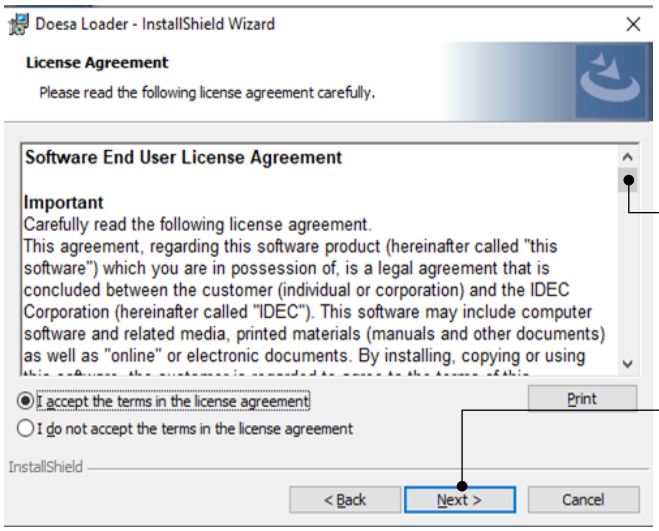
Click [Finish].

When installations of all the required softwares are completed, proceed to install the Loader.

[3] Installation of the Loader



Click [Next].



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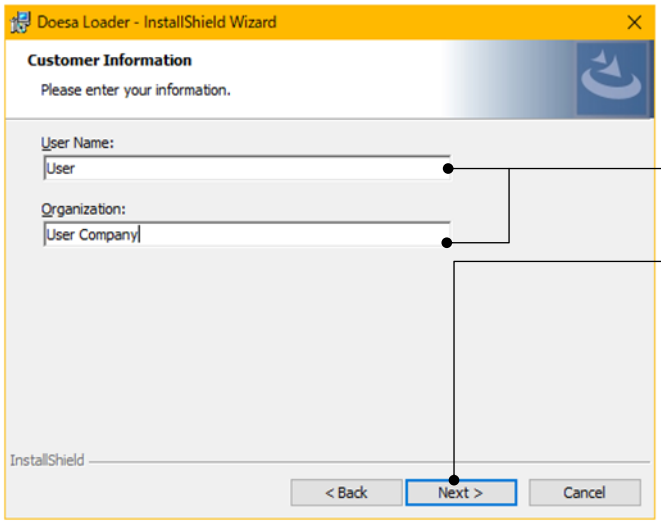
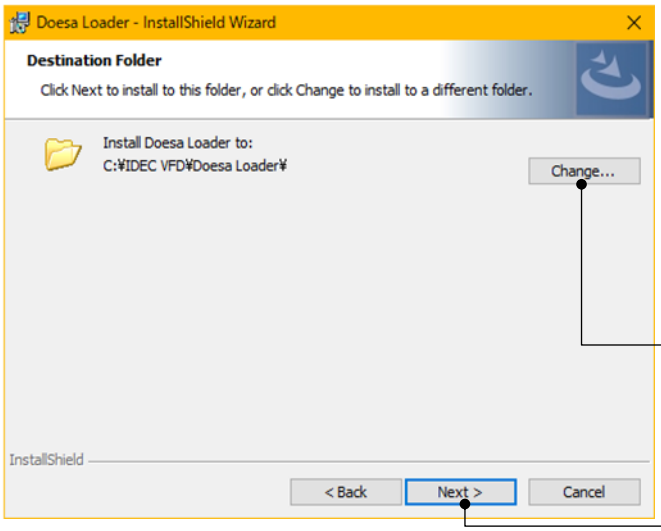
You can also use the scroll bar to view the whole page.

If you agree to the terms of the agreement, select [I accept the terms in the license agreement] and then click [Next].



Enter the user name and company name.

When the input is finished, click [Next].



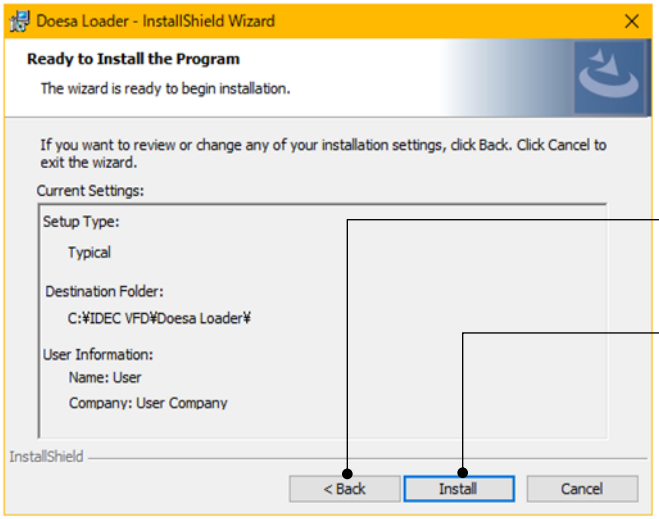
Select the destination folder.

The default folder is ¥IDEC VFD¥Doesa-Loader in the C or D drive.

(Note: The drive that has the largest hard disk space is selected.)

To install in a different folder, click the [Change] button and select another destination folder.

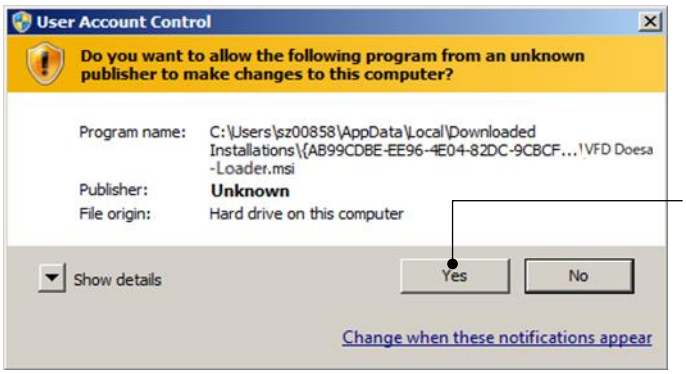
When the above selection is finished, click [Next].



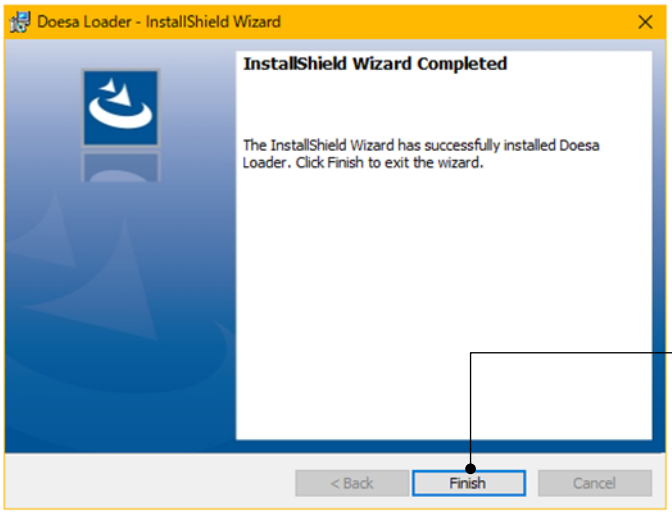
A confirmation screen for selected contents is displayed.

If a change is required, click [Back] to return to the previous screen.

If no change is required, click [Install].



When the screen on the left is displayed, click [Yes].



When the installation of the Loader is finished, the screen shown to the left is displayed.

To end the installation work and to return to the Windows, click [Finish].

1.4.1.4. USB Driver Installation Procedure

To establish communication by connecting to the USB device (VF1A-PH1 remote keypad with USB), first you must install the USB driver. This installation work is required only once at the start of using your system.

Note
- If the USB driver is not properly installed, communication is not possible via the USB connector on the VF1A-PH1.

[1] Before Installing the USB Driver

Preparing Devices

For the installation of the USB driver, connect the PC with the USB device.
Prepare the following devices.

USB devices:	VF1A-PH1 remote keypad with USB
USB cable:	Used for connecting the PC with the USB device.

Installation of the Loader

Install the Loader in advance.
The files required for the installation of the USB driver are saved in the Loader installation folder.
For information on the installation methods, refer to "1.4.1.3. The Loader Installation Procedure".

Close the Loader

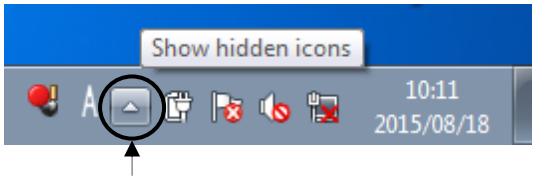
If the Loader was started after installation, close the Loader.

Close the Message Manager.

Close the Message Manager. The Message Manager is automatically started when the Loader is started. However, it does not close automatically.

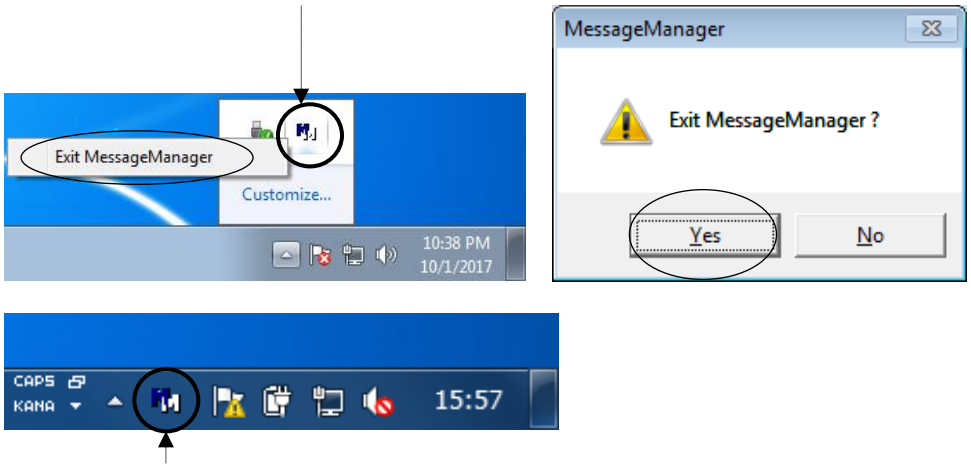
The following section describes how to close the Message Manager.

Procedure for Closing the Message Manager



Left-click here, and hidden icons are displayed as shown below.

Right-click the Message Manager icon, and an option for exiting the Message Manager appears.
Select the option, and the Message Manager is closed.



The icon may be displayed here.

Note

- If an attempt is made to install the USB driver with the Message Manager already started, the Message Manager cannot recognize the USB driver and, as a result, a communication failure may occur in the communication between the Loader and connected devices. In such a case, close the Loader and the Message Manager and then start the Loader again.

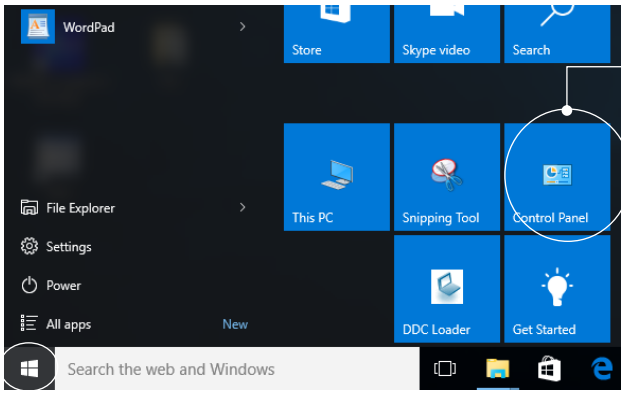
[2] Installation of the USB Driver.

Windows 10

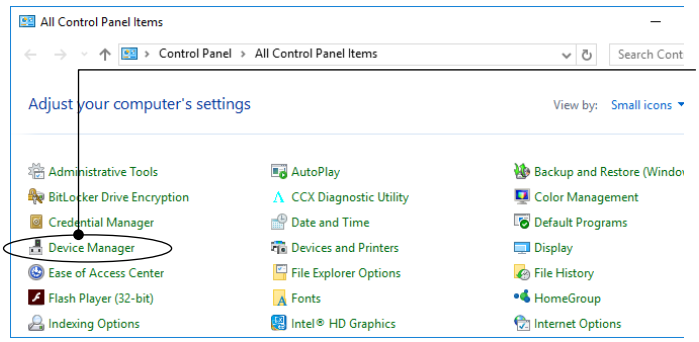
Connect the PC with the USB device (VF1A-PH1) using the USB cable.

When the OS recognizes the USB device of this Loader, the following display appears.

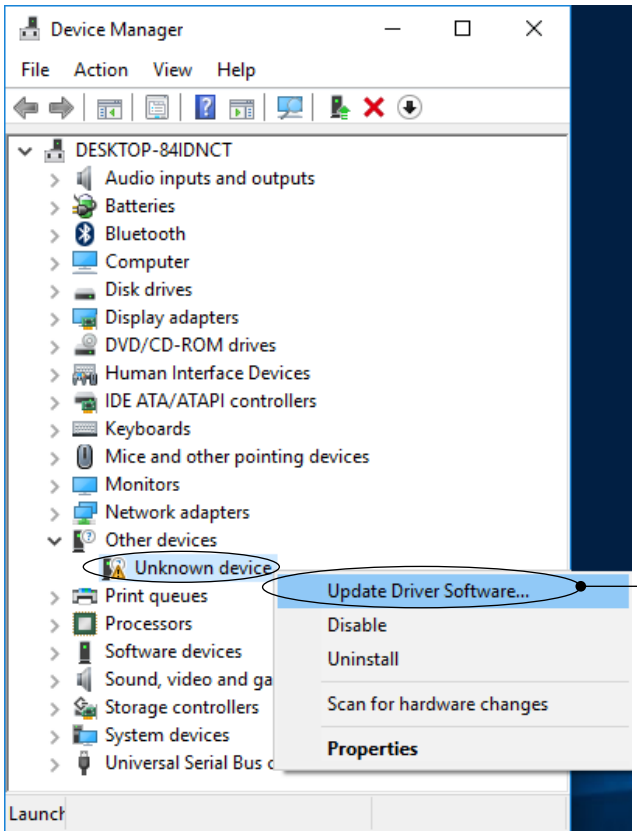
The wizard used to install the USB driver does not start automatically. Therefore, install the USB driver according to the following procedure.



Select [START] -> [Control Panel] and then left-click.

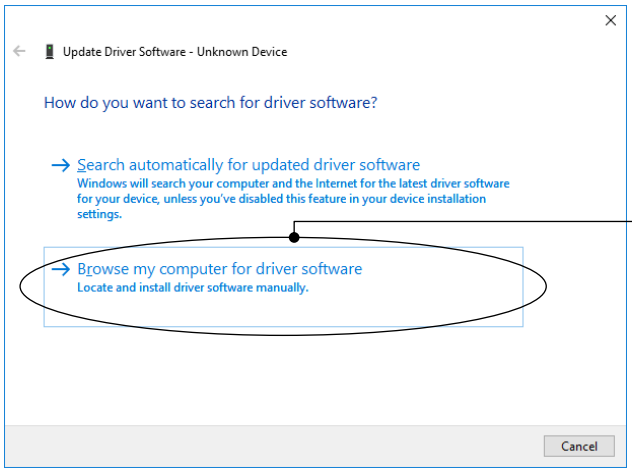


When the Control Panel home screen is displayed, select [Device Manager] and then left-click.

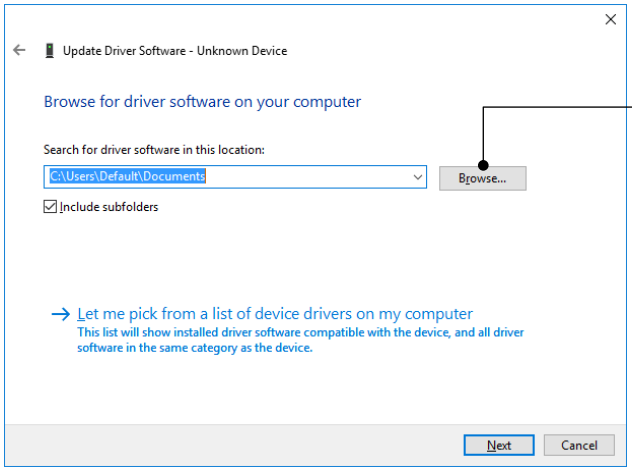


When the Device Manager screen is displayed, select "Unknown device" and then right-click to display options.

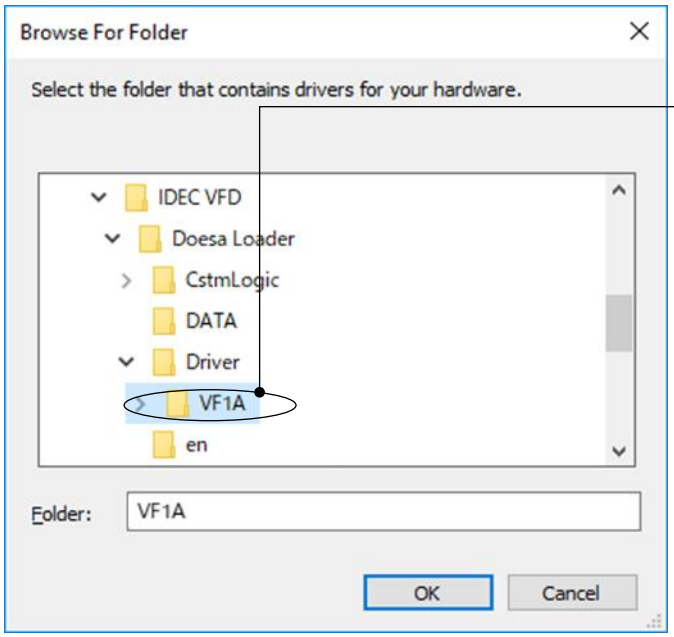
Select "Update Driver Software" and then left-click.



When the screen on the left is displayed, select "Browse my computer for driver software".



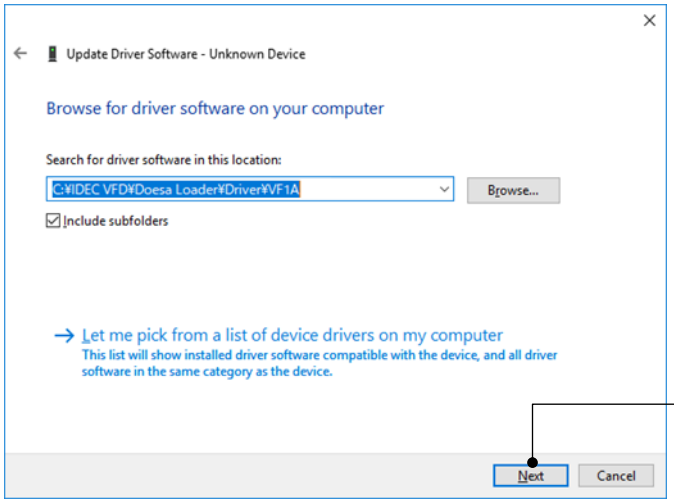
When the screen on the left is displayed, click [Browse].



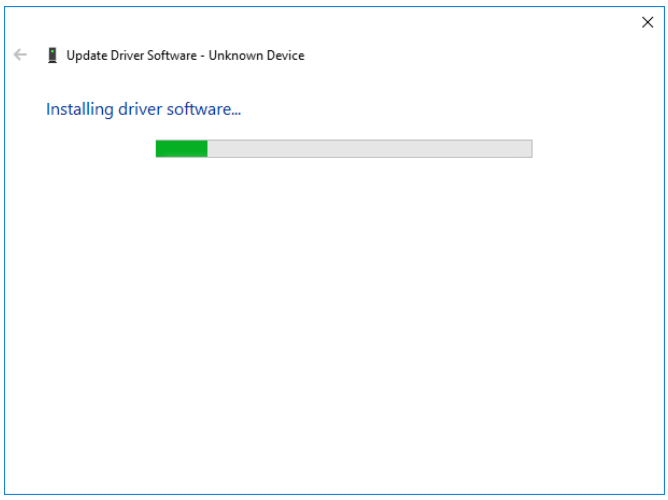
Select "…¥Driver¥VF1A" inside the Loader destination folder and then click [OK].

The default folder is C:¥ IDEC VFD¥Doesa-Loader¥Driver¥VF1A when the installation drive is C.

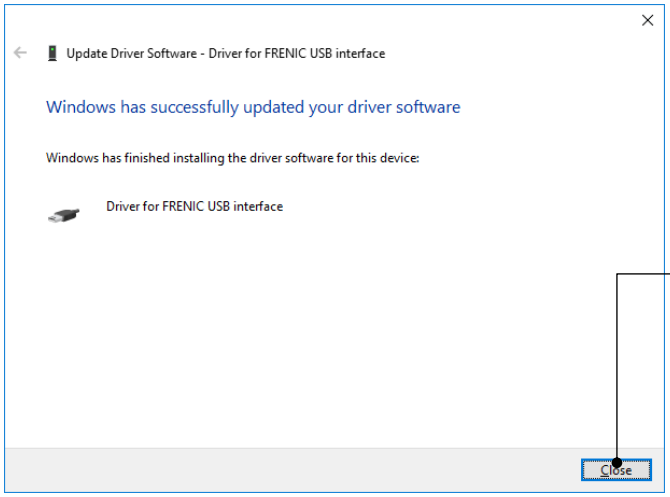
(Note: The drive that has the largest hard disk space is selected.)



Click [Next].



The installation will begin.



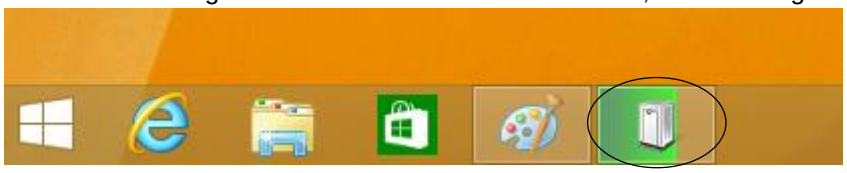
When the installation of the Loader is finished, the screen shown to the left is displayed.

To end the installation work and to return to the Windows, click [Close].

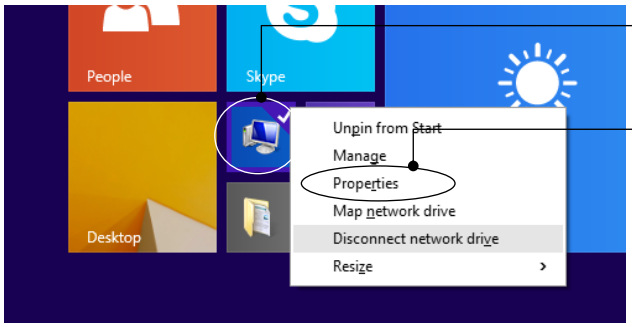
Windows 8.1

Connect the PC with the USB device (VF1A-PH1) using the USB cable.

When the OS recognizes the USB device of this Loader, the following display appears.

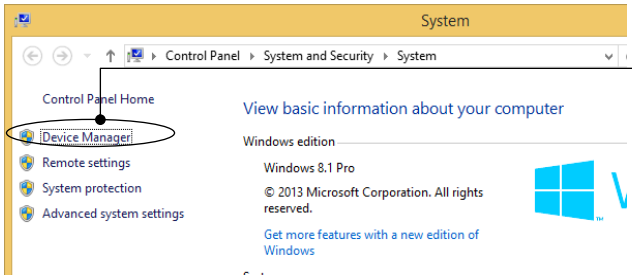


The wizard used to install the USB driver does not start automatically. Therefore, install the USB driver according to the following procedure.

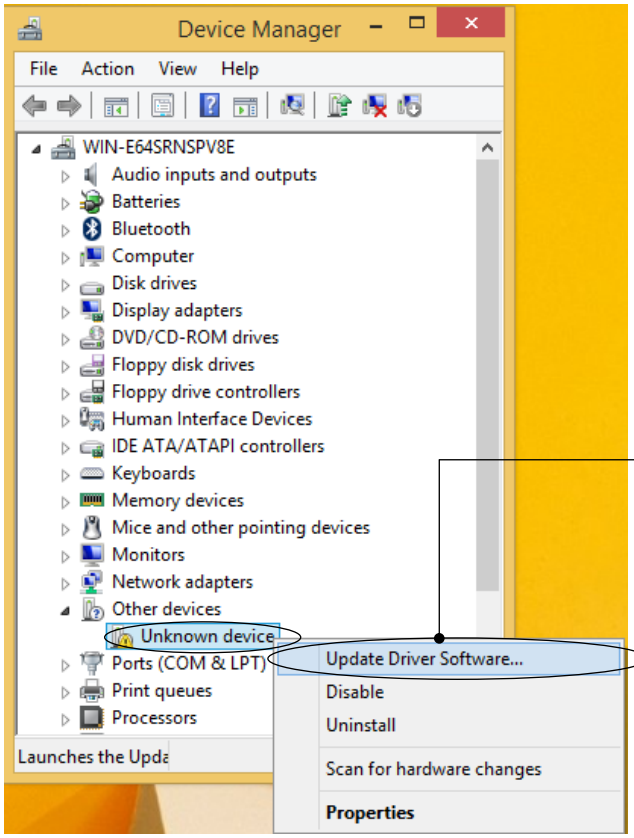


Select the [Computer] icon and then right-click to display options.

Select "Properties" and then left-click.

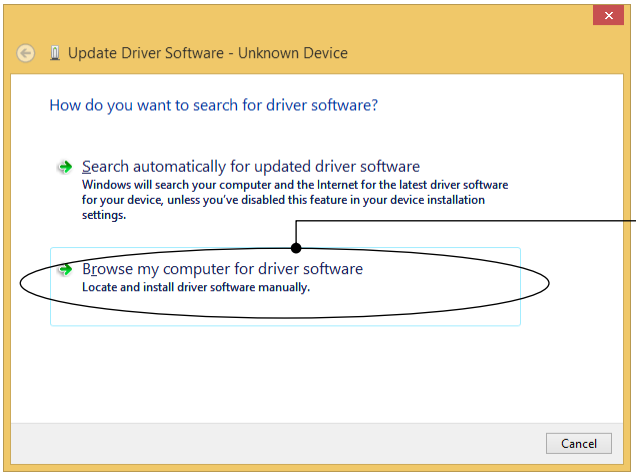


When the Control Panel home screen is displayed, select "Device Manager" and then left-click.

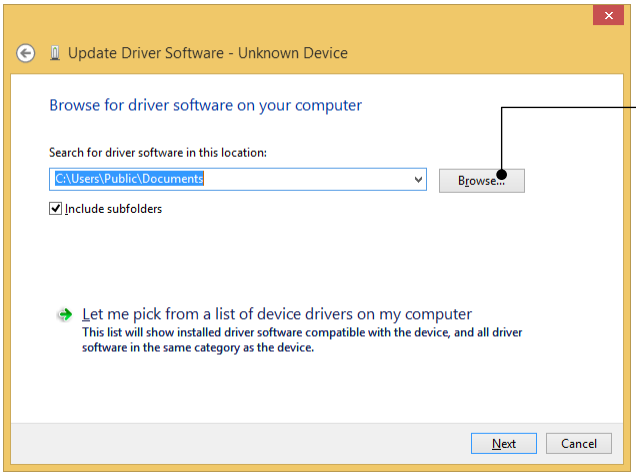


When the Device Manager screen is displayed, select "Unknown device" and then right-click to display options.

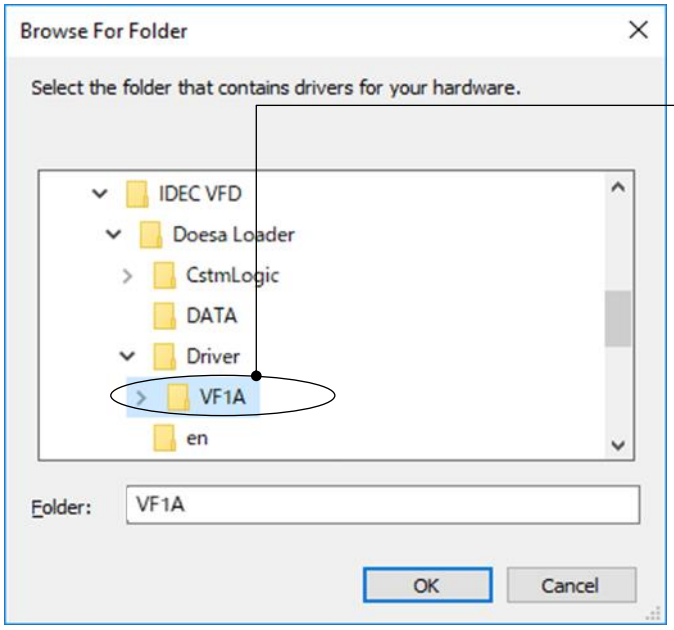
Select "Update Driver Software" and then left-click.



When the screen on the left is displayed, select and click "Browse my computer for driver software".

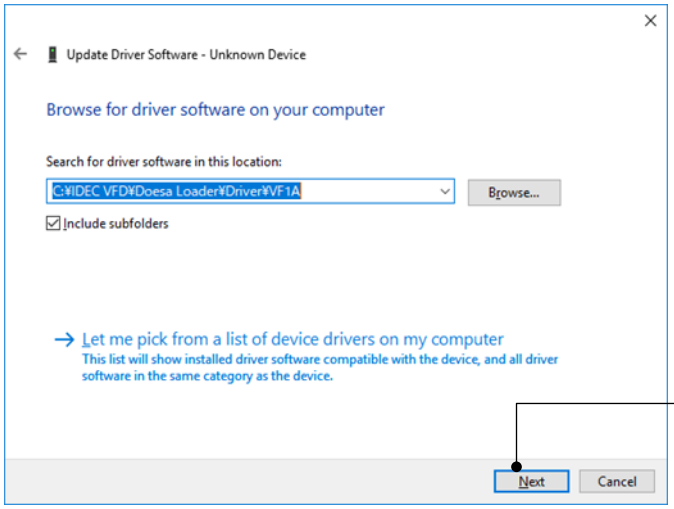


When the screen on the left is displayed, click [Browse].

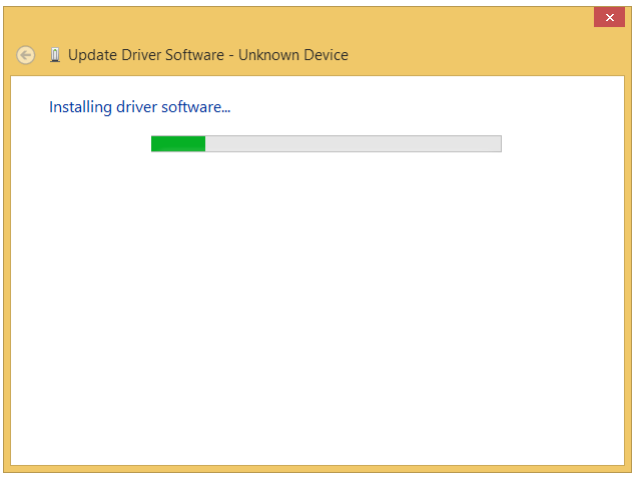


Select "…¥Driver¥VF1A" inside the Loader destination folder and then click [OK].

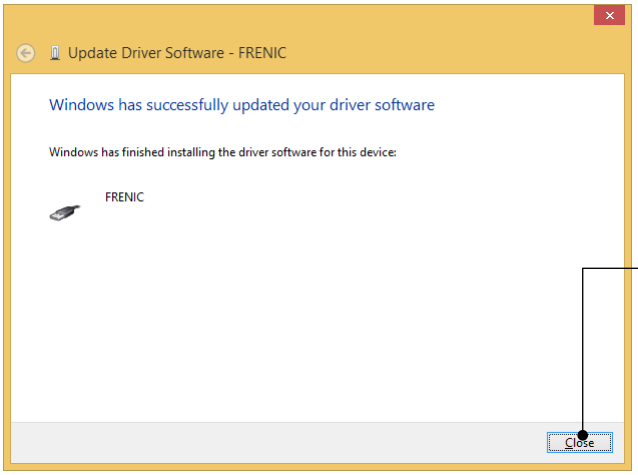
The default folder is C:¥ IDEC VFD¥Doesa-Loader¥Driver¥VF1A when the installation drive is C. (Note: The drive that has the largest hard disk space is selected.)



When the screen on the left is displayed, click [Next].



The installation will begin.



When the installation of the Loader is finished, the screen shown to the left is displayed.

To end the installation work and to return to the Windows, click [Close].

1.4.1.5. Checking the USB Driver

Check whether the USB driver for VF1A-PH1 remote keypad with USB is properly installed or not using the Device Manager of Windows.

Windows 10

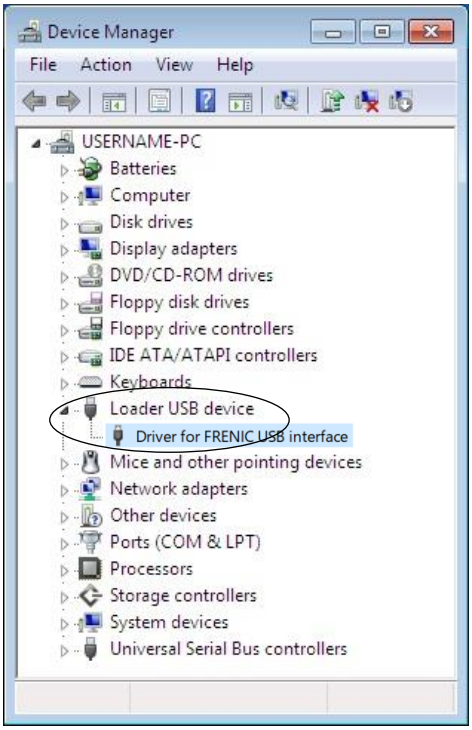
Select as follows to open the Device Manager: [Start] -> [Control Panel] -> [Device Manager]

Windows 8.1

Right-click the icon on the [Computer], select [Properties] and then select [Device Manager].

Confirm that [Driver for FRENIC USB interface] is displayed under [Loader USB device] on the Device Manager.

○: Installation succeeded.



×: Installation failed.

1.4.1.6. Installation of the Message Manager

Normally, when the VFD Doesa-Loader is installed, the Message Manager is installed at the same time. Therefore, there is no need to separately install the Message Manager.
However, after the VFD Doesa-Loader is installed. The Message Manager may need to be uninstalled as a step to recover a communication failure. In such a case, the Message Manager can be separately installed.

To install only the Message Manager, double-click [MsgMgr USB Setup.exe].
The installation wizard will be started automatically.

Install the Message Manager according to the instructions on the wizard.

Tip

- After you uninstall the Message Manager, the VFD Doesa-Loader installer can also be used to install the Message Manager.
  When using the VFD Doesa-Loader installer, after you install the Message Manager according to the procedure in "1.4.1.3. The Loader Installation Procedure" click [Cancel] on the step "[3] Installation of the ".
- If the VFD Doesa-Loader installer does not recognize the Message Manager as one of the installation targets even if the Message Manager has been uninstalled, use [MsgMgr USB Setup.exe] to install the Message Manager.

1.4.2. Uninstallation Methods

Note

- All files inside the Loader destination folder will be deleted.
  If necessary, move or back up the user files created by the Loader before uninstalling.

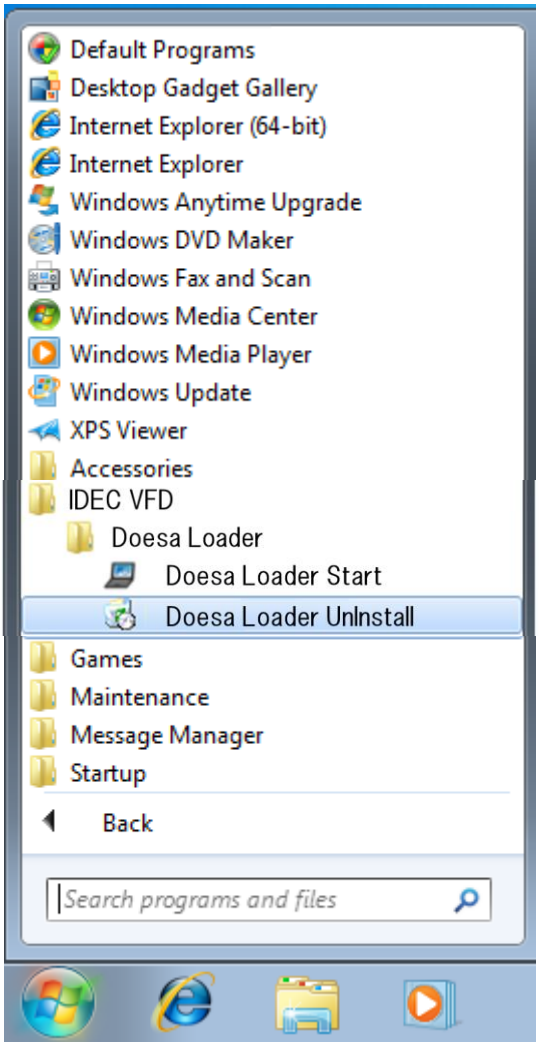
1.4.2.1. The Loader Uninstallation Procedure

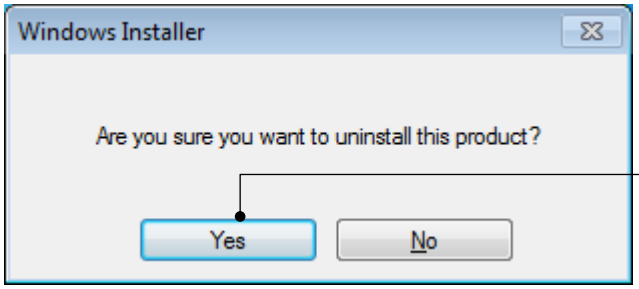
Windows 10

On the Windows, select icon → [START] → [IDEC VFD] → [Doesa-Loader Uninstall].

Windows 8.1

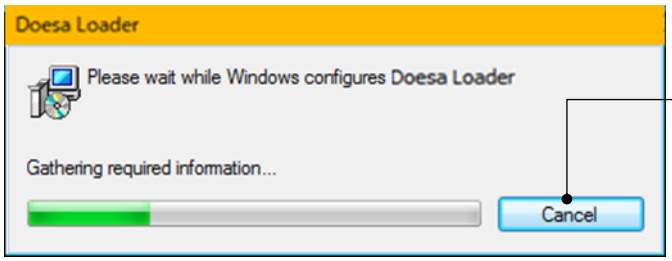
Left-click [All apps] icon and then select [IDEC VFD] → [Doesa-Loader Uninstall].





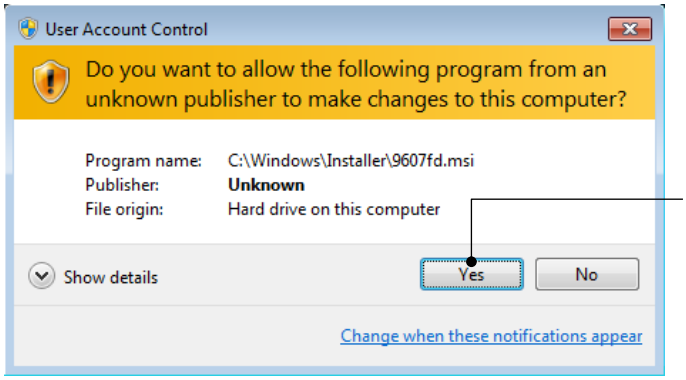
The uninstallation confirmation screen will be displayed as shown here.

Upon confirmation, click [Yes].

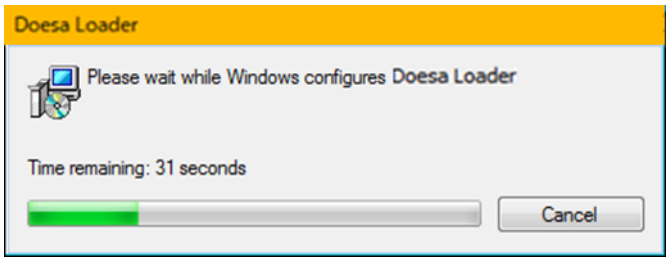


The uninstallation progress screen is displayed.

Click [Cancel] to stop uninstallation.



When the screen on the left is displayed, click [Yes].

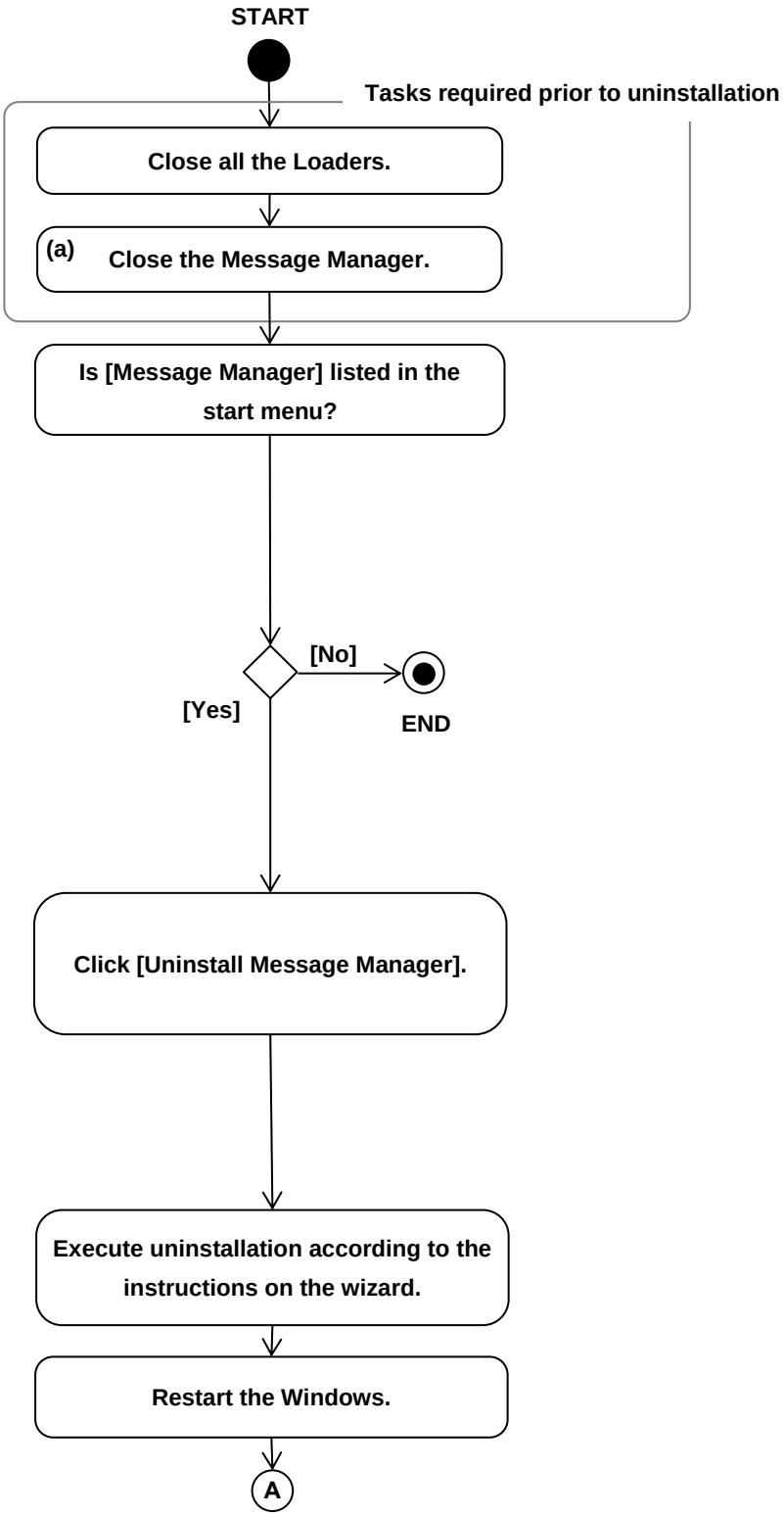


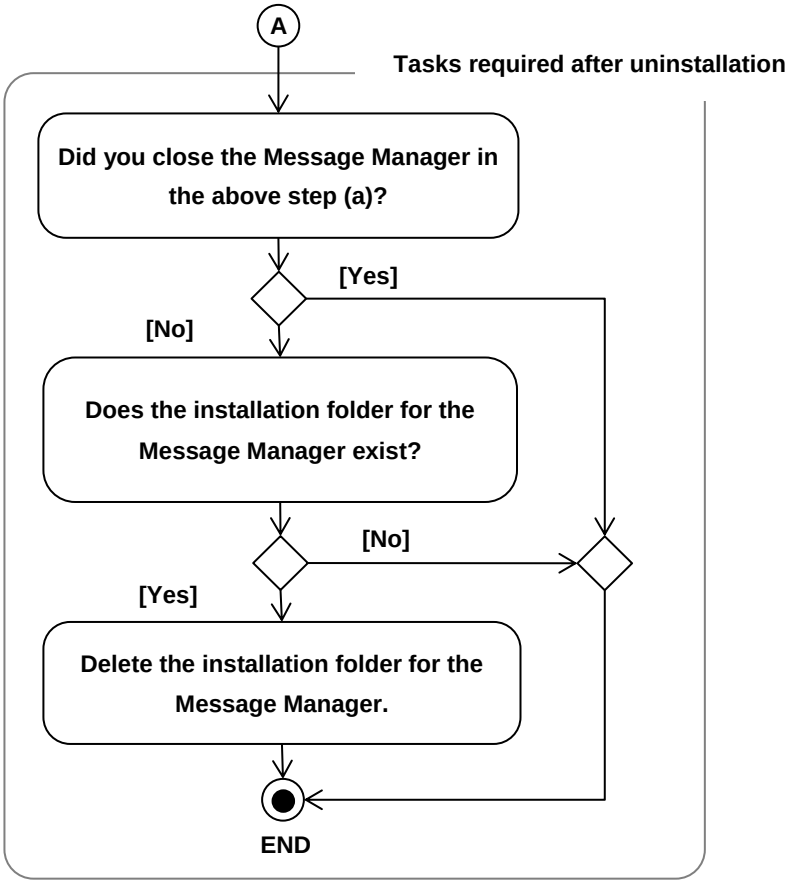
Uninstallation will continue.

Uninstallation is executed according to the above procedure.

1.4.2.2. Uninstallation of the Message Manager

Uninstall the Message Manager according to the following procedure.




A
Tasks required after uninstallation
Did you close the Message Manager in the above step (a)?
[Yes]
[No]
Does the installation folder for the Message Manager exist?
[No]
[Yes]
Delete the installation folder for the Message Manager.
END

[1] Before uninstalling the Message Manager

Close the Loaders.

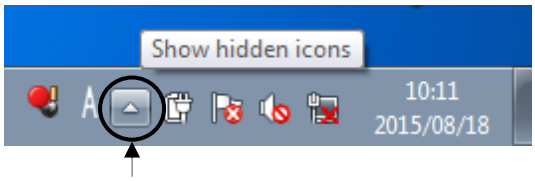
Make sure that the loaders are not running before uninstalling (deleting) the Message Manager. If any one of the loaders is running, close the loader before starting uninstallation.

Close the Message Manager.

Be sure to close the Message Manager before uninstalling (deleting) the Message Manager. The Message Manager is automatically started when the Loader is started. However, it does not close automatically.

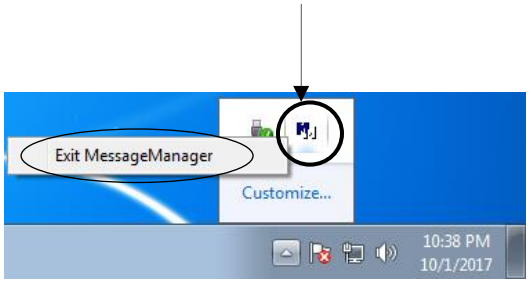
The following section describes how to close the Message Manager.

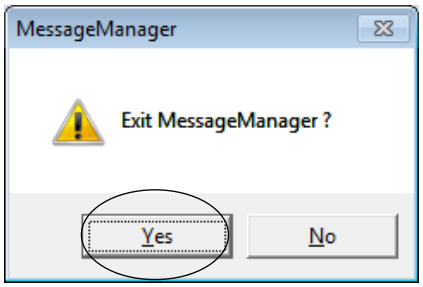
Procedure for Closing the Message Manager



Left-click here, and hidden icons are displayed as shown below.

Right-click the Message Manager icon and select [Exit MessageManager] on the context menu, and a dialog box appears. Click [Yes], and the Message Manager is closed.





The icon may be displayed here.

Tip
- If the Message Manager cannot be closed using the above procedure, shut down Windows or log out.

Note
- If an attempt is made to uninstall without closing the Message Manager, some of the files will not be deleted. Under such situation, if an attempt is made to install the Message Manager again, the installation will turn out to be incomplete and a communication failure may occur in the communication between the Loader and connected devices. Be sure to start uninstallation after the Message Manager is closed.
  If uninstallation is performed while the Message Manager is running, execute "[3] After Uninstalling the Message Manager" after uninstallation.

[2] Uninstallation of the Message Manager

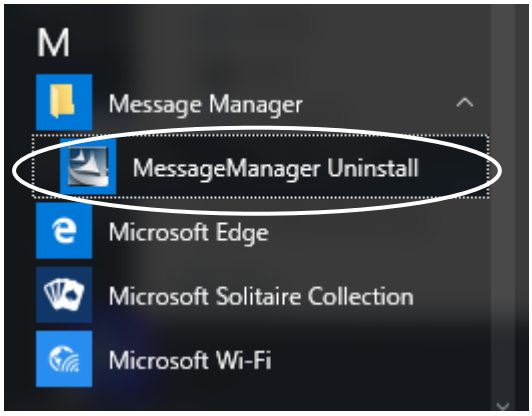
This section describes how to uninstall the Message Manager from the start menu by selecting [Message Manager] -> [Uninstall Message Manager].

Windows 10

On the Windows, select [Start] -> [All apps] -> [Message Manager] -> [Uninstall Message Manager].

Windows 8.1

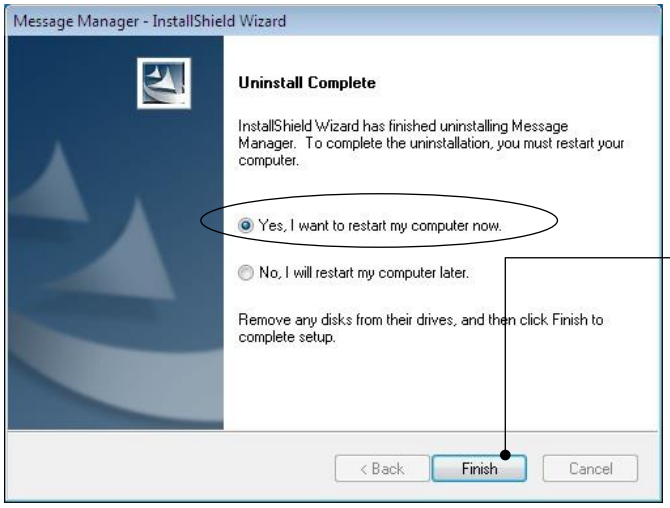
Left-click [All apps] icon and then select [Message Manager] -> [Uninstall Message Manager].



When [Uninstall Message Manager] is selected, the uninstallation confirmation screen will be displayed as shown here.

Upon confirmation, click [Yes].

Uninstallation is executed according to the above procedure.



If the system is considered to be in a good state for restarting after uninstallation, click [Finish].

Restarting is particularly important if uninstallation is performed without closing the Message Manager. Be sure to restart the system.

[3] After Uninstalling the Message Manager

The following actions are required if uninstallation is performed without closing the Message Manager.

Restarting the PC

Be sure to restart the PC at the end of "[2] Uninstallation of the Message Manager" on the previous page.

Checking the Installation Folder for the Message Manager

When the PC is started, using the Windows Explorer, access the installation folder for the Message Manager and confirm that the installation folder is deleted.

Tip

- The installation folder for the Message Manager is a folder specified under "1.4.1.3 [2] Installation of the Message Manager" if the Message Manager has been installed using the VFD Doesa-Loader.

  The default folder is as follows.

- 32-bit OS

  C:¥Program Files¥Common Files¥Fuji Electric Shared¥Message Manager

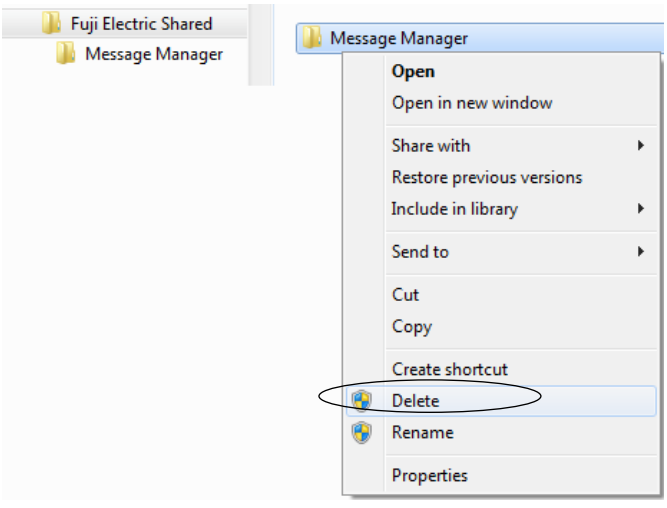
- 64-bit OS

  C:¥Program Files (x86)¥Common Files¥Fuji Electric Shared¥Message Manager

  Here,"C:" is a drive letter for the disk or partition where the Windows is installed. If the Windows is installed in a different drive, substitute a drive letter for that drive.

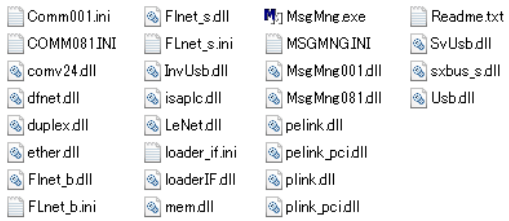
Deleting the Installation Folder for the Message Manager

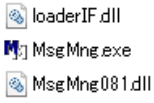
If the installation folder for the Message Manager exists, delete the installation folder.



[4] Supplement: Presence of Files during Uninstallation

The following table shows the presence of files contained in the Message Manager installation folder during uninstallation.

<table>
<tr><td rowspan="2">Uninstallation</td><td colspan="3">Presence of files inside the installation folder</td></tr>
<tr><td>When the Message Manager is stopped</td><td colspan="2">When the Message Manager is executed</td></tr>
<tr><td>Before starting uninstallation</td><td colspan="3"> 

All the files required are present.</td></tr>
<tr><td>When uninstallation is completed</td><td>The installation folder does not exist.</td><td colspan="2"> 

Some files are present.</td></tr>
<tr><td>After restarting the PC</td><td>The installation folder does not exist.</td><td>The installation folder does not exist.</td><td>

Some files may be present.</td></tr>
<tr><td>When the installation folder is manually deleted</td><td></td><td></td><td>The installation folder does not exist.</td></tr>
</table>

Note

- Do not install the Message Manager when some files are present in the folder. Otherwise, the installation will turn out to be incomplete and a communication failure may occur in the communication between the Loader and connected devices.

1.5. Settings Required Before Using the Loader

1.5.1. Setting Function Codes Related to Communication on the Inverter Side

The following section describes the function codes on the inverter side that are related to the communication with the Loader. Be sure to perform this setting before connecting the Loader with the inverter.

Table 1-4 Inverter Function Codes Related to Communication with the Loader

Function code	Name	Setting range
y01, y11	Station address	1 to 255
y04, y14	Baud rate	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps
y10, y20	Protocol selection	0: Modbus RTU protocol 1: Doesa protocol (Loader protocol) etc.

The setting range and setting contents might differ depending on the model of the using inverter.

Function codes that require settings depend on where the Loader is connected to. The function code setting ranges and guidelines by connection point are shown below.

Table 1-5 Function Code Setting Ranges by Loader Connection Point

		Loader connection point		
		RS-485 communication port 1 on the inverter (via a converter)	RS-485 communication port 2 on the inverter (via a converter)	USB connector on the VF1A-PH1
Function code	y01	1 to 255	-	1 to 255
	y04	0 to 7	-	-
	y10	0 to 2	-	-
	y11	-	1 to 255	-
	y14	-	0 to 7	-
	y20	Other than 1 (In case of y10 = 1)	0 to 2	-

-: Not used.

Setting Guidelines

Table 1-6 Setting Guidelines when the RS-485 Ch.1 and RS-485 Ch.2 are Connected

Function code	Setting Guidelines	Reference section for Loader setting
y01, y11	Match with the [RS-485 station address] of the Loader. For multi-drop connection, avoid giving a duplicate address for other inverters.	1.5.5.2. Connection Setting
y04, y14	Match with the [Baud rate] of the Loader.	1.5.5.1 Communication Settings
y10, y20	◆ For models that support “Loader (Doesa)” protocol RS-485 Communication Port 1 Set "1" to y10 and a number other than 1 to y20. RS-485 Communication Port 2 Set "1" to y20.	1.5.5.1 Communication Settings

Note

- For Doesa protocol (Loader protocol), the Loader cannot be used simultaneously by multiple communication ports of the inverter. If the Doesa protocol (Loader protocol) is used simultaneously by multiple communication ports, the Loader communicates with the communication port that has the highest priority.
  The order of priority of the communication ports is as follows: the lowest priority is given to the RS-485 communication port 1 and the higher priority is given to the RS-485 communication port 2, and the next higher priority to the USB (via the remote keypad with USB).
  For example, if 1 is set to both y10 and y20, the Loader cannot communicate with the RS-485 communication port 1. So, be careful with the setting.

Table 1-7 Setting Guidelines when the USB Connector on the VF1A-PH1 is Connected

Function code	Setting Guidelines	Reference section for Loader setting
y01	Match with the [RS-485 station address] of the Loader.	1.5.5.2. Connection Setting
y11	Not used.	-
y04, y14	Not used.	-
y10, y20	Not used.	-

1.5.2. Checking Communication Ports on the PC (when Using a Converter)

The communication port (COM) is used for the interface between the Loader on the PC and the inverter.
Because of this, the converter to be used requires a function that operates as a virtual communication port (COM) and it is necessary to check the communication port (COM) number of the connected PC.
(For details about the converter to be connected, refer to "1.2.2.2. Devices Required for RS-485 Connection".)

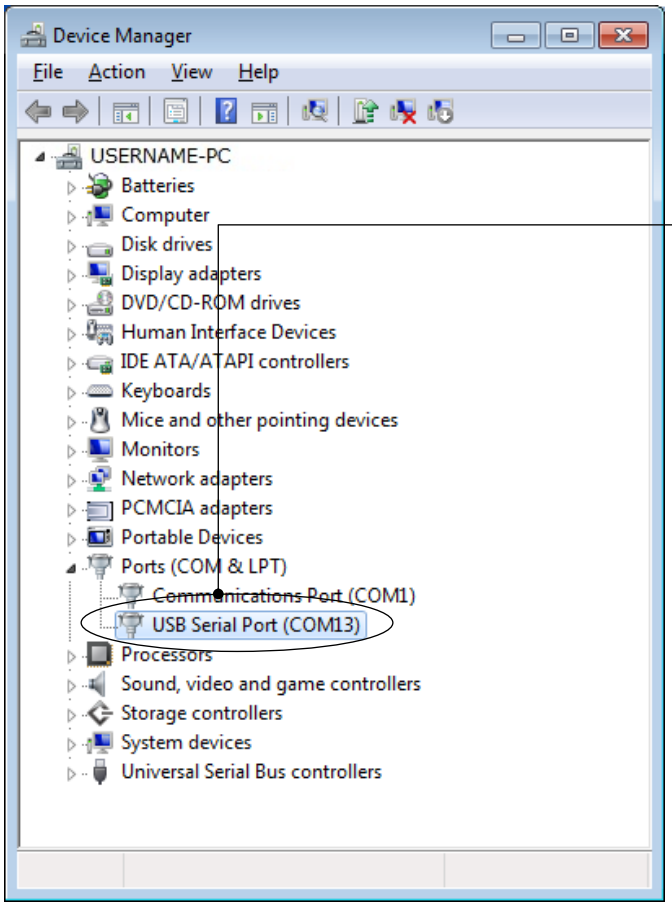
The following section describes the procedure to check the communication port number for each operating system.

Windows 10

Right-click the icon and select [Device Manager] to open it.

Windows 8.1

Right-click the icon on the [Computer], select [Properties] and then select [Device Manager].



Click the ▷ mark for Ports (COM & LPT) and check the number indicated in the square box in "USB Serial Port (COM☐)".

In the example shown to the left, the number is assigned as"COM13".

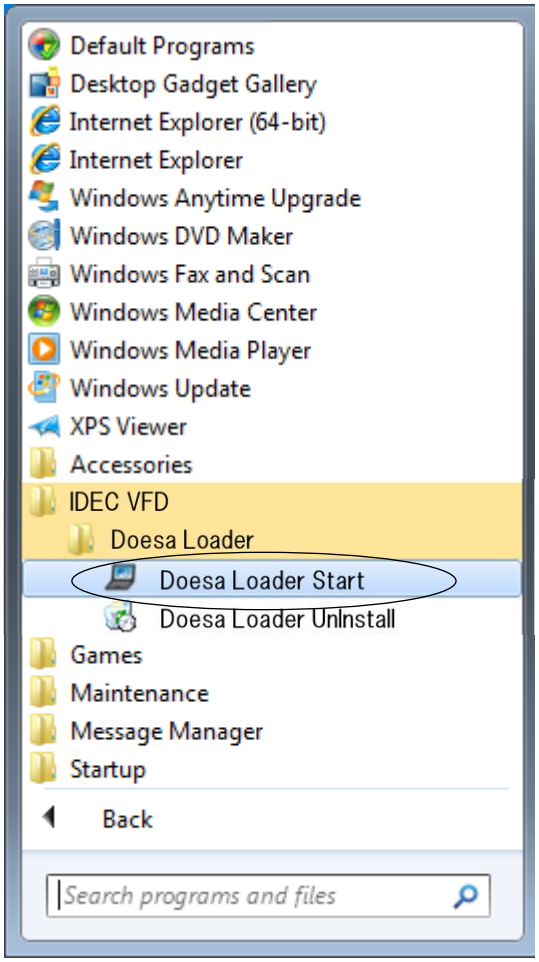
1.5.3. Starting the Loader

Windows 10

On the Windows, select the icon → [START] → [IDEC VFD] → [Doesa-Loader Start].

Windows 8.1

Left-click [All apps] icon and then select [IDEC VFD] → [Doesa-Loader Start].



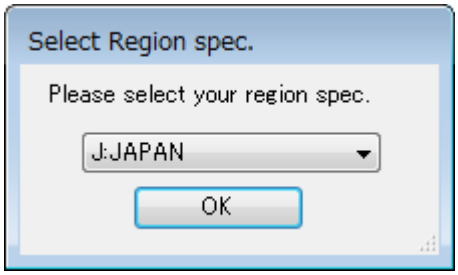
Setting the Operating Environment

When the Loader is started for the first time after installation, the language selection screen and region selection screen are displayed.

These screen are displayed only once at the start of using your system.

On the [Select language] window, select a language to be used for subsequent displays.

Tip
- The language can be changed from the main menu by selecting [Setup] -> [Language].
  For details, refer to "2.4.3. Language".



Next, select the "regional spec." for the inverter to be used.

Tip
- The "regional spec." of the inverter can be found in the nameplate on the inverter. For details, refer to "2.2.1. [1] Model, Regional Specification, Voltage, Capacity" or the instruction manuals of relevant inverters.

Tip
- The "regional spec." can be changed from the main menu by selecting [Setup] -> [Regional spec.]. For details, refer to"2.4.4. Region Spec.".

1.5.4. Overview of the Message Manager

The Message Manager is software that is used to control the Loader communication. Unless the Message Manager is started, the Loader cannot communicate with devices connected.

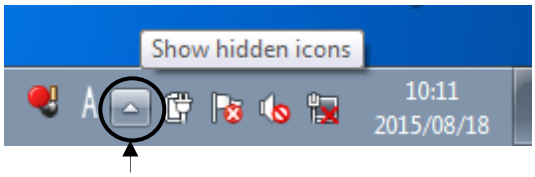
1.5.4.1. Checking the Startup of the Message Manager

When the Loader is started, the Message Manager is automatically started.

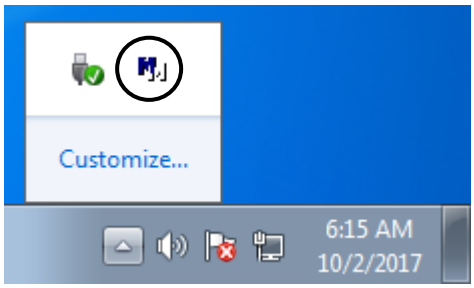
Confirm that the Message Manager icon is displayed on the task bar.

The display examples of the Message Manager icon are as shown below.

Display Examples of the Message Manager Icon



Left-click here, and hidden icons are displayed as shown below.



The icon may be displayed here.

Tip

- If the Message Manager icon is not displayed even after the Loader is started, reinstall the Message Manager.
  For information on the installation procedure, refer to "1.4.1.6. Installation of the Message Manager".
- You can also check the status of the message manager on the communication setting screen. Refer to “1.5.5.1 Communication Settings”.

1.5.4.2. Procedure for Closing the Message Manager

The Message Manager does not automatically close even when the Loader is closed. Normally, there is no need to close the Message Manager. However, the Message Manager must be closed when it needs to be uninstalled, when the USB driver needs to be installed, or when the Message Manager needs to be restarted as a step to recover a communication failure.

For information on procedures for closing the Message Manager, refer to "1.4.1.4. [1] Before Installing the USB Driver]" or "1.4.2.2. [1] Before uninstalling the Message Manager".

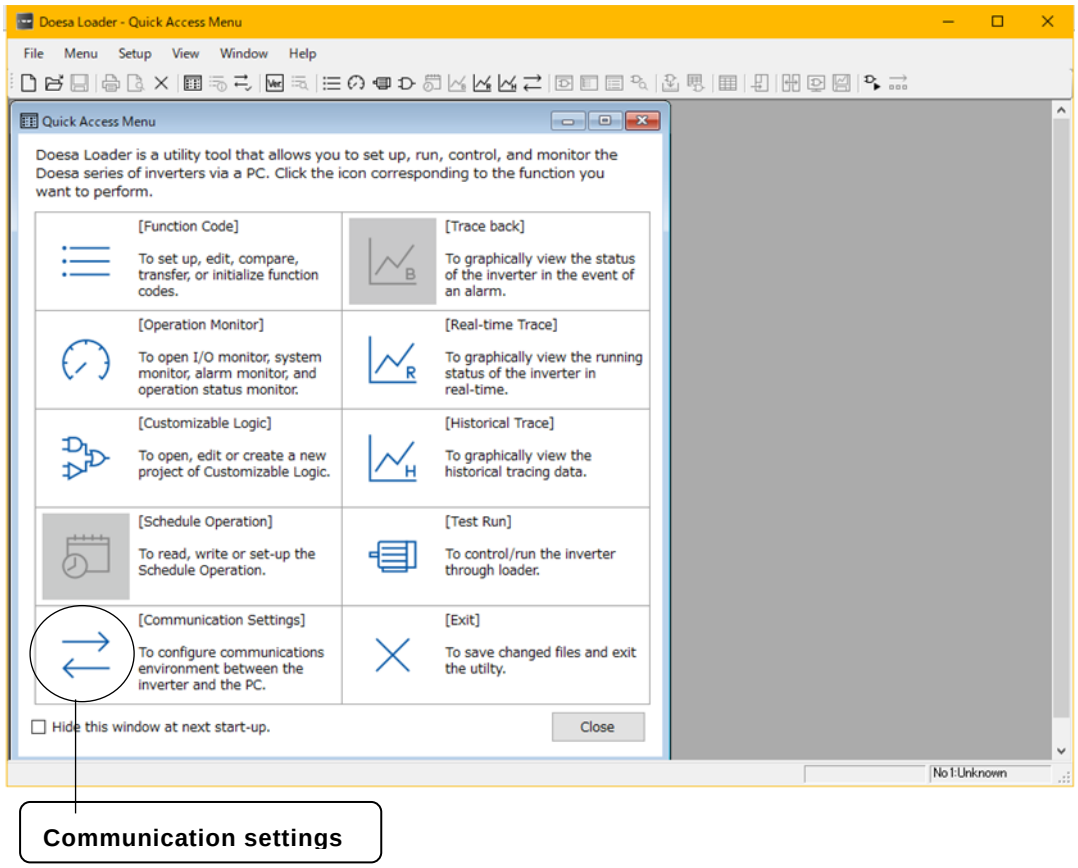
Note
- If an attempt is made to close the Message Manager while the Loader is running, a communication failure will occur in the Loader. When closing the Message Manager, be sure to close the Loader first.

1.5.5. Communication Setting and Connection Setting for the Loader

When the Loader is started, the following screen (Quick Access menu) is displayed.

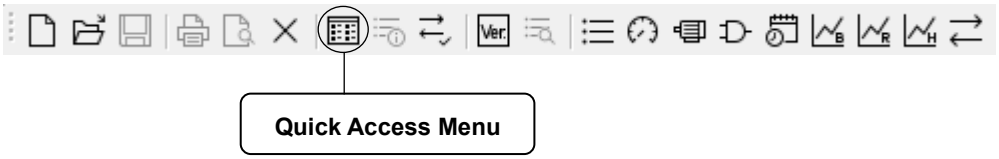
By clicking an icon on the screen, you can start the corresponding function. The details of these functions are described in the later section.

This section starts with an explanation on the communication setting function.



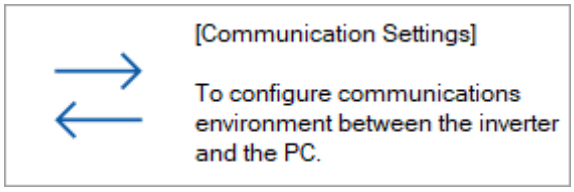
Tip

- If the Quick Access menu is not displayed, click the icon on the toolbar (the bar with various icons below the main menu as shown below) to display the Quick Access menu.

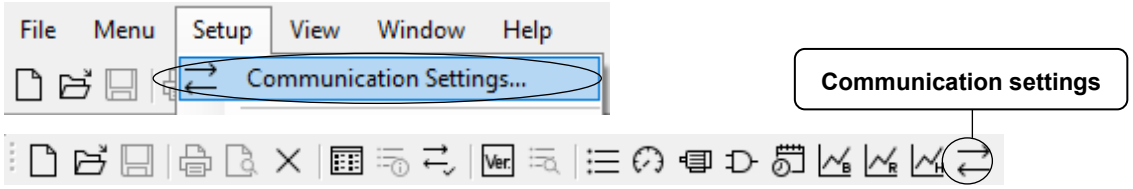


1.5.5.1. Communication Settings

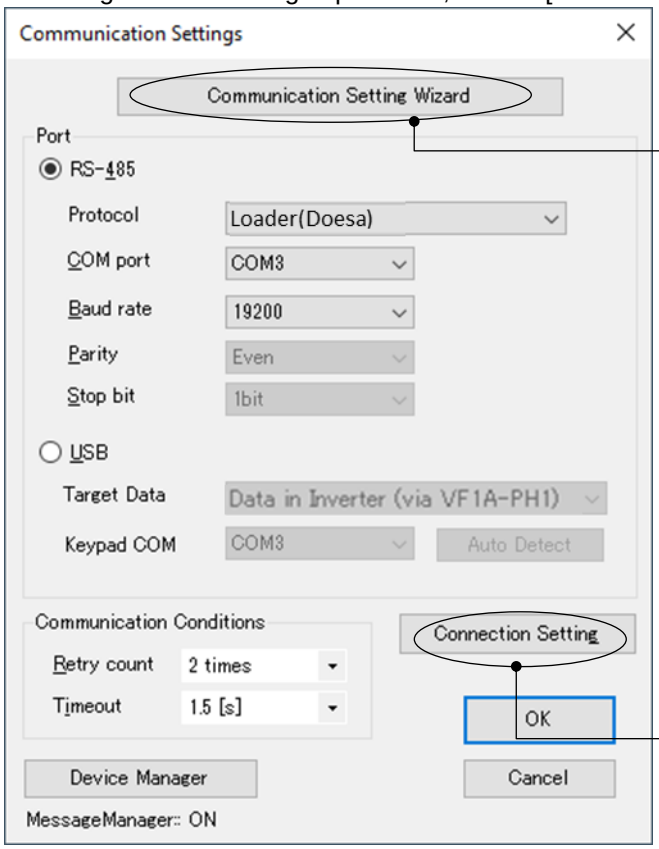
Click the [Comm Setting] icon on the left column of the Quick Access menu to display the [Communication setting] window.



The [Communication setting] window can also be displayed, without using the Quick Access menu, by selecting [Setup] -> [Communication Settings] on the main menu or by clicking the icon on the toolbar.



Referring to the following explanation, set the [Communication setting] window.



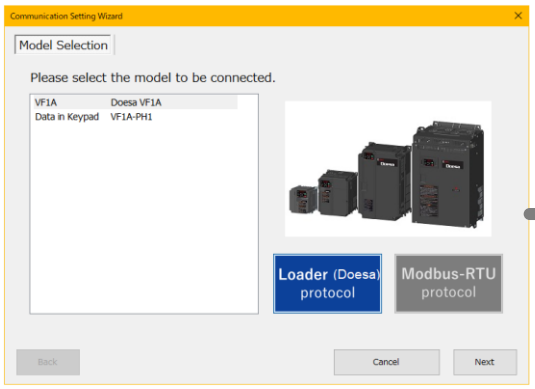
Click the [Communication Setting Wizard] button to start a wizard to set communication settings easily.
Refar to “1.5.5.1 [1] Communication Setting Wizard”.

Click the [Connection setting] button to display the [Connection setting] window.
For information on the [Connection setting] window, refer to "1.5.5.2. Connection Setting".

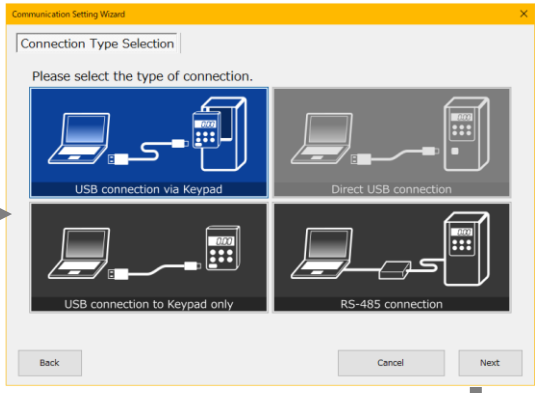
[1] Communication Setting Wizard

Communication settings can be completed by selecting the inverter to be used and the connection method in step by step , and the setting results are reflected in [1.5.5.1.[2] Port]. The next setting screen changes depending on what you select, so you can set it easily.

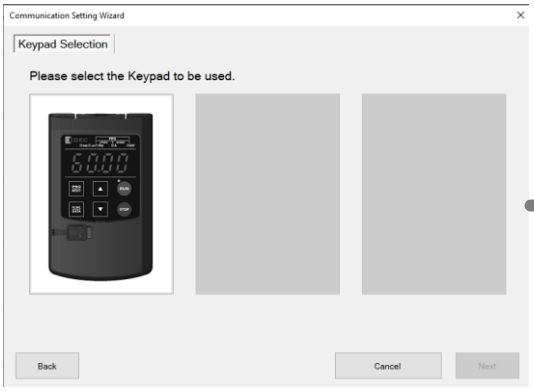
The following is an example of screen transition when connecting to the VF1A series using USB via VF1A-PH1 remote keypad.



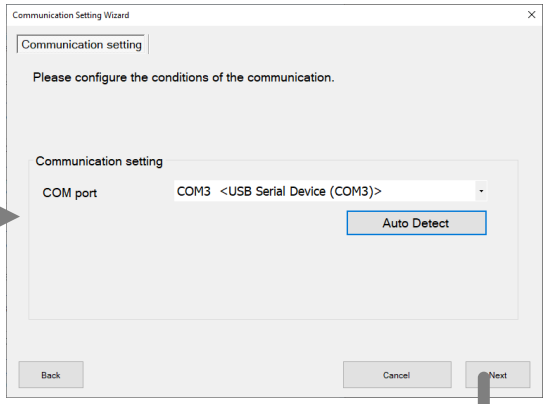
Model Selection



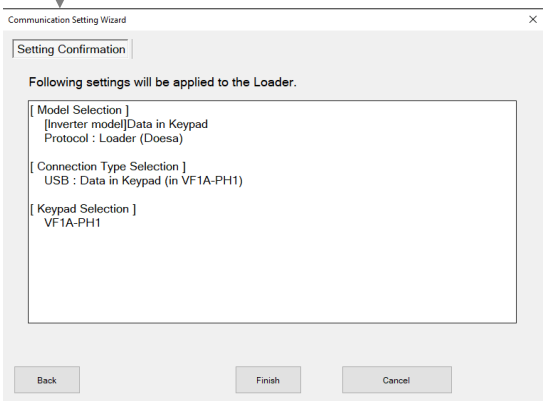
Connection Type Selection



Keypad Selection



Communication setting



Setting Confirmation

[2] Port

Set the following items related to communication.

Tip • If the communication settings using the settings wizard on the previous page have been completed, you do not need to reconfigure in this section.

RS-485 Connection

Select this for connecting the PC directly to the inverter via RS-485.
For information on connection examples, refer to "1.2.2.1. [1] Multi-drop Connection Using the RJ-45 Connectors" or "1.2.2.1. [2] Multi-drop Connection Using Terminal Blocks".

- Protocol

Select the communication protocol.
The supported protocols differ depending on the inverter.

- COM port

Select the communication port of the PC connected to the USB/RS-485 converter or RS-232C/RS-485 converter.

Tip • Check the communication port of the PC using the Device Manager of the OS. Refer to "1.5.2. Checking Communication Ports on the PC (when Using a Converter)".

- Baud rate

Set the baud rate. It must be set to the same value as the baud rate set for the inverter.

Tip • For information on the baud rate of the inverter, refer to "1.5.1. Setting Function Codes Related to Communication on the Inverter Side".

- Parity

Cannot be set in case the protocol is “Loader (Doesa)”. It is internally fixed to "Even".

- Stop bit

Cannot be set in case the protocol is “Loader (Doesa)”. It is internally fixed to "1 bit".

Tip • For information on recommended conditions of the RS-232C/RS-485 converter or USB/RS-485 converter, refer to "1.2.2.2. [1] Converter".

USB Connection

Select when connecting the PC to the inverter or keypad using a USB cable.
Select the following depending on the connection target.

- **Target Data**
  - Data in Inverter (via VF1A-PH1)
    Select this when connecting the PC to the inverter using the USB connector of the VF1A-PH1.
    For information on connection examples, refer to "1.2.3.1. [1] Connection with the Inverter via the remote keypad with USB".

  - Data in Keypad
    Select this to access the memory in the VF1A-PH1.
    Select this when using the kepyad as a temporary memory medium.
    For information on connection examples, refer to "1.3.2. Connection between the PC and the keypad".

[3] Communication Conditions

Set the following items related to communication retries.

- Retry count

Set the number of retries for when a communication failure occurs. If you set to a high number of retries, the possibility of recovering communication becomes high. However, the time until the error dialog is displayed becomes long as well.
1 time or more is recommended.

- Timeout

If a response is not returned from the inverter within the time set here, the communication error dialog will be displayed. The shorter the timeout time is set, the more quickly the error display appears. However, if it is too short, a communication error may occur even when communication is normal because of the time taken up by the inverter for its processing.

[4] Other

- Device Manager

Open Windows Device Manager to check the installation status of the USB driver.

- Message Manager

Displays the startup status of Message Manager. (ON: Indicates that it is working)
For the Message manager, refer to [1.5.4 Overview of the Message Manager].

1.5.5.2. Connection Setting

Click the [Comm Setting] icon on the left column of the Quick Access menu to display the [Communication setting] window. On this window, click the [Connection setting] button to display the [Connection setting] window.

The [Connection setting] window displays information corresponding to the equipment name (inverter) on each row as shown below. Double-click the row for the equipment to be changed or added, and the [Advanced...] window shown on the next page is displayed.

Selection of inverters for communication

Put the ☑ mark in the checkbox to the left of the "No." column to assign the corresponding inverter to be the communication target.

Communication status

Displays the state of communication between the Loader and the inverters.

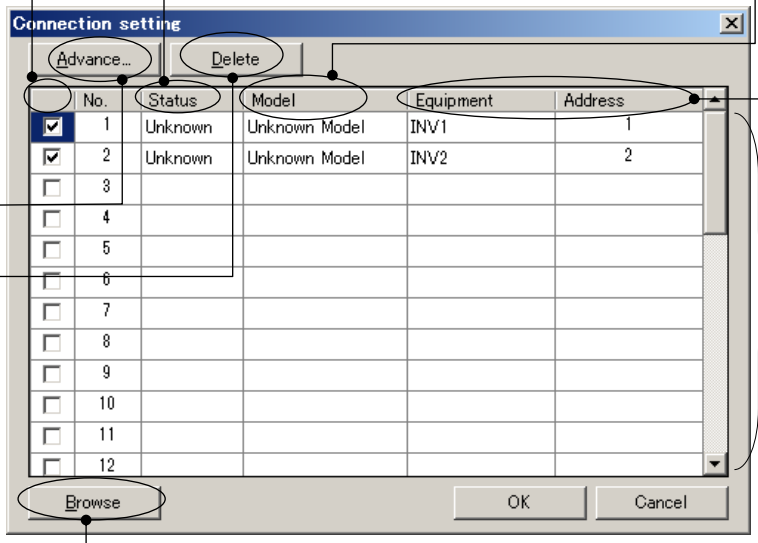
Unknown: The communication status has not been confirmed.

Connected: Communication has been established.

Disconnected: Communication has not been established.

Model

Displays the model read from the inverter.
If communication has not been established at all, [Unknown Model] is displayed.



Equipment name, RS-485 station address

Displays what has been set on the [Advanced...] window.

Number of display rows

The number of rows depends on the port selected on the [Communication setting] window.

If [RS-485] is selected, a multiple number of rows are displayed.

If [USB] is selected, only one row is displayed.

Connection check

Click the [Browse] button to check whether the connection is established between the Loader and the inverter specified by the ☑ mark in the checkbox to the left of the "No." column.
The check result is displayed in the "Status" column.

Setting

Select the row to be edited and then click the [Advance...] button to display the [Advanced...] window shown below.
It is also possible to double-click the row to be edited to display the [Advanced...] window.
Settings on the [Advanced...] window are provided on the next page.

Delete

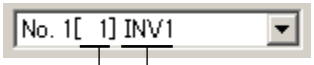
Used to delete the inverter registered on the selected row.
Used when removing inverters are disconnected from the Loader.

The [Advanced...] window is used to set [Equipment name] and [RS-485 station address].

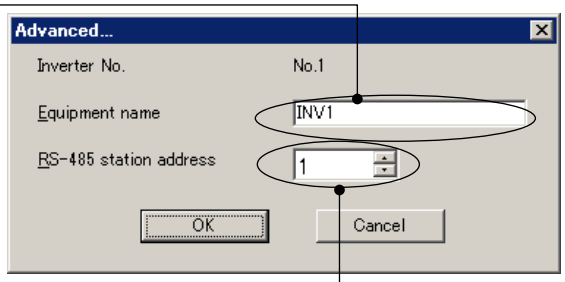
Equipment name

Enter the name of equipment where connected inverters are installed.
Not used for communication.
As shown in the display example below, the equipment name is used in the list menu for selecting target inverters on each screen.

Display example of target inverters



Equipment name
RS-485 station address



RS-485 station address

According to the port setting on the [Communication setting] window, follow the setting guidelines shown below to set the address.

Port setting on the [Communication setting] window		Setting Guidelines
RS-485 Connection		Used for communication. Match with the inverter's station address (function code y01 or y11).
USB Connection		
	Data in Inverter (via VF1A-PH1)	Used for communication. Match with the inverter's station address (function code y01).
	Data in Keypad	Used for communication. Only "1" can be set.

Tip

- For information on the station address of the inverter, refer to "1.5.1. Setting Function Codes Related to Communication on the Inverter Side".

Note

- If a communication failure occurs due to a disconnection or other faults in one of the inverters registered under the [Connection setting] window, the response becomes extremely slow. Remove the faulty inverter from the list for the connection setting.
- When using the operation monitor function, be sure to register the target inverter for monitoring in the No.1 row. When you want to monitor multiple devices connected in multi-drop connection, specify the monitored inverters serially in rows No.1, No.2, No.3, and so on.

  Example: When monitoring two inverters using the operation monitor function

  Good example

	No.	Communication status	Model
☑	1	Connected	VF1A
☑	2	Connected	VF1A
☐	3		

Note

Bad example

	No.	Communication status	Model
☑	1	Connected	VF1A
☐	2	Unknown status	VF1A
☑	3	Connected	VF1A

	No.	Communication status	Model
☐	1		
☑	2	Connected	VF1A
☑	3	Connected	VF1A

Chapter 2

Function Description

This chapter describes the main functions of the loader.

2.1. Main Window

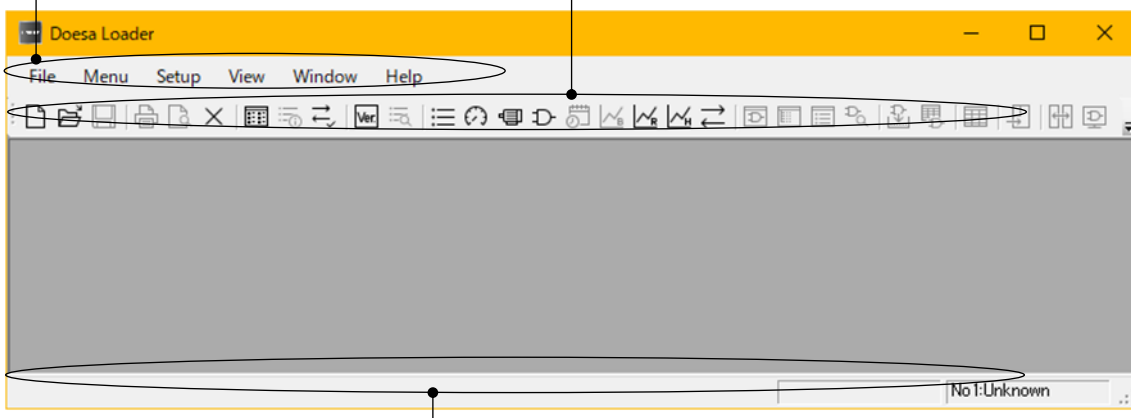
This is the window that first appears when the loader is started. The Quick Access menu is displayed on this screen when the loader starts. (The display has been omitted here.)

Main menu

You can select all the loader functions.

Toolbar

You can select the primary loader functions.



Status Bar

The text that describes the selected function appears in this area. It also displays the status of connection with the inverter in the lower right box.

Main menu

It contains six selectable functions: [File], [Menu], [Setup], [View], [Window], and [Help].

(When the [Function Code List] window is displayed, the [Edit] and [FunctionCodeEdit] options are added to the main menu.)

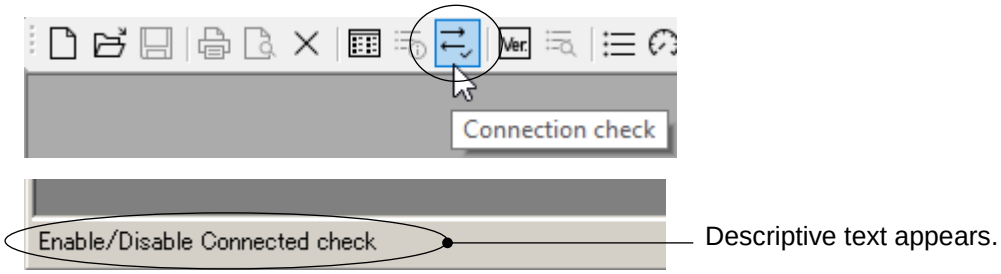
Toolbar

This allows you to select common functions quickly and easily. For example, to open a file which contains the function code data, you should normally click [File] on the main menu and then click [Open] under the [File] menu; accordingly two actions are required. Using the toolbar, you can open the file simply by clicking the icon.

Status Bar

Hover the mouse pointer over a function icon or menu displayed. Then, the text appears that describes the meaning of the function or menu.

Display example: The following text appears when you hover the mouse pointer over the [Perform Connection Check] icon on the toolbar.

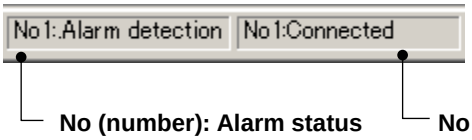


Descriptive text appears.

The lower right box is enabled when you configure the loader to "check the connection" using the communication settings (see "1.5.5.1. Communication Settings") or the [Connection Check] icon on the toolbar (see the display example above).

When configured to check the connection, the loader checks the status of the devices marked with ☑ in the [Connection Setting] window (see "1.5.5.2. Connection Setting") in the ascending order of their numbers at certain intervals and displays the result.

Display example



No (number): Identifies each device checked.
The [Number] corresponds to the [No.] column of the [Connection Setting] window.

Alarm status: Shows the inverter's alarm status.

Displayed content	Description
Nothing is displayed	The inverter is operating normally.
Alarm detection (flashing)	An alarm condition has occurred with the inverter.

The alarm status is not displayed if the connection check is disabled or the connected device is the keypad.

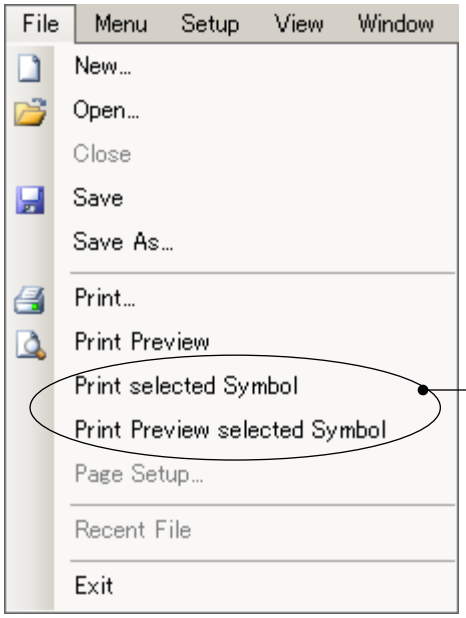
Communication status: Shows the status of the communications between the loader and the connected device.

Displayed content	Description
Connected	The communications link has been established.
Not connected	The loader cannot communicate with the device.

"Unknown" appears when the connection check is disabled.

2.2. File

The [File] menu provides the following submenus:



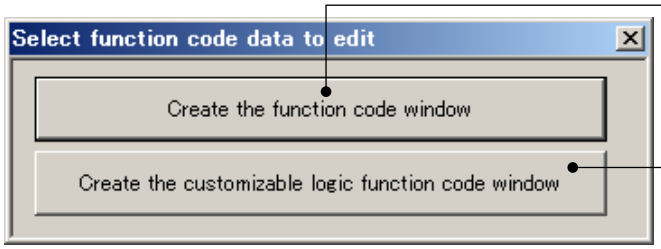
[Print selected Symbol]
[Print Preview selected Symbol]
These submenus are available when the [Customizable logic] window is open.

This section describes the main functions available under the [File] menu.

2.2.1. Create a New File

This function creates a new file of function code data.

From the main menu, click [File] > [New...] to open the [Select function code data to edit] window.



Standard function code window

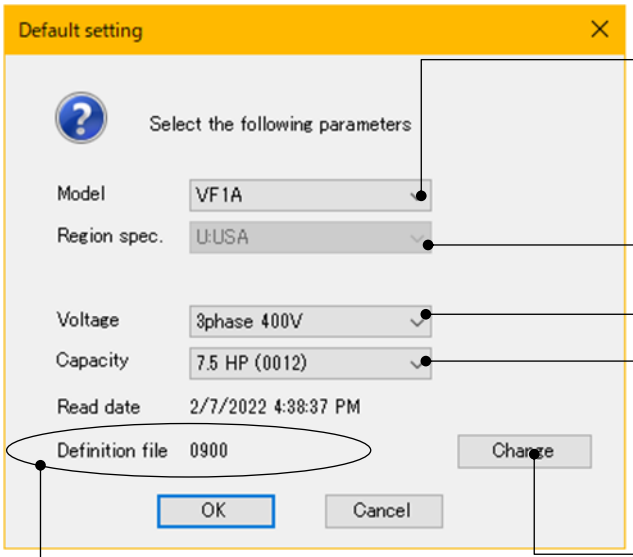
Select this when you want to edit standard function codes (such as F, E, C).

Customizable logic function code window

Select this when you want to edit customizable logic function codes (such as U, U1, UA, UB).

Click either button to open the [Default setting] window.

The [Default setting] window lets you configure the information on the inverter for which you want to edit function codes.



Model

Select the model number.

Regional specification

Displays the region specified by selecting [Setup] -> [Region spec.] from the main menu.

Voltage

Select the inverter voltage.

Capacity

Select the inverter capacity.

Change

Change the definition file according to the inverter ROM version.
Refer to "[2] Guidelines on Selecting a Definition File" on the next page.

Definition file

From the definition files installed, the loader automatically selects the most recent definition file.

[1] Model, Regional Specification, Voltage, Capacity

Correctly set these values according to the inverter for which you are editing function codes.

You can identify these values from the inverter model number printed on the rating nameplate of the inverter.

The following example shows the format of an inverter model number. For details, refer to the instruction manual of your inverter.

VF1A - G 02A1 S 4

Code	Series name
VF1A	Doesa VF1A series

Code	Applicable tiled
G	General purpose

Code	Rated output current [A]	Nominal applied motor [kW(HP)]
02A1	2.1	0.75 (1)
04A1	4.1	1.1 (1.5)
05A5	5.5	2.2 (3)
06A9	6.9	3 (4)
12A0	12	5.5 (7.5)
21A5	21.5	7.5 (10)
28A5	28.5	11 (15)
37A0	37	15 (20)
44A0	44	18.5 (25)
59A0	59	22 (30)
72A0	72	30 (40)
85A0	85	37 (50)
105A	105	45 (60)
139A	139	55 (75)

Code	Power supply
4	Three-phase 400V

Code	Applicable tiled
S	Basic type (No built-in EMC filter)

For inverter type VF1A-G□□□□S4, the destination value (function code H101) is “5: Americas” by the factory default.

You can change the regional specification by selecting [Setup] -> [Region spec.] from the main menu. Once you have changed the regional specification, you have to quit and restart the loader. Refer to "2.4.4. Region Spec." for details.

Note

- If your specified model, regional specification, voltage, or capacity is different from that of the inverter, an error may occur when reading or writing function codes due to unmatched function code attributes or other reason.

[2] Guidelines on Selecting a Definition File

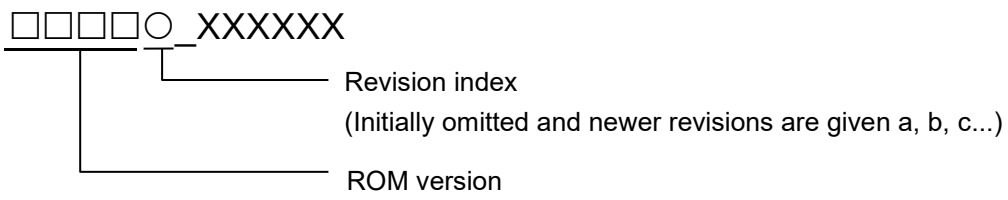
A definition file contains the information required to identify each inverter model and its functions.

Select the appropriate definition file based on the definition file version, revision index, and inverter ROM version.

Definition file version and revision index

The displayed four-digit number is the ROM version, and one letter following to the version is the revision index.

- In case of the Simplified display

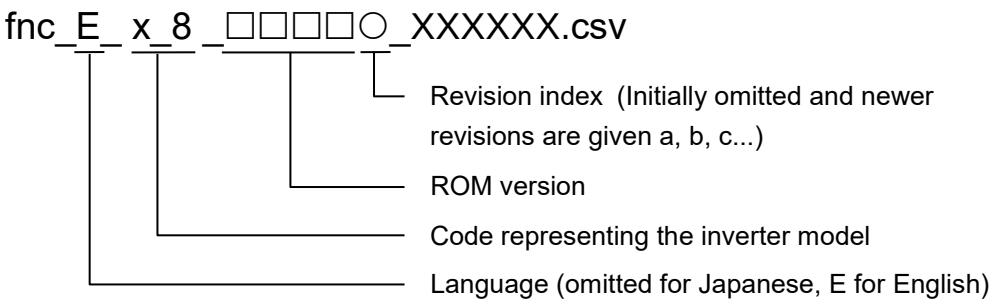


Display example:

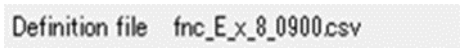
ROM version: 1300, and Revision index: a.

- In case of the File name display

Format of the definition file name (Example: VF1A)



Display example:



ROM version: 900, and Revision index: -.

ROM version of the inverter

You can identify the inverter ROM version from the inverter keypad. For more information, refer to the instruction manual of your inverter.

Tip

- When the Loader is connected to an inverter, you can identify the inverter ROM version from [Inverter ROM Version] on the [System Monitor] tab of the [Operation Monitor] window, which you can access by selecting [Operation Monitor] from the Quick Access menu.
- When the Loader is connected to an inverter, you can automatically select the optimum definition file by selecting [Read from the Inverter] (to read the settings from the inverter) from the [Edit data selection] window, which you can access by selecting [Menu] -> [Setting function code] -> [Edit data selection].

Note

- If the selected definition file is not appropriate for the inverter ROM version, an error such as failure to read or set the desired function code may occur due to the difference in the number of function codes or other reason. If this is the case, you will have to use a different method such as the inverter keypad to access the desired function code.

Tip

- If the inverter ROM version is unknown when creating a new definition file, you can change the definition file later. For more information, refer to "2.3.1.3. [3] Changing a Definition File".

  Changing a definition file may, however, cause an error due to the difference between definition files. You are recommended to select a definition file that is as appropriate as possible when creating a new one.

Guidelines for selecting definition files

Some guidelines on selecting a definition file are shown below.

- If there is a definition file of the same version as the inverter ROM version:

  Select the definition file that is of the same version as the inverter ROM version and has the newest revision index.

If there is not a definition file of the same version as the inverter ROM version, select the appropriate definition file as described below.

- If the inverter is VF1A

  Select the definition file that is of the same version as the replaced version according to the "3.2.5. Replacement of Inverter ROM Versions" and has the newest revision index.

- If there is not the inverter ROM version in "3.2.5. Replacement of Inverter ROM Versions":

  The inverter may have been upgraded after the release date of your loader. Access the technical support page on IDEC website and check for the latest loader version upgrade file. If one exists, download and use it.

  If the loader or the definition file is up-to-date but the inverter ROM version is still later than the

versions of all the definition files, select the definition file that is of the version earlier than but closest to the inverter ROM version and has the newest revision index.

- If there are only definition files whose versions are different and later than the inverter ROM version:

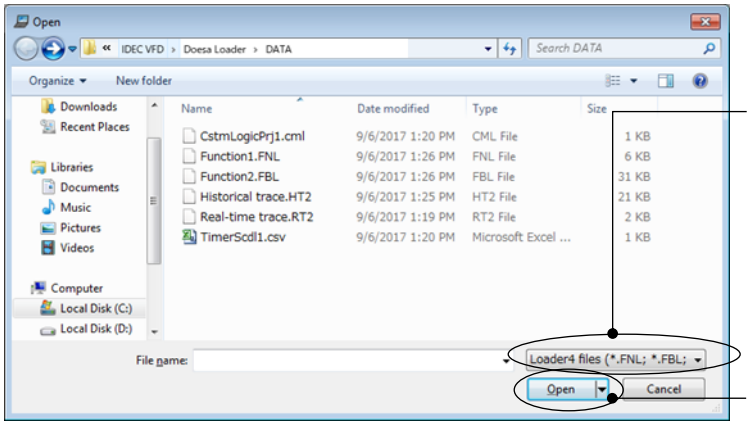
  Select the definition file that is of the version earlier than but closest to the inverter ROM version and has the newest revision index.

Tip

- If an error occurs in reading or writing function codes after you have selected a definition file in accordance with the above guidelines on selecting a definition file, contact your IDEC representative.

2.2.2. Open

Selecting [Open] displays a window that allows you to open and edit or view a saved, existing file that contains function code, realtime trace, historical trace, trace back, customizable logic, or scheduled operation information.



Filter

Select the type of files displayed in the list. Change the filter to display the files saved from a loader other than VFD Doesa-Loader.

Open

Opens the selected file.

File types

	VFD Doesa-Loader
Function code data	*.FNL *.FBL
Realtime trace data	*.RT2 (*1)
Historical trace data	*.HT2
Customizable logic project data	*.CML

(*1) To open an RT2 file that contains the traces of the signals added using the trace monitor function and correctly display the signal names, units, and data step sizes, you have to provide the customizable logic project data with which the trace monitor information was saved.

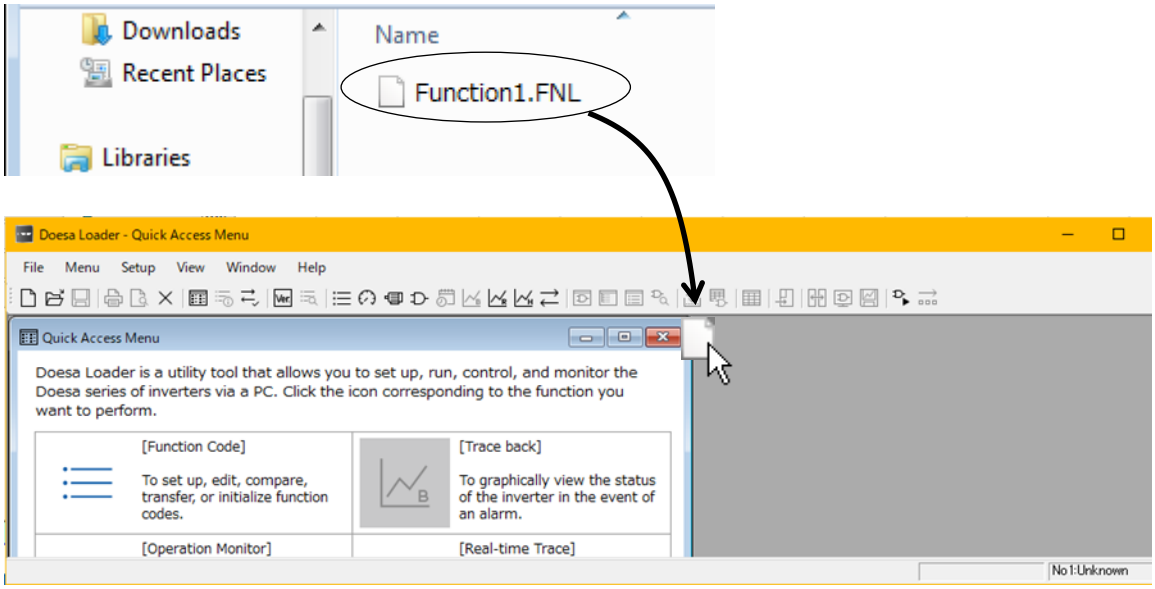
Tip

- For more information on the trace monitor function, refer to "2.3.4.10. Combination with the Customizable Logic Function".

Tip

- The file types shown on the previous page are the types of the files available in the [Open] dialog. For more information on the file types used in VFD Doesa-Loader, refer to "3.2.1. Type of Files Used by VFD Doesa-Loader".

You can also drag and drop a file on the loader screen to open it.



2.2.3. Close

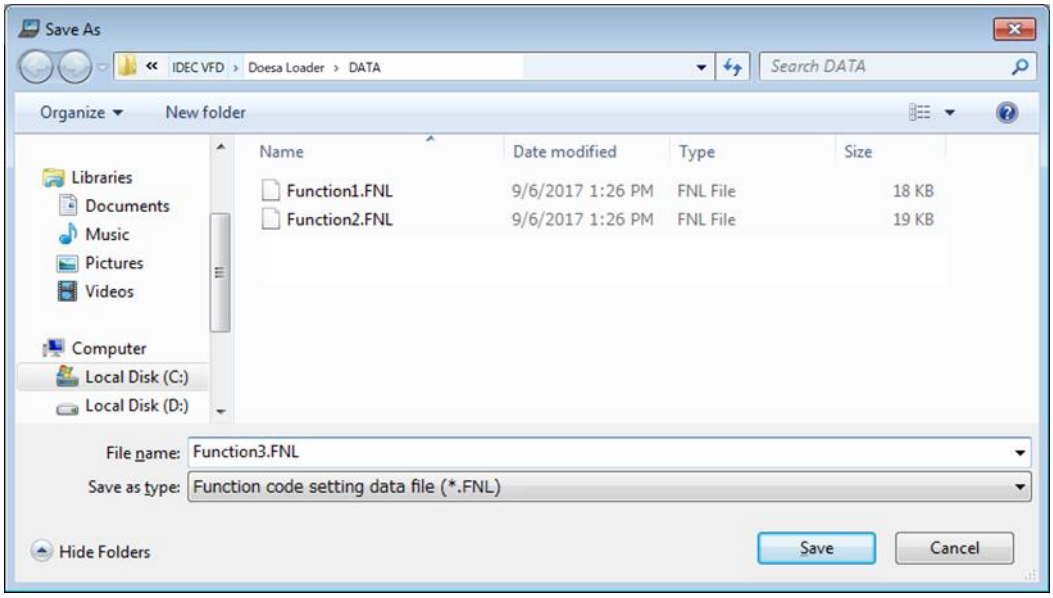
Closes the currently active window.

2.2.4. Save

This function is available when [Function Code List], [Customizable Logic], [Realtime Trace], [Historical Trace], or [Trace back] window is active. Selecting [Save] saves the data in the active window.
If the data has not been saved before, the [Save] function does the same operation as "2.2.5. Save As".

2.2.5. Save As

This function opens the following dialog, which allows you to enter the name of the active file and save it under the entered name.



* The types of files you can save are as follows:

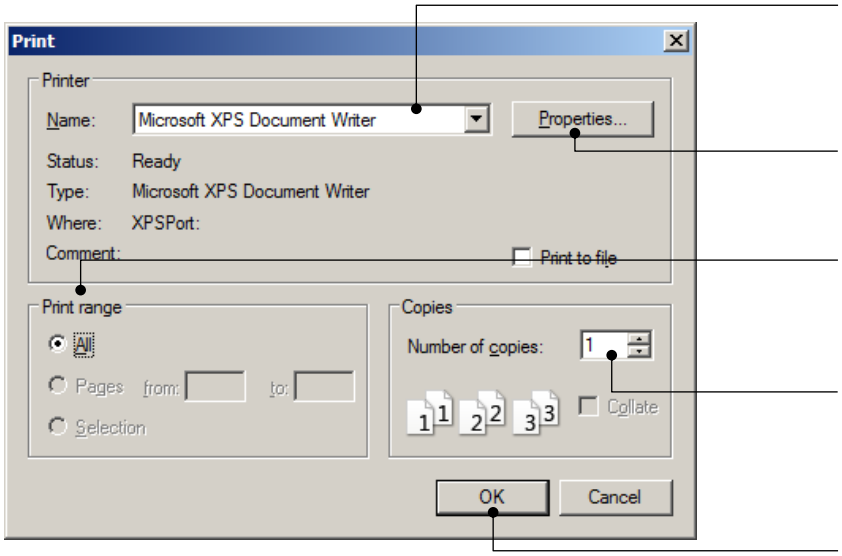
- Function code data:	*.FNL, *.FNB
- Realtime trace data:	*.RT2, *.CSV
- Historical trace data:	*.HT2, *.CSV
- Trace data (graph image):	*.JPG, *.BMP
- Customizable logic project file:	*.CML

Note

- The length of the path and file name should be up to 200 single-byte characters (up to 100 double-byte characters). Otherwise the file cannot be saved.

2.2.6. Print

This function allows you to specify the printer, its properties, the print range, and the number of copies to be printed.



Printer Name

Select an available printer

Properties

Specify the detailed settings specific to the selected printer

Print Range

Currently fixed to the [All] option

Number of copies

Specify how many copies to print

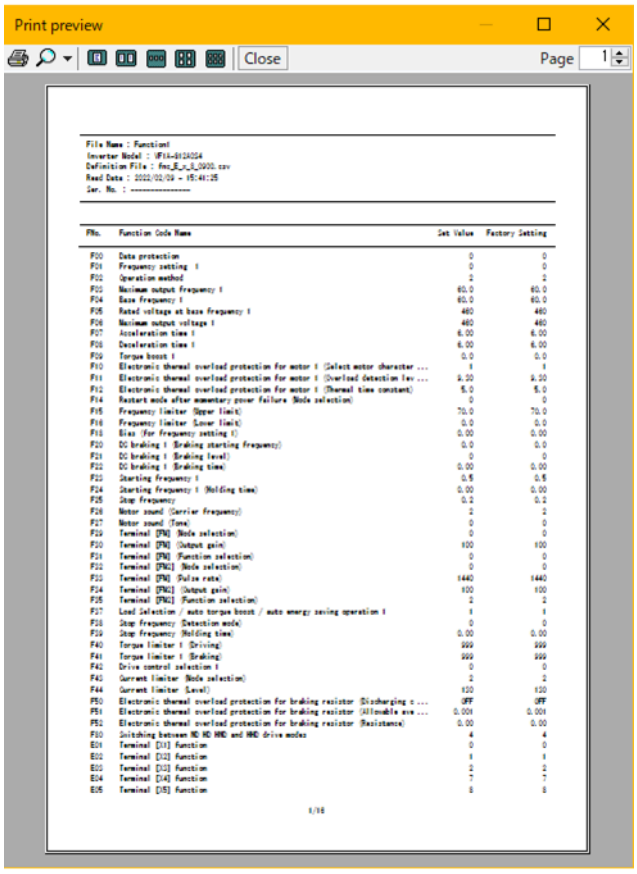
OK

Click this button to start printing

2.2.7. Print Preview

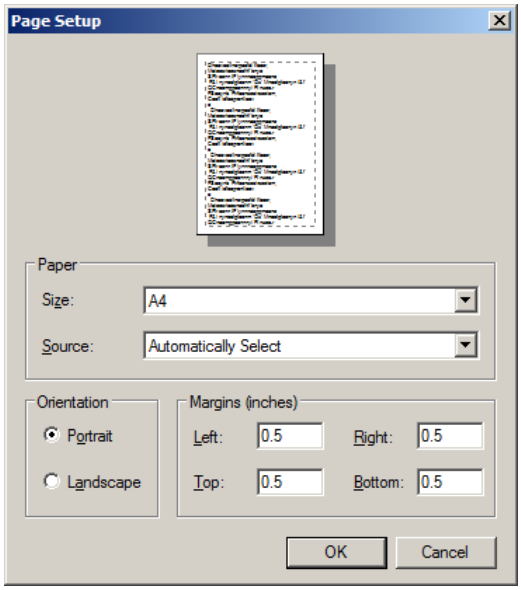
This function allows you to view the print preview of the data in the currently active [Function Code List], [Trace], or [Customizable logic] window.

Example: Print preview of the data in the [Function Code List] window



2.2.8. Page Setup

This function, which is available when the [Function Code List] or [Trace] window is active, allows you to configure page settings.

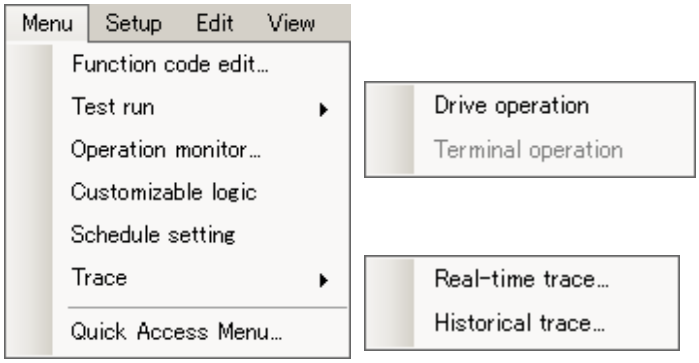


2.2.9. Exit

This function allows you to exit from the loader.

2.3. Menu

[Menu] provides the following submenus:

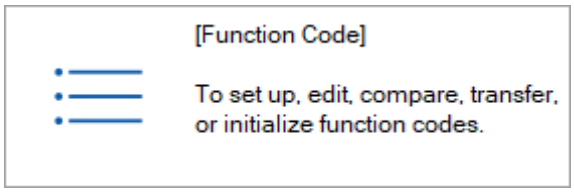


All the options except [Terminal operation] and [Quick Access Menu] are accessible from the [Quick Access Menu] window as well.

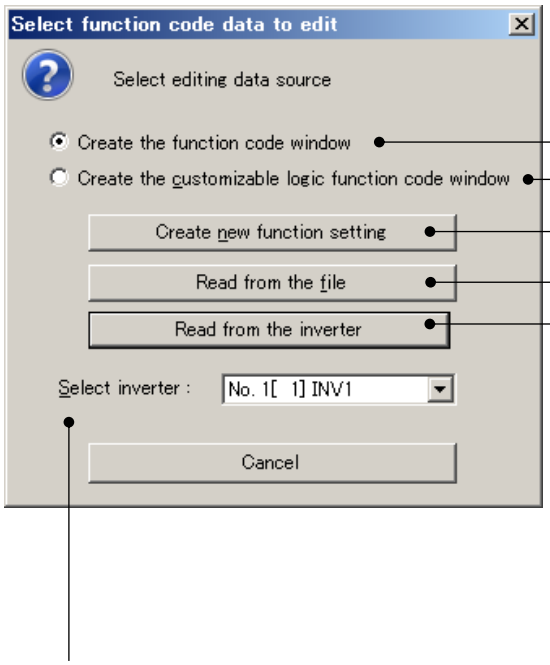
This section describes the main functions available under [Menu].

2.3.1. Function Code Settings

Select [Menu] > [Function code edit] from the main menu or click on the main window toolbar and click [Function Code] to open the [Select function code to edit] window.



The [Select function code data to edit] window allows you to select the source of the function code data you want to view/edit.



Standard function code list

Select this when you want to edit standard function codes (such as F, E, C).

Customizable logic function code list

Select this when you want to edit customizable logic function codes (such as U, U1, UA, UB).

[Create new function setting]

Click this button to open the [Function Code List] window when you want to create a function code from scratch.
Refer to "2.2.1. Create a New File".

[Read from the file]

Click this button to open a function code data file saved in your PC.
Refer to "2.2.2. Open".

[Select inverter]

([Select keypad])

From the list of the registered inverters in the [Connection Setting] window, select the inverter you want to read function code data from.

Refer to "1.5.5.2. Connection Setting".

Once you select [Data in Keypad] for [USB Connection] on the [Communication Setting] window, this label changes to [Select keypad].

[Read from the inverter]

([Read from the keypad])

Click this button to read function code data from the selected inverter and open the [Function Code List] window.

Once you select [Data in Keypad] for [USB Connection] on the [Communication Setting] window, this label changes to [Read from the keypad].

In this case, click this button to read function code data from the selected keypad and open the [Function Code List] window.

2.3.1.1. Function Code Edit

The following is the description the [Function code edit] tab of the [Function Code List] window.

This tab allows you to edit function code data while viewing the function code settings and their ranges.
You can sort function codes based on various criteria.

When the [Function Code List] window is displayed, the [Edit] and [FunctionCodeEdit] options are added to the main menu.

Tree view

[Function]:	Display the function codes by group.
[Change from Factory-set Values]:	Displays the function codes with settings different from the factory-set values (excluding communication codes).
[Contents of change (blue)]:	Displays the edited function codes before written to the inverter or keypad.
[R/W failure (pink)]:	Displays the function codes that could not be written to or read from the inverter or keypad.
[User Definition]:	The user can freely define the display items.
[Communication Code]:	Displays communication function codes only.
[Comparison Result]:	Displays the results of the comparison with the inverter or keypad function code settings or saved files only.
[Search Result]:	Displays the result of the [Edit] -> [Search] operation only.

Edit

This menu item is added once you open the [Function Code List] window. [Edit] provides the following menu options: [Undo], [Factory-set] (see "2.5. Edit"), and [Search] (see "2.3.1.1 [8] Search").

Function Code Edit

These menu items are added once you open the [Function Code List] window.
You can save and load function code settings in the CSV format. This feature is useful when you want to edit function code settings in an external application such as Microsoft Excel and then load them into the loader.
Refer to "2.7. Function Code Edit" for details.

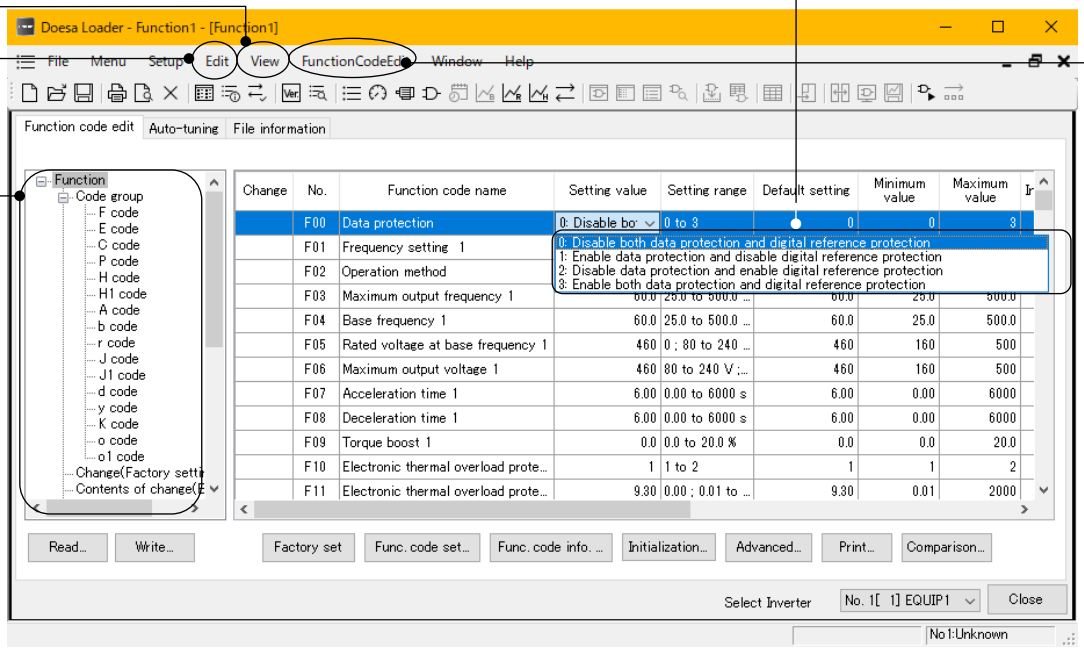
View

Once you open the [Function Code List] window, the following menu options are added to [View]:

[Function code info]:	Same as the [Function code info] button displayed at the bottom.
[Font size]:	Allows you to change the font used for function code names, etc. Refer to "2.6.3. Parameter Information and Character size" for details.

Change of Setting Values

You can select the function code data from the drop down-menu or edit window.



The following buttons are available at the bottom of the [Function code Edit] tab:

[Read]: Allows you to read the function codes from the selected inverter or keypad and load them into the loader.

[Write]: Allows you to write the edited function codes to the inverter or keypad.

[Factory-set]: Resets the selected function code to the factory-set value.

[Func. code set]: Displays the selected function code setting in the [Setting value] window. For function codes whose settings are available for selection from the list, however, the [Setting value] window does not appear.

[Func. code info.]: Displays the selected function code information in the [Function code info] window.

[Initialization]: This button, available when an inverter is selected, initializes the function code settings within the inverter. It is not available when a keypad is selected.

[Advanced]: Displays a dialog that allows you to change the display items and print settings. Select [Error Clear] to delete the list of function codes that could not be written or read so that no function codes are displayed in [R/W failure (pink)] in the tree view.

[Print]: Prints the function code list selected in the tree in the left pane.

[Comparison]: Allows you to compare the inverter data with the list, the keypad data with the list, or the function code settings in a saved file with the list. The results of comparison appear in [Comparison Result] in the tree view.

[Select inverter] ([Select keypad])

Refer to the description below.

[Close]

Closes the [Function Code Setting] window.

[Select inverter] ([Select keypad])

Select the inverter or keypad you want to write the data to. When there is only one inverter or keypad, you do not have to select it. When you are using RS-485 multi-drop connection, you have to select the desired one from the list.
As described in the following table, whether you should select an inverter or keypad as the read/write target is determined by the port setting in the [Communication Setting] window. The list corresponds to rows marked with ☑ in the [No] column in the [Connection Setting] window, and the number of list entries is equal to the number of ☑ marks.

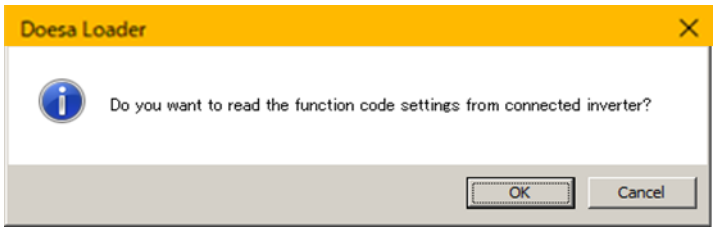
For information on the [Communication Setting] window, refer to "1.5.5.1. Communication Settings".
For information on the [Connection Setting] window, refer to "1.5.5.2. Connection Setting".

Table 2-1 Relationship between [Communication Setting] and your inverter (keypad) selection

Port setting in the [Communication Setting] window		Target inverter (Target keypad)	
		Target	List entries
RS-485 connection		Inverters	1 or greater
USB connection	Data in inverter (via VF1A-PH1)	Inverters	1
	Data in keypad	Keypad	1

[1] Read the Function Code Settings from the Inverter or Keypad

If you have selected an inverter, click [Read] button to open the following dialog.
Click [OK] to read the function code setting values from the inverter.



The above applies also if you have selected a keypad. Click [OK] to read the function code setting values from the keypad.

Note
- Be sure to read from a keypad that contains data. You cannot read from a keypad that contains no data, as is the case when you have purchased a new keypad.

- If function codes you want to read or write are password-protected:

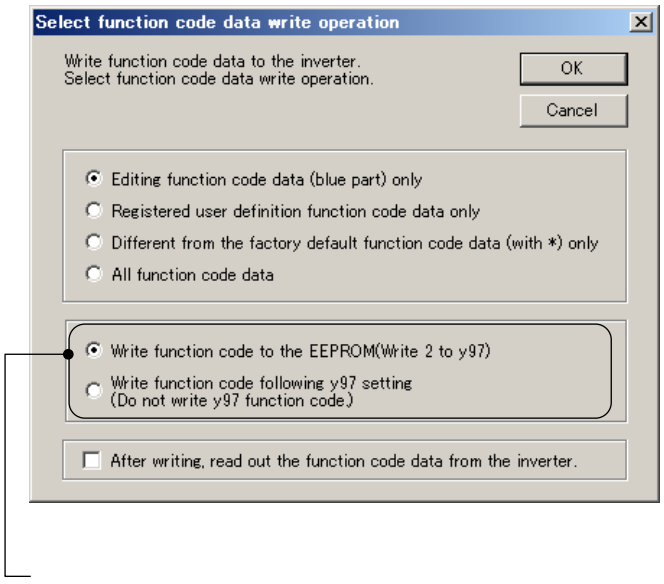
Note
- If the inverter has password protection enabled, do not read function codes from it. Before reading from the inverter, be sure to disable password protection. If you attempt to read from the inverter with password protection enabled, you may fail to read your desired function codes or the read operation may take a long time. This applies also to the write operation. Disable password protection before writing to the inverter.

Tip
- For more information on password protection, refer to the instruction manual or user's manual.

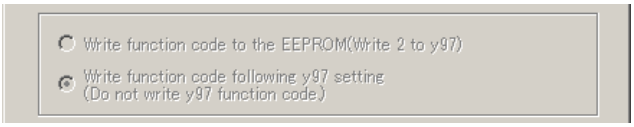
[2] Write the Function Codes from the Loader to the Inverter or Keypad

To write function codes to the inverter or remote keypad with USB, use the [Write] button displayed at the lower left of the [List Edit] window that appears when editing function codes.

The [Select function code data write operation] window opens.



These option buttons are only enabled for inverter models that have function code y97. They are disabled (as shown below) for inverter models that do not have function code y97 or when you write to a remote keypad with USB.



Hereinafter in this manual, the inverter or remote keypad with USB you want to read to or write from is referred to as the "target device".

- [Editing function code data (blue part) only]

Writes to the target device only the function code settings edited in the loader but not yet written to the target device (blue part).

- [Registered user definition function code data only]

Writes to the target device only the function code settings registered as user definitions in the [List Edit] window.

- [Different from the factory function code data (with *) only]

Writes the settings to the target device only when they are different from the factory-set values (with *) (excluding Read-only function codes).

- [All function code data]

Writes all the function code settings to the target device (excluding Read-only function codes).

- [Write function code to the EEPROM (Write 2 to y97)]

This option is disabled for inverter models that do not have function code y97 or remote keypads with USB.

Select this option if you want to:

- Save your edited function codes to an inverter configured to save the data in the temporary storage memory (i.e., with y97 set to 1) and retain them in the non-volatile memory
- Change the setting of function code y97 (from 1 to 0 or from 0 to 1)
- Write a large number of changed function code settings to an inverter configured to save the data to the non-volatile memory (with y97 set to 0)

The loader sets y97 to 2 to save the function code settings to the non-volatile memory of the inverter. This ensures that the function code settings are saved to the non-volatile memory even if y97 is set to 1 (i.e., the inverter is configured to write to the temporary storage memory).

(However, some function codes such as S01 are saved to the temporary storage memory.)

In addition, when function code y97 exists in the [Function code edit] window and you write the function codes, the loader writes the setting of y97 as well.

Note

- Therefore, when function code y97 exists in the [Function code edit] window and you write the function codes, do not forget to edit y97 in the [Function code edit] window as appropriate. Even if you do not select y97 as the function code to be written, the loader writes y97. If you do not want to change y97 in the inverter, ensure that the y97 setting in the loader is the same as in the inverter.

Tip

- Be sure to select this option when you write a large number of changed function code settings to an inverter configured to save the data to the non-volatile memory (with y97 set to 0). You can shorten the write time by selecting this option rather than the [Write function code following y97 setting (Do not write y97 function code)] option.

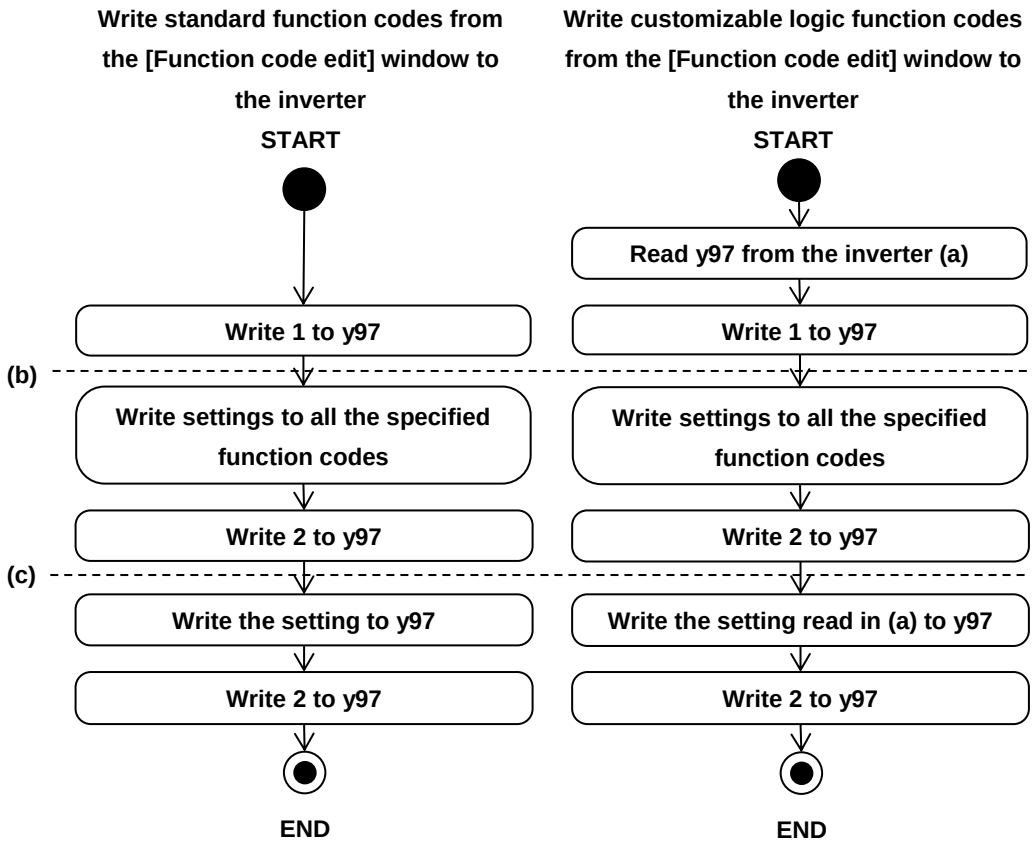
Note

- Selecting this option causes the loader to save all function codes (including those not selected) to the non-volatile memory.

Tip

- When the inverter is configured to save the data in the temporary storage memory (i.e., with y97 set to 1) but you want to save the selected function codes to the non-volatile memory, follow these steps:
  First select [Write function code to EEPROM (write 2 to y97)] to set y97 to 0.
  Next, select [Write function code following y97 setting (Do not write y97 function code)] to write settings to the function codes you want to change.
  Finally, select [Write function code to EEPROM (write 2 to y97)] to set y97 to 1.

The loader writes function codes in accordance with the following flowchart when [Write function code to EEPROM (write 2 to y97)] is selected:



Note

- If the write operation is cancelled during the period between (b) and (c) in the flowchart above, function code y97 is set to 1. Therefore, when you restore the settings before the write operation after cancellation, you should also restore the original setting of y97.

- [Write function code following y97 setting (Do not write y97 function code)]

This option is disabled for inverter models that do not have function code y97 or remote keypads with USB.

Select this option if you want to:

- Save your edited function codes to an inverter configured to save the data in the temporary storage memory (i.e., with y97 set to 1) and retain them in the temporary storage memory (you do not want to save them in the non-volatile memory).
- Write a smaller number of changed function code settings to an inverter configured to save the data to the non-volatile memory (with y97 set to 0).

The setting of y97 in the inverter determines whether the function code settings written are saved in the non-volatile or temporary storage memory of the inverter.

When you write to an inverter configured to save the data to the non-volatile memory (with y97 set to 0), the settings are saved one by one to the non-volatile memory of the inverter. For this reason, when you write a large number of changed function code settings, the write time is longer than when you select [Write function code to EEPROM (write 2 to y97)].

Even if the function codes written include y97, the setting of y97 is not written to the inverter. If you want to write the setting of y97 to the inverter, select [Write function code to EEPROM (write 2 to y97)].

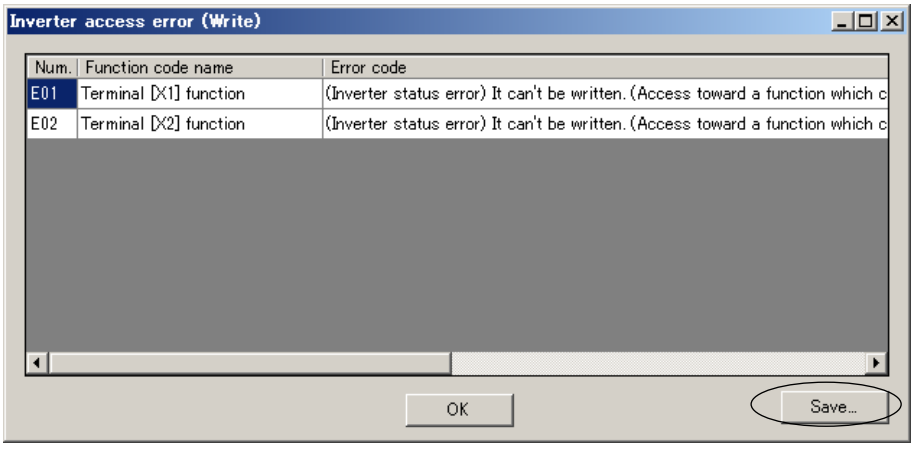
Tip

- If you want to update to the latest settings after the write operation. check [After writing read out the function code data from the inverter] (☑).
  The above applies also if you have selected a keypad. Check [After writing read out the function code data from the keypad] (☑).

- What to do if the write operation fails

The loader is not able to identify function codes whose write attribute (write enabled/disabled) dynamically change (for example, function codes that cannot be changed during operation). If you attempt to write such function codes, the write operation may fail.

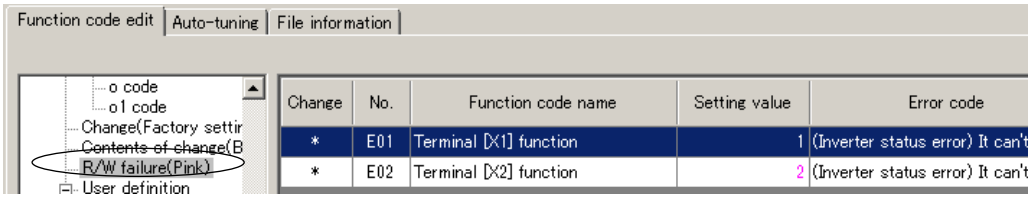
If your selected function codes include those that cannot be written, the loader attempts to write all the selected function codes and, after the write operation, displays a list of the function codes that could not be written.



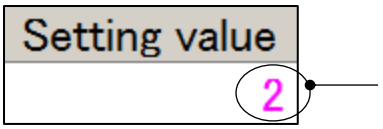
You can save the displayed list to a CSV file by clicking [Save...] at the lower right of the screen.

After you closed the error window, you can save same information in CSV format by [Export to CSV (Last error Info.] in [Function Code Edit] (see [2.7.Function Code Edit]) on the Main Menu.

To check the function codes that could not be written, select [R/W failure (pink)] from the [Function code edit] tree.



The settings of the function codes that could not be written are displayed in pink.

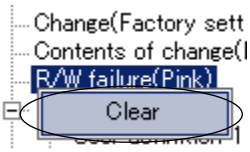


Displayed in pink.

The write operation may fail due to the following reasons:

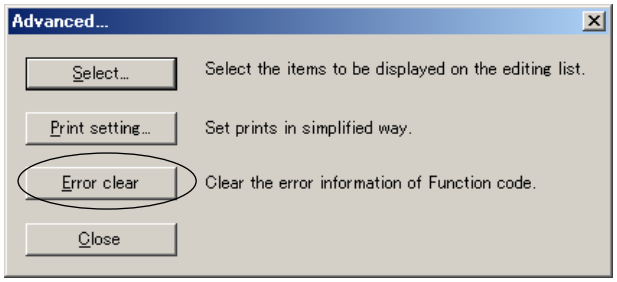
- An attempt was made to write to a function code that cannot be changed during inverter operation.
- An attempt was made to write to a function code protected from edit via a link (communication).
  Example: When the frequency command for RS-485 communication port 1 was enabled (with H30 set to 1) and the loader was connected to RS-485 communication port 2, an attempt was made to write to S01 (frequency command).
- An attempt was made to write to a password-protected function code.
- Write was cancelled in the middle.

To hide function codes from [R/W failure (pink)], right-click [R/W failure (pink)] in the [Function code edit] tree.



Then click [Clear] on the context menu to hide the function codes that could not be read or written.

Alternatively, you can also hide the function codes that could not be read or written by clicking the [Advanced] button at the bottom of [Function code edit] and then clicking [Error Clear].



- Writing customizable logic function codes from the list

Note

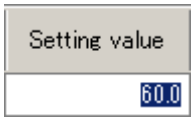
- When customizable logic function codes (U, U1, UA, UB, etc.) are displayed in the [Function code edit] window and you wish to write your edited function codes by selecting [All function code data], edit UA00 to UA69, rather than U01 to U70, for customizable logic steps 1 to 14.

U01 and UA00, U02 and UA01, ..., U70 and UA69 are written, respectively, to the same memory addresses of the inverter. If you write by selecting [All function code data], U01 to U70 are overwritten with UA00 to UA69, which are written later.

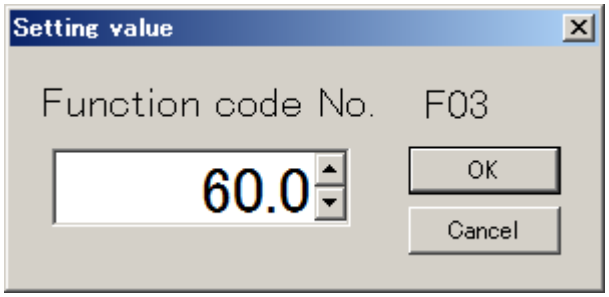
[3] Change the Settings

How to change the setting varies among function codes.

(1) To change the setting of a function code that sets frequency, time, voltage, or other numeric value, click the field of the function code setting.

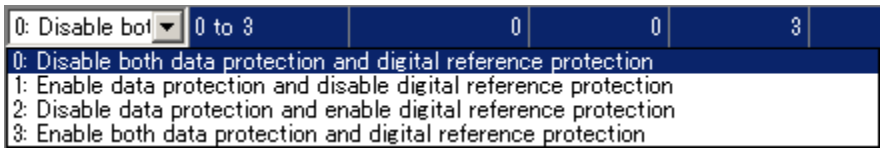


Select the desired function code and click the [Set] button at the bottom of the screen or double-click the setting field. In the [Setting value] window that appears, change the setting.



For function codes whose settings are available for selection from the list, however, the [Setting value] window does not appear.

(2) For function codes whose settings are available for selection from the list (for example, F00 "data protection" or F01 "frequency setting 1"), click the desired function code setting field to display the ▼ button. Then click the ▼ button to select the desired data from the list.

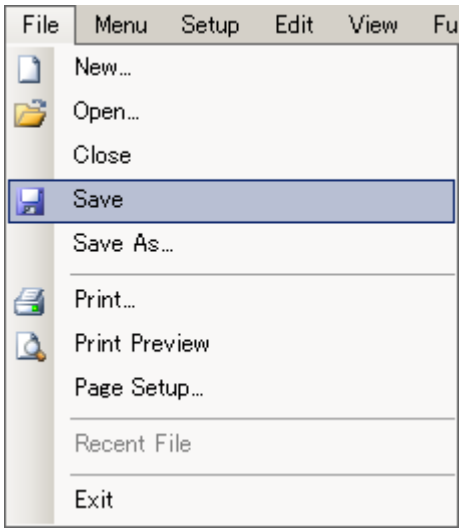


Tip

- When the changed function code data has not been written to the inverter, the data is displayed in blue.
- When the changed function code data is different from the factory-set values, the [Change] column is marked with * in the [Function code edit] window.

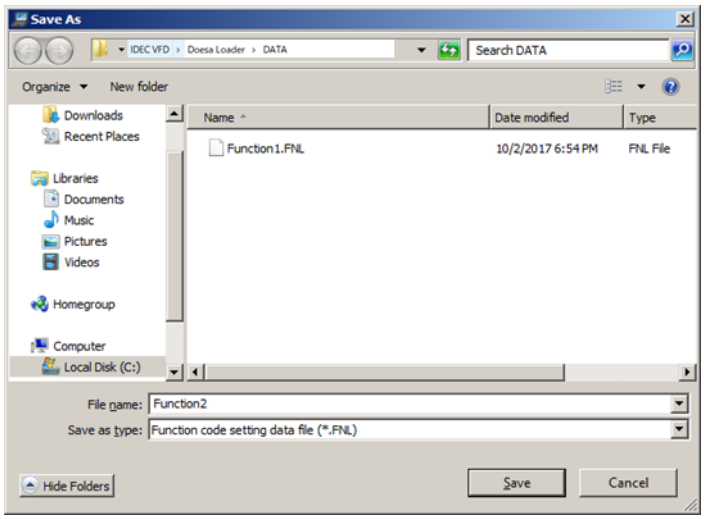
[4] Save

To save the function code settings opened in the loader, select [File] -> [Save] or [Save As ...] from the main menu.



When selecting [Save] for the data for the first time, the following dialog will open in the same manner as when selecting [Save As …].

Select [Save to ...] and enter the file name under which the data is saved in [File Name]. Then click [Save] to save the file.



***.FNL:** File format specific to the loader. Standard function code data (such as F, E, C). Files in this format can be opened only in the VFD Doesa-Loader.

***.FBL:** File format specific to the loader. Customizable logic function code data. Files in this format can be opened only in the VFD Doesa-Loader.

Tip

- You can also save standard function code data (such as F, E, C) in the CSV format. For more information, refer to "2.7. Function Code Edit".

Note

- The length of the path and file name should be up to 200 single-byte characters (up to 100 double-byte characters). Otherwise the file cannot be saved.

[5] Print

You can print the items selected from the tree in the left pane of the [Function code edit] window.

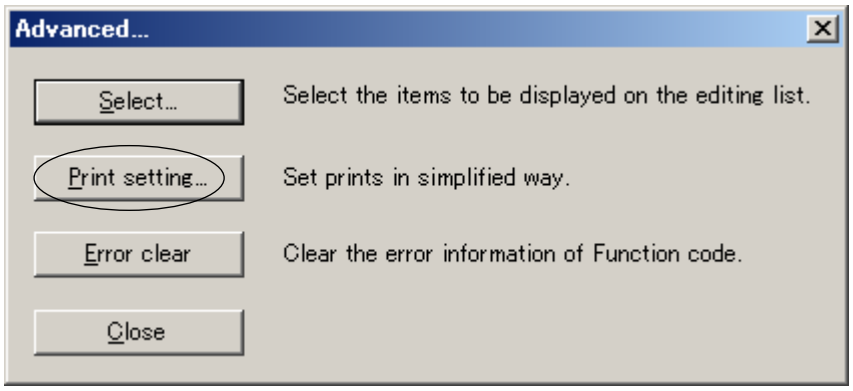
Once you select [Function] or [Code group] from the tree in the left pane of the [Function code edit] window, function codes such as F, E, C, ... or the group name appears.

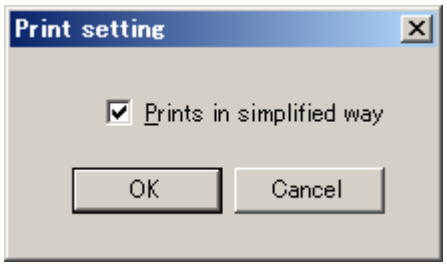
Click the [Print] button displayed at the lower right of the [Function code edit] window or select [File] -> [Print] from the main menu to display the [Print] window.

Refer to "2.2.6. Print".

How to set simple printing...

To print only the function code numbers and setting values from among the items displayed in the [Function code edit] window, click the [Advanced] button at the bottom of the window to open the [Advanced] dialog and click [Print Setting]. On the [Print Setting] dialog that appears, check (☑) [Simple Printing] and click [OK]. Note that this operation only determines the settings and does not actually print the data.



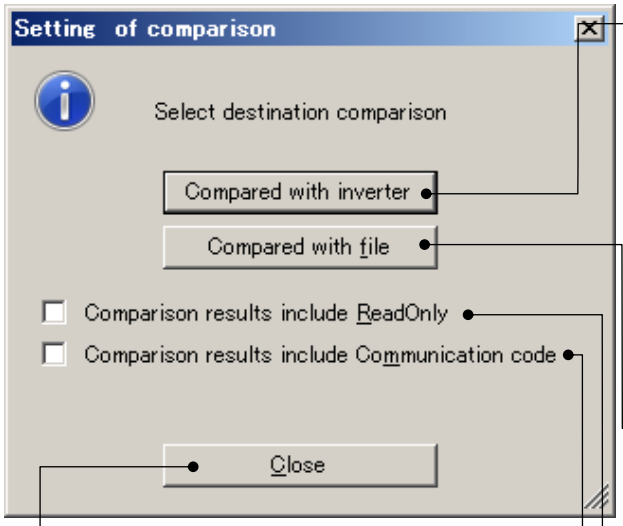


How to view the print preview before actually printing...

Select [File] -> [Print Preview] from the main menu.

[6] Compare

You can compare the function code setting data you are currently editing with the function code settings in the inverter selected in [Select inverter], the function code settings in the selected keypad, or the function code settings saved in a file and view the results.



[Compared with inverter]([Compared with keypad])

If the target device is an inverter, the loader compares the function code setting data you are currently editing with the function code settings in the inverter.

If the target device is a keypad, the label changes to [Compared with keypad] and the loader compares the function code setting data you are currently editing with the function code settings in the keypad.

[Compared with file]

The loader compares the function code setting data you are currently editing with the function code setting data saved in the file.

[Comparison results include ReadOnly]

Check this checkbox to include "Read-Only" function codes in the scope of comparison.

[Comparison results include Communication code]

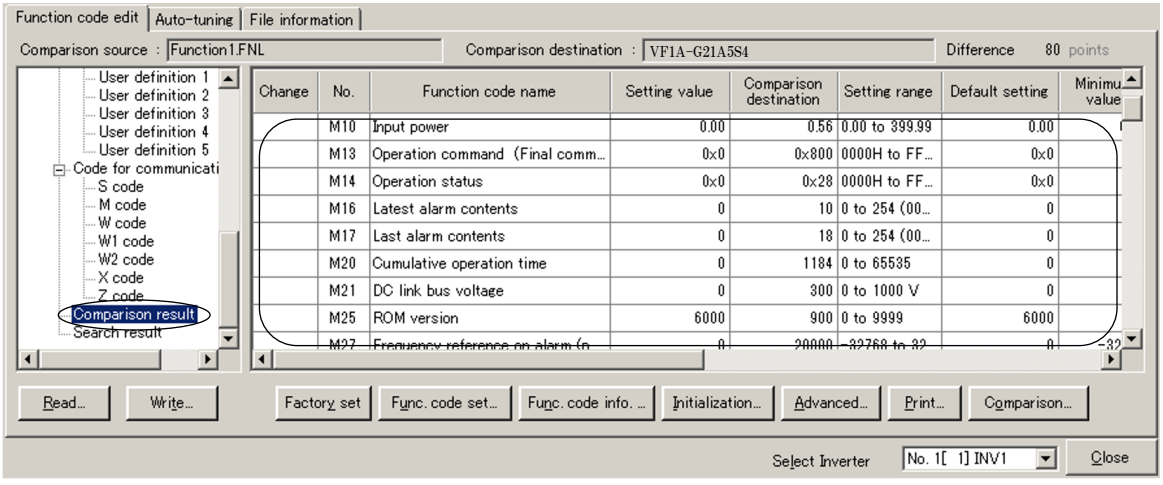
Check this checkbox to include "Communication Code" function codes in the scope of comparison.

Close

Close this dialog.

* You should select the inverters to be compared in advance by clicking ▼ next to the [Select Inverter] box at the bottom of the [Function code edit] window.

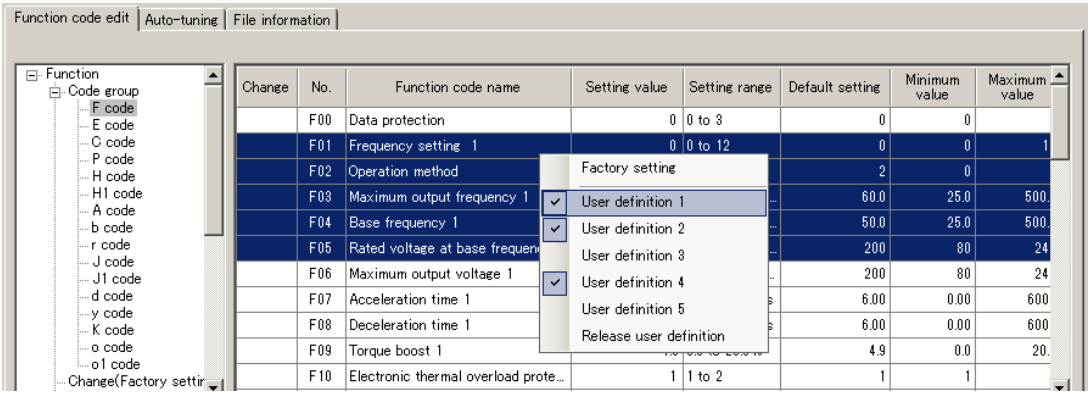
Upon completion of comparison, the focus automatically moves to [Comparison Result] in the left pane tree of the [Function code edit] window and the comparison results are listed.



[7] User Definition (Display desired function codes only)

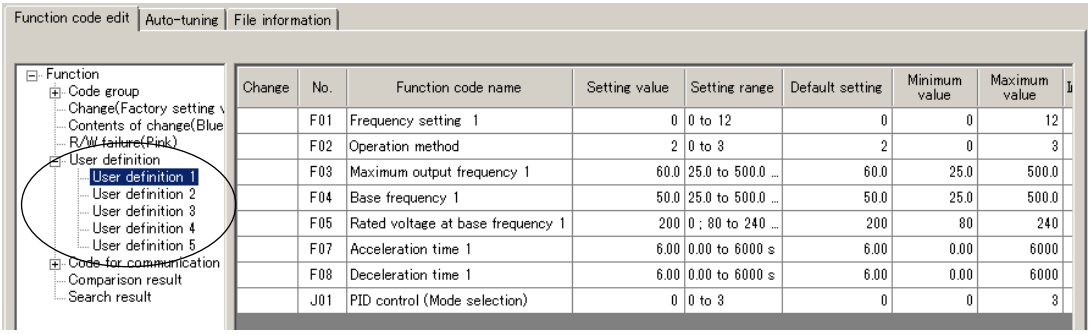
Registration

To register function codes in a user definition, select your desired function code(s) from the list of function codes displayed in the [Function code edit] window and click the right mouse button. The available user definition group names ("User Definition 1" to "User Definition 5" in the example below) are displayed on the submenu. Click your desired user definition name. The selected function codes are then registered in that user definition.



Display

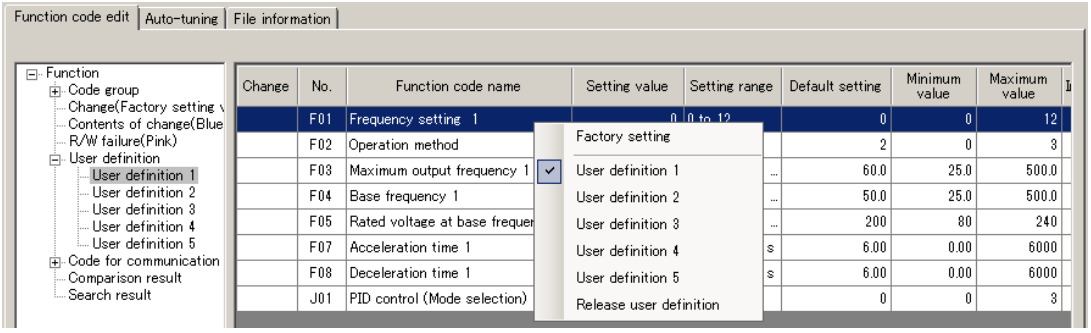
From the list of user definition groups displayed in the tree in the left pane ("User Definition 1" to "User Definition 5" in the example below), select and left-click your desired group to display the function codes registered in that group.



Unregistration

To unregister a function code(s), select your desired function codes and click the right mouse button. Select your desired user definition group from among the user definition groups marked with ☑ on the submenu, and left-click it. The selected function codes are unregistered.

If your selected function code is registered in two or more user definition groups, you can unregister that function code from all the user definition groups by left-clicking [Release user definition] on the submenu.



Renaming a user definition name

To rename a user definition, left-click or right-click one of "User Definition 1" to "User Definition 5" in the tree in the left pane and left-click [Name change].

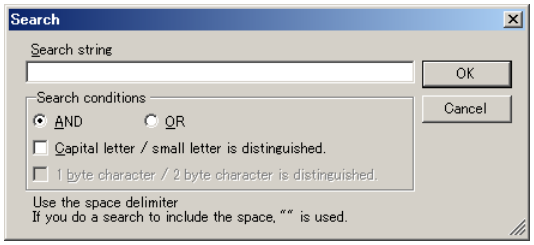
About writing and reading to the inverter

For supported inverter models, the contents of favorites (formerly known as quick setup) set in the inverter are read as user-defined, and conversely, the contents of user-defined are written as inverter favorites.

Refar to “2.3.1.1 [1] Read the Function Code Settings from the Inverter or Keypad”.

[8] Search (Search function code terminologically)

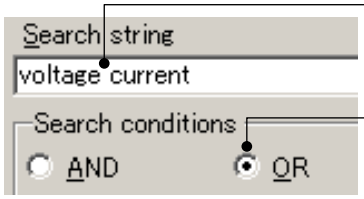
Select [Edit] -> [Search] from the main menu to open the [Search] dialog.



From among the words contained in the Function code edit window, enter the keyword to be searched and click the [OK] button.

The focus automatically moves to [Search Result] in the left pane tree of the [Function code edit] window and the function codes that include the entered keyword are listed.

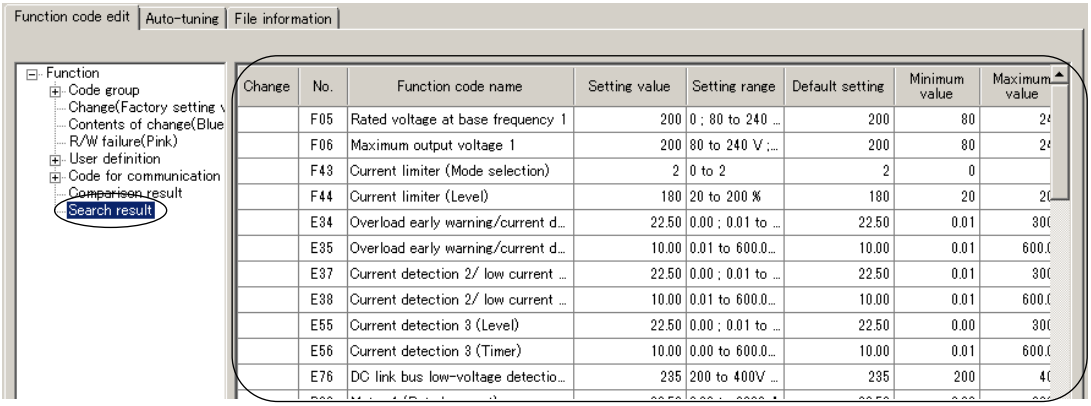
The following is an example of searching keywords "voltage" and "current" with the OR condition.



Delimit keywords "voltage" and "current" with a single-byte space.

Select [OR].

Function codes that include "voltage" OR "current" are listed.



Note

- The search target range includes all items (changes, No., function code names, setting values, and so on).
  However, the items hidden by clicking [Advanced] -> [Display Item] are also included in the search target.
- The text of function code information are not included in the search target.

2.3.1.2. Auto Tuning

This function automatically measures the motor parameters and saves them to the inverter.

Note

- Before performing tuning, carefully check the description of tuning (including the settings required before tuning, machine preparation, precautions, etc.) in the User's Manual of your inverter.

[Motor tuning (Select)]

Select the tuning method.

Check the condition of the machine to determine whether to perform "Inactive tuning" or "Active tuning". (For more information, refer to the User's Manual of your inverter.)

[Motor]

Displays the currently selected motor.

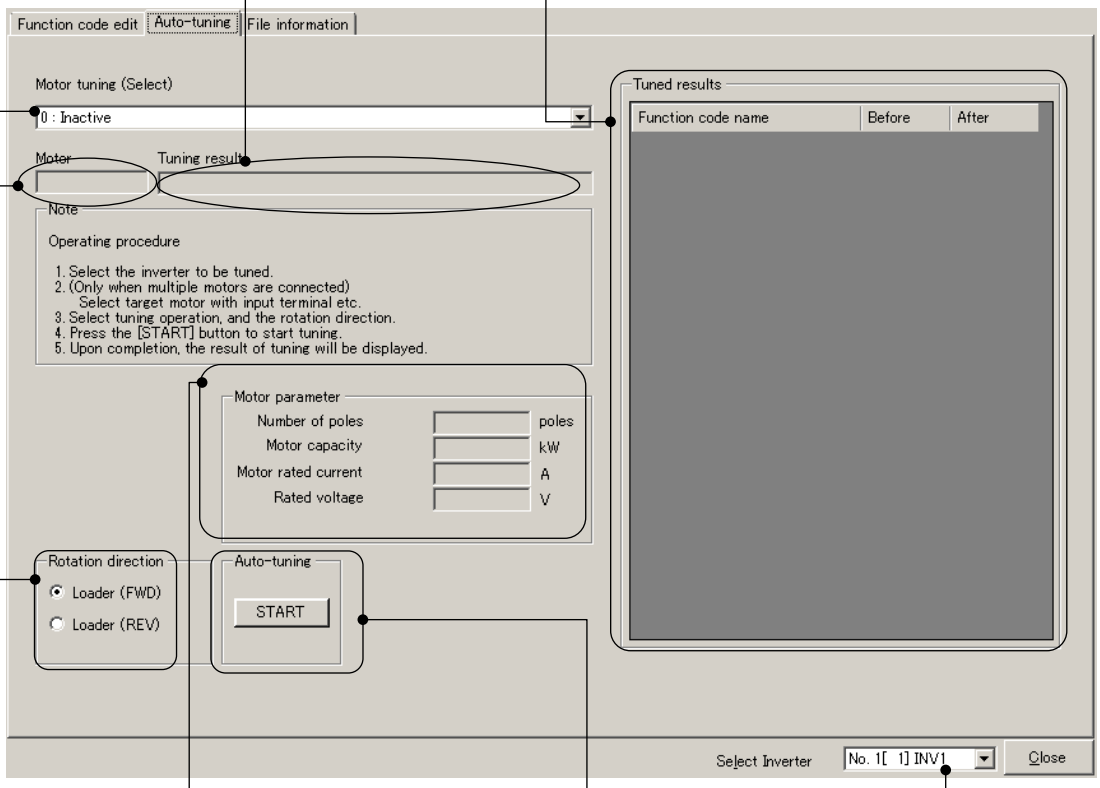
[Tuning result]

Displays the tuning result upon completion of tuning.

[Tuned result]

Clicking the [START] button causes the loader to read the motor parameters from the inverter and display them in the [Before] column.

Upon completion of tuning, the loader reads the motor parameters from the inverter and displays them in the [After] column.



[Rotation direction]

[Loader (FWD)]: Forward rotation
[Loader (REV)]: Reverse rotation

Select either of the two rotation directions according to the direction in which the machine actually rotates.

[Motor parameter]

Clicking the [START] button causes the loader to read the motor parameters from the inverter and display them.

[Auto tuning]

Click the [START] button to start tuning.

When you click the [START] button, a confirmation dialog appears. Click [OK] on the confirmation dialog to start tuning in the direction selected under [Rotation direction].

[Select inverter]

Select the inverter you want to tune.

2.3.1.3. File Information

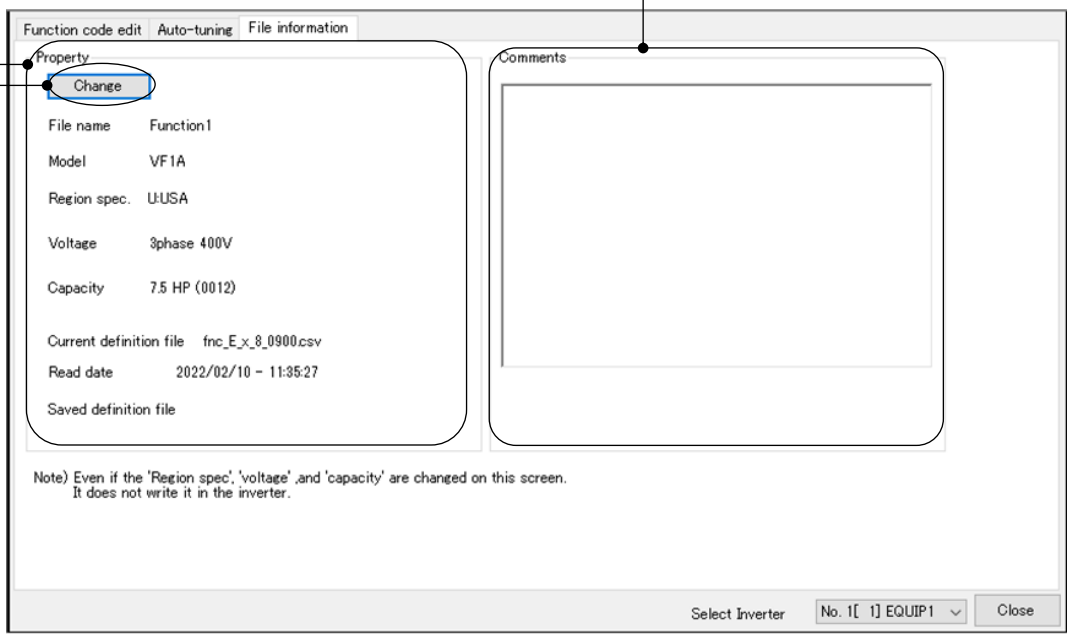
This function displays the information related to the currently displayed list of function codes. You can change [Voltage], [Capacity] and [Current definition file] as you want.

[Properties]

- If you have read function codes from the inverter, this area displays the inverter information.
- If you have read function codes from the keypad, this area displays the inverter information saved in the keypad.
- If you have opened the [Function Code Setting] window by clicking [Create new function setting], this area displays the initial settings for creating a new function code.
- If you have opened a saved data file by clicking [Open] under the [File] menu, this area displays the information contained in the saved file.

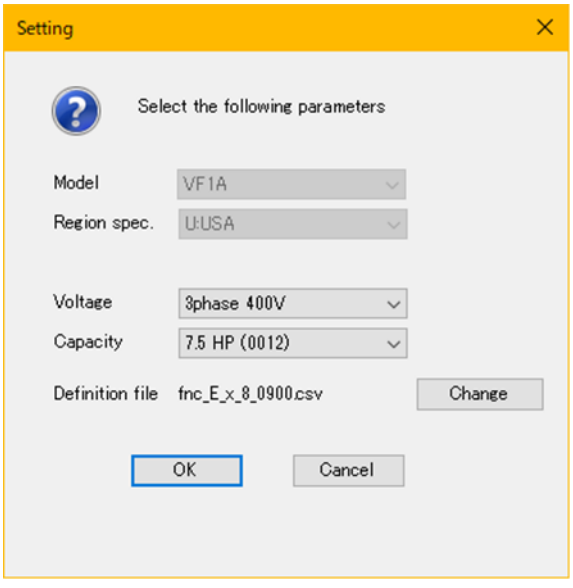
Comment

You can save a comment as needed.



[Change]

Click this button to open the [Setting] dialog shown at right.



[1] Changing the Input Power Supply Voltage

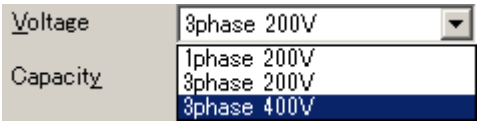
You can change the input power supply voltage of the inverter whose function code data is currently displayed in the function code list.

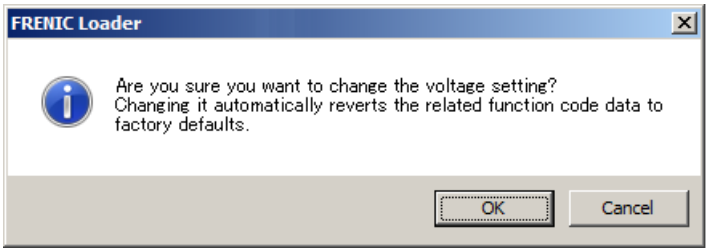
Correctly set these values according to the inverter for which you are editing function codes.

Tip

- You can identify the input power supply voltage from the inverter model number printed on the rating nameplate of the inverter. Refer to "2.2.1. [1] Model, Regional Specification, Voltage, Capacity" for details.

Changing the value in the [Voltage] box automatically modifies the [Setting], [Factory-Set Values], [Minimum] and [Maximum] values of function codes whose factory-set values change depending on the voltage setting (for example, function codes whose data copy attribute is set to "1").





Note

- As shown in the above dialog, changing the voltage setting automatically initializes the settings of the function codes related to the voltage. So, save the file you are currently editing as needed.

[2] Changing the Inverter Capacity

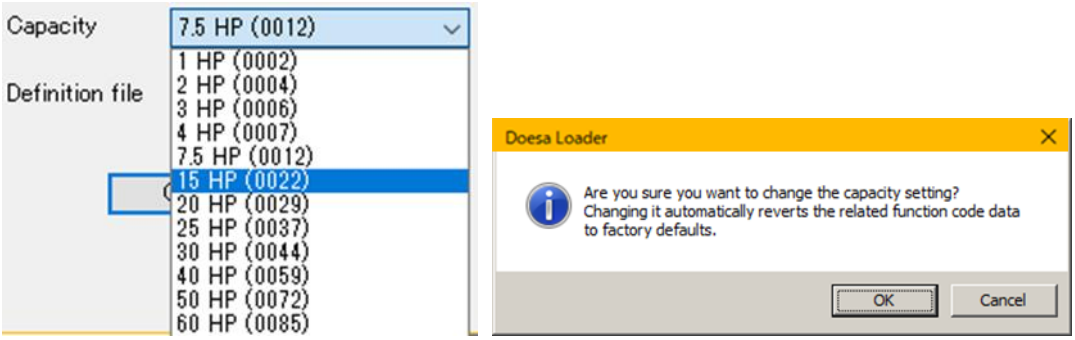
You can change the capacity of the inverter whose function code data is currently displayed in the function code list.

Correctly set these values according to the inverter for which you are editing function codes.

Tip

- You can identify the inverter capacity from the inverter model number printed on the rating nameplate of the inverter. Refer to "2.2.1. [1] Model, Regional Specification, Voltage, Capacity" for details.

Changing the value in the [Capacity] box automatically modifies the [Setting] and [Factory-Set Values] values of function codes whose factory-set values change depending on the capacity setting (for example, function codes whose data copy attribute is set to "2") to the values associated with the new capacity value.



* For some models, current types are displayed enclosed in (). Example: 11 kW (0022)

Note

- As shown in the above dialog, changing the capacity setting automatically initializes the settings of the function codes related to the capacity. So, save the file you are currently editing as needed.

[3] Changing a Definition File

Select a definition file appropriate for the inverter ROM version.

For example, your selected definition file may not be appropriate if you have been using a definition file with default settings because the inverter ROM version was unknown when you created the function code list. If this is the case, you should select a different definition file.

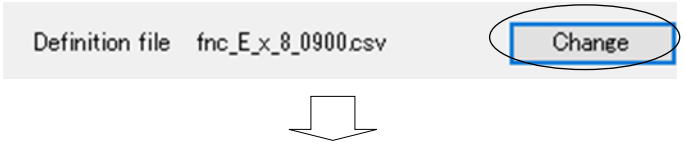
Note

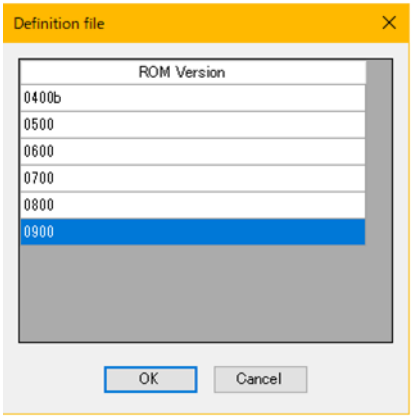
- If the selected definition file is not appropriate for the inverter ROM version, an error such as failure to read or write function codes may occur due to the difference in the number of function codes or other reason.

Tip

- If you read the settings from the inverter by selecting [Read from the inverter] on the [Menu] -> [Function code edit] -> [Select function code to edit] window, the loader automatically selects the optimum definition file and therefore you usually do not have to select a different definition file.

To change the definition file, click the [Change] button on the [Setting] dialog.

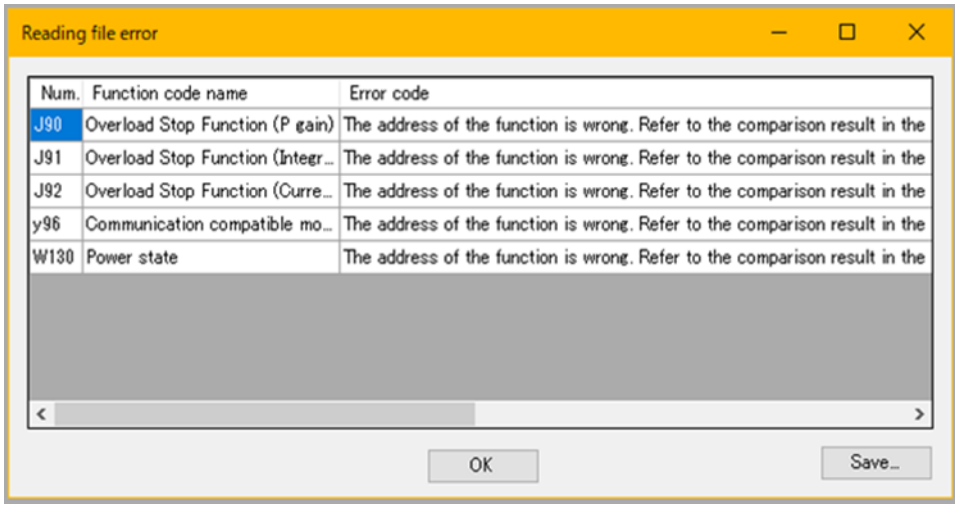




From among the definition files displayed on the list, select the definition file appropriate for the inverter ROM version and click the [OK] button.

For information on how to select a definition file, refer to "2.2.1. [2] Guidelines on Selecting a Definition File".

Changing a definition file may, however, cause an error due to the difference between the definition files before change and after change.
The figure below shows an example of an error that may occur when you change the definition file from "fnc_E_x_8_0900.csv" to "fnc_E_x_8_0600.csv". The function code settings not affected by the file read error are applied as-is.



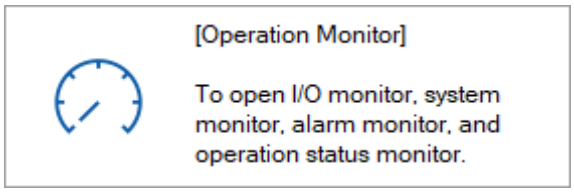
Tip

- Any function codes that existed before the change of the definition file but do not exist after the change are deleted from the [Function code edit] window.

2.3.2. Operation Monitor

You can monitor the status of the inverter during operation.

Select [Menu] > [Operation Monitor] from the main menu or click on the main window toolbar and click [Operation Monitor Setting] to open the [Operation Monitor] window.



Note

- You should use the [Operation Monitor] window only when the loader is connected to an inverter or keypad. The loader displays no signal if you open the [Operation Monitor] window without connection.
- Depending on the communication link condition, it may take a long time to detect the communication target. The loader does not respond until the communication target is detected. To avoid the inability to operate the loader for a long time, you should use the loader in an environment with as good communication conditions as possible.
- Whenever you use the [Operation Monitor] window, specify the monitored inverter in the No.1 row on the [Communication Setting] -> [Connection Setting] window. When you want to monitor multiple devices connected in multi-drop connection, specify the monitored inverters serially in rows No.1, No.2, No.3, and so on. For information on [Connection Setting], refer to "1.5.5.2. Connection Setting".

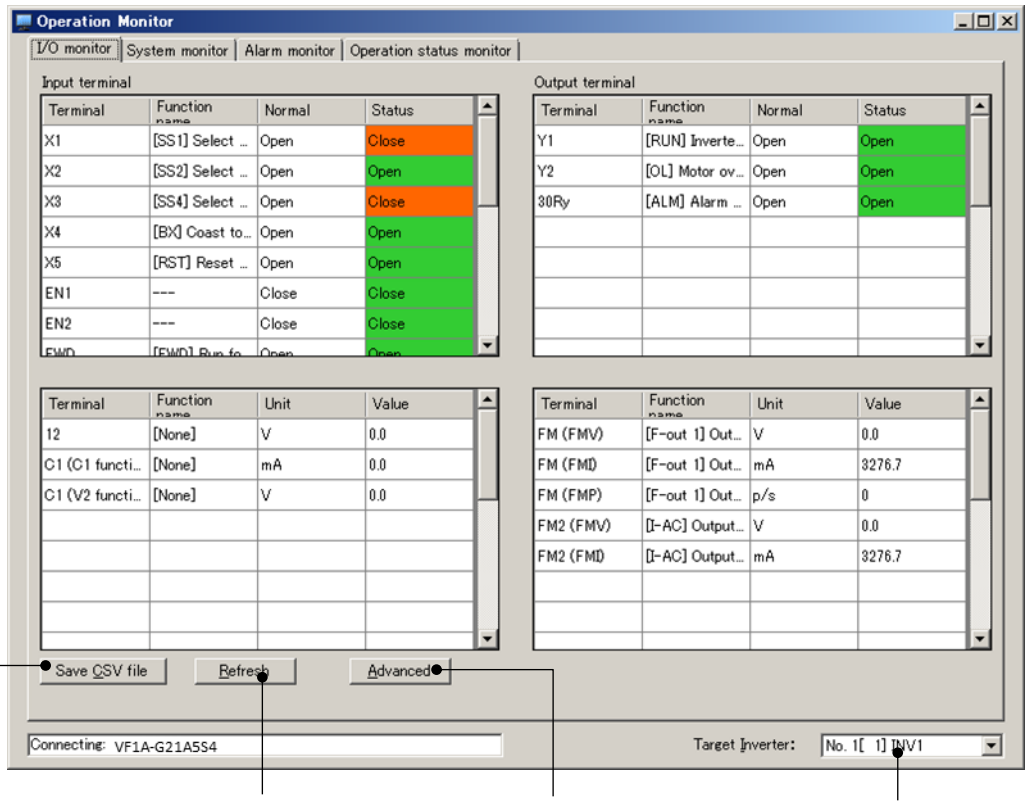
If you have selected [Data in Keypad] for [USB Connection] on the [Communication Setting] window and the loader is connected to a keypad, the [Operation Monitor] window displays the inverter information saved in the memory of the keypad. For information on the memory function of the remote keypad with USB, refer to "1.3.1 Memory Function of the keypad".

Note

- Be sure to read from a keypad that contains data. You cannot read from a keypad that contains no data, as is the case when you have purchased a new keypad.

2.3.2.1. I/O Monitor (for monitoring inverter input and output terminals)

You can monitor the status of an inverter's input and output terminals.



[Save CSV file]
Allows you to save the I/O monitor data to a CSV file.

[Refresh]
Update the terminal function, status, and values.

[Advanced]
Click this button to show/hide signals and change the display order.

[Target inverter]
Select the inverter you want to monitor.

Status color

Green if a normally-open terminal is open or a normally-closed terminal is closed; orange otherwise.

[Normal]	[Status (Open)]	[Status (Closed)]
Open	Green	Orange
Close	Orange	Green

Special value

If '3276.7' is displayed as the value for an output terminal, it means that the output terminal is not associated with an output type expressed with a unit of measurement (voltage output [V], current output [mA], pulse output [p/s]).

For example, when the value for terminal FM is displayed as shown at right, this terminal is not associated with current output (unit: mA).

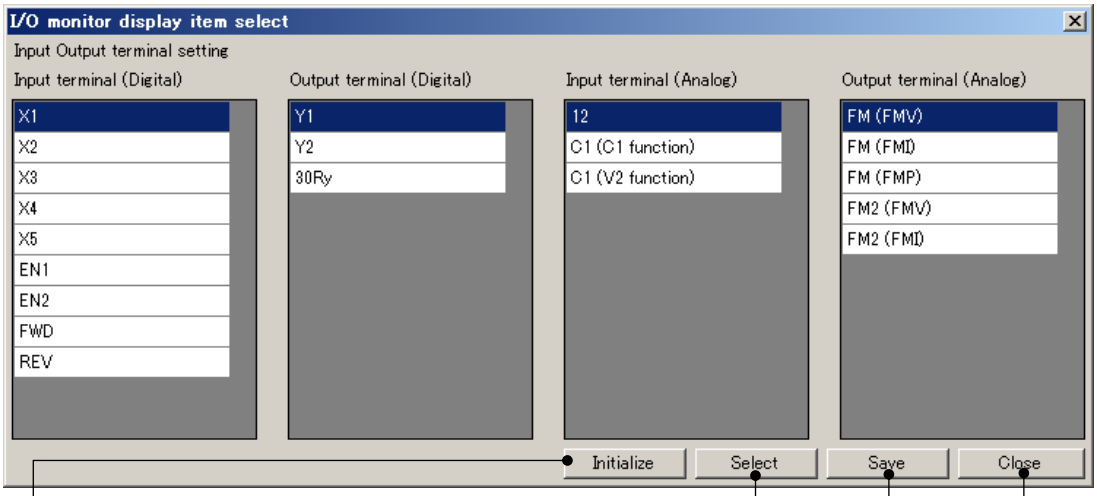
Terminal	Function name	Unit	Value
FM (FMI)	[F-out 1] Out...	mA	3276.7

Note

- When the loader is connected to an inverter that has password protection enabled, the functions of terminals may not be displayed (with [READ_ERR] displayed instead). If this is the case, you should disable password protection to have the terminal functions correctly displayed. For more information on password protection, refer to the instruction manual or user's manual of your inverter.

How to show/hide signals and change the display order

Click the [Advanced] button to open the [I/O monitor display item select] window.
This window allows you to select which signals to display in the [I/O Monitor] window and change the display order.



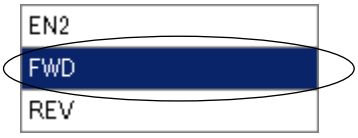
Initialize
Click this button to initialize the settings.

Select
Click this button to open a saved setting file.

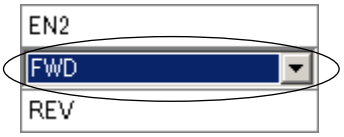
Save
Click this button to save the settings to a text file

Close
Click this button to close the window.

To hide a signal

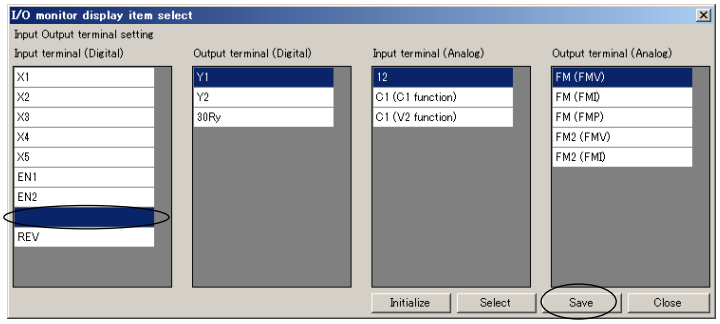


Left-click the signal you want to hide.



Left-click it again to activate the list box.

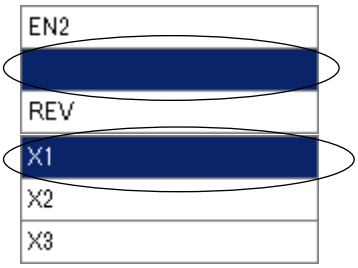
Select the blank from the list.



Click [Save] to save the settings to a file.

To change the display order

For example, suppose you want to move [FWD] to the position of [X1].

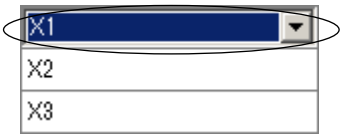


Hide the signal you want to move.
(Refer to "To hide a signal" above.)

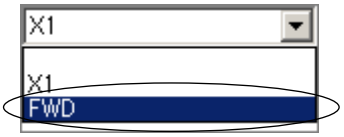
[FWD] is hidden in the example at left.

Left-click the destination position.

[X1] is left-clicked in the example at left.

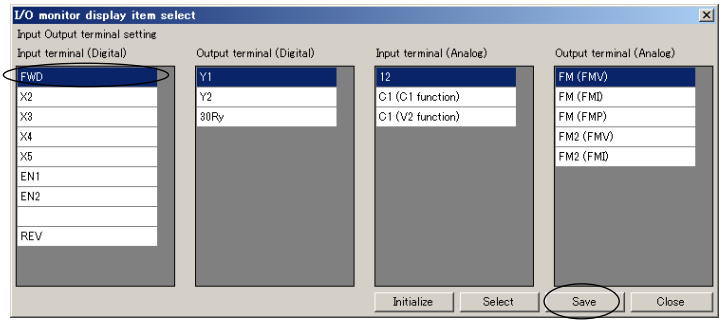


Left-click it again to activate the list box.



From the list, select the signal you want to move.
(The list displays the currently selected signal and the hidden signal.)

[FWD] is selected in the example at left.



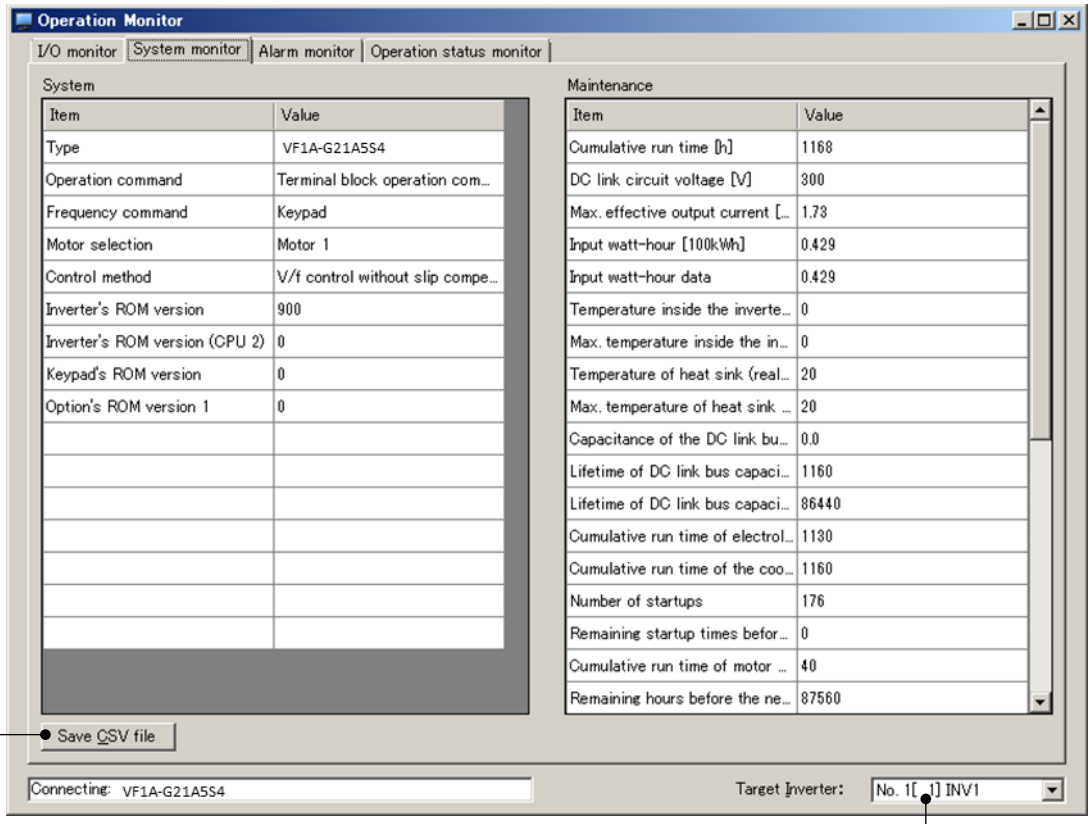
Click [Save] to save the settings to a file.

Note

- If you close the [I/O monitor display item select] window without saving the settings, your changes will not be reflected to the [I/O Monitor] window.

2.3.2.2. System Monitor (for monitoring the internal setup information and maintenance status of the inverter)

The system monitor allows you to check the inverter's ROM version, model, internal setup information, and maintenance information.



[Save CSV file]

Click this button to save the system monitor data to a CSV file.

[Target inverter] ([Target keypad])

Select the inverter you want to monitor.

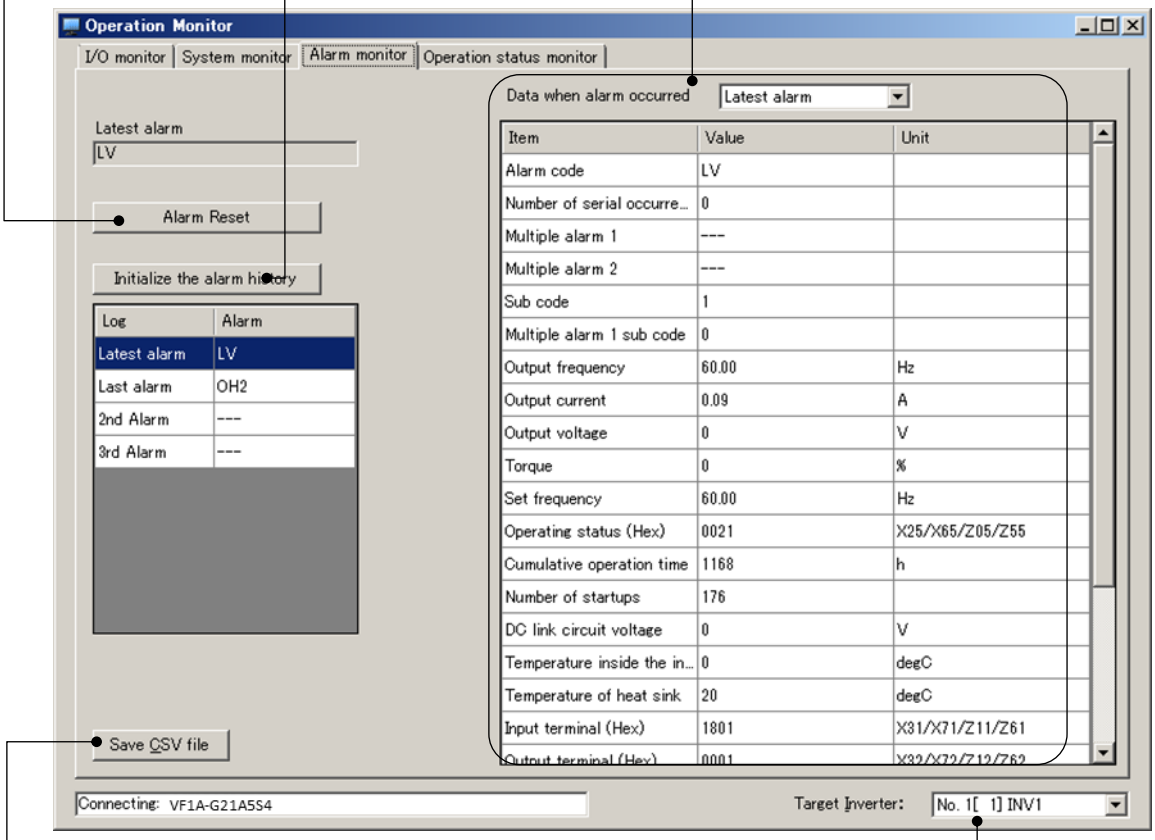
2.3.2.3. Alarm Monitor (for monitoring the inverter's alarm information)

Shows the inverter's alarm status. The alarm monitor allows you to check the content of the current alarm and the various operation information recorded when the alarm occurred.

[Alarm Reset]
Click this button to reset (clear) the current alarm.

[Initialize the alarm history]
Click this button to initialize the connected inverter's alarm history.

[Data when alarm occurred]
This list displays the operation information recorded at the time of the occurrence of the alarm you selected from the list box.



[Save CSV file]
Click this button to save the data when alarm occurred to a CSV file.

[Target inverter] ([Target keypad])
Select the inverter you want to monitor.

⚠WARNING
• Carefully note that resetting the alarm with the operation command on causes the inverter to start unexpectedly as soon as the alarm is cleared. **Failure to observe this could result in an accident.**

Note • The [Initialize the alarm history] button may not work on an inverter that has password protection enabled. If this is the case, you should disable password protection so that you can use [Initialize the alarm history]. For more information on password protection, refer to the instruction manual or user's manual of your inverter.

Hexadecimal value

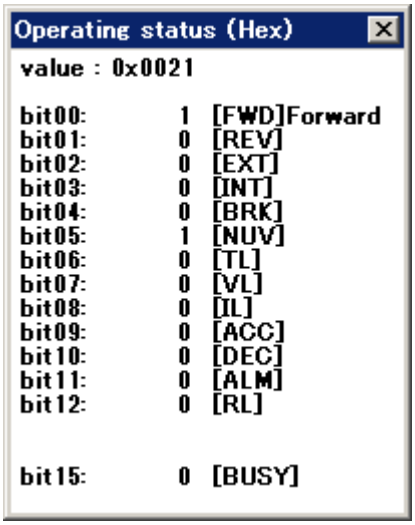
If an item name in the [Item] column is followed by "(Hex)", the [Value] column shows a hexadecimal value and the [Unit] column shows the function code information. The function code information shows the most recent alarm, the second most recent alarm, the third most recent alarm, and the fourth most recent alarm, respectively, from left to right.

Detailed information will be displayed by clicking [+] symbol on the "Unit" column if it is available.

For example, when the loader is connected to VF1A and the operation status value for the most recent alarm is '0021' (as shown below):

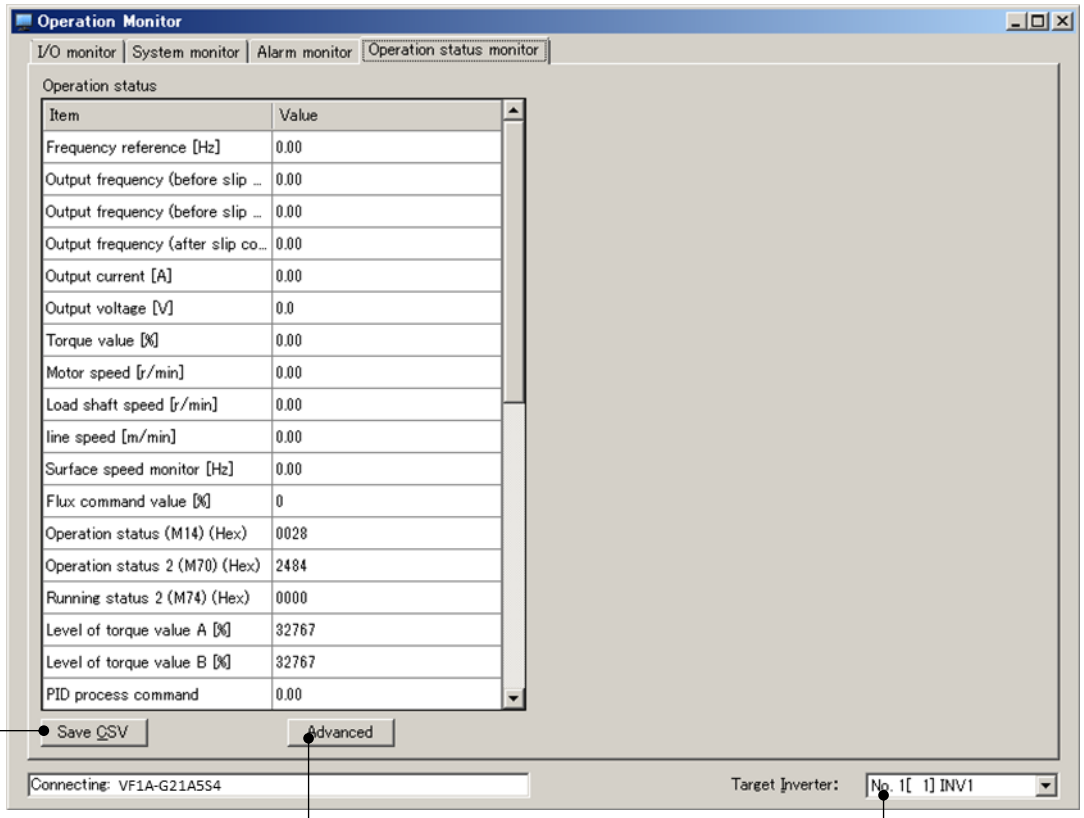
Item	Value	Unit
Operating status (Hex)	0021	[+]X25/X65/Z05/Z55

Detailed information



2.3.2.4. Operation Status Monitor (for monitoring the inverter operation status)

Allows you to check information such as the present output frequency and output voltage.



[Save CSV file]

Click this button to save the operation information to a CSV file.

[Advanced]

Click this button to show/hide signals and change the display order.

For more information, refer to "2.3.2.1How to show/hide signals and change the display order".

[Target inverter] ([Target keypad])

Select the inverter you want to monitor.

Special value

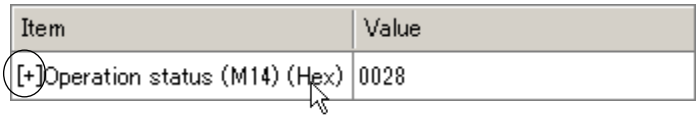
If the torque limit value is '32767', it means "no operation".

Hexadecimal value

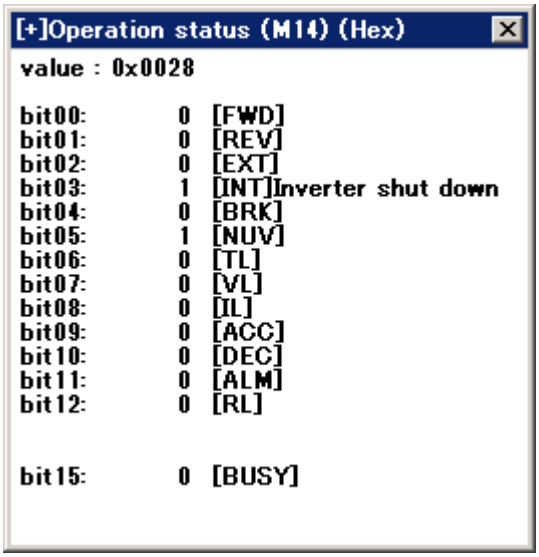
If an item name in the [Item] column is followed by "(Hex)", the [Value] column shows a hexadecimal value. The function code is shown in the pair of parentheses immediately preceding "(Hex)".

Detailed information will be displayed by clicking [+] symbol on the "Item" column if it is available.

For example, when the loader is connected to VF1A and the operation status value is '0028' (as shown below):



Detailed information

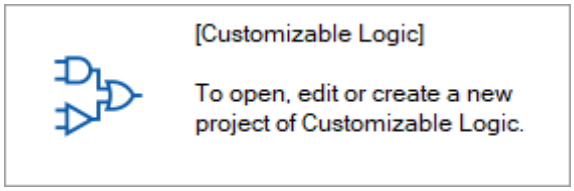


2.3.3. Customizable Logic

The customizable logic function allows you to create logic circuits using a graphical editor tool and transfer them to the inverter.

Also, you can debug your circuits on screen.

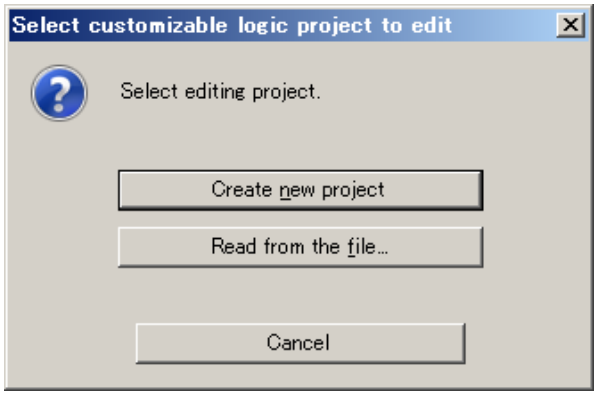
Select [Menu] > [Customizable Logic] from the main menu or click on the main window toolbar and click [Customizable Logic] to open the [Select customizable logic project to edit] window.



The [Select customizable logic project to edit] window allows you to select the customizable logic you want to view/edit.

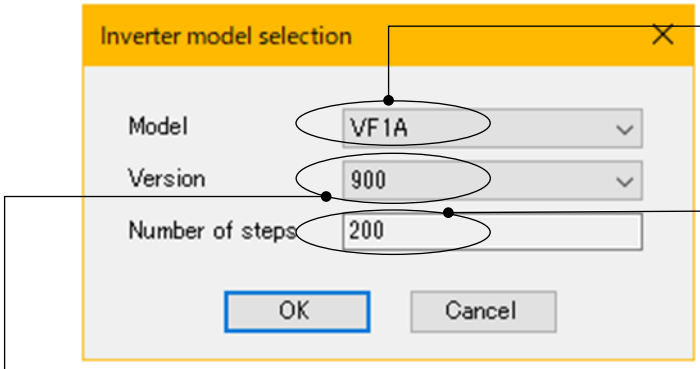
2.3.3.1. Select Customizable Logic Project to Edit

When you start the editor, the [Select customizable logic project to edit] window (shown below) appears first.



- [Create new project]

Click this button to create a new customizable logic project.
The model and version numbers affect how many steps you can use, what types of circuits you can create, etc. So, correctly set the model and version numbers according to the target inverter.



Model

Select the model number of the target inverter.

Number of steps

Shows the maximum number of steps.

Version

Select the ROM version of the target inverter.
For VF1A ROM version 5600 or later, interpret the ROM version in accordance with the instructions in "3.2.5 Replacement of Inverter ROM Versions"
If the list of choices does not contain the same version as the inverter ROM version, select the version earlier than and the closest to the inverter ROM version.
If the inverter ROM version is later than all the versions in the list of choices, the inverter may have been upgraded after the release date of your loader. Access the technical support page on IDEC website and check for the latest loader version upgrade file. If one exists, download and use it.

Tip

- You can identify the inverter model number you should select in the [Model] list box from the inverter model number printed on the rating nameplate of the inverter. Refer to "2.2.1. [1] Model, Regional Specification, Voltage, Capacity" for details.
- You can identify the inverter ROM version from the inverter keypad.
  For more information, refer to the instruction manual of your inverter.
  When The Loader is connected to an inverter, you can identify the inverter ROM version from [Inverter ROM Version] on the [System Monitor] tab of the [Operation Monitor Setting] window, which you can access by selecting [Operation Monitor Setting] from the Quick Access menu.

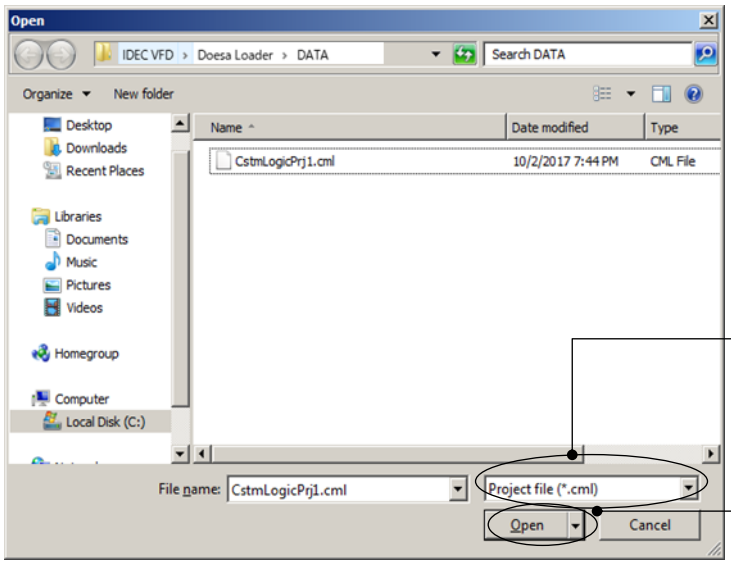
Tip

- If the inverter ROM version is unknown when creating a new definition file, you can change the version number later. For more information, refer to "2.3.3.12. Project Properties".

  However, changing the version number changes how many steps you can use and what types of circuits you can create. As the result, an error may occur during step number assignment. You are recommended to select a version number that is as appropriate as possible when creating a new circuit.

- [Read from the file]

Click this button to load a customizable logic project file saved in your PC and open a window for editing the file data.



Filter

Select the type of files displayed in the list.

[Open]

Opens the selected file.

File types

	VFD Doesa-Loader
Customizable logic data	*.CML

2.3.3.2. Editor Screen

Project management window

Allows you to manage the project files and function block properties.

Toolbox

Allows you to access the symbols provided by the customizable logic function.

Icons for customizable logic

[Select inverter] ([Select keypad])

Select the device you want to connect to.

[Update]

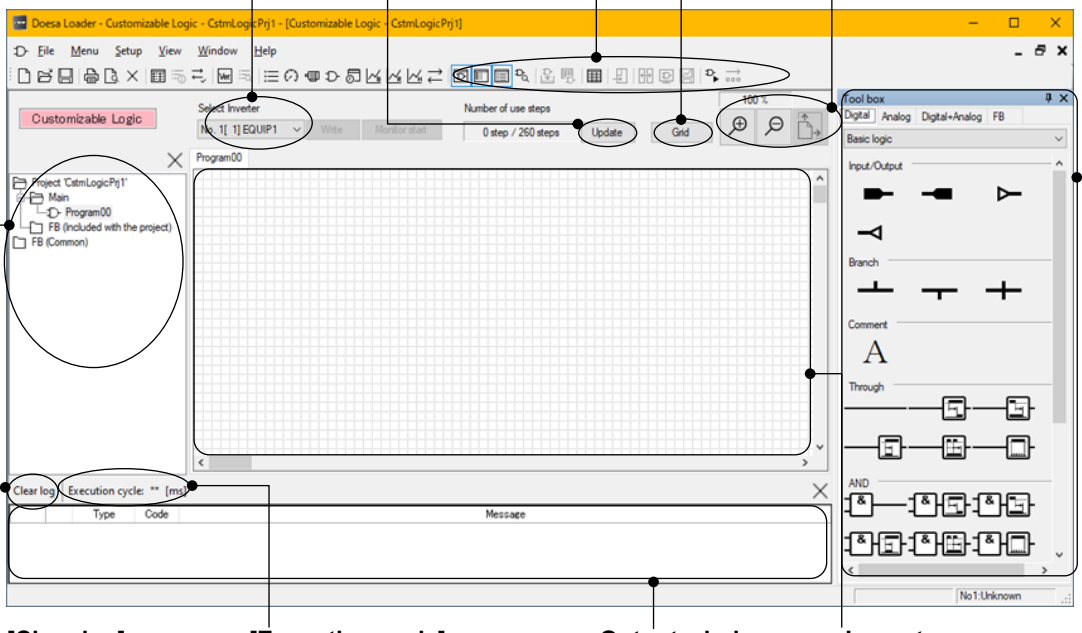
Click this button to update the number of steps.

[Grid]

Click this button to change the grid size.

Zoon in/Zoom out

Allows you to zoom in or out to the layout area.



[Clear log]

Click this button to clear the messages in the output window.

[Execution cycle]

Shows the approximate time between two executions of a step. The execution cycle is determined by the model and the maximum number of steps.
You cannot set the execution cycle as you want.

Output window

Displays information such as the results of auto assignment of function codes.

Layout area

Allows you to place symbols to draw a customizable logic function circuit.

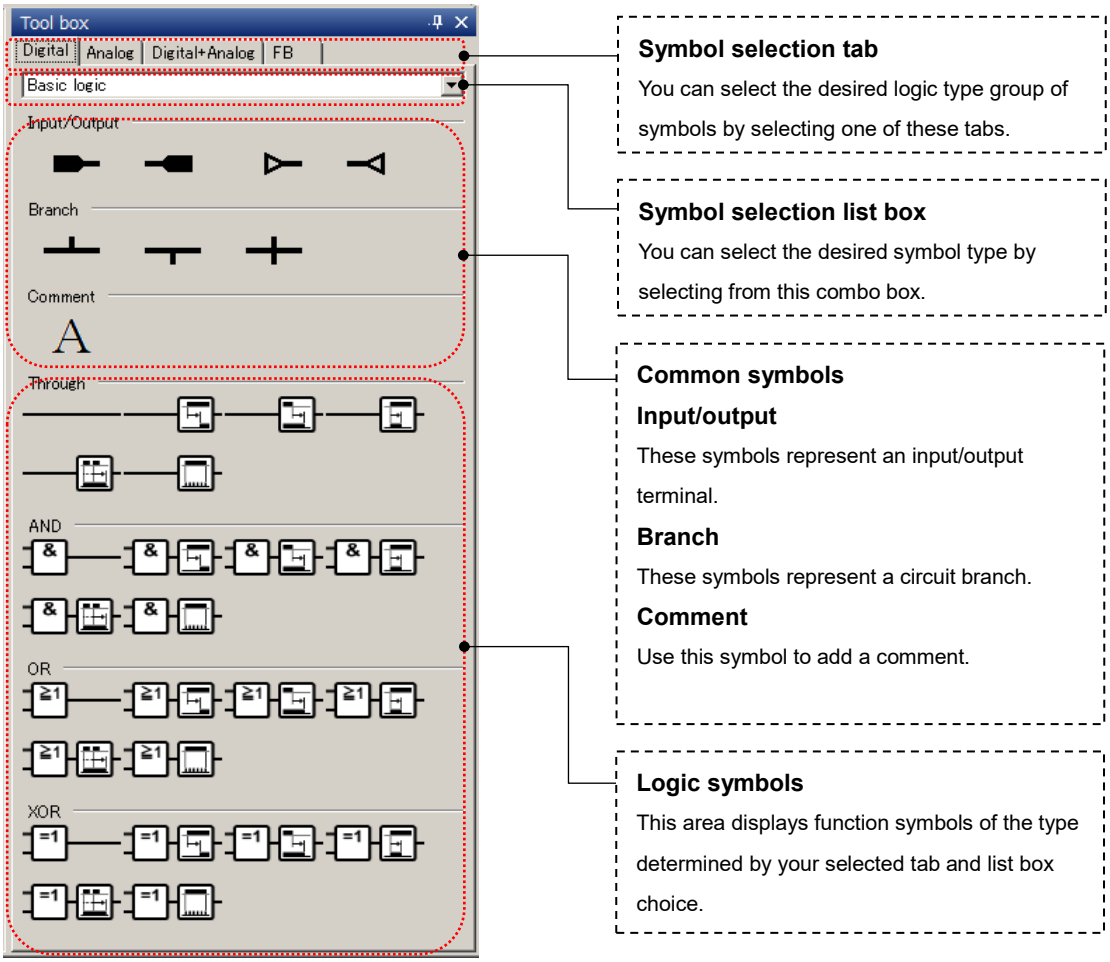
Icons for customizable logic

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13)

No.	Icon name	Function	Related section
(1)	Toolbox	Show or hide the toolbox.	2.6.4
(2)	Project management window	Show or hide the project management window.	2.6.4
(3)	Output window	Show or hide the output window.	2.6.4
(4)	Search symbol	Search symbols placed on the editor screen based on the specified keyword.	2.3.3.5

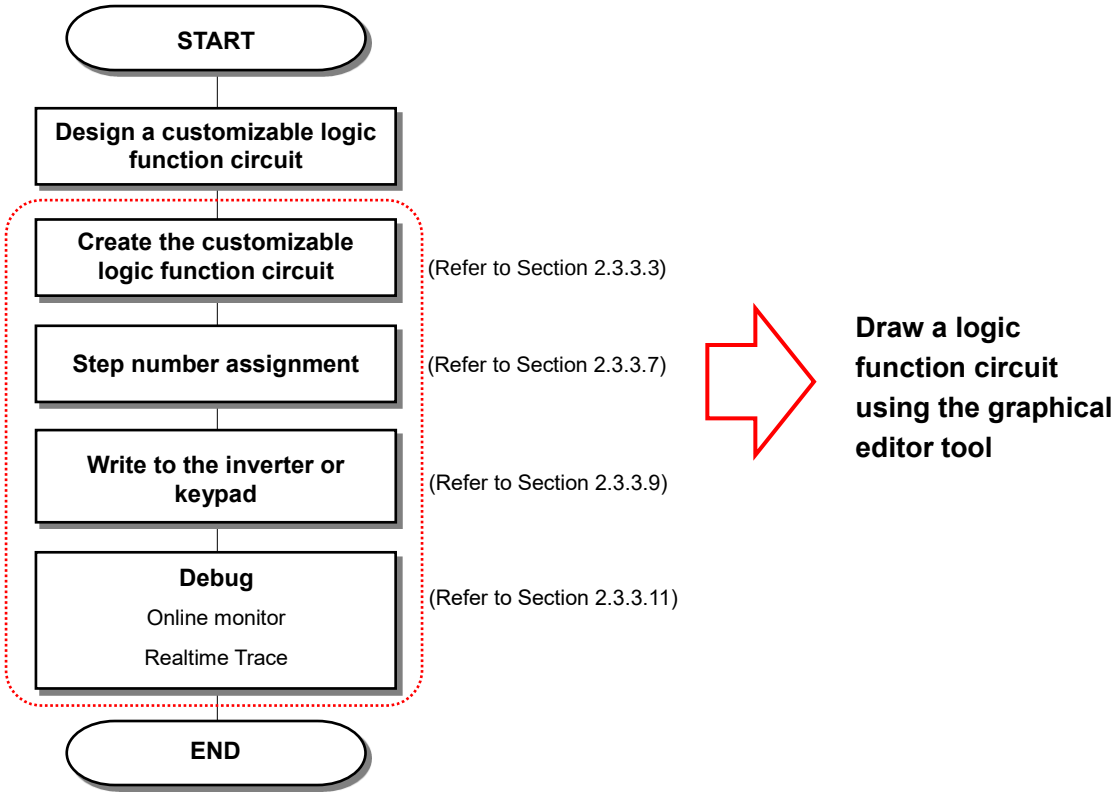
No.	Icon name	Function	Related section
(5)	Auto step number assignment	Perform auto step number assignment and circuit check.	2.3.3.7
(6)	Step number assignment screen	Display the screen for managing step numbers.	2.3.3.7
(7)	Settings for the user setting area and the customizable logic memory area	Display the list screen of function codes U121- and U171-, the list screen of the input/output terminal properties, and the list screen of the function code settings for each step.	2.3.3.6
(8)	Write to inverter (Write to keypad)	Write the edited circuit to the inverter or keypad.	2.3.3.9
(9)	Comparison	Compare the edited circuit with a circuit in the inverter, keypad, or saved file.	2.3.3.10
(10)	Monitor	Monitor the operation status of the circuit written to the inverter.	2.3.3.11
(11)	Save trace monitor information	Create and save the signal information for using the realtime trace function to monitor the operation status of the circuit written to the inverter.	2.3.4.10
(12)	Start/stop customizable logic	Start/stop the circuit written to the inverter.	-
(13)	Online batch processing	Simplify the series of operations from [Step number assignment] to [Write to the inverter] to [Start customizable logic] to [Start monitor].	2.3.3.11

Toolbox



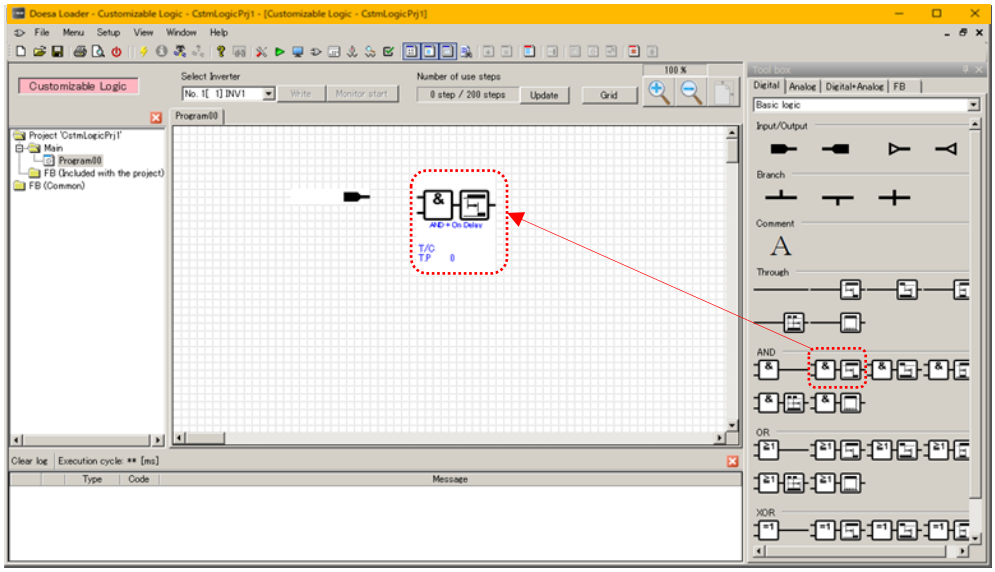
2.3.3.3. Workflow of Creating a Circuit

The following is the basic workflow of creating a customizable logic circuit. The steps for creating a circuit are described in the remainder of this section.



[1] Placing Customizable Logic Function Symbols

Select the desired symbols from the toolbox and drag & drop them in the layout area.



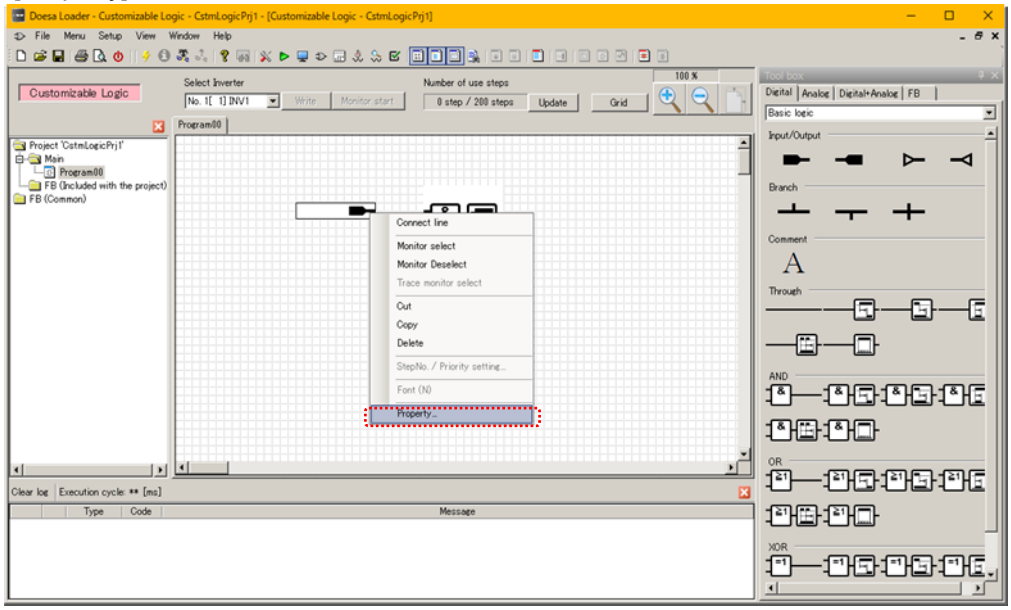
The execution order of customizable logic functions is determined by the order you placed them in the layout area.

Refer to "2.3.3.7. Step Number Assignment" for details.

[2] Configuring Customizable Logic Function Symbols

To configure the signal selection, timer value, and other parameters of each symbol, use the dialog you can open by selecting and double-clicking a symbol.

Alternatively, you can open this dialog by selecting and right-clicking a symbol and selecting [Property] on the context menu.



The properties of the respective symbols are as follows.

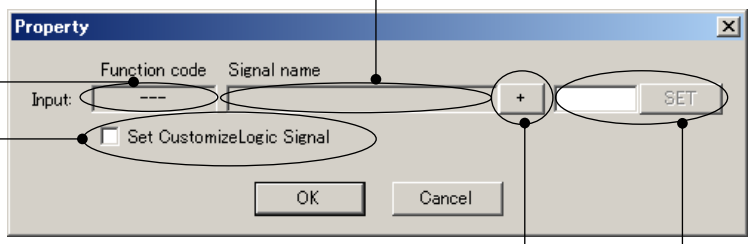
- Properties of an Input Terminal

Function code

The function code is displayed once the auto step number assignment completes successfully.

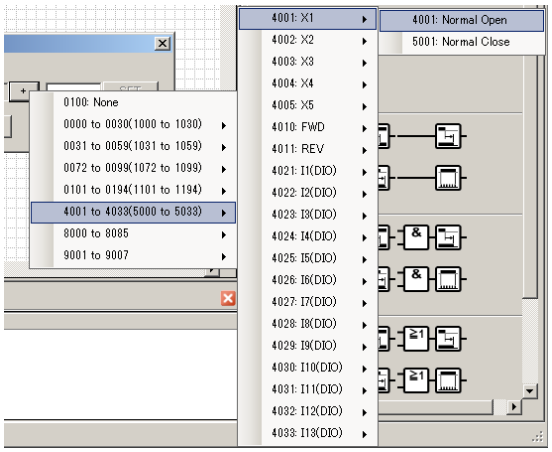
Signal name

Displays the code and name of the configured signal.



+ button

Click this button to open the list of available signals.



Signal code setting field and [SET] button

You can specify a signal by entering its code. For information on what code you can enter, refer to the setting range for function code U02 and U03.

For details on signals, refer to "2.3.3.16. List of Input Terminal Signal Codes".

[Set Customize Logic Signal]

This check box is enabled if you select a terminal input signal (number 40XX or 50XX).
Checking this check box allows you to write the "disable function" settings to the function codes for which you configure the terminal function when writing to the inverter.

For example, when you are configuring an X1 terminal, you may want to write "100[NONE]" to the X1 terminal function E01.

Note

- Once you have written the input terminal properties with the [Set Customize Logic Signal] check box checked, you cannot restore the original terminal function by re-writing the properties with the check box cleared. To restore the original terminal function, use some other method such as editing the function code list in the loader or using the keypad connected to the inverter.

Note

- With the [Set Customize Logic Signal] check box checked, you cannot write the properties to an analog input terminal (such as terminal 12). To disable the analog input terminal function, set the related function codes (such as F01 and E61) by some other method such as editing the function code list in the loader or using the keypad connected to the inverter.

- Properties of an Output Terminal

In the [Output selection] area on the properties screen, configure the customizable logic output signals 1 "CLO1" to 10 "CLO10" connected to the internal step outputs.

In the [Function selection] area on the properties screen, configure the inverter signals connected to the customizable logic output signals 1 "CLO1" to 10 "CLO10".

Hereinafter, a customizable logic output signal is referred to as a "CLO".

Output selection

CLO assignment

Displays the assigned CLO.
When you place an output terminal symbol, an unused CLO is automatically assigned.

To change the assignment, use the + button.

Internal step output

Once the auto step number assignment completes successfully, this field is automatically populated with the step number.

Function code

Once you configure a CLO, this field is automatically populated with the function code corresponding to that CLO.

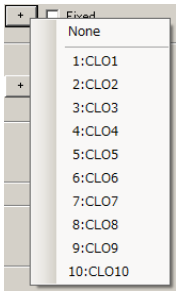
+ button

Select the desired CLO from the list.

You cannot select a CLO already used by another output terminal.

To use a CLO already used by another output terminal, temporarily clear the selection of that CLO for that output terminal.

Once you configure a CLO, [Fixed] is automatically checked.

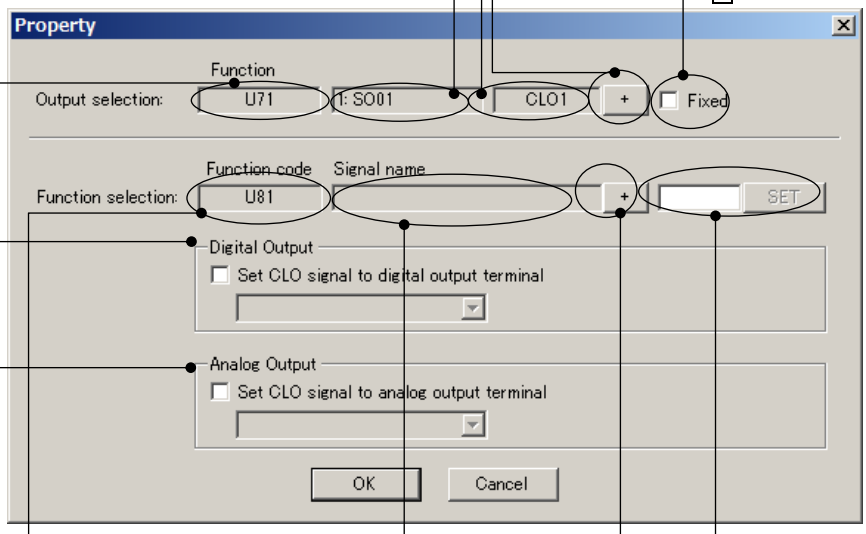


Fixed

You can select whether to allow or disallow the auto CLO assignment by the auto step number assignment.

☐ : Allow the auto assignment

☑ : Disallow the auto assignment



Function selection

Function code

Once you configure a CLO, this field is automatically populated with the corresponding function code.

Signal name

Displays the code and name of the inverter signal connected to the CLO.

+ button

Select the desired signal from the list.

Signal code setting field and [SET] button

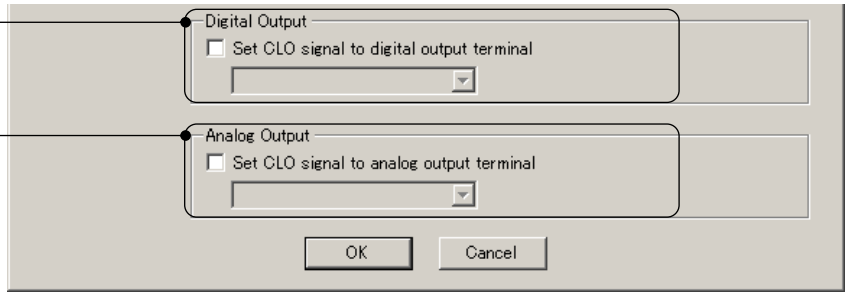
You can specify a signal by entering its code.
For information on what code you can enter, refer to the setting range for function code U81.

Digital output

Refer to the next page.

Analog output

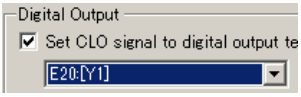
Refer to the next page.



Digital output

Select the digital output terminal (Y terminal) you want to connect to the CLO.
Checking this check box allows you to write the [CLO assignment] setting to the function code for which you configure the terminal function when writing to the inverter.

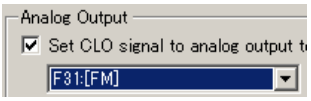
For example, if you select CLO1 for the [CLO assignment] setting (see the previous page) in the [Output selection] area and select "E20:[Y1]" under [Digital output], you can write "111 [CLO1]" to E20



Analog output

Configure the analog output terminal connected to the CLO.
Checking this check box allows you to write the [CLO assignment] setting to the function code for which you configure the terminal function when writing to the inverter.

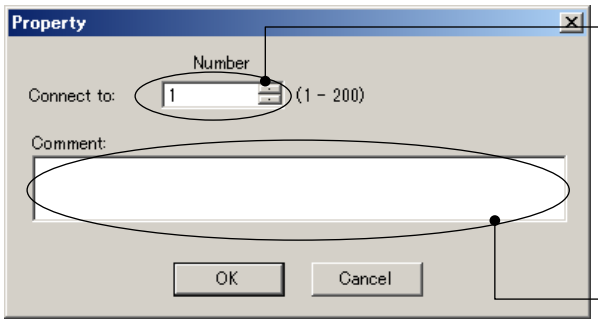
For example, if you select CLO1 for the [CLO assignment] setting (see the previous page) in the [Output selection] area and select "F31:[FM]" under [Analog output], you can write "111 [CLO1]" to F31.



Note

- Once you have written the properties with the [Digital output] or [Analog output] check box checked, you cannot restore the original terminal function by re-writing the properties with the check box cleared. To restore the original terminal function, use some other method such as editing the function code list in the loader or using the keypad connected to the inverter.

- Properties of a Link Terminal (output)



Terminal number

Specify the number to identify the symbol.

The number must be unique to this particular terminal.

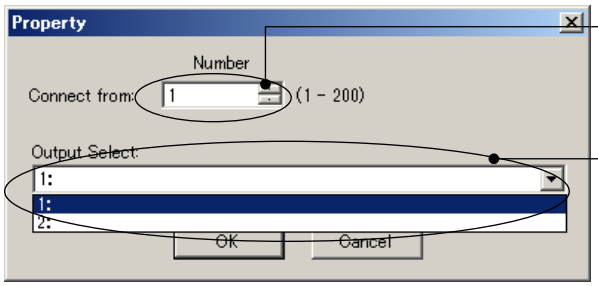
Specifying a number already used by another terminal would cause an error during the auto step number assignment.

Comment

You can add a comment.

Your entered comment will be displayed next to the symbol.

- Properties of a Link Terminal (input)



Terminal number

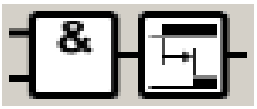
Specify the terminal number of the connection source link terminal (output).

Output terminal selection

From the list, select the terminal number of the connection source link terminal (output).

The list displays the terminal numbers of link terminals (output) existing in the layout area along with comments.

- Properties of a Function Block


etc.

Step

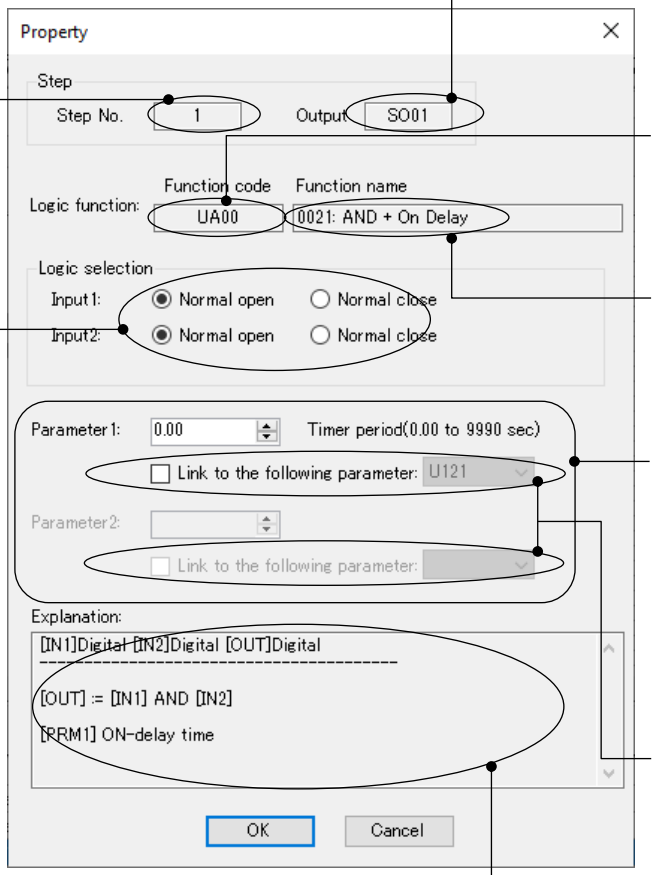
Step No.

Once the auto step number assignment completes successfully, this field is automatically populated with the step number.

The customizable logic steps will be executed in the ascending order of step numbers.

Output

Once the auto step number assignment completes successfully, this field is automatically populated with the internal step outputs, such as "SO01".



Logic function

Function code

Once the auto step number assignment completes successfully, this field is automatically populated with the function code.

Function name

This field is populated with the block selection code and the function block name. For details on function blocks, refer to "2.3.3.18. List of Logic Symbols".

Parameter 1, Parameter 2

Each logic symbol represents a different function.

For example, the "AND + ON" delay logic lets you specify the ON-delay time for [Parameter 1].

For a Function Code logic, specify the function code type and the function code number.

Link to the following parameter:

Set a link that the setting value of parameter 1 or 2 refers to the user setting/memory area (example: U121).

Setting a link requires 1 step for each.

Description

Describes the functions of the logic symbol.

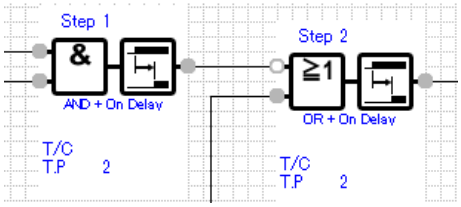
Logical selection

Input 1, Input 2

These buttons are enabled for a logic symbol with digital input. Use them to specify the input terminal logic.

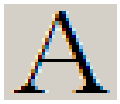
For example, this feature is useful when you want to input the logical inversion of an internal step output.

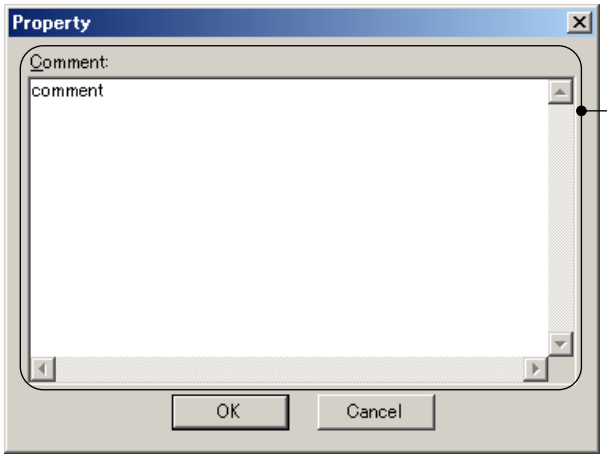
The following is an example of using a negative logic for input 1 in step 2.



The contact symbols of and represent a positive logic and a negative logic, respectively.

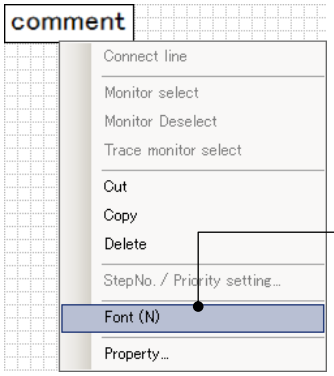
- Properties of a Comment





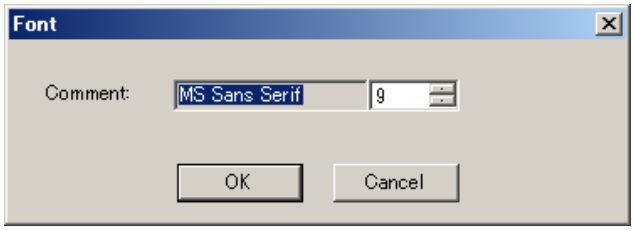
Comment

You can add a comment.



[Font]

To display the [Font] window, right-click the comment symbol and select [Font] on the context menu.



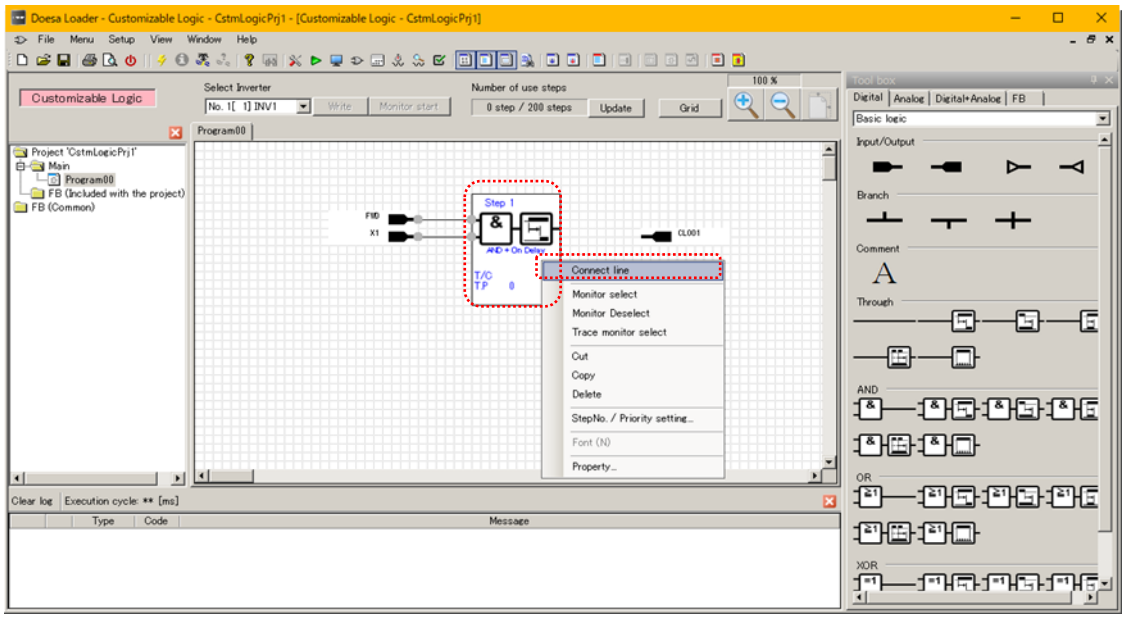
The [Font] window allows you to change the font size for comments.

Your changes to the font size are applied to all comments.

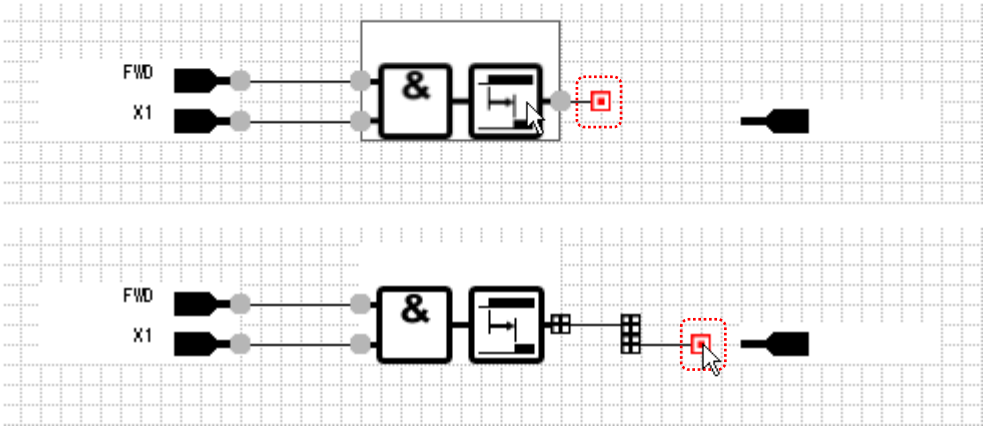
You can change the font size within the range of 8 to 99.
If you specify a value smaller than 8, the font size is set to 8; if you specify a value greater than 99, it is set to 99.

[3] Connecting Logics

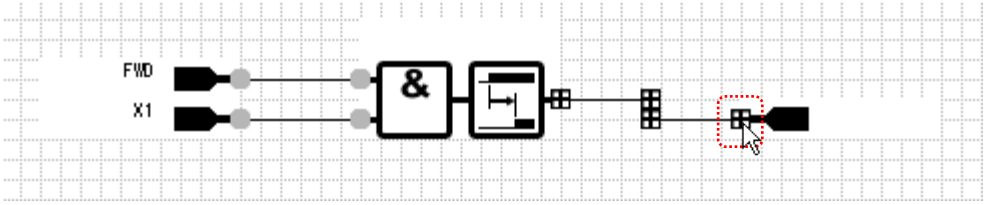
To connect logics, select and right-click the symbol and select [**Connect line**] on the context menu.



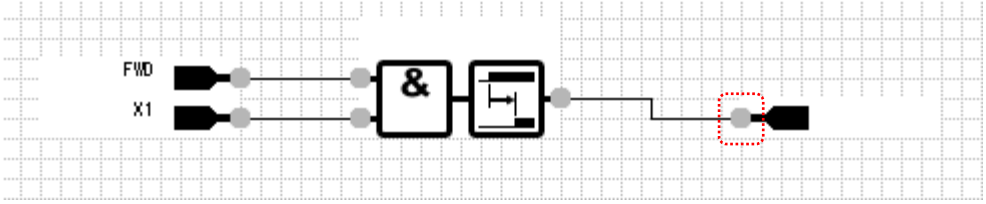
The connection line appears. Hover the mouse pointer on the red square at one end of the connection line and move it to the symbol you want to connect while holding down the left mouse button.



Once the connection line is connected to the symbol, the square at one end of the connection line changes from red to black.



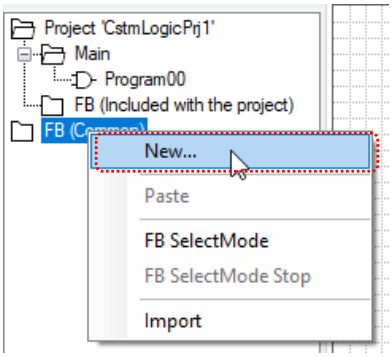
When you release the left mouse button, the square at one end of the connection line changes from a black square to a gray circle, indicating that the connection line is complete.

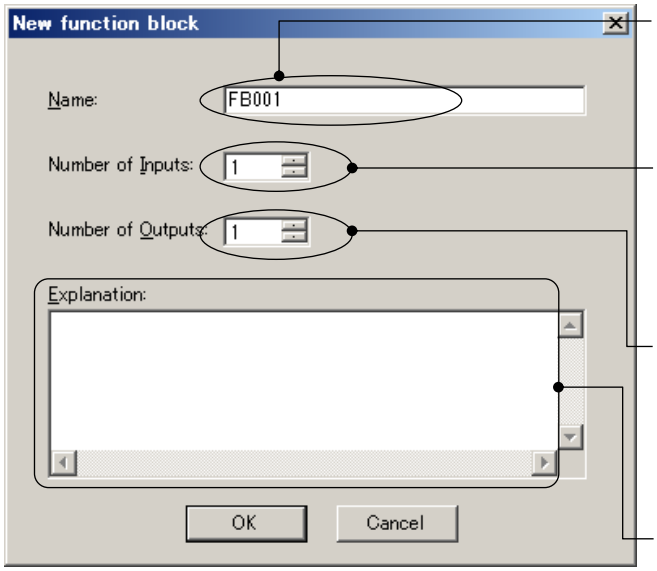


[4] Creating a Function Block (FB)

To create a function block (FB), select and right-click [FB (Common)] from the tree and select [**New...**] on the context menu.

The [New function block] dialog appears. Enter necessary information and click [**OK**].





Name

You can enter a name of your choice.

Number of inputs

Specify the number of inputs for the FB. Specify the exact number of signals you want to use. You can also create a FB without input by specifying '0'.

Number of outputs

Specify the number of outputs for the FB. Specify the exact number of signals you want to use. You can also create a FB without output by specifying '0'.

Description

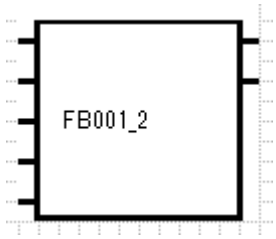
You can enter any description you want.

Tip

- You can change these parameters even after you create the FB. To change them, right-click the FB symbol or name under [FB (Common)] in the project management window and select [Properties] on the context menu.

Note

- Be sure to specify the exact number of inputs/outputs you want to use.
  The following example shows a FB symbol with the number of inputs set to 5 and the number of outputs set to 2 placed in the layout area.

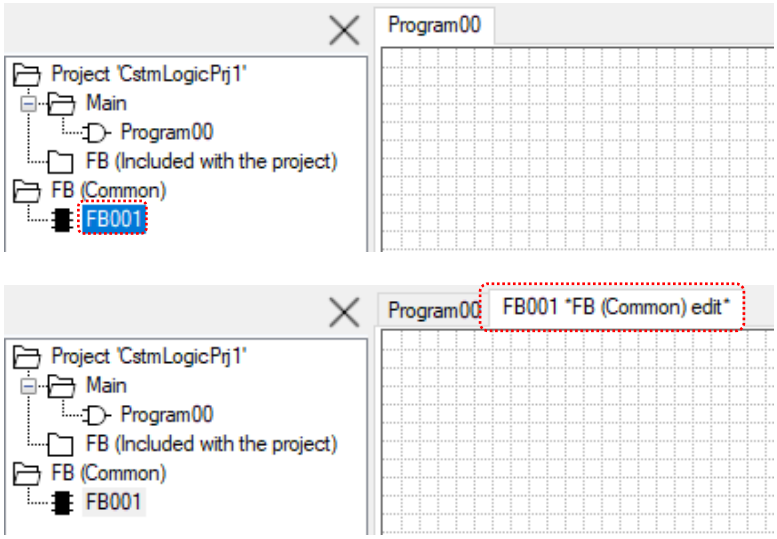


If the circuit that contains this FB symbol use four inputs and one output only, and you perform the auto step number assignment, an error message will appear indicating that the setting of the number of input terminals differs from that in the actual logic or that the setting of the number of output terminals differs from that in the actual logic.

Tip

- The input/output terminals for an FB are numbered 1, 2, ... from top to down.
  In the above example, the terminals on the left side are numbered [Input1], [Input2], ...[Input5] from top to down, and the terminals on the right side are numbered [Output1] and [Output2] from top to down.

Select [**FB001**] (or a FB with your specified name) that appears in the tree and double-click it to display the [**FB001*FB (Common) edit***].



To edit the internal customizable logic functions of a new function block, do the following steps:

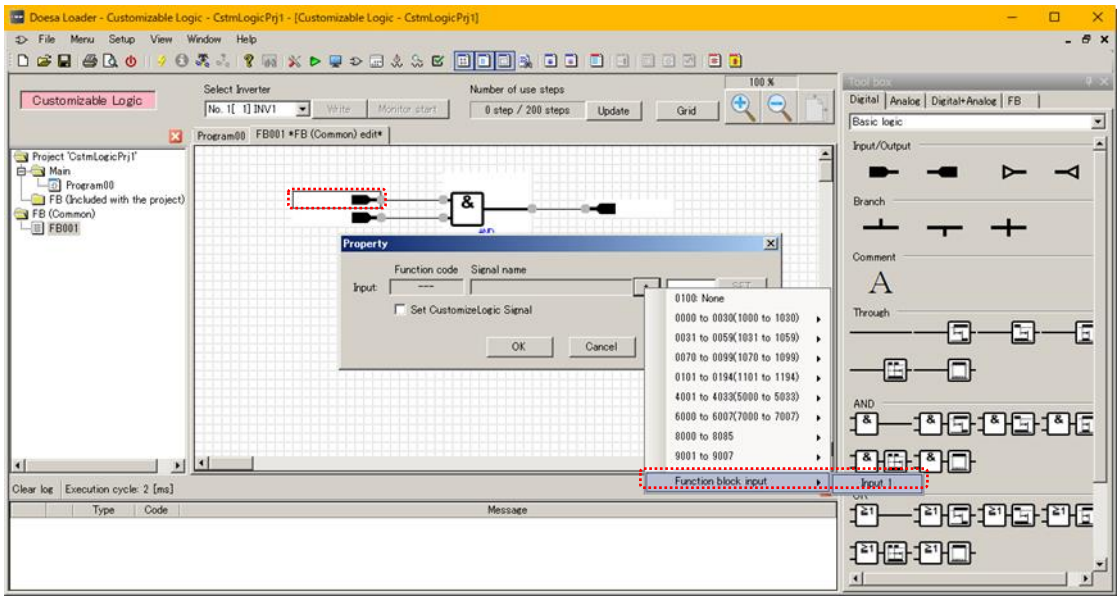
(1) Place input/output symbols in the layout area.

(2) Assign the required functions to the input/output symbols.

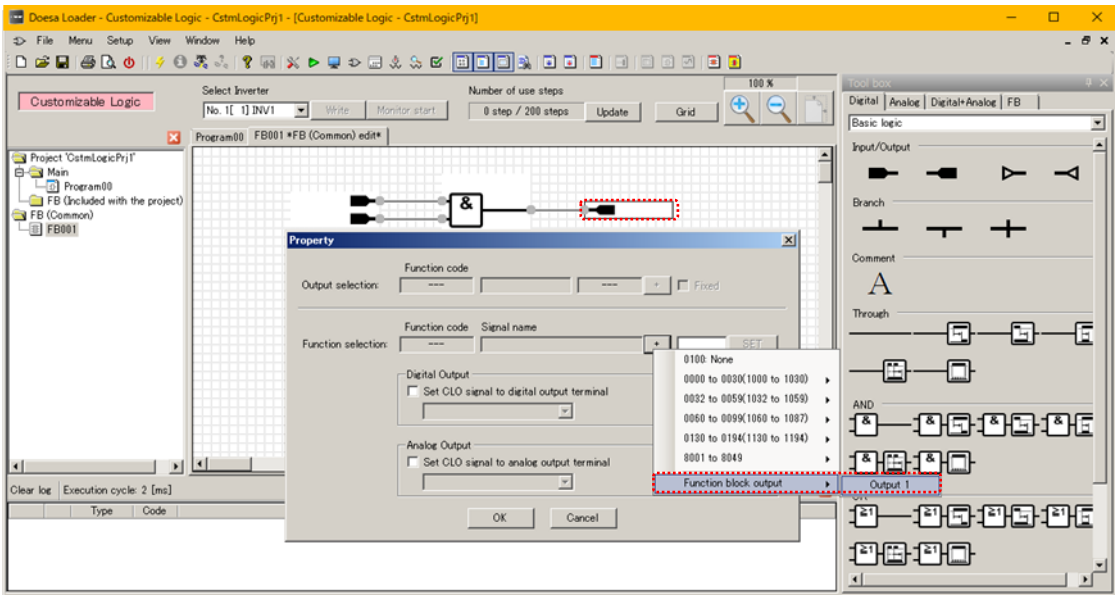
(3) Select the logic symbol from the toolbox, configure the logic, and connect the input/output symbols.

An example is shown below.

To edit the input for the FB, select [**Function block input**] -> [**Input1**].



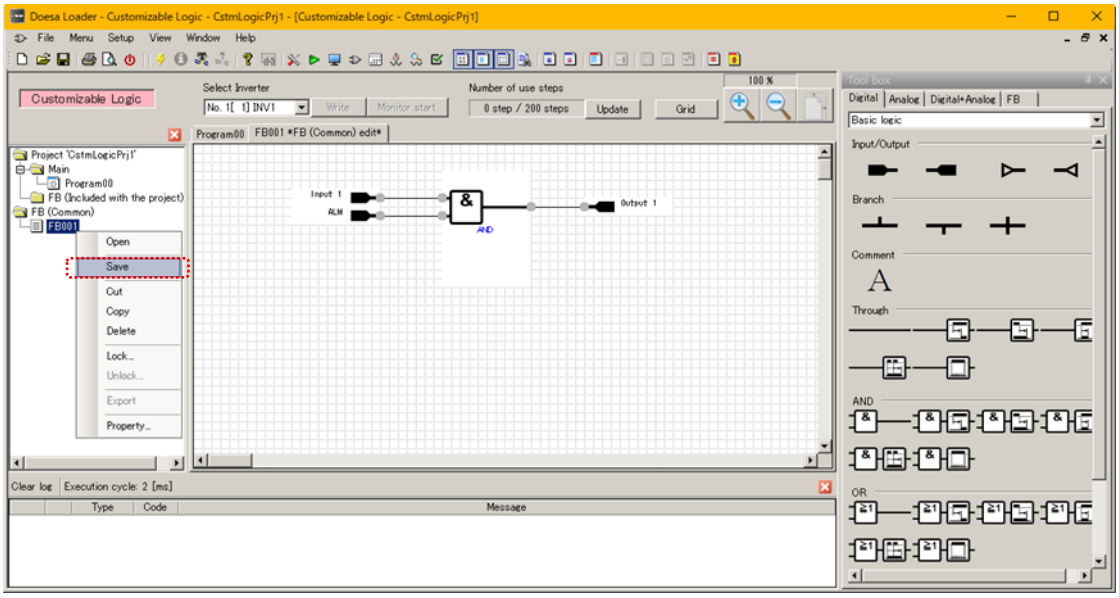
To edit the output for the FB, select [**Function block output**] -> [**Output1**].



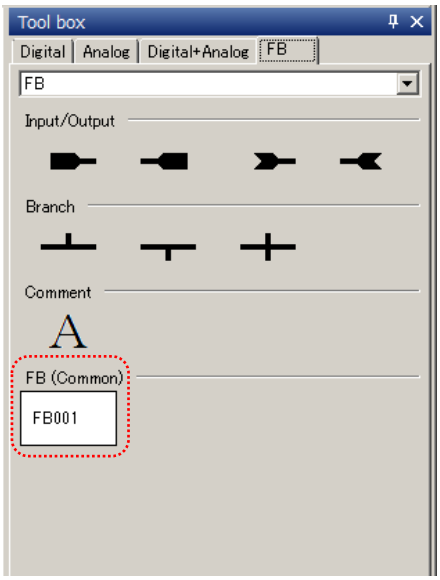
Tip

- You can select [Function block input] and [Function block output] on the FB edit tab only.

When you are finished editing the FB, select and right-click [FB (Common)] from the tree and select [**Save**] on the context menu.



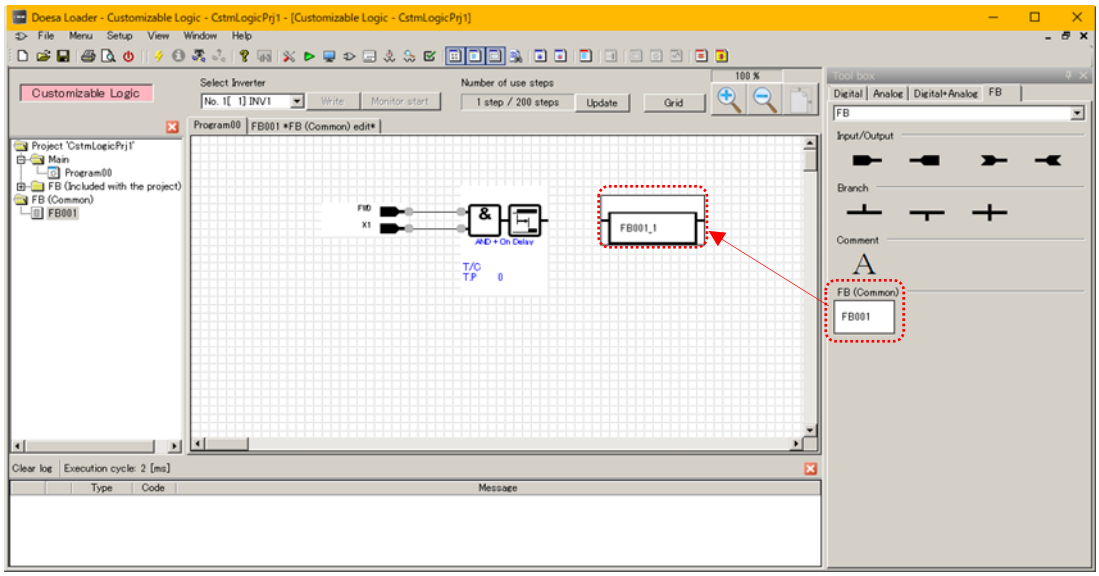
Once you save an [FB (Common)], the FB symbol appears on the [FB] tab of the toolbox.



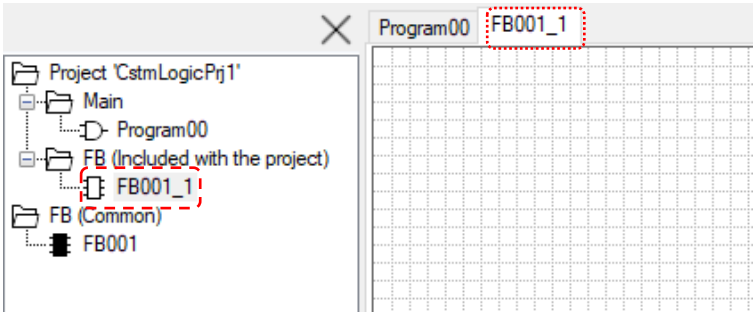
Tip

- Once you save an FB (Common), you can use the same FB in another project.

Return to the [Program00] sheet, select the FB symbol from the toolbox and drag & drop in the layout area.



Once you place "**FB001_1**" in the layout area, "**FB001_1**" is added to the project management window. Select and double-click "**FB001_1**" to open the edit tab for "**FB001_1**".



Note

- "FB001_1" is an FB that belongs to the project and therefore is handled separately from FB (Common) "FB001". Changes made to either of the two FBs will not be automatically reflected to the other.

Tip

- You can check the circuit you edited with the auto step number assignment. For more information on the auto step number assignment, refer to "2.3.3.7. Step Number Assignment".

Note

- The function blocks (FBs) under [FB (Common)] are not checked by the auto step number assignment. To check the function blocks (FBs) under [FB (Common)], you should add them to the project.

2.3.3.4. Precautions to Take when Creating a Circuit

[1] Timer Time

A circuit that uses a timer does not operate exactly according to the timer time setting if:

The timer time setting is smaller than the execution cycle

The timer time will become equal to the execution cycle if the timer time setting is smaller than the execution cycle.

Example: If the execution cycle is 20 ms, the timer time setting of 0.01 s is changed to 0.02 s when the circuit operates.

The timer time setting is not equal to a multiple of the execution cycle

The timer time will be rounded up to the next multiple of the execution cycle if the timer time setting is not equal to a multiple of the execution cycle.

Example: If the execution cycle is 20 ms, the timer time settings of 0.03 s and 0.05 s are changed to 0.04 s and 0.06 s when the circuit operates.

[2] "CLC" and "CLTC" Functions of General-purpose Input Terminals

The "CLC" and "CLTC" of a general-purpose input signal are signals for customizable logic.

"CLC" : Allows you to stop the customizable logic circuit operation.

"CLTC" : Allows you to clear all the customizable logic timers.

However, you cannot set "CLC" or "CLTC" (E01=80, 81) in the [Function selection] area on the editor screen.
To configure these functions, use some other method such as editing the function code list in the loader or using the keypad connected to the inverter.

[3] Circuit Read From the Inverter

The editor screen cannot display a circuit read from the inverter.

However, you can load a circuit as a function code by selecting [Function code edit...] -> [Read from the inverter] from the Quick Access menu (or, for some models, checking the [Open the customizable logic setting screen] check box).

[4] Function Block 3001: conversion 1, 3002: conversion 2

To write a circuit to the keypad and then write it to the inverter using the keypad's copy function, use [**Manually** set the conversion coefficient].

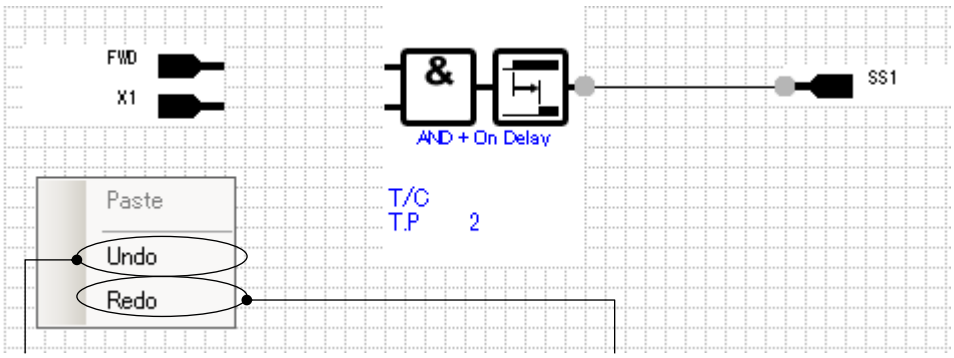
The [Auto calculate the conversion coefficient] setting is ignored by the keypad's copy function. Even if you set it, you cannot write the circuit to the inverter.

When you write the circuit directly from the loader to the inverter, you can use either [Manually set the conversion coefficient] or [Auto calculate the conversion coefficient].

2.3.3.5. Useful Features

[1] Undo/redo

You can select the undo or redo command from the right-click menu of the layout area.



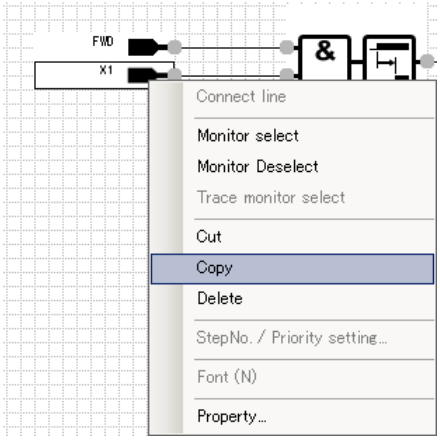
Undo

You can undo up to 3 previous layout changes such as moving and deleting a symbol or connection line.
You can also use [Ctrl] + [Z].
You cannot undo changes to the properties.

Redo

You can redo the last action. You can also use [Ctrl] + [Y].

[2] Copy/paste

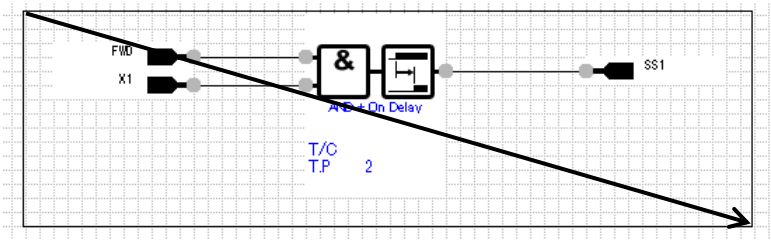


You can select the copy command from the right-click menu of a symbol. You can also use [Ctrl] + [C].

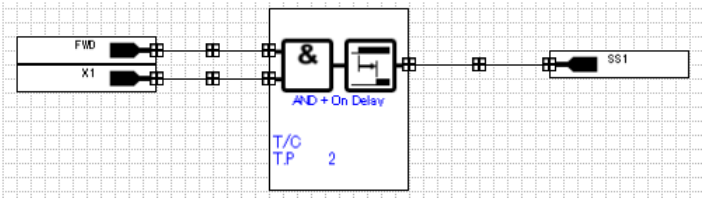
You can select the paste command from the right-click menu of the layout area (rather than a symbol). You can also use [Ctrl] + [V].

[3] Range Selection

You can select a range by dragging the mouse pointer in the layout area while holding down the left or right mouse button.



Once you release the mouse button, the symbol(s) in the range is selected.



Tip

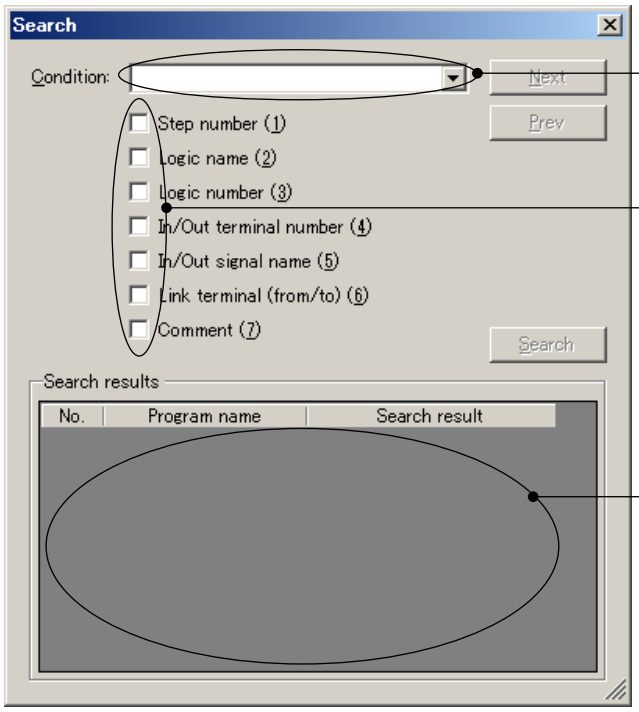
- You can select all the symbols by pressing [Ctrl] + [A].

[4] Symbol Search

The [Symbol search] feature allows you to search for a symbol in the layout area.

Click the [Symbol search] icon on the toolbar.

The [Search] dialog appears.



Condition

Combo box

Enter the search keyword.

Check boxes

Use these check boxes to specify the search conditions.
If you check two or more check boxes, they will be ORed.

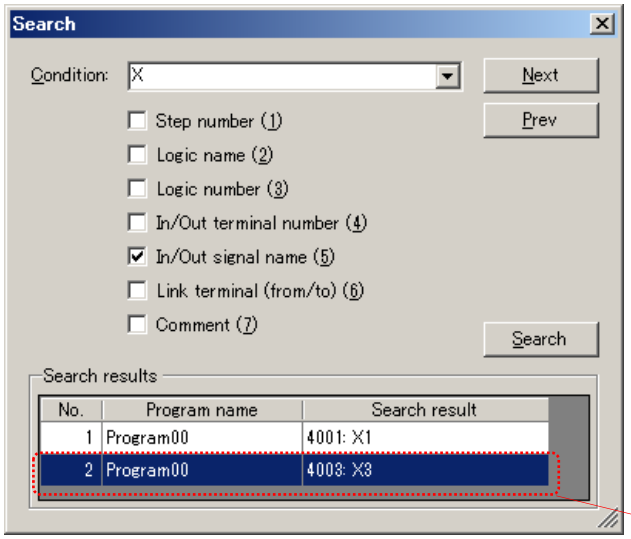
Once you select at least one check box, the [Next], [Prev], and [Search] buttons are enabled.

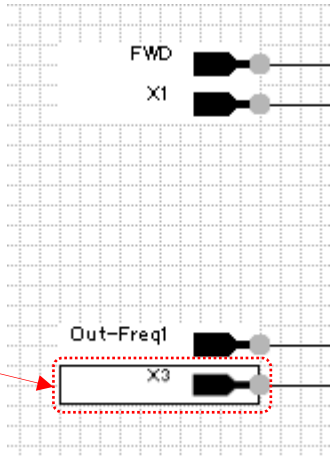
Search results

The search results are displayed.

When you double-click one of the search results, the focus moves to the matching symbol.

The following is an example of searching for symbols that use an X terminal as an input terminal.

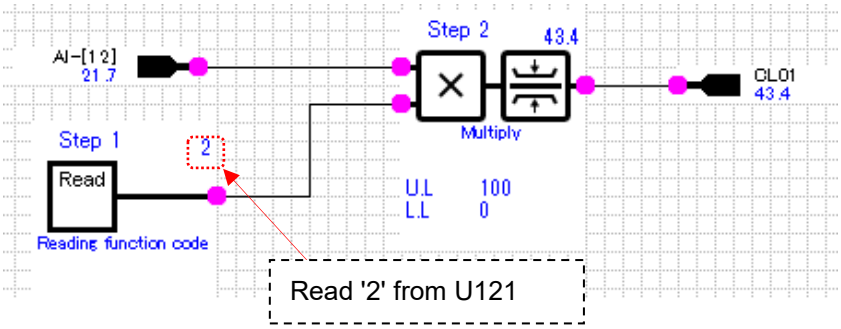




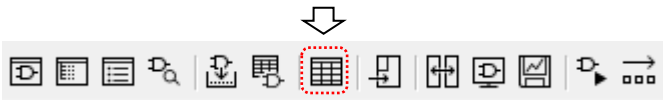
Double-clicking one of the search results moves the focus to the matching symbol.

2.3.3.6. Settings for the User Setting Area and the Memory Area

You can use function codes U121- and U171- as you want.
You can use these function codes as analog inputs by reading them with the function code read logic.
For example, when you want to double the input of terminal 12, you can use function code U121 by setting it to the constant of 2.00 as shown below.



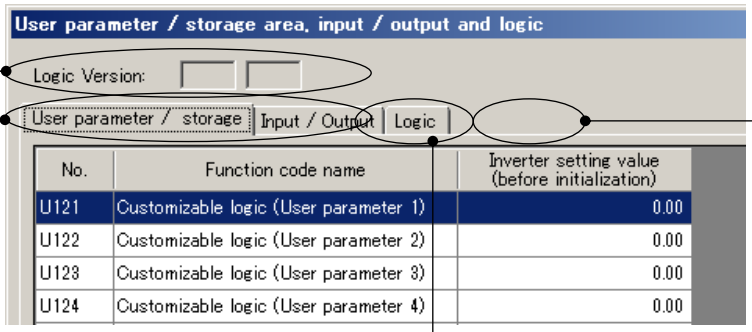
To use function codes U121- and U171-, click the [User parameter/Customizable logic storage area setting] icon on the toolbar.



The [User parameter/storage area, input/output and logic] window appears.

Logic version

Clicking the [Read from the inverter] button on the [User parameter/storage] tab displays the settings of function codes U197 and U199 read from the inverter.



Logic check

You can view the list of the settings for each step.

User setting area

- Customizable logic storage area

You can edit function codes U121- and U171-.

Input/output check

You can view the list of the settings of input and output terminals.

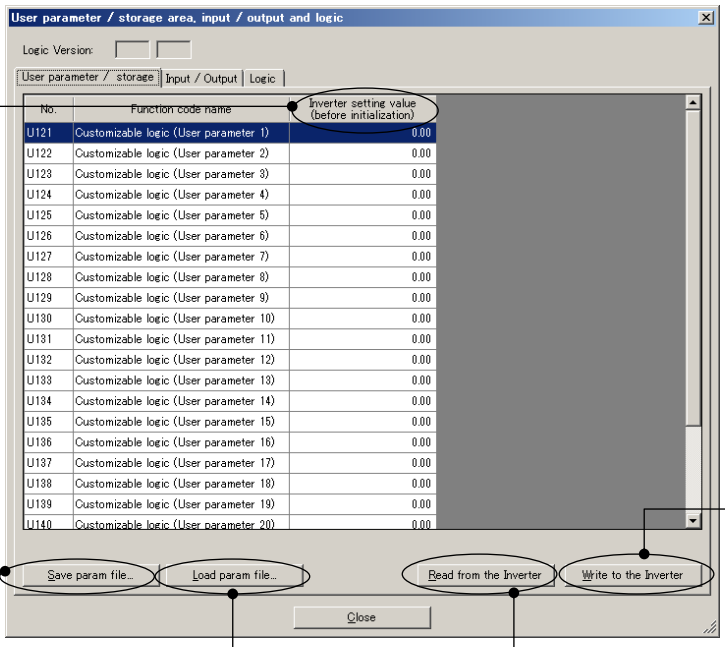
Open the [User parameter/storage] tab.

Inverter settings before initialization

You can configure the settings of function codes U121- and U171-.

If you open this window by clicking [User parameter/Customizable logic storage area setting] on the toolbar, '0.00' appears.

If you click [Write] or [Write to the inverter] and have this window automatically displayed upon completion of write, the settings read from the inverter before write appear.



Write to the inverter

(Write to the keypad)

Write the settings of function codes U121- and U171- to the inverter or keypad.

Save param file

Click this button to save the settings to a CSV file.

Load param file

Click this button to load a saved setting file.

Read from the inverter (Read from the keypad)

Click this button to read the settings from the inverter or keypad.

Configure necessary settings in the [Inverter setting value (before initialization)] column.
When you finish configuring the settings, save the parameters by clicking [Save param file].

Note

- Once you close the [User parameter/storage area, input/output and logic] window without saving the settings, they are lost and will not be restored the next time you open the window. Whenever you want to save the settings, be sure to click [Save param file].

Before writing to the inverter, check that the inverter can operate safely if function codes U121- and U171- are written to it.

Note

- You can write function codes U121- and U171- while the inverter is operating and while the customizable logic function is starting but the inverter may exhibit unexpected behavior, which can be very dangerous.
  If you cannot ensure the safety, stop the inverter and the customizable logic function before the write.

Tip

- The [User parameter/storage] tab is not available with inverters that do not have function codes U121- and U171-.

2.3.3.7. Step Number Assignment

Once you created a customizable logic function circuit, you have to assign step numbers to the respective symbols and FBs. There are three methods of assignment.

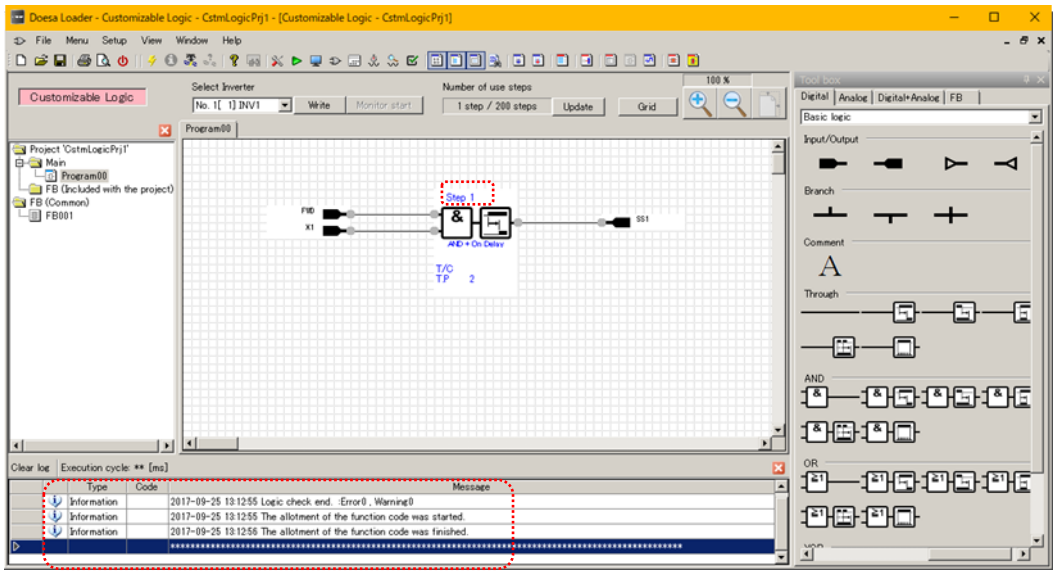
Tip

- The customizable logic functions are executed in the ascending order of step numbers.

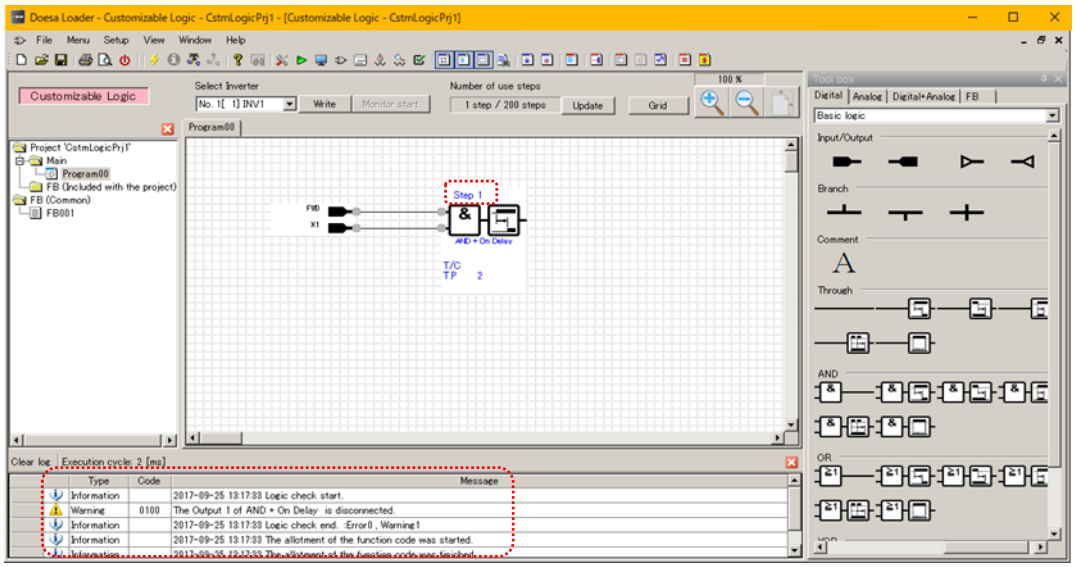
Assignment method 1: Auto step number assignment (function check)

Click the [Step No. automatic allotment] icon on the toolbar to perform auto step number assignment and circuit check.

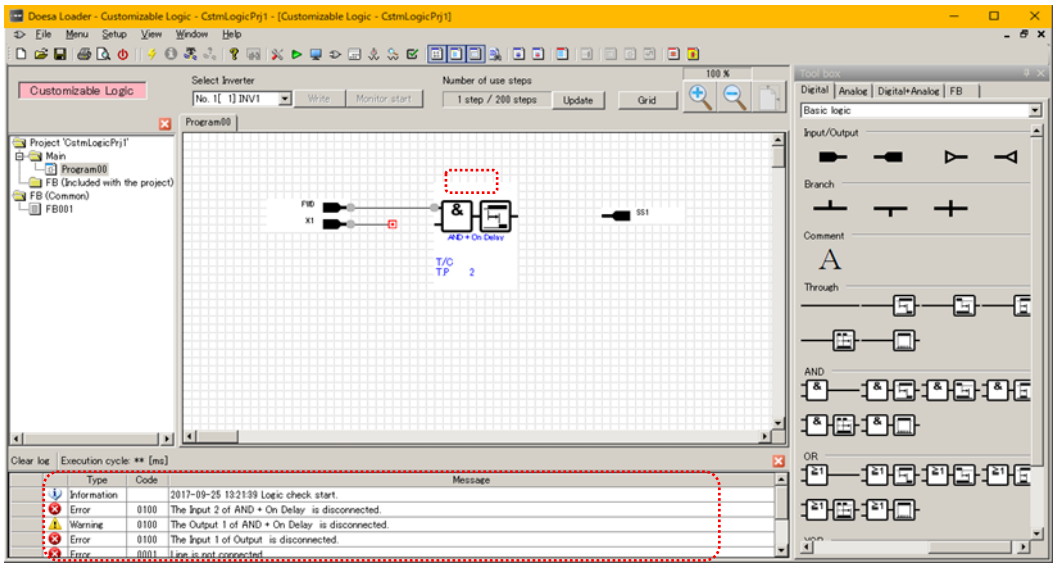
If no error is detected as the result of the circuit check, step numbers are assigned.



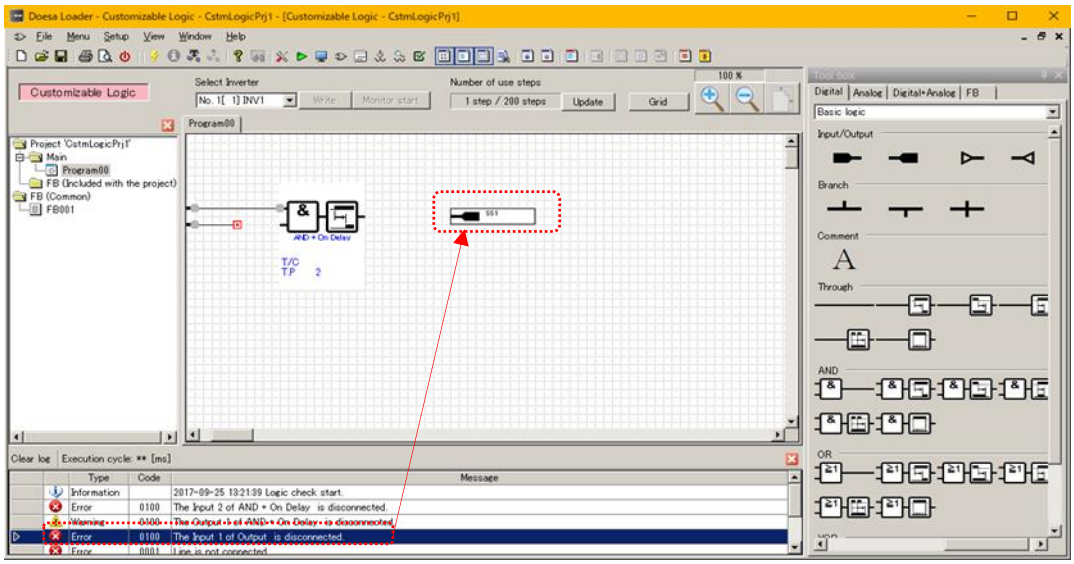
Step numbers are assigned even if a warning occurs.



If any error is detected as the result of the circuit check, step numbers are not assigned.



If this is the case, you can double-click the warning or error message displayed in the output window to jump to the symbol in which the error occurred.

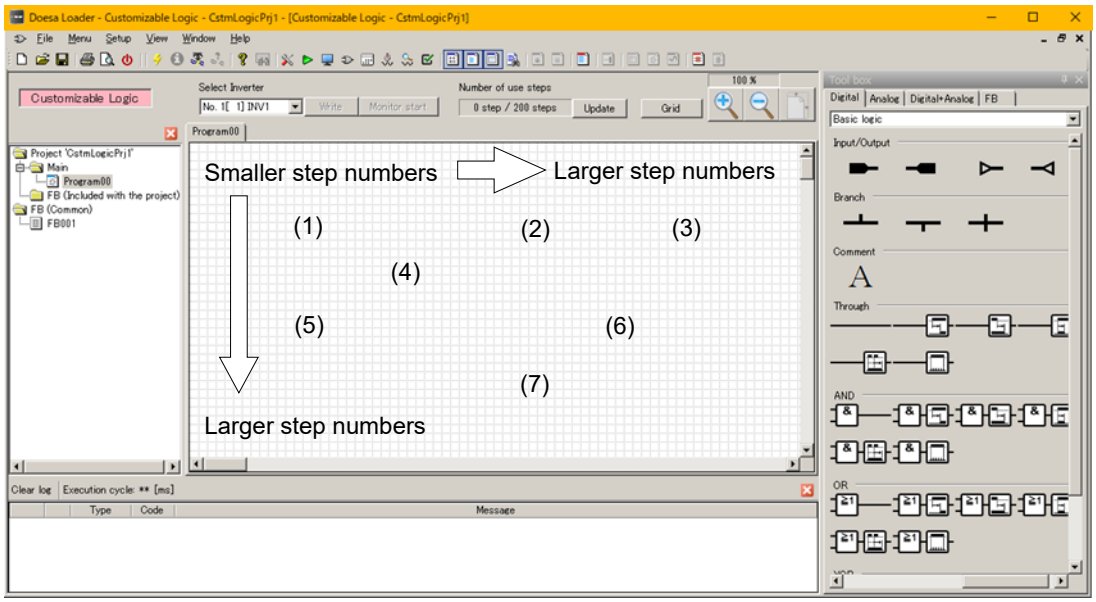


- Rules of auto step number assignment

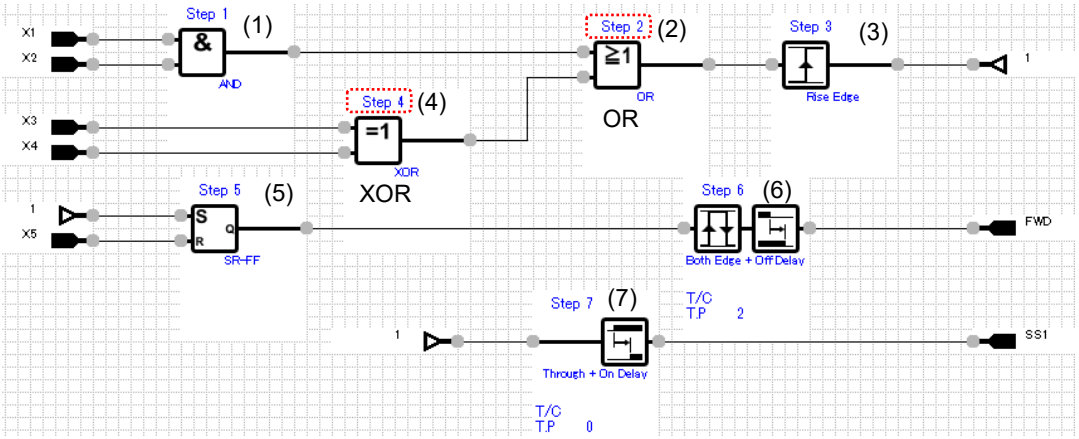
The rules of the auto step number assignment to customizable logic function symbols are as follows:

(1) The step numbers are assigned in the ascending order from top to down in the layout area.

(2) If two or more symbols are at the same height in the layout area, they are assigned step numbers in the ascending order from left to right.



An example is shown below.



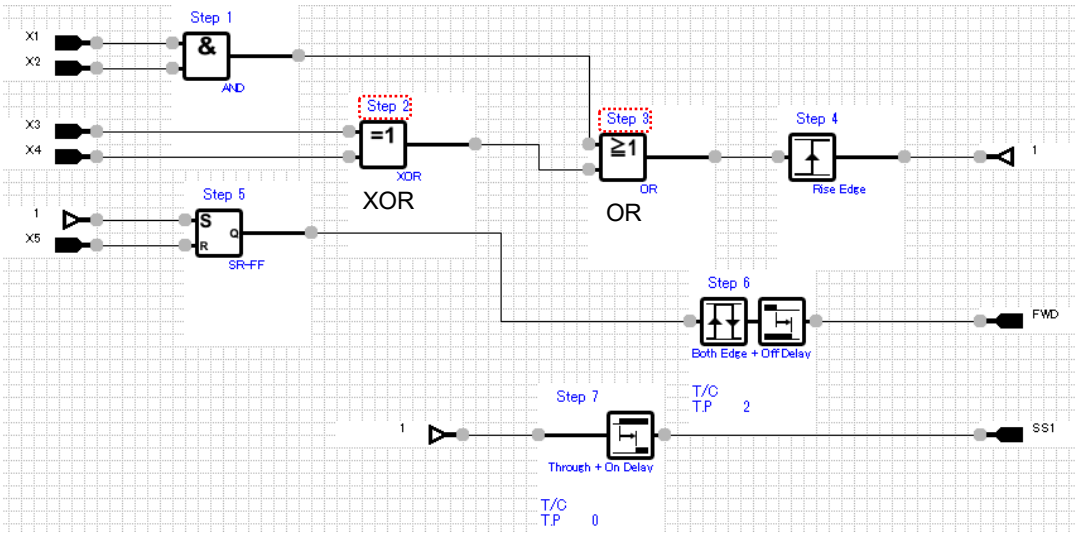
In the above example, the XOR circuit is assigned Step 4, and the OR circuit Step 2. As the result, the output of Step 4 is connected to the input of Step 2

In this case, the output of Step 4 is input to Step 2 in the next execution cycle.

Execution cycle	Execution order
Current cycle	(1) -> (2) -> (3) -> **(4)** -> (5) -> (6) -> (7)
	Output of Step 4
Next cycle	(1) -> **(2)** -> (3) -> (4) -> (5) -> (6) -> (7)

To input the output of the XOR circuit to the OR circuit in the same execution cycle as the OR circuit, adjust the positions of the symbols.

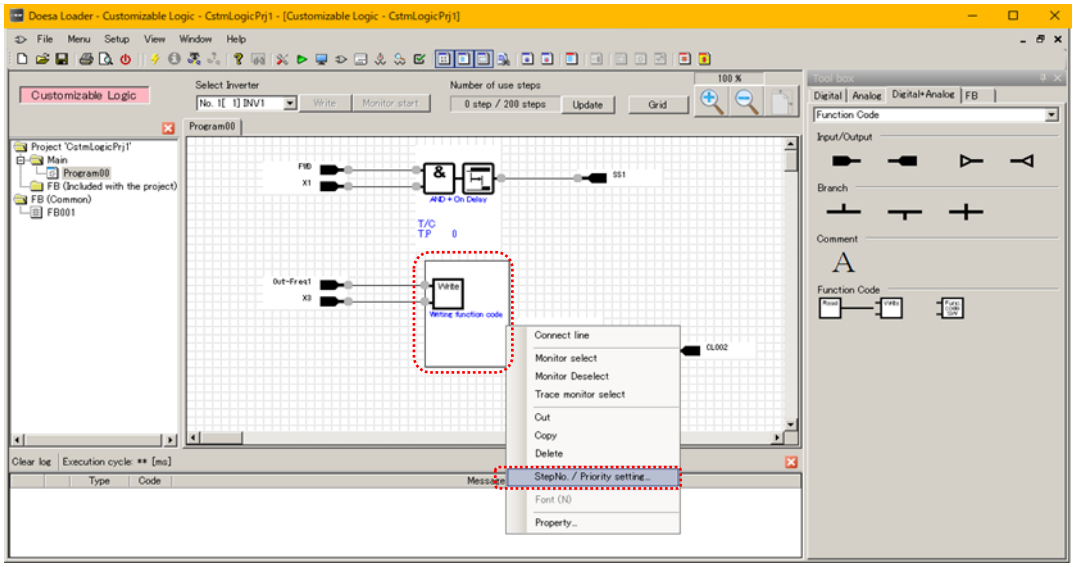
The following example shows the result of moving down (2), (3), (6), and (7) shown on the previous page and then performing the auto step number assignment again.



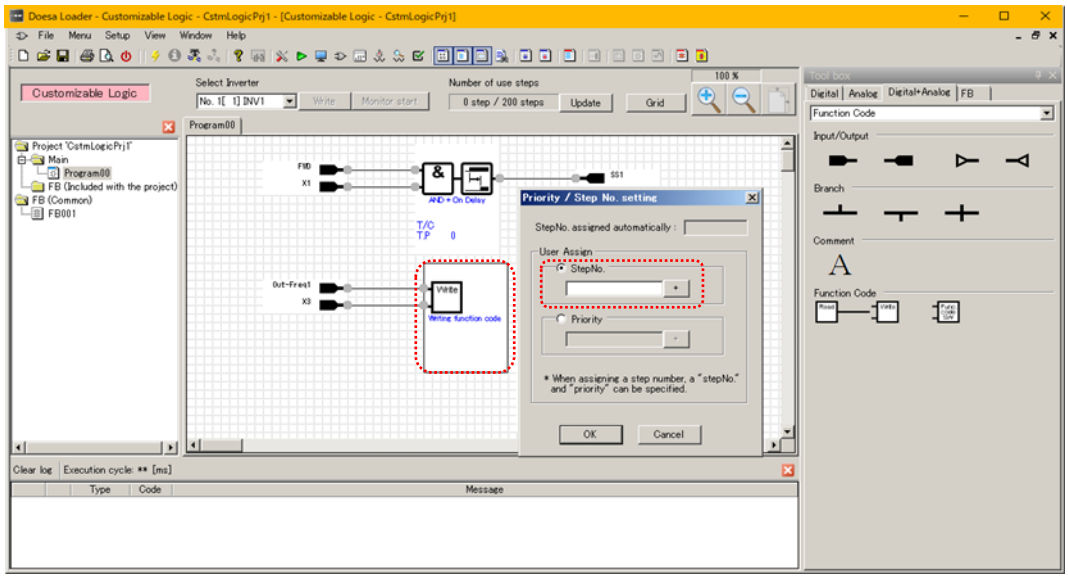
Now the XOR circuit and the OR circuit are assigned Step 2 and Step 3, respectively. This means that the output of the XOR circuit is input to the OR circuit in the same execution cycle as the OR circuit.

Assignment method 2: Manual step number assignment

You can opt to manually assign step numbers.
To do so, select and right-click a customizable logic function symbol and select [**Step No./Priority setting**] on the context menu.



Specify your desired step number.



Click the [Step No. automatic allotment] icon on the toolbar to check the edited circuits.

Note

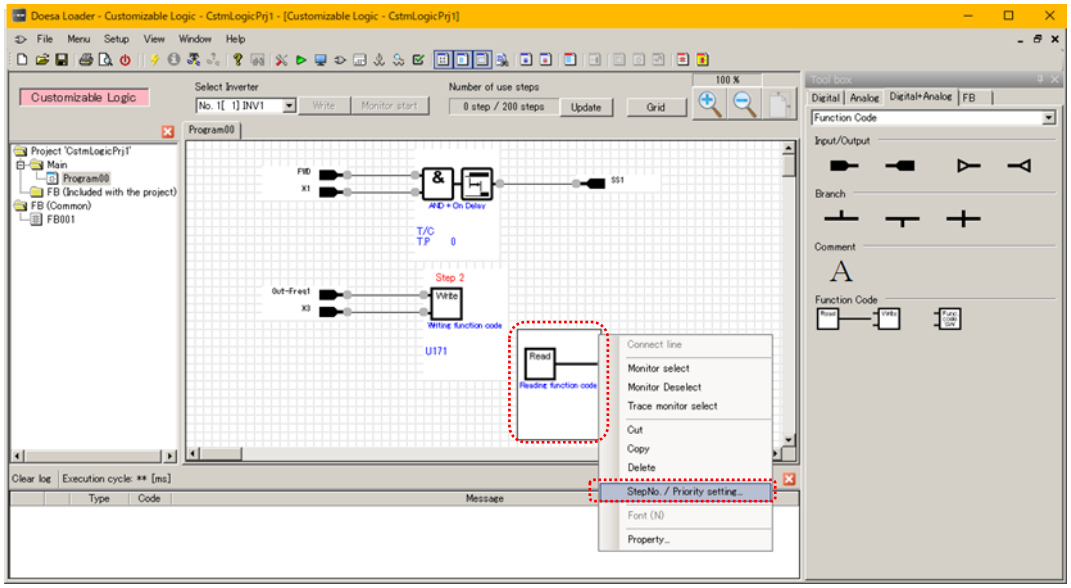
- You have to perform the auto step number assignment even if you have manually assigned a step number.
  Without performing the auto step number assignment, you cannot write to the inverter.

Note

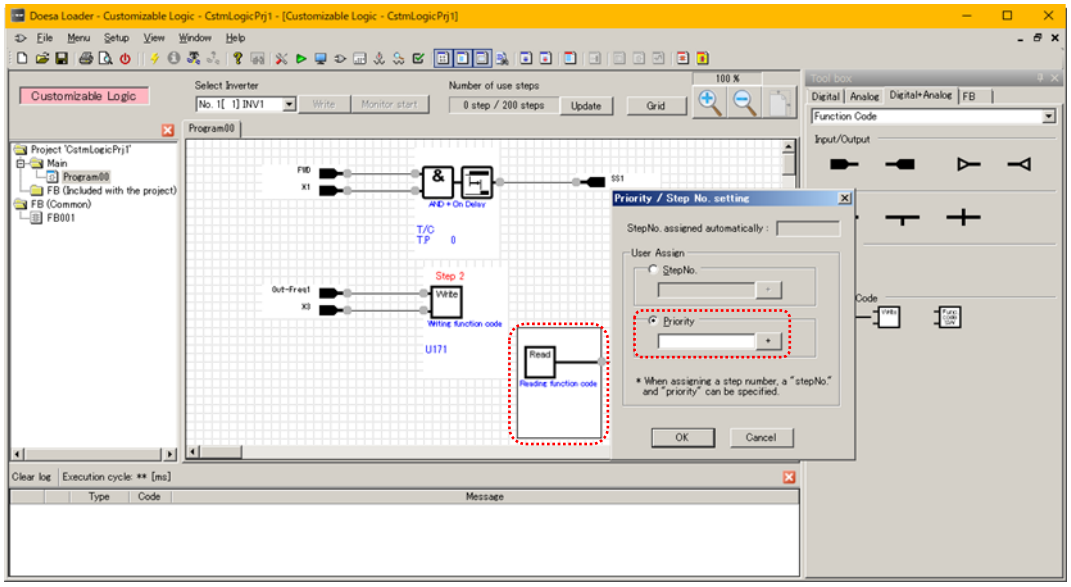
- If the inverter is one in which the execution cycle depends on the maximum step number and you specify a larger step number, the execution cycle will follow the specified step number even if you use one step only.

Assignment method 3: Step number priority setting

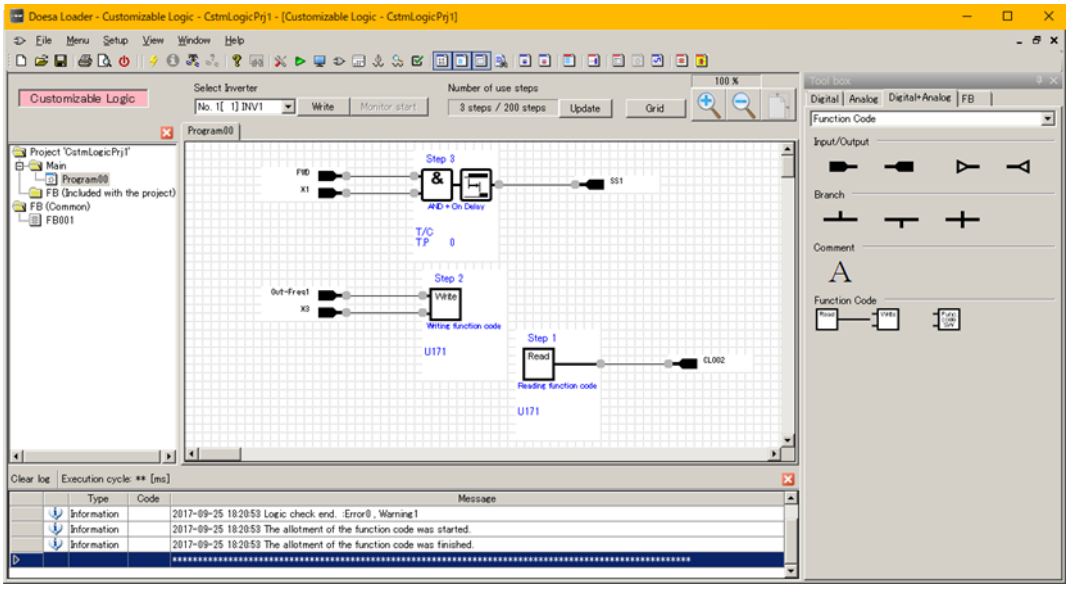
You can specify the priorities applied when automatically assigning step numbers.
To do so, select and right-click a customizable logic function symbol and select [**Step No./Priority setting**] on the context menu.



Specify your desired priority by entering a number equal to or greater than 1. The smaller the number, the higher the priority and the smaller the step number assigned.



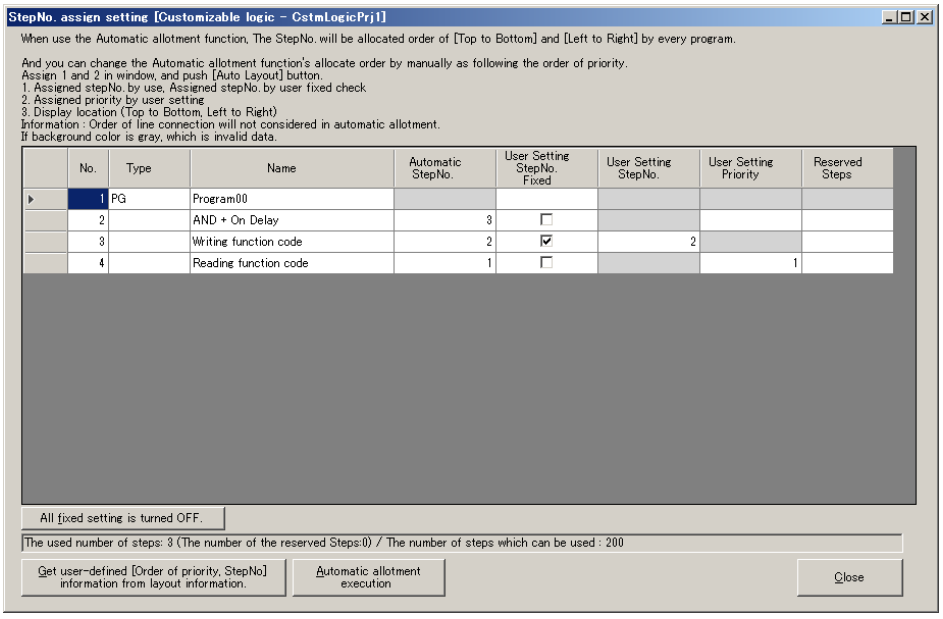
Click the [Step No. automatic allotment] icon on the toolbar to perform auto step number assignment.



The above three step number assignment methods are prioritized as follows:
Auto assignment < priority setting < manual step number assignment

To check the step number assignment

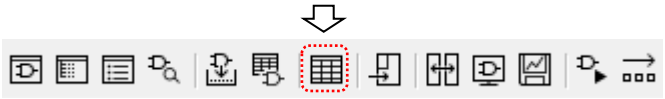
The step number assignment screen allows you to view and change the assignment status.



2.3.3.8. Circuit Check

You can view the lists of the input/output terminal properties and the settings for each step.

Click the [User parameter/Customizable logic storage area setting] icon on the toolbar.



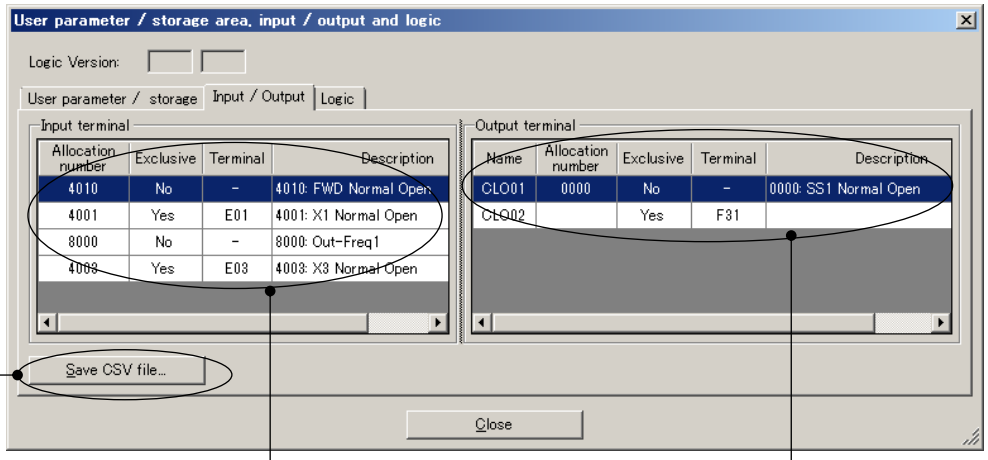
The [User parameter/storage area, input/output and logic] window appears.

Tip

- A limited set of functions is available with some inverter models. Refer to "1.1.2Loader Functions by VF1A Series Inverter Model" for details.

[1] Input/output Check

To view the list of the input/output terminal properties, open the [Input/Output] tab.



Input terminal

Allocation number

Shows the signal code of the input terminal.

Exclusive

Displays [Yes] if the [Set Customize Logic Signal] check box is checked on the input terminal properties window.

Terminal

Displays the function code assigned to the terminal function if [Exclusive] is [Yes]. You can write the "disable function" setting to this function code when writing to the inverter.

Description

Displays the assigned number and signal name.
This signal name is the same as shown on the input terminal properties screen.

[Save CSV file]

Click this button to save the displayed information to a CSV file.

Output terminal

Name

Displays customizable logic output signals 1 "CLO1" to 10 "CLO10".

Allocation number

Displays the inverter signal codes connected to customizable logic output signals 1 "CLO1" to 10 "CLO10".

Exclusive

Displays [Yes] if the [Output terminal digital] or [Output terminal analog] check box is checked on the output terminal properties window.

Terminal

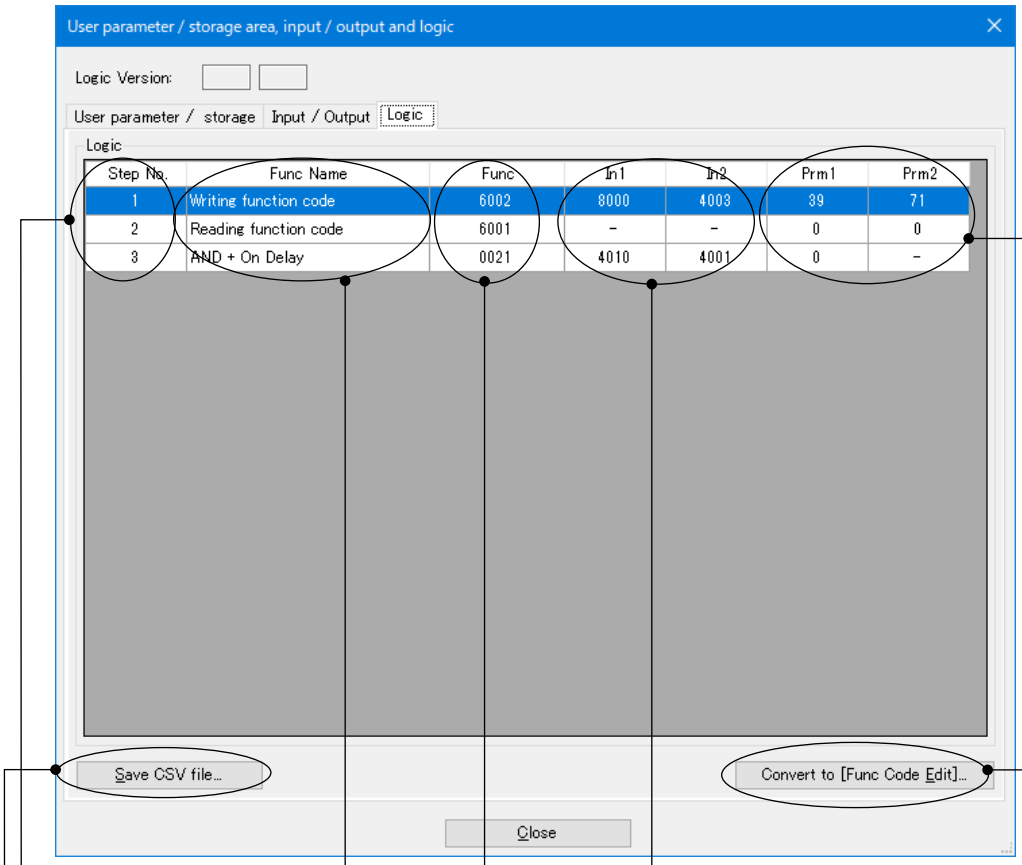
Displays the function code assigned to the terminal function if [Exclusive] is [Yes]. You can write customizable logic output signals 1 "CLO1" to 10 "CLO10" to this function code when writing to the inverter.

Description

Displays the assigned number and signal name. This signal name is the same as shown on the output terminal properties screen.

[2] Logic Check

To view the list of the settings for each step, open the [Logic] tab.



Step No.

Displays the step number.

Func Name

Displays the function block name.

Func

Displays the block selection code.
For information on this code, refer to the setting range for function code U01 or "2.3.3.18. List of Logic Symbols".

[Save CSV file]

Click this button to save the displayed information to a CSV file.

In1, In2

Displays the signal code of the input terminal connected to the logic symbol.

For information on what code you can enter, refer to the setting range for function code U02 and U03.

Prm1, Prm2

Displays the [Parameter 1] and [Parameter 2] settings on the logic symbol properties window (or the function code type and the function code number).

Convert to [Func Code Edit]

Converts and displays the listed contents in the "Function Code Edit" window.

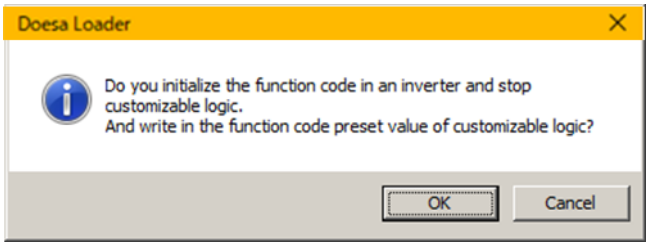
2.3.3.9. Write

Your edited circuits are assigned step numbers and converted to the inverter function code settings when the function check completes successfully.
Once the conversion completes successfully, the [Write] button is enabled.

[1] To Write to the Inverter

To register these settings in the inverter, check that the inverter is stopped and then click the [Write] button or the [Write to the inverter] icon on the toolbar.

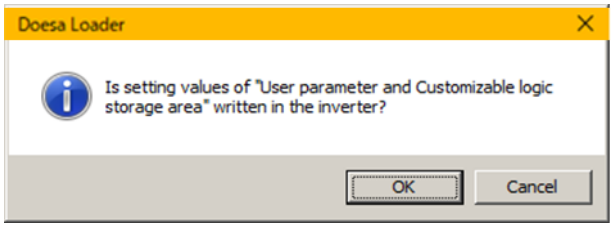
Click [OK] to start the write operation.



Note

- The write operation fails while the inverter is running. Stop the inverter and then perform the write operation.
- If you stop the customizable logic function while the inverter is running, an "ECL: Customizable logic error" alarm occurs.
- The write operation may fail with an inverter that has password protection enabled. If this is the case, you should disable password protection to perform the write operation. For more information on password protection, refer to the instruction manual or user's manual of your inverter.

Upon completion of write, you are presented with a dialog that prompts you to confirm the write operation to the user setting and customizable logic memory area (function codes U121- and U171-).



At this time, the settings of function codes U121- and U171- in the inverter have been initialized to 0.

Click [OK] if you want to restore the setting of function codes U121- and U171- in the inverter.

Click [Cancel] if you do not use function codes U121- and U171- or you accept the settings of 0.

When you want to write new settings to function codes U121- and U171-, click [Cancel] and, upon completion of write, perform the write operation from the [User parameter/storage area, input/output and logic] window.

[2] To write to the Keypad

If you have selected [Data in Keypad (in VF1A-PH1)] for [USB Connection] on the [Communication Setting] window, you can write your edited circuits to the VF1A-PH1 remote keypad with USB. In this case, the write operation to the inverter uses the keypad's copy function.

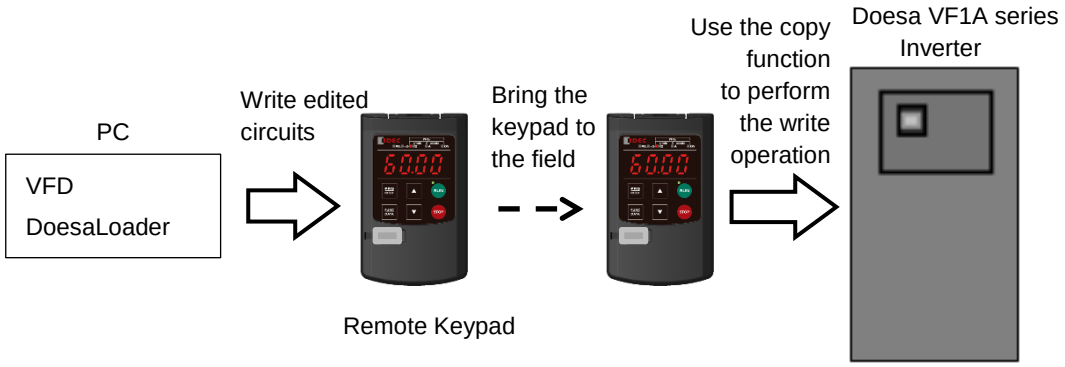


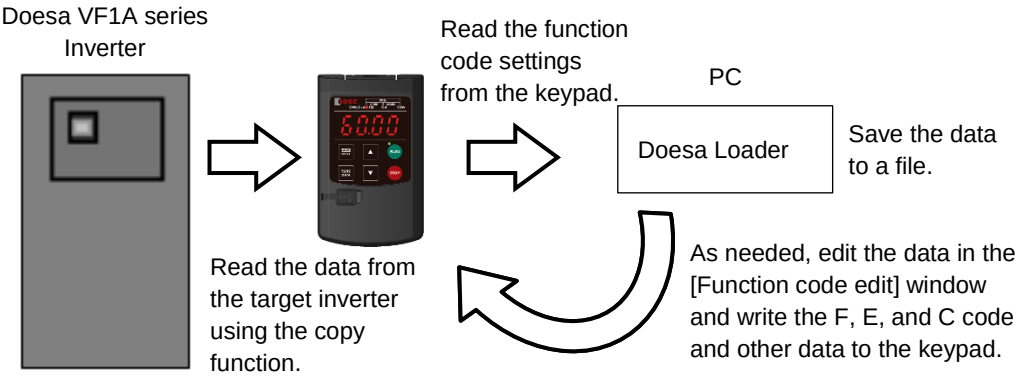
Figure 2-1 Workflow of writing circuits to a keypad

Preparation

The write operation through the keypad's copy function writes, not only the customizable logic related function code data, but also all other function code data (such as F codes, E codes, and C codes) to the inverter. Therefore, you should write the function code data other than related to the customizable logic to the keypad in advance.

To write the function code data to the keypad, use one of the following two methods:

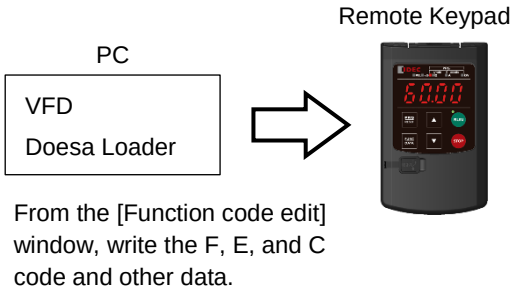
(1) Read the function code setting data from the target inverter to the keypad using the copy function. (As needed, read the data from the keypad to the loader and write the data back to the keypad after editing the data in the loader.)



Tip

- When you read data from the keypad to the loader for backup or similar purposes and work with the inverter that has the customizable logic function codes, be sure to save both the list of basic function codes (such as F, E, C) and the list of the customizable logic function codes.

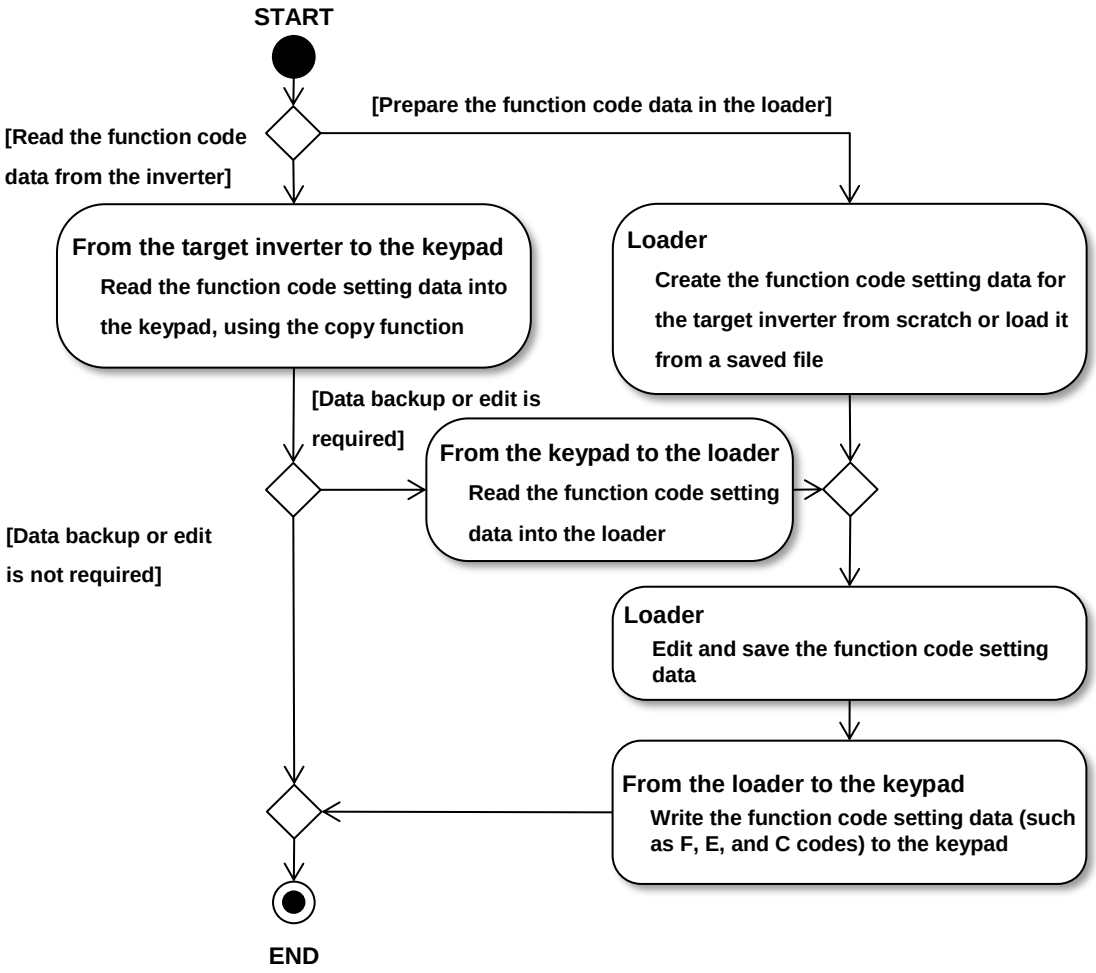
(2) From the loader to the keypad, write the function code setting data for the target inverter you have created from scratch or loaded from a saved file.



Tip

- To the inverter that has the customizable logic function codes, write the list of basic function codes (such as F, E, C). In this case, you do not have to write the list of the customizable logic function codes. The customizable logic function codes are written from the customizable logic editor screen.

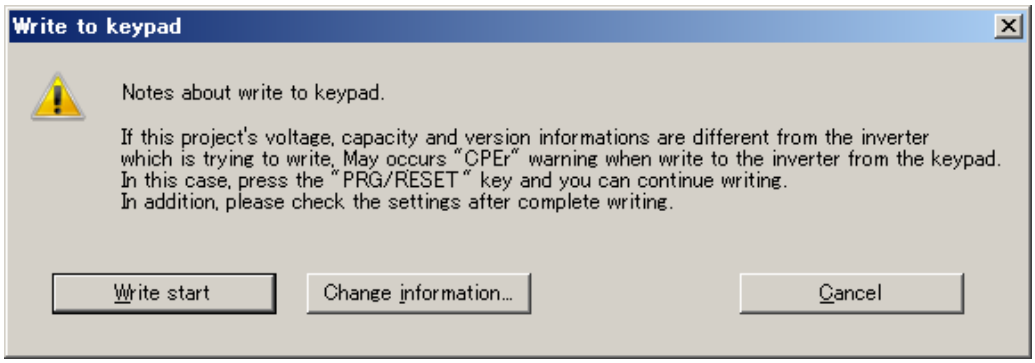
The workflow of the preparation is shown below:



Write the edited circuits to the keypad

Click the [Write] button or the [Write to the keypad] icon on the toolbar

Read the precautions displayed on the dialog box that appears.



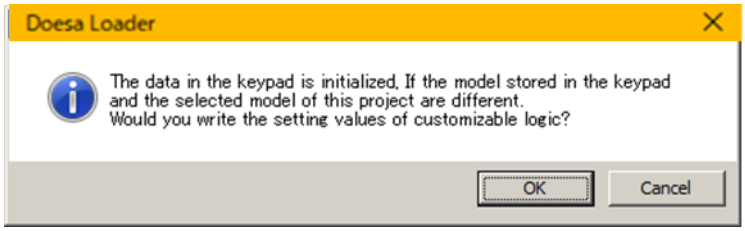
Click [Change information] to open the project properties window.

Correctly configure the model, regional specification, voltage, capacity, and inverter ROM version according to the target inverter. For more information, refer to "2.3.3.12. Project Properties".

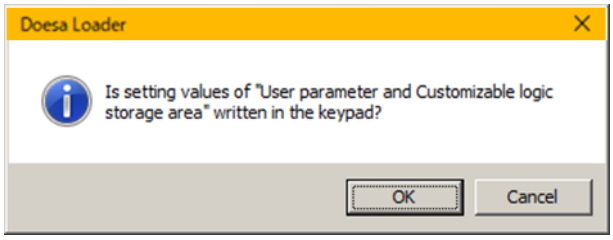
Note

- If the model, regional specification, voltage, capacity, and inverter ROM version are not correctly configured, the write operation from the keypad to the inverter may fail with a [CPEr] warning or error displayed.

Click [Write start] to open the following dialog.
Click [OK] to start the write operation.



Upon completion of write, you are presented with a dialog that prompts you to confirm the write operation to the user setting and customizable logic memory area (function codes U121- and U171-).



At this time, the settings of function codes U121- and U171- in the keypad have been initialized to 0.

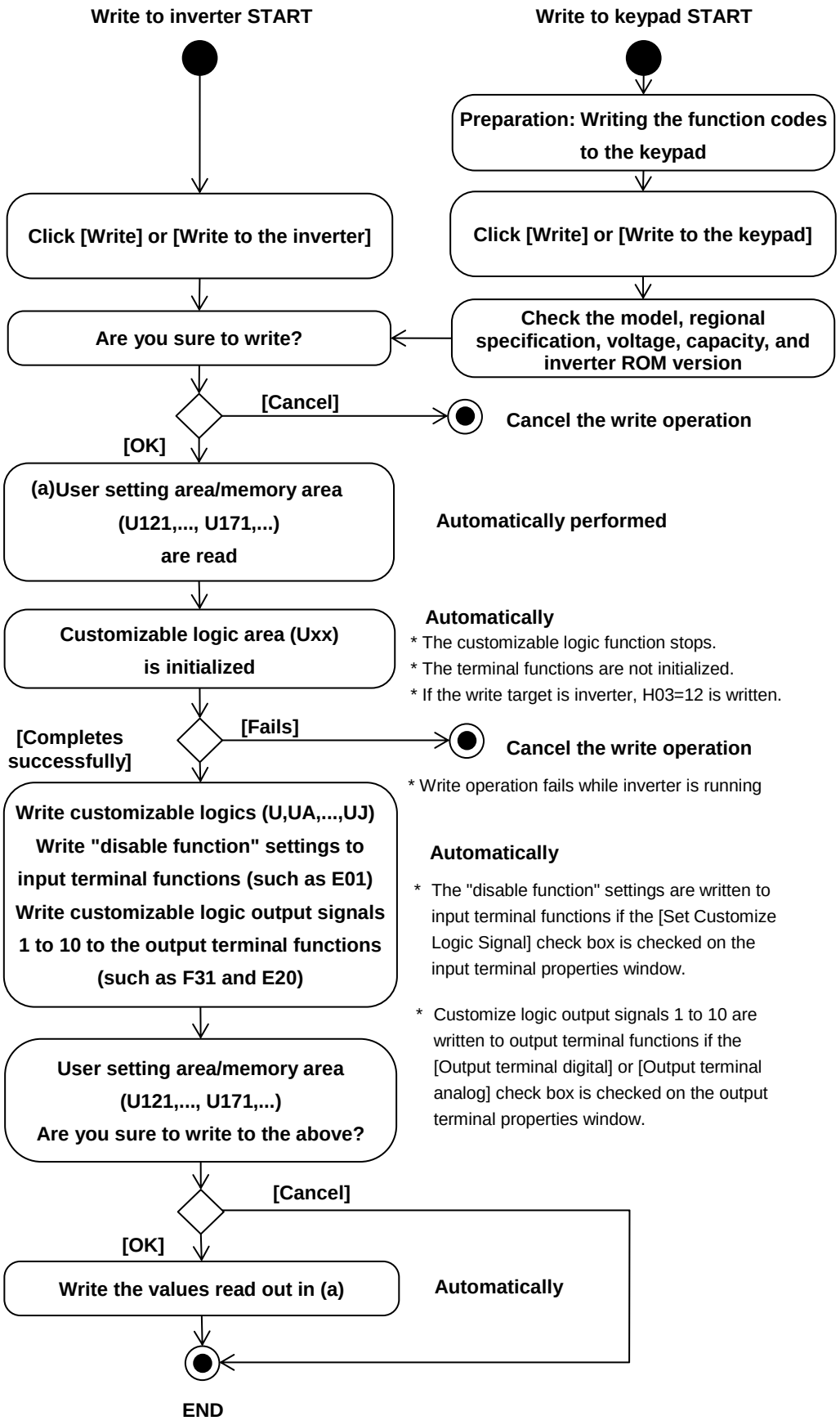
Click [OK] if you want to restore the setting of function codes U121- and U171- in the keypad.

Click [Cancel] if you do not use function codes U121- and U171- or you accept the settings of 0.

When you want to write new settings to function codes U121- and U171-, click [Cancel] and, upon completion of write, perform the write operation from the [User parameter/storage area, input/output and logic] window.

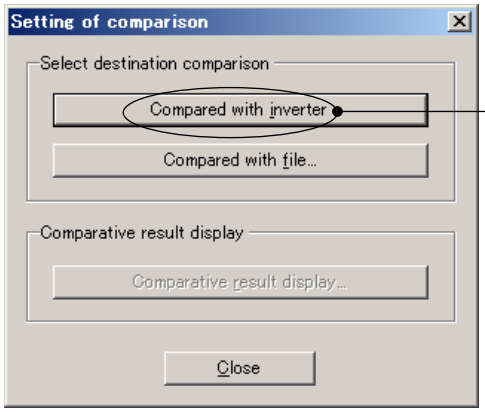
[3] Workflow of Writing the Circuits

The workflow of writing the circuits is shown below:



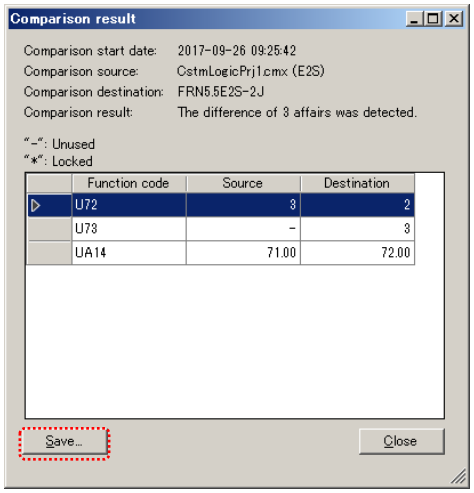
2.3.3.10. Comparison

Your edited circuits are assigned step numbers and converted to the inverter function code settings when the customizable logic function check completes successfully.
Once the conversion completes successfully, [Compare] on the toolbar is enabled.
Click [Compare] to compare the settings of the edited circuits with those in the inverter, keypad, or saved file.

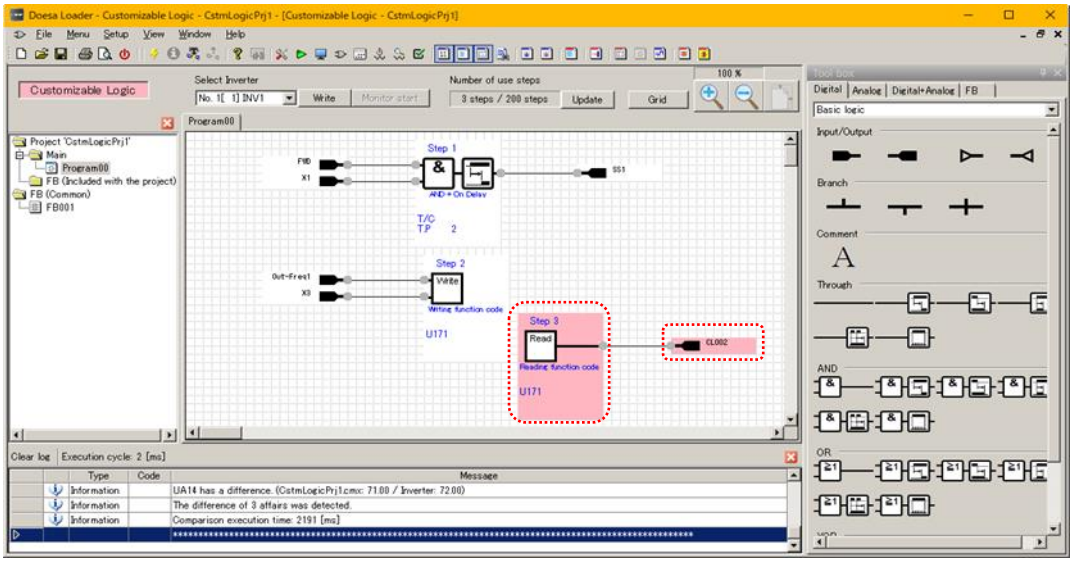


If the target device is a keypad, the label changes to [Compared with keypad].

The comparison results are displayed using the inverter function codes. You can save the comparison results to a CSV file.



Differences are displayed for symbols as well.



2.3.3.11. Debug Function

Using the online monitor or the trace monitor, you can check how the customizable logics written to the inverter operate on the inverter. In addition, the online batch processing is a useful feature that reduces the number of button clicks when you edit circuits.

Tip

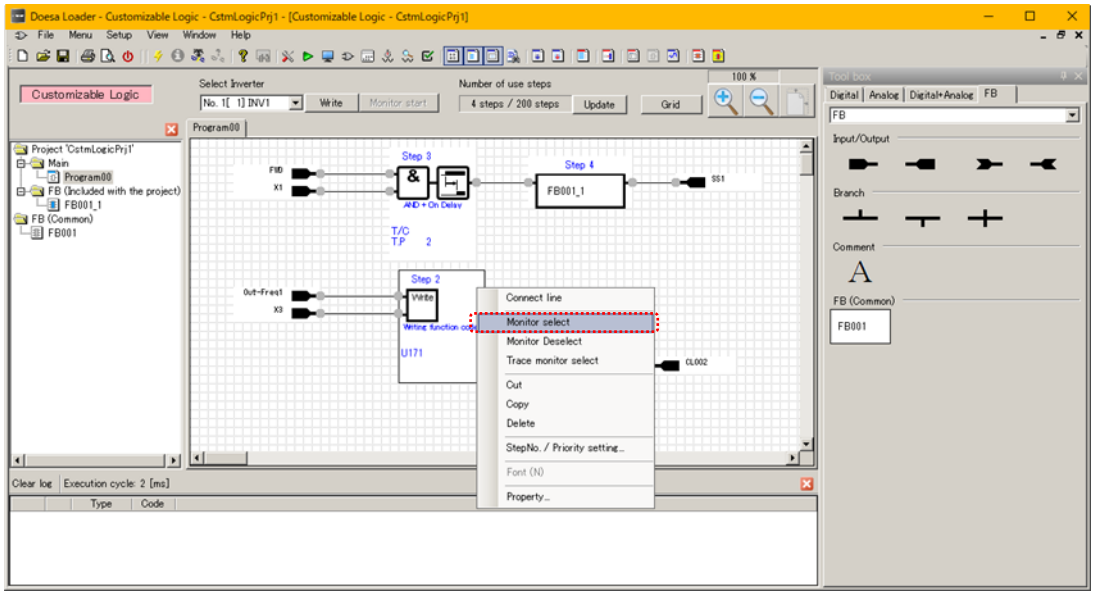
- You can use all of the online monitor, the trace monitor, and the online batch processing when the loader is connected to the inverter. These features are not available if you have selected [Data in Keypad] for [USB Connection] on the [Communication Setting] window.
- A limited set of functions is available with some inverter models. Refer to "1.1.2. Loader Functions by VF1A Series Inverter Model" for details.

[1] Online Monitor

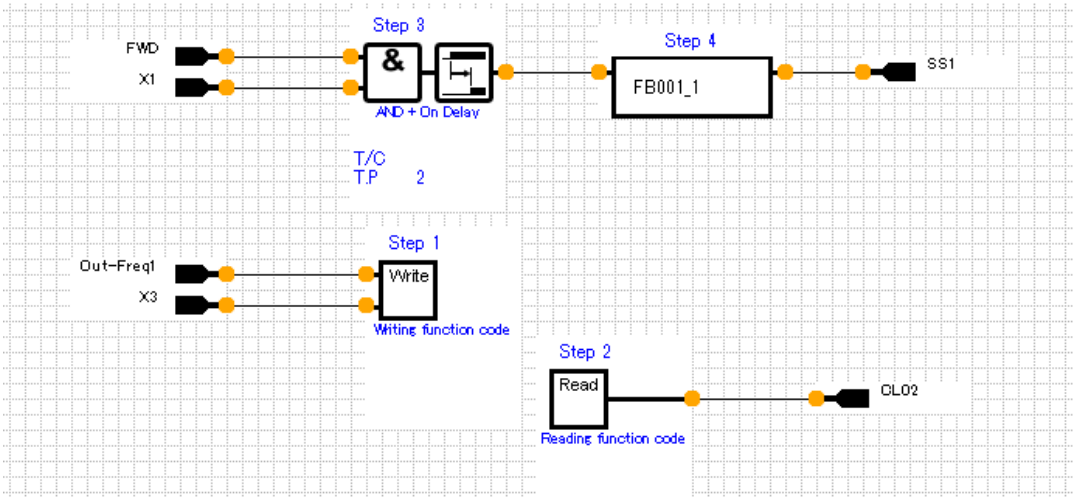
The online monitor allows you to monitor the timer values or signals for a symbol as numeric values.

Once you convert the customizable logic function settings you created, perform the step number assignment, and write the settings to the inverter or you confirm that there are no differences the result in the comparison results, you can run the online monitor on your selected symbol.

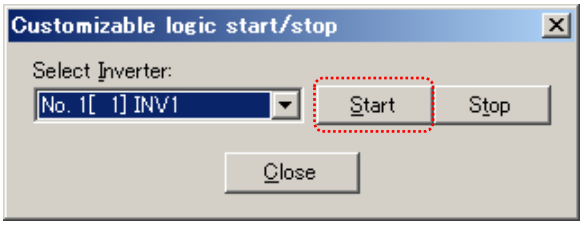
Select and right-click the symbol you want to monitor and select [**Monitor select**] on the context menu.



The following example shows the result of selecting [Monitor select] for all the symbols in the layout area shown on the previous page.

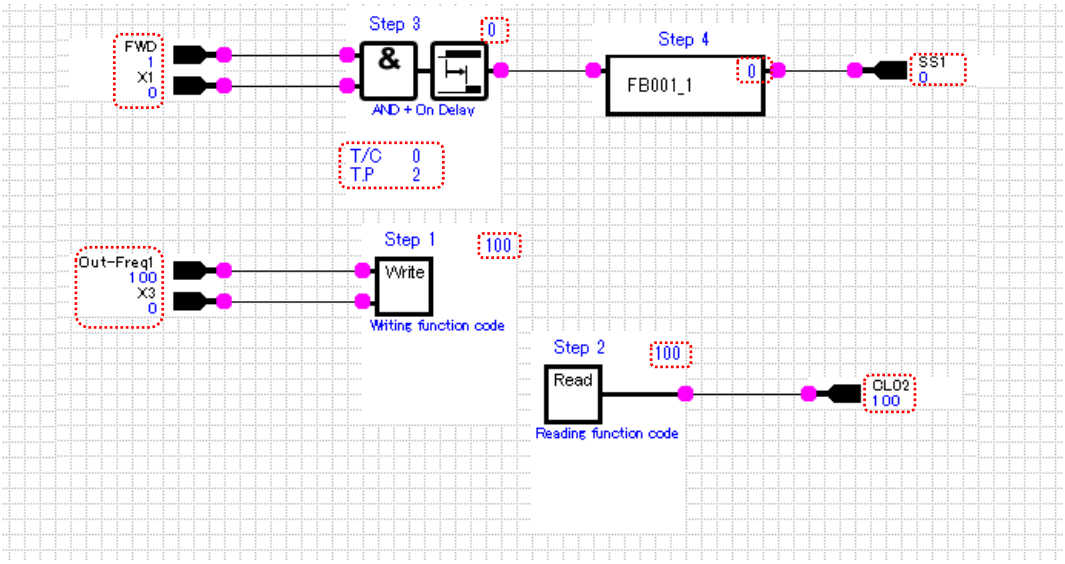


Start the inverter customizable logic.



Once you start the inverter customizable logic, the online monitor starts.

You can check the status of the inputs/outputs, logic symbols, and function blocks (FBs) highlighted in red in the layout area.



The display examples are shown below.

- Digital input

The logical values of OFF and ON are 0 and 1, respectively.
The status of "0: Open /1: Closed" is shown under the function name.

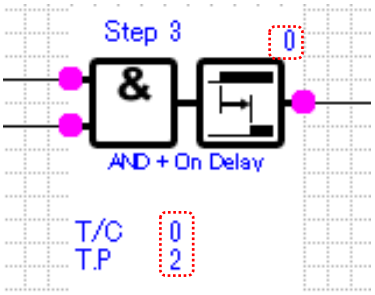
- Digital input (logical inversion)

The "~" character prefixed to the function name represents logical inversion.
For logical inversion, the status of "0: Closed /1: Open" is shown under the function name.

- Analog input

A value is shown under the function name.
For information on the meaning of this value, refer to the page regarding "U code (customizable logic)" in the User's Manual of your inverter.
Example: For Out-Freq1, the unit is % and "100%" means the maximum output frequency.

- Customizable logic function symbol



The output data is shown at the upper right.
Functions (1) and (2) are shown under the symbol.

List of function names

Monitor name	Name	Range
T.P	Timer period	0.00 to 9990 s
CNT	Count	0.00 to 9990
U.L	Upper Limit	-9990 to 0 to 9990
L.L	Lower Limit	-9990 to 0 to 9990
1ST	1st Additional Value	-9990 to 0 to 9990
2ND	2nd Additional Value	-9990 to 0 to 9990
DEV	Deviation	-9990 to 0 to 9990
HYST	Hysteresis Width	-9990 to 0 to 9990
REF	Reference Value	-9990 to 0 to 9990
MAX	Maximum Scale	-9990 to 0 to 9990
MIN	Minimum Scale	-9990 to 0 to 9990
KA	Factor KA	-9990.0 to +9990.0
KB	Factor KB	-9990.0 to +9990.0
T.C(T/C)	Time constant	0: No filter / 0.01 to 5.00 s
FIX	Fixed as 0	
ACC	ACC	0: No limit. 0.01 to 600 s
DEC	DEC	0: No limit. 0.01 to 600 s
Gain	Gain ratio	0 to 200%
Frq	Lower frequency limit	0 to 500 Hz
Val1	Set Value	-9990 to 0 to 9990
Val2	Set Value2	-9990 to 0 to 9990
Step	Step number	1 to 200

Tip

- The value of the online monitor is displayed with 3 significant digits.
  Minimum step in each range of value is shown in following table.

Range of value	Minimum step
±0.00 – 9.99	0.01
±10.0 – 99.9	0.1
±100 – 999	1
±1000 – 9990	10

[2] Trace Monitor

The online monitor allows you to monitor the timer values or signals for a symbol as waveforms.
Refer to "2.3.4.10. Combination with the Customizable Logic Function".

[3] Online Batch Processing

Until your desired circuits complete, you will repeat a series of tasks such as editing circuits, performing step number assignment, wiring to the inverter, starting the customizable logic, and starting monitors.

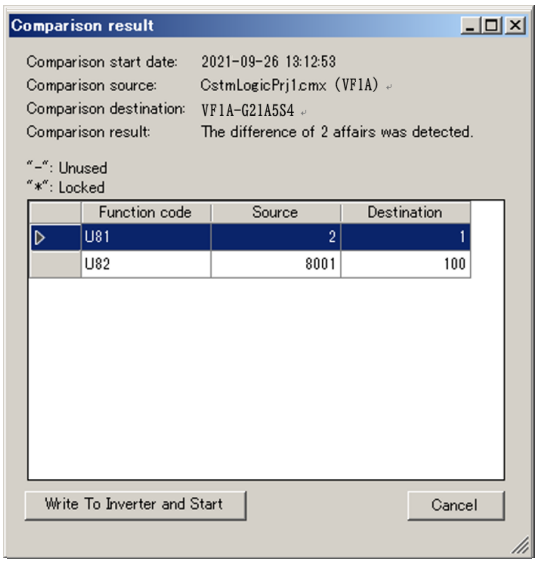
During such time, you can simplify the series of tasks from performing step number assignment to starting monitors by using the online batch processing.

Prior to using the online batch processing, make sure that the inverter is stopped and that [Monitor select] has been selected for at least one of the symbols in the layout area.

To use the online batch processing, click the [Online operation] icon on the toolbar.

The loader compares the circuits you are editing with those in the inverter and, if all the comparison results match, automatically starts the monitors.

If the comparison results do not match each other, the [Comparison result] window appears.

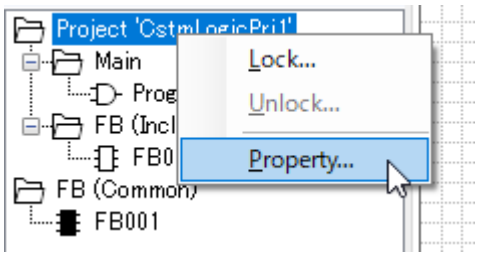


Click the [Write to Inverter and Start] button at the lower left of the [Comparison result] window to write to the inverter and automatically start the monitors.

2.3.3.12. Project Properties

The project properties window allows you to add a version and comment to the created project.

To open this window, right-click the project name displayed at the top of the project management window and select [Property...] on the context menu.

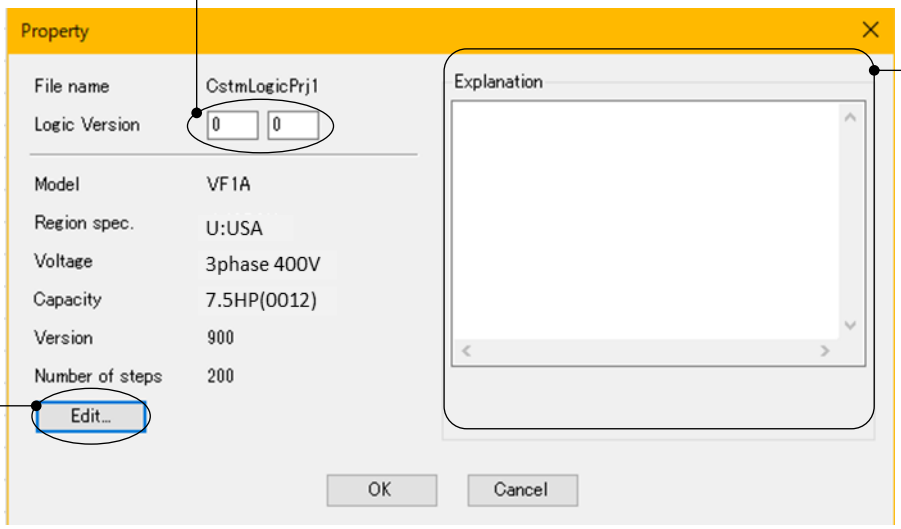


The [Property] window opens.

Logic version

Use these fields if you want to version-control your project. This is different from the inverter ROM version.

When you write the edited circuits to the inverter or keypad, the settings are written to function codes U197 and U199.



Explanation

You can add a comment.

Edit

Click the [Edit] button to open the [Inverter model selection] window shown at right.

This window allows you to change the model, regional specification, voltage, capacity, and inverter ROM version.

Configure these settings correctly according to the target inverter.

Which items you should configure varies depending on how you write to the inverter. Refer to the Table on the next page.

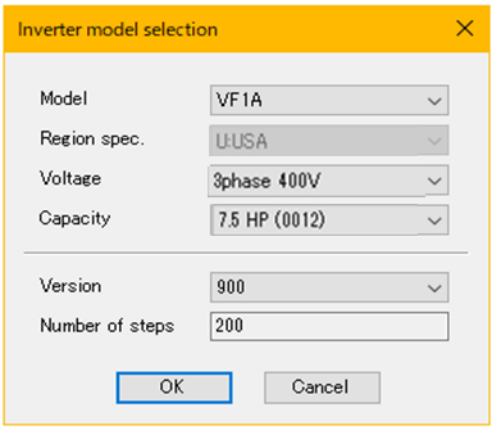


Table 2-2 List of the items you should configure on the [Inverter model selection] window

Setting item	When directly writing from the loader to the inverter	When writing from the loader to the keypad and then writing from the keypad to the inverter
Model	○	○
Regional specification	—	(*2)
voltage	—	○
Capacity	—	○
Version (*1)	○	○

○: Configuration required —: Configuration not required

(*1) This is the inverter ROM version. Here, you can change the version you set when creating a new project in "2.3.3.1. Select Customizable Logic Project to Edit".

(*2) You can change the regional specification by selecting [Setup] -> [Region spec.] from the main menu. Once you have changed the regional specification, you have to quit and restart the loader. Refer to "2.4.4. Region Spec." for details.

Tip

- You can identify the inverter model number you should select in the [Model] list box from the inverter model number printed on the rating nameplate of the inverter. Refer to "[1] Model, Regional Specification, Voltage, Capacity" in "2.2.1. Create a New File" for details.
- You can identify the inverter ROM version from the inverter keypad.
  For more information, refer to the instruction manual of your inverter.
  When The Loader is connected to an inverter, you can identify the inverter ROM version from [Inverter ROM Version] on the [System Monitor] tab of the [Operation Monitor] window, which you can access by selecting [Operation Monitor setting] from the Quick Access menu.

2.3.3.13. Lock Function

The lock function allows you to protect your created circuits from view and edit.

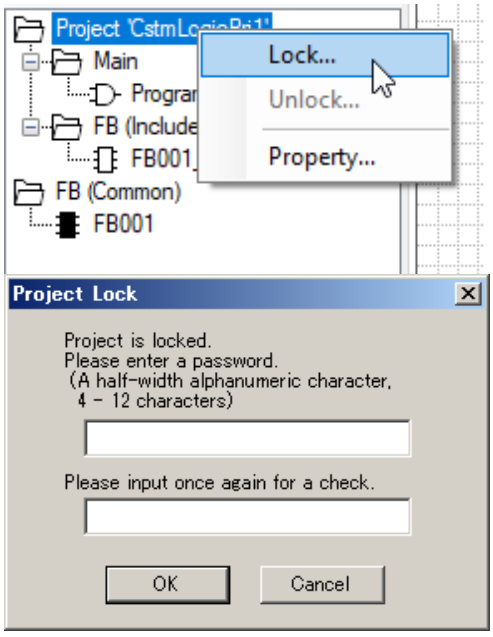
Note

- The lock function is only available on your PC. If you write circuits with the lock function enabled, they can be freely viewed and edited on the inverter. To restrict the view and edit of circuits on the inverter, use the inverter's password protection. For more information on password protection, refer to the instruction manual or user's manual of your inverter.

[1] Locking the Project

Locking the project protects it from view and edit. (However, this feature does not protect FBs under [FB (Common)] from view and edit.)

To lock the project,

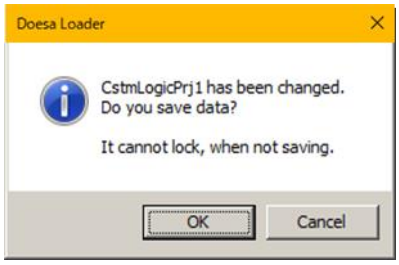


Right-click the project name displayed at the top of the project management window and select [Lock...] on the context menu.

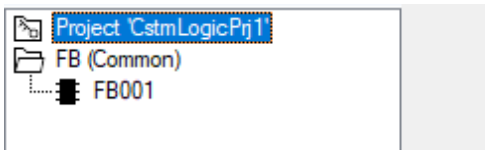
Enter the password and click [OK].

Note

- The password you use to lock the project is not within the knowledge of IDEC CORPORATION.
  Take sufficient care in configuring and managing the password because there is no way to release the password in the event you have lost it.

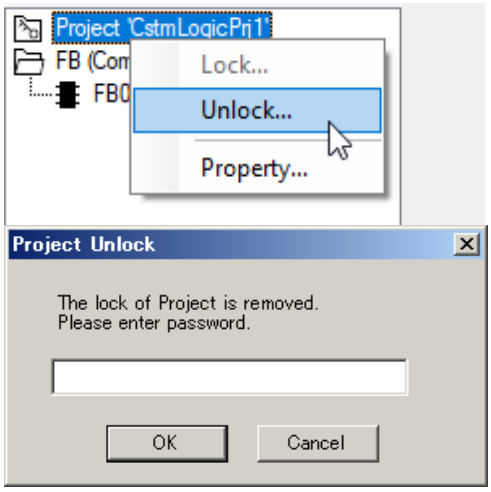


Click [OK] to save the project.



The icon preceding the project name changes to a locked one , meaning that the circuits in the project are protected from view.

To release the lock,



Right-click the project name displayed at the top of the project management window and select [Unlock...] on the context menu.

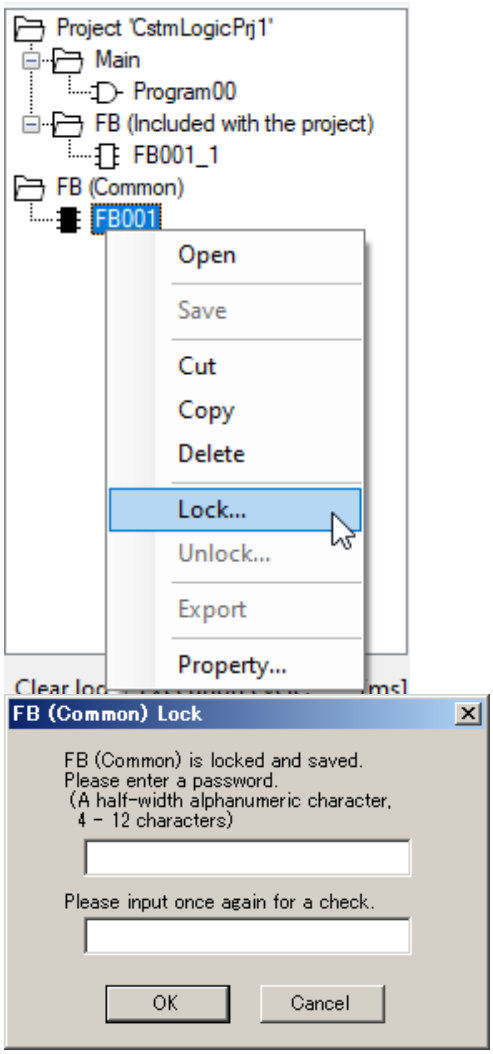
Enter the password and click [OK].

If your entered password is correct, the circuits are no longer protected from view.

[2] Locking FBs (Common)

You can protect an FB under [FB (Common)] from view and edit. (However, this feature does not protect the project itself from view and edit.)

To lock an FB under [FB (Common)],



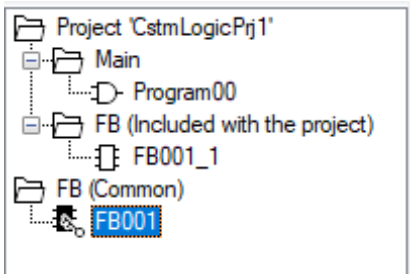
Right-click an FB name under the [FB (Common)] in the project management window and select [Lock...] on the context menu.

Enter the password and click [OK].

The FB protected with the password is then automatically saved.

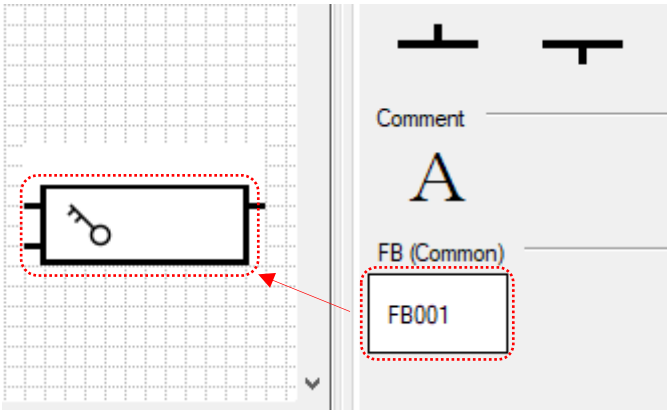
Note

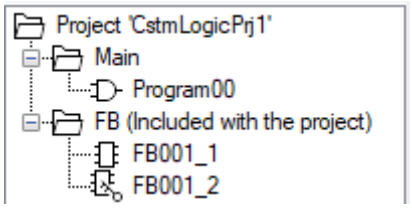
- The password you use to lock an FB is not within the knowledge of IDEC CORPORATION.
  Take sufficient care in configuring and managing the password because there is no way to release the password in the event you have lost it.



The icon preceding the FB changes to a locked one, meaning that the FB is protected from view.

If you place a locked FB from the FB tab of the toolbox to the layout area, a locked mark appears on it.

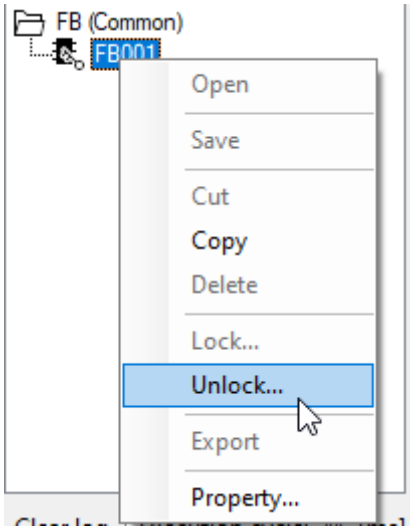




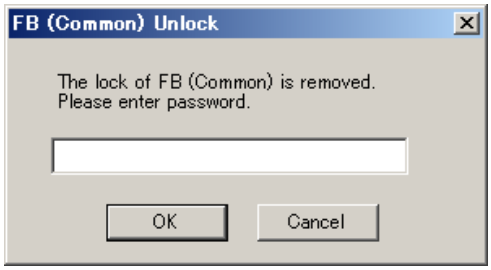
In addition, an FB with a locked icon is added under [FB (Included with project)] in the project management window.

Double-clicking an FB with a locked icon does not display the circuits.

To release the lock,



Right-click an FB name under the [FB (Common)] in the project management window and select [Unlock...] on the context menu.



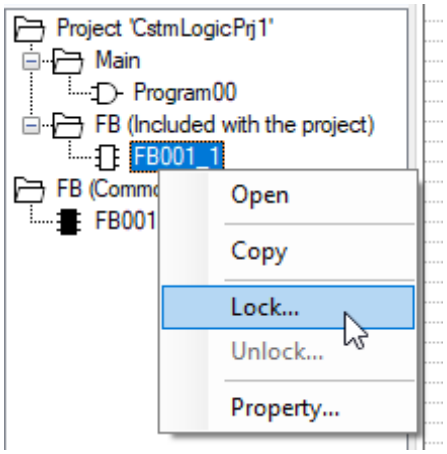
Enter the password and click [OK].

If your entered password is correct, the icon becomes an unlocked one and the circuits are no longer protected from view.

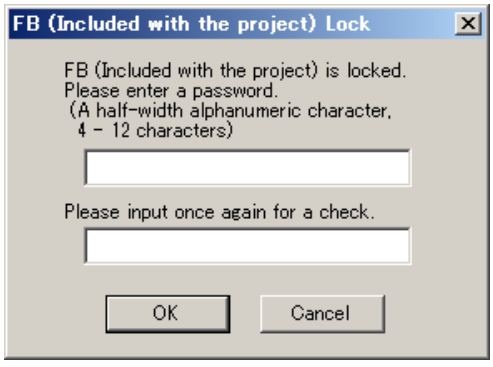
[3] Locking an FB under [FB (Included with project)]

You can protect an FB under [FB (Included with project)] from view and edit. (However, this feature does not protect the project itself from view and edit.)

To lock an FB under [FB (Included with project)],



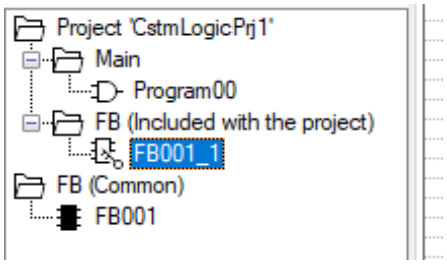
Right-click an FB name under the [FB (Included with project)] in the project management window and select [Lock...] on the context menu.



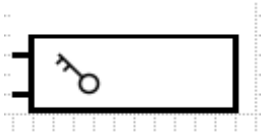
Enter the password and click [OK].

Note

- The password you use to lock an FB is not within the knowledge of IDEC CORPORATION.
  Take sufficient care in configuring and managing the password because there is no way to release the password in the event you have lost it.

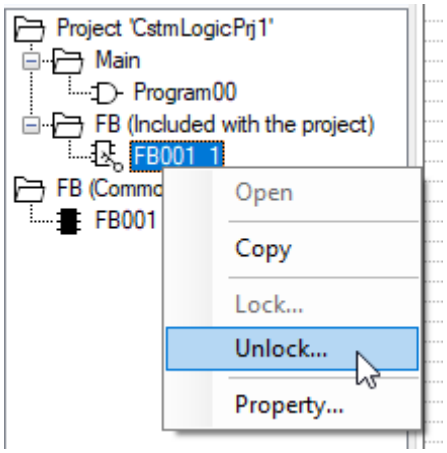


The icon preceding the FB changes to a locked one, meaning that the FB is protected from view.



In addition, a locked icon appears on the FB when you place it in the layout area.

To release the lock,



Right-click an FB name under the [FB (Included with project)] in the project management window and select [Unlock...] on the context menu.

Enter the password and click [OK].

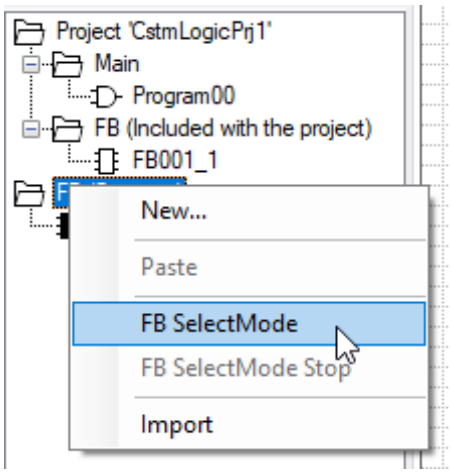
If your entered password is correct, the icon becomes an unlocked one and the circuits are no longer protected from view.

2.3.3.14. Importing/exporting an FB under [FB (Common)]

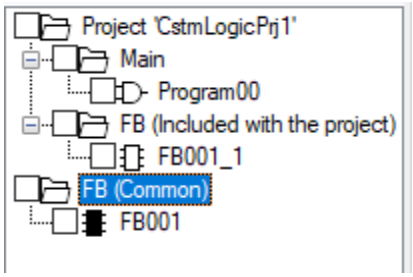
The import/export function allows you to use your created FB in the VFD Doesa-Loader software installed on another PC.

[1] Exporting an FB

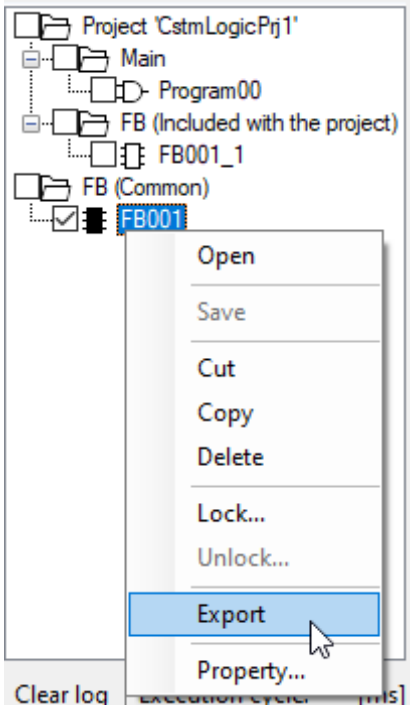
You can save the desired FB(s) to a file.



Right-click [FB (Common)] in the project management window and select [FB Select Mode] on the context menu.



Check boxes appear on the left side of the icons in the project management window.

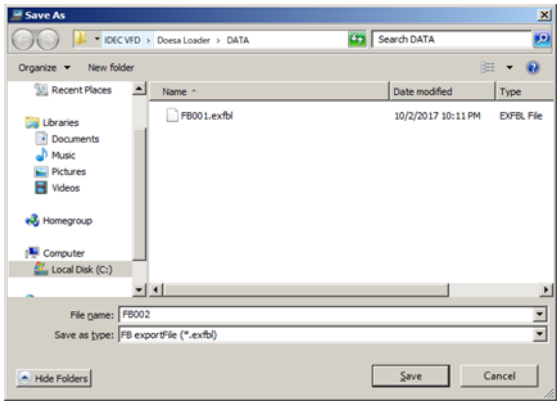


From among the FBs under [FB (Common)], select the FB(s) you want to save to a file by checking their check boxes.

Right-click the FB name and select [Export] on the context menu.

Tip

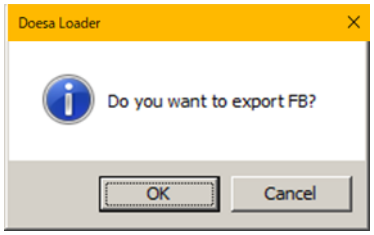
- [Export] does not appear on the context menu of an FB other than under [FB (Common)].
- You cannot export any FBs other than under [FB (Common)].
- You can also export a locked FB.



Select [Save to ...] and enter the file name under which the data is saved in [File Name]. Then click [Save] to save the file.

File types

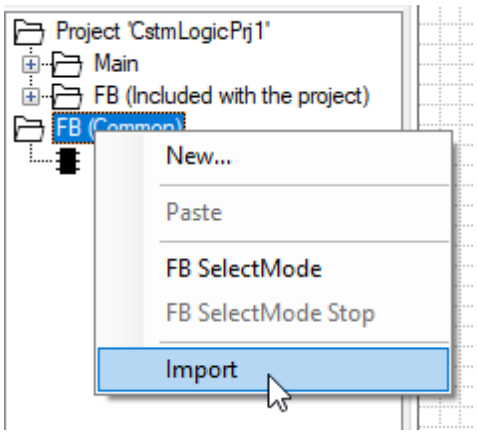
- FB export file: "*.exfbl"



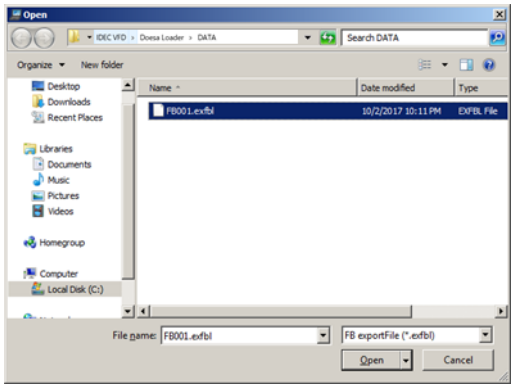
Click [OK].

[2] Importing an FB

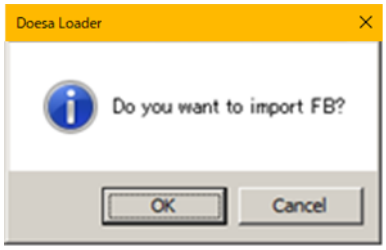
You can import FBs saved in a file to the project.



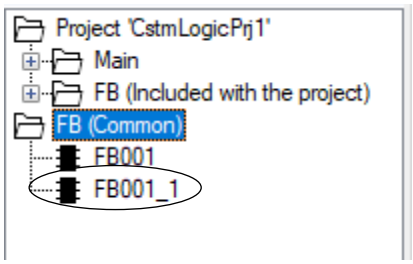
Right-click [FB (Common)] in the project management window and select [Import] on the context menu.



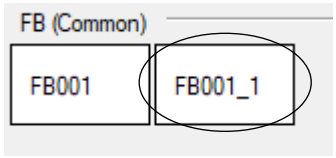
Select an FB file.



Click [OK].



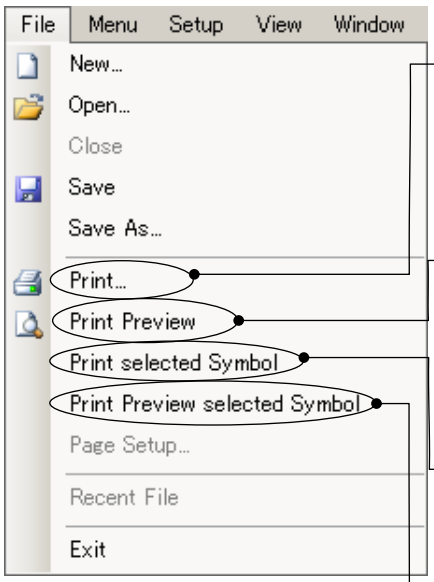
The imported FB(s) is added under [FB (Common)] in the project management window.



The imported FB(s) are added to the [FB] tab of the toolbox.

2.3.3.15. Printing the Customizable Logic

When the [Customizable logic] window is active, you can print the content of the layout area by selecting [File] from the main menu.



[Print]

When the [Customizable logic] window is active, select this command to print the content of the layout area.

For more information on the [Print] dialog, refer to "2.2.6. Print".

[Print Preview]

When the [Customizable logic] window is active, select this command to view the print preview of the layout area.

For more information on the [Preview] window, refer to "2.2.7. Print Preview".

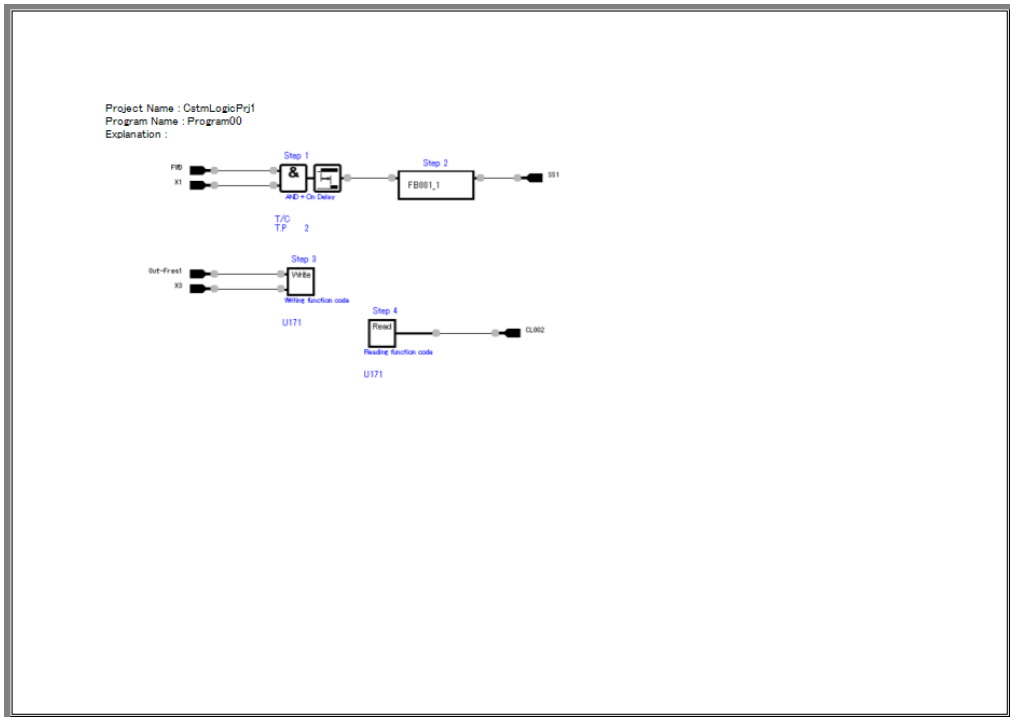
[Print selected Symbol]

This command is available when the [Customizable logic] window is active. Select it to print only the symbol selected in the layout area.

[Print Preview selected Symbol]

This command is available when the [Customizable logic] window is active. Select this command to view the print preview of only the symbol selected in the layout area.

The following is an example printout. [Page Setup] is not available. The content of the layout area is automatically adjusted to fit in one A4 landscape page.



2.3.3.16. List of Input Terminal Signal Codes

This section describes the signal codes specified in input terminal properties. Reference this section when creating circuits. The numbers up to 60XX represent logical value (ON/OFF) input signals. Numbers 80XX and greater represent numeric value input signals.

For information on the input terminal properties, refer to "Properties of an Input Terminal" in "2.3.3.3. Workflow of Creating a Circuit".

Restrictions

The signal codes described below are only available when supported by the inverter. For information on the available signal codes, refer to the description of function code U02 and U03 in the User's Manual of your inverter. Alternatively, you can refer to the description of function code U02 and U03 in [Function code information] on the [Function code edit] window (also with selecting the "Create the customizable logic function code window", depending on the applied inverter models).

Numbers from 0000 to 12XX

Almost the same as general-purpose output signals (i.e., signals selectable for E20). (Some signals are excluded from the signals selectable for E20.)

For information on these signals, refer to the description of function code E20 in the User's Manual of your inverter.

Numbers 4000 to 50XX

These numbers represent the digital terminal input signals to the inverter.

Refer to the function codes U02 and U03 in the user's manual for the signals that can actually be used for each inverter model.

An example is shown below.

Allocation number		Signal name	Details
Active ON	Active OFF		
4001 -	5001 -	X1, X2,...	Represent the ON/OFF status of the inverter terminal blocks if the remote operation command is disabled. Represent the ON/OFF status of each bit of function code S06 when the remote operation command is enabled.
4010	5010	FWD	
4011	5011	REV	
4021 -	5021 -	I1, I2, ...	Represent the ON/OFF status of input signals for option cards with digital terminal input signals.
4041 -	5041 -	CLI1, CLI2, …	These are digital input signals dedicated to customizable logic that can be reassigned to any X terminal.
4081 -	5081 -	KP-RUN/FWD, KP-REV, …	Represent the ON/OFF status of the keypad button.
4101 -	5101 -	X1-TERM, X2-TERM,...	Represent always the ON/OFF status of the physical inverter terminal blocks even if the remote operation command is enabled.

Note
- When you configure input terminals for these signals, be aware that other functions that use the configured signals can operate. For example, if you set the X1 terminal function selection (function code E01) to '0' ([SS1] multi-step frequency selection) and then turn the X1 terminal from OFF to ON, the multi-step frequency selection is enabled from disabled state in parallel with the change of the input terminal logical value. Care must be taken especially for the X terminal, the FWD terminal, and the REV terminal, whose functions are configured with the factory-set values.

Tip
- To use a signal exclusively as the customizable logic input, you must check the [Set Customize Logic Signal] check box on [Properties of an Input Terminal] or explicitly set the signal function selection to "100[NONE]".

Numbers 6000 to 70XX

These signals cannot be selected for general-purpose output signals (i.e., signals selectable for E20).

Refer to the function codes U02 and U03 in the user's manual for the signals that can actually be used for each inverter model.

An example is shown below.
Each function is described assuming the active ON logical (positive logic).

Allocation number		Signal name	Description
Active ON	Active OFF		
6000	7000	FL_RUN	Final operation command RUN. Turns ON when the operation command is issued.
6001	7001	FL_FWD	Final operation command FWD. Turns ON when the forward rotation operation command is issued.
6002	7002	FL_REV	Final operation command REV. Turns ON when the reverse rotation operation command is issued.
6003	7003	DACC	Turns ON when acceleration starts.
6004	7004	DDEC	Turns ON when deceleration starts.
6005	7005	REGA	Turns ON when regeneration avoidance starts.
6006	7006	DR_REF	Turns ON when the dancer is in the reference position.
6007	7007	ALM_ACT	Turns ON when an alarm occurs and the alarm can be reset (with no alarm cause identified).
6100	-	TRUE	Always ON (TRUE).
6101	-	FALSE	Always OFF (FALSE).

Numbers 80XX

Almost the same as inverter analog general-purpose output signals (i.e., signals selectable for F31). These assigned numbers are codes created by adding 8000 to F31 signal codes. (Some signals are excluded from the signals selectable for F31.)

Numeric values are expressed in the unit of %.

Refer to the function code F31 in the user's manual of each inverter model for the assignment number, function, and the definition of 100% of each signal.

An example of signal name is shown below.

Signal name	
Out-Freq1	Output frequency 1 (before slip compensation), or Reference speed (Final)
Out-Freq2	Output frequency 2 (after slip compensation), or Primary frequency
Out-I	Output current
Out-V	Output voltage
Torque	Output torque
Load	Load factor
In-Power	Consumed power
PID-PV	PID feedback value
Speed	Detected speed value/estimated speed value
DC-Link-V	DC intermediate circuit voltage
M-out	Motor output
PID-SV	PID command
PID-MV	PID output
Deviation	Position deviation during synchronous operation
H-sink-tmp	Cooling fin temperature
Internal-tmp	Internal air temperature
F-ref	Set frequency
PG-fb	PG feedback value
Torque-I	Torque current reference
PID-ERR	PID deviation
Line-ref	Reference line speed
RollDiameter	Roll diameter ratio
F-ref (Final)	Frequency set point (Final)
PID-PV 1	PID feedback value 1
PID-SV 1	PID command 1
PID-PV 2	PID feedback value 2
PID-SV 2	PID command 1
EPID1-PV	External PID feedback value 1
EPID1-SV	External PID command 1
EPID1-Out	External PID final output 1
EPID2-PV	External PID feedback value 2
EPID2-SV	External PID command 2
EPID2-Out	External PID final output 2
EPID3-PV	External PID feedback value 3
EPID3-SV	External PID command 3
EPID3-Out	External PID final output 3

Numbers 90XX

These numbers represent the analog terminal input signals to the inverter.

Refer to the function codes U02 and U03 in the user's manual for the signals that can actually be used for each inverter model.

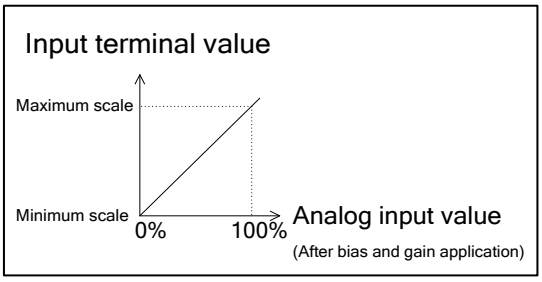
An example is shown below.

Allocation number	Name	Details	Numeric value
9001	AI-[12]	Analog terminal 12 input signal	Scale-transformed physical quantity obtained by applying gain/bias to the input signal
9002	AI-[C1]	Analog C1 terminal input signal or Analog C1 terminal input signal (C1 function)	
9003	AI-[V2]	Analog V2 terminal input signal or Analog C1 terminal input signal (V2 function)	
9004	AI-[32]	Analog terminal 32 input signal (input signal for option card with analog input)	
9005	AI-[C2]	Analog terminal C2 input signal (input signal for option card with analog input)	
9006	PtCh1	Temperature detection Pt channel 1 (Input signal for option card with a temperature measuring resistor)	Filtered temperature (From the function code setting field, you can select one of the following units: [K], [ºC], and [ºF].)
9007	PtCh2	Temperature detection Pt channel 2 (Input signal for option card with a temperature measuring resistor)	
9008	AI-[V3]	Analog C1 terminal input signal (V3 function)	Scale-transformed physical quantity obtained by applying gain/bias to the input signal
9010	UP/DOWN	Set point value by UP / DOWN control	0～100%

To help understand the numeric values for an input terminal for which one of the numbers from 9001 to 9005 is selected, the following example shows the results of applying a gain and bias to each of the [12] and [C1] terminals:

Input terminal	If the gain = 100% and the bias = 0%		If the gain = 200% and the bias = 0%	
	Input value	After application	Input value	After application
[12]	0 to +10 V	0 to 100%	0 to +5V	0 to 100%
	-10 to 0V	-100 to 0%	-5 to 0V	-100 to 0%
[C1]	4 to 20 mA	0 to 100%	4 to 12mA	0 to 100%
	0 to 20 mA	0 to 100%	0 to 10mA	0 to 100%

The numeric value for an input terminal will be the value created by transforming the scale after the gain and bias application from "0 to 100%" to "minimum to maximum".



Note
- When you configure input terminals for these signals, be aware that other functions that use the configured signals can operate. For example, if you set the frequency setting 1 (function code F01) to '1' (terminal 12) and then change the input voltage for terminal 12, the step frequency setting changes in parallel with the change of the input terminal numeric value.

Tip
- To use a signal exclusively as the customizable logic input, you must explicitly configure the F01, C30, E61, E62, E63, and other related function codes not to use the signal configured for the input terminal.
- By factory default, the F01, C30, and other related function codes are configured not to use such a signal.

2.3.3.17. List of Output Terminal Signal Codes

This section describes the signal codes specified in output terminal properties. Reference this section when creating circuits. The numbers up to 12XX represent logical (ON/OFF) signal value output signals. Numbers 80XX and greater represent numeric value output signals.

For information on the output terminal properties, refer to "Properties of an Output Terminal" in "2.3.3.3. Workflow of Creating a Circuit".

Restrictions

The signal codes described below are only available when supported by the inverter. For information on the available signal codes, refer to the description of function code U81 in the User's Manual of your inverter. Alternatively, you can refer to the description of function code U81 in [Function code information] on the [Function code edit] window (also with selecting the "Create the customizable logic function code window", depending on the applied inverter models).

Numbers from 0000 to 12XX

Almost the same as general-purpose input signals (i.e., signals selectable for E01). (Some signals are excluded from the signals selectable for E01 and 98[FWD] and 99[REV] are added.)

For information on these signals, refer to the description of function code E01 in the User's Manual of your inverter.

Numbers 80XX

Almost the same as inverter analog general-purpose input signals (signals selectable for E61). These assigned numbers are codes created by adding 8000 to E61 signal codes. (Some signals are excluded from the signals selectable for E61.)

Except for some signals, numeric values are expressed in the unit of percentage.

Refer to the function code E61 in the user's manual of each inverter model for the definition of the assignment number, function, and numerical value of each signal.

An example of signal names is shown below.

Signal name	
Aux-freq1	Frequency auxiliary setting 1
Aux-freq2	Frequency auxiliary setting 2
Aux-freq3	Frequency auxiliary setting 3
Aux-freq4	Frequency auxiliary setting 4
N-Ref Unipolar	Speed command (Not reversible operation by polarity)
N-Ref Bipolar	Speed command (Reversible operation by polarity)

Signal name	
PID-SV1	PID command 1
PID-SV2	PID command 2
PID-PV1	PID feedback value
Ratio set	Ratio setting
Trq-lim.A	Analog torque limit value A
Trq-lim.B	Analog torque limit value B
Trq-bias	Torque bias
Trq-cmd	Torque command
Trq-curr	Torque current command
LampRatio	Acceleration/deceleration time ratio setting
Freq-lim.H	Upper limit frequency
Freq-lim.L	Lower limit frequency
Spd-lim.F	Forward rotation (FWD) speed limit value
Spd-lim.R	Reverse rotation (REV) speed limit value
Ai-mon	Analog input monitor
PID-PV2	PID feedback value 2
Aux-SV1	PID process command auxiliary setting 1
Aux-SV2	PID process command auxiliary setting 2
FlowRate	Flow sensor
EPID1-SV	External PID process command 1
EPID1-PV	External PID feedback value 1
EPID1-MU	External PID manual command 1
EPID2-SV	External PID process command 2
EPID2-PV	External PID feedback value 2
EPID2-MU	External PID manual command 2
EPID3-SV	External PID process command 3
EPID3-PV	External PID feedback value 3
EPID3-MU	External PID manual command 3

2.3.3.18. List of Logic Symbols

This section describes the respective function blocks. Reference this section when creating circuits.

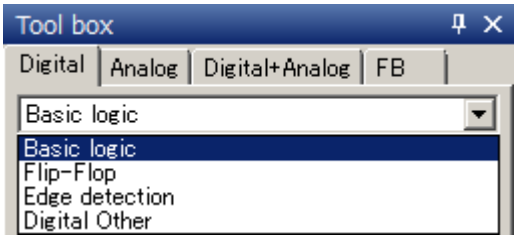
Restrictions

The function blocks described below are only available and displayed on the toolbox when supported by the inverter. Additionally even if the function blocks are displayed on the toolbox, some blocks might be not available depending on the version of the inverter.

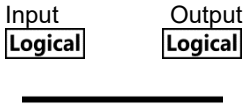
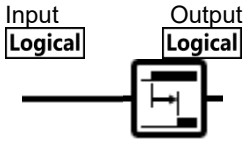
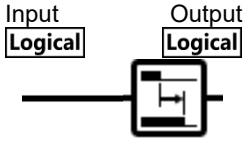
For information on the available function blocks, refer to the description of function code U01 in the User's Manual of your inverter. Alternatively, you can refer to the description of function code U01 in [Function code information] on the [Function code edit] window (also with selecting the "Create the customizable logic function code window", depending on the applied inverter models).

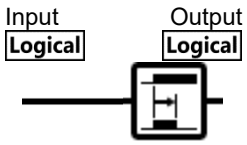
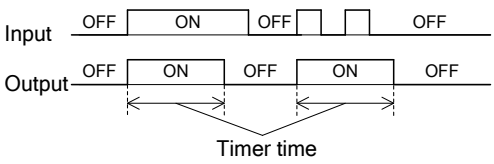
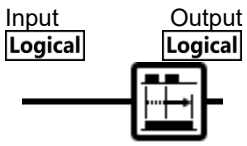
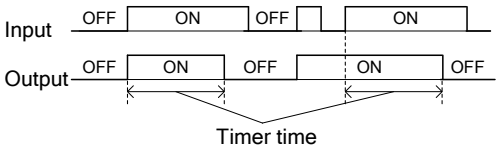
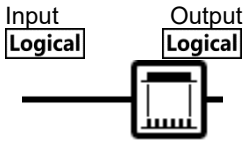
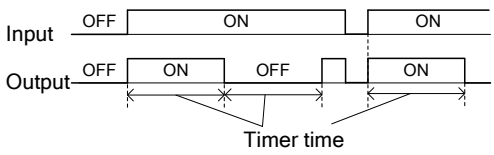
2.3.3.18.1. [Digital] - Basic Logic

To select a basic logic symbol, choose [Basic logic] from the [Digital] tab.

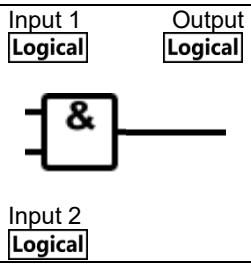
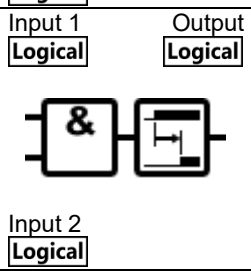
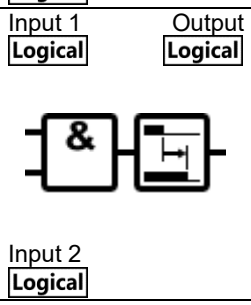
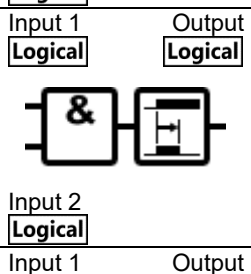
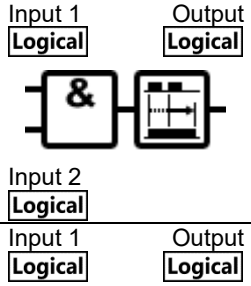
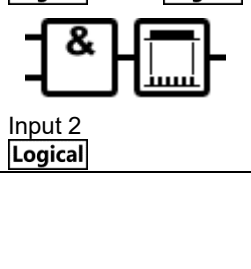


10 to 15: Through

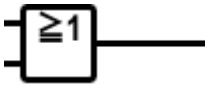
Block selection	Symbol	Function block	Description
10		Through output	Through output without a logical circuit Use “2005: Analog through” for the through output an analog signal.
11		Through output + ON-delay timer	Turning ON the input starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the input turns OFF the output.
12		Through output + OFF-delay timer	Turning OFF the input starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.

Block selection	Symbol	Function block	Description
13		Through output + Pulse (1 shot)	Turning ON the input starts the timer. The output remains ON until reaching the timer time. While the output is ON, the timer operation continues without regard of the input status. Setting the timer time to 0 turns OFF the output. 
14		Through output + Retriggerable timer	Turning ON the input starts the timer. The output remains ON until reaching the timer time. If an OFF to ON edge at the input occurs while the output is ON, however, the output remains ON from that time until reaching the timer time. Setting the timer time to 0 causes the output to turn ON when the input turns ON. 
15		Through output + Pulse train output	Outputs a pulse signal with a period twice the timer time and a duty of 50%. Useful for flashing a light emitting device. Turning ON the input turns ON the output and starts the timer. When reaching the timer time, the output turns OFF and the timer restarts. When reaching the timer time again, the output turns ON and the timer restarts. Setting the timer time to 0 turns OFF the output. 

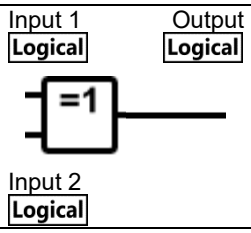
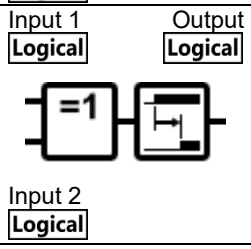
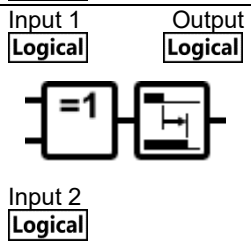
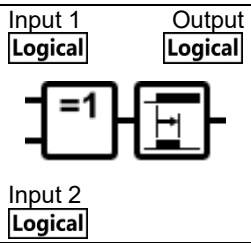
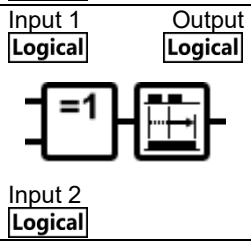
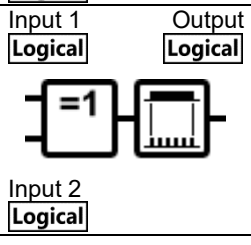
20 to 25: AND

Block selection	Symbol	Function block	Description
20		Logical product (AND)	This is an AND circuit with 2 inputs/1 output.
21		Logical product (AND) + ON-delay timer	This is a combination of an AND circuit with 2 inputs/1 output and an ON-delay timer. Turning ON the AND circuit output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the AND circuit output turns OFF the output.
22		Logical product (AND) + OFF-delay timer	This is a combination of an AND circuit with 2 inputs/1 output and an OFF-delay timer. Turning ON the AND circuit output turns ON the output. Turning OFF the AND circuit output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
23		Logical product (AND) + Pulse (1 shot)	This is a combination of an AND circuit with 2 inputs/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
24		Logical product (AND) + Retriggerable timer	This is a combination of an AND circuit with 2 inputs/1 output and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
25		Logical product (AND) + Pulse train output	This is a combination of an AND circuit with 2 inputs/1 output and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

30 to 35: OR

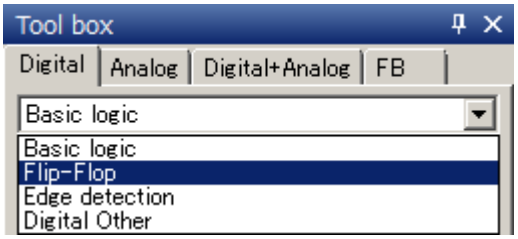
Block selection	Symbol	Function block	Description
30	Input 1 Logical, Output Logical  Input 2 Logical	Logical sum (OR)	This is an OR circuit with 2 inputs/1 output.
31	Input 1 Logical, Output Logical Input 2 Logical	Logical sum (OR) + ON-delay timer	This is a combination of an OR circuit with 2 inputs/1 output and an ON-delay timer. Turning ON the OR circuit output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the OR circuit output turns OFF the output.
32	Input 1 Logical, Output Logical Input 2 Logical	Logical sum (OR) + OFF-delay timer	This is a combination of an OR circuit with 2 inputs/1 output and an OFF-delay timer. Turning ON the OR circuit output turns ON the output. Turning OFF the OR circuit output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
33	Input 1 Logical, Output Logical Input 2 Logical	Logical sum (OR) + Pulse (1 shot)	This is a combination of an OR circuit with 2 inputs/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
34	Input 1 Logical, Output Logical Input 2 Logical	Logical sum (OR) + Retriggerable timer	This is a combination of an OR circuit with 2 inputs/1 output and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
35	Input 1 Logical, Output Logical Input 2 Logical	Logical sum (OR) + Pulse train output	This is a combination of an OR circuit with 2 inputs/1 output and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

40 to 45: XOR

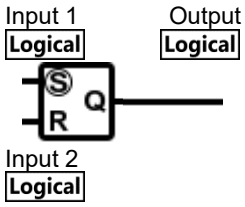
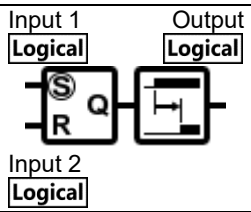
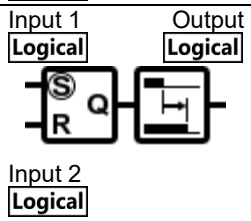
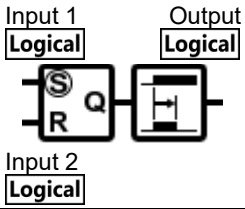
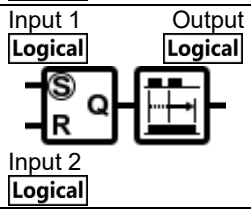
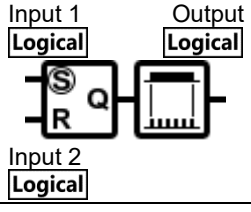
Block selection	Symbol	Function block	Description
40		Exclusive OR (XOR)	This is an XOR circuit with 2 inputs/1 output.
41		Exclusive OR (XOR) + ON-delay timer	This is a combination of an XOR circuit with 2 inputs/1 output and an ON-delay timer. Turning ON the XOR circuit output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the XOR circuit output turns OFF the output.
42		Exclusive OR (XOR) + OFF-delay timer	This is a combination of an XOR circuit with 2 inputs/1 output and an OFF-delay timer. Turning ON the XOR circuit output turns ON the output. Turning OFF the XOR circuit output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
43		Exclusive OR (XOR) + Pulse (1 shot) output	This is a combination of an XOR circuit with 2 inputs/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
44		Exclusive OR (XOR) + Retriggerable timer	This is a combination of an XOR circuit with 2 inputs/1 output and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
45		Exclusive OR (XOR) + Pulse train output	This is a combination of an XOR circuit with 2 inputs/1 output and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

2.3.3.18.2. [Digital] - Flip-flop

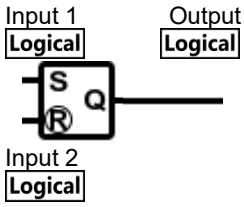
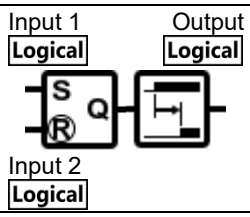
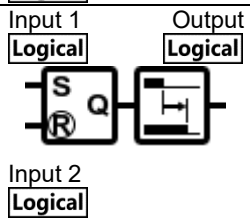
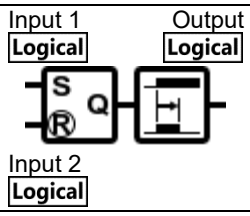
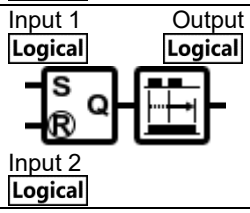
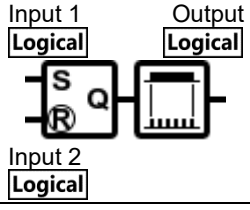
To select a flip-flop symbol, choose [Flip-Flop] from the [Digital] tab.



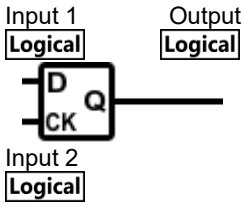
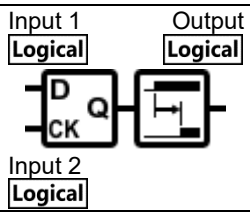
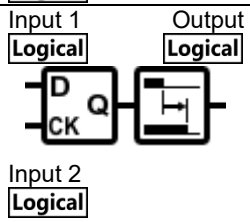
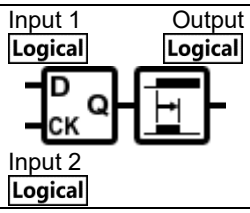
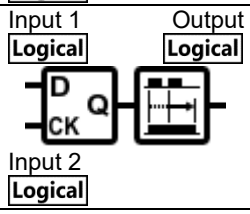
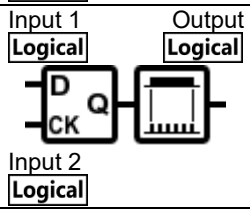
50 to 55: SR-FF

Block selection	Symbol	Function block	Description
50		Set priority flip-flop	This is a set priority flip-flop. When Input 1 (SET) turns ON, the output turns ON, and when Input 2 (RESET) turns ON, the output turns OFF. If there is no input, the previous state is maintained. When both inputs are ON, Input 1 (SET) has priority. For supported inverter, you can specify the initial state (OFF (0) or ON (1)) of the flip-flop immediately after starting the customizable logic with Parameter 2. For non-supported models, the initial state is OFF (0).
51		Set priority flip-flop + ON-delay timer	This is a combination of a set priority flip-flop and an ON-delay timer. Turning ON the flip-flop output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the flip-flop output turns OFF the output.
52		Set priority flip-flop + OFF-delay timer	This is a combination of a set priority flip-flop and an OFF-delay timer. Turning ON the flip-flop output turns ON the output. Turning OFF the flip-flop output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
53		Set priority flip-flop + Pulse (1 shot)	This is a combination of a set priority flip-flop and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
54		Set priority flip-flop + Retriggerable timer	This is a combination of a set priority flip-flop and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
55		Set priority flip-flop + Pulse train output	This is a combination of a set priority flip-flop and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

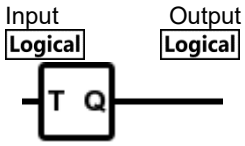
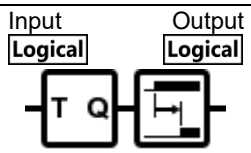
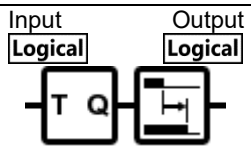
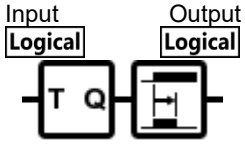
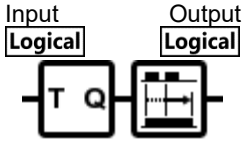
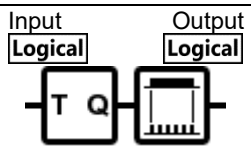
60 to 65: RS-FF

Block selection	Symbol	Function block	Description
60		Reset priority flip-flop	This is a reset priority flip-flop. When Input 1 (SET) turns ON, the output turns ON, and when Input 2 (RESET) turns ON, the output turns OFF. If there is no input, the previous state is maintained. When both inputs are ON, Input 2 (RESET) has priority. For supported inverter, you can specify the initial state (OFF (0) or ON (1)) of the flip-flop immediately after starting the customizable logic with Parameter 2. For non-supported models, the initial state is OFF (0).
61		Reset priority flip-flop + ON-delay timer	This is a combination of a reset priority flip-flop and an ON-delay timer. Turning ON the flip-flop output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the flip-flop output turns OFF the output.
62		Reset priority flip-flop + OFF-delay timer	This is a combination of a reset priority flip-flop and an OFF-delay timer. Turning ON the flip-flop output turns ON the output. Turning OFF the flip-flop output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
63		Reset priority flip-flop + Pulse (1 shot)	This is a combination of a reset priority flip-flop and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
64		Reset priority flip-flop + Retriggerable timer	This is a combination of a reset priority flip-flop and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
65		Reset priority flip-flop + Pulse train output	This is a combination of a reset priority flip-flop and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

140 to 145: D-FF

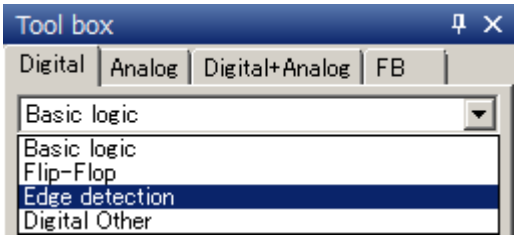
Block selection	Symbol	Function block	Description
140		D (delay) flip-flop	This is a delay flip-flop. The rising edge of Input 2 (CK) reflects the state of Input 1 (D) to the output. For supported inverter, you can specify the initial state (OFF (0) or ON (1)) of the flip-flop immediately after starting the customizable logic with Parameter 2.
141		D (delay) flip-flop + ON-delay timer	This is a combination of a delay flip-flop and an ON-delay timer. Turning ON the flip-flop output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the flip-flop output turns OFF the output.
142		D (delay) flip-flop + OFF-delay timer	This is a combination of a delay flip-flop and an OFF-delay timer. Turning ON the flip-flop output turns ON the output. Turning OFF the flip-flop output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
143		D (delay) flip-flop + Pulse (1 shot)	This is a combination of a delay flip-flop and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
144		D (delay) flip-flop + Retriggerable timer	This is a combination of a delay flip-flop and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
145		D (delay) flip-flop + Pulse train output	This is a combination of a delay flip-flop and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

150 to 155: T-FF

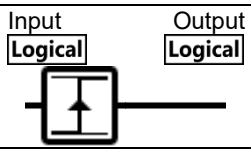
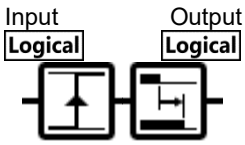
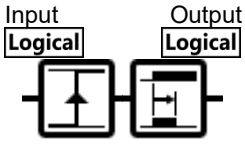
Block selection	Symbol	Function block	Description
150		T (toggle) flip-flop	This is a toggle flip-flop. The output status is inverted by the rising edge of Input 1 (T). For supported inverter, you can specify the initial state (OFF (0) or ON (1)) of the flip-flop immediately after starting the customizable logic with Parameter 2.
151		T (toggle) flip-flop + ON-delay timer	This is a combination of a delay flip-flop and an ON-delay timer. Turning ON the flip-flop output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the flip-flop output turns OFF the output.
152		T (toggle) flip-flop + OFF-delay timer	This is a combination of a delay flip-flop and an OFF-delay timer. Turning ON the flip-flop output turns ON the output. Turning OFF the flip-flop output starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
153		T (toggle) flip-flop + Pulse (1 shot)	This is a combination of a delay flip-flop and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
154		T (toggle) flip-flop + Retriggerable timer	This is a combination of a delay flip-flop and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
155		T (toggle) flip-flop + Pulse train output	This is a combination of a delay flip-flop and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

2.3.3.18.3. [Digital] - Edge Detection

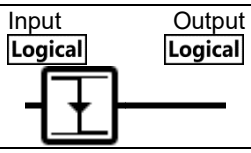
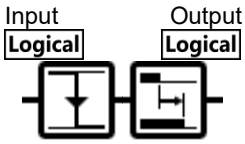
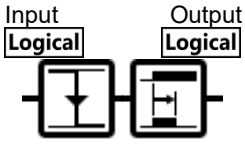
To select an edge detection symbol, choose [Edge detection] from the [Digital] tab.



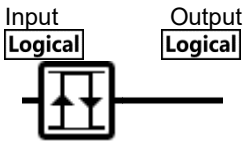
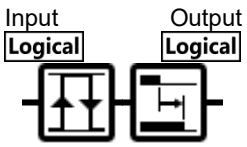
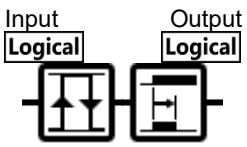
70, 72, 73: Rise Edge

Block selection	Symbol	Function block	Description
70		Rise edge detection	This is a rise detection with 1 input/1 output. Once a rise of an input signal is detected, the ON signal is output until the end of one execution cycle time.
72		Rise edge detection + OFF-delay timer	This is a combination of a rise detection with 1 input/1 output and an OFF-delay timer. When a rise edge is detected, the output turns ON. Turning OFF the rise edge detection starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
73		Rise edge detection + Pulse (1 shot)	This is a combination of a rise detection with 1 input/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".

80, 82, 83: Fall Edge

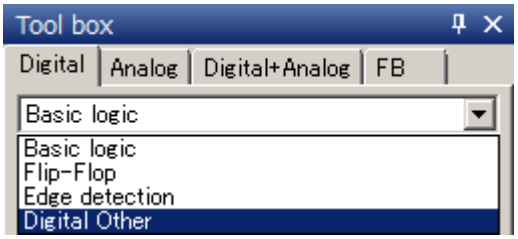
Block selection	Symbol	Function block	Description
80		Fall edge detection	This is a fall detection with 1 input/1 output. Once a fall of an input signal is detected, the ON signal is output until the end of one execution cycle time.
82		Fall edge detection + OFF-delay timer	This is a combination of a fall detection with 1 input/1 output and a general-purpose timer. When a fall edge is detected, the output turns ON. Turning OFF the rise edge detection starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
83		Fall edge detection + Pulse (1 shot)	This is a combination of a fall detection with 1 input/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".

90, 92, 93: Both Edges

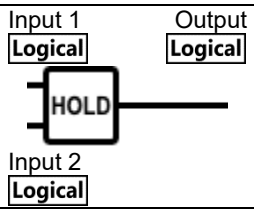
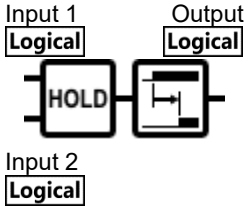
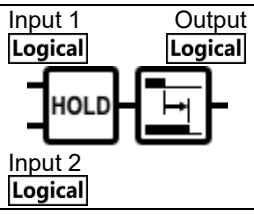
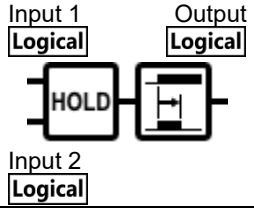
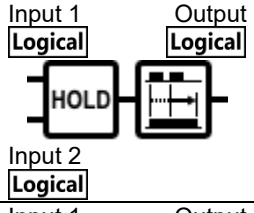
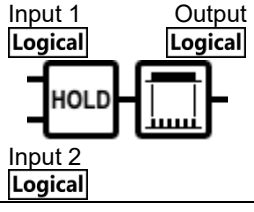
Block selection	Symbol	Function block	Description
90		Rise and fall edge detection	This is a rise and fall detection with 1 input/1 output. Once a rise or fall of an input signal is detected, the ON signal is output until the end of one execution cycle time.
92		Rise and fall edge detection + OFF-delay timer	This is a combination of a rise and fall detection with 1 input/1 output and an OFF-delay timer. Turning OFF the rise and fall edge detection starts the OFF-delay timer. When the timer time has elapsed, the output turns OFF.
93		Rise and fall edge detection + Pulse (1 shot)	This is a combination of a rise and fall detection with 1 input/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".

2.3.3.18.4. [Digital] - Digital Other

To select a "digital other" symbol, choose [Digital Other] from the [Digital] tab.

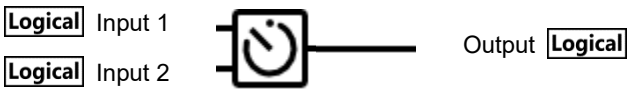


100 to 105: Hold

Block selection	Symbol	Function block	Description
100		Hold	This is a "hold previous value" function with 2 inputs/1 output. Input 2 is the hold control signal. Turning OFF Input 2 outputs Input 1. Turning ON Input 2 holds the previous output value.
101		Hold + ON-delay timer	This is a combination of a "hold previous value" function with 2 inputs/1 output and an ON-delay timer. Turning ON the hold output starts the ON-delay timer. When the timer time has elapsed, the output turns ON. Turning OFF the hold output turns OFF the output.
102		Hold + OFF-delay timer	This is a combination of a "hold previous value" function with 2 inputs/1 output and an OFF-delay timer. Turning ON the hold output turns ON the output.
103		Hold + Pulse (1 shot)	This is a combination of a "hold previous value" function with 2 inputs/1 output and a pulse (1 shot) output. For information on the operation of a pulse (1 shot), refer to Block selection 13 "Through output + Pulse (1 shot)".
104		Hold + Retriggerable timer	This is a combination of a "hold previous value" function with 2 inputs/1 output and a retriggerable timer. For information on the operation of a retriggerable timer, refer to Block selection 14 "Through output + Retriggerable timer".
105		Hold + Pulse train output	This is a combination of a "hold previous value" function with 2 inputs/1 output and a pulse train output. For information on the operation of a pulse train output, refer to Block selection 15 "Through output + Pulse train output".

110, 120, 130: Counter/Timer

Block selection	Item	Details
110	Category	Counter/Timer
	Function block	Up counter
	Symbol	Parameter 1: Target value
	Description	This is an up counter output with a reset input. Parameter 1 sets the target value. Input 2 is a reset signal. Turning ON Input 2 sets the counter value to 0. If the counter value is less than Parameter 1, +0.01 is added to the counter value at the rise of Input 1. When the counter value is equal to or more than Parameter 1, the output turns ON. When the output is ON, nothing is added to the counter value. Stopping the customizable logic sets the counter value to 0.
	Input 1	Logical value: When the count signal changes from OFF to ON, +0.01 is added to the counter value.
	Input 2	Logical value: Turning ON the input signal sets the counter value to 0.
	Output	Logical value: ON when the counter value is equal to or more than the target value
	Property settings	Parameter 1: Target value: 0.00 to 9990 (significant digits: 3 digits)
120	Category	Counter/Timer
	Function block	Down counter
	Symbol	Parameter 1: Counter initial value
	Description	This is an down counter output with a reset input. Parameter 1 sets the initial value. Input 2 is a reset signal. Turning ON Input 2 sets the counter value to Parameter 1. If the counter value is more than 0, +0.01 is subtracted from the counter value at the rise of Input 1. When the counter value is equal to or less than 0, the output turns ON. When the output is ON, nothing is subtracted from the counter value. Stopping the customizable logic sets the counter value to Parameter 1.
	Input 1	Logical value: When the count signal changes from OFF to ON, +0.01 is subtracted from the counter value.
	Input 2	Logical value: Turning ON the reset signal sets the counter value to Parameter 1.
	Output	Logical value: ON when the counter value is equal to or less than the 0.
	Property settings	Parameter 1: Target value: 0.00 to 9990 (significant digits: 3 digits)

Block selection	Item	Details
130	Category	Counter/Timer
	Function block	Timer with a reset input
	Symbol	Parameter 1: Target time 
	Description	This is an OFF-delay timer output with a reset function. Parameter 1 sets the target time. Input 2 is a reset signal. Turning ON Input 2 sets the timer current value to 0. Turning ON Input 1 turns ON the output and starts the timer. While the timer is operating, the output remains ON without regard of the status of Input 1. When the timer current value is equal to or more than the target time, the output turns OFF without regard of the status of Input 1. Also, the timer stops and the timer current value becomes 0. If both Input 1 and Input 2 are turned ON, Input 2 takes precedence. Stopping the customizable logic sets the timer current value to 0.
	Input 1	Logical value: When the signal changes from OFF to ON, the timer is started.
	Input 2	Logical value: Turning ON the reset signal sets the timer current value to 0.
	Output	Logical value: ON during the period from when Input 2 turns OFF and Input 1 turns ON to when the timer current value becomes less than the target time.
	Property settings	Parameter 1: Target time: 0.00 to 9990 [s] (significant digits: 3 digits)

2.3.3.18.5. [Analog] - Basic Operator

Calculator

2001: Addition

Block selection	Item	Details
2001	Category	Calculator
	Function block	Addition
	Symbol	Parameter 1: Upper limit value Numeric Input 1 Numeric Input 2 Output Numeric Parameter 2: Lower limit value
	Description	This is a combination of an addition circuit with 2 inputs/1 output and an output limiter. This function block performs an addition between Input 1 and Input 2 and outputs the result. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Calculation	Output = Input 1 + Input 2
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

2002: Subtraction

Block selection	Item	Details
2002	Category	Calculator
	Function block	Subtraction
	Symbol	Parameter 1: Upper limit value Numeric Input 1 Numeric Input 2 Output Numeric Parameter 2: Lower limit value
	Description	This is a combination of an subtraction circuit with 2 inputs/1 output and an output limiter. This function block performs a subtraction between Input 1 and Input 2 and outputs the result. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Calculation	Output = Input 1 - Input 2
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

2003: Multiplication

Block selection	Item	Details
2003	Category	Calculator
	Function block	Multiplication
	Symbol	Parameter 1: Upper limit value Numeric Input 1 Numeric Input 2 Output Numeric Parameter 2: Lower limit value
	Description	This is a combination of a multiplication circuit with 2 inputs/1 output and an output limiter. This function block performs a multiplication between Input 1 and Input 2 and outputs the result. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Calculation	$\mathrm{Output} = \mathrm{Input}\,1 \times \mathrm{Input}\,2$
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

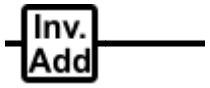
2004: Division

Block selection	Item	Details
2004	Category	Calculator
	Function block	Division
	Symbol	Parameter 1: Upper limit value Numeric Input 1 Numeric Input 2 Output Numeric Parameter 2: Lower limit value
	Description	This is a combination of a division circuit with 2 inputs/1 output and an output limiter. This function block performs a division between Input 1 and Input 2 and outputs the result. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Calculation	$\mathrm{Output} = \mathrm{Input}\,1 \div \mathrm{Input}\,2$
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

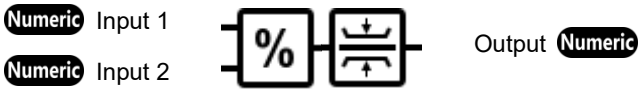
2006: Absolute value

Block selection	Item	Details
2006	Category	Calculator
	Function block	Absolute value
	Symbol	Parameter 1: Upper limit value Numeric Input Output Numeric Parameter 2: Lower limit value
	Description	This function block determines the absolute value of the input and outputs the result. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

2007: Inverse addition

Block selection	Item	Details
2007	Category	Calculator
	Function block	Inverse addition
	Symbol	Parameter 1: Offset Numeric Input  Output Numeric Parameter 2: Bias
	Description	This is an inverting circuit with 1 input/1 output. It corrects the sign inversion value of the input based on Parameter 1 (offset) and Parameter 2 (bias) and outputs it. The output is limited by ±9990. This is similar to the function block "inverse addition switchover (4002)". For information on the inverse addition switchover, refer to "4002: Inverse addition switchover" in "[Digital + Analog] - Basic operator".
	Calculation	Output = - (Input - Function 1) + Function 2
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Offset: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Bias: -9990 to +9990 (significant digits: 3 digits)

2010: Modulo

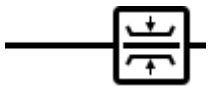
Block selection	Item	Details
2103	Category	Calculator
	Function block	Modulo
	Symbol	Parameter 1: Upper limit value  Parameter 2: Lower limit value
	Description	Outputs the result of modulo operation of Input 1 and Input 2. Divides input 1 by input 2 and outputs the remainder. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Calculation	$\mathrm{Output} = \mathrm{Input\ 1\ mod\ Input\ 2}$
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

2103: Average

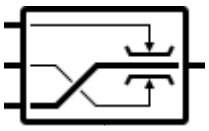
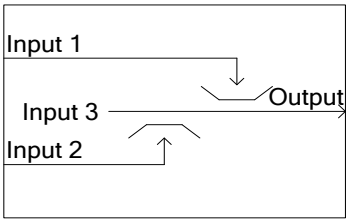
Block selection	Item	Details
2103	Category	Calculator
	Function block	Average calculation
	Symbol	Parameter 1: Upper limit value Parameter 2: Lower limit value
	Description	Outputs the addition average value of Input 1 and Input 2. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Calculation	$\mathrm{Output} = \frac{\mathrm{Input\ 1} + \mathrm{Input\ 2}}{2}$
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

Limiter

2005: Limiter

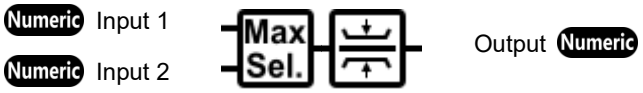
Block selection	Item	Details
2005	Category	Limiter
	Function block	Limiter
	Symbol	Parameter 1: Upper limit value Numeric Input  Output Numeric Parameter 2: Lower limit value
	Description	This is an upper/lower limiter circuit with 1 input/1 output. This function block determines the limited value of Input 1 and outputs the result. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. If the upper limit value is equal to the lower limit value, the upper limit value is interpreted as +9990 and the lower limit value as -9990. In this case, "Through" appears under the symbol. If the upper limit value is less than the lower limit value, the upper limit value is output.
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

2008: Variable limiter

Block selection	Item	Details
2008	Category	Limiter
	Function block	Variable limiter
	Symbol	Parameter 1: Input 3 (step number) Numeric Input 1 Numeric Input 2 Numeric Input 3: Function block output  Output Numeric
	Description	You can apply variable upper and lower limits to Input 3. The output is limited by the upper and lower limit values assigned to Input 1 and Input 2. If Input 1 (upper limit value) is less than Input 2 (lower limit value), Input 1 is output. Input 3 accepts the connection of the output of a function block (a symbol that allows step number assignment). You cannot connect an input terminal directly to it. If you do not connect Input 3, the variable upper and lower limit values are applied to the output (SOxx) with step number xx specified in Parameter 1. If you connect Input 3, performing the auto step number assignment overwrites Parameter 1 with the step number specified by Input 3.
	Calculation	 The lower limit is applied first and then the upper limit is applied. If you do not connect Input 3, replace Input 3 shown to the left with the output of the step number specified in Parameter 1.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Step number: 1 to maximum step number

Selector

2101: Maximum selection

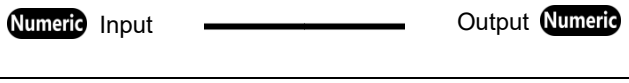
Block selection	Item	Details
2101	Category	Selector
	Function block	Maximum selection
	Symbol	Parameter 1: Upper limit value  Parameter 2: Lower limit value
	Description	Compares Input 1 and Input 2 and outputs the larger of the two. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

2102: Minimum selection

Block selection	Item	Details
2102	Category	Selector
	Function block	Minimum selection
	Symbol	Parameter 1: Upper limit value Parameter 2: Lower limit value
	Description	Compares Input 1 and Input 2 and outputs the smaller of the two. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

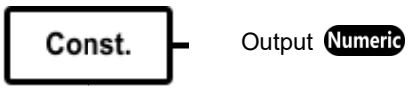
Analog through

2005: Analog through

Block selection	Item	Details
2005	Category	Analog through
	Function block	Analog through
	Symbol	
	Description	This is a through output of analog values without arithmetic processing. Use “10 to 15: Through” for the through output a digital signal. Tip • Since this function is internally the same as "2005: Limiter", it has the same number.
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990

Constant value

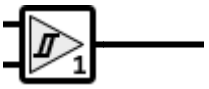
2009: Constant value

Block selection	Item	Details
2009	Category	Constant value
	Function block	Constant value
	Symbol	
		Parameter 2: Constant value
	Description	The value set for Parameter 2 is always output as a constant. Tip • Since this function is internally the same as "2009: Linear function", it has the same number.
	Calculation	$\mathrm{Output} = \mathrm{Parameter}\ 2$
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 2: Constant value: -9990 to +9990 (significant digits: 3 digits)

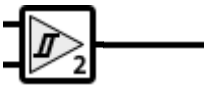
2.3.3.18.6. [Analog] - Comparator

Analog comparator

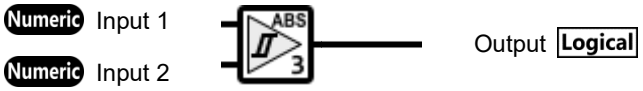
2051: Comparison 1

Block selection	Item	Details
2051	Category	Analog comparator
	Function block	Comparison 1
	Symbol	Parameter 1: Deviation judgment value Numeric Input 1 Numeric Input 2  Output Logical Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the two input deviations (including any equal sign). If both the output ON and OFF conditions are true, the ON condition takes precedence.
	Calculation	Output ON condition: Input 1 - Input 2 ≥ Parameter 1 + |Parameter 2| Output OFF condition: Input 1 - Input 2 ≥ Parameter 1 - |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Deviation judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

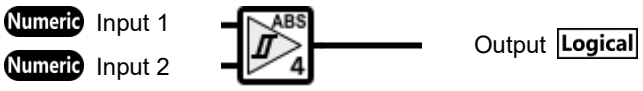
2052: Comparison 2

Block selection	Item	Details
2052	Category	Analog comparator
	Function block	Comparison 2
	Symbol	Parameter 1: Deviation judgment value Numeric Input 1 Numeric Input 2  Output Logical Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the two input deviations (not including equal signs).
	Calculation	Output ON condition: Input 1 - Input 2 > Parameter 1 + |Parameter 2| Output OFF condition: Input 1 - Input 2 < Parameter 1 - |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Deviation judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

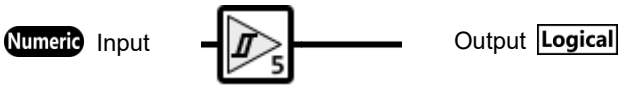
2053: Comparison 3

Block selection	Item	Details
2053	Category	Analog comparator
	Function block	Comparison 3
	Symbol	Parameter 1: Deviation judgment value  Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the two input deviations (absolute values) (including any equal sign). If both the output ON and OFF conditions are true, the ON condition takes precedence.
	Calculation	Output ON condition: |Input 1 - Input 2| ≥ Parameter 1 + |Parameter 2| Output OFF condition: |Input 1 - Input 2| ≦ Parameter 1 - |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Deviation judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

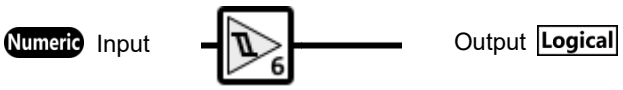
2054: Comparison 4

Block selection	Item	Details
2054	Category	Analog comparator
	Function block	Comparison 4
	Symbol	Parameter 1: Deviation judgment value  Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the two input deviations (absolute values) (not including equal signs).
	Calculation	Output ON condition: |Input 1 - Input 2| > Parameter 1 + |Parameter 2| Output OFF condition: |Input 1 - Input 2| < Parameter 1 - |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Deviation judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

2055: Comparison 5

Block selection	Item	Details
2055	Category	Analog comparator
	Function block	Comparison 5
	Symbol	Parameter 1: Judgment value  Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the input and the judgment value. The hysteresis width is configurable but takes effect only if the OFF condition is true.
	Calculation	Output ON condition: Input ≥ Parameter 1 Output OFF condition: Input 1 < Parameter 1 - |Parameter 2|
	Input	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

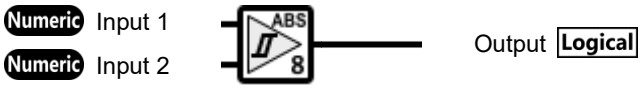
2056: Comparison 6

Block selection	Item	Details
2056	Category	Analog comparator
	Function block	Comparison 6
	Symbol	Parameter 1: Judgment value  Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the input and the judgment value. The hysteresis width is configurable but takes effect only if the OFF condition is true.
	Calculation	Output ON condition: Input ≥ Parameter 1 Output OFF condition: Input 1 < Parameter 1 + |Parameter 2|
	Input	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

2057: Comparison 7

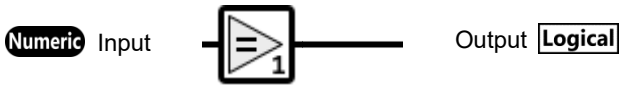
Block selection	Item	Details
2057	Category	Analog comparator
	Function block	Comparison 7
	Symbol	Parameter 1: Deviation judgment value Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the two input deviations. The ON condition does not include the equal sign, and the OFF condition includes the equal sign.
	Calculation	Output ON condition: Input 1 - Input 2 > Parameter 1 + |Parameter 2| Output OFF condition: Input 1 - Input 2 ≦ Parameter 1 - |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Deviation judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

2058: Comparison 8

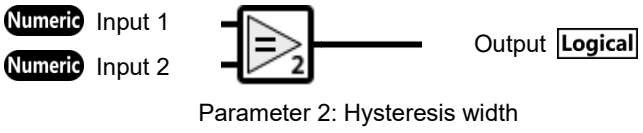
Block selection	Item	Details
2058	Category	Analog comparator
	Function block	Comparison 8
	Symbol	Parameter 1: Deviation judgment value  Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of the two input deviations (absolute values). The ON condition does not include the equal sign, and the OFF condition includes the equal sign.
	Calculation	Output ON condition: |Input 1 - Input 2| > Parameter 1 + |Parameter 2| Output OFF condition: |Input 1 - Input 2| ≦ Parameter 1 - |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Deviation judgment value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

Equal

2071: Equal comparison 1

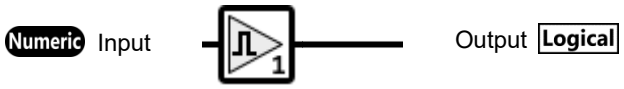
Block selection	Item	Details
2071	Category	Equal
	Function block	Equal comparison 1
	Symbol	Parameter 1: Judgment value 
	Description	Digitally outputs the comparison result of Input 1 and the judgment value. If Input 1 and the judgment value are equal, ON (true) is output. Tip • Since this function is internally the same as "2071: Window comparison 1", it has the same number.
	Calculation	Output ON condition: $\mathrm{Input} = \mathrm{Parameter}\ 1$ Output OFF condition: $\mathrm{Input} \neq \mathrm{Parameter}\ 1$
	Input	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Judgment value: -9990 to +9990 (significant digits: 3 digits)

2059: Equal Comparison 2

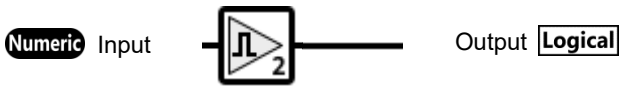
Block selection	Item	Details
2059	Category	Equal
	Function block	Equal comparison 2
	Symbol	 Parameter 2: Hysteresis width
	Description	Digitally outputs the comparison result of Input 1 and the judgment value. If Input 1 and Input 2 are equal, ON (true) is output.
	Calculation	Output ON condition: |Input 1 - Input 2| ≧ |Parameter 2| Output OFF condition: |Input 1 - Input 2| < |Parameter 2|
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 2: Hysteresis width: -9990 to +9990 (significant digits: 3 digits)

Window comparator

2071: Window comparison 1

Block selection	Item	Details
2071	Category	Window comparator
	Function block	Window comparison 1
	Symbol	Parameter 1: Upper threshold  Parameter 2: Lower threshold
	Description	Digitally outputs the comparison result of Input 1 and the upper/lower thresholds. If Input 1 is within the range between the upper threshold and the lower threshold (including equal signs), ON (true) is output.
	Calculation	Output ON condition: Parameter 1 ≥ Input ≥ Parameter 2 Output OFF condition: (Input > Parameter 1) or (Parameter 2 > Input)
	Input	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Upper threshold: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower threshold: -9990 to +9990 (significant digits: 3 digits)

2072: Window comparison 2

Block selection	Item	Details
2072	Category	Window comparator
	Function block	Window comparison 2
	Symbol	Parameter 1: Upper threshold  Parameter 2: Lower threshold
	Description	Digitally outputs the comparison result of Input 1 and the upper/lower thresholds. If Input 1 is within the range between the upper threshold and the lower threshold (not including equal signs), ON (true) is output.
	Calculation	Output ON condition: Parameter 1 > Input > Parameter 2 Output OFF condition: (Input ≥ Parameter 1) or (Parameter 2 ≥ Input)
	Input	Numeric value: -9990 to +9990
	Output	Logical value: ON when the output ON condition is true; OFF when the output OFF condition is true.
	Property settings	Parameter 1: Upper threshold: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower threshold: -9990 to +9990 (significant digits: 3 digits)

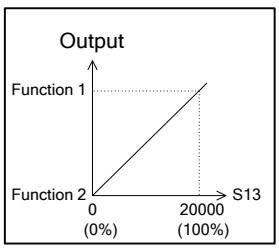
2.3.3.18.7. [Analog] - Converter

Converter

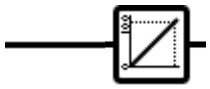
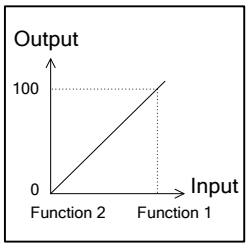
2009: Linear function

Block selection	Item	Details
2009	Category	Converter
	Function block	Linear function
	Symbol	Parameter 1: Coefficient K_A Numeric Input → Output Numeric Parameter 2: Coefficient K_B
	Description	This function block calculates the linear function passed as input. It calculates the output value based on the predefined linear function (one indicated in the "Calculation" field below). The coefficients of the linear function are given by Parameter 1 and Parameter 2. The output is limited by the internal limiter. When Parameter 1 is set to 0.00, no error occurs even if the input is not connected.
	Calculation	$\text{Output} = K_A \times \text{Input} + K_B$
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Coefficient K_A : -9990 to +9990 (significant digits: 3 digits) Parameter 2: Coefficient K_B : -9990 to +9990 (significant digits: 3 digits)

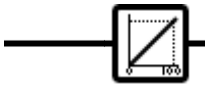
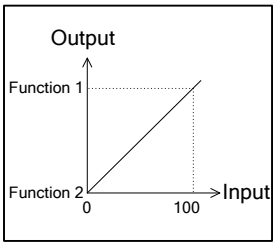
2151: S13 function code input

Block selection	Item	Details
2151	Category	Converter
	Function block	S13 function code input
	Symbol	Parameter 1: Value output when S13 is 20000 S13 (%) → Output Numeric Parameter 2: Value output when S13 is 0
	Description	Converts the settings "0 to 20000/0 to 100%" of function code S13 (PID command value) so that the values specified in Parameter 2 and Parameter 1 are output when S13 is 0 and 20000, respectively. 
	Calculation	$\text{Output} = \frac{(\text{Function 1} - \text{Function 2})}{20000} \times \text{S13} + \text{Function 2}$
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Value output when S13 is 20000: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Value output when S13 is 0: -9990 to +9990 (significant digits: 3 digits)

2201: Inverse scale transformation

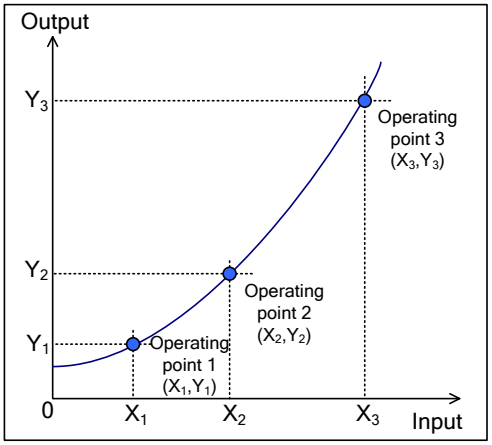
Block selection	Item	Details
2201	Category	Converter
	Function block	Inverse scale transformation
	Symbol	Parameter 1: Value input when the output is 100 Numeric Input  Output Numeric Parameter 2: Value input when the output is 0
	Description	Inversely transform the scale of Input 1 from "minimum to maximum" to "0 to 100%". Use this function block for the connection to an analog output terminal. The maximum number of steps that can be used is two. If you set both Parameter 1 and Parameter 2 to the same value, the output is 0. 
	Calculation	$\text{Output} = 100 \times \frac{\text{Input} - \text{Function 2}}{\text{Function 1} - \text{Function 2}}$
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Value input when the output is 100: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Value input when the output is 0: -9990 to +9990 (significant digits: 3 digits)

2202: Scale transformation

Block selection	Item	Details
2202	Category	Converter
	Function block	Scale transformation
	Symbol	Parameter 1: Value output when the input is 100 Numeric Input  Output Numeric Parameter 2: Value output when the input is 0
	Description	Inversely transform the scale of Input 1 from "minimum to maximum" to "0 to 100%". For input selection, you can only use a setting from 8000 to 8085 The maximum number of steps that can be used is two. 
	Calculation	$\text{Output} = \frac{(\text{Function 1} - \text{Function 2})}{100} \times \text{Input} + \text{Function 2}$
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Value output when the input is 100: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Value output when the input is 0: -9990 to +9990 (significant digits: 3 digits)

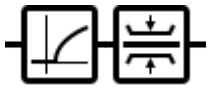
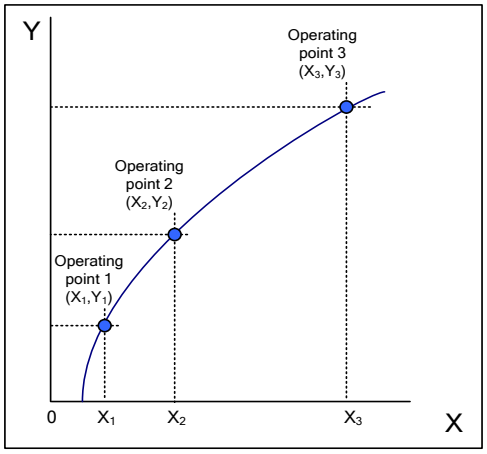
3001: Conversion 1

<table>
<tr><th>Block selection</th><th>Item</th><th>Details</th></tr>
<tr><td rowspan="7">3001</td><td>Category</td><td>Converter</td></tr>
<tr><td>Function block</td><td>Conversion 1</td></tr>
<tr><td>Symbol</td><td>Parameter 1: Upper limit value

Parameter 2: Lower limit value</td></tr>
<tr><td>Description</td><td>This function block calculates the quadratic function passed as input.
It calculates the output value based on the predefined quadratic function (one indicated in the "Calculation" field below).
The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2.
For more information on the limit operation, refer to "2005: Limiter".
You can select whether to manually set or automatically calculate coefficients K_A, K_B, K_C.
<u>To manually set the conversion coefficients</u>
You can set each coefficient using an exponent. For example, you can specify a mantissa and an exponent part to define K_A as follows:
$K_A = (\text{Mantissa}) \times 10^{(\text{Exponent part})}$
The same applies to K_B and K_C.
<u>To automatically calculate the conversion coefficients</u>
Specify the input-output relationship using three points: (X_1, Y_1), (X_2, Y_2), and (X_3, Y_3).
Then each coefficient is set to an automatically calculated value.
The maximum number of steps that can be used is one for both Conversion 1 (3001) and Conversion 2 (3002).
When you use both Conversion 1 (3001) and Conversion 2 (3002), Conversion 1 (3001) takes precedence.
 

If you use two or more instances of Conversion 1 (3001), the one with the smallest step number takes precedence.
Do not select Auto Calculation when you want to write to the keypad. Refer to "2.3.3.4. [4] Function Block 3001: conversion 1, 3002: conversion 2" for details.</td></tr>
<tr><td>Calculation</td><td>$\text{Output} = K_A \times (\text{Input})^2 + K_B \times \text{Input} + K_C$</td></tr>
<tr><td>Input</td><td>Numeric value: -9990 to +9990</td></tr>
<tr><td>Output</td><td>Numeric value: -9990 to +9990 (limit value: ±9990)</td></tr>
<tr><td>Property settings</td><td>To manually set the conversion coefficients:
Mantissas of K_A, K_B, and K_C: -9.999 to 9.999
Exponent parts of K_A, K_B, and K_C: -5 to 5
To automatically calculate the conversion coefficients:
X_1, Y_1, X_2, Y_2, X_3, Y_3: -9990 to +9990 (significant digits: 3 digits)
Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits)
Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)</td></tr>
</table>

3002: Conversion 2

Block selection	Item	Details
3002	Category	Converter
	Function block	Conversion 2
	Symbol	Parameter 1: Upper limit value Numeric Input  Output Numeric Parameter 2: Lower limit value
	Description	This function block calculates the output value based on the predefined function (one indicated in the "Calculation" field below). The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter". You can select whether to manually set or automatically calculate coefficients K_A, K_B, K_C. To manually set the conversion coefficients You can set each coefficient using an exponent. For example, you can specify a mantissa and an exponent part to define K_A as follows: $K_A = (\text{Mantissa}) \times 10^{(\text{Exponent part})}$ The same applies to K_B and K_C. To automatically calculate the conversion coefficients Specify the input-output relationship using three points: (X_1, Y_1), (X_2, Y_2), and (X_3, Y_3). Then each coefficient is set to an automatically calculated value.  The maximum number of steps that can be used is one for both Conversion 1 (3001) and Conversion 2 (3002). When you use both Conversion 1 (3001) and Conversion 2 (3002), Conversion 1 (3001) takes precedence. If you use two or more instances of Conversion 2 (3001), the one with the smallest step number takes precedence. If the calculation result inside $\sqrt{\ }$ is a negative value, '0' is output. Do not select Auto Calculation when you want to write to the keypad. Refer to "2.3.3.4. [4] Function Block 3001: conversion 1, 3002: conversion 2" for details.
	Calculation	$\text{Output} = \sqrt{\frac{\text{Input} + K_A}{K_B}} \times K_C$
	Input	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	To manually set the conversion coefficients: Mantissas of K_A, K_B, and K_C: -9.999 to 9.999 Exponent parts of K_A, K_B, and K_C: -5 to 5 To automatically calculate the conversion coefficients: X_1, Y_1, X_2, Y_2, X_3, Y_3: -9990 to +9990 (significant digits: 3 digits) Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

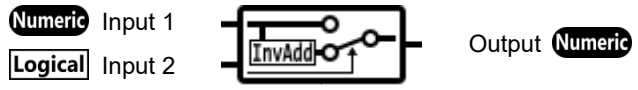
2.3.3.18.8. [Digital + Analog] - Basic operator

Basic operator

4001: Hold

Block selection	Item	Details
4001	Category	Basic operator
	Function block	Hold
	Symbol	Parameter 1: Upper limit value Parameter 2: Lower limit value
	Description	Turning OFF Input 2 (logical value) outputs Input 1 as-is. Turning ON Input 2 (logical value) holds the output value. The output is limited by the upper and lower limit values assigned to Parameter 1 and Parameter 2. For more information on the limit operation, refer to "2005: Limiter".
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: The previous output value is output.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Upper limit value: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Lower limit value: -9990 to +9990 (significant digits: 3 digits)

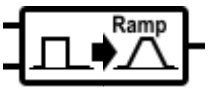
4002: Inverse addition switchover

Block selection	Item	Details
4002	Category	Basic operator
	Function block	Inverse addition switchover
	Symbol	Parameter 1: Offset  Parameter 2: Bias
	Description	Turning OFF Input 2 (logical value) outputs Input 1 as-is. Turning ON Input 2 (logical value) outputs the calculation result of the expression indicated in the "Calculation" field below. This is similar to the function block "inverse addition (2007)". For information on the inverse addition, refer to "2007: Inverse addition" in "[Analog] - Basic Operator".
	Calculation	Output when Input 2 is ON = -(Input 1 - Parameter 1) + Parameter 2
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: Outputs the calculation result of the expression indicated in the "Calculation" field above.
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Offset: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Bias: -9990 to +9990 (significant digits: 3 digits)

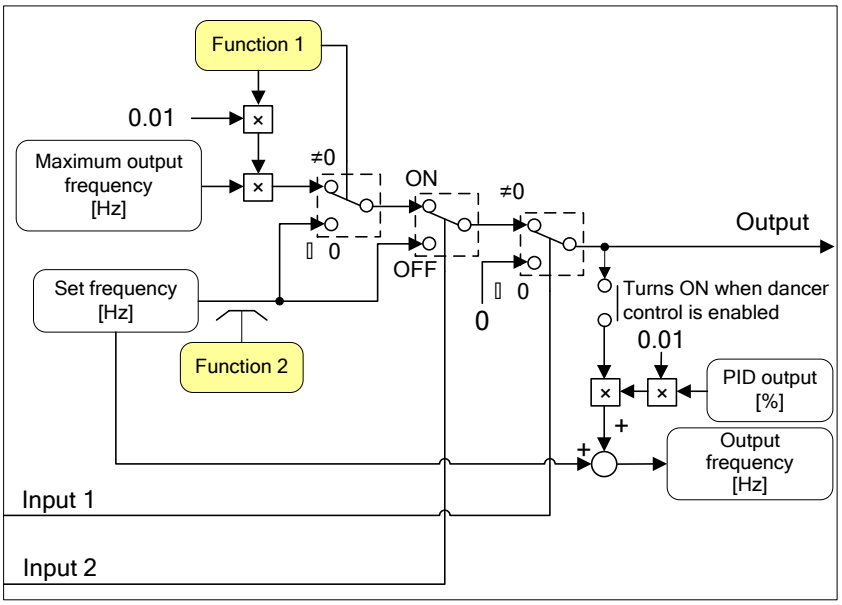
4005: Low pass filter

Block selection	Item	Details
4005	Category	Basic operator
	Function block	Low pass filter
	Symbol	Parameter 1: Time constant [s] Numeric Input 1 Logical Input 2 Output Numeric
	Description	Turning OFF Input 2 outputs Input 1 as-is. Turning ON Input 2 outputs Input 1 after applying a low pass filter to it. The low pass filter calculation uses the previous output value. When Input 2 changes from OFF to ON, the previous output value is the output value before the low pass filter is applied. The previous output value is '0' when the customizable logic is started or the CLC terminal is turned ON.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: Outputs Input 1 after applying a low pass filter to it.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Time constant: 0.01 to 5.00 [s] (A value of 0.00 disables the filter.)

4006: Change rate limit

Block selection	Item	Details
4006	Category	Basic operator
	Function block	Change rate limit
	Symbol	Parameter 1: Rise time [s] Numeric Input 1 Logical Input 2  Output Numeric Parameter 2: Fall time [s]
	Explanation	The change rate limit function block limits the change amount per unit time of Input 1. You can also set the limit value by specifying the time for Input 1 to change from 0 to 100. You can specify the limit values separately for the rise amount and the fall amount. Turning OFF Input 2 outputs Input 1 as-is. Turning ON Input 2 outputs Input 1 after applying the change rate limit to it. The change rate limit calculation uses the previous output value. When Input 2 changes from OFF to ON, the previous output value is the output value before the change rate limit is applied. The previous output value is '0' when the customizable logic is started or the CLC terminal is turned ON.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: Outputs Input 1 after applying the change rate limit to it.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Rise time: Time for Input 1 to change from 0 to 100 0.01 to 600 [s] (significant digits: 3 digits) (When set to 0, no limit is applied.) Parameter 2: Fall time: Time for Input 1 to change from 0 to 100 0.01 to 600 [s] (significant digits: 3 digits) (When set to 0, the same time as Parameter 1 is used.)

6101: PID dancer output gain frequency

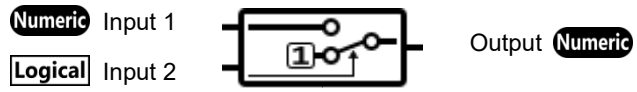
<table>
<tr><th>Block selection</th><th>Item</th><th>Details</th></tr>
<tr><td rowspan="4">6101</td><td>Category</td><td>Basic operator</td></tr>
<tr><td>Function block</td><td>PID dancer output gain frequency</td></tr>
<tr><td>Symbol</td><td>Parameter 1: Gain ratio [%]
Numeric Input 1
Logical Input 2
Dancer PID MV mode sw
Output Numeric
Parameter 2: Frequency lower limit value [Hz]</td></tr>
<tr><td>Description</td><td>This function block is used in the dancer control PID.
You can select whether to calculate the frequency correction amount by assuming that the 100% of the PID output is equivalent to the maximum output frequency or the commanded frequency (by the line speed command).
Setting Input 1 to 0 outputs 0.
Setting Input 1 to a non-zero value outputs the value calculated using the expression indicated in the "Calculation" field.
The output is intended for use in monitoring.
If the dancer control is enabled (i.e., function code J01 is set to 3), the function block calculates the frequency correction amount using the expression indicated in the "Calculation" field below and reflects it to the output frequency.
The maximum number of steps that can be used is one. If you use two or more instances of PID dancer output gain frequency (6101), the one with the smallest step number takes precedence.
 
</td></tr>
<tr><td>Calculation</td><td>Output
<table>
<tr><th>Input 1</th><th>Input 2</th><th>Parameter 1</th><th>Output</th></tr>
<tr><td>0</td><td>OFF/ON</td><td>Not used</td><td>0</td></tr>
<tr><td rowspan="3">Non-zero</td><td>OFF</td><td>Not used</td><td rowspan="2">If set frequency is equal to or more than Parameter 2, the set frequency is output.
If the set frequency is less than Parameter 2, Parameter 2 is output.</td></tr>
<tr><td rowspan="2">ON</td><td>0</td></tr>
<tr><td>Non-zero</td><td>$\frac{\text{Function 1}}{100} \times \text{Maximum output frequency}$</td></tr>
</table>
$\text{Frequency correction amount} = \frac{\text{PID output [\%]}}{100} \times \text{Output}$
Output frequency − Set frequency + Frequency correction amount</td></tr>
</table>

Block selection	Item	Details
6101	Input 1	Numeric value: If set to 0, 0 is output. If set to a non-zero value, the calculation is performed.
	Input 2	Logical value: OFF: Calculates the frequency correction amount from the set frequency. ON: If Parameter 1 is 0, same as OFF. If Parameter 1 is non-zero, the function block calculates the frequency correction amount from the maximum output frequency.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Gain ratio: 0 to 200 [%] Parameter 2: Frequency lower limit value: 0 to 500 [Hz]

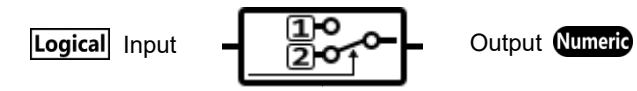
2.3.3.18.9. [Digital + Analog] - Selector

Selector

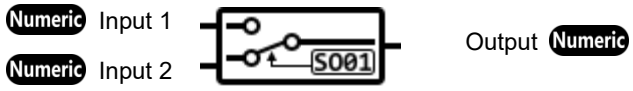
4003: Selection 1

Block selection	Item	Details
4003	Category	Selector
	Function block	Selection 1
	Symbol	Parameter 1: Value output when the Input 2 is ON 
	Description	Turning OFF Input 2 outputs Input 1 as-is. Turning ON Input 2 outputs Parameter 1.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: Parameter 1 is output.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Value output when Input 2 is ON: -9990 to +9990 (significant digits: 3 digits)

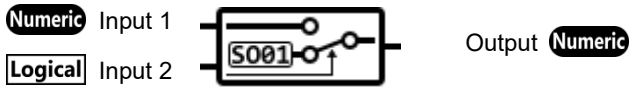
4004: Selection 2

Block selection	Item	Details
4004	Category	Selector
	Function block	Selection 2
	Symbol	Parameter 1: Value output when the Input 2 is OFF  Parameter 2: Value output when the Input 2 is ON
	Explanation	Turning OFF Input 2 (logical value) outputs Parameter 1. Turning ON Input 2 (logical value) outputs Parameter 2.
	Input	Logical value: OFF: Parameter 1 is output. ON: Parameter 2 is output.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Value output when Input 2 is OFF: -9990 to +9990 (significant digits: 3 digits) Parameter 2: Value output when Input 2 is ON: -9990 to +9990 (significant digits: 3 digits)

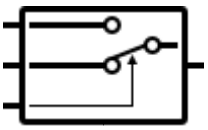
5001 to 5014: Selection 3-1 to 3-14

Block selection	Item	Details
5001 to 5014	Category	Selector
	Function block	Selection 3-1 to 3-14
	Symbol	[Example in 5001] 
	Description	Turning OFF the output (SOxx) with step number xx (where xx is 1, 2,..., 14) outputs Input 1. Turning ON the output (SOxx) outputs Input 2. The output (SOxx) must be a logical value. SO01 to SO14 — Logical value: OFF: Input 1 is output. ON: Input 2 is output.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Not used

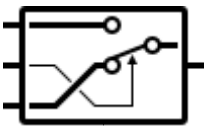
5101 to 5114: Selection 4-1 to 4-14

Block selection	Item	Details
5101 to 5114	Category	Selector
	Function block	Selection 4-1 to 4-14
	Symbol	[Example in 5001] 
	Description	Turning OFF Input 2 outputs Input 1. Turning ON Input 2 outputs the output (SOxx) with step number xx (where xx is 1, 2,..., 14). The output (SOxx) must be a numeric value.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: The output (SOxx) is output.
	Output	Numeric value: -9990 to +9990
	Property settings	Not used

5000: Selection 3

Block selection	Item	Details
5000	Category	Selector
	Function block	Selection 3
	Symbol	Parameter 1: Step number Numeric Input 1 Numeric Input 2 Logical Input 3: Function block output  Output Numeric
	Description	Input 3 accepts the connection of the output of a function block (a symbol that allows step number assignment). You cannot connect an input terminal directly to it. Turning OFF Input 3 outputs Input 1. Turning ON Input 3 outputs Input 2. Input 3 must be a logical value. If Input 3 is not connected, the function block uses the output (SOxx) with step number xx specified in Parameter 1 instead of Input 3. If you connect Input 3, performing the auto step number assignment overwrites Parameter 1 with the step number specified by Input 3.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Numeric value: -9990 to +9990
	Input 3	Logical value: OFF: Input 1 is output. ON: Input 2 is output.
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Step number: 1 to maximum step number

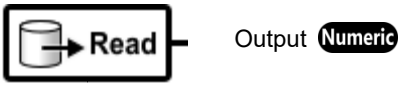
5100: Selection 4

Block selection	Item	Details
5100	Category	Selector
	Function block	Selection 4
	Symbol	Parameter 1: Step number Numeric Input 1 Logical Input 2 Numeric Input 3: Function block output  Output Numeric
	Description	Input 3 accepts the connection of the output of a function block (a symbol that allows step number assignment). You cannot connect an input terminal directly to it. Turning OFF Input 2 outputs Input 1. Turning ON Input 2 outputs Input 3. Input 3 must be a numeric value. If Input 3 is not connected, the function block uses the output (SOxx) with step number xx specified in Parameter 1 instead of Input 3. If you connect Input 3, performing the auto step number assignment overwrites Parameter 1 with the step number specified by Input 3.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Input 1 is output. ON: Input 3 is output.
	Input 3	Numeric value: -9990 to +9990
	Output	Numeric value: -9990 to +9990
	Property settings	Parameter 1: Step number: 1 to maximum step number

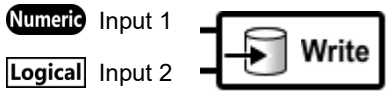
2.3.3.18.10. [Digital + Analog] - Function Code

Function Code

6001: Function code read

Block selection	Item	Details
6001	Category	Function Code
	Function block	Function code read
	Symbol	Parameter 1: Function code group  Parameter 2: Function code number
	Description	This function block outputs the function code data specified by Parameter 1 and Parameter 2. It can correctly read out the following data formats: [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [12], [22], [24], [29], [35], [37], [45], [61], [67], [68], [74], [92], [93] However, the value is limited within the range of -9990 to 9990. In addition, for [29], the function block displays 20000 as 100%. Do not use any other data format than above because the function block cannot correctly read other formats. If an attempt is made to read out a non-existent function code, the output will be 0. For more information on the data formats, refer to Chapter 5 of the Appendix " RS-485 Communication User's Manual". Alternatively, you can refer to the data format for each function code on the [Function code edit] window accessible from the [Function Code List] window. For more information on [Function code edit], refer to "2.3.1.1. Function Code Edit".
	Input	None
	Output	Numeric value: -9990 to +9990 (limit value: ±9990)
	Property settings	Parameter 1: Function code group Parameter 2: Function code number: 00 to 99

6002: Function code write

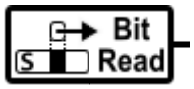
Block selection	Item	Details
6002	Category	Function Code
	Function block	Function code write
	Symbol	Parameter 1: Fixed to function code group U1  Parameter 2: Function code number
	Description	Select the function code you want to write to, using Parameter 1 and Parameter 2. You can select function codes U171-. The written value is retained even if the power is turned off. Turning ON Input 2 writes Input 1 to the selected function code. If Input 2 is OFF, nothing is written. The values written to function codes U171- are stored in the volatile memory (RAM) and, once the inverter detects low voltage, stored in the non-volatile memory (EEPROM). The maximum number of steps that can be used is one per function code. If you use two or more instances of function code write (6002), the one with the smallest step number takes precedence. When you perform the auto step number assignment, a warning that states "Output 1 for function code write is not connected" appears but you can ignore it safely.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Nothing is written. ON: Input 1 is written to the function code selected by Parameter 1 and Parameter 2.
	Output	None
	Property settings	Parameter 1: Function code group: U1 Parameter 2: Function code number: 71 to 75

6003: function code change

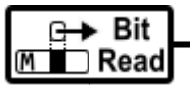
Block selection	Item	Details
6003	Category	Function Code
	Function block	Function code change
	Symbol	Parameter 1: Function code group Numeric Input 1 Logical Input 2 Parameter 2: Function code number
	Description	Select the function code whose setting you want to change, using Parameter 1 and Parameter 2. Turning ON Input 2 changes the setting of the selected function code to Input 1. However, this does not change the setting stored in the non-volatile memory (EEPROM). Turning OFF Input 2 restores the original setting of the selected function code. The maximum number of steps that can be used is one per function code. If you use two or more instances of function code change (6003) for the same function code, the one with the smallest step number takes precedence. Before reading and writing function codes from the loader or copying them to the keypad, be sure to restore the original setting of the selected function code by turning OFF Input 2. If you use the function code change (6003) function block to change the setting of a function code and then load the setting into the loader or copy it to the keypad, the data that is being changed is read, rather than the data stored in the non-volatile memory. Moreover, if you select [Write 2 to y97] and write the data from the loader, the data that is being changed by the function code change (6003) function block is stored in the non-volatile memory. Before stopping the customizable logic, you are recommended to turn OFF Input 2. Stopping the customizable logic with Input 2 still ON retains the data that is being changed by the function code change (6003) function block. To restore the original setting from this state, you must (1) start the customizable logic and turn OFF Input 2, (2) turn off the power to the inverter, or (3) restore the original setting using a keypad, etc.
	Input 1	Numeric value: -9990 to +9990
	Input 2	Logical value: OFF: Nothing is written. ON: Input 1 is written to the function code specified by Parameter 1 and Parameter 2.
	Output	None
	Property settings	Parameter 1: Function code group Parameter 2: Function code number

Bit Extraction

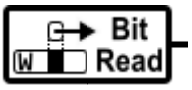
6011: Bit extraction [S]

Block selection	Item	Details
6011	Category	Bit Extraction
	Function block	Bit extraction [S]
	Symbol	Parameter 1: Function code number  Output Logical Parameter 2: Bit position
	Description	This function block outputs the bit information of the communication function code (S code) specified by Parameter 1 and 2. It can correctly read out the following data formats: [14], [15], [16], [43], [44], [77], [78], [91] Do not use any other data format than above because the function block cannot correctly read other formats. If an attempt is made to read out a non-existent function code, the output will be 0. For more information on the data formats, refer to Chapter 5 of the Appendix " RS-485 Communication User's Manual". Alternatively, you can refer to the data format for each function code on the [Function code edit] window accessible from the [Function Code List] window. For more information on [Function code edit], refer to "2.3.1.1. Function Code Edit".
	Input	None
	Output	Logical value
	Property settings	Parameter 1: Function code number: 0 to 99 (Truncate after the decimal point) Parameter 2: Bit position to be read: 0 to 15 (Truncate after the decimal point)

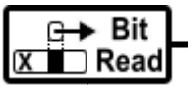
6012: Bit extraction [M]

Block selection	Item	Details
6012	Category	Bit Extraction
	Function block	Bit extraction [M]
	Symbol	Parameter 1: Function code number  Output Logical Parameter 2: Bit position
	Description	This function block outputs the bit information of the communication function code (M code) specified by Parameter 1 and 2. See “6011: Bit extraction [S]” for other operations.
	Input	None
	Output	Logical value
	Property settings	Parameter 1: Function code number: 0 to 99 (Truncate after the decimal point) Parameter 2: Bit position to be read: 0 to 15 (Truncate after the decimal point)

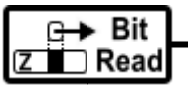
6013: Bit extraction [W]

Block selection	Item	Details
6013	Category	Bit Extraction
	Function block	Bit extraction [W]
	Symbol	Parameter 1: Function code number  Output Logical Parameter 2: Bit position
	Description	This function block outputs the bit information of the communication function code (W code) specified by Parameter 1 and 2. See “6011: Bit extraction [S]” for other operations.
	Input	None
	Output	Logical value
	Property settings	Parameter 1: Function code number: 0 to 99 (Truncate after the decimal point) Parameter 2: Bit position to be read: 0 to 15 (Truncate after the decimal point)

6014: Bit extraction [X]

Block selection	Item	Details
6014	Category	Bit Extraction
	Function block	Bit extraction [X]
	Symbol	Parameter 1: Function code number  Output Logical Parameter 2: Bit position
	Description	This function block outputs the bit information of the communication function code (X code) specified by Parameter 1 and 2. See “6011: Bit extraction [S]” for other operations.
	Input	None
	Output	Logical value
	Property settings	Parameter 1: Function code number: 0 to 99 (Truncate after the decimal point) Parameter 2: Bit position to be read: 0 to 15 (Truncate after the decimal point)

6015: Bit extraction [M]

Block selection	Item	Details
6015	Category	Bit Extraction
	Function block	Bit extraction [Z]
	Symbol	Parameter 1: Function code number  Output Logical Parameter 2: Bit position
	Description	This function block outputs the bit information of the communication function code (Z code) specified by Parameter 1 and 2. See “6011: Bit extraction [S]” for other operations.
	Input	None
	Output	Logical value
	Property settings	Parameter 1: Function code number: 0 to 99 (Truncate after the decimal point) Parameter 2: Bit position to be read: 0 to 15 (Truncate after the decimal point)

2.3.4. Trace

Trace function

You can observe the inverter operation status as continuous waveform information.
The loader provides the following three types of the trace function:

(1) Realtime trace: Reads the sequential waveform data from the inverter and displays it in a graph. This is suitable for long-time monitoring.

(2) Historical trace: Reads the waveform data of the inverter operation status based on an arbitrary trigger saved in the inverter's memory and displays it in a graph. This is suitable for monitoring with small sampling times.

Tip

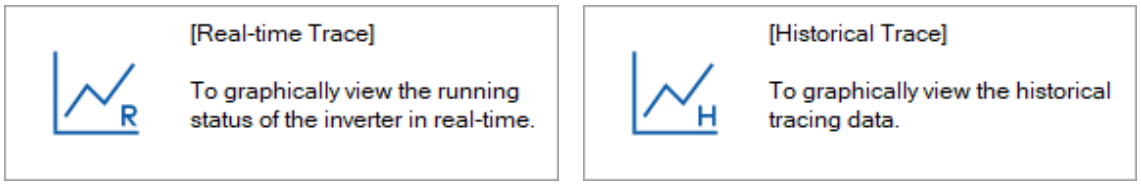
- The Realtime trace and Historical trace can be used when communication with the inverter is possible.

Offline setting function

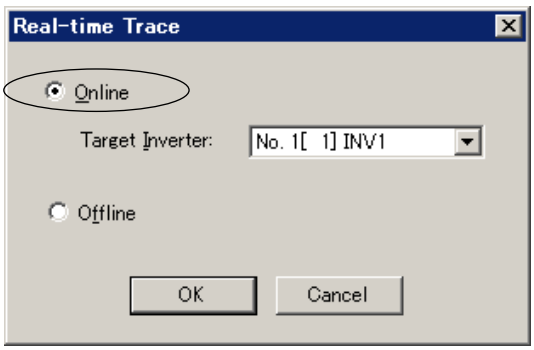
When the loader cannot communicate with the inverter to be traced, you cannot use the trace function but you can configure the advanced waveform settings. This is useful when you want to prepare the trace settings in advance.

2.3.4.1. Trace Function

Select [Menu] > [Trace] from the main menu or click on the main window toolbar and then click [Real-Time Trace], [Historical Trace], or [Trace back] to open the corresponding trace function window.



[Select Online/Offline] window is displayed first.



Select [Online], then select [Target Inverter] in the dropdown list.

Click [OK].

Then the trace window (see “2.3.4.2.Realtime Trace”, “2.3.4.3.Historical Trace”) is displayed.

Tip

- For the [Target Inverter], the model registered in [Connection Settings] (see “1.5.5.2.Connection Setting”) is displayed.
- Select an inverter that can communicate with the loader in the [Target Inverter]. If communication is not established, an error is displayed and the trace window is not displayed.

2.3.4.2. Realtime Trace

The following is the description of the [Realtime Trace] window.

Subwindow
- [Monitor], [Graph position adjustment], and [File information] tabs
(Refer to "2.3.4.7. Subwindow")

The trace operation status is displayed

Display time frame and sampling time

Cursor position

Trace type is displayed

Show/hide the subwindow

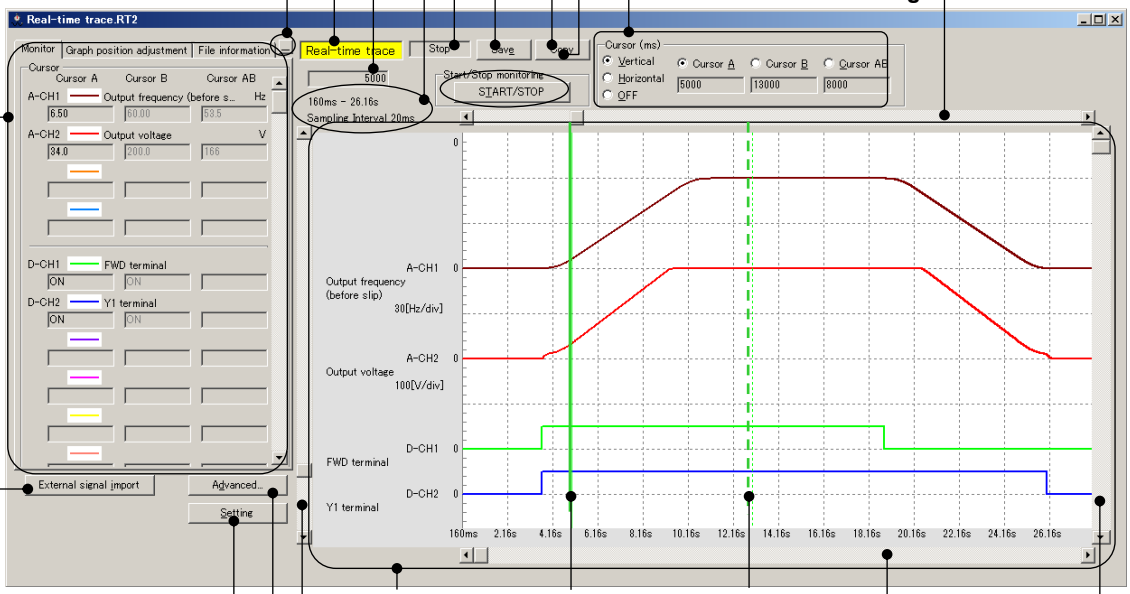
Click this button to save the trace data
(Refer to "2.3.4.4. Saving the Trace Data")

Click this button to copy the waveform monitor
(Refer to "2.3.4.5. Copying the Trace Data Screen")

Click this button to start/stop the trace operation

Cursor setting and position display
The position is displayed only when "vertical" is selected.
(Refer to "2.3.4.7. [1] Cursor")

Scrollbar for moving the vertical cursor



[Setting]
Click this button to import/export the settings.
(Refer to "2.3.4.9. Setting Export/Setting Import")

Waveform screen

Cursor A

Cursor B

Scrollbar for moving the horizontal cursor

Advanced waveform settings
Advanced settings for each channel.
(Refer to "2.3.4.8. Advanced Waveform Settings")

Waveform screen vertical scrollbar

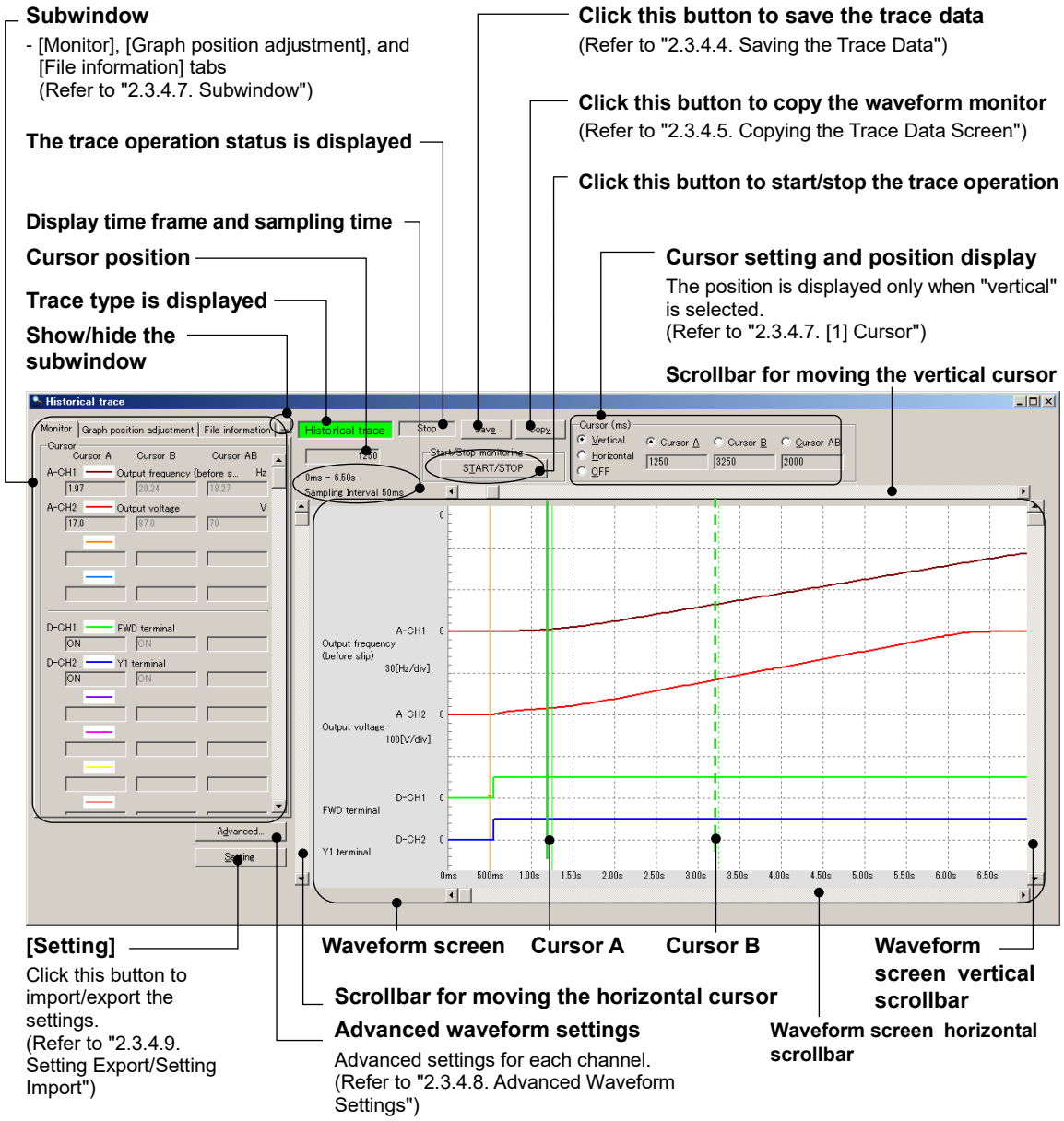
Waveform screen horizontal scrollbar

External signal import
Click this button to import the customizable logic trace data. This button appears once you save the trace monitor information.
(Refer to "2.3.4.10. Combination with the Customizable Logic Function")

Tip
- The realtime trace works even if without a trigger setting.

2.3.4.3. Historical Trace

The following is the description of the [Historical Trace] window.



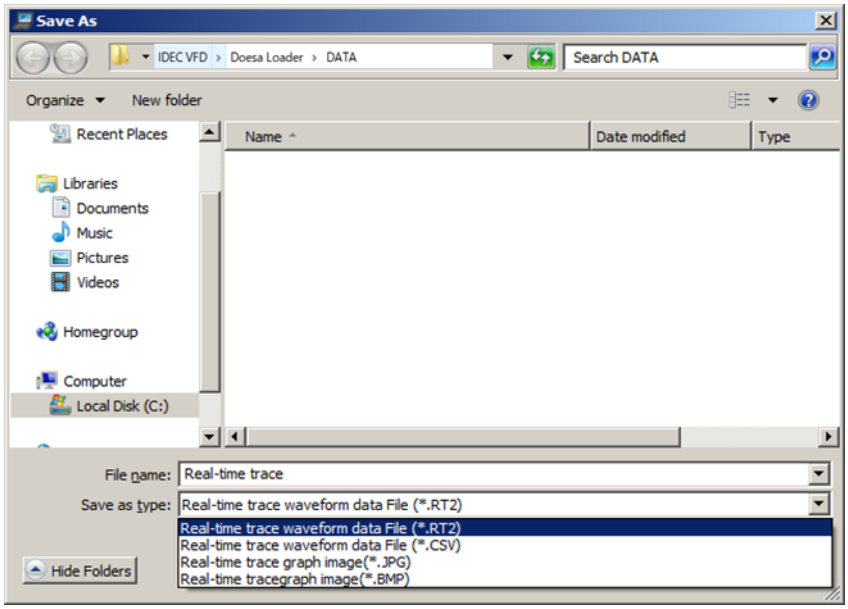
Note

- To use the historical trace, you must configure the trigger settings. For information on trigger settings, refer to "2.3.4.8. [2] A-Ch1 to A-Ch4 (analog settings)" and "2.3.4.8. [3] D-Ch1 to D-Ch8 (digital settings)".

2.3.4.4. Saving the Trace Data

To save the trace data, click the [Save] button around the top center of the trace or select [File] -> [Save As...].

When selecting [Save] for the data for the first time, the following dialog will open in the same manner as when selecting [Save As …]. Select [Save to ...] and [Save as type] and enter the file name under which the data is saved in [File Name]. Then click [Save] to save the file.



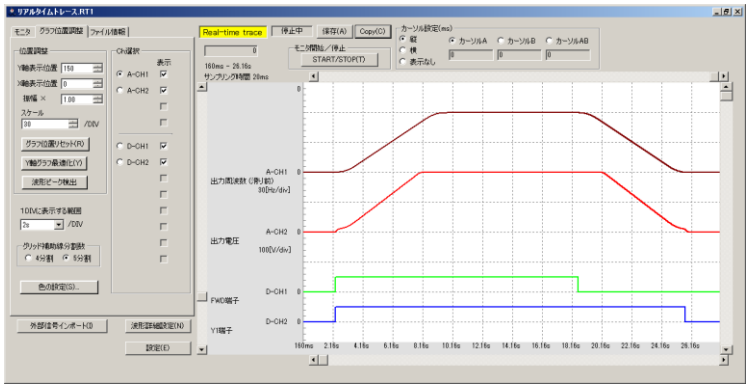
- Realtime trace waveform information: *.RT2, *.CSV (comma separated format)
- Historical trace waveform information: *.HT2, *.CSV (comma separated format)
- Each trace graph image: *.JPG, *.BMP

Note
- Once you save a *.CSV, *.JPG, or *.BMP file, you cannot reload it into The Loader.

Note
- Opening a saved *.RT2, *.HT2, trace data file in Doesa-Loader makes the [START/STOP] button unavailable.
  If you plan to run the trace with the same settings as the saved trace data, save the settings by selecting [Setting] -> [Setting Export]. For more information on [Setting Export], refer to "2.3.4.9. Setting Export/Setting Import".

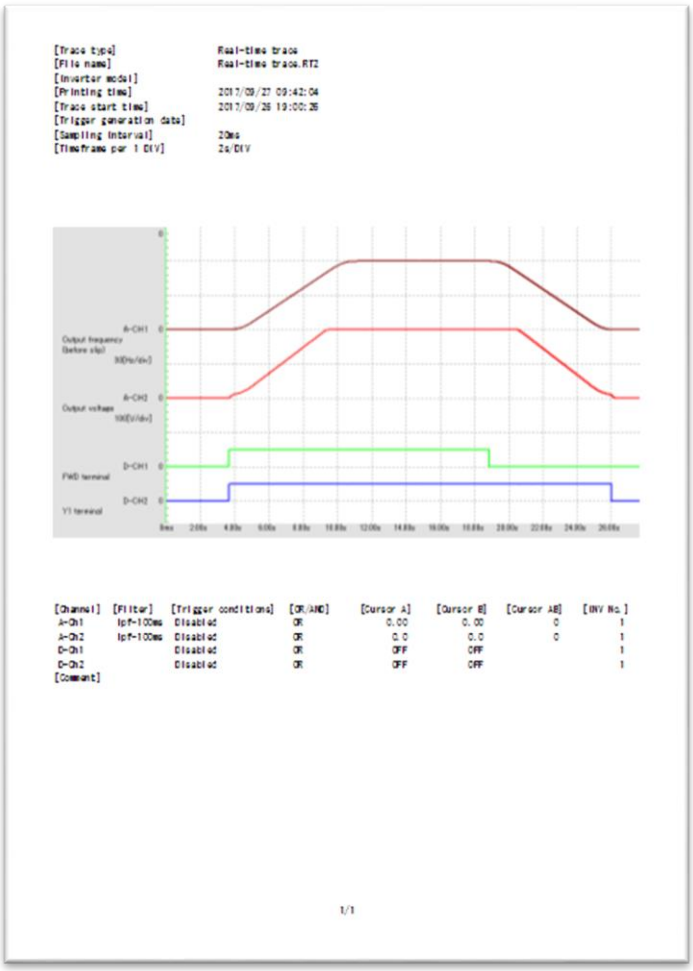
2.3.4.5. Copying the Trace Data Screen

To copy the content of the trace data screen, click the [Copy] button around the top center of the trace screen. The data is copied to the clipboard, from which you can paste the data to a document or elsewhere.



2.3.4.6. Printing the Trace Data

To print the trace data, select [File] -> [Print] with the trace screen active. The following is an example printout of trace data:



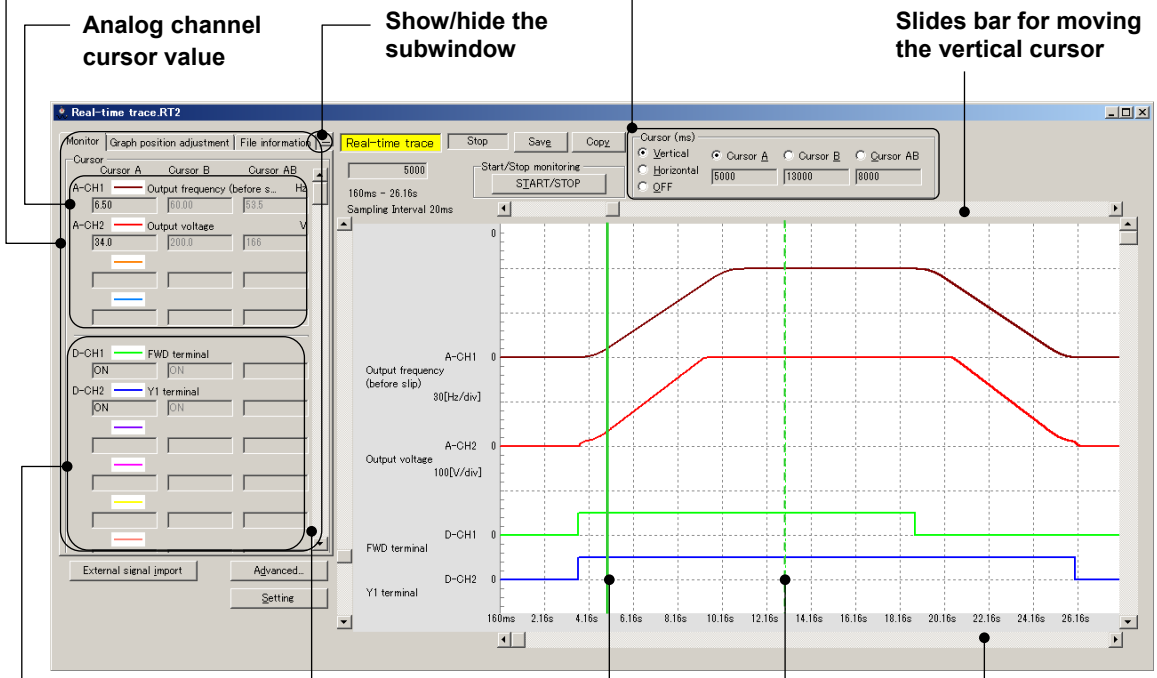
2.3.4.7. Subwindow

[1] Cursor

The boxes on the cursor subwindow display the measurement value or status of each channel at the respective cursor positions.

Cursor value monitoring area
Analog: 4 channels
Digital: 8 channels
Channels not visible in the monitoring area can be displayed using the vertical slides bar at the cursor value monitoring area.

Cursor settings
Vertical: 2 (either cursor A or cursor B or both)
Horizontal: 2 (either cursor A or cursor B or both)
Hide

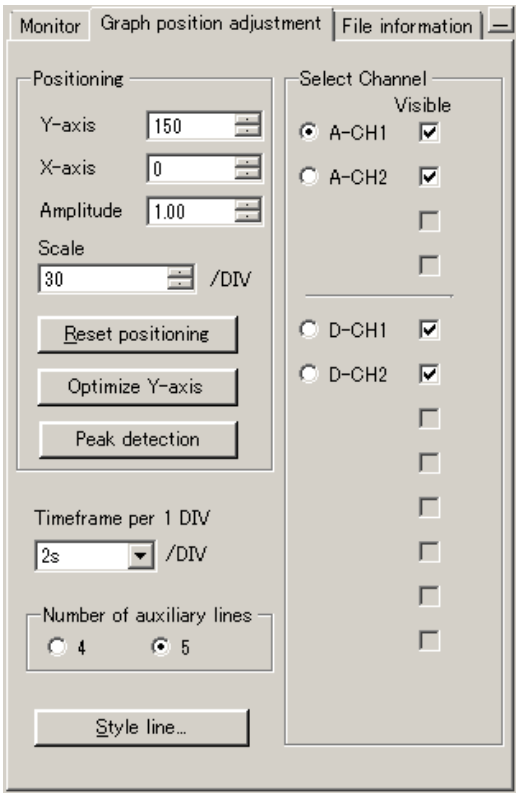


Use the scroll bar to move to the waveform screen to be analyzed and click the point to be observed in the graph. The cursor will move to that position. The cursor movement position is the sampling point (time point) closest to the clicked point. The trace data of all channels on the cursor appears on the [Monitor] tab at left.

Alternatively, you can move the cursor using the cursor movement scrollbar or by dragging the mouse.
The cursor keys on the keyboard are also available.
However, while tracing, neither waveform screen nor cursor can be moved.

[2] Adjust Graph Position

The graph position adjustment subwindow allows you to adjust the graph position for each channel.



Select Channel

Select the channel for which you want to adjust the graph position and color.

Display

Display only the channels you have marked with ☑.

Y axis display position

Set the Y axis display position of the selected channel.
The upper edge is position 0.

X axis display position

Set the X axis display position of the selected channel.
The left edge is position 0.

Amplitude

Set the amplitude of the selected channel by magnification.
Change the magnification using point 0 for reference.

As you change the amplitude, the [Scale] value changes accordingly and the graph display also changes according to the [Scale] value.

Scale

Set the scale of the selected channel.
Enter the numeric value per DIV for the Y axis.
This setting applies to the analog setting channels only.

Graph position reset

Reset the display position and amplitude setting of the selected channel to the initial values.
- Y axis display position: Ch1 = 50 and the value increments by +50 for the subsequent channels.
- X axis display position: Each Channel = 0
- Amplitude: 1.00

Optimize Y axis graph

Arrange the Y axis display position and scale of the displayed channels without overlapping by channel.
Reset the amplitude setting to the initial value.

- Y axis display position: Ch1 = 100 and the value increments by +100 (analog) or +50 (digital) for subsequent channels.
- Scale: Set the scale value based on the multiple of 50 so that the maximum value can be within two grids.
  For example, 50Hz/DIV if the maximum value is 1Hz or 100Hz/DIV if the maximum value is 53Hz.

Detect waveform peak

Move Cursor A to the maximum value of the selected channel automatically. If there are two or more peaks, the cursor moves to the earliest one.
This setting applies to the analog setting channels only.

Display range in one DIV

Set the time to be displayed in one DIV for the X axis on the waveform screen.

Historical trace and Trace back: 1 ms to 10 min
Realtime trace: 20 ms to 60 min

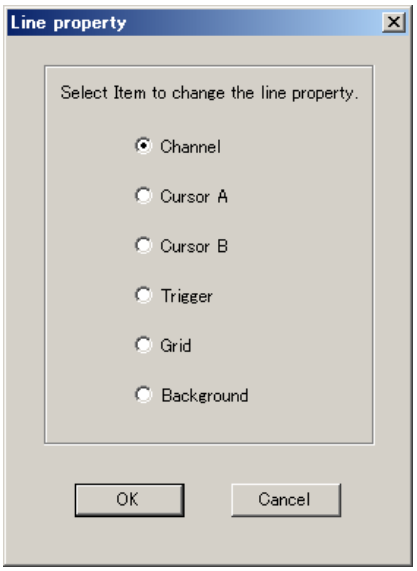
You cannot specify a time smaller than the sampling time.

Number of grid auxiliary lines

Set the number of grid auxiliary lines for the Y axis.

Color setting

The color setting data is held. Once you obtain the waveform, you can change the color setting.



Channel line

Select the line color, type, thickness for the selected channel.

Cursor line A

Select the line color, type, thickness for Cursor A.

Cursor line B

Select the line color, type, thickness for Cursor B.

Trigger line

Select the line color, type, and thickness of the trigger line.

Grid line

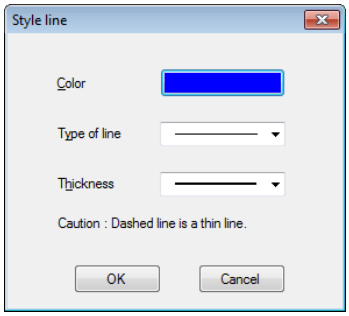
Select the line color, type, and thickness of the grid line.

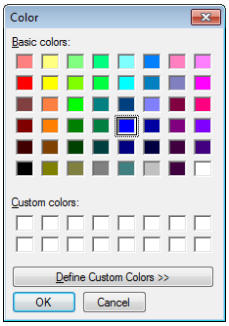
Graph background color setting

Select the waveform monitor background color.

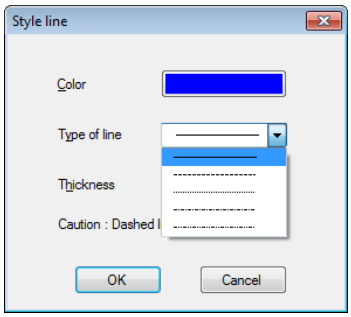
The line color, type, and thickness settings are as follows:

- Color

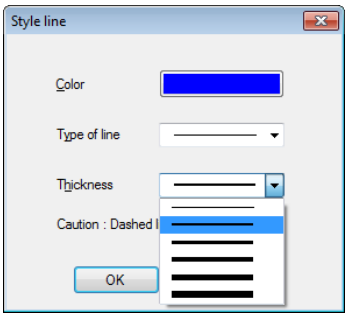




- Line type



- Line thickness



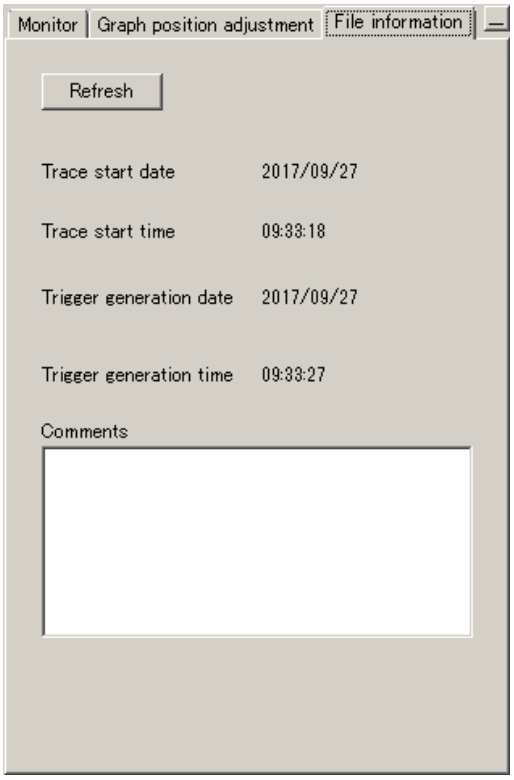
[3] File Information

The file information subwindow displays the date/time information for the trace. Also, you can add a comment.

The date/time information uses the clock managed by the operating system of the PC. Even if you trace an inverter model that has a realtime clock (RTC), the loader uses the clock managed by the operating system of the PC.

The content of the file information subwindow is saved to trace data files (RT2 and HT2 files). When you open a saved file, the information contained in it is displayed. The content of this subwindow is not contained in a file saved by selecting [Setting] -> [Setting Export] (i.e., an EXRTM or EXHIM file).

The content of the file information subwindow is included in the printout of a waveform.



Refresh

Click this button to update the time information (such as the trace start date) displayed in the file information subwindow.
When you start the trace with the file information subwindow open, its display content will not be automatically updated. It will be updated when you click the [Refresh] button or open a different subwindow.

Trace start date

The date when the trace was started.

Trace start time

The time when the trace was started.

Trigger detection date

The date when a trigger was detected.

Trigger detection time

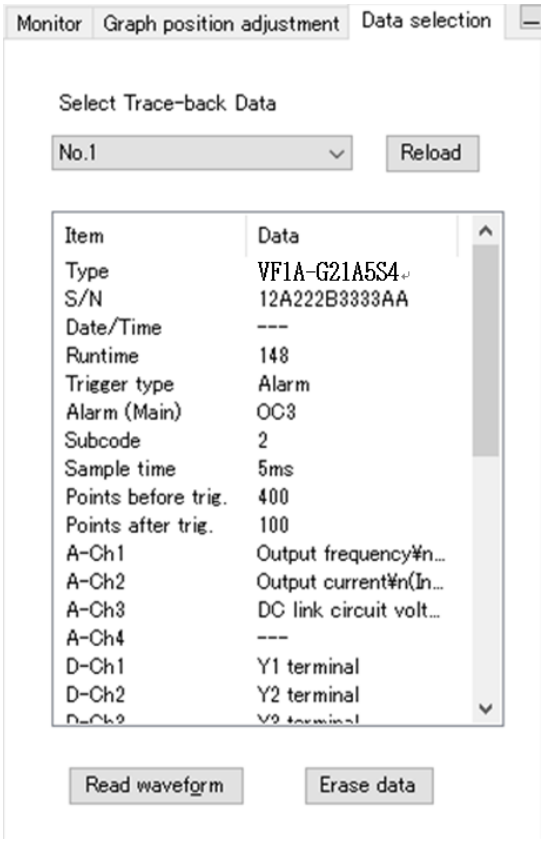
The time when a trigger was detected.

Comment

You can add a comment.

[4] Data selection

The data selection subwindow allows you to select, read, and erase the trace back data.



Select Trace-back Data

Select the trace back data number to be checked.

Reload

Click this button to get the list of traceback data stored on the connected keypad. After received data list properly, the trace back data drop-down list will be updated.

Trace back information

Displays additional information such as inverter status and trace conditions related to the traceback data selected in the drop-down list.

Read waveform

Click this button to read the waveform of the traceback data selected in the drop-down list and display it on the waveform screen.

Erase data

Click this button to erase the trace back data selected in the drop-down list from the connected keypad.

2.3.4.8. Advanced Waveform Settings

[1] Channel Configuration

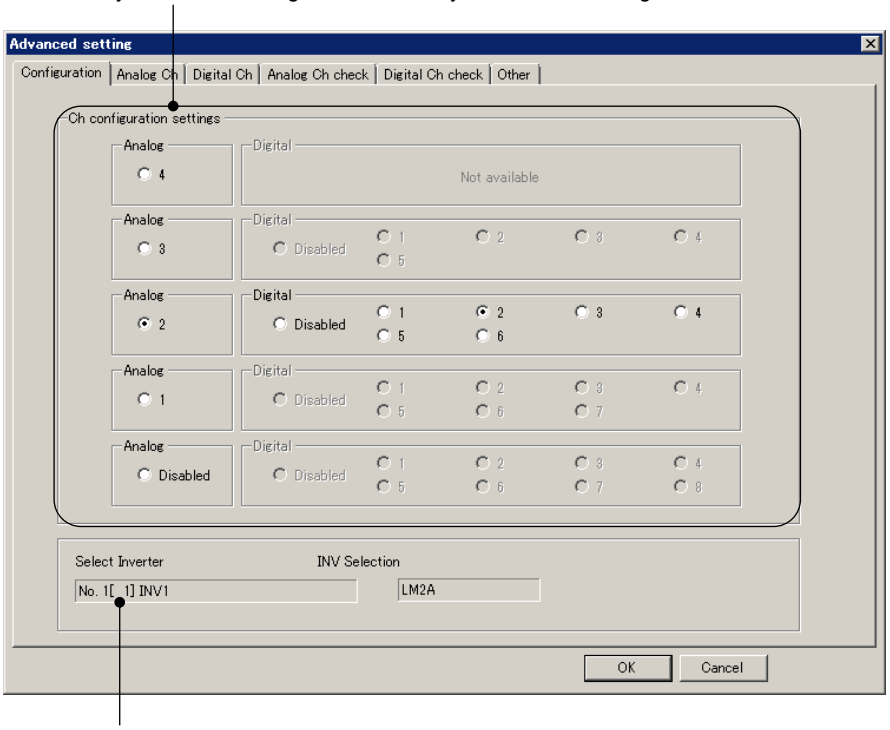
You can set the configuration of analog channels and digital channels to be traced. For more information on the settings for each channel, refer to [2] to [5].

The loader stores in memory the settings for each inverter model. One you open the [Realtime Trace] or [Historical Trace] window, the [Advanced settings] window displays the previous settings for the inverter model you want to trace this time.

In the [Traceback] window, the [Advance settings] window displays the settings of the currently connected inverter. If the target inverter is not connected, the previous settings will be displayed.

Ch configuration settings

Select the number of channels you want to use.
The number of analog channels can be up top 4, and the total number of analog and digital channels can be up to 8.
However, if you select 4 analog channels, then you cannot select digital channels.



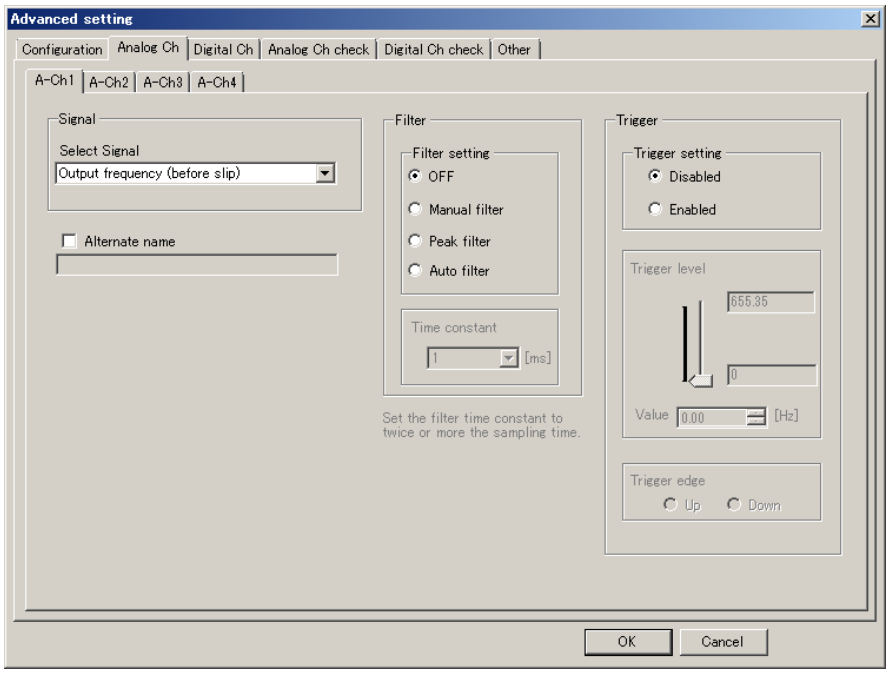
[Select inverter]

Displays the inverter selected in the [Select Online/Offline] window (see [2.3.4.1.Trace Function]).

You can trace only the inverter displayed here.

[2] A-Ch1 to A-Ch4 (analog settings)

You can configure analog channel settings.



Signal

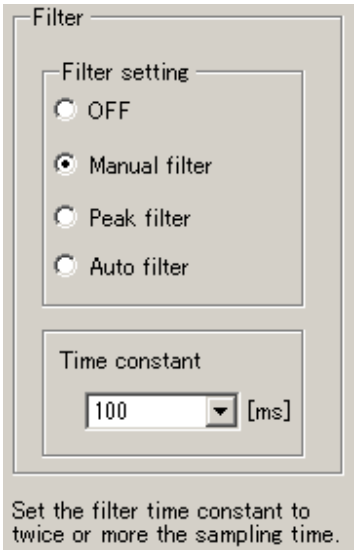
From the list box, select the signal you want to trace. You can select, for example, the output frequency, the output current, or the output voltage. (Available signals differ depending on the inverter model.)

Alternative name

You can assign an alternative name to the signal.
Once you assign an alternative name, that name appears in the waveform screen and subwindow.
You cannot use single-byte @, #, and \ characters.

Filter

The filter settings for each channel are as follows:



OFF

Select this if you do not want to use a filter.

Manual filter

Traces the data after a low pass filter is applied.

Select the filter time constant from the list box below.

Peak filter

Traces the maximum value within the sampling time.

Auto filter

Traces the data after a low pass filter is applied.
The filter time constant is given by the following expression:

Filter time constant = Sampling time x 3.2

Filter time constant

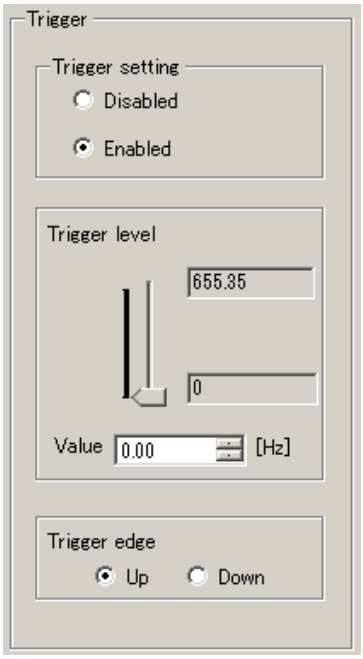
Select the filter time constant when you use the manual filter.
The valid range is 1 [ms] to 100 [ms].

Note
- The filter time constant should be at least twice the sampling time.

Tip
- To use a filter for the realtime trace, the dedicated communication command must be supported by the inverter model. For more information, refer to "Table 1-1" in "1.1.2. Loader Functions by VF1A Series Inverter Model".

Trigger

The trigger settings for each channel are as follows:



Trigger setting

Select the channel for which you want to configure a trigger.
An analog channel accepts only one trigger.

Trigger level

Select the appropriate trigger level depending on the data quantity handled for the monitor item selected for each channel.

Trigger edge

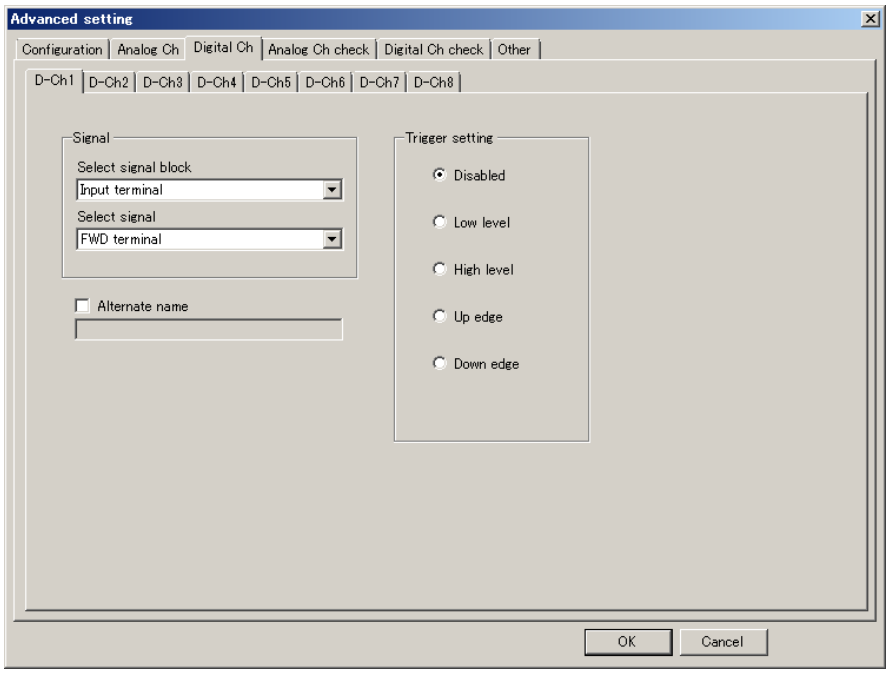
Select the trigger rise or fall edge.

Tip

- To use a trigger for the realtime trace, the dedicated communication command must be supported by the inverter model. For more information, refer to "Table 1-1" in "1.1.2. Loader Functions by VF1A Series Inverter Model".

[3] D-Ch1 to D-Ch8 (digital settings)

You can configure digital channel settings.



Select signal

From the list box, select the signal you want to trace. You can select, for example, the X or Y terminal. (Available signals differ depending on the inverter model.)

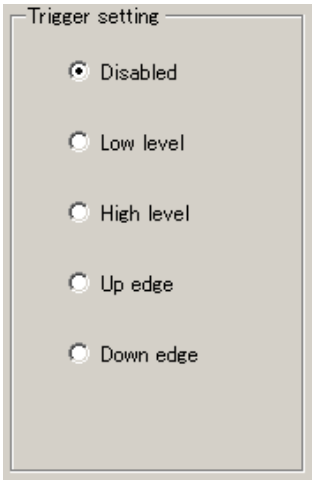
Alternative name

You can assign an alternative name to the signal.
Once you assign an alternative name, that name appears in the waveform screen and subwindow.

You cannot use single-byte @, #, and \ characters.

Trigger setting

The trigger settings for each channel are as follows:



Trigger setting

Select one of the following: Low (L) level, Hi (H) level, Up edge, Down edge.

A digital channel accepts one or more trigger settings.

You can specify triggers with the "OR" or "AND" condition.

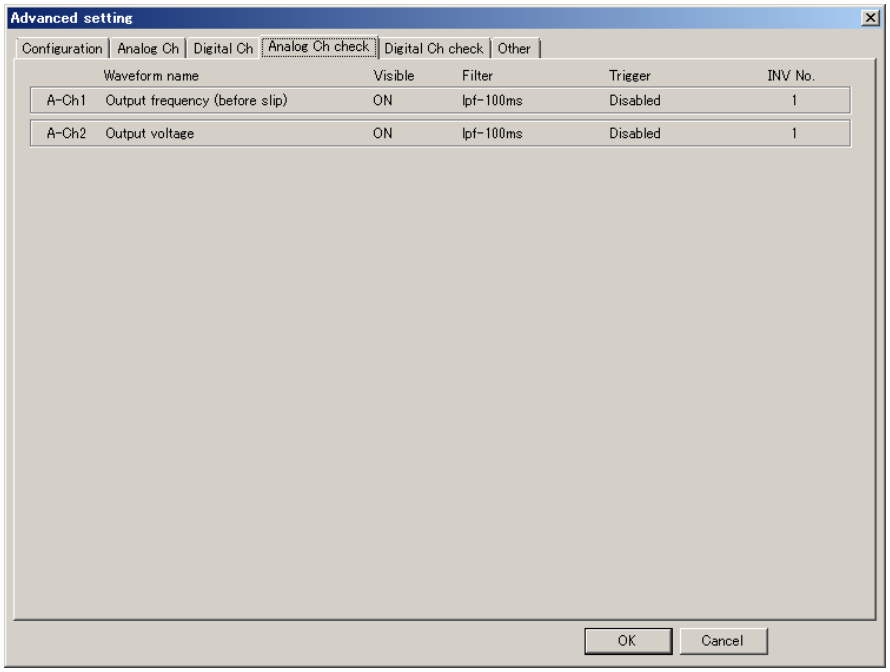
* Refer to "Trigger detection conditions" in "[5] Other Settings".

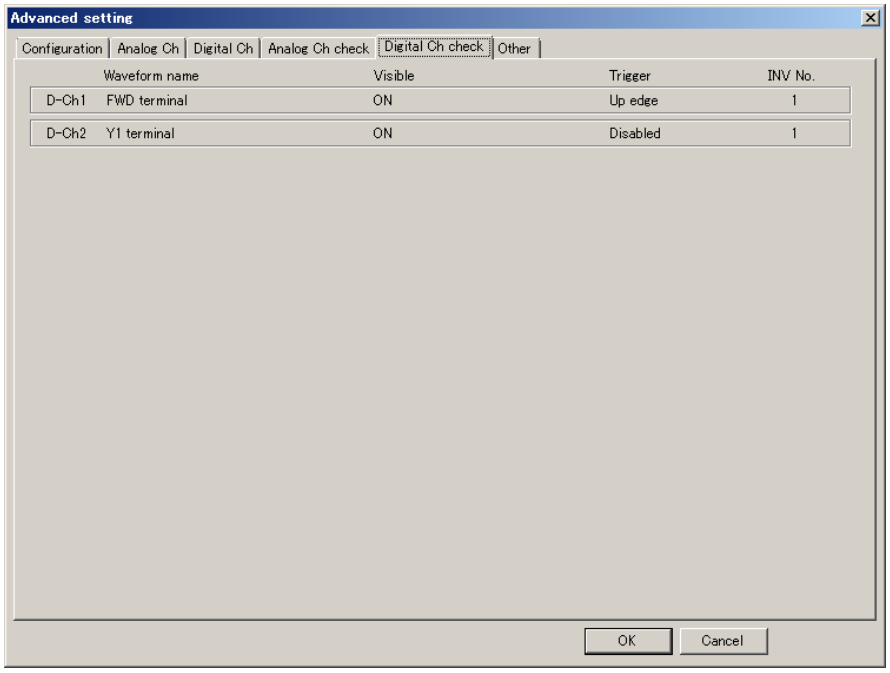
Tip

- To use a trigger for the realtime trace, the dedicated communication command must be supported by the inverter model. For more information, refer to "Table 1-1" in "1.1.2. Loader Functions by VF1A Series Inverter Model".

[4] Ch Setting Check (analog/digital)

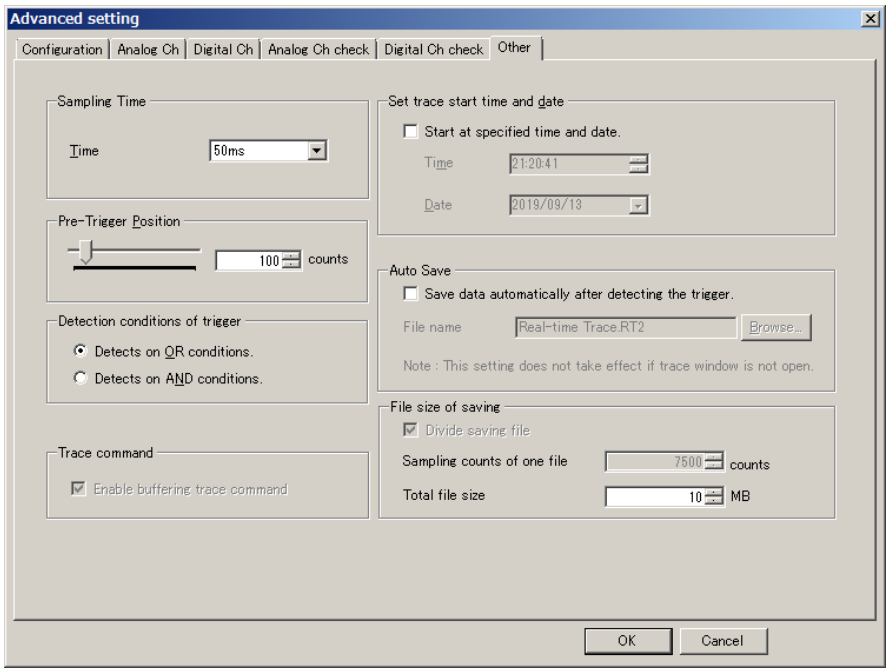
The data configured for each channel is listed. To save the settings, click the [OK] button. To cancel the settings, click the [Cancel] button.





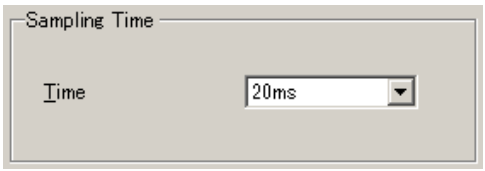
[5] Other Settings (including sampling time setting)

Configure the advanced settings for the waveform monitor.



Sampling time setting

The following sampling time settings are available.



Sampling time setting	Realtime			Historical / Trace back
	When using the dedicated communication command (*)		When not using the dedicated communication command	
	If the port specified in [Communication Setting] is RS-485 connected	If the port specified in [Communication Setting] is USB connected		
0.5 ms	×	×	×	△
1 ms	×	×	×	○
2 ms	△ (note)	△ (note)	×	○
5 ms	△ (note)	△ (note)	×	○
10 ms	○ (note)	○ (note)	×	○
20 ms	○ (note)	○ (note)	×	○
50 ms	○ (note)	○ (note)	×	○
100 ms	○	○	×	○
200 ms	○	○	○	○

○: Selectable △: Selectable depending on the inverter model ×: Not selectable

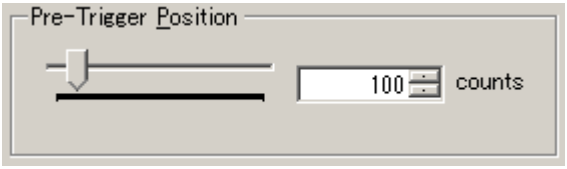
(*) You can only use the dedicated communication command with an inverter model that supports it.

Note

- When using the realtime trace with a small sampling time, the graph display may be incomplete if the communication speed is insufficient.
  Please increase the communication speed as much as possible.

Pre-trigger position

Set the number of sampling points of data preceding the trigger position.

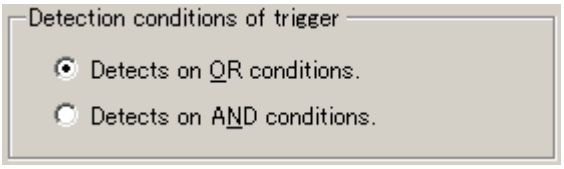


The setting can be up to 999 counts for the realtime trace or up to 499 counts for the historical trace.

Trigger detection conditions

Configure two or more trigger detection conditions for digital channels with the "OR" or "AND" condition.

Analog: 1 channel only
Digital: 1 to 8 channels



Note

- To configure the sampling time setting, pre-trigger position, and trigger detection conditions for the realtime trace, you have to check the [Enable buffering trace command] check box on the [Advanced waveform settings] -> [Other settings] window.

Enable buffering trace command

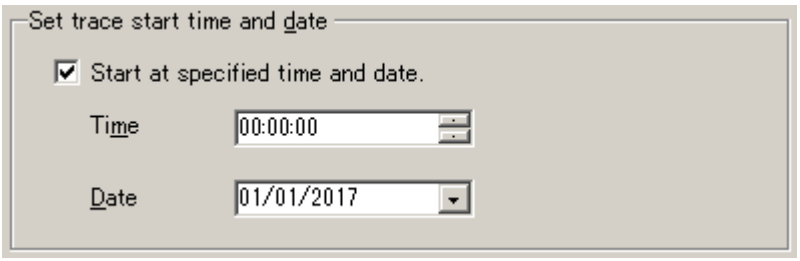
Check this check box to have the realtime trace use the data buffered in the inverter's memory.

Tip

- This setting is not available for the historical trace and the trace back.
- The dedicated communication command must be supported by the inverter model. For more information, refer to "Table 1-1" in "1.1.2. Loader Functions by VF1A Series Inverter Model".
- If the dedicated communication command is supported by the inverter model connected, this check box is enabled automatically, and cannot be unchecked.

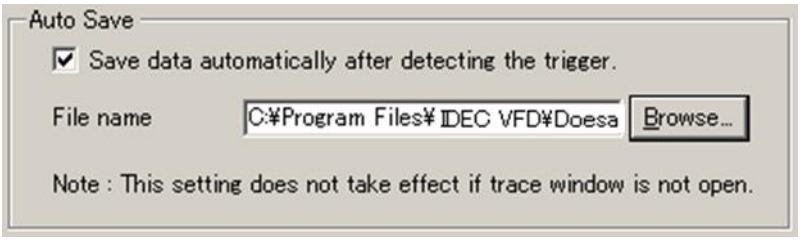
Trace start time and date

Set the date/time when to start the trace.



Auto Save

Use this setting if you want to have the trace data automatically saved.

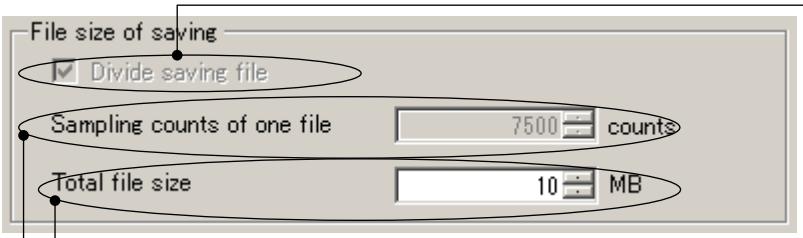


The data is automatically saved:

- When you stop the realtime trace by clicking [START/STOP].
- When the accumulated trace data becomes more than can be written to the specified number of split files during the realtime trace.
- When the size of all split files exceeds the total file size during the realtime trace.
- After the historical trace waveform has been drawn.

File size of saving (available for the realtime trace only)

This setting is available if the trace auto save check box is checked.



Divide saving file

Currently this check box is always checked.
Split files are always saved.

Sampling count of one file

This represents approximate data counts per channel saved in one file. This setting is fixed to 7500 counts. For example, if the sampling time is 20 ms, one file contains the data from 0 ms to approximately 150,000 ms (= 7500 x 20 ms).

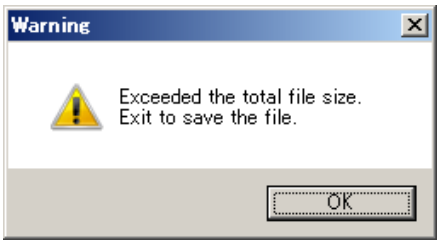
Total file size

Specify the total file size in MB. If the size of all saved files exceeds this size, the realtime trace is stopped and no more files are saved

The file name of a split file is the file name specified under [Auto Save] suffixed by a serial number such as _1, _2, _3 before the file name extension.

For example, if the file name specified under [Auto Save] is "Realtime_Trace.RT2", the names of the split files will be

"Realtime_Trace-1.RT2",
"Realtime_Trace-2.RT2",
"Realtime_Trace-3.RT2",
and so on.



When the size of all split files exceeds the total file size, the dialog at right appears and the realtime trace is stopped.

2.3.4.9. Setting Export/Setting Import

With VFD Doesa-Loader, you cannot open saved trace data files with an extension of *.RT2, *.HT2 and run the trace.

To run the trace with the same settings as the saved trace data, you should follow these steps:

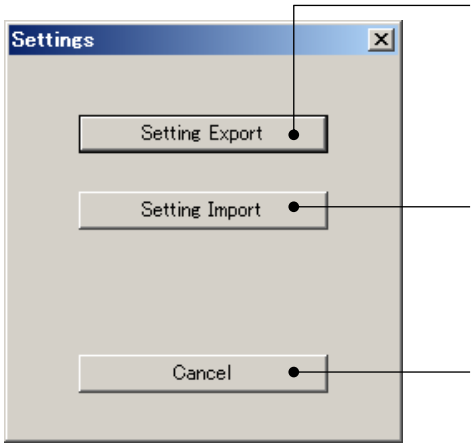
Step 1: When you save the trace data, save the settings separately from the trace data by using the [Setting Export] function.

Step 2: When you run the trace, first open the same trace screen as step 1 with the loader connected to the inverter you want to trace.

Step 3: Load the settings by using the [Setting Import] function.

To use [Setting Export] and [Setting Import], click the [Setting] button under the [Advanced Waveform Settings] button.

The [Settings] window appears.



Setting Export

Saves the advanced waveform settings to a file.
Click this button to open the [Save As...] dialog.

Setting Import

Loads the advanced waveform settings from a file.
Click this button to open the [Open] dialog.

Cancel

Click this button to close the [Settings] dialog.

File types

***.EXRTM:** Realtime trace format. You can import these files only when working with the [Realtime Trace] window.

***.EXHIM:** Historical trace format. You can import these files only when working with the [Historical Trace] window.

***.EXTBM:** Trace back format. You can import these files only when working with the [Trace back] window.

The inverter model must match the currently selected one on the trace window. If it does not match, a warning dialog displays, then it blocks to import settings.

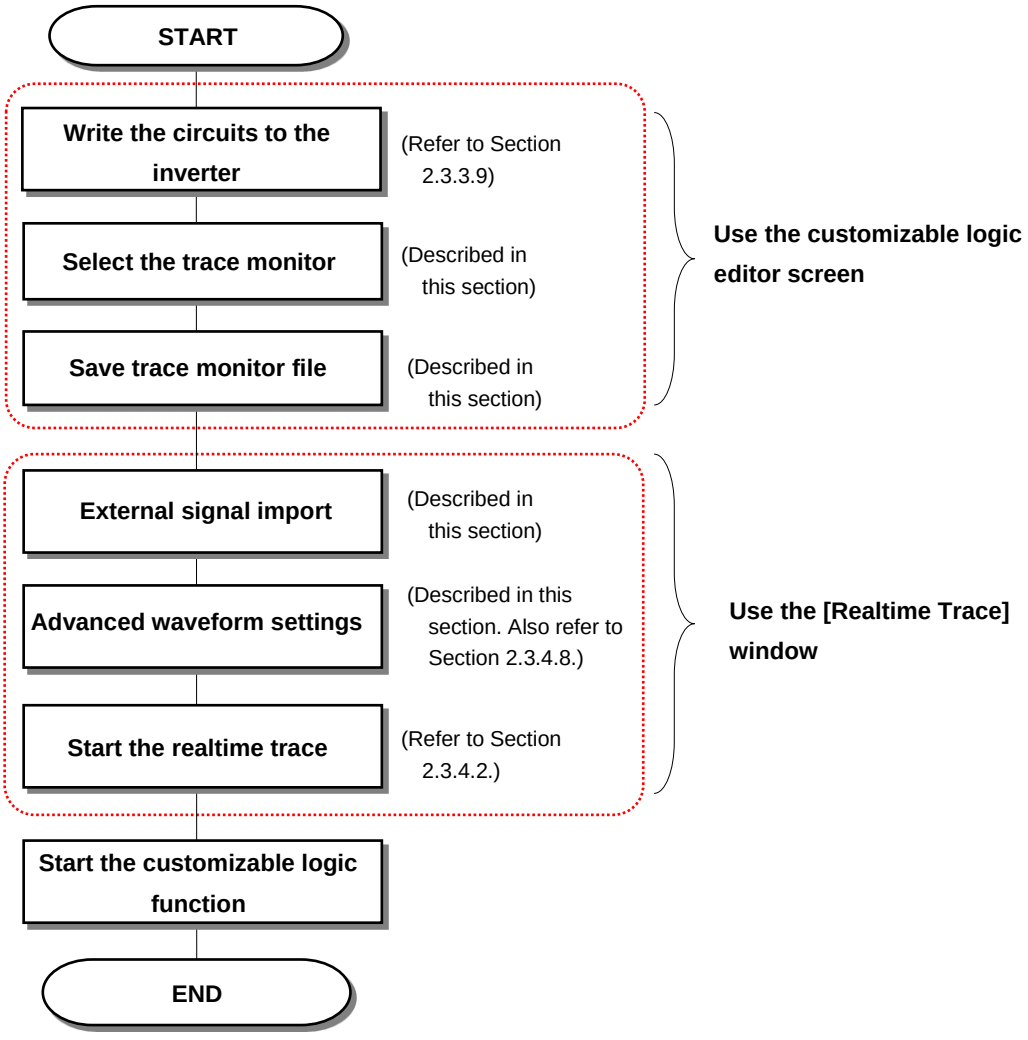
2.3.4.10. Combination with the Customizable Logic Function

After writing your created settings for the customizable logic function to the inverter or if the comparison result shows no difference, you can monitor your selected symbol using the realtime trace.

Tip • A limited set of functions is available with some inverter models. Refer to "1.1.2. Loader Functions by VF1A Series Inverter Model" for details.

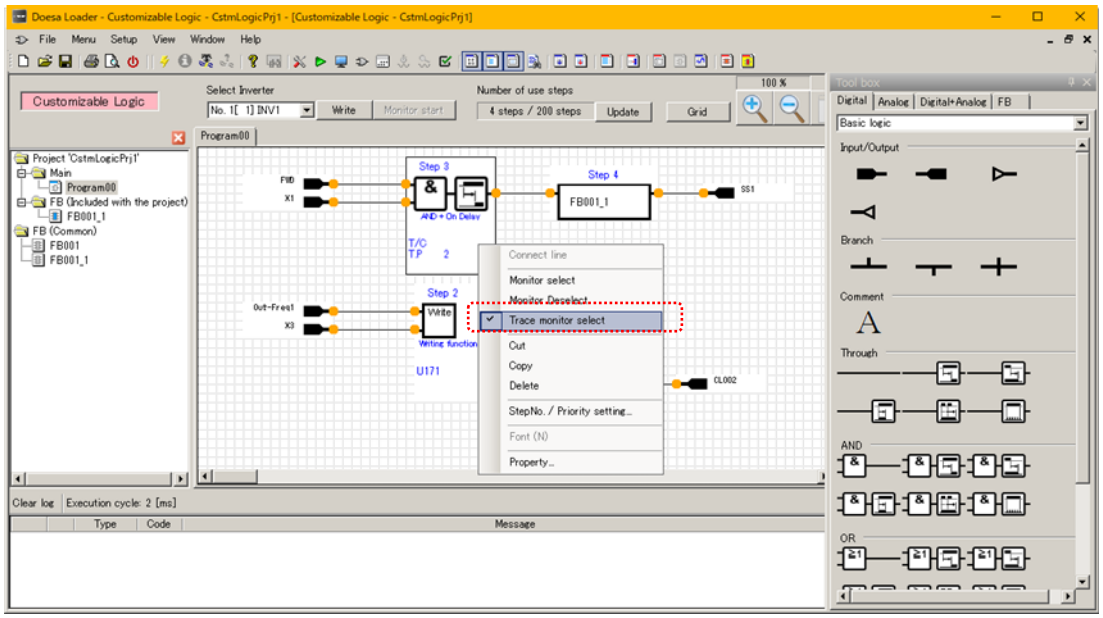
[1] How to Monitor a Customizable Logic Signal Using the Realtime Trace

The following is the basic procedure for monitoring a customizable logic signal using the realtime trace:



- Selecting the Trace Monitor

On the customizable logic editor screen, right-click the symbol whose waveform you want to monitor.
Select [Trace monitor select] on the context menu.



Tip

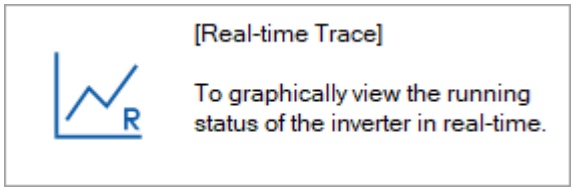
- [Trace monitor select] is applicable to a function block only. It is not applicable to an input or output terminal or function block (FB).

- Save Trace Monitor File

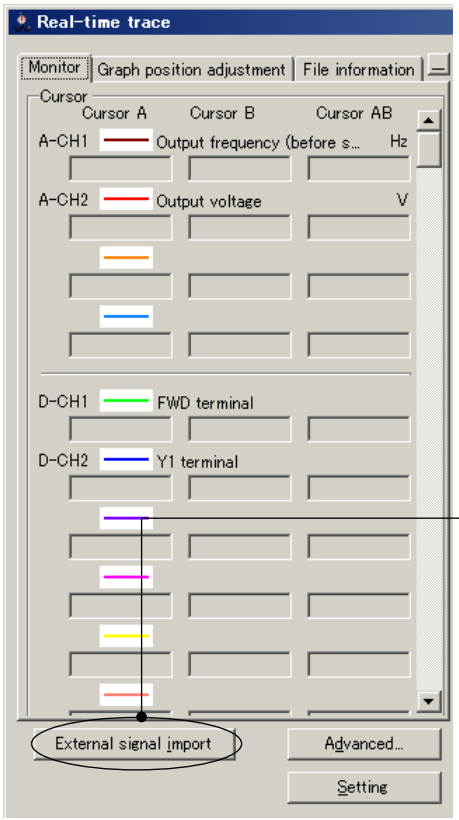
Click [Trace monitor file] on the toolbar to save the information of the symbol for which you selected the trace monitor.

- External Signal Import

Select on the main window toolbar and click [Realtime Trace] to open the [Realtime Trace] window.



Alternatively, you can open the [Realtime Trace] window without using the Quick Access menu by selecting [Menu] -> [Trace] -> [Realtime Trace] from the main menu.



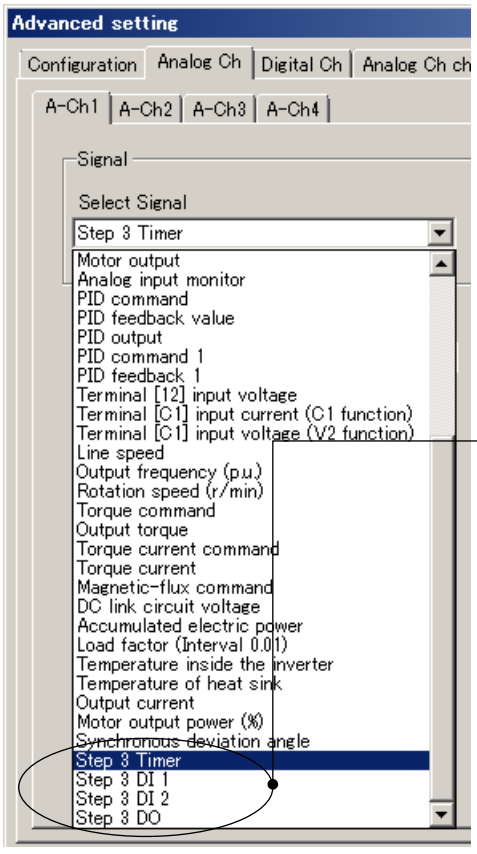
Click the [External signal import] button at the lower left of the [Realtime Trace] window.

(Using the customizable logic editor screen, load the information saved by clicking [Save trace monitor file].)

Tip

- The [External signal import] button appears once you click [Save trace monitor file].

- Advanced Waveform Settings



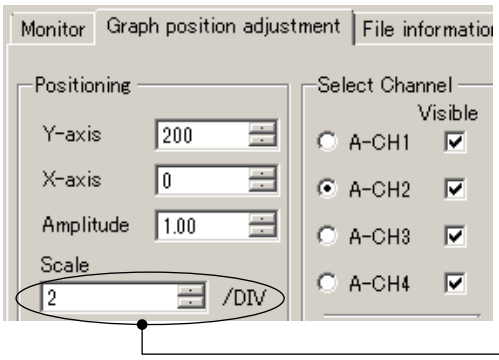
- Next, click the [Advanced...] button at the right of the [External signal import] button and configure the channel settings.

To select a signal within the customizable logic function, use the [Analog Ch] tabs for both analog and digital signals.

The customizable logic signals are added at the bottom of the [Select Signal] list.

For information on other settings, refer to "2.3.4.8. Advanced Waveform Settings".

- Graph Position Adjustment



To monitor a digital signal, set [Scale] to '2' on the [Graph position adjustment] tab.

To start the trace, click the [START/STOP] button at the top of the trace screen.
Refer to "2.3.4.1 Trace Function" for details.

[2] Saving the Customizable Logic Signal Trace Data

You can save the customizable logic signal trace data in the same way as other trace data.
Refer to "2.3.4.4. Saving the Trace Data" for details.

At this time, however, you should save the customizable logic project data as well.

The same applies when you perform [Setting Export] from [Settings] under the [Advanced waveform settings] button. Be sure to save the customizable logic project data as well.

[3] Opening the Saved Customizable Logic Signal Trace Data

Before you open a file that contains the customizable logic signal trace data (i.e., an RT2 or RT1 file), you should click [External signal import] to load the same signal information as when the trace data was collected.

Note

- If the signal information you load by clicking [External signal import] is not appropriate, the loader will not correctly display the signal names, units, and data step sizes.

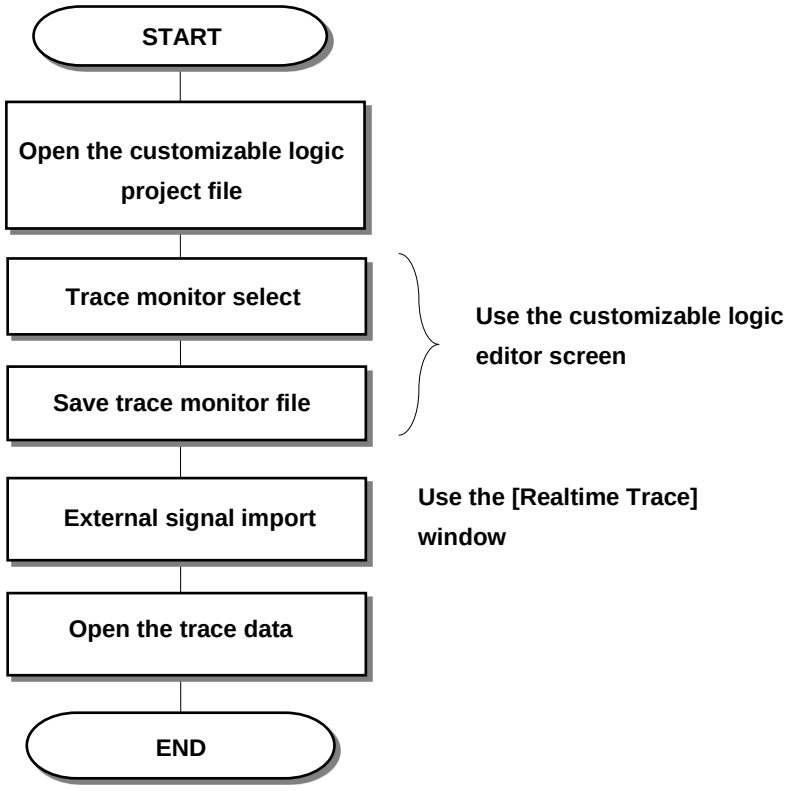
Therefore, you should follow these steps to open the trace data:

First, open the customizable logic project data used when the trace data was collected.

Next, select [Trace monitor select] -> [Save trace monitor file] -> [External signal import], similarly to when you collected the trace data.

For more information on [Trace monitor select] and [Save trace monitor file], refer to "2.3.4.10. [1] How to Monitor a Customizable Logic Signal Using the Realtime Trace".

Finally, open the trace data.



The same applies when you perform [Setting Import] from [Settings] under the [Advanced waveform settings] button.
Before you use [Setting Import] to load the customizable logic signal settings saved using [Setting Export], you should use [External signal import] to load the same signal information as when you performed [Setting Export].

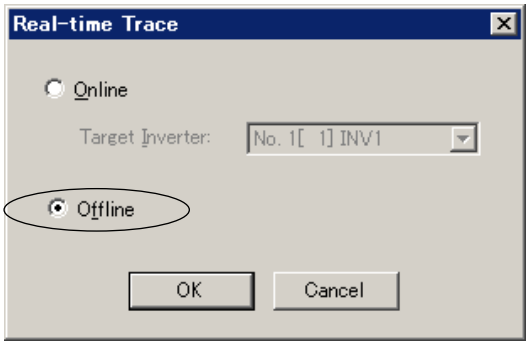
2.3.4.11. Offline setting function

You can make setting up the trace function without communication to any inverter. It is useful in case you want to prepare setting in offline situation in advance.

Select [Menu] > [Trace] from the main menu or click on the main window toolbar and then click [Real-Time Trace], [Historical Trace], or [Trace back] to open the corresponding trace function window.

[Real-time Trace] To graphically view the running status of the inverter in real-time.	[Historical Trace] To graphically view the historical tracing data.

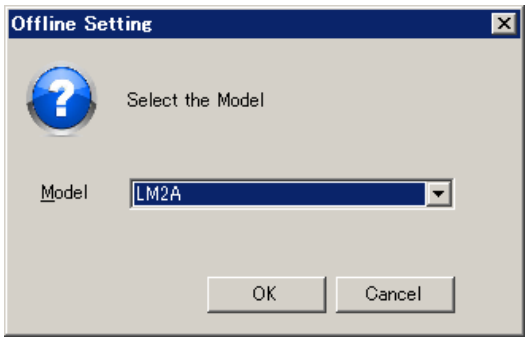
[Select Online/Offline] window is displayed first.



Select [Offline].

Click [OK].

Then [Offline Settings] window is displayed.



Select the inverter model to be configured.

Click [OK].

The trace window (see “2.3.4.2. Realtime Trace” or “2.3.4.3.Historical Trace”.) is displayed.

Tip

- The model list shows only the inverter models that support the tracing function (see “1.1.2.Loader Functions by VF1A Series Inverter Model”).

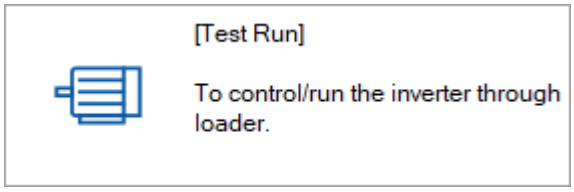
The Trace window displayed as offline cannot perform the trace function, as the START/STOP buttons disabled.

In order to make setting up the Trace function, open [Detailed Waveform Settings] (see [2.3.4.8.Advanced Waveform Settings]).

To save or restore your settings, use Export/Import function. (see [2.3.4.9.Setting Export/Setting Import]).

2.3.5. Test Run

Select [Menu] -> [Test run] -> [Drive operation] from the main menu or select on the main window toolbar and click [Test run] to open the [Drive operation] menu under the toolbar.



Tip

- You cannot perform operations if you have selected [Data in Keypad] for [USB Connection] on the [Communication Setting] window. If you cannot perform operations for another reason, refer to "2.3.5.3. If You Cannot Use the [Drive operation] Menu".

Note

- You should use [Test run] only while connected to the inverter.
- Depending on the communication link condition, it may take a long time to detect the communication target. The loader does not respond until the communication target is detected. To avoid the inability to operate the loader for a long time, you should use the loader in an environment with as good communication conditions as possible.
- Do not attempt operations with an inverter that has password protection enabled. If the loader does not respond or is forcibly terminated, the means to stop the inverter may be limited, which can be very dangerous.

Drive operation buttons

FWD: Click this button to rotate the motor in the forward direction. (The button appears depressed during rotation.)

REV : Click this button to rotate the motor in the reverse direction. (The button appears depressed during rotation.)

STP : Click this button to stop the inverter.

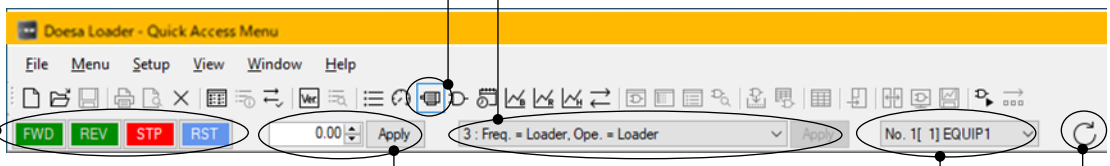
RST : Click this button to reset the alarm.

Test Run

Click this button to open the [Drive operation] menu under the toolbar. Click it again to close the [Drive operation] menu.

Frequency command/operation command change (update)

Sends the frequency/operation command source to the inverter.



Frequency command (update)

Sends the frequency command [Hz] to the inverter.

Target

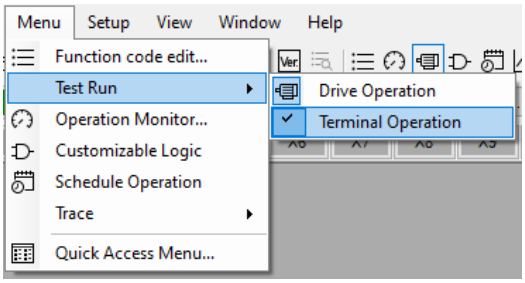
Select the device you want to test-run.

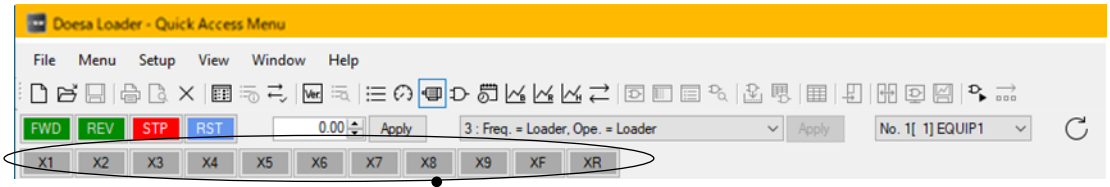
Update

Click this button to synchronize the display of the drive operation buttons, the frequency command, and the frequency command/operation command change with the inverter.

To close the [Drive operation] menu, click the [Test run] button on the toolbar (see above). Alternatively, you can close it by selecting [Menu] -> [Test run] -> [Drive operation] from the main menu.

In addition, you can display the terminal operation buttons under the [Drive operation] menu by selecting [Menu] -> [Test run] -> [Terminal operation] from the main menu.





Terminal operation buttons

X1, X2, ...,X9:	These buttons allow you to turn ON X1 to X9 terminals. The number of terminals you can operate varies depending on the inverter model.
XF:	Click this button to turn ON the FWD terminal.
XR:	Click this button to turn ON the REV terminal.

To hide the terminal operation buttons, select [Menu] -> [Test run] -> [Terminal operation] from the main menu, similarly to when you display them.

Note

- When you use the terminal operation buttons to operate a terminal, the logical inversion settings of the terminal function are ignored.
  The following example shows what occurs when the free run command "BX" is selected with E01.

Function code data	Physical terminal	Loader's terminal operation button
7	Free run when the X1 terminal is ON (normally open)	Free run when the [X1] button is ON (normally open)
1007	Free run when the X1 terminal is OFF (normally closed)	

  You should be careful, especially when you configure the forced stop ("STOP") using a logical inversion (E01=1030). If the physical terminal is enabled, you can run the inverter by turning OFF the X1 terminal. However, if the operation command from the loader is enabled, you cannot run the inverter unless you turn ON the [X1] button.

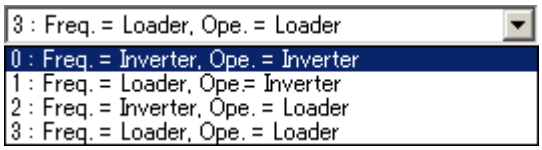
Once you open the [Drive operation] menu, the [Frequency command/operation command change] field shows "0: Freq = Inverter, Ope = Inverter", which means that you cannot use the loader to change the frequency command or start/stop the inverter. Hence, you cannot click the operation buttons [STOP], [FWD], and [REV] on the loader screen.

Similarly, once you display the terminal operation buttons, you cannot click the [X1], [X2], [X3], [X4], [X5], [X6], [X7], [X8], [X9], [XF], and [XR] buttons.

The drive operation and terminal operation buttons are enabled only when "Ope = Loader" is shown in the [Frequency command/operation command change] field.
Also, the frequency command is enabled only when "Freq = Loader" is shown.
However, the [RST] button is always enabled.

2.3.5.1. Operating the Inverter from the Loader

Click ▼ next to the [Frequency command/operation command change] field and select "**1: Freq = Loader, Ope = Inverter**", "**2: Freq = Inverter, Ope = Loader**", or "**3: Freq = Loader, Ope = Loader**" from the pull-down list depending on the command you want issue from the loader. See the table below.



Command you want issue from the loader	[Frequency command/operation command change]	Frequency command	Drive operation buttons [FWD], [REV], [STOP]	Terminal operation buttons [X1] to [X9], [FWD], [REV]
None	**0: Freq = Inverter, Ope = Inverter** (default)	Disabled (Not operable)	Disabled (Not operable)	Disabled (Not operable)
Frequency command	**1: Freq = Loader, Ope = Inverter**	Enabled (Operable)	Disabled (Not operable)	Disabled (Not operable)
Operation command	**2: Freq = Inverter, Ope = Loader**	Disabled (Not operable)	Enabled (Operable)	Enabled (Operable)
Frequency command Operation command	**3: Freq = Loader, Ope = Loader**	Enabled (Operable)	Enabled (Operable)	Enabled (Operable)

To issue both the frequency command and the operation command from the loader, follow these steps:

1) From the [Frequency command/operation command change] field, select "**3: Freq = Loader, Ope = Loader**" and click [Apply].

2) This enables the frequency command field as well as the drive operation buttons [STOP], [FWD], and [REV], the terminal operation buttons [X1], [X2], ... (number of terminals you can operate varies depending on the inverter model), and the [FWD] and [REV] buttons.

3) Enter a frequency in the frequency command field and click [Apply]. To rotate the motor in the forward direction, click the [FWD] button. To rotate the motor in the reverse direction, click the [REV] button. To stop it, click the [STOP] button.

Tip
- When you close the [Drive operation] menu, the loader automatically writes "0: Freq = Inverter, Ope = Inverter".

2.3.5.2. Monitoring the Inverter Operation Status from the Loader

You can monitor the inverter operation status using the operation monitor and the realtime trace.

Refer to "2.3.2. Operation Monitor" and "2.3.4.2. Realtime Trace.

2.3.5.3. If You Cannot Use the [Drive operation] Menu

You may be unable to use the [Drive operation] menu in the following cases:

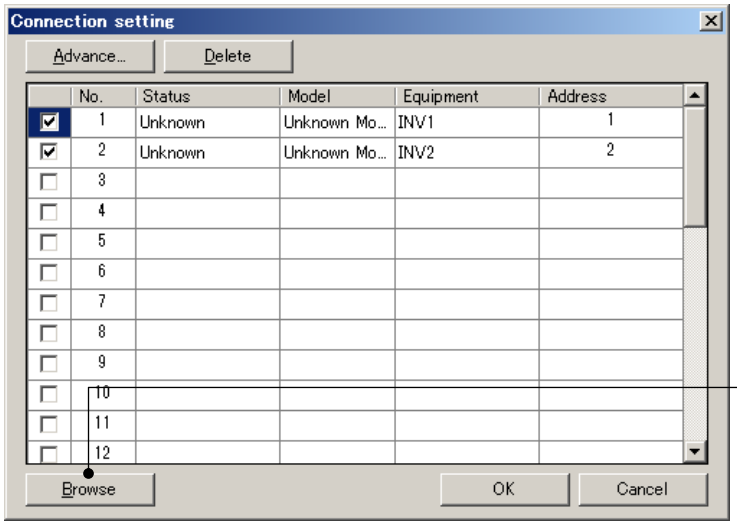
[1] A communication Error Has Occurred

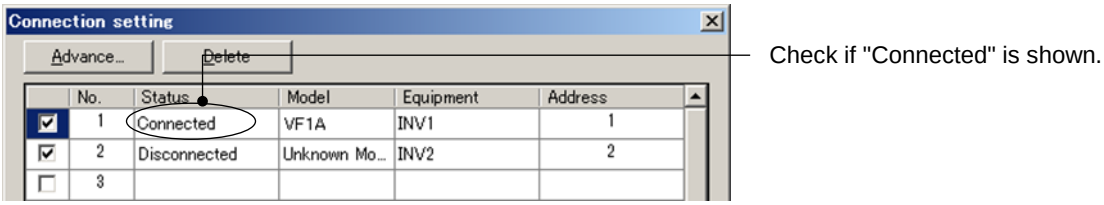
If a communication error has occurred between the loader and the inverter and you attempt to use the [Drive operation] menu or a terminal operation button, the following dialog appears:

If you respond by clicking [Cancel], the drive operation buttons, the frequency command field, the [Frequency command/operation command change] field, and the terminal operation buttons will be disabled. Even if the communication is restored, the loader will not automatically resume the communication with the inverter with which a communication error occurred.

If this is the case, check the communication status by clicking [Browse] on the [Connection Setting] window.

If "Connected" is shown in the [Status] column, it means that the communication between the loader and the inverter has been resumed and you can enable the [Drive operation] menu and the terminal operation buttons by clicking ↻ at the right of the [Drive operation] menu.

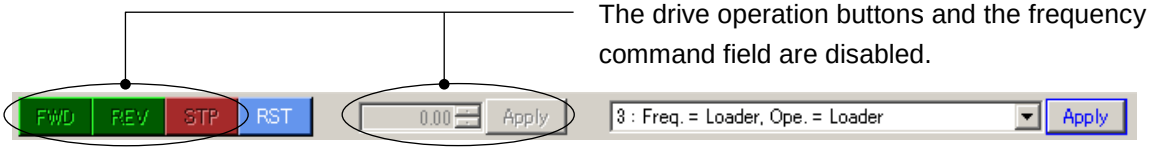




If "Connected" is shown after you click [Browse] but the [Cannot communicate with inverter] dialog appears when you attempt to use the [Frequency command/operation command change] field, the inverter may have password protection enabled. If this is the case, you must disable the password protection of the inverter. For more information on password protection, refer to the instruction manual or user's manual of your inverter.

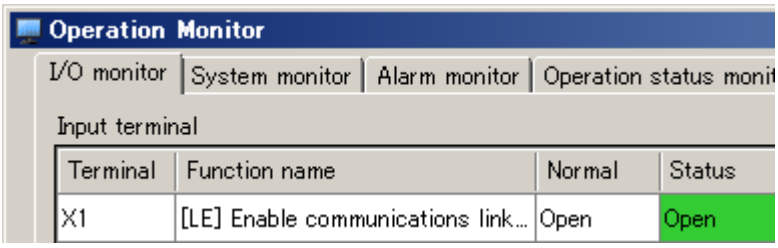
[2] "LE" Enable Communications Link Is Assigned

If "LE" Enable communications link is assigned to the general-purpose input signal (X terminal) and "LE" is OFF, you cannot use the drive operation buttons and the frequency command field even after you change the [Frequency command/operation command change] field to a non-zero setting.



In this case, you can enable the [Drive operation] menu and the terminal operation buttons by clicking ↻ at the right of the [Drive operation] menu after enabling "LE" or unassigning "LE".

You can check the assignment and ON/OFF status of "LE" Enable communications link, using the [Operation Monitor] > [I/O Monitor] window. The following example shows what is displayed when "LE" Enable communications link (E01=24) is assigned to the X1 terminal and "LE" is OFF (i.e., the X1 terminal is OFF).



To assign "LE" Enable communications link, use function codes E01, E02, and so on. For more information, refer to the User's Manual of your inverter.

[3] The Inverter Has a Realtime Clock (RTC)

If the loader is connected to an inverter model that has a realtime clock (RTC) and the realtime clock (RTC) is not configured (or it is initialized), you cannot operate the inverter with the schedule operation function enabled. To operate the inverter, you should configure the inverter's date and time or disable the timer operation function.

⚠WARNING

- Carefully note that resetting the alarm with the operation command on causes the inverter to start unexpectedly as soon as the alarm is cleared.
  Failure to observe this could result in an accident.

- If the loader goes down or is forcibly terminated during the operation with the test run screen open, it will be impossible to stop the inverter operation with the loader. If this is the case, stop the inverter by doing one of the following:
  Failure to observe this could result in an accident.
  <How to stop the inverter when the loader goes down or is forcibly terminated>
  1) If an emergency stop switch is available, use the switch to stop the inverter.
  2) Turn off the inverter power.
  3) Turn off the inverter operation command and switch the inverter from "remote command mode" to "local command mode".
     More specifically, do one of the following:
     - Turn off the terminal to which the "LE" command is assigned.
     - Zero the data for the link function for support (function code: y99).
     - Zero the data for the link function (function code H30).

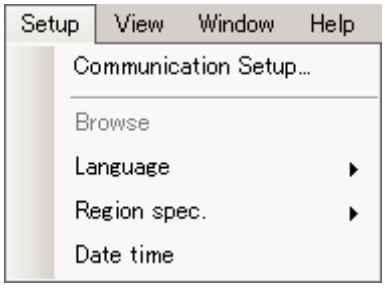
- Do not remove the RS-485 cable, USB cable, or keypad during the operation with the test run screen open. Doing so would be dangerous because it would be impossible to stop the inverter operation with the loader.
  Failure to observe this could result in an accident.

Even after you have stopped the inverter by doing one of the above, the settings of the inverter's frequency command via internal communication (communication dedicated function code S05), operation command (communication dedicated function code S06), and link function for support (function code y99) will be retained. If you attempt to operate the motor in this state, the motor may suddenly start. For safety, reset the data of the above function codes (S05, S06, and y99) to 0 by following these steps:

1) Turn off the power to the inverter. Wait for the inverter to completely stop. Then turn back on the power.
2) Zero the data of the link function for support (function code y99) using a keypad. Then start the loader and zero the data of the frequency command via communication (communication dedicated function code S05) and the operation command (communication dedicated function code S06) on the [Function code edit] window.

2.4. Setup

The [Setup] menu provides the following submenus:



This section describes the main functions available under the [Setup] menu.

2.4.1. Communication Settings

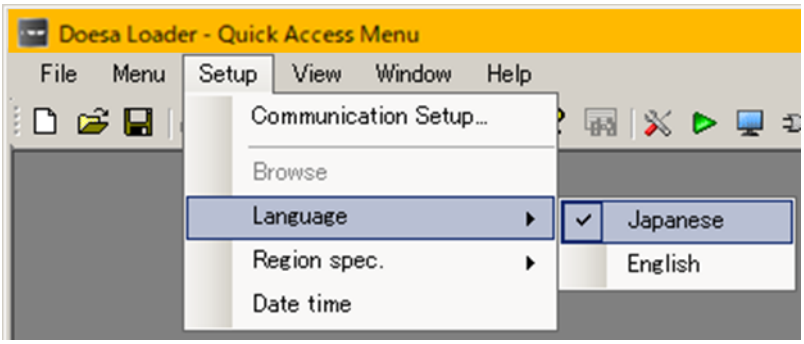
Refer to "1.5.5.1. Communication Settings".

2.4.2. Browse

Not available.

2.4.3. Language

You can configure the language settings of the loader. From the main menu, click [Setup] -> [Language] to select the desired language and then exit from the loader.



Restart the loader and the selected language will be displayed.

* The selected language will not be displayed until you restart the loader.

Tip

- Depending on the language supported by the operating system, you may not be able to select Japanese language.

2.4.4. Region Spec.

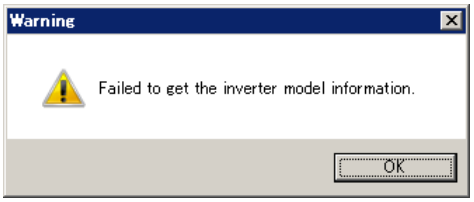
You should configure [Region spec.] correctly according to your inverter.

Tip

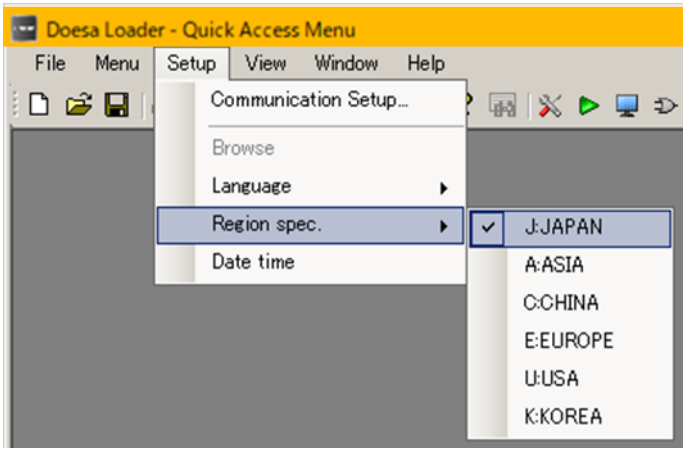
- You can identify the inverter region spec. from the inverter model number printed on the rating nameplate of the inverter. For more information, refer to "2.2.1. [1] Model, Regional Specification, Voltage, Capacity" or the instruction manual of your inverter.

If the region spec. you specify in the loader does not match the region spec. of the inverter, the following problems may occur.

- The inverter model you want to connect is missing from the list box on the [Default setting] window accessible by clicking [Function code edit...] -> [New...] -> [Default setting] from the Quick Access menu.
- The communication wirings and the inverter and loader communication settings are correct but an attempt to communicate with the inverter fails with the message "Failed to get the inverter model information" displayed.



You can change the loader's region spec. setting by clicking [Setup] -> [Region spec.] from the main menu.



When you are finished changing the setting, exit from the loader.

Restart the loader to apply the new region spec.

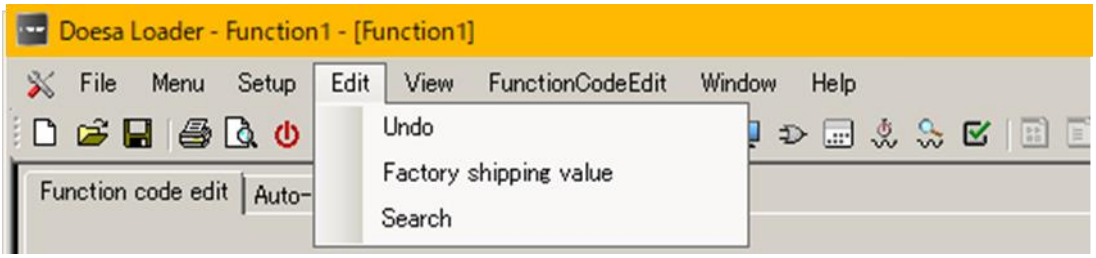
* The new region spec. will not be applied until you restart the loader.

Tip

- Normally, you set the region spec. once when you start the loader for the first time. Refer to "Setting the Operating Environment" in "1.5.3. Starting the Loader" for details.

2.5. Edit

Once you open the [Function Code List] window, the [Edit] option is added to the main menu.



[Undo]: Click this button to restore the second most recent setting of the function code you edited in the [Function code edit] window.

[Factory shipping value]: Click this button to reset the function code setting selected in the [Function code edit] window to the factory-set value.

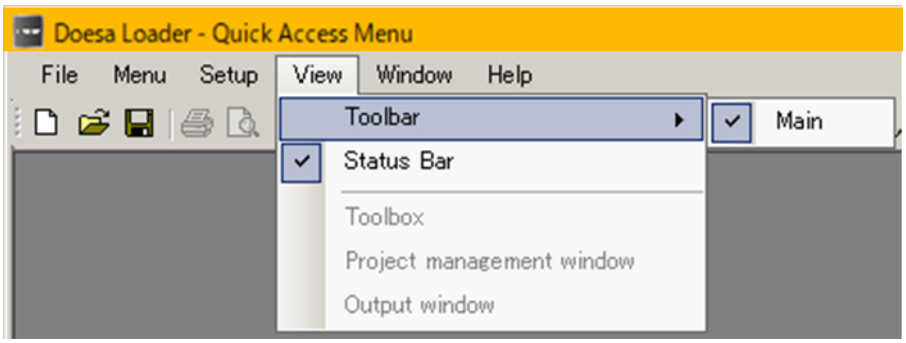
[Search]: Refer to "2.3.1.1. [8] Search (Search function code terminologically)".

Tip

- You can open the [Function Code List] window by selecting [Function Code] from the Quick Access menu. Refer to "2.3.1. Function Code " for details.

2.6. View

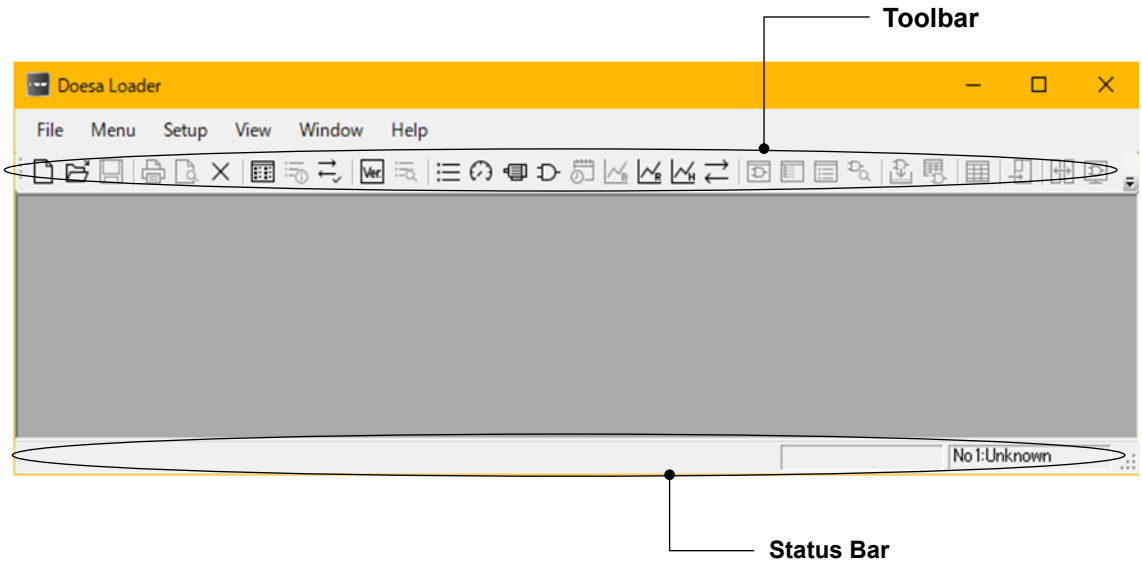
You can specify which elements to display on the loader screen.



2.6.1. Toolbar

You can show or hide the toolbar.

Showing the toolbar allows you to use your desired feature (such as the Quick Access menu) by just clicking its icon.



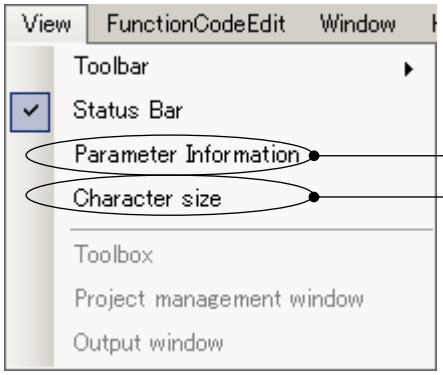
2.6.2. Status Bar

You can show or hide the status bar.

For information on what is displayed on the status bar, refer to "2.1. Main Window".

2.6.3. Parameter Information and Character size

These menu items are added once you open the [Function Code List] window.



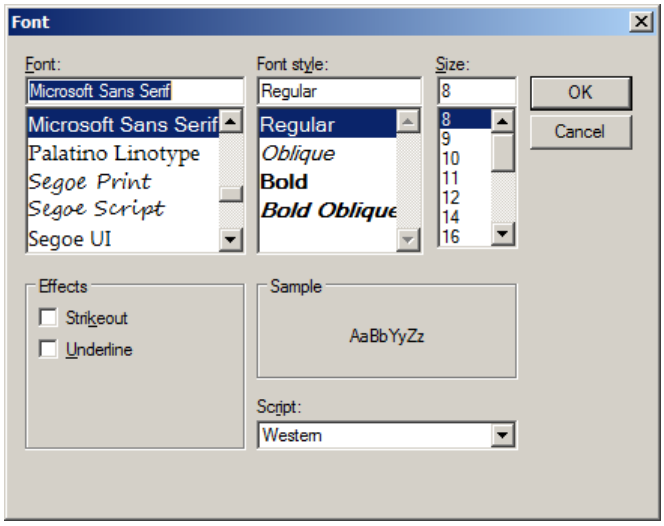
Parameter Information

This menu item provides the same function as the [Function code information] button on the [Function code edit] window.

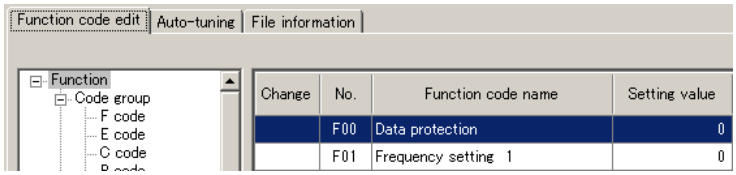
Select it to display the information of your selected function code in the function code information window.

Character size

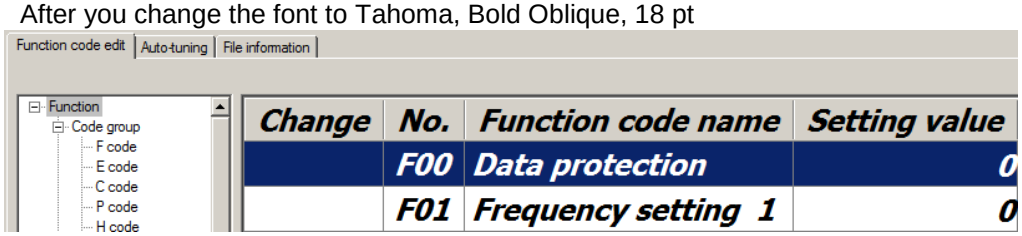
Select this menu item to open the [Font] window (as shown below). The [Font] window allows you to change the font for the function code names in the [Function code edit] window.



Example: Default font



After you change the font to Tahoma, Bold Oblique, 18 pt

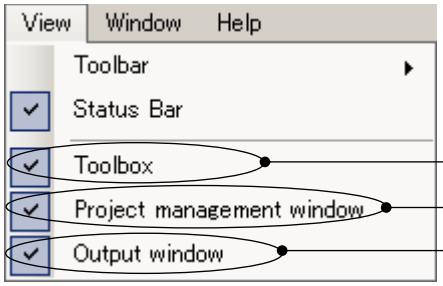


Tip

- Once you close the [Function Code List] window, the font settings will be reset to the defaults. You cannot save the font settings.
- The font settings are ignored when you print the data.
- You can open the [Function Code List] window by selecting [Function Code] from the Quick Access menu. Refer to "2.3.1. Function Code " for details.
- The [Function code edit] window is actually a tab of the [Function Code List] window.

2.6.4. Toolbox, Project Management Window, Output Window

These menu items are activated once you open the [Customizable logic] window. They allow you to show or hide the windows relating to the customizable logic function. For information on these windows, refer to "2.3.3.2. Editor Screen".



Toolbox

Show or hide the toolbox.

Project management window

Show or hide the project management window.

Output window

Show or hide the output window.

2.7. Function Code Edit

Once you open the [Function Code List] window, the [FunctionCodeEdit] option is added to the main menu.

2.7.1. Import and Export

This function allows you to save the function code setting data to a file in CSV format and restore from the CSV file.

This is useful when you want to edit function code settings in an external application such as Microsoft Excel and then load them into the loader.

Import

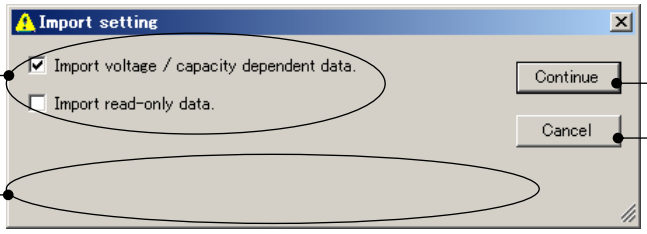
Allows you to import function code settings from a function code data file in the CSV format and display them in the [Function code edit] window. Before you import the settings, you should open the [Function Code List] window.

After selecting a CSV file to be imported, [Import setting] dialog is displayed.

Import target selection

Select whether to import data that has different set values depending on the voltage series and capacity, and read-only data such as for monitoring.

For more information for such data, refer to the “User's Manual” or "RS-485 Communication User's Manual" for your inverter.



Continue

Click this button to proceed the import operation.

Cancel

Click this button to cancel the import operation.

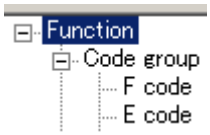
Additional information

Displays messages if the CSV file to be imported differs from the inverter model, voltage, capacity, version, or etc. in the current [Function Code List] window. If it is the intended import operation, press the [Continue] button to proceed the operation. In that case, some data may not be imported correctly, therefore make sure that the intended result is obtained after the operation.

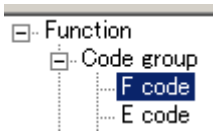
Nothing is displayed here if the settings of the CSV file to be imported matches to [Function Code List] window.

Export

Allows you to export the function code settings in the [Function code edit] window to a CSV file.
Before exporting the settings, you should select the function code you want to export from the tree view of the [Function code edit] window.



For example, to export all the function code settings, select the [Function] node at the top of the tree.



To export a particular function code group, select the function code group you want to export from within the tree.

After selecting the function code(s), click [Export].

You can edit the exported CSV file in an external application such as Microsoft Excel.

Tip

- You can open the [Function Code List] window by selecting [Function code edit...] from the Quick Access menu. Refer to "2.3.1. Function Code " for details.
- The [Function code edit] window is actually a tab of the [Function Code List] window.
- If two or more instances of the [Function code edit] window are open, the imported settings are displayed in the active instance of the [Function code edit] window.
- You cannot use [Import] or [Export] on the customizable logic function code list.

[1] CSV File Format

The following example shows the format of a CSV file that contains the exported function code data. For more information on the format, refer to "CSV File Format" in "3.2.2. Function Code Setting Specifications".

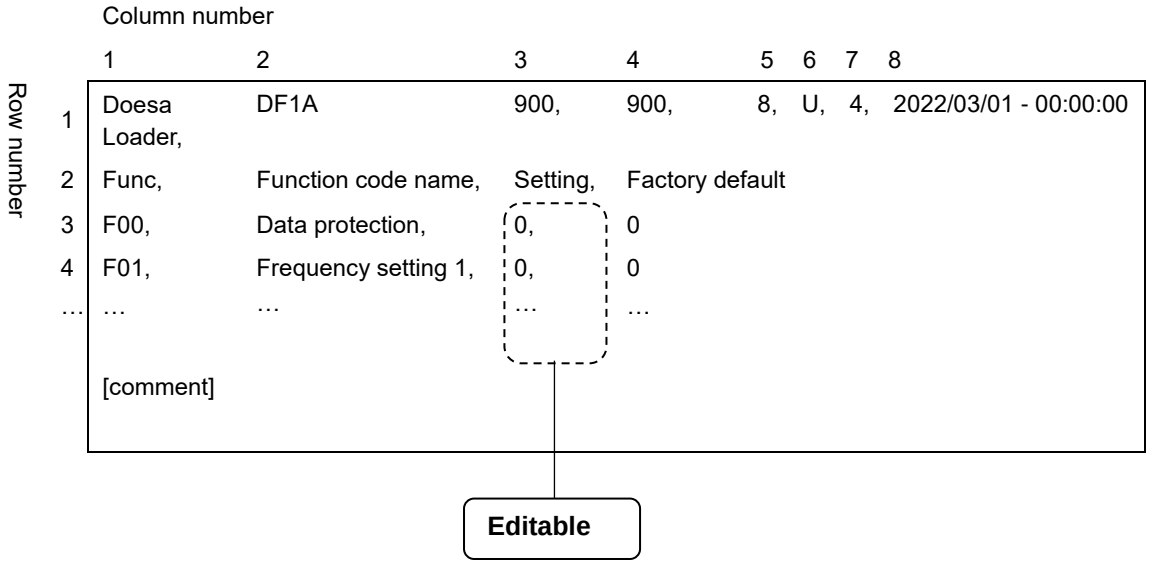


Figure 2-2 Format of a CSV file that contains function code settings

[2] Editing a CSV File

To avoid import failures, you are recommended to edit an exported CSV file to create a CSV file for import. In addition, you are recommended to save the function code settings to the FNL format as well as the CSV format and manage both the FNL and CSV files. You can avoid import failures by opening that FNL file while you are importing the data.

Basically, you should only edit the settings of the exported CSV file (the portion enclosed in dotted lines in Figure 2-2 above). You should edit the settings correctly in accordance with the following input rules.

Setting input rules

(1) A function code setting should be configured using a decimal or hexadecimal value. You cannot use a string such as "OFF".

When using a decimal value: You can use single-byte numbers (0 to 9), minus sign (-), and decimal point (.).

When using a hexadecimal value: Prefix the value with 0x. You can use single-byte numbers (0 to 9), alphabets a to f and A to F.
Example: A decimal value of 32767 is expressed in hexadecimal as 0x7FFF.

(2) Enter a value within the valid range for the function code. A value outside the valid range will not be imported. You can check the valid range for a function code in the [Function code edit] window.

(3) You can enclose the setting in double quotation marks.

Example: You can enter "32767" to represent a decimal value of 32767.

(4) The setting of 999 has a special meaning and is treated as a decimal value of 32767 (0x7FFF in hexadecimal).

Example: The valid range of VF1A F40 torque limit value 1 (drive) is 0 to 300 %; 999, where '999' means "no operation" rather than representing a percentage and it is treated as 32767 in a CSV file.

(5) Strings such as "OFF", "Auto", and "Inherit" are treated as a decimal value of either 0 or 32767 (0x0 or 0x7FFF in hexadecimal) depending on the function code. For more information, refer to the description of the data format in the "RS-485 Communication User's Manual" for your inverter. Or export function code settings that include strings, open the exported CSV file, and check the numeric values.

Example: The valid range of VF1A F50 electronic thermal (for breaking resistor protection) (rated discharge withstand current) is 1 to 9000 kWs; OFF, where "OFF" is treated as a decimal value of 32767 (0x7FFF in hexadecimal).

Tip
- If in Microsoft Excel you convert an exported CSV file to a different format such as XLS, edit it and re-export it to a CSV file, you may be unable to import the resulting file. If this is the case, open the CSV file in a text editor (such as Windows Notepad) and check if it complies with the rules described in "Figure 2-2 Format of a CSV file that contains function code settings".

Tip
- If a warning such as "Model mismatch", "Voltage mismatch", "Capacity mismatch", or "Some function codes cannot be loaded" appears when you

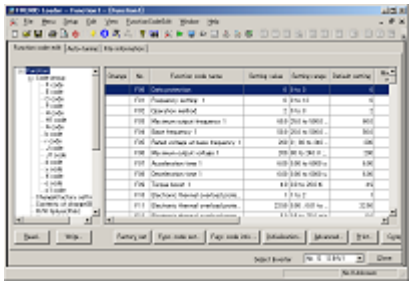
attempt to import a CSV file, there may be a mismatch in model, voltage, capacity, or inverter ROM version between the CSV file and the [Function code edit] window.
To check for any mismatch, abort the import and export the function codes from the [Function code edit] window. Then compare the CSV file you are going to import with the exported CSV file.
For more information on the CSV file format, refer to "Figure 2-2 Format of a CSV file that contains function code settings".
If a mismatch is found, correct the CSV file you are going to import so that it matches the exported CSV file.

[3] Recommended Way of Use

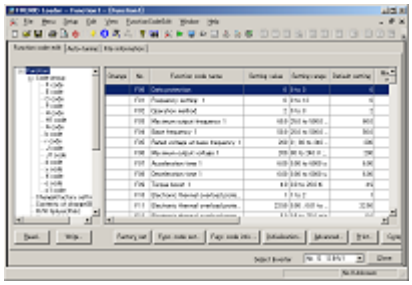
You are recommended to primarily use the [Function code edit] window when you configure function code settings and use the [Export] and [Import] functions as needed for assistance.

An example of use is shown below:

Edit the function code settings in the [Function code edit] window.



Export some of the function code data and edit it using a spreadsheet application or a text editor.



Import the function code settings from a CSV file to the settings you edited in the [Function code edit] window.

Tip

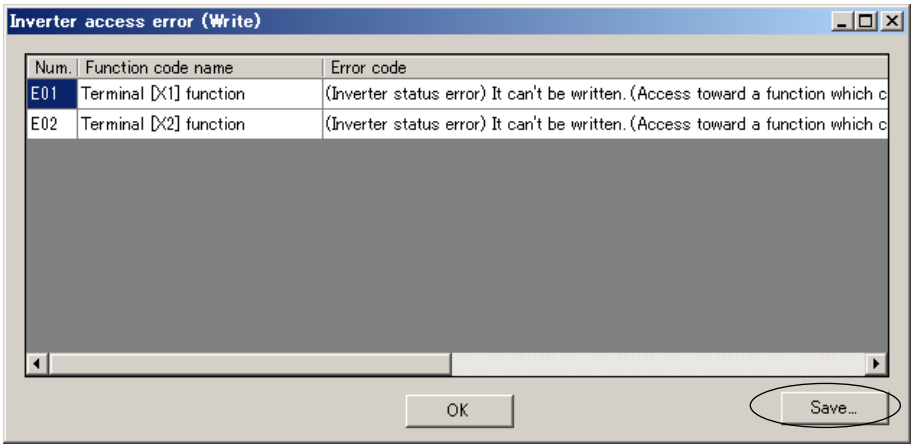
- To avoid import errors, save the function code data to the FNL format as well as the CSV format.

  Before you import the function code settings, select [Function Code] -> [Read from the file] to open the FNL file you saved when you exported the data.

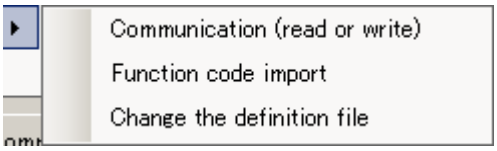
2.7.2. Export to CSV (Last error Info.)

This function is same as the [Save...] button in the error window as shown below. This is used to save the error information to the CSV file in case closed the error window without save the information.

An example of the error window with the [Save...] button



The submenu shown in right hand is activated after the error window is displayed even once.



2.7.2.1. Commuication (read or write)

If the error window with the [Save...] button is displayed even once at reading/writing data from/to the inverter in the [FunctionCodeEdit] window, this menu becomes available.

This is used to save the error information to the CSV file in case closed the error window without saving the information.

2.7.2.2. Function code import

If the error window with the [Save...] button is displayed even once at importing data from a file in the [FunctionCodeEdit] > [Import...] on the Main Menu, this menu becomes available.

This is used to save the error information to the CSV file in case closed the error window without saving the information.

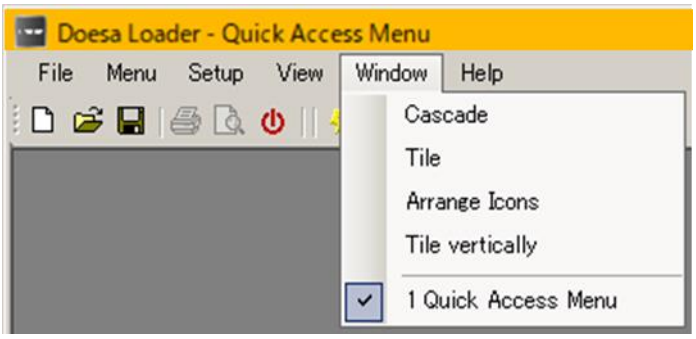
2.7.2.3. Change the definition file

If the error window with the [Save...] button is displayed even once at changing the definition file on the [File Information] window, this menu becomes available.

This is used to save the error information to the CSV file in case closed the error window without saving the information.

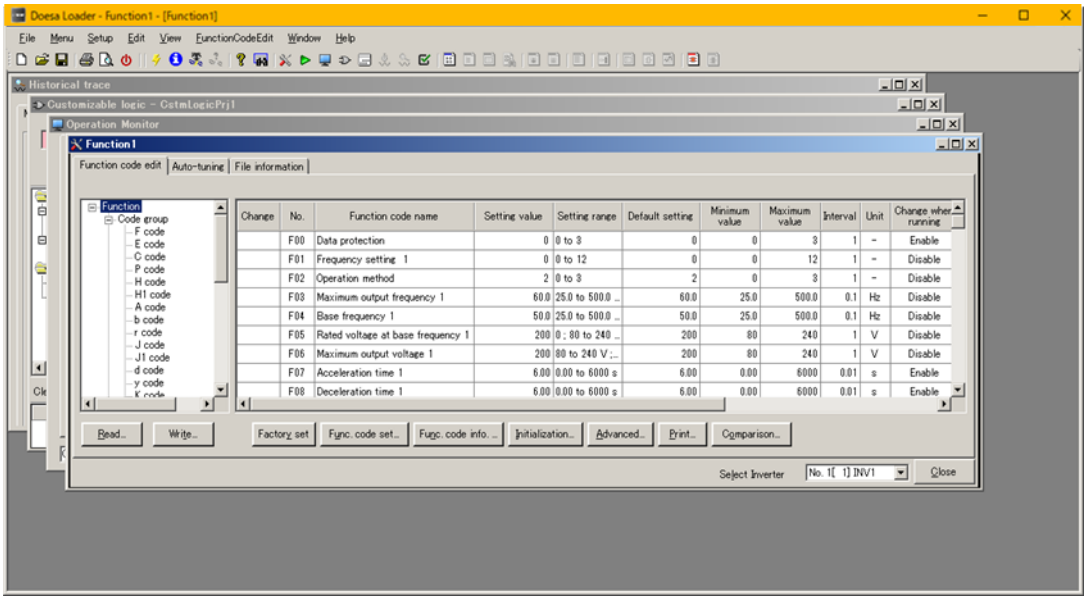
2.8. Window

You can arrange the windows on the loader screen.



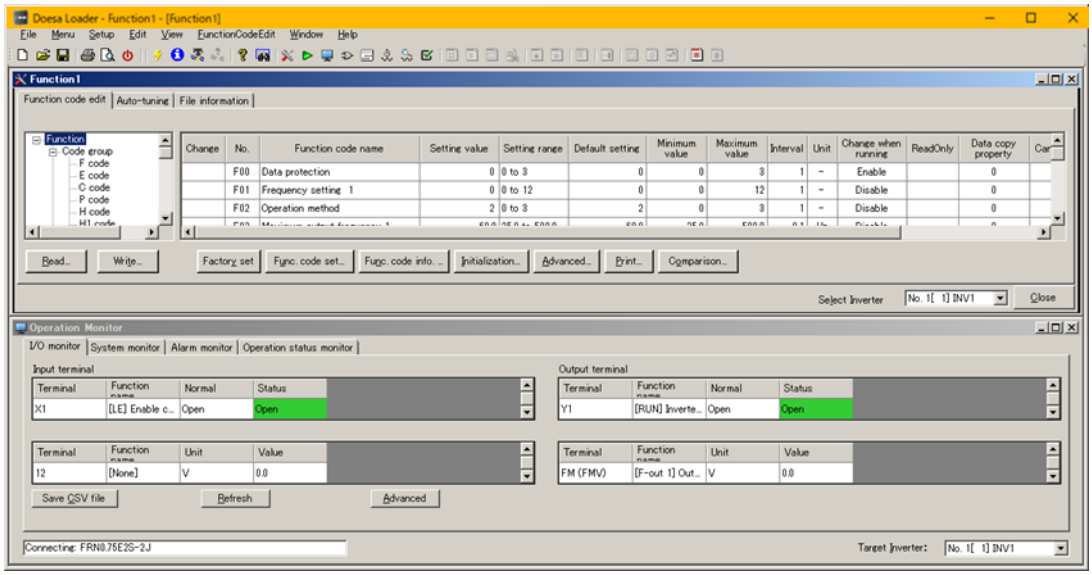
2.8.1. Cascade

Click [Window] -> [Cascade] to cascade windows.



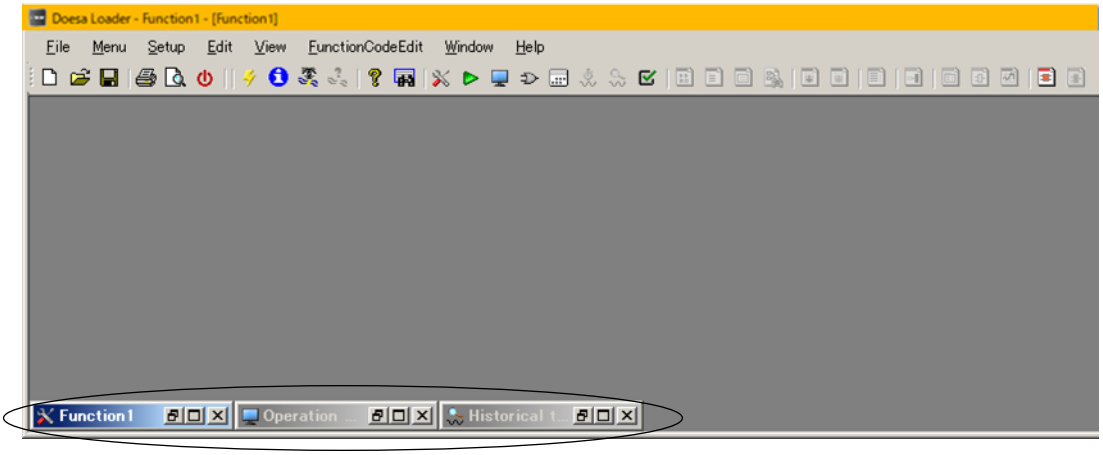
2.8.2. Tile

Click [Window] -> [Tile] to tile windows.



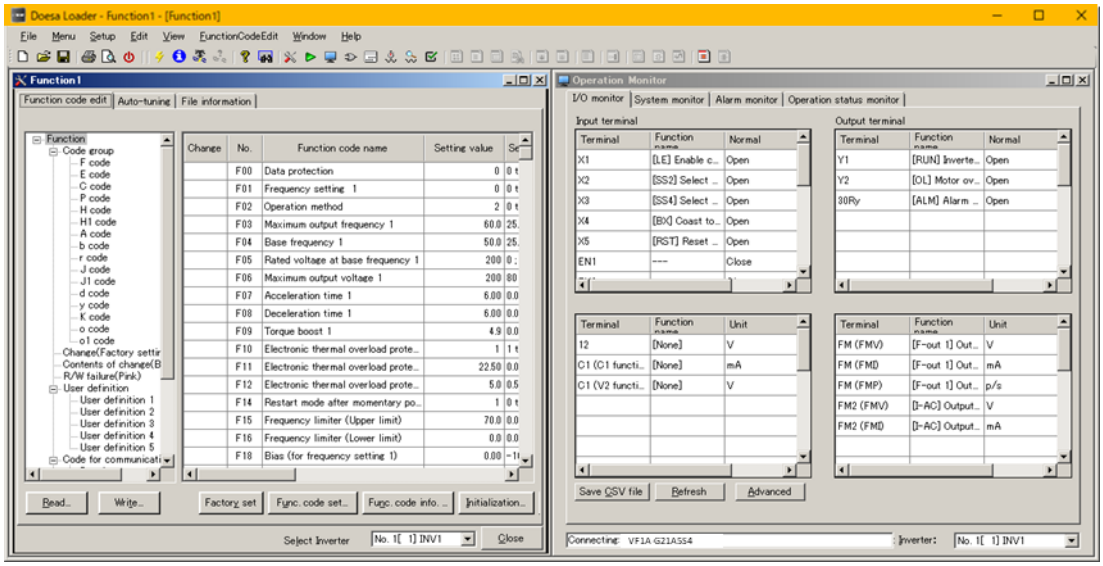
2.8.3. Arrange Icons

Click [Window] -> [Arrange Icons] to minimize windows and arrange the icons at the bottom of the main window.



2.8.4. Tile Vertically

Click [Window] -> [Tile vertically] to tile windows vertically.



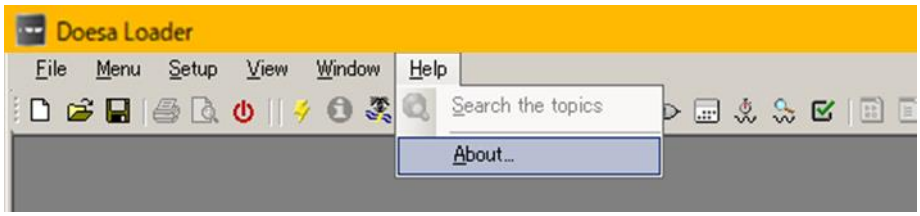
2.9. Help

2.9.1. Search the Topics

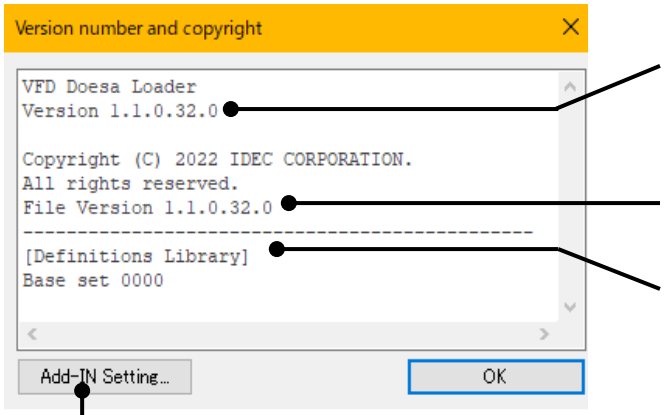
Not available.

2.9.2. About

Displays the version and copyright information for this loader.



Implemented the management function of the additional definition library files.



Version

The main version that integrates executable and definition files.

File Version

Version of the executable file itself.

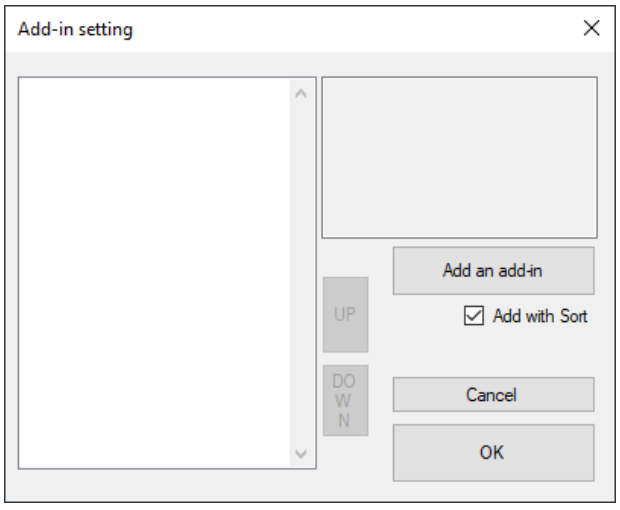
Definitions Library

Installed definition file library type and version are listed here.

Add-IN Setting

Displays the Add-in setting window which manages additional definition library files.

The files will be provided as needed by IDEC CORPORATION.



Chapter 3

Reference Information

This chapter provides information on troubleshooting and standard specifications.

3.1. Frequently Asked Questions

3.1.1. Loader Specifications

Q1.	What is the supported OS?
A1.	The supported OS is Microsoft 8.1, and 10.

3.1.2. Communication-Related Information

3.1.2.1. Connection Methods and Connection Devices

■ Recommended Cables

Q1.	Where can we get these cables?
A1.	Cables For Connecting RJ-45 Connectors Commercially available LAN cables can be used. Cables for Connecting Terminal Blocks Not available from IDEC CORPORATION. Recommended cable is as follows. Manufacturer: Furukawa Electric Co., Ltd. AWM2789 Long distance connection cable and so on. For these products, please contact Furukawa Electric Co., Ltd. or their distributor. USB Cable Please use commercially available USB cables.
	□ Refer to "1.2.2.2. [2] Cables (for RJ-45 connector connection)". □ Refer to "1.2.2.2. [3] Cables (using terminal blocks)".

■ Connection Methods

Q2.	Is it possible to connect the RJ-45 connector on the inverter to the LAN terminal of the PC directly using the LAN cable?
A2.	Both the inverter and the PC may be damaged. Never connect them directly. They must be connected via the RS-232C/RS-485 or USB/RS-485 converter or the remote keypad with USB. For information on the specific connection methods, refer to "1.2.2" and "1.2.3".
	□ Refer to "1.2.2. RS-485 Communication Port Connection". □ Refer to "1.2.3. USB Communication Port Connection".

■ RS-232C/RS-485 or USB/RS-485 converter

Q3.	Can we get these converters through IDEC CORPORATION? Where can we get these converters?
A3.	Not available from IDEC CORPORATION. The recommended converters are as follows: System Sacom Industry Corp. - KS-485PTI (RS-232C/RS-485 converter) - USB-485I RJ-45-T4P (USB/RS-485 converter) and so on. For these products, please contact System Sacom Industry Corp. or their distributor.

Q4.	The converter is not recognized by Windows 8 or later version. Any solution?
A4.	The converter may not be supported by Windows 8 or later version. Please contact the converter manufacturer because IDEC CORPORATION does not handle the converters. If the converter is supported by Windows 8 or later version, it is possible that you failed in installing the converter drive software. Please reinstall the software.

3.1.2.2. USB Communication

■ USB Communication

Communication target : Inverter via the remote keypad with USB

: Remote keypad with USB

Q1.	USB communication does not work.
Q1'.	The following message is displayed: "Failed to obtain the inverter model information."
A1-1.	Power may not have been supplied to the inverter.
A1-2.	The USB driver may not have been installed. Confirm that [Driver for FRENIC USB interface] is displayed under [Loader USB device] on the Device Manager of the Windows PC. For information on the specific confirmation procedure, refer to "1.4.1.5".
	□ Refer to "1.4.1.5. Checking the USB Driver".
	If [Unknown device] is displayed instead of [Driver for FRENIC USB interface], set up the USB driver again. For information on the specific procedure, refer to "1.4.1.4".
	□ Refer to "1.4.1.4. USB Driver Installation Procedure".
	If neither [Driver for FRENIC USB interface] nor [Unknown device] is displayed, refer to "Q2".
	□ Refer to "Q2.".
A1-3.	If you are using the USB hub, stop using the hub.
A1-4.	The Message Manager may not have been installed. Confirm that the Message Manager icon is displayed on the task bar of the Windows PC while the Loader is running. For information on the specific confirmation procedure, refer to "1.5.4.1".
	□ Refer to "1.5.4.1.Checking the Startup of the Message Manager".
	If the Message Manager icon is not displayed on the task bar of the Windows PC, uninstall the Message Manager and then reinstall it. For information on the specific procedure, refer to "1.4.2.2" and "1.4.1.6" of this instruction manual.
	□ Refer to "1.4.2.2. Uninstallation of the Message Manager". □ Refer to "1.4.1.6. Installation of the Message Manager".
	If the Message Manager icon is displayed on the task bar of the Windows PC, refer to "Q3".
	□ Refer to "Q3".

A1-5.	The timeout setting for the Loader may be too short. If the timeout is set to a value smaller than 1.5 s, a communication error may be detected before the Loader receives a response from the communicating device. Set to a value larger than the default value and try to see if communication is possible. Set the timeout setting on [Communication Conditions] on the [Communication setting] window. Refer to "1.5.5.1. [3]" of this instruction manual.
	□ Refer to "1.5.5.1. [3] Communication Conditions".
A1-6.	When the communication target is the inverter via the remote keypad with USB The inverter may not be applicable to the communication via the keypad. For the correspondence table, refer to "1.1.1" of this instruction manual.
	□ Refer to "1.1.1. Features".
A1-7.	When the communication target is the inverter via the remote keypad with USB The keypad may have been connected to the RS-485 communication port 2 of the inverter. Connect to the RS-485 communication port 1.
A1-8.	When the communication target is the inverter via the remote keypad with USB If a LAN cable is used for the connection between the keypad and the inverter, the LAN cable used may be a cross cable. If a cross cable is being used, replace it with a straight cable.
A1-9.	When the communication target is the inverter via the remote keypad with USB The port setting on the [Communication setting] of the Loader may not be correct. Make sure that the setting is as follows: [USB connection], [Data in Inverter (via VF1A-PH1)]. For information on the specific setting procedure, refer to "1.5.5.1".
	□ Refer to "1.5.5.1. Communication Settings".
A1-10.	When the communication target is the inverter via the VF1A-PH1 remote keypad with USB The address set on [Address] (for the RS-485 station address) on the [Connection setting] window accessed from the [Communication setting] window of the Loader may not the same as the station address of the inverter. Make sure that the address is the same. For information on the specific setting procedure, refer to "1.5.1" and "1.5.5.2".
	□ Refer to "1.5.1. Setting Function Codes Related to Communication on the Inverter Side". □ Refer to "1.5.5.2. Connection Setting".
A1-11.	When the communication target is the remote keypad with USB The port setting on the [Communication setting] of the Loader may not be correct. Make sure that the setting is as follows: [USB connection], [Data in Keypad]. For information on the specific setting procedure, refer to "1.5.5.1".
	□ Refer to "1.5.5.1. Communication Settings".

Q2.	When it is checked whether the USB driver is recognized by the Device Manager, "Unknown device" is not displayed. How can I make the Device Manager properly recognize the driver?
A2-1.	The connection between the PC with the USB device may be incomplete. Check the connection by disconnecting and then reconnecting the USB cable, connecting to another USB port on the PC, or replacing the USB cable.
A2-2.	It is necessary to connect the PC to the USB device to display "Unknown device". After that, install the USB driver.
	□ Refer to "1.4.1.4. USB Driver Installation Procedure".

Q3.	Although the Message Manager is running, communication does not work.
A3-1.	The USB driver may not have been properly recognized by the Message Manager. In such a case, the Message Manager must be restarted. Close the Message Manager, and restart the Loader. For information on procedures for closing the Message Manager, refer to "1.4.1.4".
	□ Refer to "1.4.1.4. [1] Before Installing the USB Driver".
A3-2.	The Message Manager itself or its registry may have been damaged due to some reason. Uninstall the Message Manager and then reinstall it. For information on the specific procedure, refer to "1.4.2.2" and "1.4.1.6" of this instruction manual.
	□ Refer to "1.4.2.2. Uninstallation of the Message Manager". □ Refer to "1.4.1.6. Installation of the Message Manager".

Q4.	After changing the function code from the Loader, I checked it using the keypad and found that the function code was not changed.
A4.	If you are using the remote keypad with USB, the port setting on [Communication setting] of the Loader may be set to [USB connection], [Data in Keypad]. If that's the case, change the setting to [Data in Inverter (via VF1A-PH1)]. For information on the specific setting procedure, refer to "1.5.5.1" of this instruction manual.
	□ Refer to "1.5.5.1. Communication Settings".

Q5.	Set the Loader to work offline from the inverter (for example, bringing the Loader to your office), edit the function code on the Loader, and write the edited result in the remote keypad with USB. Is it possible to copy the edited data to the inverter just by using the keypad (at the work site) without using the Loader?
A5.	Yes. It must be noted, however, that it is possible only with the models that support the keypad as standard or as an option. For information on the keypad support details, refer to "1.1.2. Table 1-1" of this instruction manual.
	□ Refer to "1.1.2. Table 1-1 Correspondence between VF1A Series Inverter Models and Loader Functions".
	If customizable logic is used, care must be taken. If the customizable logic is used for the inverter that supports the setting specified in [Open customizable logic setting screen] under [Function code setting], both the basic function code settings (such as F, E, or C codes) and customizable logic setting (Uxx) must be written when writing the data from the Loader to the keypad. For reference information, refer to "2.3.3.9" of this instruction manual.
	□ Refer to "2.3.3.9. [2] To write to the Keypad".

Q6.	USB communication is not possible after the PC enters the standby (sleep) state.
A7.	Disconnect and then reconnect the USB cable. If the communication cannot be recovered even after that, restart the PC.

Q7.	The seven-segment LED display on the VF1A-PH1 shows "-Ld-". What does that mean?
A8.	It means that the connection between the VF1A-PH1 and the inverter is not established and only the PC side is connected. If this is displayed while using the Loader, communication with the inverter is not possible. Check the connection between the VF1A-PH1 and the inverter and take necessary actions.

3.1.2.3. RS-485 Communication

■ RS-485 communication

Communication target : Inverter via the USB/RS-485 converter

: Inverter via the RS-232C/RS-485 converter

Q1.	RS-485 communication does not work.
A1-1.	Power may not have been supplied to the inverter. Check whether the power is properly supplied.
A1-2.	When using the USB/RS-485 converter The USB driver may not have been installed. Confirm that [USB Serial Port (COM□)] is displayed under [Port (COM and LPT)] on the Device Manager of the Windows PC. For information on the specific confirmation procedure, refer to "1.5.2".
	□ Refer to "1.5.2. Checking Communication Ports on the PC (when Using a Converter)".
	If [Unknown device] is displayed, set up the USB driver again. For information on the specific procedure, refer to the instruction manual of the converter currently used.
A1-3.	When using the RS-232C/RS-485 converter The Loader does not allow switching with RS-232C flow control signals (RTS or DTR) from the PC. The transmission and reception switching must be done automatically through monitoring transmission data. If a converter other than the ones we recommend, confirm the transmission and reception switching method specified in the instruction manual of the converter currently used. There is no problem with the converters we recommend because the transmission and reception switching is done automatically through monitoring transmission data.
	□ Refer to "1.2.2.2. [1] Converter".
A1-4.	The number of the COM port on the Windows may not match with the COM port setting on the Loader. Check the COM port. For information on the specific procedure, refer to "1.5.2" and "1.5.5.1" of this instruction manual.
	□ Refer to "1.5.2. Checking Communication Ports on the PC (when Using a Converter)". □ Refer to "1.5.5.1. Communication Settings".

A1-5.	The Message Manager may not have been installed. Confirm that the Message Manager icon is displayed on the task bar of the Windows PC while the Loader is running. For information on the specific confirmation procedure, refer to "1.5.4.1".
	□ Refer to "1.5.4.1. Checking the Startup of the Message Manager".
	If the Message Manager icon is not displayed on the task bar of the Windows PC, uninstall the Message Manager and then reinstall it. For information on the specific procedure, refer to "1.4.2.2" and "1.4.1.6" of this instruction manual.
	□ Refer to "1.4.2.2. Uninstallation of the Message Manager". Refer to "1.4.1.6. Installation of the Message Manager".
	If the message Manager icon is displayed on the task bar of the Windows PC, refer to "3.1.2.2. Q3".
	□ Refer to "3.1.2.2. USB Communication Q3".
A1-6.	The timeout setting for the Loader may be too short. If the timeout is set to a value smaller than 1.5 s, a communication error may be detected before the Loader receives a response from the communicating device. Set to a value larger than the default value and try to see if communication is possible. Set the timeout setting on [Communication Conditions] on the [Communication setting] window. Refer to "1.5.5.1. [3]" of this instruction manual.
	□ Refer to "1.5.5.1. [3] Communication Conditions".
A1-7.	The port setting on the [Communication setting] of the Loader may not be correct. Make sure that it is set to [RS-485 connection]. For information on the specific setting procedure, refer to "1.5.5.1".
	□ Refer to "1.5.5.1. Communication Settings".
A1-8.	The [Baud rate] for the RS-485 connection set under the [Communication setting] of the Loader may not be the same as the [Baud rate] of the inverter. Make sure that the baud rate is the same. For information on the specific setting procedure, refer to "1.5.1" and "1.5.5.2".
	□ Refer to "1.5.1. Setting Function Codes Related to Communication on the Inverter Side". □ Refer to "1.5.5.2. Connection Setting".
A1-9.	The address set on [Address] (for the RS-485 station address) on the [Connection setting] window accessed from the [Communication setting] window of the Loader may not the same as the station address of the inverter. Make sure that the address is the same. For information on the specific setting procedure, refer to "1.5.1" and "1.5.5.2".
	□ Refer to "1.5.1. Setting Function Codes Related to Communication on the Inverter Side". □ Refer to "1.5.5.2. Connection Setting".

A1-10.	Some models have a multiple number of RS-485 communication ports. (Example: VF1A series) If a communication port on the terminal block is used instead of the communication port for keypad connection, the default value of the function code for setting the communication protocol must be a value other than the Doesa (Loader) protocol. Make sure that it is set to "Doesa (Loader) protocol". For information on the specific setting procedure, refer to "1.5.1".
	□ Refer to "1.5.1. Setting Function Codes Related to Communication on the Inverter Side".
A1-11.	When using the inverter with two RS-485 ports If both the RS-485 settings 1 and 2 of the inverter are set to "Doesa (Loader) protocol", communication is not possible when the Loader is connected to the RS-485 communication port 1. Connect the Loader to the RS-485 communication port 2 or change the protocol option for the RS-485 setting 1 to a value other than [Doesa protocol].

Q2.	Is it possible to use the Loader while communicating with the inverter with two RS-485 ports?
A2.	It is possible to use the general-purpose communication together with the Loader. Likewise, with the communication using the field bus option, the Loader can be used at the same time. It must be noted that, if the function code is changed from both of them, the data changed later becomes valid.

Q3.	When using the Loader to control a multiple of inverters equipped with two RS-485 ports, is it possible to connect one port to the PC and to use the other port to make a multi-drop connection with other inverters?
A3.	No, it's not possible to use them that way. Use either one of the ports. A multiple of inverters can be controlled using the Loader only if they are directly connected. * Such connection is not allowed not only for the Loader, but also for ordinary RS-485 communication. It is because a unique station address must be assigned to each port.

Q4.	With using the inverter equipped with two RS-485 ports, what will happen if both of the two ports are set to the Loader (Doesa) protocol?
A4.	We do not recommend that kind of setting. If the ports are set that way, the one on the terminal block side has the higher priority.

3.1.2.4. Common to Communication

Q1.	We use the inverter in an application where its continuous operation cannot be stopped halfway. If the Loader is connected, will it cause the inverter to stop?
A1.	Even if you connect the Loader, it will not cause the inverter to stop working. However, care must be taken because if you switch to test run, the inverter may stop. If the operation is controlled using the keypad, care must be taken because the inverter will stop if you disconnect the keypad by mistake when connecting the Loader.

3.1.3. How to Use the Loader

3.1.3.1. Function Code Settings

Q1.	When I tried to make new settings by editing the function codes for the inverter with 400-V specification, it was set to 200-V specification. How can I change the setting to 400-V specification?
A1.	From the Quick Access menu or main menu, select [Function code setting], select [New] on the [Select data to edit] window, and on the [Initial setting] window, set models, capacities, and voltage series for the inverter you will be using.
	□ Refer to "2.2.1. Create a New File".

Q2.	Is it possible to compare function codes set values for two or more inverters?
A2.	The function codes for two inverters can be compared simultaneously on the Loader screen. When comparing the codes for a multiple inverters, read the function code set values for every converter, save them as a set data file using the file function, and then compare a data file with the next one opened one after another. For information on the comparison function, refer to "2.3.1.1. [6] Compare" of this instruction manual. The set data can also be saved in CSV format, so the data can be compared using a commercially available software. For information on saving in CSV format, refer to "2.7" of this instruction manual.
	□ Refer to "2.3.1.1. Function Code Edit [6] Compare". □ Refer to "2.7. Function Code Edit".

Q3.	I want to perform offline tuning using the Loader, but P04 is not present in the function code under [Function code edit]. How can I perform offline tuning?
A3.	From the Quick Access menu or main menu, select [Function code edit] and then select [Autotuning] tab on the [Function code list] window to perform the tuning.
	□ Refer to "2.3.1.2. Auto Tuning".

Q4.	I cannot read the file where Loader's function code settings are saved.
A4.	For some reasons, the definition files required for executing the Loader may have been lost. When the function code settings are saved, they are linked to the definition files in correspondence with the ROM number. Therefore, you cannot read the file if the definition file that the Loader refers to does not exist when the file is opened. The definition files are generated when the Loader is installed. To generate the definition files, uninstall the Loader once and then install it again.
	□ Refer to "1.4.2.1. The Loader Uninstallation Procedure". □ Refer to "1.4.1.3. The Loader Installation Procedure".

Q5.	I cannot select models on [New] under [Function code settings]. (Selection options are not displayed.)
A5.	For some reasons, the files (such as INI file, DLL file) required for executing the Loader may have been lost or the environment definitions (such as registry setting) may have been corrupted. Uninstall the Loader once and then install it again.
	□ Refer to "1.4.2.1. The Loader Uninstallation Procedure". □ Refer to "1.4.1.3. The Loader Installation Procedure".

Q6.	Model names that are not listed in the catalog are displayed as optional items.
A6.	The Loader is common to applications in Japan or abroad. Therefore, all the applicable models that we sell in Japan and abroad are displayed. If models not listed in the catalog are displayed, the [Regional spec.] may be set to an optional item other than [J: JAPAN]. On the main menu, select [Setup] and set [J: JAPAN] for [Regional spec.]. Then restart the Loader.
	□ Refer to "2.4.4. Region Spec.".

Q7.	After writing function code data in the inverter using the Loader, I read the written data. The values read were different from what I just wrote in.
A7.	Some function codes (H42, H43, H44, H47, H48, etc.) including those related to the run time or service life are set as monitor only or updated according to operation. Therefore, the read value may be different from what was written in. Applicable function codes are different depending on the inverter models. Refer to the instruction manual or user's manual for the inverter model currently used.

Q8.	With the inverter models provided with the password function, it is not possible to set or change the password from the Loader.
A8.	Password setting or changing via communication is disabled on the inverter side to prevent malicious password decoding. Unlock the password from the keypad.

3.1.3.2. Alarm History

Q1.	When I checked the alarm history using the Loader, I only found numerical data in the function code settings.
A1.	The numerical data that can be confirmed on [Function code edit] window indicates alarm code numbers. Refer to the alarm code table provided separately in the RS-485 Communication User's Manual. If you access the [Alarm monitor] tab on the [Operation monitor] window selected from the [Operation monitor settings] on the Quick Access menu, the alarm codes can be checked in the same format as those displayed on the keypad.
	□ Refer to "2.3.2.3. Alarm Monitor (for monitoring the inverter's alarm information)".

3.1.3.3. Customizable Logic

Q1.	What should I enter in the [Version] displayed for [Inverter model selection] when I select [New] after selecting [Customizable logic] and [Select edit data] on the Quick Access menu?
A1.	Set the ROM version of the inverter. For information on checking the ROM version, refer to the instruction manual or user's manual for the inverter model currently used. If the Loader is connected to the inverter, you can confirm the ROM version on [Inverter ROM version] displayed on the [System monitor] tab on the [Operation monitor] window that can be accessed from the [Operation monitor settings] on the Quick Access menu. The set values entered in [Model] and [Version] affect the usable number of steps and usable circuit types. The entry in [Version] can be changed at a later stage. However, if any change is made to [Version], an error may occur when step numbers are assigned. You are recommended to select a version number that is as appropriate as possible when creating a new circuit.
	□ Refer to "2.3.3.1. Select Customizable Logic Project to Edit". □ Refer to "2.3.2.2. System Monitor (for monitoring the internal setup information and maintenance status of the inverter)". □ Refer to "2.3.3.12. Project Properties".

Q2.	The newly created project does not work properly.
A2-1.	Check whether the customizable logic is started. If "U00", the inverter's function code, is 1, it means that the customizable logic has been started.
A2-2.	Use the comparison function to check if the project is properly written in the inverter.
	□ Refer to "2.3.3.10. Comparison".
A2-3.	Check if the user set values required for the customizable logic and the set values for the storage area are properly written.
	□ Refer to "2.3.3.6. Settings for the User Setting Area and the Memory Area". □ Refer to "2.3.3.9. Write".
A2-4.	Use the on-line monitoring function to check if symbols and FB inputs and outputs operate properly.
	□ Refer to "2.3.3.11. Debug Function".
A2-5.	The process execution sequence may not be correct. Check the execution sequence. The execution sequence is represented by step numbers.
	□ Refer to "2.3.3.7. Step Number Assignment".

Q3.	How can I debug a newly created project?
A3.	After you finish assigning the step numbers, use the following functions to debug the project. - On-line monitoring function that displays status in the vicinity of symbols - Trace monitoring function that displays I/O of symbols in waveforms as a realtime trace
	□ Refer to "2.3.3.11. Debug Function". □ Refer to "2.3.4.10. Combination with the Customizable Logic Function".

Q4.	Can I print the newly created project?
A4.	Either the project layout area or the selected portion of the area can be printed.
	□ Refer to "2.3.3.15. Printing the Customizable Logic".

Q5.	The newly created project may contain unique know-how. Is it possible to hide symbols or their connections or to disable any changes to them?
A5.	You can hide or display with a password by using the lock function. However, it must be noted that the lock function is enabled on the PC, but disabled on the inverter. If you write the circuit that is protected with the lock function into the inverter, the circuit can be freely displayed and edited on the inverter. To apply restrictions to display or edit of the circuit on the inverter, you need to use the inverter's password function (H197, H198, and H99)
	□ Refer to "2.3.3.13. Lock Function".

Q6.	Is it possible to operate processes with different cycles within a project?
A6.	It is possible depending on the inverter model. For the customizable logic specifications for each inverter model, refer to “3.2.4.Customizable Logic Specifications” However, even for inverter models that do not support such operation, it is possible to make it appear to process with multiple cycles by adjusting the process I/O refresh timing. For example, for a project whose number of steps for the VF1A model is 75, the execution cycle is 10 ms. It is not possible to allow processes with cycles such as 2 ms or 5 ms that is shorter than 10 ms. Accordingly, the latch function or hold function will be added so that the I/O signals of the target processes are updated at the integer multiple of 10 ms.

Q7.	Is it possible to share the newly created function blocks (FBs) with other people or with other PCs?
A7.	The import/export function allows you to use your created FB in the VFD Doesa-Loader software installed on another PC.
	□ Refer to "2.3.3.14. Importing/exporting an FB under [FB (Common)]".

Q8.	Can I use the newly created project on different models?
A8.	If a project is created using only the symbols that are common to different models, the whole project can be set as an FB so that it can be used among different models using the import/export function. By clicking the [Change] button on the [Properties] screen of the project, you can also change the model on the [Inverter model selection]. If symbols that are not common among different models are used, the newly created project cannot be used when the number of steps of the created circuit exceeds the maximum number of steps of another model.
	□ Refer to "2.3.3.3. [4] Creating a Function Block (FB)". □ Refer to "2.3.3.14. Importing/exporting an FB under [FB (Common)]". □ Refer to "2.3.3.12. Project Properties".

3.1.3.4. Trace

Q1.	Is it possible to use the waveform data obtained through the realtime trace or historical trace on a commercially available software?
A1.	The waveform data can be saved in CSV format and thus the data can be used with commercially available software applications. Besides, if the waveform data has already been saved in the file formats (extensions: RT2, HT2, RTM, HIM, or RT1) dedicated to the Loader, read the data on the Loader by clicking [File] -> [Open], and then save the data in CSV format by clicking [Save as]. Note that the data saved in CSV format cannot be opened with the Loader.
	□ Refer to "2.3.4.4. Saving the Trace Data".

3.1.3.5. Test Run

Q1.	When I try to change [Switching frequency/operation command], the following message appears and I cannot make any changes: [Cannot communicate with the inverter. Retry communication?]
A1-1.	An error may have occurred in the communication between the Loader and the inverter. Access the [Connection setting] window from the [Communication setting] window of the Loader and then click the [Browse] button on the [Connection setting] window to check the state of communication. For information on checking methods, refer to "2.3.5.3" and "1.5.5.2" of this instruction manual.
	□ Refer to "2.3.5.3. If You Cannot Use the [Drive operation] Menu". □ Refer to "1.5.5.2. Connection Setting".
	If "Not connected" is displayed, check communication cable connections or communication settings. For information on checking methods, refer to "3.1.2.2. Q1." and "3.1.2.3. Q1." of this instruction manual.
	□ Refer to "3.1.2.2. USB Communication Q1". □ Refer to "3.1.2.3. RS-485 Communication Q1".
	If "Connected" is displayed, refer to "A1-2" on the following section.
A1-2.	If you cannot change [Switching frequency/operation command] even if "Connected" is displayed when the the [Browse] button is clicked, the inverter may be rejecting the [Switching frequency/operation command] request. With the inverter provided with the password function, the cause could be that the password protection has been enabled. If the [Password protected] dialog is displayed when [Read from Inverter] is selected on [Function code setting], it means that the password protection is enabled. If that dialog is not displayed, select [Read from Inverter] on [Function code setting], and then try writing in the function code y99 on the [Function code edit] window. If the [Password protected] dialog is displayed, it means that the password protection is enabled. If the password protection is enabled, it needs to be removed. For information on password protection, refer to the instruction manuals or user's manuals of relevant inverters.

3.1.4. Terminology

Q1.	What does the "Message Manager" (hereinafter referred as "the MM")?
A1.	It is a software that controls communication between our Loader and the inverter. If the Message Manager is not installed, if it was deleted, or if the existing one was overwritten by reinstalling the Message Manager, communication may be disabled.
	□ Refer to "1.5.4. Overview of the Message Manager".

Q2.	What does the "definition file" mean?
A2.	It is a file that contains information required to identify various models and their functions. If new function codes are added as functional improvement to a certain model, a new definition version (file name) is given to the new one of the same model. Our naming rule specifies that a file name must include the ROM number. When function codes with attributes are read from the inverter, optimum definition files are automatically detected. If you attempt to write function code set values in the inverter with different ROM number, a warning will be displayed. In such a case, select definition files again and perform writing. Writing should be normal now.
	□ Refer to "2.3.1.3. [3] Changing a Definition File".

3.2. The Loader Standard Specifications

Item		Specification	Remarks
Name		VFD Doesa-Loader	
Supported inverters		Doesa VF1A series	・With special inverters other than standard series models, function codes may not be properly displayed.
Number of connected inverters		For USB connection: Only one inverter For RS-485 connection: 31 inverters max.	
Supported keypads		Remote keypad with USB: VF1A-PH1	・The VF1A-PH1 is an optional product. ・For information on the kepyad support detail, refer to "1.1.2. Table 1-1 Correspondence between VF1A Series Inverter Models and Loader Functions" or catalogs of relevant inverters.
Recommended cable		RS-485: Shielded twisted-pair cable for long distance transmission USB: USB cable (mini B connector)	RS-485 connection: Refer to "1.2.2. RS-485 Communication Port Connection". USB connection: Refer to "1.2.3. USB Communication Port Connection".
Operating environment	Supported OS	Microsoft Windows 8.1 Microsoft Windows 10	32bit/64bit Japanese/English
	Memory	2 GB or more	4GB or more is recommended
	Storage	Approx. 800 MB or more of free space	
	Serial port	RS-232C, USB	In case of RS-232C, conversion to RS-485 is required to connect to the inverter. In case of USB, remote keypad with USB or conversion to RS-485 is required to connect to the inverter not equipped with USB.
	Monitor	Monitor with 1024 x 768 or higher resolution	FHD (1920 x 1080) or higher is recommended.
Transfer specification	Communication port	COM1 to COM255	PC port used for loader
	Baud rate	USB connection: 12 Mbps between the Loader and the Remote Keypad with USB port Between the Remote Keypad with USB port and the inverter VF1A-PH1: 19200 bps For RS-485 connection: 115200, 76800, 57600, 38400, 19200, 9600, 4800, 2400 bps	・19200 bps or faster is recommended ・The available communication speed varies depending on the inverter model and communication protocol.
	Communication protocol	Doesa protocol (Loader protocol) Modbus RTU protocol	・The available communication protocol varies depending on the inverter model.
	Character length	8 bits	Common between protocols.

Item		Specification	Remarks
	Stop bit length	Doesa protocol: 1 bit (fixed) Modbus RTU protocol: 1 bit or 2 bits without parity 1 bit with parity	
	Parity	Doesa protocol: Even (fixed) Modbus RTU protocol: None / Even / Odd	
	Retry count	None, 1 to 10 times	Retry count to communication timeout error detection
	Timeout setting	100 ms, 300 ms, 500 ms, 1.0 s to 1.9 s, 2.0 to 9.0 s, 10.0 to 60.0 s	Set a time longer than the y09 or y19 response interval time.

3.2.1. Type of Files Used by VFD Doesa Loader

Table 3-1 List of Files Used by the Loader

File types			File extension	File operation		Related section
				Save	Open	
Function code setting	Standard function codes	Function code data	FNL	○	○	2.2.2 2.2.4 2.2.5 2.3.1.1. [4]
			CSV	○	○	2.7
	Customizable logic function codes	Function code data	FBL	○	○	2.2.2 2.2.4 2.2.5 2.3.1.1. [4]
	Error information - File read error - Inverter access error		CSV	○	×	—
Operation monitor	I/O monitoring	Monitor data	CSV	○	×	2.3.2.1
		Display item selection	TXT	○	○	
	Monitor data of the system monitor		CSV	○	×	2.3.2.2
	Monitor data of the alarm monitor		CSV	○	×	2.3.2.3
	Operating state monitoring	Monitor data	CSV	○	×	2.3.2.4
		Display item selection	TXT	○	○	
Customizable logic	Project data		CML	○	○	2.2.2 2.2.4 2.2.5 2.3.3.1
	User setting area and customizable logic memory area		CSV	○	○	2.3.3.6
	Input/output check		CSV	○	×	2.3.3.8. [1]
	Logic check		CSV	○	×	2.3.3.8. [2]
	Comparison results		CSV	○	×	2.3.3.10
	Common function blocks (FBs)		EXFBL	○	○	2.3.3.14

○: Possible ×: Not possible

File types		File extension	File operation		Related section
			Save	Open	
Realtime trace	Waveform data	RT2	○	○	2.2.2 2.2.4 2.2.5 2.3.4.4
		CSV	○	×	2.2.5 2.3.4.4
	Waveform images	JPG	○	×	
		BMP	○	×	
	Advanced	EXRTM	○	○	2.3.4.9
Historical trace	Waveform data	HT2	○	○	2.2.2 2.2.4 2.2.5 2.3.4.4
		CSV	○	×	2.2.5 2.3.4.4
	Waveform images	JPG	○	×	
		BMP	○	×	
	Advanced	EXHIM	○	○	2.3.4.9

○: Possible ×: Not possible

3.2.2. Function Code Setting Specifications

■ CSV File Format

The following section shows an example of CSV file format when the function code data is exported by selecting [Export] on the [FunctionCodeEdit] window accessed from the main menu.

Column number

Row number	1	2	3	4	5	6	7	8
1	Doesa Loader,	VF1A,	900,	900,	8,	U,	4,	2022/03/01 - 00:00:00
2	Func,	Function code name,	Setting,	Factory default				
3	F00,	Data protection,	0,	0				
4	F01,	Frequency setting 1,	0,	0				
…	…	…	…	…				
	[comment]							

1st row

Column number	Item name	Description	Import target
1	Loader name	Fixed at "Doesa Loader".	○
2	Inverter model	Indicates the model number of the inverter	○
3	Inverter ROM version	Indicates the ROM version of the inverter	○
4	Function code set version	Indicates the function code version.	○
5	Capacity code	Refer to "Table 3-2" shown below.	○
6	Regional specification	J: Japan, A: Asia, C: China, E: Europe, U: USA, T: Taiwan, K: South Korea	-
7	Voltage code	1: Single-phase 100 V, 2: Single-phase 200 V, 3: three-phase 200 V, 4: three-phase 400 V	○
8	Date and time	Indicates the date and time when the data is exported.	-

○: Used for importing. -: Not used for importing.

Table 3-2 List of Capacity Codes

Code	Capacity [kW]	Code	Capacity [kW]	Code	Capacity [kW]	Code	Capacity [kW]	Code	Capacity [kW]
1	0.1	8	5.5	15	37	22	160	29	400
2	0.2	9	7.5	16	45	23	200	30	450
3	0.4	10	11	17	55	24	220	31	500
4	0.75	11	15	18	75	25	250	32	560
5	1.5	12	18.5	19	90	26	280	33	630
6	2.2	13	22	20	110	27	315	-	-
7	3.7	14	30	21	132	28	355	-	-

2nd row

Indicates the item name for the 3rd row and onwards. Not used for importing.

From the 3rd row down to the row above the [comment]

Column number	Item	Description	Import target
1	Function code	Same as the No. column on the [Function code edit] window.	○
2	Function code name	Same as the function code name on the [Function code edit] window.	-
3	Set value	Numerical values that correspond to the set values on the [Function code edit] window.	○
4	Factory default	Numerical values that correspond to the factory default values on the [Function code edit] window.	-

○: Used for importing. -: Not used for importing.

Row below [comment] and onward

Same as the comment on the [File information]. Not used for importing.

3.2.3. Tracing Specifications

Table 3-3 Tracing Specifications

<table>
<tr><th>Item</th><th>Realtime</th><th>Historical</th><th></th></tr>
<tr><td rowspan="2">Sampling time</td><td>When using the special communication commands (*1)
2 ms to 200 ms (*2)</td><td colspan="2" rowspan="2">0.5 ms to 200 ms (*2)</td></tr>
<tr><td>When not using the special communication commands
200 ms</td></tr>
<tr><td>Number of samplings</td><td>15000 points/channel
(Number that can be continuously displayed)</td><td>500 points/channel</td><td></td></tr>
<tr><td>Number of displayed data items</td><td colspan="3">Analog: 4 channels
Digital: 8 channels (*3)</td></tr>
</table>

(*1) The special communication commands, the historical trace can be used by the inverters that support those functions.

(*2) The sampling time setting range differs depending on the inverter model. Also, if the sampling time is extremely short in real-time tracing, the graph display may be interrupted depending on the communication speed and communication status.

(*3) If four analog channels are selected, digital selection is not possible.

3.2.4. Customizable Logic Specifications

■ Number of steps

Depends on the inverter models.

	Doesa VF1A Series Inverters
Number of steps	Version 300 or earlier 100
	Version 400 or later 200

■ Execution cycle

Depends on the inverter models.

		Doesa VF1A Series Inverters
Execution cycle		Depends on the maximum step No. (following table)
Maximum step No. (*1)	1 – 10	2 ms
	11 – 20	5 ms
	21 – 50	
	51 – 100	10 ms
	101 – max	20 ms
Multitask function		Not available

(*1) If 75 is manually assigned to the step number even if only one step is used, the maximum step No. becomes 75 and the execution cycle becomes 10 ms.

■ Multitask function

Processes with multiple different execution cycles can be mixed and executed at the same time in one project. The multitask function can be enabled by setting U100 = 127 on the inverter model which supports it.
For details, refer to the user's manual for each inverter model.

3.2.5. Replacement of Inverter ROM Versions

When selecting definition files for the function code settings, when newly creating a customizable logic, or when setting the version using the customizable logic project properties, for the following inverter models, replace the ROM version and select it according to the table.

Doesa VF1A series

ROM version	Replaced version	Remarks
1000	900	VF1A-G21A5S4 or more
6200	900	VF1A-G12A0S4 or less

MEMO

Inverter Support Software

VFD Doesa-Loader

PC Loader Instruction Manual

April 2022

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