KEYENCE

H06GB

Vision Sensor

IV3 Series

User's Manual
(Field Network)

Read this manual before use.
After you read this manual, keep it in a safe place for future reference.

EtherNet/IP™

PROFINET

TCP/IP

Introduction

Read this manual before using the product in order to achieve maximum performance.
Keep this manual in a safe place after reading it so that it can be used at any time.

Symbols

The following symbols alert the reader to important messages.
Be sure to read these messages carefully.

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, could result in product damage as well as property damage.

Important

Indicates cautions and limitations that must be followed during operation.

Point

Indicates additional information on proper operation.

Reference

Indicates tips for better understanding or useful information.

Indicates the reference pages in this manual or the reference pages in separate manuals.

Cautions

(1) Unauthorized reproduction of this manual in whole or part is prohibited.
(2) The contents of this manual may be changed for improvements without prior notice.
(3) An utmost effort has been made to ensure the contents of this manual are as complete as possible. If there are any mistakes or questions, please contact a KEYENCE office listed in the back of the manual.
(4) Regardless of item (3), KEYENCE will not be liable for any effect resulting from the use of this unit.
(5) Any manuals with missing pages or other paging faults will be replaced.

Safety Information

General Precautions

⚠ DANGER

- **This product is only intended to detect objects. Do not use this product for the purpose of protecting a human body or a part of the human body.**
- **This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere.**
- **This product cannot be used in an application that requires functional safety. Do not use this product in applications that are expected to have a major impact on human life or property such as nuclear power generation, aviation, rail transport, ships, automobiles, medical equipment, and amusement equipment.**

⚠ WARNING

- **If this product is used in a manner not specified by the manufacturer, the protection provided by this product may be impaired.**
- **Prior to installing this product, perform a sufficient risk assessment for the machine where this product is to be installed. Then, check that appropriate risk reduction measures have been implemented. Provide appropriate protective fail-safe measures on the machine independent from this product to ensure that the machine operates safely even in the event that an error occurs on this product.**

⚠ CAUTION

Verify that this product is operating correctly in terms of functionality and performance before the start and the operation of this product.

NOTICE

- **Do not modify this product or use it in any way other than described in the specification. The functions and performance cannot be guaranteed in any such situations.**
- **When this product is used in combination with other instruments, functions and performance may be degraded depending on the operating conditions and surrounding environment.**
- **Do not subject the instruments, including peripherals, to rapid temperature changes. Doing so may cause condensation and may damage instruments or peripherals.**
- **Remove the power cable from the power supply if you will not use this product for a long time.**

Version of the IV3 Series

You can download the most recent operation software for the sensor and the control panel (IV3-CP50) from the KEYENCE website.
Refer to the description on the website for the installation method.
URL : www.keyence.com/glb

Sensor operation software

Version	Description
R1.30.**	This version is covered by this manual.

Control panel operation software

Version	Description
R1.30.**	This version is covered by this manual.

IV3-Navigator (IV3-H1), software for the IV3

Version	Description
R1.30.**	This version is covered by this manual.

Structure of This Manual

1	Getting Started	This chapter describes the system configuration and overview of the IV3 Series.
2	EtherNet/IP	This chapter describes the overview of EtherNet/IP and the EtherNet/IP communication specifications and functions of the IV3 Series.
3	Cyclic Communication	This chapter describes the overview, setting method, data allocation, and operating procedure of cyclic communication in EtherNet/IP communication.
4	PROFINET	This chapter describes the overview of PROFINET and the PROFINET communication specifications and functions of the IV3 Series.
5	Data I/O Communication	This chapter describes the overview, setting method, data allocation, and operating procedure of the data I/O communication of PROFINET communication.
6	TCP/IP No Procedure Communication	This chapter describes the overview, setting method, commands, and responses of TCP/IP no procedure communication.
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MEMO

1

Getting Started

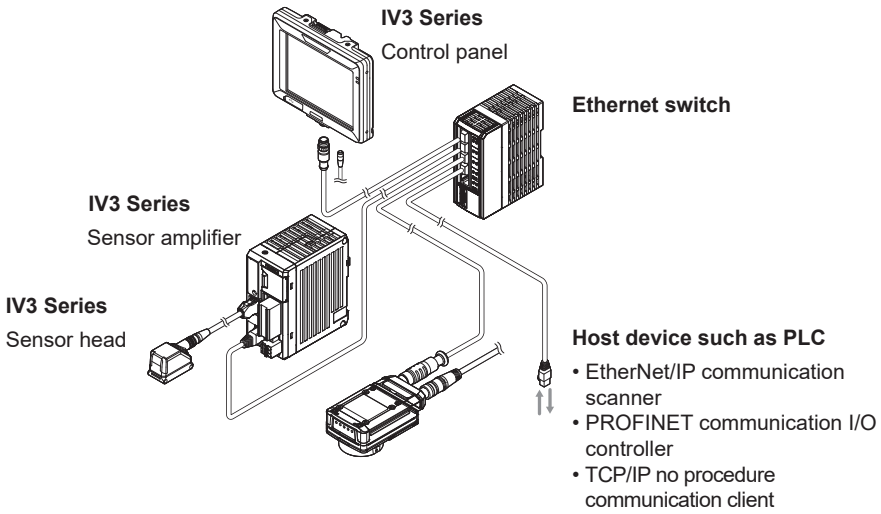
This chapter describes the system configuration and overview of the IV3 Series.

Overview of IV3 Series

IV3 Series

The IV3 Series is a “Vision Sensor”. This sensor can be installed easily, so detections of the shapes of parts and other such detections that were difficult to perform with a photoelectric switch can be achieved easily.
To set the operating conditions, use IV3-Navigator (IV3-H1), software for the IV3, or the control panel (IV3-CP50). After setting is completed, the sensor can be operated independently.
The IV3 Series operates as an EtherNet/IP communication adapter, a PROFINET communication I/O device, or a TCP/IP communication server.
With EtherNet/IP communication, PROFINET communication, or TCP/IP no procedure communication, the control output signal, status result, etc. can be output to the PLC, PC, etc. as communication data.

System configuration example



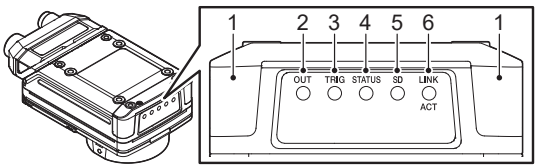
Reference

- The IV3 Series cannot use multiple communication protocols simultaneously.
- For details on installing, connecting, and operating the IV3 Series, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.

Operation of the indicator lights

■ IV3 Series:

Operation of the indicator lights



1 Status indicators

- Green (ON) .....The total status result is “OK”.
- Green (Blink)....Under startup or setting in progress. Operation is stopped. Blinks once a second.
- Red (ON).....Comprehensive result is “NG”.
- Red (Blink) .....An error occurred.
- (OFF) .....Standby status until the first judgment finishes after starting the operation or after switching the program number.
- Green and red are blinking alternately...Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink.

2 OUT

Indicates the comprehensive result.

- Green (ON) .....The total status result is “OK”.
- Green (Blink) .....Startup is in progress. Alternatively, a program is not set.
- Red .....The total status result is “NG”.
- Orange (blinking) .....• Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink. The LED blinks 4 times with a period of approximately 1 second.
  • Settings are being restored from the SD card. Blinks once a second.
- (OFF) .....Setting in progress. Standby status until the first judgment finishes after starting the operation or after switching the program number.

3 TRIG

Lights in green (one-shot) according to the input of the internal or external trigger.

- Orange (Blink) .....Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink. The LED blinks 4 times with a period of approximately 1 second.

4 STATUS

Indicates the Ethernet connection status.

- Green (ON) .....Connected normally to the sensor.
- Green (Blink) .....The IP address has been retrieved but the sensor is not correctly connected.
- Red (ON).....The IP address coincides with other device or a network loop is detected.
- Red (Blink) .....Communication timeout has occurred with the Ethernet/IP scanner.
- (OFF) .....IP address is not assigned. The device is not correctly connected.

5 SD

- Green (ON) .....The SD card is recognized. It stops being accessed if the cover is opened.
- Green (Blink) .....The SD card is being accessed.
- (OFF) .....The SD card is not mounted or not recognized.

Reference The operation of the SD access indicator in the slot part is as follows;

Green (ON)	The SD card is being accessed.
(OFF)	The SD card is not mounted or not recognized.

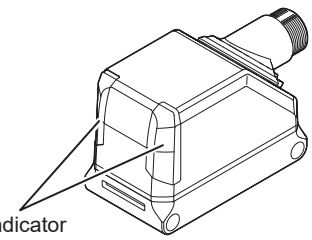
6 LINK/ACT

Indicates the status of the Ethernet link.

- Green (ON) .....Normally linked.
- Green (Blink) .....Normally linked, and the data is sending/receiving.
- (OFF) .....The sensor is not correctly linked.

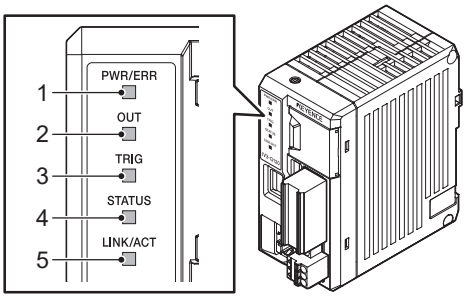
■ IV3-G Series:

Operation of the sensor head indicator lights



- Green (lit) .....Overall status result is “OK”.
- Green (blinking) .....Starting or in [Setting] status. Operation is stopped. Blinks approximately once a second.
- Red (lit) .....Overall status result is “NG”.
- Red (blinking)...An error or a warning has occurred.
- (Unlit) .....
  - Standby status until the first judgment finishes after starting operation or after switching the program number.
  - The versions of the sensor head and sensor amplifier do not match.
  - An incompatible type of sensor head is connected.
- Green and red are blinking alternately ...Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink.

Operation of the sensor amplifier indicator lights



1 PWR/ERR

- Green (lit) .....In [RUN] status.
- Green (blinking) .....Starting or in [Setting] status. Operation is stopped. Blinks approximately once a second.
- Red (lit) .....An unrecoverable error has occurred.
- Red (blinking)...A recoverable warning has occurred.
- Orange (blinking) .....Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink. The LED blinks 4 times with a period of approximately 1 second.
- (Unlit) .....Power is not supplied.

2 OUT

Indicates the overall status result.

- Green .....Overall status result is “OK”.
- Red .....Overall status result is “NG”.
- Orange (blinking) .....
  - Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink. The LED blinks 4 times with a period of approximately 1 second.
  - Settings are being restored from the SD card. Blinks once a second.
- (Unlit) .....In [Setting] status. Standby status until the first judgment finishes after starting operation or after switching the program number.

3 TRIG

Lights in green (one-shot) according to the input of the internal or external trigger.

- Orange (blinking) .....Flash LED has been requested by the PROFINET communication I/O controller. Or, a request has been made for the sensor LED to blink. The LED blinks 4 times with a period of approximately 1 second.

4 STATUS

Indicates the connecting status to Ethernet.

- Green (lit) .....Connected correctly.
- Green (blinking) .....The IP address has been retrieved, but the sensor is not connected correctly.
- Red (lit) .....The IP address coincides with that of another device or a network loop has been detected.
- Red (blinking)...A timeout has occurred in the communication with the EtherNet/IP communication scanner.
- (Unlit) .....IP address is not assigned. Not connected correctly.

5 LINK/ACT

Indicates the linking status to Ethernet.

- Green (lit) .....Normally linked.
- Green (blinking) .....Normally linked, and the data is being sent/received.
- (Unlit) .....Sensor is not normally linked.

Reference The operation of the SD access indicator in the slot part is as follows;

Green (ON)	The SD card is being accessed.
(OFF)	The SD card is not mounted or not recognized.

MEMO

2

EtherNet/IP

This chapter describes the overview of EtherNet/IP and the EtherNet/IP communication specifications and functions of the IV3 Series.

Overview of EtherNet/IP

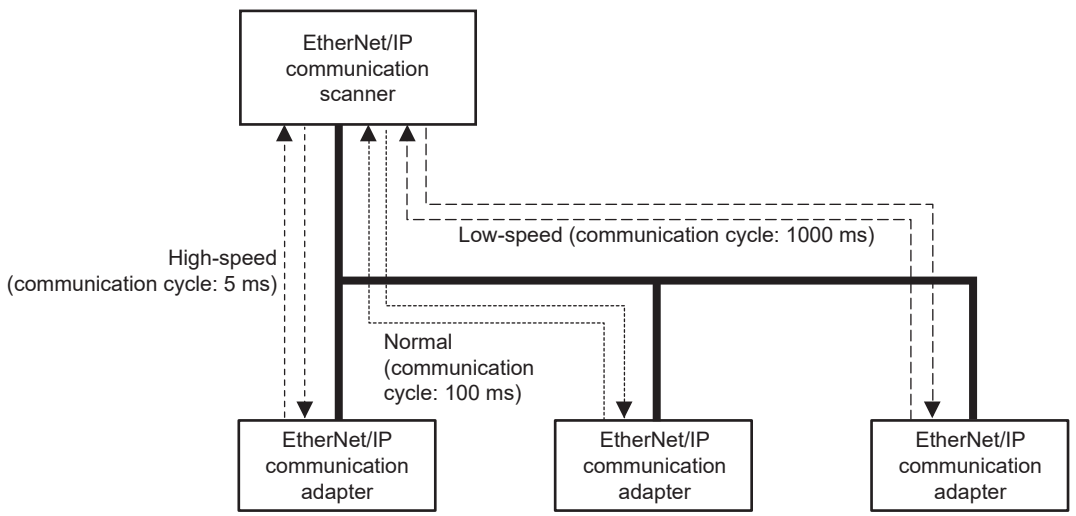
What is EtherNet/IP?

EtherNet/IP is an open industrial networking standard developed and maintained by the ODVA (Open DeviceNet Vendor Association, Inc.). All supported devices can use the communication network regardless of the vendor.
Ethernet and an industrial protocol have been combined and standardized as EtherNet/IP (Industrial Protocol). Communication is achieved by combining a protocol called CIP (Common Industrial Protocol) and TCP/IP and Ethernet. This allows the network to be shared and used with standard Ethernet.

To start the EtherNet/IP communication, one device needs to open a communication line called a “connection” with the other device. The device that will open a connection is referred to as the “scanner”, and the device whose connection will be opened is referred to as the “adapter” (IV3 Series is an adapter device).

The EtherNet/IP communication offers the following two types of communications: Cyclic communication for sending and receiving data periodically (Implicit communication), and message communication for sending and receiving commands/responses at a timing defined by the user.
In cyclic communication, you can set the RPI (Request Packet Interval: communication cycle) based on the priority of the data to be sent/received, enabling sending/receiving of data with adjusted overall communication load. Various data including the control output, status result import, trigger control, and program switch requests can be communicated without a ladder program.
In message communication, you can send/receive the required commands and responses at the required timings. Message communication is used for applications requiring no specific timing, unlike cyclic communication, such as for reading and writing the adapter device settings.

The IV3 Series supports cyclic communication (Implicit communication).



EtherNet/IP communication specifications and functions in the IV3 Series

This section describes the overview of the EtherNet/IP communication functions supported in the IV3 series.

EtherNet/IP communication specifications in the IV3 Series

Cyclic communication (Implicit messages)	**Number of connections**	16

Overview of the EtherNet/IP communications functions in the IV3 Series

The following shows the list of functions that can be used to control the IV3 Series using EtherNet/IP communication.

Function	Content
Trigger input	Executes a trigger input for the sensor.
Program switching	Switches the currently running program for the sensor.
External master registration	Executes an external master registration for the sensor.
Setting value (judgment threshold) rewriting	Rewrites the threshold that is used as the reference for tool judgment.
Master text/master date rewriting	Rewrites the master text/master date that is used as the reference for OCR tool judgment.
Rewrite FTP/SD-saved file name	Rewrites the name of the image file to transfer to the FTP server or SD card.
Warning clear input	Executes a warning clear.
Read out status	Allows you to check the unit status (Imaging, RUN, BUSY, Error, etc.).
Read overall status result	Reads out the overall status result.
Read judgment processing time	Reads out the judgment processing time.
Read each tool's status result	Read each tool's status result
Read statistics information	Reads out the number of triggers issued and the number of trigger errors.

Point

- If you are switching programs using EtherNet/IP communication, set the [Switching method] option to [Panel/PC/Network/Automatic Switching]. For details on the setting method, refer to the "IV3 Series User's Manual (Control Panel/PC Software)".
- If the external master registration will be executed frequently using EtherNet/IP communication, set the [Write to ROM at external master reg.] option to [No] in order to protect the non-volatile memory within the sensor. For details of the setting, refer to the "IV3 Series User's Manual (Control Panel / PC Software)".
- If the FTP/SD-saved file name will be rewritten frequently using EtherNet/IP, set the [Non-volatile memory writing flag] bit to OFF (0) in order to protect the non-volatile memory within the sensor. For details, refer to "To change the FTP/SD-saved file name" (Page 3-32).

List of supported PLCs

Check the instruction manual of each PLC for details on the setting methods.

KEYENCE PLC

PLC model	EtherNet/IP communication unit	CPU unit firmware version	Software used	Version of the software used
KV-8000	Built-in port	Ver. 1.0 or later	KV STUDIO	Ver. 10.0 or later
	KV-XLE02			
	KV-EP21V			
KV-7500	Built-in port	Ver. 1.0 or later		Ver. 8.0 or later
	KV-XLE02	Ver. 2.2 or later		Ver. 9.2 or later
	KV-EP21V	Ver. 1.0 or later		Ver. 8.0 or later
KV-7300	KV-XLE02	Ver. 2.2 or later		Ver. 9.2 or later
	KV-EP21V	Ver. 1.0 or later		Ver. 8.0 or later
KV-5500	Built-in port	Ver. 2.0 or later		Ver. 6.0 or later
	KV-EP21V			
KV-5000	KV-EP21V			
KV-3000	KV-EP21V			
KV-NC32T	KV-NC1EP	Ver. 2.0 or later		Ver. 7.1 or later
KV-N24**				
KV-N40**				
KV-N60**				

Rockwell Automation PLC

PLC model	EtherNet/IP communication unit	Firmware version	Software used	Version of the software used
1756 ControlLogix	1756-ENBT 1756-EN2T	Ver. 13	RSLogix5000	Ver. 13
1769 CompactLogix	Built-in port	Ver. 13		

- The EDS file can be downloaded from the KEYENCE web site. The EDS file is also included in the folder in which the PC software for IV3 Series IV3-Navigator (IV3-H1) has been installed.
- The tag file which is used while communicating with Rockwell Automation PLC can be downloaded from the KEYENCE web site.

3

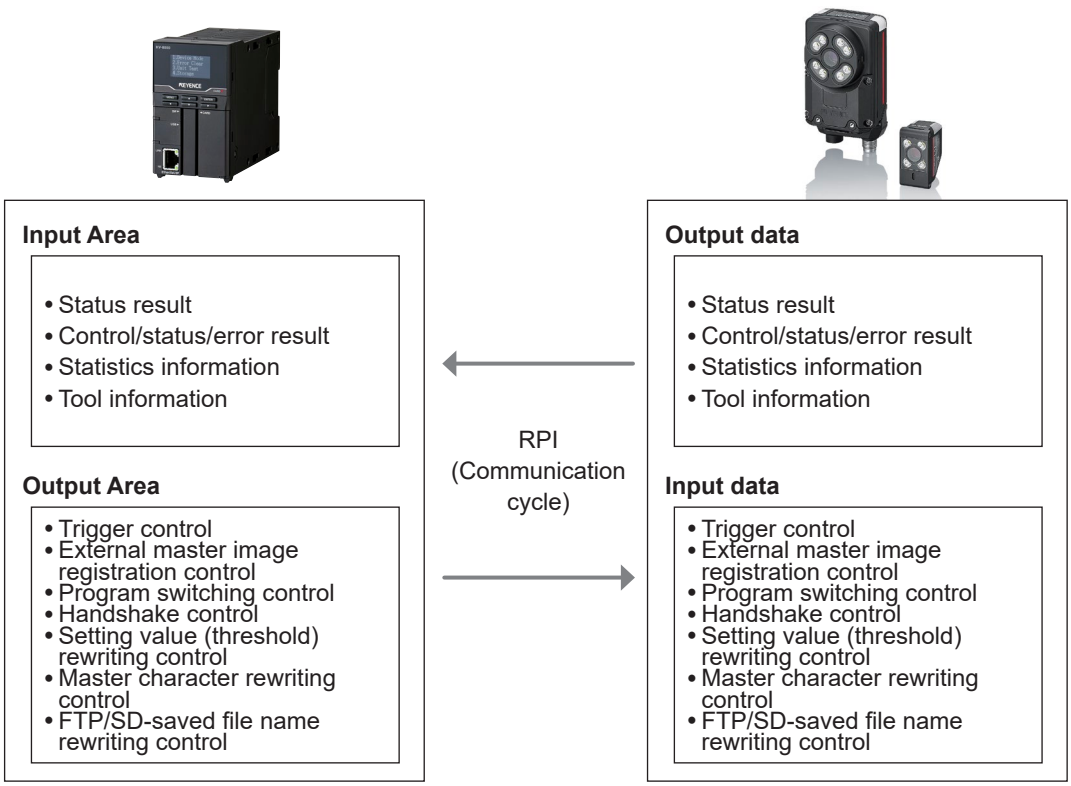
Cyclic communication

This chapter describes the overview, setting method, data allocation, and operating procedure of cyclic communication when using EtherNet/IP communication.

Overview of the cyclic communication

What is cyclic communication?

This function enables cyclic (i.e. in fixed intervals) data communications with EtherNet/IP devices.
This function provides high-speed control in several to several tens of milliseconds.
Communication can be controlled by referencing and updating the variables in the PLC, making it easy to control the programs on the PLC side.



Point

- Communication settings for cyclic communication, such as the RPI (communication cycle) and the data size, will be configured on the PLC side.
- In a network with many connected devices (including the EtherNet/IP devices), a network delay and/or packet loss may occur when there is a heavy load on the network. Conduct a thorough verification before operation.

Cyclic communication setting method

This following explains the setting method when using cyclic communication.

Point

If you have modified the protocol settings, the connection with the sensor will be terminated and then restarted.

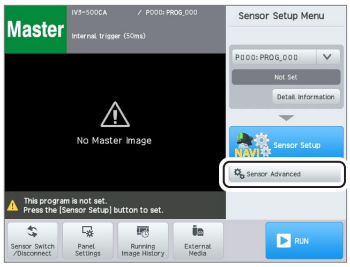
Setting the IV3 Series

You can configure the following settings for the IV3 Series using the control panel (IV3-CP50) or IV3-Navigator (IV3-H1).

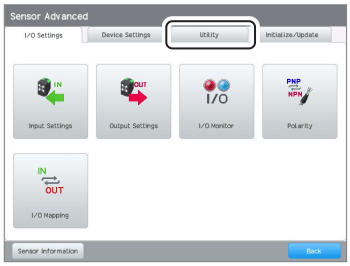
When configuring settings on the control panel (IV3-CP50)

Set the field network settings of the sensor to [EtherNet/IP].

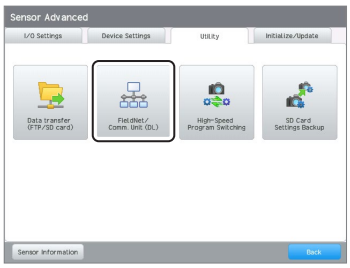
1 Tap the [Sensor Advanced] button on the [Sensor Setup Menu] screen.



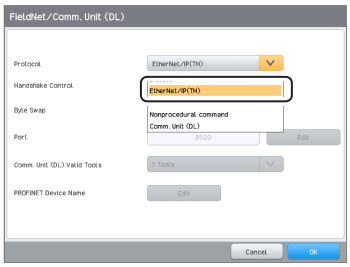
2 Tap the [Utility] tab.



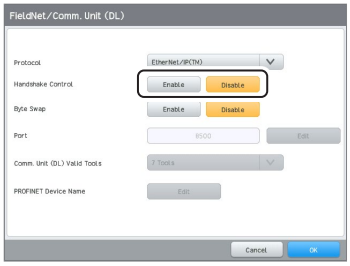
3 Tap [FieldNet/Comm. Unit (DL)].



4 Select [EtherNet/IP(TM)] for the protocol.



5 To enable the handshake control, select [Enable].



- **Disable (default value)**

  Select if the trigger interval is greater than the communication cycle (RPI). A status result can be obtained in real time. In most situations, select [Disable].

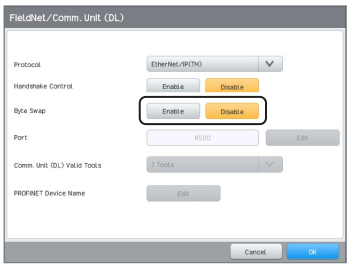
- **Enable**

  Select if the trigger interval is less than the communication cycle (RPI) and the number of triggers is 10 or less. If the status result is not picked up due to the trigger internal being faster than the communication cycle, the status result can be saved up to ten times in the buffer.

Point

- When the protocol is set as [Disable], this setting item is shaded and cannot be selected.
- When the data handshake control is set as [Enabled], the status result will not be updated until [Result acquisition complete notice] (“Address2, Bit0” of Output Assembly) is input.
  “Operating procedure of the cyclic communication” (Page 3-38)

6 To enable byte swap for the data region, select [Enable].



Point

The order with which the read text of the OCR tool or the FTP/SFTP-transferred file name is stored in the data memory of the PLC (two bytes) can be changed in units of bytes.

- Disable: First byte → Last byte (Example for the string “AB”: 0x4142)
- Enable: Last byte → First byte (Example for the string “AB”: 0x4241)

Set byte swap in accordance with the specifications of each PLC. For details, see the instruction manual for the PLC.
When connecting to the KEYENCE KV Series, select [Enable].

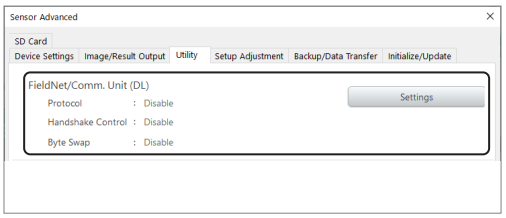
7 After setting is completed, tap the [OK] button.

When setting by IV3-Navigator (IV3-H1)

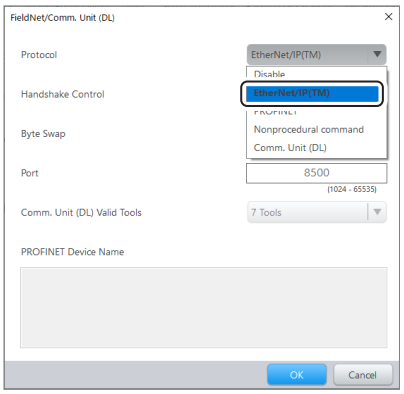
Set the field network settings of the sensor to [EtherNet/IP].

1 Display the Advanced Sensor Settings screen.

2 Select the [Utility] tab, and then click [Settings] under [FieldNet/Comm. Unit (DL)].



3 Select [EtherNet/IP(TM)] in [Protocol] for the field network.



● Handshake Control

- Disable (default value)
  Select if the trigger interval is greater than the communication cycle (RPI). A status result can be obtained in real time. Normally select [Disable].
- Enable
  Select if the trigger interval is less than the communication cycle (RPI) and the number of triggers is 10 or less. If the status result is not picked up due to the trigger interval being faster than the communication cycle, the status result can be saved up to ten times in the buffer.

Point

- When the protocol is set as [Disable], this setting item is shaded and cannot be selected.
- When the data handshake control is set as [Enabled], the status result will not be updated until [Result acquisition complete notice] (“Address2, Bit0” Output Assembly) is input.
“Operating procedure of the cyclic communication” (Page 3-38)

● **Byte swap**

To enable byte swap in the data region, select [Enable].

Point

The order with which the read text of the OCR tool or the FTP/SFTP-transferred file name is stored in the data memory of the PLC (two bytes) can be changed in units of bytes.

- Disable: First byte → Last byte (Example for the string “AB”: 0x4142)
- Enable: Last byte → First byte (Example for the string “AB”: 0x4241)

Set byte swap in accordance with the specifications of each PLC. For details, see the instruction manual for the PLC.
When selecting to the KEYENCE KV Series, select [Enable].

4 **After setting is completed, click the [OK] button.**

The system returns to the Advanced Sensor Settings screen.

5 **Click the [OK] button.**

PLC settings

You can set the following settings for the PLC:

(1) Set the connection to be used for cyclic communication.

(2) Set the device to be used for cyclic communication.

For details of the setting, refer to the instruction manual of each PLC.

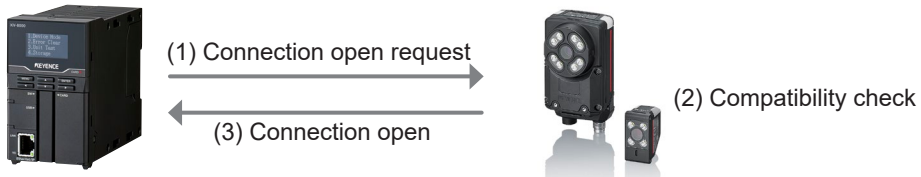
Reference

If you are using the KEYENCE KV series, (1) and (2) can be set automatically simply by making a selection in KV STUDIO.

Establishing the connection

In cyclic communication, one device opens a logical communication circuit called a “connection” with the other device; data communication will become possible if the opening is successful.
The device that will open a connection is referred to as the “scanner”, and the device whose connection will be opened is referred to as the “adapter”.
(IV3 Series is an adapter device)
In EtherNet/IP communication, a connection must be opened from the scanner when cyclic communication is started.

Communication is started using the following procedure:
(1) The scanner sends a connection open request to the adapter.
(2) Compatibility will be checked on the adapter side.
(3) A connection will open if no error is encountered in the compatibility check.



Reference

- A compatibility check is used to check whether the device set by the scanner and the IV3 Series are in match with one another, in order to prevent the scanner from communicating with a wrong device when it attempts communication with the IV3 Series.
- Communication settings for cyclic communication, such as the communication cycle (RPI) and the data size, will be configured on the scanner side.
  In a network with many connected devices (including the EtherNet/IP devices), a network delay and/or packet loss may occur when there is a heavy load on the network. Conduct a thorough verification before the operation.

There are many types of connections, and the connections available for each device are defined in the EDS file. The EDS file can be downloaded from the KEYENCE web site. The EDS file is also included in the folder in which the PC software for IV3 Series IV3-Navigator (IV3-H1) has been installed.

Point

For the EDS file when using the KEYENCE KV Series, download the [IV3 Series] KV STUDIO communication unit setup file (the ez1 file) and register it in KV STUDIO.

The following shows the list of connections that are available in the IV3 Series.

No	Connection name	Application type	I/O	Assembly Instance	Size (bytes)	RPI
1	Monitor Data And External Input (Monitor/External input)	Exclusive Owner	This unit → Scanner	64H (100)	2 to 1400	5 to 10000ms
			Scanner → This unit	65H (101)	2 to 104	
2	Monitor Data (Input Only) (Monitor data)	Input Only	This unit → Scanner	64H (100)	2 to 1400	5 to 10000ms
			Scanner → This unit	FEH (254)	0	

When using the KEYENCE KV series (EtherNet/IP communication scanner), the names of the connections with the IV3 Series will be “Monitor/External Input” and “Monitor Data”. The relationship of each connection name is as described below.

1: Monitor Data And External Input → Monitor/External input
2: Monitor Data (Input Only) → Monitor data

Reference

- The trigger timings of each connection are controlled by the cyclic communications; and both the point-to-point and Multicast connection types are supported.
- If you wish to open “Exclusive Owner” and “Input Only” connections simultaneously, set the connection type to “Multicast” and match the RPI and the size.
- The details of each application type are as described below.

[Exclusive Owner]

- This connection allows you to configure the data transmission from the scanner to the IV3 Series, and vice versa.
- This connection type is used when the scanner will not only monitor the data of the IV3 Series but also provide external input to the IV3 Series.
- It is not possible for multiple scanners to open "Exclusive Owner" connections for a single IV3 Series unit.

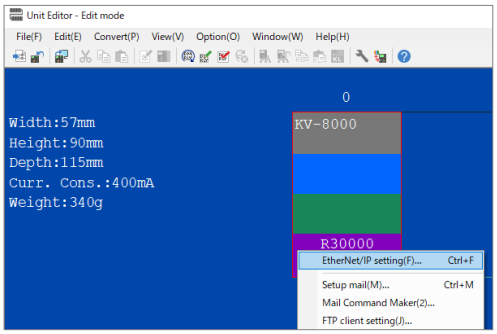
[Input Only]

- This connection only allows you to configure the data transmission from the IV3 Series to the scanner.
- This connection is used when the scanner will only monitor the data of the IV3 Series.
- Multiple scanners can simultaneously open “Input Only” connections for a single IV3 Series unit.
- If connections will be opened simultaneously from multiple scanners, set the connection type to “Multicast” and match the RPI and the size.

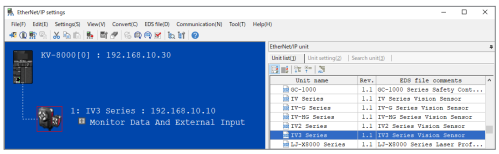
KEYENCE KV series settings

The following section explains the setting method when using KV-8000.
For details on the required setting methods such as the PLC unit configuration and the KV STUDIO settings for communication with a PC, refer to the KV Series manuals.

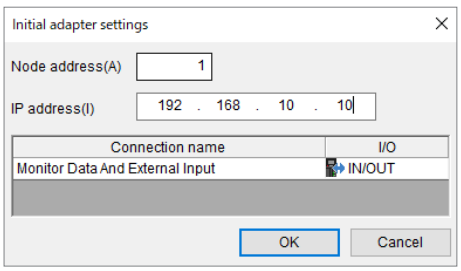
1 Right-click KV-8000 in the unit editor of KV STUDIO, and then select [EtherNet/IP setting].



2 Drag [IV3 Series] from the Unit list and add it to the scan list.

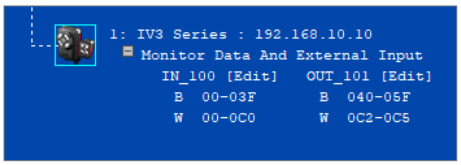


3 Set the Node address and IP address for the IV3 Series on the [Initial adapter settings] screen.

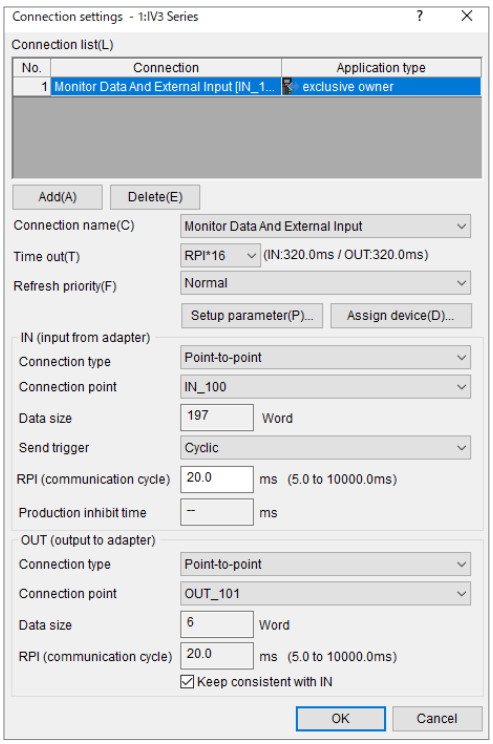


4 Modify the settings as necessary.

Click the connection name in the scan list.



The [Connection settings] screen will open.



Reference

- The default values of the EDS (EZ1) file are shown below.
  Input Assembly: 197 words (394 bytes)
  Output Assembly: 6 words (12 bytes)
- When entering tool information for Tools 17 to 64, change the Input Assembly data size to 1360 bytes.

● **Connection name**

Select [Monitor Data And External Input] or [Monitor data].

● **RPI (communication cycle)**

You can set the cyclic communication cycle.

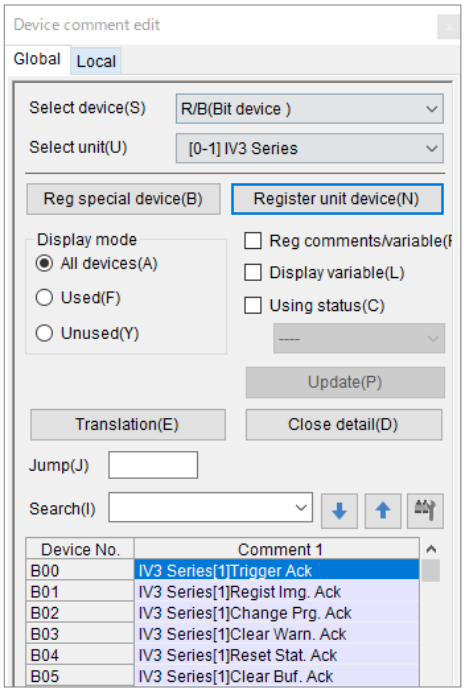
● **Connection type**

Select [Point-to-point] or [Multicast].

5 **Save the settings and close [EtherNet/IP settings] and the unit editor.**

6 **Select [Device comment edit window] from the [Edit] menu in KV STUDIO.**

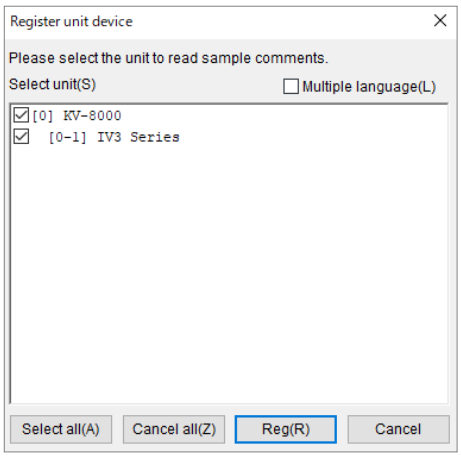
The [Device comment edit] screen will open.



Click [Details].

The [Register unit device] screen will open.

7 **Make sure that the [IV3 Series] checkbox is ON ☑ in the [Select unit] field, and then click the [Reg] button.**



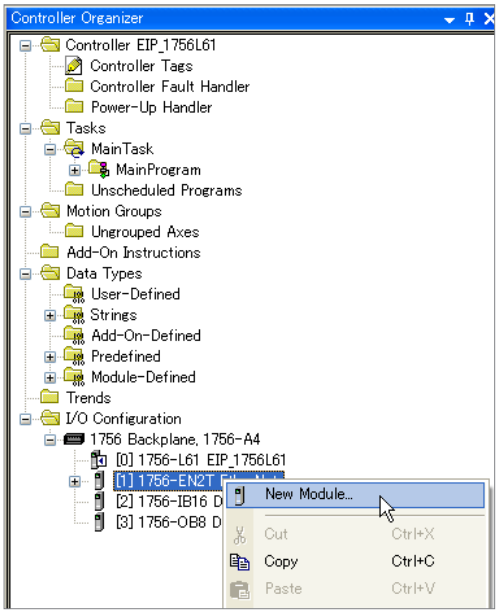
8 **Select [PLC Transfer] from the [Monitor/Simulator] menu of KV STUDIO.**

Rockwell Automation ControlLogix series settings

The following section explains the setting method when using a ControlLogix PLC.

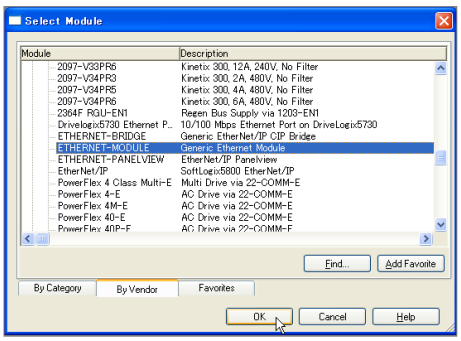
- The EDS file can be downloaded from the KEYENCE web site. The EDS file is also included in the folder in which the PC software for IV3 Series IV3-Navigator (IV3-H1) has been installed.
- The tag file which is used while communicating with Rockwell Automation PLC can be downloaded from the KEYENCE web site.

1 Select the EtherNet/IP communication unit to be connected with the IV3 Series in the I/O configuration of RsLogix5000, and then right-click to select [New Module].



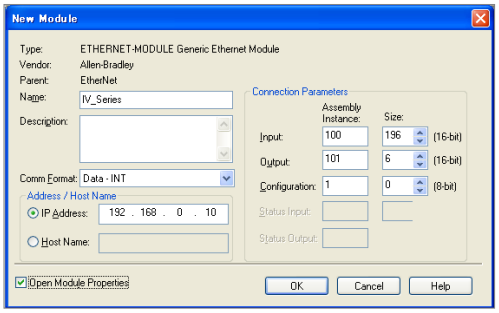
The [Select Module] screen will open.

2 Apply a filter with Communications, and then select EtherNET-MODULE (Generic Ethernet Module) and click the [OK] button.



The [New Module] screen will open.

3 Modify the settings as necessary.



- **Name (Device name)**

  You can assign a desired name. The following tags will be generated based on the entered names and used for the data sent and received using cyclic communication.
  - (Device name): I..... Information received from the IV3 Series
  - (Device name): O... Information to be sent to the IV3 Series
  - (Device name): C ... Not used.

- **Comm Format**

  Enter the desired format. Due to the structure of the assembly object, programming will be easier with a format that supports a 2-byte (INT) alignment.

- **IP Address**

  Enter the IP address of the IV3 Series.

- **Input (Assembly Instance)**

  Enter “100”.

- **Input (Size)**

  Enter the Input Assembly size of the IV3 Series. This depends on the Comm Format selected.

- **Output (Assembly Instance)**
  Enter “101”.
- **Output (Size)**
  Enter the Output Assembly size for the IV3 Series. This depends on the Comm Format selected.
- **Configuration (Assembly Instance)**
  Enter “1”.
- **Configuration (Size)**
  Enter “0”.

Reference

- Setting the Comm Format option to [Input Data] will enable you to establish cyclic communication with multiple PLCs using the “Input only” connection.
  To set the Comm Format to [Input Data], perform the following settings on each PLC.

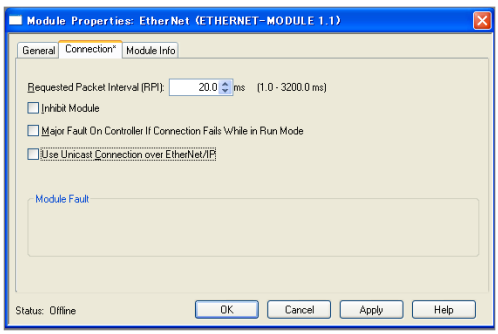
Item	Setting contents
Comm Format	Input Data-INT
Input (Assembly Instance)	100
Input (Size)	Input Assembly size of the IV3 Series The default value of the EDS file is 197 (394 bytes).
Output (Assembly Instance)	254
Output (Size)	Output Assembly size for the IV3 Series The default value of the EDS file is 6 (12 bytes).

If communications with multiple PLCs will be established using the “Input Only” connection, set the connection type to “Multicast”.

- For details of the Input Assembly and Output Assembly sizes for the IV3 Series, refer to “EtherNet/IP communication specifications in the IV3 Series” (Page 2-3) .
- When entering tool information for Tools 17 to 21, change the Input Assembly data size to 500 bytes.
- The upper limit for Input (Size) is 500 bytes. Tool information for Tools 22 to 64 cannot be entered.

4 Set the RPI (communication cycle) for cyclic communication.

Make sure to set a value longer than or equal to 5 ms.



5 Download the settings to the PLC.

The EtherNet/IP communication will be enabled when you switch to online after downloading the settings.

Data allocation in the cyclic communication

Input Assembly (IV3 Series → PLC)

Input Assembly are devices that write responses from the IV3 Series to the PLC.
The device map of the data allocated for the Input Assembly is as shown below.
These parameters output the statuses, status results and statistics information of the IV3 Series.
For details of each parameter, refer to 🕮 “Input Assembly parameter details” (Page 3-15).

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Setting value change response	SD card saving stop response	Buffer clear response	Statistics reset response	Warning clear response	Program switching response	Master registration response	Trigger response
1	Setting value change failed	SD card saving stop failed	Reserved by system			Program switching failed	Master registration failed	Trigger failed
2	SD card identification status	Trigger Ready	Ready	RUN	Imaging status	BUSY	Result update complete	Result available
3	Error	Warning	Buffer overrun	Insufficient free space on SD card	Reserved by system			Sorting mode information
4	Reserved by system	Overall judgment NG	LOGIC4	LOGIC3	LOGIC2	LOGIC1	Position correction	Overall judgment OK
5	Reserved by system							
6	Tool 8	Tool 7	Tool 6	Tool 5	Tool 4	Tool 3	Tool 2	Tool 1
7	Tool 16	Tool 15	Tool 14	Tool 13	Tool 12	Tool 11	Tool 10	Tool 9
8 - 9	Error No. (Unsigned 16-bit integer)							
10 - 11	Warning No. (Unsigned 16-bit integer)							
12 - 13	Number of remaining buffers (Unsigned 16-bit integer)							
14 - 15	Checksum (Unsigned 16-bit integer)							
16 - 17	Current program No. (Unsigned 16-bit integer)							
18 - 19	Program No. during judgment (Unsigned 16-bit integer)							
20 - 21	Result No. (Unsigned 16-bit integer)							
22 - 23	Processing time (Unsigned 16-bit integer)							
24 - 25	Processing time MAX (16-bit unsigned integer)							
26 - 27	Processing time MIN (Unsigned 16-bit integer)							
28 - 29	Processing time AVE (Unsigned 16-bit integer)							
30 - 31	Reserved by system							
32 - 35	Number of triggers (Unsigned 32-bit integer)							
36 - 39	Number of OKs (standard mode)/number of sorts (sorting mode) (Unsigned 32-bit integer)							
40 - 43	Number of NGs (Unsigned 32-bit integer)							
44 - 47	Number of trigger errors (Unsigned 32-bit integer)							
48 - 51	Reserved by system							

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
52 - 53	Position correction score (Unsigned 16-bit integer)							
54 - 55	Position correction score MAX (Unsigned 16-bit integer)							
56 - 57	Position correction score MIN (Unsigned 16-bit integer)							
58 - 59	Position correction score Lower threshold (Unsigned 16-bit integer)							
60 - 71	Reserved by system							
72 - 73	Tool 1 matching rate (Unsigned 16-bit integer)							
74 - 75	Tool 1 matching rate MAX (Unsigned 16-bit integer)							
76 - 77	Tool 1 matching rate MIN (Unsigned 16-bit integer)							
78 - 79	Tool 1 lower threshold (Unsigned 16-bit integer)							
80 - 81	Tool 1 upper threshold (Unsigned 16-bit integer)							
82 - 83	Decimal point position (Unsigned 16-bit integer)*1							
84 - 85	Pitch present value MAX/color average H (hue) (Unsigned 16-bit integer)*2							
86 - 87	Pitch present value MIN/color average S (saturation) (Unsigned 16-bit integer)*2							
88 - 89	Number of pitches/color average V (brightness)/brightness average (Unsigned 16-bit integer)*3							
90 - 91	Reserved by system							
92 - 391	Tool 2 to 16 (Same as Tool 1) The start address of tool number “n” is 72 + (n-1) x 20							
392 - 393	Master number/total status product type							
394	Tool 24	Tool 23	Tool 22	Tool 21	Tool 20	Tool 19	Tool 18	Tool 17
395	Tool 32	Tool 31	Tool 30	Tool 29	Tool 28	Tool 27	Tool 26	Tool 25
396	Tool 40	Tool 39	Tool 38	Tool 37	Tool 36	Tool 35	Tool 34	Tool 33
397	Tool 48	Tool 47	Tool 46	Tool 45	Tool 44	Tool 43	Tool 42	Tool 41
398	Tool 56	Tool 55	Tool 54	Tool 53	Tool 52	Tool 51	Tool 50	Tool 49
399	Tool 64	Tool 63	Tool 62	Tool 61	Tool 60	Tool 59	Tool 58	Tool 57
400 - 1359	Tool 17 to 64 (Same as Tool 1; assigned in groups of 20 bytes) The start address of tool number “m” is 400+(m-17) x 20							
1360 - 1399	Reserved by system							

*1: When scaling is enabled with the Width/Diameter/Pitch tool. For other tools and when the scaling is not enabled, the contents of the data are 0.

*2: When using the Pitch/Color Average tool. When not using these tools, the contents of the data are 0.

*3: When using the Pitch/Color Average/Brightness Average tool. When not using these tools, the contents of the data are 0.

Reference

When using standard mode and setting multiple position adjustment tools, the information of each position adjustment tool starting with the second one is assigned to a tool from Tool 1 to Tool 64.

Point

The data allocation when the OCR tool is used is as follows:
- 72-73: Tool 1 matching rate (unsigned 16-bit integer)
- 74-75: Tool 1 lower threshold (unsigned 16-bit integer)
- 76-77: Text read #1 to 2
- 78-79: Text read #3 to 4
- 80-81: Text read #5 to 6
- 82-83: Text read #7 to 8
- 84-85: Text read #9 to 10
- 86-87: Text read #11 to 12
- 88-89: Text read #13 to 14
- 90-91: Text read #15 to 16

The data allocation of sorting mode is as follows:
- 394-395: Tool 1 status product type (unsigned 16-bit integer)
- 396-397: Tool 2 status product type (unsigned 16-bit integer)
- 398-399: Tool 3 status product type (unsigned 16-bit integer)

Input Assembly parameter details

■ Input Assembly Address 0: Control result (response)

The Bits at Address 0 of the Input Assembly have the following functions:

Address	Bit	Item	Content	Data content
0	0	Trigger response	Stores the external trigger response.	0 : OFF 1 : ON
	1	Master image registration response	Stores the master image registration response.	0 : OFF 1 : ON
	2	Program switching response	Stores the program switching response.	0 : OFF 1 : ON
	3	Warning clear response	Stores the warning clear response.	0 : OFF 1 : ON
	4	Statistics reset response	Stores the statistics reset response.	0 : OFF 1 : ON
	5	Buffer clear response	Stores the buffer clear response.	0 : OFF 1 : ON
	6	SD card saving stop response	Stores the SD card saving stop response.	0 : OFF 1 : ON
	7	Setting value change response	Stores the setting value change response.	0 : OFF 1 : ON

■ Input Assembly Address 1: Control error result

The Bits at Address 1 of the Input Assembly have the following functions:

Address	Bit	Item	Content	Data content
1	0	Trigger failed	This bit is output when the external trigger is unsuccessful.	0 : - 1 : The external trigger has failed.
	1	Master image registration failed	This bit is output when the master image registration is unsuccessful.	0 : - 1 : Master image registration has failed.
	2	Program switching failed	This bit is output when program switching is unsuccessful.	0 : - 1 : Program switching has failed.
	3 to 5	Reserved by system	---	---
	6	SD card saving stop failed	This bit is output when the SD card saving stop is unsuccessful. This occurs when the sensor is in [Setting] status. This bit does not turn ON when the SD card is not identified.	0 : - 1 : The SD card saving stop has failed.
	7	Setting value change failed	This bit is output when the setting value change is unsuccessful.	0 : - 1 : The setting value change has failed.

■ Input Assembly Address 2 to 3: Handshake control/status/error result

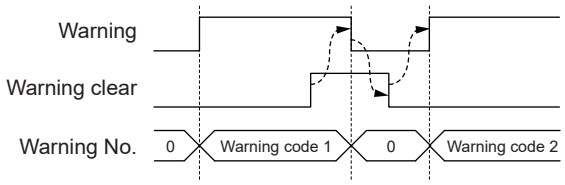
The Bits at Address 2 to 3 of the Input Assembly have the following functions:

Address	Bit	Item	Content	Data content
2	0	Result available	This bit is output when the status result can be acquired.	0 : The status result cannot be acquired. 1 : The status result can be acquired.
	1	Result update complete	This bit switches the ON/OFF statuses when the status result is updated.	0 <=> 1: The statuses will be switched when the status result is updated.
	2	BUSY	This bit is output when the unit is unable to accept new trigger inputs, such as while performing imaging, processing a judgment, registering an external master image, switching programs, etc.	0 : The unit is not in busy status. 1 : The unit is in busy status.
	3	Imaging	This bit is output while the unit is performing imaging operation.	0 : The unit is not performing imaging operation. 1 : The unit is performing imaging.
	4	RUN	This bit is output when the unit is “RUN” and no system errors have occurred.	0 : The unit is not in operation. 1 : The unit is operating normally.
	5	Ready	This bit is output when the start-up sequence of this unit completes after power-on.	0 : The start-up has not completed yet. 1 : The start-up has completed.
	6	Trigger Ready	This is output when the trigger can be received.	0: The trigger cannot be received. 1: The trigger can be received.
	7	SD card identification status	This bit is output when the SD card is identified correctly.	0 : The SD card has not been identified. 1 : The SD card has been identified.

Address	Bit	Item	Content	Data content
3	0	Sorting mode information	This bit is output when the unit is in [RUN] status and Sorting mode.	0 : In [RUN] status in standard mode 1 : In [RUN] status in Sorting mode
	1 to 3	Reserved by system	---	---
	4	Insufficient free space on SD card	This bit is output when the free space on the SD card is 100 MB or less.	0 : No insufficient free space error has occurred. 1 : An insufficient free space (100 MB or less) error has occurred.
	5	Buffer overrun status	If handshake control is [Enabled], this bit is output when an overrun of the status result has occurred.	0 : No buffer overrun has occurred. 1 : The buffer is in overrun status.
	6	Warning status	This bit outputs the warning status of the unit.	0 : The unit is not in warning status. 1 : The unit is in warning status.
	7	Error status	This bit outputs the error status of the unit.	0 : The unit is not in error status. 1 : The unit is in error status.

Reference

- By monitoring whether the unit is in “Imaging” status, you can determine whether the target object or the unit can be moved before completion of the image processing.
- “BUSY” and “Imaging” statuses may be skipped in some cyclic frequency settings. It is therefore necessary to take the imaging condition into consideration when setting the cyclic frequency.
- Warning statuses can be cleared from the EtherNet/IP communication. For the warning details, refer to the warning code. The first occurred warning code will be displayed.
- When two or more warnings are issued, all subsequent warnings after the first warning will be saved in the history. If you clear the warnings, the warning code of the highest priority warning will be displayed.



- Error statuses cannot be cleared from the EtherNet/IP communication. For the error details, refer to the error code. The error code of the highest priority error will be displayed.
- The buffer overrun status can be cleared using a warning clear.

■ Input Assembly Address 4 to 7 and 394 to 399: Status result

The Bits at Address 4 to 7 and 394 to 399 of the Input Assembly have the following functions:

Address	Bit	Item	Content	Data content
4	0	Overall judgment OK	Displays the “total status result is OK”.	0 : NG 1 : OK
	1	Position correction	Displays the position correction result.	0 : NG 1 : OK
	2	Logic 1	Displays the result of Logic 1.	0 : NG 1 : OK
	3	Logic 2	Displays the result of Logic 2.	0 : NG 1 : OK
	4	Logic 3	Displays the result of Logic 3.	0 : NG 1 : OK
	5	Logic 4	Displays the result of Logic 4.	0 : NG 1 : OK
	6	Overall judgment NG	Displays the “total status result is NG”.	0 : OK 1 : NG
	7	Reserved by system	---	---
5	0 to 7	Reserved by system	---	---
6	0 to 7	Tools 1 to 8	Assigns to Bit 0 to Bit 7 the results of Tools 1 to 8 and displays these results.	0 : NG 1 : OK
7	0 to 7	Tools 9 to 16	Assigns to Bit 0 to Bit 7 the results of Tools 9 to 16 and displays these results.	0 : NG 1 : OK
394	0 to 7	Tools 17 to 24	Assigns to Bit 0 to Bit 7 the results of Tools 17 to 24 and displays these results.	0 : NG 1 : OK
395	0 to 7	Tools 25 to 32	Assigns to Bit 0 to Bit 7 the results of Tools 25 to 32 and displays these results.	0 : NG 1 : OK
396	0 to 7	Tools 33 to 40	Assigns to Bit 0 to Bit 7 the results of Tools 33 to 40 and displays these results.	0 : NG 1 : OK
397	0 to 7	Tools 41 to 48	Assigns to Bit 0 to Bit 7 the results of Tools 41 to 48 and displays these results.	0 : NG 1 : OK
398	0 to 7	Tools 49 to 56	Assigns to Bit 0 to Bit 7 the results of Tools 49 to 56 and displays these results.	0 : NG 1 : OK
399	0 to 7	Tools 57 to 64	Assigns to Bit 0 to Bit 7 the results of Tools 57 to 64 and displays these results.	0 : NG 1 : OK

Reference

- If the position correction/logic/tool is not set, the data content will be “0”.
- If the status result of the tool is either “trigger standby” (no judgment) or “judgment not possible”, the data content will be OFF (0).

In sorting mode, Address 394 to 399 have the following functions:

Address	Data type	Item	Content	Data content
394 to 395	UINT	Tool 1 status product type	Stores the product type determined by Tool 1 when the Tool 1 status result is OK (1).	0: M0 or NG 1 to 7: M1 to M7
396 to 397	UINT	Tool 2 status product type	Stores the product type determined by Tool 2 when the Tool 2 status result is OK (1).	0: M0 or NG 1 to 7: M1 to M7
398 to 399	UINT	Tool 3 status product type	Stores the product type determined by Tool 3 when the Tool 3 status result is OK (1).	0: M0 or NG 1 to 7: M1 to M7

Point

- Check against each tool's status result. If the product type cannot be determined (the result is NG), the value becomes 0.
- The product types determined by Tools 4 to 8 in sorting mode cannot be displayed.

■ Input Assembly Address 8 to 23: Error/status/status result information

The Bits at Address 8 to 23 of the Input Assembly have the following functions:

Address	Data type*	Item	Content	Data content
8 to 9	UINT	Error code	Displays the currently occurring error code.	0 to 128
10 to 11	UINT	Warning code	Displays the currently occurring warning code.	0 to 128
12 to 13	UINT	Number of remaining buffers	Displays the number of status results that can be buffered, if handshake control is [Enabled].	0 to 10
14 to 15	UINT	Checksum	Displays the current sensor setting status using an arbitrary 5-digit integer.	0 to 65535
16 to 17	UINT	Current program No.	Displays the current program No.	0 to 127
18 to 19	UINT	Program No. during judgment	Displays the program No. of the latest judgment process.	0 to 127
20 to 21	UINT	Result No.	Displays the judgment process counts.	0 to 32767
22 to 23	UINT	Processing time	Displays the processing time of the latest judgment process.	0 to 10000

* UINT : Unsigned 16-bit integer
UDINT : Unsigned 32-bit integer

Reference

- The unit of processing time is msec.
- If two or more errors are occurring at the same time, the error code of the highest priority error will be displayed.
  “Error code list” (Page 3-33)
- The first occurred warning code will be displayed.
  “Warning code list” (Page 3-35)
- A checksum can be used to monitor whether the sensor settings have been modified by a third party.
- The checksum can check whether program is switched.
- The checksum will remain unchanged even if you change the IP address, subnet mask, default gateway or port number of the IV3 Series.
- For the number of remaining buffers, refer to “Reading out the status result (handshake control: [Enable])” (Page 3-42).
- The upper limit value of the result No. is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- The result No. will also count the judgment process counts that were skipped due to the cyclic frequency setting.

■ Input Assembly Address 24 to 51: Statistics information

The Bits at Address 24 to 51 of the Input Assembly have the following functions:

Address	Data type*	Item	Content	Data content
24 to 25	UINT	Processing time MAX	Displays the maximum processing time value.	0 to 10000
26 to 27	UINT	Processing time MIN	Displays the minimum processing time value.	0 to 10000
28 to 29	UINT	Processing time AVE	Displays the average processing time value.	0 to 10000
30 to 31	---	Reserved by system	---	---
32 to 35	UDINT	Number of triggers	Displays the total number of triggers issued.	0-999999999
36 to 39	UDINT	OK count (standard mode) Total sort count (sorting mode)	Displays the total number of issued triggers whose total status result was “OK” or with which the product type was determined.	0-999999999
40 to 43	UDINT	Number of NGs (standard mode/sorting mode)	Displays the total number of issued triggers whose total status result was “NG” or with which the product type was not determined.	0-999999999
44 to 47	UDINT	Number of trigger errors	Number of triggers issued that generated a trigger error	0-999999999
48 to 51	---	Reserved by system	---	---

* UINT : Unsigned 16-bit integer
UDINT : Unsigned 32-bit integer

Reference

- The unit of processing time is msec.
- The maximum number of triggers is 999999999. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- The maximum value for the number of OK triggers, number of NG triggers, and the number of trigger errors is 999999999. The value will stop updating when the upper limit value is reached.
- A reset will occur in the following conditions:
  - When [Statistics reset] is input
  - When a tool is added/deleted/copied
  - When the sensor is switched OFF
  - When the program is switched
  - When a correction for the sensor is started
  - When the sensor is initialized

■ Input Assembly Address 52 to 71: Position correction information

The Bits at Address 52 to 71 of the Input Assembly have the following functions:

Address	Data type*	Item	Content	Data content
52 to 53	UINT	Position adjustment tool matching rate	Stores the matching rate of the position adjustment tool.	0 to 100
54 to 55	UINT	Position adjustment tool matching rate MAX	Stores the maximum matching rate value of the position adjustment tool.	0 to 100
56 to 57	UINT	Position adjustment tool matching rate MIN	Stores the minimum matching rate value of the position adjustment tool.	0 to 100
58 to 59	UINT	Position adjustment tool threshold	Stores the threshold value of the position adjustment tool.	0 to 100
60 to 71	---	Reserved by system	---	---

* UINT : Unsigned 16-bit integer
UDINT : Unsigned 32-bit integer

Reference

Maximum and minimum matching rate values of the position adjustment tool will be reset in the same manner as the statistics information.
If the position adjustment tool is not set, the data content will be “0”.

■ Input Assembly Address 72 to 391 and 400 to 1359: Tool information (other than OCR tool)

The Bits at Address 72 to 391 and 400 to 1359 of the Input Assembly have the following functions:

Address	Data type*	Item	Content	Data content
72 to 73	UINT	Tool 1 matching rate	Stores the matching rate of Tool 1.	0 to 9999
74 to 75	UINT	Tool 1 matching rate MAX	Stores the maximum matching rate value of Tool 1.	0 to 9999
76 to 77	UINT	Tool 1 matching rate MIN	Stores the minimum matching rate value of Tool 1.	0 to 9999
78 to 79	UINT	Tool 1 lower threshold	Stores the lower threshold value of Tool 1.	0 to 9999
80 to 81	UINT	Tool 1 upper threshold	Stores the upper threshold value of Tool 1.	0 to 9999
82 to 83	UINT	Tool 1 decimal point position	Stores the decimal point position for matching rate when scaling is enabled with the Width/ Diameter/Pitch tool.	0: No decimal point 1: 1 digit after decimal point 2: 2 digits after decimal point 3: 3 digits after decimal point
84 to 85	UINT	Tool 1 pitch present value MAX, color average H (hue)	Maximum value of all pitches	0 to 9999
			Color Average tool H (hue)	0 to 359
86 to 87	UINT	Tool 1 pitch present value MIN, color average S (saturation)	Minimum value of all pitches	0 to 9999
			Color Average tool S (saturation)	0 to 255
88 to 89	UINT	Tool 1 number of pitches, color average V (brightness), brightness average	Number of pitches	0 to 9999
			Color Average tool V (brightness)	0 to 255
			Brightness Average tool brightness	0 to 255
90 to 91	---	Reserved by system	---	---

The information of tools 2, 3, ... 64 will be assigned for each 20-byte Address of Input Assembly.

* UINT : Unsigned 16-bit integer

Reference

- Maximum and minimum matching rate values of the tool will be reset in the same manner as the statistics information.
- If the tool is not set, the data content will be “0”.
- If the upper threshold value of the tool is not set, the data content of the tool’s upper limit value will be “65535”.
- The decimal point position when the scaling is enabled is applied to the data results of matching rate, matching rate MAX, matching rate MIN, lower threshold, upper threshold, pitch present value MAX, pitch present value MIN.
  (Example): When the “Tool 1 matching rate” is 505 and “Tool 1 decimal point position” is 1, the matching rate of Tool 1 is “50.5”.
- The information for tools (other than the learning tool) in sorting mode outputs the information of the tool that was determined as the master image registered to the judged product type. If the status of sorting is NG, the information of product type M0 is output. However, MAX, MIN, and the thresholds are invalid values.

■ Input Assembly Address 72 to 391 and 400 to 1359: Tool information (for the OCR tool)

The Bits at Address 72 to 391 and 400 to 1359 of the Input Assembly have the following functions:

Address	Data type*	Item	Content	Data content
72 to 73	UINT	Tool 1 matching rate	Stores the matching rate of Tool 1.	Shade contrast setting Disable: 0, 100 Enable: 0 to 100
74 to 75	UINT	Tool 1 lower threshold	Stores the lower threshold value of Tool 1.	Shade contrast setting Disable: 50 (fixed value) Enable: 0 to 100
76 to 91	----	Tool 1 text read	Stores text read (up to 16 letters) by Tool 1. If the number of letters is less than 16, the remaining devices are stored as NULL.	ASCII

The information of tools 2, 3, ... 64 will be assigned for each 20-byte Address of Input Assembly.

* UINT : Unsigned 16-bit integer

● Example of tool 1 text read

Number of triggers	Text read	Address															
		76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
1st	ABCDEF	A (0x41)	B (0x42)	C (0x43)	D (0x44)	E (0x45)	F (0x46)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
2nd	ABF	A (0x41)	B (0x42)	F (0x46)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
3rd	ABCDEFGHIJKLMNOP	A (0x41)	B (0x42)	C (0x43)	D (0x44)	E (0x45)	F (0x46)	G (0x47)	H (0x48)	I (0x49)	J (0x4A)	K (0x4B)	L (0x4C)	M (0x4D)	N (0x4E)	O (0x4F)	P (0x50)
4th	2019.3.28	2 (0x32)	0 (0x30)	1 (0x31)	9 (0x39)	. (0x2E)	3 (0x33)	. (0x2E)	2 (0x32)	8 (0x38)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
5th	---- (No text read)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)

Point

- All addresses (72 to 91) are simultaneously updated at each trigger. The previous data is discarded.
- Data with no read text is stored as NULL (0x00).
- Read text is output as ASCII code.
- Correctly set byte swap in accordance with the PLC specifications.
  “Setting the IV3 Series” (Page 3-3)
- If outputting the data type of STRING, use 15 or fewer characters of the read text. As NULL cannot be stored for the 16th letter, the text may not be output correctly.
- If the tool is not set, the data content will be “0”.

■ Input Assembly Address 392: Master number/total status product type

The Bits at Address 392 of the Input Assembly have the following functions:

Address	Data type*	Item	Content	Data content
392 to 393	UINT	In standard mode with multiple master registration enabled: master number	Stores the master number (00 to 07) from the total status result obtained from the results of each tool when “total status result is OK” is OK (1).	0: 00 or NG 1 to 7: 01 to 07
		In sorting mode: total status product type	Stores the product type (M0 to M7) from the total status result obtained from the results of each tool when “total status result is OK” is OK (1).	0: M0 or NG 1 to 7: M1 to M7

* UINT: Unsigned 16-bit integer

Point

- Check that “total status result is NG” is OK (1), and then check the master number or product type. If the master number or product type cannot be determined (the result is NG), the value becomes 0.
- When obtaining the master number, set [Total status condition] as shown below. Failing to do so will prevent you from obtaining correct master numbers.
  - Total status condition: Logic n (n = 1 to 4)
  - Logic n setting
    - Logic: OR
    - Set master number (Master00 to Master07): Use

  For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- If there are multiple master numbers whose status is OK, the lowest master number is output.

Output Assembly (PLC → IV3 Series)

Output Assembly are devices that write instructions from the PLC to the IV3 Series.
The device map of the data allocated for the Output Assembly is as shown below.
These parameters are responsible for the control instructions for the IV3 Series, clearing of warnings, and handshake control.
For details of each parameter, refer to “Output Assembly parameter details” (Page 3-27).

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Setting value change request	SD card saving stop request	Buffer clear request	Statistics reset request	Warning clear request	Program switching request	Master registration request	Trigger request
1	Reserved by system							
2	Reserved by system							Result acquisition complete notification
3	Reserved by system							
4 - 5	Program No.							
6 - 7	Upper/lower limit setting No. (tools other than the OCR tool) Master text setting No. (OCR tool) FTP/SD-saved setting No. (FTP client / SD card saving function)							
8 - 11	Upper/lower limit (tools other than the OCR tool) Master text/number of letters (OCR tool) FTP/SD saving settings (FTP client / SD card saving function)							
12 - 103	Reserved by system							

Reference

When using standard mode and setting multiple position adjustment tools, the information of each position adjustment tool starting with the second one is assigned to a tool from Tool 1 to Tool 64.

Output Assembly parameter details

■ Output Assembly Address 0 to 1: Control request

The Bits at Address 0 to 1 of the Output Assembly have the following functions:

Address	Bit	Item	Content	Data content
0	0	Trigger request	Requests the external trigger.	0 : OFF 1 : ON
	1	Master image registration request	Requests a master image registration.	0 : OFF 1 : ON
	2	Program switching request	Requests program switching.	0 : OFF 1 : ON
	3	Warning clear request	Requests a warning clear.	0 : OFF 1 : ON
	4	Statistics reset request	Requests a statistics reset.	0 : OFF 1 : ON
	5	Buffer clear request	Requests a buffer clear.	0 : OFF 1 : ON
	6	SD card saving stop request	Requests to stop the saving of data to the SD card. Execute this request before turning off the sensor.	0 : OFF 1 : ON
	7	Setting value change request	Requests a setting value change.	0 : OFF 1 : ON
1	0 to 7	Reserved by system	---	---

Reference

- The following will occur when a buffer clear is requested:
  - If handshake control is [Enabled]
    - The current status result will be cleared.
    - The status result in the buffer will be cleared.
    - The result available bit will become OFF (0).
    - The number of remaining buffers will become “10”.
  - If the handshake control is [Disabled]
    - The current status result will be cleared.
    - The result available bit will become OFF (0).
- If you are switching programs using EtherNet/IP communication, set the [Switching method] option to [Monitor/PC/Network]. For details of the setting, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- Buffer overrun and warning statuses will not be cleared even if you execute a buffer clear request.
- To request a trigger, set the [Trigger Type] option to [External Trigger].
- [Internal Trigger Control with IN1 Input] cannot be used.

■ Output Assembly Address 2 to 3: Handshake control

The Bits at Address 2 to 3 of the Output Assembly have the following functions:

Address	Bit	Item	Content	Data content
2	0	Result acquisition complete notification	Permits the updating of the status result.	0: OFF 1: ON
	1 to 7	Reserved by system	---	---
3	0 to 7	Reserved by system	---	---

Reference

A result acquisition completion notice is used when handshake control is [Enabled].
Updating of the status result will be permitted when you request a result acquisition completion notice.
For details, refer to 🕮 “Reading out the status result (handshake control: [Enable])” (Page 3-42).

■ Output Assembly Address 4 to 5: Program No.

The Bits at Address 4 to 5 of the Output Assembly have the following functions:

Address	Data type*	Items	Content	Data content
4 to 5	UINT	Program number	Stores the program No. for when a program switching is requested.	0 to 127

* UINT: Unsigned 16-bit integer

■ Output Assembly Address 6 to 11: Threshold (for a tool other than the OCR tool)

The Bits at Address 6 to 11 of the Output Assembly for tools other than the OCR tool have the following functions:

Address	Data type*	Items	Content	Data content
6 to 7	UINT	Upper/lower limit setting No.	Stores the tool and direction of the threshold value to be changed.	0 to 129
8 to 11	UDINT	Upper/lower limit	Stores the threshold value for when a threshold value change is requested.	0 to 99999

* UINT: Unsigned 16-bit integer
UDINT: Unsigned 32-bit integer

Reference

The setting value setting number rules are shown below.
0: Position correction lower threshold
1: Reserved by system
2: Tool 1 lower threshold 3: Tool 1 upper threshold
4: Tool 2 lower threshold 5: Tool 2 upper threshold
6: Tool 3 lower threshold 7: Tool 3 upper threshold
:
32: Tool 16 lower threshold 33: Tool 16 upper threshold
:
128: Tool 64 lower threshold 129: Tool 64 upper threshold

To change the threshold of a tool which is using scaling function, input the value which is 10 times of the threshold in [Threshold].
Example) 9999 → 99990 99.9 → 999

NOTICE

Cutoff processing is done for a number of 4 or more digits.
Example) 99995 → 99990

■ Output Assembly Address 6 to 11: Master text (for the OCR tool)

The Bits at Address 6 to 11 of the Output Assembly for the OCR tool have the following functions:

Address	Data type*	Items	Content	Data content
6 to 7	UINT	Master text setting No.	Stores the destination for a master text change. Divides the 16 master letters into groups of four letters. Specifies a tool number and location of the text to be changed.	• When the text is read: 201 to 456 • When the date is read: 701 to 956 • When only judging the number of letters: 501 to 628
8 to 11	----	Master text	Stores the master text/ number of letters after a change. The master text is changed in groups of four letters.	• Master text (ASCII) when the text/date reading settings are set • Minimum and maximum number of letters from 1 to 16 when judging only the number of letters (UDINT*)

* UINT: Unsigned 16-bit integer
UDINT: Unsigned 32-bit integer

● To change the master text/date

- Specify [Master text setting No.] and write the text in the applicable address number in the table below.
- The master text/date changes in groups of four letters. Also append NULL (0x00) to the end of the text that you want to change. Overwrite the text from the beginning of the text until NULL (0x00) at the end in groups of four letters. Not appending NULL (0x00) will not allow you to correctly change the master text/date. If you overwrite all 16 letters, NULL (0x00) does not need to be appended.
- When the master text/date is changed, it is not saved in non-volatile memory.
- For details of how to change the master text, see “Changing the master text” (Page 3-51).

Address	Stored data								
	Tool 1				Tool 2		…	Tool 64	
6 to 7 (UINT)	201	202	203	204	205	…	…	…	456
8	1st letter	5th letter	9th letter	13th letter	1st letter	…	…	…	13th letter
9	2nd letter	6th letter	10th letter	14th letter	2nd letter	…	…	…	14th letter
10	3rd letter	7th letter	11th letter	15th letter	3rd letter	…	…	…	15th letter
11	4th letter	8th letter	12th letter	16th letter	4th letter	…	…	…	16th letter

Address	Stored data								
	Tool 1				Tool 2		…	Tool 64	
6 to 7 (UINT)	701	702	703	704	705	…	…	…	956
8	1st letter	5th letter	9th letter	13th letter	1st letter	…	…	…	13th letter
9	2nd letter	6th letter	10th letter	14th letter	2nd letter	…	…	…	14th letter
10	3rd letter	7th letter	11th letter	15th letter	3rd letter	…	…	…	15th letter
11	4th letter	8th letter	12th letter	16th letter	4th letter	…	…	…	16th letter

● To set the number of letters when judging only the number of letters

Address	Stored data								
	Tool 1		Tool 2		Tool 3		…	Tool 64	
6 to 7 (UINT)	501	502	503	504	505	…	…	627	628
8 to 11 (UDINT)	Minimum number of letters	Maximum number of letters	Minimum number of letters	Maximum number of letters	Minimum number of letters	…	…	Minimum number of letters	Maximum number of letters

Point

Correctly set byte swap in accordance with the PLC specifications.
“Setting the IV3 Series” (Page 3-3)

■ Output Assembly Address 6 to 11: FTP/SD-saved file name (FTP client / SD card saving function)

The Bits at Address 6 to 11 of the Output Assembly for the FTP client / SD card saving function have the following functions:

Address	Data type*	Item	Content	Data content
6 to 7	UINT	FTP/SD-saved setting No.	• Stores the transfer condition number for the file name to change and the setting number specifying whether to write to non-volatile memory. • Stores the setting number specifying the character position in the file name to change. The 64-character file name is subdivided so the setting number can be specified in groups of four letters.	• File name transfer condition number and specifying whether to write to non-volatile memory: 1001 • File name character position specification: 1011 to 1026
8 to 11		FTP/SD saving settings	When [FTP/SD-saved setting No.] is 1001 Bit 0: Transfer condition 1 Bit 1: Transfer condition 2 Bit 2: Transfer condition 3 Bit 3: Transfer condition 4 Bits 4 to 7: Reserved by system Bit 8: Write to non-volatile memory Bits 9 to 31: Reserved by system When [FTP/SD-saved setting No.] is 1011 to 1026 Stores the file name after it is changed in groups of four letters.	When [FTP/SD-saved setting No.] is 1001 0: OFF, 1: ON When [FTP/SD-saved setting No.] is 1011 to 1026 File name character (ASCII)

* UINT: Unsigned 16-bit integer

● To change the FTP/SD-saved file name

- Write 1001 to [FTP/SD-saved setting No.: Addresses 6 to 7] and specify the transfer condition for changing the file name.
- Use [FTP/SD saving settings: Addresses 8 to 11] to set to ON (1) the bit of the transfer condition number to change. If multiple bits are set to ON (1), the condition with the smallest number is specified. If all the bits are set to OFF (0), transfer condition 1 is specified. Set the non-volatile memory writing flag bit to OFF (0) when not writing and to ON (1) when writing.

Address	Stored data
6 to 7 (UINT)	1001

Address	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
8	Reserved by system				Transfer condition 4	Transfer condition 3	Transfer condition 2	Transfer condition 1
9	Reserved by system							Non-volatile memory writing flag
10	Reserved by system							
11	Reserved by system							

- Write to [FTP/SD-saved setting No.: Addresses 6 to 7] the setting number corresponding to the character position in the file name to change.
- Write to [FTP/SD saving settings: Addresses 8 to 11] the character string after the change.
- Change the file name in groups of four letters. Add a NULL (0x00) after the character string to change to. Overwrite the file name in groups of four letters from the starting letter to the ending NULL (0x00). If NULL (0x00) is not added, it will not be possible to change to the correct file name. When overwriting all 64 characters, there is no need to add NULL (0x00).
- For details on how to make this change, refer to “Changing the FTP/SD-saved file name” (Page 3-53).

Address	Stored data						
6 to 7 (UINT)	1011	1012	1013	1014	…	1025	1026
8	1st letter	5th letter	9th letter	13th letter	…	57th letter	61st letter
9	2nd letter	6th letter	10th letter	14th letter	…	58th letter	62nd letter
10	3rd letter	7th letter	11th letter	15th letter	…	59th letter	63rd letter
11	4th letter	8th letter	12th letter	16th letter	…	60th letter	64th letter

Error code list

The following shows the list of error codes that are generated in the IV3 Series.

Error code	Content	Cause	Countermeasure
0	No error	---	---
1 - 32	Program No. xx corruption error	• A data error has occurred in program No. xx. • Data corruption may have occurred due to a power-off while writing settings data and/or due to noise.	• Initialize the program No. xx. • Cycle power to the sensor. • Do not switch off the unit while the settings are being saved. • If the error persists, contact your nearest KEYENCE office.
52	Program switching error (on startup; external input)	On startup, a program switching error (external input) occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Use external input to select a value from P000 to P031.
53	Program switching error (on startup; Panel/PC/Network/ Automatic Switching)	On startup, a program switching error (Panel/ PC/Network/Automatic Switching) occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup or operation mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Select a value from P000 to P031. • You can select whether to continue operation with P000 or to change to setup mode when the error message is cleared.
55	Program switching error (in [RUN] status)	While the unit was in [RUN] status, a program switching error occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Select a value from P000 to P031.
97 - 99	Non-volatile memory error	• A data error has occurred. • Data corruption may have occurred due to a power-off while writing settings data and/or due to noise.	• Initialize the settings of this unit. • Cycle power to the sensor. • Do not switch off the unit while the settings are being saved. • If the error persists, contact your nearest KEYENCE office.

Error code	Content	Cause	Countermeasure
95 - 96 100 - 128	System error	An error may have occurred in the sensor.	• Cycle power to the sensor. • If the error persists, contact your nearest KEYENCE office.
79	System error	No sensor head is connected to the sensor amplifier.	Connect a sensor head to the sensor amplifier, and then cycle power to the sensor. If the error persists, contact your nearest KEYENCE office.

Reference

If two or more errors are occurring at the same time, the error code of the highest priority will be displayed.
The greater the error code, the higher the priority of the error will be.

Warning code list

The following shows the list of warning codes that are generated in the IV3 Series.

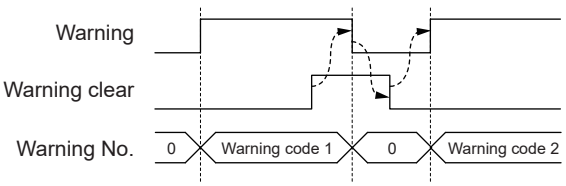
Warning code	Content	Cause	Countermeasure
0	No error	---	---
54	Expansion program setting mismatch error (normal)	While the unit was in [Setting] status, a program setting error occurred in the expansion program.	Identify the SD card containing the correct expansion program once more.
58	External master registration error (OCR)	For the new master image, the characters and date cannot be read with the OCR tool.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
60	Field Network Error, Invalid request (OCR/ threshold)	• A change to the master text/date, threshold, or character count has been requested from EtherNet/IP while the unit is in “Setting” status. • A threshold change for a tool whose threshold cannot be changed has been requested. • A parameter that is not valid has been entered.	• Make requests while the device is running. • Input a valid parameter. • When changing the master text/date or master text, the following situations are invalid: - The settings number is outside of the range of the data content - The specified tool is not being used - The specified tool is not the OCR tool - The specified OCR tool detection operation (character/date/character count) does not match the change request - When only judging the number of characters, the number of characters is outside of the data content range • Threshold changes are not valid for the following tools. - In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool - In sorting mode, tools other than the learning tool
61	Field network bad request error (FTP/SD)	A parameter that is not valid has been entered.	• Make requests while the device is running. • Set the transfer condition before making the request. • When saving to the SD card, set a file name with 16 characters or less before making the request. Character 17 and later are not valid. • Only use valid characters—listed below—in the file name. 0,1,2,3,,,,7,8,9 a,b,c,,d,,,,x,y,z A,B,C,D,,,,X,Y,Z ␣ (space symbol) (,),+,-,=,.,’,!,#,$,%,&,@, _

Warning code	Content	Cause	Countermeasure
62	Field network overrun error	An overrun of the status result has occurred.	• Request a result acquisition completion notice to permit the updating of the status result. • Refer to the operation procedure and reference program when setting the handshake control to [Enable]. • Set the handshake control to [Disable].
63	Field Network Error, Invalid request (Save Master)	External master registration has been requested from EtherNet/IP while the unit is in “Setting” status.	Do not request an external master registration while the unit is in “Setting” status.
64	Field Network Error, Invalid request (Change Program)	• Program switching has been requested from EtherNet/IP while the unit is in “Setting” status. • A program switching request to a non-existent program No. was made from EtherNet/IP. • A program switching requested was made from EtherNet/IP while the program switching method was set to [External input].	• Do not request a program switching while the unit is in “Setting” status. • Specify the correct program number. When SD card program expansion is set to [Disable], specify a number between 0 and 31. When it is set to [Enable], specify a number between 0 and 127. • If you are switching programs from EtherNet/IP, set the [Switching method] option to [Monitor/PC/Network].
65	Trigger error	A trigger was applied while the busy bit was ON. (If you have set the trigger error option to [Enable].)	Do not apply triggers while the unit is in the busy status.
66	External master registration error (Insufficient outline)	The outline tool is unable to extract the outline of the new master image.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
67	External master registration error (Insufficient area)	The color area/area tool is unable to extract the area of the new master image.	
68	External master registration error (Brightness correction failed)	The brightness of the new master image cannot be corrected appropriately.	
69	External master registration error (Insufficient edge faild)	The edge tool is unable to extract the edge of the new master image.	
70	FTP Transfer Error (Insufficient Data Buffer)	Transfer has failed because a volume of data exceeding the remaining FTP buffer capacity has been generated.	• Modify the trigger cycle of this unit. • Check the load status of the network.
71	FTP Transfer Error (Transfer Failed)	Data transfer to the destination folder has failed.	Check the access permissions of the destination folder.

Warning code	Content	Cause	Countermeasure
72	FTP Connection Error	Connection to the FTP server has failed.	• Check the IP address of the FTP server. • Check the port number of the FTP server. • Check the user name for logging into the FTP server. • Check the password for logging into the FTP server.
73	External master registration error (Insufficient work memory)	There is insufficient work memory.	Delete one or more detection tools.
74	External master registration error (No images)	There are no registered images for master registration.	Perform the master image registration after having captured the image to be used for the registration.
75	SD Card Transfer Error (Insufficient Transfer Buffer)	An SD card transfer error occurred because the data buffer was insufficient.	• Set the sensor trigger cycle to a longer value. • Use the result update complete bit to control the trigger. In this situation, set the busy output timing to “Until Data Transfer Is Complete”.
76	SD Card Transfer Error (Transfer Failed)	An SD card transfer error occurred because the transfer failed.	• Check the free space. • Remove the SD card from its slot, reinsert the SD card, and then close the cover. Check that the SD card indicator lights.
77	External master registration error (learning tool/sorting mode)	An external master registration request occurred when the learning tool or sorting mode was in use.	External master image registration cannot be used when the learning tool or sorting mode is in use.

Reference

• When two or more warnings are issued, all subsequent warnings after the first warning will be saved in the history.
If you clear the warnings, the warning code of the highest priority warning will be displayed.



• The greater the warning code, the higher the priority of the warning will be.
• The SD card saving stop failed warning will not occur.

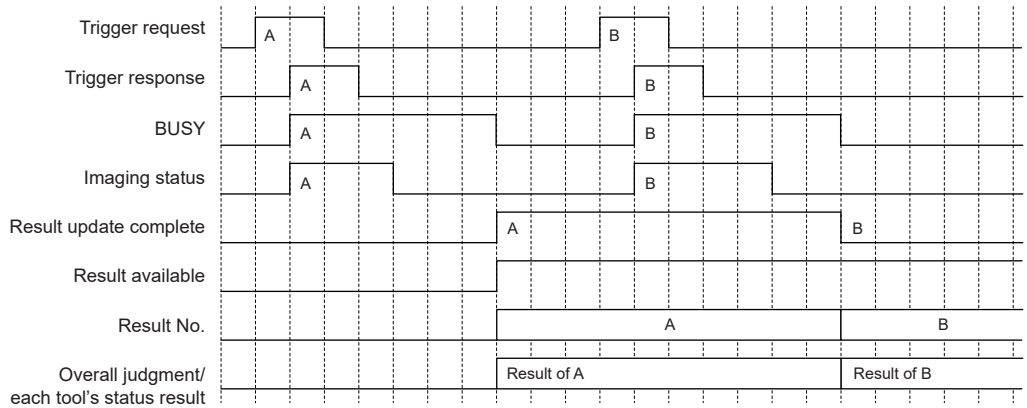
Operating procedure of the cyclic communication

This section explains the method for communicating from the PLC to the IV3 Series using cyclic communication.
It also introduces reference programs. When making use of the reference programs, give thought to items such as error processing during programming.

Reading out the status result (handshake control: [Disable])

The operation procedure when the data handshake control is set to [Disable] is shown below.

■ When a trigger is successful



(1) Execute a [Trigger request]. (0 → 1) Trigger request is retained until trigger response is set to ON
(2) If the trigger is valid, [Trigger response] will change from 0 to 1.
(3) Once the judgment process ends, the [Result update complete] Bit will switch and [Overall judgment]/ [Each tool's status result] will be updated. The read text will be updated for the OCR tool.

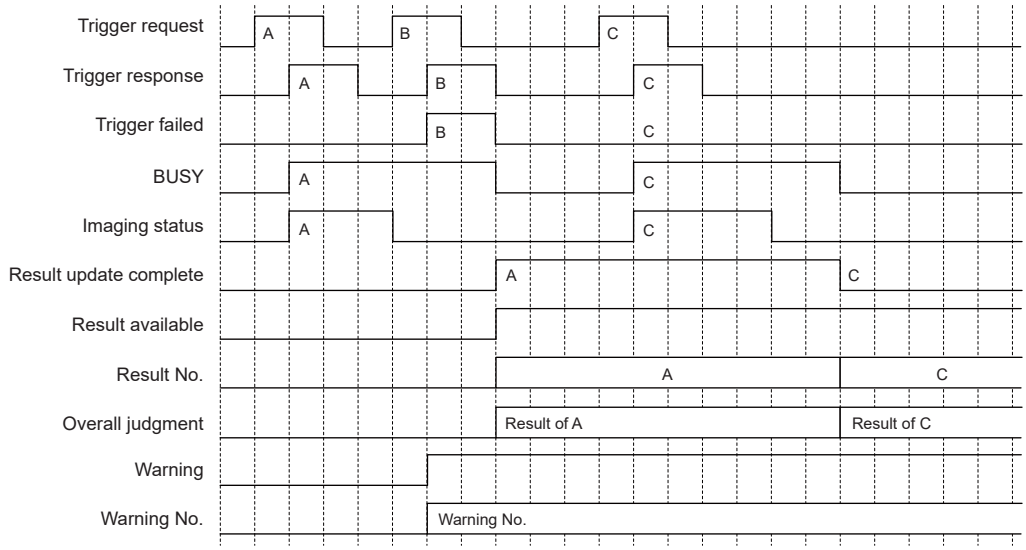
Point

Do not cancel (1 → 0) [Trigger request] before [Trigger response] changes from 0 to 1. The trigger may not be able to be requested correctly.

Reference

- [Result update complete] will switch (toggle) to "1" if its value was "0" after the previous judgment update or switch to "0" if its value was "1".
- [Result available] will switch from 0 to 1 at the timing when the first judgment process has been confirmed; and the new value will be retained thereafter.
- [Result available] will be reset in the following conditions:
  - If handshake control is set to [Disabled]
    - When the program is switched
    - When the unit's status is switched from "Setting" to "RUN"
    - When a buffer clear request is issued
  - If handshake control is set to [Enabled]
    - When a buffer clear request is issued
- [Result No.] will be counted up each time the status result is updated. The upper limit value is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- [Result No.] will also count the judgment process counts that were skipped due to the cyclic frequency setting.
- [Busy] and [Imaging] may be skipped in some cyclic frequency settings. It is therefore necessary to take the imaging condition into consideration when setting the cyclic frequency.

■ When a trigger is unsuccessful



(1) Execute a [Trigger request]. (0 → 1) Trigger request is retained until trigger response is set to ON
(2) If the trigger is valid, [Trigger response] will change from 0 to 1.
(3) When the judgment process ends, the [Result update complete] bit will be switched and the [Overall judgment] will be updated.
(4) If you wish to output trigger errors, set the trigger error option to [Enabled].
If a trigger has been input while the trigger error option is set to [Enabled] and the unit is in “BUSY” status, [Trigger failed] will change from 0 to 1 ignoring the trigger input. No judgment process will be performed for trigger B.
(5) If the trigger input is unsuccessful, [Warning] will switch from “0” to “1” and [Warning No.] will be updated to “65”. For details, refer to “Warning code list” (Page 3-35).

Point

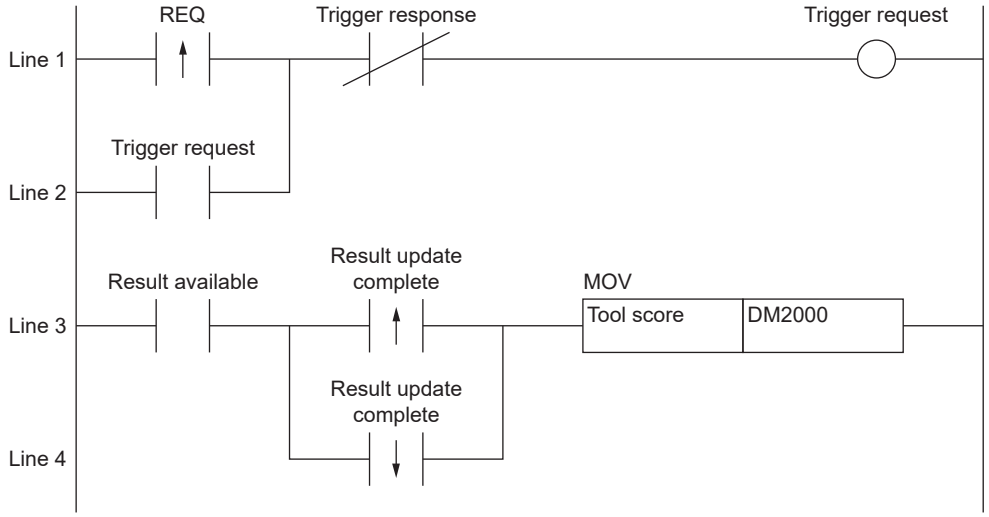
Do not cancel (1 → 0) [Trigger request] before [Trigger response] changes from 0 to 1. The trigger may not be able to be requested correctly.

Reference

- [Result update complete] will switch to “1” if its value was “0” after the previous judgment update (or from “0” to “1” if the previous value was “1”).
- [Result available] will switch from 0 to 1 at the timing when the first judgment process has been confirmed; and the new value will be retained thereafter.
- [Result No.] will be counted up each time the status result is updated. The upper limit value is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- [Result No.] will also count the judgment process counts that were skipped due to the cyclic frequency setting.
- [Busy] and [Imaging] may be skipped in some cyclic frequency settings. It is therefore necessary to take the imaging condition into consideration when setting the cyclic frequency.
- [Number of trigger errors] will be counted up at the timing when the [Result updated] BIT is switched.

Reference programs

■ KEYENCE KV series



Description of the reference program

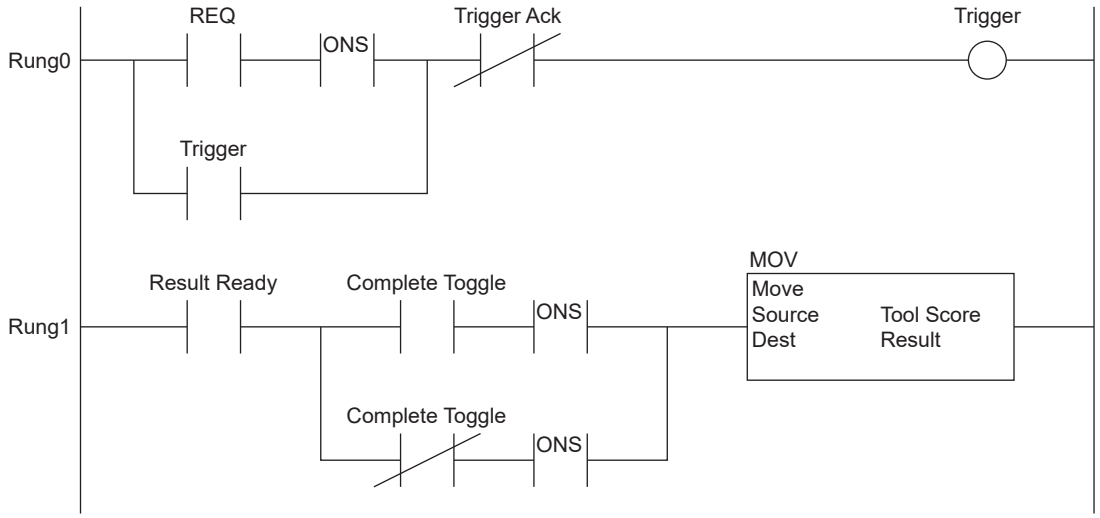
● Line 1/Line 2

Sets “REQ” to ON and executes a trigger request.
“Trigger response” ON will set “Trigger request” to OFF (“Trigger request” is retained until “Trigger response” is set to ON).

● Line 3/Line 4

“Result available” ON + Rising or falling of “Result update complete” will copy the data that have been written to the tool score to DM2000.

■ Rockwell Automation PLC



Description of the reference program

● Rung0

Sets “REQ” to ON and executes “Trigger”.
“Trigger Ack” ON will set Trigger to OFF (“Trigger” will be retained until “Trigger Ack” becomes ON).

● Rung1

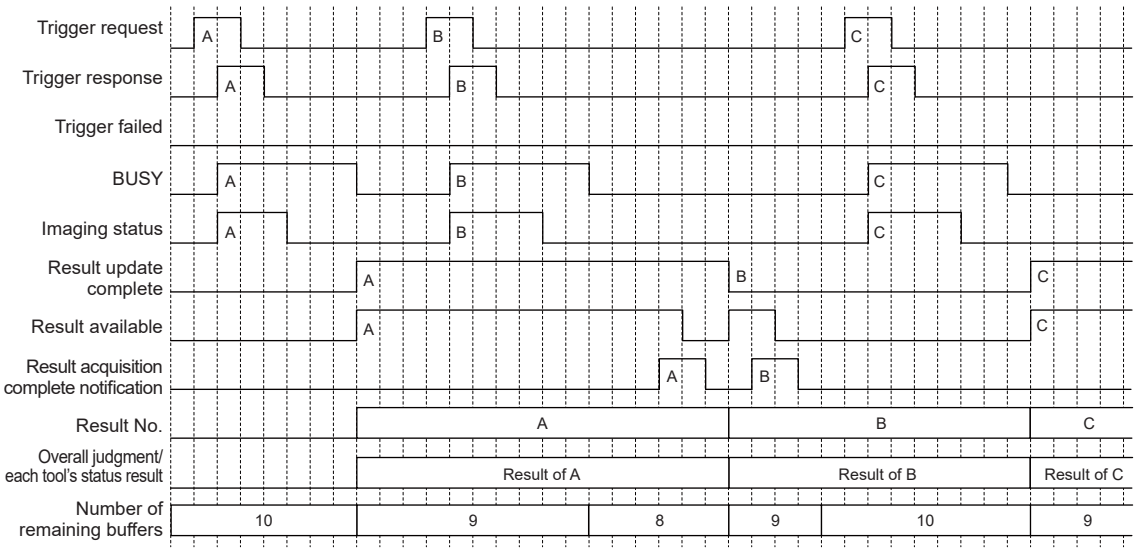
“Result Ready” ON + Rising or falling of “Complete Toggle” will copy the data that have been written to “Tool Score” to “Result”.

Point

To ensure synchronicity between Input Data and Output Data, use the CPS instruction at the beginning of the ladder.

Reading out the status result (handshake control: [Enable])

The following describes the operating procedure when the data handshake control is set to [Enabled].
You can acquire all status results without fail by setting the data handshake control to [Enabled].



(1) Execute a [Trigger request]. (0 → 1) Trigger request is retained until trigger response is set to ON
(2) If the trigger is valid, [Trigger response] will change from 0 to 1.
(3) Once the judgment process ends, the [Result update complete] Bit will switch, [Result available] will switch from 0 to 1, and [Overall judgment]/[Each tool's status result] will be updated. The read text will be updated for the OCR tool.
(4) [Number of remaining buffers] will be reduced by 1 when the status result is updated.
(5) Executes [Result acquisition complete notice] (0 → 1). [Number of remaining buffers] will be incremented by 1.

Point

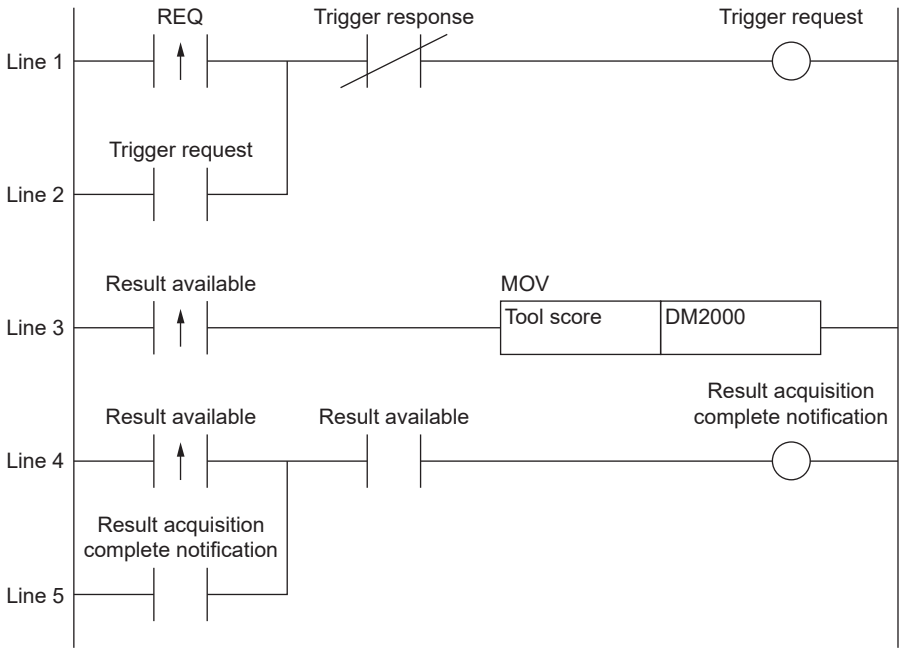
Do not cancel (1 → 0) [Trigger request] before [Trigger response] changes from 0 to 1. The trigger may not be able to be requested correctly.

Reference

- [Result update complete] will switch (toggle) to "1" if its value was "0" after the previous judgment update or switch to "0" if its value was "1".
- [Result No.] will be counted up each time the status result is updated. The upper limit value is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- [Result No.] will also count the judgment process counts that were skipped due to the cyclic frequency setting.
- [Busy] and [Imaging] may be skipped in some cyclic frequency settings. It is therefore necessary to take the imaging condition into consideration when setting the cyclic frequency.
- [Number of trigger errors] will be counted up at the timing when the [Result updated] BIT is switched.
- If handshake control has been set to [Enabled], the status result will not be updated until [Result acquisition complete notice] is set ON/OFF (0 → 1 → 0), even if the next trigger has been input and a judgment process has been executed.
- If a new trigger is input when [Number of remaining buffers] is "0", [Buffer overrun] will switch from "0" to "1". The status result from the new trigger will be ignored.
- [Buffer overrun] can be cleared using [Warning clear].

Reference programs

■ KEYENCE KV series



Description of the reference program

● Line 1/Line 2

Sets “REQ” to ON and executes a trigger request.
“Trigger response” ON will set “Trigger request” to OFF (“Trigger request” is retained until “Trigger response” is set to ON).

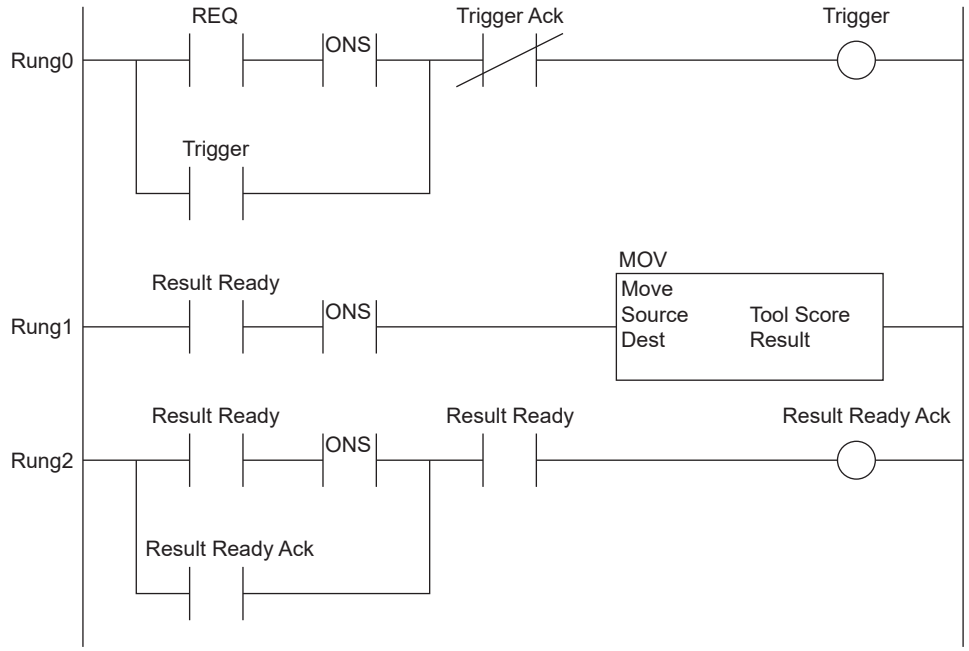
● Line 3

The result available bit becomes ON to copy the data written in the tool score to DM2000.

● Line 4/Line 5

“Result available” ON will execute a result acquisition completion notice.
“Result available” OFF will set “Result acquisition completion notice” to OFF (“Result acquisition completion notice” will be retained until “Result available” becomes OFF).

■ Rockwell Automation PLC



Description of the reference program

● Rung0

Sets “REQ” to ON and executes “Trigger”.
“Trigger Ack” ON will set Trigger to OFF (“Trigger” will be retained until “Trigger Ack” becomes ON).

● Rung1

“Result Ready” ON will copy the data written in “Tool Score” to “Result”.

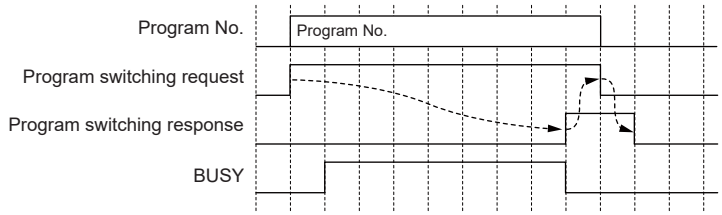
● Rung2

“Result Ready” ON will execute “Result Ready Ack”.
“Result Ready” OFF will set “Result Ready Ack” to OFF (“Result Ready Ack” will be retained until “Result Ready” becomes OFF).

Point

To ensure synchronicity between Input Data and Output Data, use the CPS instruction at the beginning of the ladder.

Switching the programs



(1) Write the program No. to be set to [Program No.].
(2) Execute [Program switching request], maintaining the state (0 → 1) until [Program switching response] is received.
(3) When the program switch is complete, [Program switching response] (0 → 1) is received.
(4) Once [Program switching response] is received, clear [Program switching request] (1 → 0). When [Program switching request] is cleared, [Program switching response] is cleared.

Point

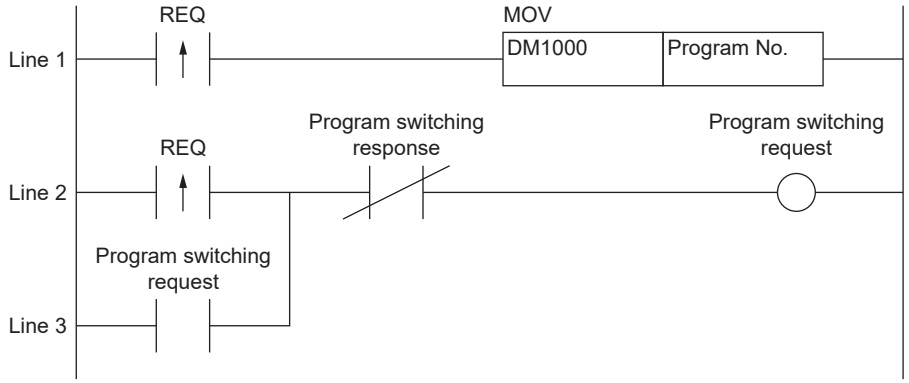
- Do not cancel (1 → 0) [Program switching request] before [Program switching response] changes from 0 to 1. The program may not be able to switch correctly.
- When [Program switching request] was canceled (1 → 0) before [Program switching response] changes from 0 to 1, execute (0 → 1) [Program switching request] and cancel (1 → 0) it again.

Reference

- [BUSY] will change from 0 to 1 while the program switching is in progress.
- If the program switching fails, [Program switching failed] will change from “0” to “1”.
- If the program switching is unsuccessful, [Warning] will switch from “0” to “1” and [Warning No.] will be updated to “64”. For details, refer to “Warning code list” (Page 3-35).
- You cannot switch programs using EtherNet/IP communication while the unit is in [Setting] status.
- If you are switching programs using EtherNet/IP communication, set the [Switching method] option to [Monitor/PC/Network]. For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- The program No. switched to from EtherNet/IP communication will be deleted when the power is turned off.

Reference programs

■ KEYENCE KV series



Description of the reference program

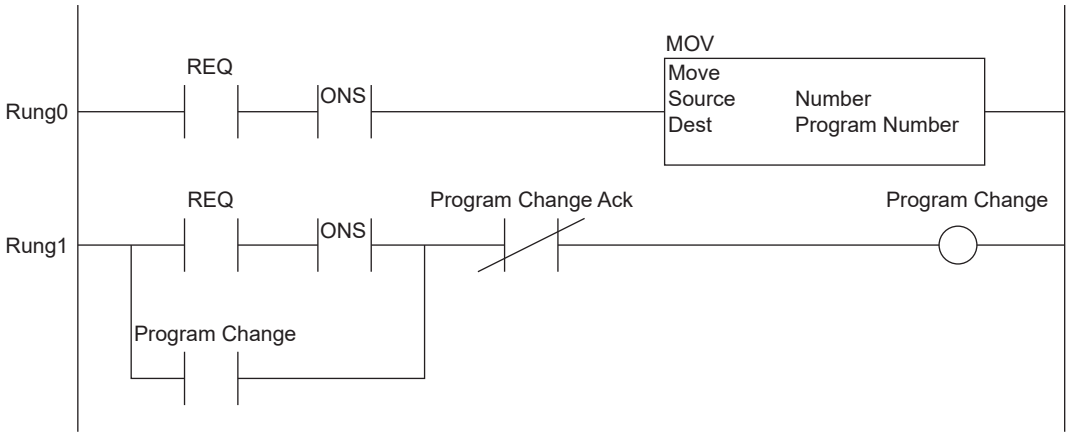
● Line 1

This line sets “REQ” to ON and copies the DM1000 data, which contains the program No. to be set, to the program No.

● Line 2/Line 3

Sets “REQ” to ON and executes a program switching request.
“Program switching response” ON to will set “Program switching request” to OFF (“Program switching request” will be retained until “Program switching response” becomes ON).

■ Rockwell Automation PLC



Description of the reference program

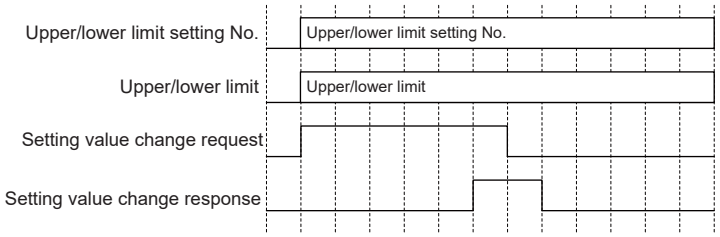
● Rung0

This line sets “REQ” to ON and copies the Number data, which contains the program No. to be set, to the program No.

● Rung1

Sets “REQ” to ON and executes “Program Change”.
“Program Change Ack” ON will set “Program Change” to OFF (“Program Change” will be retained until “Program Change Ack” becomes ON).

Changing the tool adjustment threshold



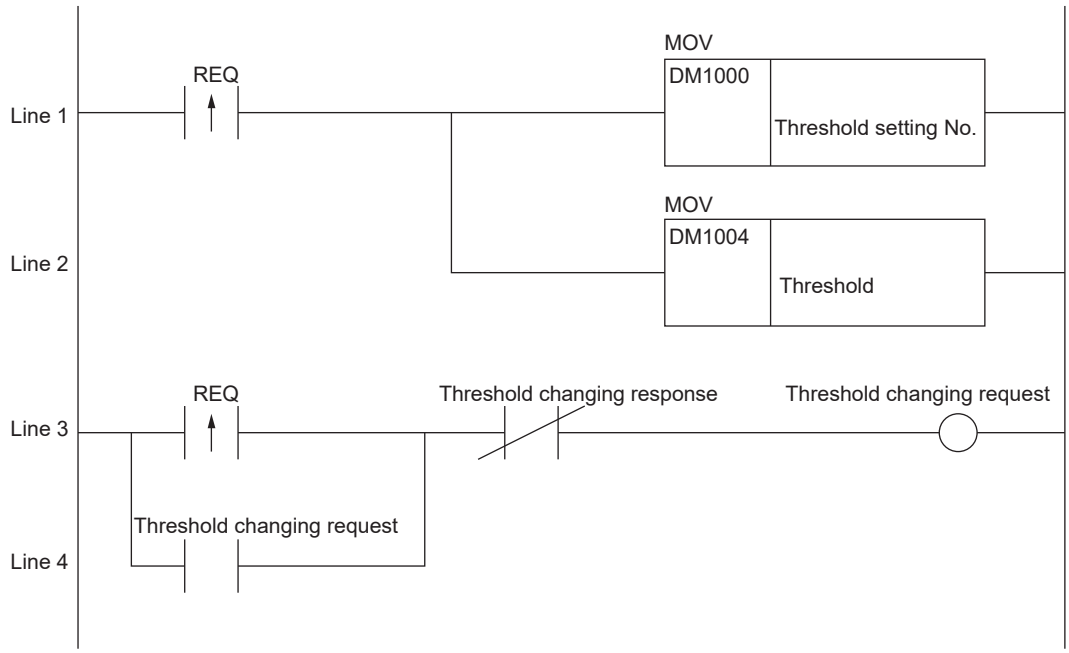
(1) Write the tool number and threshold type of the threshold to be changed to [Upper/lower limit setting No.].
(2) Write the threshold to be changed to [Upper/lower limit].
(3) Execute [Setting value change request]. (0→1)
(4) You can check the input status in [Setting value change response].

Reference

- If the setting value change fails, [Setting value change failed] will switch from “0” to “1”.
- If the setting value change fails, [Warning] will switch from “0” to “1” and [Warning No.] will be updated to 60. For details, refer to “Warning code list” (Page 3-35).
- Thresholds cannot be changed for the following tools.
  - In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool
  - In sorting mode, tools other than the learning tool

Reference programs

■ KEYENCE KV series



Description of the reference program

● **Line 1**

This line sets “REQ” to ON and copies the DM1000 data, which contains the threshold setting No. to be set, to the threshold setting No.

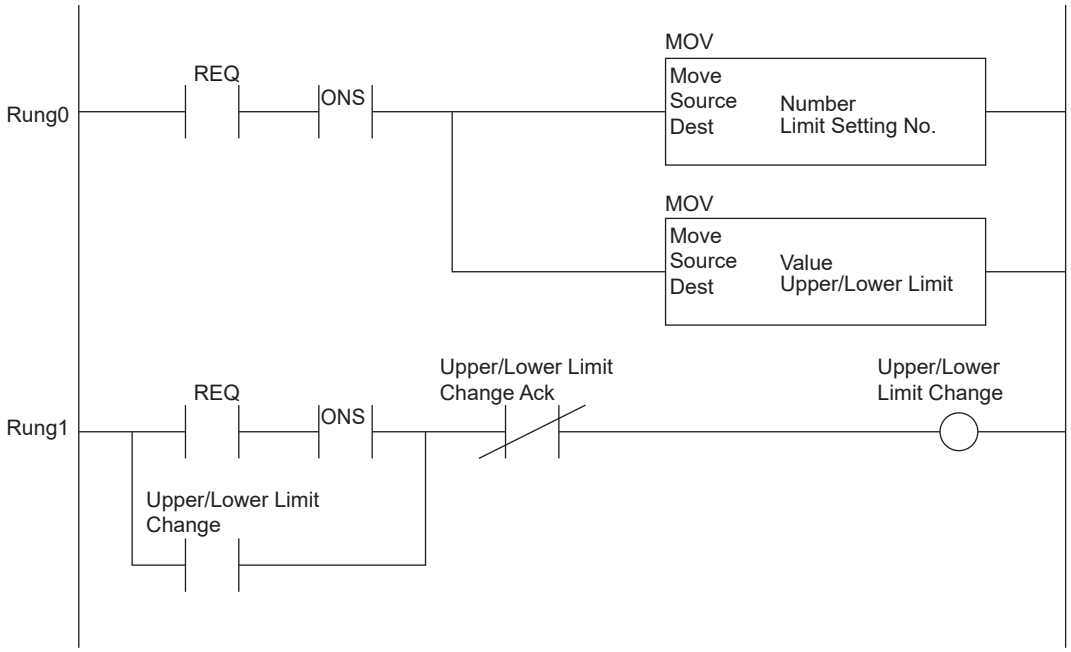
● **Line 2**

This line sets “REQ” to ON and copies the DM1004 data, which contains the threshold to be set, to the threshold.

● **Line 3/Line 4**

Sets “REQ” to ON and executes a threshold changing request.
“Threshold changing response” ON will set “Threshold changing request” to OFF (“Threshold changing request” will be retained until “Threshold changing response” becomes ON).

■ Rockwell Automation PLC



Description of the reference program

● Rung0

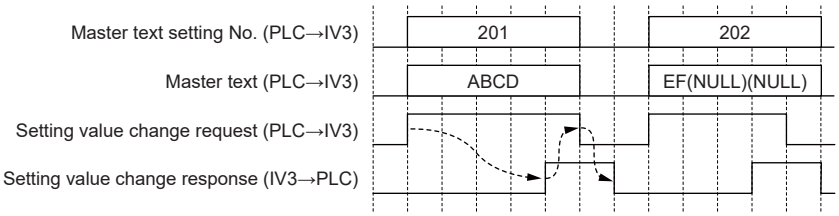
This line sets “REQ” to ON and copies the Number data, which contains the Limit Setting No. to be set, to the Limit Setting No. This line also copies the Value data, which contains the Upper/Lower Limit to be set, to the Upper/Lower Limit.

● Rung1

Sets “REQ” to ON and executes “Upper/Lower Limit Change”.
“Upper/Lower Limit Change Ack” ON will set “Upper/Lower Limit Change” to OFF.
(“Upper/Lower Limit Change” will be retained until “Upper/Lower Limit Change Ack” becomes ON.)

Changing the master text

This section shows the master text for Tool 1 changing to [ABCDEF] as an example. The text is overwritten twice in groups of four letters.



(1) Overwrite [Master text setting No.: Address 6 to 7] with 201 (master text (first to fourth letter) when the read text settings are set with Tool 1).
(2) Overwrite [Master text: Address 8] with A (0x41), [Master text: Address 9] with B (0x42), [Master text: Address 10] with C (0x43), and [Master text: Address 11] with D (0x44).
(3) Execute [Setting value change request] (0→1). The request is retained until [Setting value change response] can be confirmed.
(4) Once the change is complete, [Setting value change response] changes from 0 to 1.
(5) Setting [Setting value change request] to 0 sets [Setting value change response] to 0.
(6) Overwrite [Master text setting No.: Address 6 to 7] with 202 (master text (fifth to eighth letter) when the read text settings are set with Tool 1).
(7) Overwrite [Master text: Address 8] with E (0x45), [Master text: Address 9] with F (0x46), [Master text: Address 10] with NULL (0x00), and [Master text: Address 11] with NULL (0x00).
(8) Execute [Setting value change request] (0→1). The request is retained until [Setting value change response] can be confirmed.
(9) Once the change is complete, [Setting value change response] changes from 0 to 1.
(10) Setting [Setting value change request] to 0 sets [Setting value change response] to 0.

Point

Append NULL text to the end of the text.
If you change “ABCDEFG” to “1234” and did not write NULL, the text is changed to “1234EFG”.

Example of a failure	Master text/date							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Master text/date before change	A	B	C	D	E	F	G	NULL
Text to be written	1	2	3	4	None			
Master text/date after change	1	2	3	4	E	F	G	

Example of a success	Master text/date							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Master text/date before change	A	B	C	D	E	F	G	NULL
Text to be written	1	2	3	4	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
Master text/date after change	1	2	3	4				

Point

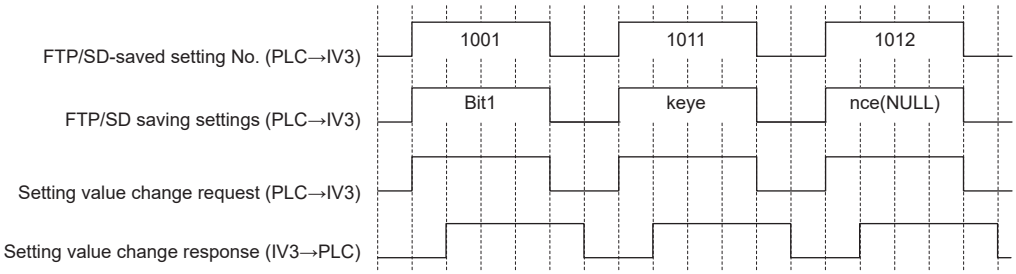
- Arbitrary text can be changed in groups of four letters.
  To change “2019.4.5” to “2019.4.6”, you can change only 202 for [Setting value setting No.: Address 6 to 7] (master text (fifth to eighth letter) when the read text settings are set with Tool 1).

	Master text/date							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Master text/date before change	2	0	1	9	.	4	.	5
Text to be written	None				.	4	.	6
Master text/date after change	2	0	1	9	.	4	.	6

- Changes in groups of four are applied immediately. Do not execute a trigger until all text changes are complete.

Changing the FTP/SD-saved file name

This section shows an example in which the transfer condition 2 file name is changed to “keyence”. No data is written to non-volatile memory.
The text is overwritten twice in groups of four letters.

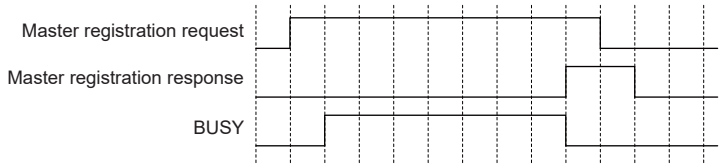


(1) Write 1001 to [FTP/SD-saved setting No.: Addresses 6 to 7] to enable the specification of the transfer condition number.
(2) Set [FTP/SD saving settings: Address 8 Bit 1] to ON (1). (Specify transfer condition 2.)
Set [FTP/SD saving settings: Address 9 Bit 0] to OFF (0). (No writing to non-volatile memory)
(3) Execute [Setting value change request: Address 0 Bit 7] (0→1). The request is retained until [Setting value change response] can be confirmed.
(4) Once the transfer condition number specification is complete, [Setting value change response] changes from 0 to 1.
(5) Setting [Setting value change request: Address 0 Bit 7] to 0 sets [Setting value change response] to 0.
(6) Overwrite [FTP/SD-saved setting No.: Addresses 6 to 7] with 1011 (first to fourth letter of the FTP/SD-saved file name).
(7) Overwrite [FTP/SD saving settings: Address 8] with k (0x6B), [FTP/SD saving settings: Address 9] with e (0x65), [FTP/SD saving settings: Address 10] with y (0x79), and [FTP/SD saving settings: Address 11] with e (0x65).
(8) Execute [Setting value change request: Address 0 Bit 7] (0→1). The request is retained until [Setting value change response] can be confirmed.
(9) Once the transfer condition number specification is complete, [Setting value change response] changes from 0 to 1.
(10) Setting [Setting value change request: Address 0 Bit 7] to 0 sets [Setting value change response] to 0.
(11) Overwrite [FTP/SD-saved setting No.: Addresses 6 to 7] with 1012 (fifth to eighth letter of the FTP/SD-saved file name).
(12) Overwrite [FTP/SD saving settings: Address 8] with n (0x6E), [FTP/SD saving settings: Address 9] with c (0x63), [FTP/SD saving settings: Address 10] with e (0x65), and [FTP/SD saving settings: Address 11] with NULL (0x00).
(13) Execute [Setting value change request: Address 0 Bit 7] (0→1). The request is retained until [Setting value change response] can be confirmed.
(14) Once the transfer condition number specification is complete, [Setting value change response] changes from 0 to 1.
(15) Setting [Setting value change request: Address 0 Bit 7] to 0 sets [Setting value change response] to 0.

Point

- Append the NULL character to the end of the text.
  If you change “ABCDEF” to “1234” and did not write NULL, the text is changed to “1234EF”.
- Arbitrary text can be changed in groups of four letters.
  To change “ABCDEF” to “ABCDGH”, you can change only 1012 for [FTP/SD-saved setting No.: Addresses 6 to 7] (the fifth to eighth letters of the FTP file name).
- Changes in groups of four letters are applied immediately. Do not execute a trigger until all text changes are complete.
- If multiple transfer condition numbers are specified, the condition with the smallest number is used.
- If data is not written to non-volatile memory, the set transfer condition number and file name will be deleted when the power is turned off.

Registering a master image externally



(1) Execute a [Master registration request]. (0 → 1)
(2) You can check the input status in [Master registration response].

Reference

- [BUSY] will change from 0 to 1 while the master image registration is in progress.
- If the master image registration is unsuccessful, [Master registration failed] will change from 0 to 1.
- If the master image registration is unsuccessful, [Warning] will switch from “0” to “1” and [Warning No.] will be updated according to the failure details. For details, refer to “Warning code list” (Page 3-35).
- You cannot register a master image from the EtherNet/IP communication while the unit is in [Setting] status.
- If you wish to write the master registration data to the sensor ROM, set the [Write to ROM at external master reg.] option to [Yes]. For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- Master images cannot be registered externally when the learning tool is in use or in sorting mode.

MEMO

4

PROFINET

This chapter describes the overview of PROFINET and the PROFINET communication specifications and functions of the IV3 Series.

Overview of PROFINET

What is PROFINET?

PROFINET is an open industrial networking standard developed and maintained by the PI (PROFINET International).
All supported devices can use the communication network regardless of the vendor.
PROFINET allows easy integration with the currently used field bus (such as PROFIBUS), enabling you to protect existing assets without modifying the legacy system.

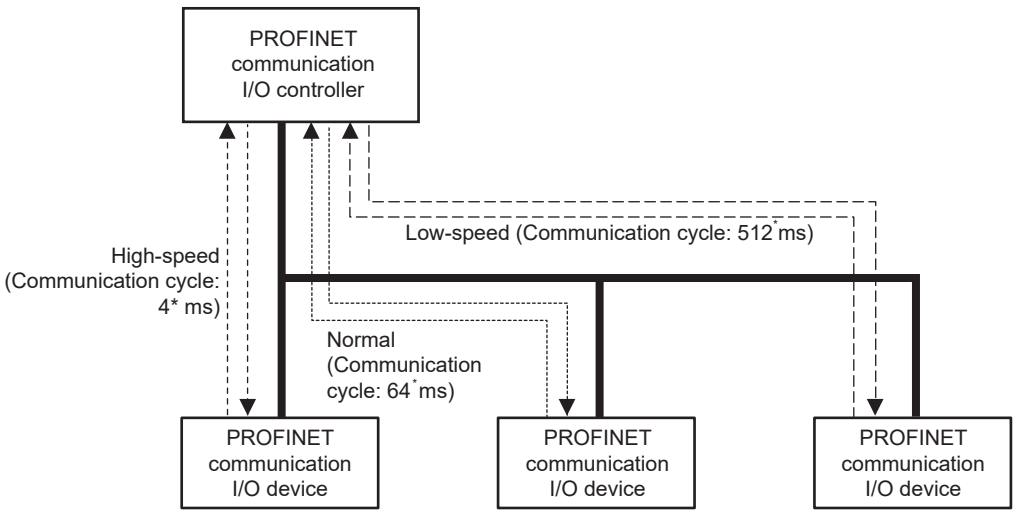
The following two types of communication standards exist for the PROFINET communication: PROFINET CBA communication for data communications between processes and between I/O controllers, and PROFINET I/O communication for data communications between the I/O controller and I/O device.

The PROFINET communication for the IV3 Series supports the PROFINET I/O communication and complies with Conformance Class B.

The PROFINET I/O communication offers the following two types of communication methods for cyclic data: Real-time communication (RT) and isochronous real-time communication (IRT).
Real-time communication provides similar communication performance as the existing field bus, such as the device control in normal factory automation, using Ethernet. The isochronous real-time communication is capable of meeting stringent real-time requirements, including synchronized motion control.

Real-time communications offer the following two types of communications: Data I/O communication for sending and receiving data periodically, and record data communication for sending and receiving commands/responses at arbitrary timings. In data I/O communication, you can set the SendCycle (Communication cycle) based on the priority of the data to be sent/received, enabling sending/receiving of data with adjusted overall communication load. Record data communication is used for communication applications that require little punctuality (unlike the data I/O communication).

The IV3 Series supports the data I/O communication provided by the real-time communications (RT).



* If you configure the setting to "auto", the overall communication load will be adjusted and the SendCycle (Communication cycle) will be set automatically.

PROFINET communication specifications and functions in the IV3 Series

IV3 Series PROFINET communication specifications

Data I/O communication	**Communication size**	to 1400 byte

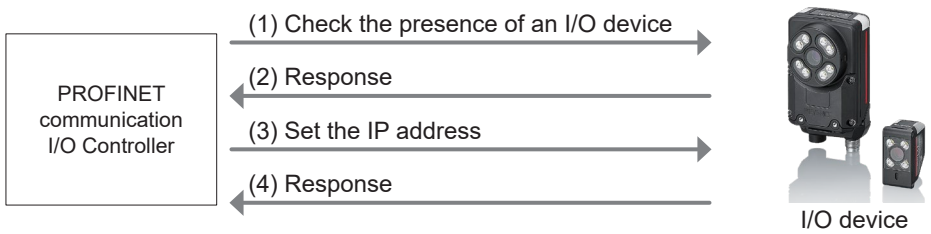
Specifying the IP address using the DCP protocol

In PROFINET communication, you can specify the IP address of I/O devices using the DCP protocol (Discovery and Configuration Protocol).

The DCP protocol offers two methods for setting the IP address.

(1) The IP address can be set by the I/O controller based on the device name information of the I/O device.

(2) The IP address and device name of the I/O device can be set by the I/O supervisor (PC, etc.).



Reference

- If the IP address of the I/O device will be set by the I/O controller, the I/O device name must match the name in the config of the I/O controller.
- If the IP address will be set by the DCP protocol, the IP address of the sensor will be initialized.
- The IP address set by the DCP protocol will be stored in the volatile memory. When you restart the sensor, the sensor will start up with its IP address in "----" (unregistered) status.

Overview of the PROFINET communication functions of the IV3 Series

The functions that can be used to control the IV3 Series via PROFINET communication are listed below.

Function	Content
Trigger input	Executes a trigger input for the sensor.
Program switching	Executes program switching for the sensor.
External master registration	Executes an external master registration for the sensor.
Setting value (judgment threshold) rewriting	Rewrites the threshold that is used as the reference for tool judgment.
Master text/master date rewriting	Rewrites the master text/master date that is used as the reference for OCR tool judgment.
Rewrite FTP/SD-saved file name	Rewrites the name of the image file to transfer to the FTP server or SD card.
Warning clear input	Executes a warning clear.
Read out status	Allows you to check the unit status (Imaging, RUN, BUSY, Error, etc.).
Read overall status result	Reads out the overall status result.
Read judgment processing time	Reads out the processing time of the judgment.
Read each tool's status result	Read each tool's status result
Read statistics information	Reads out the number of triggers issued and the number of trigger errors.

Point

- If you are switching programs using PROFINET communication, set the [Switching method] option to [Panel/PC/Network/Automatic Switching]. For details on the setting method, refer to the "IV3 Series User's Manual (Control Panel/PC Software)".
- If external master registration will be executed frequently using PROFINET communication, set the [Write to ROM at external master reg.] option to [No] in order to protect the non-volatile memory within the sensor. For details on the setting method, refer to the "IV3 Series User's Manual (Control Panel/PC Software)".
- If the FTP/SD-saved file name will be rewritten frequently using PROFINET communication, set the [Non-volatile memory writing flag] bit to OFF (0) in order to protect the non-volatile memory within the sensor. For details, refer to "To change the FTP/SD-saved file name" page 5-24.

List of supported PLCs

Check the instruction manual of each PLC for details of the setting methods.

Siemens PLC

PLC model	PROFINET communication unit	Firmware version	Software used	Version of the software used
S7 300 series Example: CPU315-2 PN/DP	- (Built in the unit)	V3.2.6	TIA Portal	15.1
S7 1200 series Example: CPU1212C	- (Built in the unit)	V4.2	TIA Portal	15.1
S7 1500 series Example: CPU1516-3 PN/DP	- (Built in the unit)	V2.06.0	TIA Portal	15.1

When using STEP 7, use V5.6.

Phoenix Contact PLC

PLC model	PROFINET communication unit	Firmware version	Software used	Version of the software used
ILC 350 PN	- (Built in the unit)	V 3.53F.13	PC WORX	6.10.56

MEMO

5

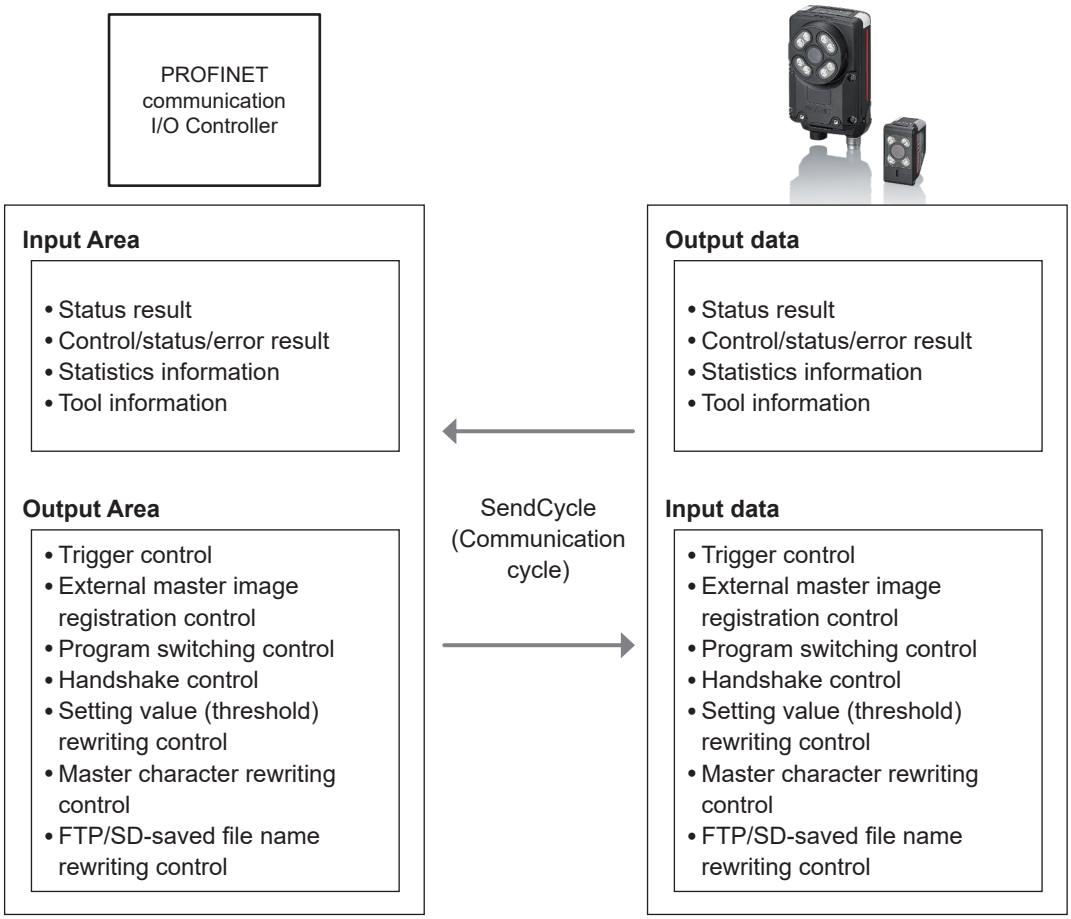
Data I/O communication

This chapter describes the overview, setting method, data allocation, and operating procedure of data I/O communication in the PROFINET communication.

Overview of the data I/O communication

What is data I/O communication?

This function enables cyclic (i.e. in fixed intervals) data communications with PROFINET devices. This function provides high-speed control in several to several tens of milliseconds.
The communication can be controlled by referencing and updating the variables in the PLC, making it easy to control the programs on the PLC side.



Point

- Communication settings for data I/O communication, such as SendCycle (communication cycle) and the data size, will be configured on the PLC side.
- In a network with many connected devices (including PROFINET devices), a network delay and/or packet loss may occur when there is a heavy load on the network. Conduct a thorough verification before the operation.

Data I/O communication setting method

This following explains the setting method when using data I/O communication.

Point

If you have modified the protocol settings, the connection with the sensor will be terminated and then restarted.

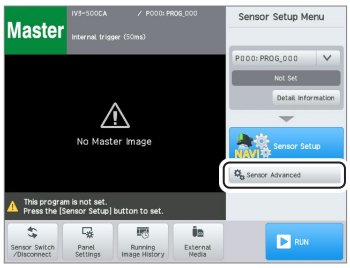
Setting the IV3 Series

You can configure the following settings for the IV3 Series using the control panel (IV3-CP50) or IV3-Navigator (IV3-H1).

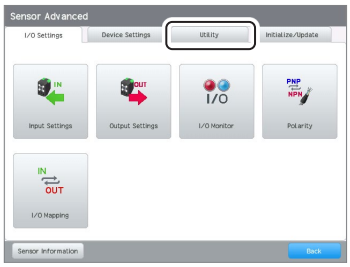
When configuring settings on the control panel (IV3-CP50)

Set the field network settings of the sensor to [PROFINET].

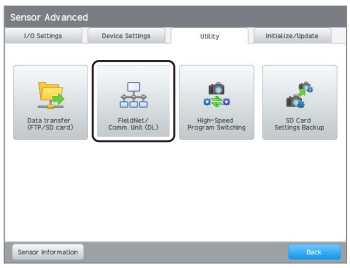
1 Touch the [Sensor Advanced] button on the [Sensor Setup Menu] screen.



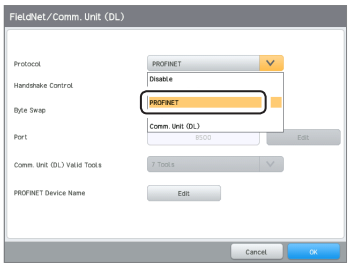
2 Tap the [Utility] tab.



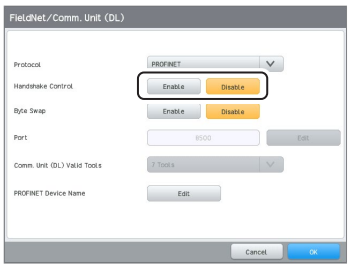
3 Tap [FieldNet/Comm. Unit (DL)].



4 Select [PROFINET] for the protocol.



5 To enable handshake control, select [Enable].



- **Disable (default value)**

  Select if the trigger interval is greater than the communication cycle (RPI). A status result can be obtained in real time. In most situations, select [Disable].

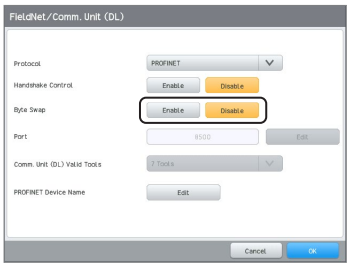
- **Enable**

  Select if the trigger interval is less than the communication cycle (RPI) and the number of triggers is 10 or less. If the status result is not picked up due to the trigger interval being faster than the communication cycle, the status result can be saved up to ten times in the buffer.

Point

- If the protocol is set to [Disable], the settings will be greyed out and disabled.
- If data handshake control has been set to [Enable], the status result will not be updated until [Result acquisition complete notice] (Address2, Bit0 of Command Control) is input.
  “Operating procedure of the data I/O communication” (Page 5-41)

6 To enable byte swap for the data region, select [Enable].



Point

The order with which the read text of the OCR tool or the FTP/SFTP-transferred file name is stored in the data memory of the PLC (two bytes) can be changed in units of bytes.

- Disable: First byte → Last byte (Example for the string “AB”: 0x4142)
- Enable: Last byte → First byte (Example for the string “AB”: 0x4241)

Set byte swap in accordance with the specifications of each PLC. For details, see the instruction manual for the PLC.

7 Set the PROFINET device name as necessary.

Default value: The same as the IV3 Device Name

“Setting the PROFINET device name” (Page 5-6)

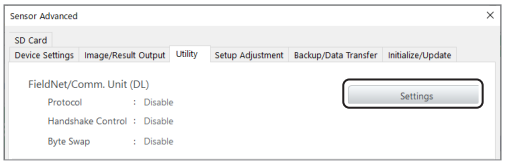
8 Once you have finished configuring the settings, touch the [OK] button.

When setting by IV3-Navigator (IV3-H1)

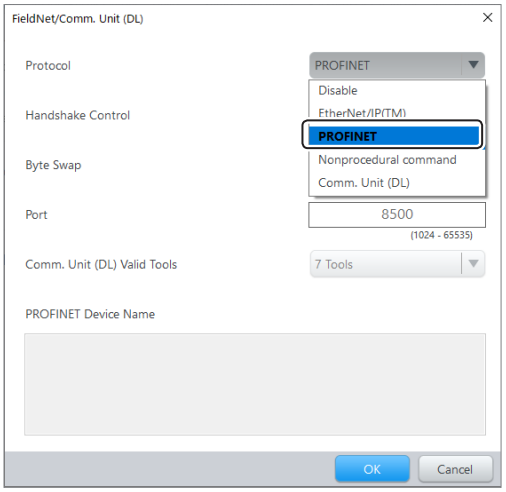
Set the field network settings of the sensor to [PROFINET].

1 Open the Advanced Sensor Settings screen.

2 Select the [Utility] tab, and then click [Settings] under [FieldNet/Comm. Unit (DL)].



3 Select [PROFINET] in [Protocol] for the field network.



● Handshake Control

- Disable (default value)
  Select if the trigger interval is greater than the communication cycle (RPI). A status result can be obtained in real time. Normally select [Disable].
- Enable
  Select if the trigger interval is less than the communication cycle (RPI) and the number of triggers is 10 or less. If the status result is not picked up due to the trigger interval being faster than the communication cycle, the status result can be saved up to ten times in the buffer.

Point

- If the protocol is set to [Disabled], the settings will be greyed out and disabled.
- If data handshake control has been set to [Enabled], the status result will not be updated until [Result acquisition complete notice] (“Address2 Bit0” of Command Control) is input.
“Operating procedure of the data I/O communication” (Page 5-41)

● Byte swap

To enable byte swap in the data region, select [Enable].

Point

The order with which the read text of the OCR tool or the FTP/SFTP-transferred file name is stored in the data memory of the PLC (two bytes) can be changed in units of bytes.

- Disable: First byte → Last byte (Example for the string “AB”: 0x4142)
- Enable: Last byte → First byte (Example for the string “AB”: 0x4241)

Set byte swap in accordance with the specifications of each PLC. For details, see the instruction manual for the PLC.

● PROFINET device name

Set the PROFINET device name as necessary.

Default value: The same as the IV3 Device Name

“Setting the PROFINET device name” (Page 5-6)

4 When you have finished configuring the settings, click the [OK] button.

The system returns to the Advanced Sensor Settings screen.

5 Click the [OK] button.

You will return to the main screen of [Setting].

Setting the PROFINET device name

Point

- Device naming rules for when PROFINET communication is used
  - Do not use characters other than “a-z”, “0-9”, “-”, and “.”.
  - “-” (Half-width hyphen) cannot be used at the beginning and end of the name.
  - Two or more consecutive “-” (half-width hyphen) or “.” (half-width dot) characters cannot be used.
  - IP addresses cannot be used.
  - “y port-x (x: 0-999)” cannot be used.
  - “n.n.n.n (n: 0-999)” cannot be used.
- The sensor will be restarted if the device name or network setting is modified while the PROFINET function is in use.
- When using the control panel (IV3-CP50) to set the PROFINET device name, the maximum number of characters is 128. This limit is 240 characters when setting the name with IV3-Navigator (IV3-H1).

When configuring settings on the control panel (IV3-CP50)

1 **Touch the [Sensor Advanced] button on the sensor settings menu screen.**

2 **Tap the [Utility] tab, and then tap [FieldNet/Comm. Unit (DL)].**

3 **Tap [Edit] next to the PROFINET device name and enter the new name.**

Point

- The maximum device name length is 128 characters. To specify a name with 129 or more characters, use IV3-Navigator (IV3-H1).
- If a device name is set with 129 or more characters, it will not be possible to display all device names. To view the device name, switch to the [Sensor Information] screen from the [Sensor Advanced] screen.

4 **Once you have finished configuring the settings, touch the [OK] button.**

You will return to the sensor expansion screen.

When setting by IV3-Navigator (IV3-H1)

1 **Open Advanced Sensor Settings screen.**

2 **Select the [Utility] tab.**

3 **Click [Settings] under [FieldNet/Comm. Unit (DL)].**

● **PROFINET device name**

Enter the device name to use in PROFINET communication.

4 **Once you have finished configuring the settings, click the [OK] button.**

You will return to the sensor expansion screen.

PLC settings

You can set the following settings for the PLC:

(1) Establish a real-time communication for setting up the data I/O communication.

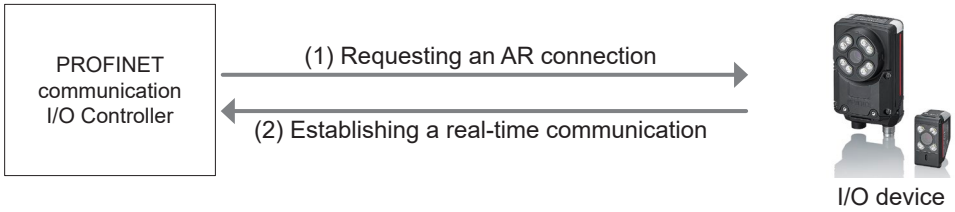
(2) Set the I/O device to be used for the data I/O communication.

For details of the setting process, refer to the instruction manual of each PLC.

Establishing the data I/O communication

To start data I/O communication, you need to create a communication path called AR (Application Relation) and establish a real-time communication between the I/O controller and the I/O device . When you create the AR, separate communication channels for data I/O and record data communications will be set up. These communication channels are called CR (Communication Relation).

The communication is started in the following procedure:
(1) The I/O controller requests an AR connection to the I/O device.
(2) A response is returned from the I/O device, establishing a real-time communication.
(3) A connection will open if no error is encountered in the compatibility check.



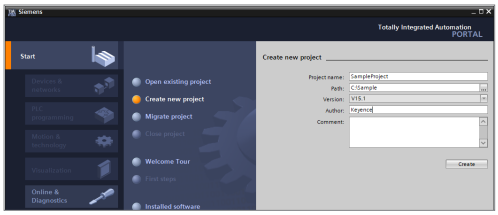
Reference

Communication settings for data I/O communication, such as SendCycle (communication cycle) and the data size, will be configured on the I/O controller side.
In a network with many connected devices (including PROFINET devices), a network delay and/or packet loss may occur when there is a heavy load on the network. Conduct a thorough verification before the operation.

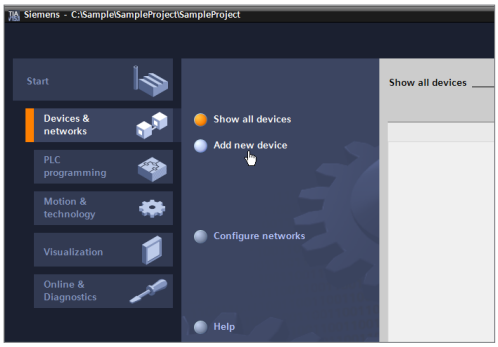
Setting the Siemens TIA Portal

This following explains the setting method when using TIA Portal.

1 Launch [TIA Portal V11] with the PC and CPU connected.

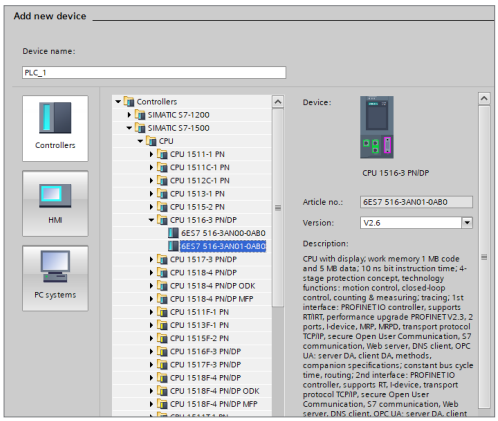


2 Select the [Devices & networks] tab, and then click [Add new device].

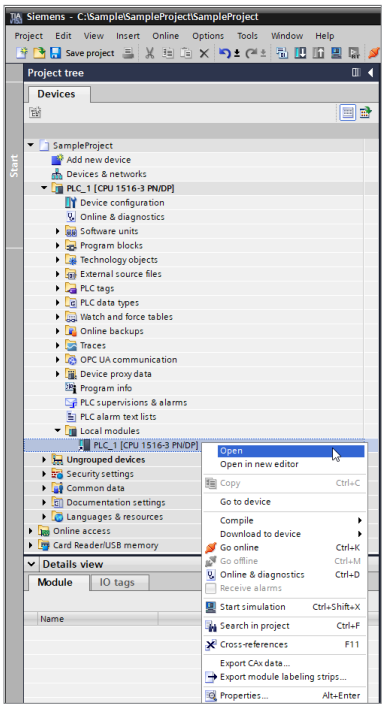


The [Add new device] screen will appear.

3 Select the CPU to be connected.

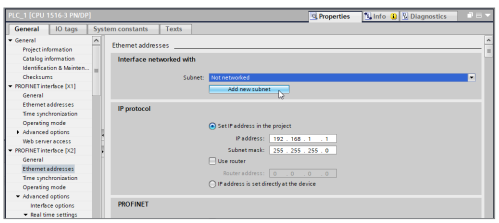


4 Right-click the selected CPU in [Project tree], and then click [Open].

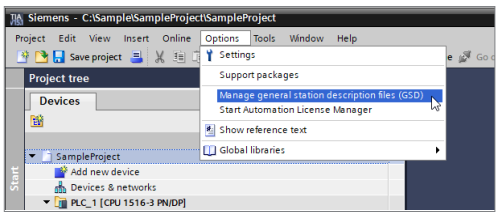


The [(Set device name [Selected CPU])] screen will appear.

5 Set the IP address and subnet mask of the CPU from [General] - [PROFINET interface] - [Ethernet addresses], and then click the [Add new subnet] button.



6 Install the GSDML file if you are configuring the IV3 Series for the first time.

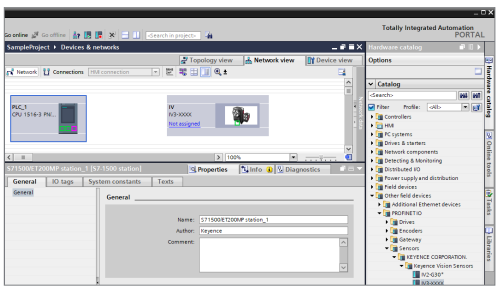


- Select [Manage general station description files (GSD)] from the [Options] menu.
- Select the GSDML file for the IV3 Series you wish to install, and then click the [Install] button.
- Restart TIA Portal V11 after the installation.

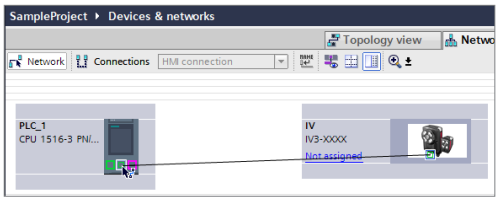
Reference

The GSDML file for the IV3 Series can be downloaded from the KEYENCE web site.
www.keyence.com/glb

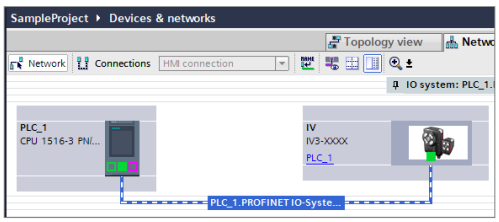
7 Open [Other field devices] - [PROFINET I/O] - [Sensors] - [KEYENCE CORPORATION] - [Keyence Vision Sensors] from [Hardware catalog] on the [Devices] - [Devices & networks] screen, and then drag & drop [IV3-XXXX].



8 Connect the PLC with the IV3 Series by mouse operation.



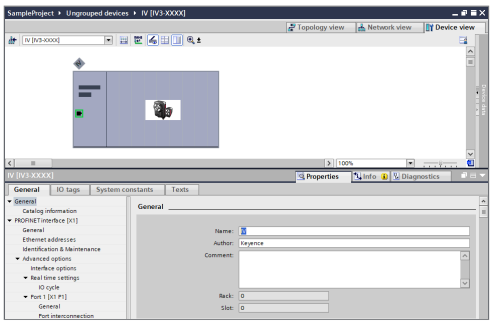
If the connection is successful, the following information will appear.



9 Double-click the IV3 Series' icon on the [Devices & networks] screen.

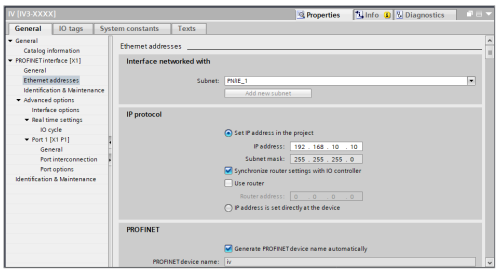
The [IV3] screen will appear.

10 Enter the same character string as the PROFINET device name of the IV3 Series to be connected.

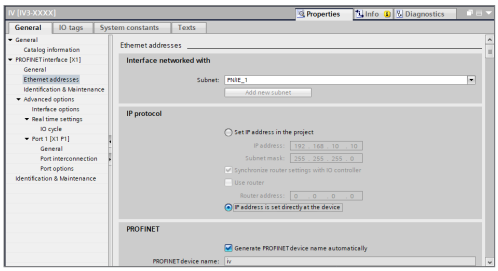


11 Click the [Properties] tab. Select [PROFINET interface [x1]] - [Ethernet addresses] under [General], and then select the IP address setting method for the IV3 Series.

● **To set a new IP address for the IV3 Series using the DCP protocol**



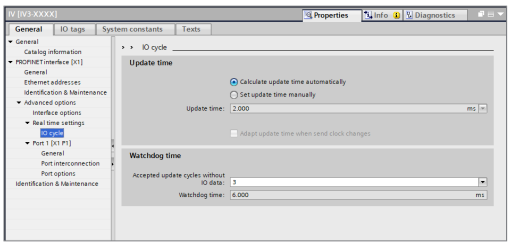
● **To use the IP address that is already registered for the IV3 Series**



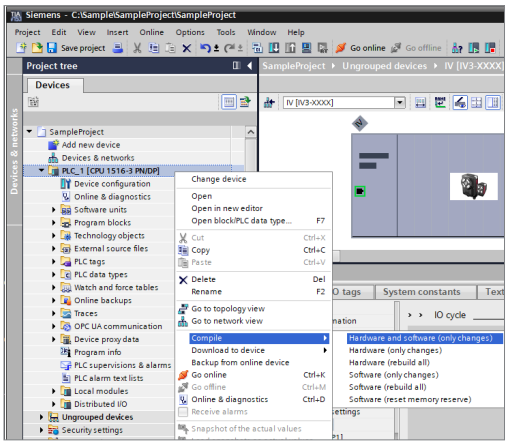
Reference

- If the IP address will be set by the DCP protocol, the IP address of the sensor will be initialized.
- The IP address set by the DCP protocol will be stored in the volatile memory. When you restart the sensor, the sensor will start up with its IP address in "----" (unregistered) status.

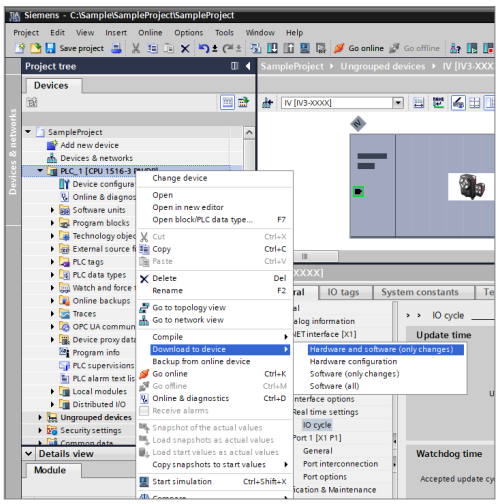
12 Click the [Properties] tab. Select [PROFINET interface [x1]] - [Advanced options] - [Real time settings] in [General], and then set the SendCycle (communication cycle) for the data I/O communication in [Update time].



13 Click the CPU in the [Devices] tab. Select [Compile] and save the settings.

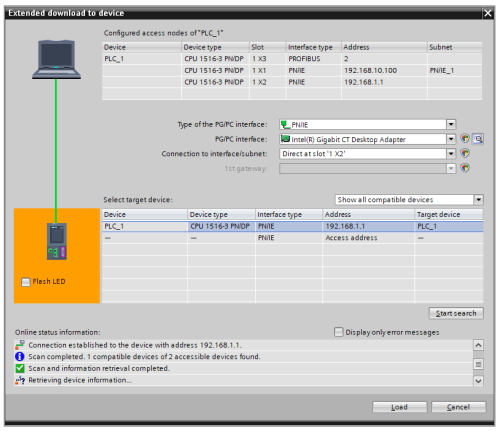


14 Click the CPU in the [Devices] tab. Select [Download to device] - [All] to download the setting to the CPU.



The [Extended download to device] screen will open.

15 Click the [Load] button to perform the download.

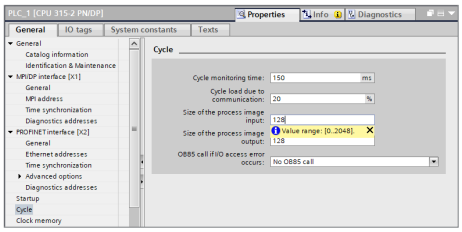


16 Set the CPU mode switch to “RUN”.

If the connection is successful, the RUN LED of the CPU will light in green and data I/O communication will become enabled.

Point

- Change the [Size of the process image input] setting according to the PLC model. By default, the value is 128. Change this value to match the size to use.



- Modifying [Size of the process image input] may affect the scan time of the PLC. Conduct a thorough verification before operation.

Data allocations in the data I/O communication

PROFINET communication for the IV3 Series is defined using the following modules:

- Command Control Module
- Command Status Bits Module
- Device Result Bits Module
- Device Status Words Module
- Device Statistics Module
- Position Adjust Result Module
- Tool Result Module

Reference

When using standard mode and setting multiple position adjustment tools, the information of each position adjustment tool starting with the second one is assigned to a tool from Tool 1 to Tool 64.

Control Modules (PLC → IV3 Series)

Control Modules are modules that write instructions from the PLC to the IV3 Series.
The device map of the data allocated for the Control Modules is as shown below.
These parameters are responsible for the control instructions for the IV3 Series, clearing of warnings, and handshake control.
For details of each parameter, refer to 🕮 “Control Modules parameter details” (Page 5-18).

■ Command Control

Slot No.: 1
Module size: 12 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Setting value change request	SD card saving stop request	Buffer clear request	Statistics reset request	Warning clear request	Program switching request	Master registration request	Trigger request
1	Reserved by system							
2	Reserved by system							Result acquisition complete notification
3	Reserved by system							
4 - 5	Program No.							
6 - 7	Upper/lower limit setting No. (tools other than the OCR tool) Master text setting No. (OCR tool) FTP/SD-saved setting No. (FTP client / SD card saving function)							
8 - 11	Upper/lower limit (tools other than the OCR tool) Master text/number of letters (OCR tool) FTP/SD saving settings (FTP client / SD card saving function)							

Status Modules (IV3 Series → PLC)

Status Modules are modules that write responses from the IV3 Series to the PLC.
The device map of the data allocated for the Status Modules is as shown below.
These parameters output the statuses, status results and statistics information of the IV3 Series.
For details of each parameter, refer to “Status Modules parameter details” (Page 5-25).

■ Command Status Bits

Slot No.: 2
Module size: 4 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Setting value change response	SD card saving stop response	Buffer clear response	Statistics reset response	Warning clear response	Program switching response	Master registration response	Trigger response
1	Setting value change failed	SD card saving stop failed	Reserved by system			Program switching failed	Master registration failed	Trigger failed
2	SD card identification status	Trigger Ready	Ready	RUN	Imaging status	BUSY	Result update complete	Result available
3	Error	Warning	Buffer overrun	Insufficient free space on SD card	Reserved by system			Sorting mode information

■ Device Result Bits

Slot No.: 3
Module size: 4 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0	Reserved by system	Overall judgment NG	LOGIC4	LOGIC3	LOGIC2	LOGIC1	Position correction	Overall judgment OK
1	Reserved by system							
2	Tool 8	Tool 7	Tool 6	Tool 5	Tool 4	Tool 3	Tool 2	Tool 1
3	Tool 16	Tool 15	Tool 14	Tool 13	Tool 12	Tool 11	Tool 10	Tool 9

■ Device Status Words

Slot No.: 4

Module size: 16 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 - 1	Error No. (Unsigned 16-bit data)							
2 - 3	Warning No. (Unsigned 16-bit data)							
4 - 5	Number of remaining buffers (Unsigned 16-bit data)							
6 - 7	Checksum (Unsigned 16-bit data)							
8 - 9	Current program No. (Unsigned 16-bit data)							
10 - 11	Program No. during judgment (Unsigned 16-bit data)							
12 - 13	Result No. (Unsigned 16-bit data)							
14 - 15	Processing time (Unsigned 16-bit data)							

■ Device Statistics

Slot No.: 5

Module size: 28 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 - 1	Processing time MAX (Unsigned 16-bit data)							
2 - 3	Processing time MIN (Unsigned 16-bit data)							
4 - 5	Processing time AVE (Unsigned 16-bit data)							
6 - 7	Reserved by system							
8 - 11	Number of triggers (Unsigned 32-bit data)							
12 - 15	Number of OKs (standard mode)/number of sorts (sorting mode) (Unsigned 32-bit data)							
16 - 19	Number of NGs (Unsigned 32-bit data)							
20 - 23	Number of trigger errors (Unsigned 32-bit data)							
24 - 27	Reserved by system							

Tool Result Modules (IV3 Series→ PLC)

Tool Result Modules are modules that write responses from the IV3 Series to the PLC.
The device map of the data allocated for the Tool Result Modules is as shown below.
Stores the matching rate and threshold information of the position correction and other tools.
For details of each parameter, refer to “Tool Result Modules parameter details” (Page 5-31).

■ Position Adjust Result

Slot No.: 6
Module size: 20 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 - 1	Position correction score (Unsigned 16-bit data)							
2 - 3	Position correction score MAX (Unsigned 16-bit data)							
4 - 5	Position correction score MIN (Unsigned 16-bit data)							
6 - 7	Position correction score Lower threshold (Unsigned 16-bit data)							
8 - 19	Reserved by system							

■ Tool Result (other than OCR tool)

Slot No.: 7 to 70
Module size: 20 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 - 1	Tool matching rate (Unsigned 16-bit data)							
2 - 3	Tool matching rate MAX (Unsigned 16-bit data)							
4 - 5	Tool matching rate MIN (Unsigned 16-bit data)							
6 - 7	Tool lower threshold (Unsigned 16-bit data)							
8 - 9	Tool upper threshold (Unsigned 16-bit data)							
10 - 11	Decimal position (Unsigned 16-bit integer)*1							
12 - 13	Pitch present value MAX/color average H (hue) (Unsigned 16-bit integer)*2							
14 - 15	Pitch present value MIN/color average S (saturation) (Unsigned 16-bit integer)*2							
16 - 17	Number of pitches/color average V (brightness)/brightness average (Unsigned 16-bit integer)*3							
18 - 19	Reserved by system							

*1: When scaling is enabled with the Width/Diameter/Pitch tool. For other tools and when scaling is not enabled, the contents of the data are 0.
*2: When using the Pitch/Color Average tool. When not using these tools, the contents of the data are 0.
*3: When using the Pitch/Color Average/Brightness Average tool. When not using these tools, the contents of the data are 0.

■ Tool Result (for the OCR tool)

Slot No.: 7 to 70

Module size: 20 bytes

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 - 1	Tool matching rate (Unsigned 16-bit integer)							
2 - 3	Tool lower threshold (Unsigned 16-bit integer)							
4 - 5	Characters read (First and second)							
6 - 7	Characters read (Third and fourth)							
8 - 9	Characters read (Fifth and sixth)							
10 - 11	Characters read (Seventh and eighth)							
12 - 13	Characters read (Ninth and tenth)							
14 - 15	Characters read (11th and 12th)							
16 - 17	Characters read (13th and 14th)							
18 - 19	Characters read (15th and 16th)							

Extended Modules (IV3 Series → PLC)

Extended modules are modules that write responses from the IV3 to the PLC. The device map of the data allocated for the Extended Modules is as shown below.
For details of each parameter, refer to “Extended Modules parameter details” (Page 5-34).

■ Device Result Bits

Slot No.: 71
Module size: 8 bytes

Standard mode

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 to 1	Master number (unsigned 16-bit data)							
2	Tool 24	Tool 23	Tool 22	Tool 21	Tool 20	Tool 19	Tool 18	Tool 17
3	Tool 32	Tool 31	Tool 30	Tool 29	Tool 28	Tool 27	Tool 26	Tool 25
4	Tool 40	Tool 39	Tool 38	Tool 37	Tool 36	Tool 35	Tool 34	Tool 33
5	Tool 48	Tool 47	Tool 46	Tool 45	Tool 44	Tool 43	Tool 42	Tool 41
6	Tool 56	Tool 55	Tool 54	Tool 53	Tool 52	Tool 51	Tool 50	Tool 49
7	Tool 64	Tool 63	Tool 62	Tool 61	Tool 60	Tool 59	Tool 58	Tool 57

Sorting mode

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0 to 1	Total status product type (unsigned 16-bit data)							
2 to 3	Tool 1 status product type (unsigned 16-bit data)							
4 to 5	Tool 2 status product type (unsigned 16-bit data)							
6 to 7	Tool 3 status product type (unsigned 16-bit data)							

Control Modules parameter details

■ Command Control Address 0 to 1: Control request

The Bits at Address 0 to 1 of the Command Control have the following functions:

Address	Bit	Item	Content	Data content
0	0	Trigger request	Requests the external trigger.	0 : OFF 1 : ON
	1	Master image registration request	Requests a master image registration.	0 : OFF 1 : ON
	2	Program switching request	Requests program switching.	0 : OFF 1 : ON
	3	Warning clear request	Requests a warning clear.	0 : OFF 1 : ON
	4	Statistics reset request	Requests a statistics reset.	0 : OFF 1 : ON
	5	Buffer clear request	Requests a buffer clear.	0 : OFF 1 : ON
	6	SD card saving stop request	Requests to stop the saving of data to the SD card. Execute this request before turning off the sensor.	0 : OFF 1 : ON
	7	Setting value change request	Requests a setting value change.	0 : OFF 1 : ON
1	0 to 7	Reserved by system	---	---

Reference

- The following will occur when a buffer clear is requested:
  - If handshake control is [Enabled]
    - The current status result will be cleared.
    - The status result in the buffer will be cleared.
    - The result available bit will become OFF (0).
    - The number of remaining buffers will become “10”.
  - If handshake control is [Disabled]
    - The current status result will be cleared.
    - The result available bit will become OFF (0).
- If you are switching programs using the PROFINET communication, set the [Switching method] option to [Monitor/PC/Network]. For details of the setting, refer to the “IV3 Series User’s Manual (Control panel / PC Software)”.
- Buffer overrun and warning statuses will not be cleared even if you execute a buffer clear request.
- To request a trigger, set the [Trigger Type] option to [External Trigger].
- [Internal Trigger Control with IN1 Input] cannot be used.

■ Command Control Address 2 to 3: Handshake control

The Bits at Address 2 to 3 of the Command Control have the following functions:

Address	Bit	Item	Content	Data content
2	0	Result acquisition complete notification	Permits the updating of the status result.	0 : OFF 1 : ON
	1 to 7	Reserved by system	---	---
3	0 to 7	Reserved by system	---	---

Reference

A result acquisition completion notice is used when handshake control is [Enabled].
Updating of the status result will be permitted when you request a result acquisition completion notice.
For details, refer to “Reading out the status result (handshake control: [Enable])” (Page 5-44).

■ Command Control Address 4 to 5: Program No.

The Bits at Address 4 to 5 of the Command Control have the following functions:

Address	Data type*	Items	Content	Data content
4 to 5	WORD	Program number	Stores the program No. when program switching is requested.	0 to 127

* WORD: Unsigned 16-bit integer

■ Command Control Address 6 to 11: Threshold (for a tool other than the OCR tool)

The Bits at Address 6 to 11 of the Command Control for tools other than the OCR tool have the following functions:

Address	Data type*	Items	Content	Data content
6 to 7	WORD	Upper/lower limit setting No.	Stores the tool and direction of the threshold value to be changed.	0 to 129
8 to 11	DWORD	Upper/lower limit	Stores the threshold value for when a threshold value change is requested.	0 to 99999

* WORD: Unsigned 16-bit integer
DWORD: Unsigned 32-bit integer

Reference

The setting value setting number rules are shown below.

0: Position correction lower threshold
1: Reserved by system
2: Tool 1 lower threshold 3: Tool 1 upper threshold
4: Tool 2 lower threshold 5: Tool 2 upper threshold
6: Tool 3 lower threshold 7: Tool 3 upper threshold
:
32: Tool 16 lower threshold 33: Tool 16 upper threshold
:
128: Tool 64 lower threshold 129: Tool 64 upper threshold

To change the threshold of a tool which is using the scaling function, input the value which is 10 times the threshold in [Threshold].
Example) 9999 → 99990 99.9 → 999

NOTICE

Cutoff processing is done for the number of 4 or more digits.
Example) 99995 → 99990

■ Command Control Address 6 to 11: Master text (for the OCR tool)

The Bits at Address 6 to 11 of the Command Control for the OCR tool have the following functions:

Address	Data type*	Items	Content	Data content
6 to 7	WORD	Master text setting No.	Stores the destination for a master text change. Divides the 16 master letters into groups of four letters. Specifies a tool number and location of the text to be changed.	• When the text is read: 201 to 456 • When the date is read: 701 to 956 • When only judging the number of letters: 501 to 628
8 to 11	----	Master text	Stores the master text/ number of letters after a change. The master text is changed in groups of four letters.	• Master text (ASCII) when the text/date reading settings are set • Minimum and maximum number of letters from 0 to 16 when judging only the number of letters (DWORD*)

* WORD: Unsigned 16-bit integer
DWORD: Unsigned 32-bit integer

● To change the master text/date

- Specify [Master text setting No.] and write the text in the applicable address number in the table below.
- The master text/date changes in groups of four letters. Also append NULL (0x00) to the end of the text that you want to change. Overwrite the text from the beginning of the text until NULL (0x00) at the end in groups of four letters. Not appending NULL (0x00) will not allow you to correctly change the master text/ date. If you overwrite all 16 letters, NULL (0x00) does not need to be appended.
- For details of how to change the master text, see “Changing the master text” (Page 5-50).

Address	Stored data								
	Tool 1				Tool 2	…	…	…	Tool 64
6 to 7 (WORD)	201	202	203	204	205	…	…	…	456
8	1st letter	5th letter	9th letter	13th letter	1st letter	…	…	…	13th letter
9	2nd letter	6th letter	10th letter	14th letter	2nd letter	…	…	…	14th letter
10	3rd letter	7th letter	11th letter	15th letter	3rd letter	…	…	…	15th letter
11	4th letter	8th letter	12th letter	16th letter	4th letter	…	…	…	16th letter

Address	Stored data								
	Tool 1				Tool 2	…	…	…	Tool 64
6 to 7 (WORD)	701	702	703	704	705	…	…	…	956
8	1st letter	5th letter	9th letter	13th letter	1st letter	…	…	…	13th letter
9	2nd letter	6th letter	10th letter	14th letter	2nd letter	…	…	…	14th letter
10	3rd letter	7th letter	11th letter	15th letter	3rd letter	…	…	…	15th letter
11	4th letter	8th letter	12th letter	16th letter	4th letter	…	…	…	16th letter

● To set the number of letters for judging only the number of letters

Address	Stored data								
	Tool 1		Tool 2		Tool 3		…	Tool 64	
6 to 7 (WORD)	501	502	503	504	505	…	…	627	628
8 to 11 (DWORD)	Minimum number of letters	Maximum number of letters	Minimum number of letters	Maximum number of letters	Minimum number of letters	…	…	Minimum number of letters	Maximum number of letters

Point

Correctly set byte swap in accordance with the PLC specifications.
“Setting the IV3 Series” (Page 5-3)

■ Command Control Address 6 to 11: FTP/SD-saved file name (FTP client / SD card saving function)

The Bits at Address 6 to 11 of the Command Control for the FTP client / SD card saving function have the following functions:

Address	Data type*	Item	Content	Data content
6 to 7	UINT	FTP/SD-saved setting No.	• Stores the transfer condition number for the file name to change and the setting number specifying whether to write to non-volatile memory. • Stores the setting number specifying the character position in the file name to change. The 64-character file name is subdivided so the setting number can be specified in groups of four letters.	• File name transfer condition number and specifying whether to write to non-volatile memory: 1001 • File name character position specification: 1011 to 1026
8 to 11		FTP/SD saving settings	When [FTP/SD-saved setting No.] is 1001 Bit 0: Transfer condition 1 Bit 1: Transfer condition 2 Bit 2: Transfer condition 3 Bit 3: Transfer condition 4 Bits 4 to 7: Reserved by system Bit 8: Write to non-volatile memory Bits 9 to 31: Reserved by system When [FTP/SD-saved setting No.] is 1011 to 1026 Stores the file name after it is changed in groups of four letters.	When [FTP/SD-saved setting No.] is 1001 0: OFF, 1: ON When [FTP/SD-saved setting No.] is 1011 to 1026 File name character (ASCII)

* UINT: Unsigned 16-bit integer

● To change the FTP/SD-saved file name

- Write 1001 to [FTP/SD-saved setting No.: Addresses 6 to 7] and specify the transfer condition for changing the file name.
- Use [FTP/SD saving settings: Addresses 8 to 11] to set to ON (1) the bit of the transfer condition number to change. If multiple bits are set to ON (1), the condition with the smallest number is specified. If all the bits are set to OFF (0), transfer condition 1 is specified. Set the non-volatile memory writing flag bit to OFF (0) when not writing and to ON (1) when writing.

Address	Stored data
6 to 7 (UINT)	1001

Address	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
8	Reserved by system				Transfer condition 4	Transfer condition 3	Transfer condition 2	Transfer condition 1
9	Reserved by system							Non-volatile memory writing flag
10	Reserved by system							
11	Reserved by system							

- Write to [FTP/SD-saved setting No.: Addresses 6 to 7] the setting number corresponding to the character position in the file name to change.
- Write to [FTP/SD saving settings: Addresses 8 to 11] the character string after the change.
- Change the file name in groups of four letters. Add a NULL (0x00) after the character string to change to. Overwrite the file name in groups of four letters from the starting letter to the ending NULL (0x00). If NULL (0x00) is not added, it will not be possible to change to the correct file name. When overwriting all 64 characters, there is no need to add NULL (0x00).
- For details on how to make this change, refer to “Changing the FTP/SD-saved file name” (Page 5-52).

Address	Stored data						
6 to 7 (UINT)	1011	1012	1013	1014	…	1025	1026
8	1st letter	5th letter	9th letter	13th letter	…	57th letter	61st letter
9	2nd letter	6th letter	10th letter	14th letter	…	58th letter	62nd letter
10	3rd letter	7th letter	11th letter	15th letter	…	59th letter	63rd letter
11	4th letter	8th letter	12th letter	16th letter	…	60th letter	64th letter

Status Modules parameter details

■ Command Status Bits Address 0: Control result (response)

The Bits at Address 0 of the Command Status Bits have the following functions:

Address	Bit	Item	Content	Data content
0	0	Trigger response	Stores the external trigger response.	0 : OFF 1 : ON
	1	Master image registration response	Stores the master image registration response.	0 : OFF 1 : ON
	2	Program switching response	Stores the program switching response.	0 : OFF 1 : ON
	3	Warning clear response	Stores the warning clear response.	0 : OFF 1 : ON
	4	Statistics reset response	Stores the statistics reset response.	0 : OFF 1 : ON
	5	Buffer clear response	Stores the buffer clear response.	0 : OFF 1 : ON
	6	SD card saving stop response	Stores the SD card saving stop response.	0 : OFF 1 : ON
	7	Setting value change response	Stores the setting value change response.	0 : OFF 1 : ON

■ Command Status Bits Address 1: Control error result

The Bits at Address 1 of the Command Status Bits have the following functions:

Address	Bit	Item	Content	Data content
1	0	Trigger failed	This bit is output when the external trigger is unsuccessful.	0 : - 1 : The external trigger has failed.
	1	Master image registration failed	This bit is output when master image registration is unsuccessful.	0 : - 1 : Master image registration has failed.
	2	Program switching failed	This bit is output when program switching is unsuccessful.	0 : - 1 : Program switching has failed.
	3 to 5	Reserved by system	---	---
	6	SD card saving stop failed	This bit is output when the SD card saving stop is unsuccessful. This occurs when the sensor is in [Setting] status. This bit does not turn ON when the SD card is not identified.	0 : - 1 : The SD card saving stop has failed.
	7	Setting value change failed	This bit is output when the setting value change is unsuccessful.	0 : - 1 : The setting value change has failed.

■ Command Status Bits Address 2 to 3: Handshake control/status/error result

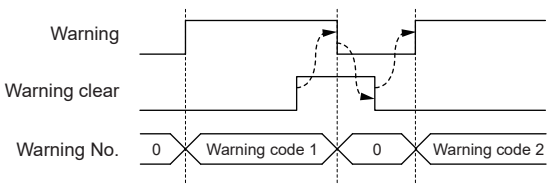
The Bits at Address 2 to 3 of the Command Status Bits have the following functions:

Address	Bit	Item	Content	Data content
2	0	Result available	This bit is output when the status result can be acquired.	0 : The status result cannot be acquired. 1 : The status result can be acquired.
	1	Result update complete	This bit switches the ON/OFF statuses when the status result is updated.	0 <=> 1: The statuses will be switched when the status result is updated.
	2	BUSY	This bit is output when the unit is unable to accept new trigger inputs, such as while performing imaging, processing a judgment, registering an external master image, switching programs, etc.	0 : The unit is not in busy status. 1 : The unit is in busy status.
	3	Imaging	This bit is output while the unit is performing imaging operation.	0 : The unit is not performing imaging operation. 1 : The unit is performing imaging.
	4	RUN	This bit is output when the unit is in “RUN” and no system errors have occurred.	0 : The unit is not in operation. 1 : The unit is operating normally.
	5	Ready	This bit is output when the start-up sequence of this unit completes after power-on.	0 : The start-up has not completed yet. 1 : The start-up has completed.
	6	Trigger Ready	This is output when the trigger can be received.	0: The trigger cannot be received. 1: The trigger can be received.
	7	SD card identification status	This bit is output when the SD card is identified correctly.	0 : The SD card has not been identified. 1 : The SD card has been identified.

Address	Bit	Item	Content	Data content
3	0	Sorting mode information	This bit is output when the unit is in [RUN] status and sorting mode.	0 : In [RUN] status in standard mode 1 : In [RUN] status in sorting mode
	1 to 3	Reserved by system	---	---
	4	Insufficient free space on SD card	This bit is output when the free space on the SD card is 100 MB or less.	0 : No insufficient free space error has occurred. 1 : An insufficient free space (100 MB or less) error has occurred.
	5	Buffer overrun status	If handshake control is [Enabled], this bit is output when an overrun of the status result has occurred.	0 : No buffer overrun has occurred. 1 : The buffer is in overrun status.
	6	Warning status	This bit outputs the warning status of the unit.	0 : The unit is not in warning status. 1 : The unit is in warning status.
	7	Error status	This bit outputs the error status of the unit.	0 : The unit is not in error status. 1 : The unit is in error status.

Reference

- By monitoring whether the unit is in “Imaging” status, you can determine whether the target object or the unit can be moved before completion of the image processing.
- “BUSY” and “Imaging” statuses may be skipped in some data I/O cycle settings. It is therefore necessary to take the imaging condition into consideration when setting the cyclic frequency.
- Warning statuses can be cleared from PROFINET communication. For the warning details, refer to the warning code. The first occurred warning code will be displayed.
- When two or more warnings are issued, all subsequent warnings after the first warning will be saved in the history. If you clear the warnings, the warning code of the highest priority warning will be displayed.



- Error statuses cannot be cleared from the PROFINET communication. For the error details, refer to the error code. The error code of the highest priority error will be displayed.
- The buffer overrun status can be cleared using a warning clear.

■ Device Results Bits Address 0 to 3: Status result

The Bits at Address 0 to 3 of the Device Results Bits have the following functions:

Address	Bit	Item	Content	Data content
0	0	Overall judgment OK	Displays the “total status result is OK”.	0 : NG 1 : OK
	1	Position correction	Displays the position correction result.	0 : NG 1 : OK
	2	Logic 1	Displays the result of Logic 1.	0 : NG 1 : OK
	3	Logic 2	Displays the result of Logic 2.	0 : NG 1 : OK
	4	Logic 3	Displays the result of Logic 3.	0 : NG 1 : OK
	5	Logic 4	Displays the result of Logic 4.	0 : NG 1 : OK
	6	Overall judgment NG	Displays the “total status result is NG”.	0 : OK 1 : NG
	7	Reserved by system	---	---
1	0 to 7	Reserved by system	---	---
2	0	Tool 1	Displays the result of Tool 1.	0 : NG 1 : OK
	1	Tool 2	Displays the result of Tool 2.	0 : NG 1 : OK
	2	Tool 3	Displays the result of Tool 3.	0 : NG 1 : OK
	3	Tool 4	Displays the result of Tool 4.	0 : NG 1 : OK
	4	Tool 5	Displays the result of Tool 5.	0 : NG 1 : OK
	5	Tool 6	Displays the result of Tool 6.	0 : NG 1 : OK
	6	Tool 7	Displays the result of Tool 7.	0 : NG 1 : OK
	7	Tool 8	Displays the result of Tool 8.	0 : NG 1 : OK
3	0	Tool 9	Displays the result of Tool 9.	0 : NG 1 : OK
	1	Tool 10	Displays the result of Tool 10.	0 : NG 1 : OK
	2	Tool 11	Displays the result of Tool 11.	0 : NG 1 : OK
	3	Tool 12	Displays the result of Tool 12.	0 : NG 1 : OK
	4	Tool 13	Displays the result of Tool 13.	0 : NG 1 : OK
	5	Tool 14	Displays the result of Tool 14.	0 : NG 1 : OK
	6	Tool 15	Displays the result of Tool 15.	0 : NG 1 : OK
	7	Tool 16	Displays the result of Tool 16.	0 : NG 1 : OK

Reference

- If the position correction/logic/tool is not set, the data content will be “0”.
- If the status result of the tool is either “trigger standby” (no judgment) or “judgment not possible”, the data content will be OFF (0).

■ Device Status Words Address 0 to 15: Error/status/status result information

The Bits at Address 0 to 15 of the Device Status Words have the following functions:

Address	Data type*	Item	Content	Data content
0 to 1	WORD	Error code	Displays the currently occurring error code.	0 to 128
2 to 3	WORD	Warning code	Displays the currently occurring warning code.	0 to 128
4 to 5	WORD	Number of remaining buffers	Displays the number of status results that can be buffered, if handshake control is [Enabled].	0 to 10
6 to 7	WORD	Checksum	Displays the current sensor setting status using an arbitrary 5-digit integer.	0 to 65535
8 to 9	WORD	Current program No.	Displays the current program No.	0 to 127
10 to 11	WORD	Program No. during judgment	Displays the program No. of the latest judgment process.	0 to 127
12 to 13	WORD	Result No.	Displays the judgment process counts.	0 to 32767
14 to 15	WORD	Processing time	Displays the processing time of the latest judgment process.	0 to 10000

* WORD : Unsigned 16-bit integer
DWORD : Unsigned 32-bit integer

Reference

- The unit of processing time is msec.
- If two or more errors are occurring at the same time, the error code of the highest priority error will be displayed.
  “Error code list” (Page 5-36)
- The first occurred warning code will be displayed.
  “Warning code list” (Page 5-38)
- A checksum can be used to monitor whether the sensor settings have been modified by a third party.
- The checksum can check whether program is switched.
- The checksum will remain unchanged even if you change the IP address, subnet mask, default gateway or port number of the IV3 Series.
- For the number of remaining buffers, refer to “Reading out the status result (handshake control: [Enable])” (Page 5-44).
- The upper limit value of the result No. is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- The result No. will also count the judgment process counts that were skipped due to the data I/O cycle settings.

■ Device Statistics Address 0 to 27 (Statistics information)

The Bits at Address 0 to 27 of the Device Statistics have the following functions:

Address	Data type*	Item	Content	Data content
0 to 1	WORD	Processing time MAX	Displays the maximum processing time value.	0 to 10000
2 to 3	WORD	Processing time MIN	Displays the minimum processing time value.	0 to 10000
4 to 5	WORD	Processing time AVE	Displays the average processing time value.	0 to 10000
6 to 7	---	Reserved by system	---	---
8 to 11	DWORD	Number of triggers	Displays the total number of triggers issued.	0-999999999
12 to 15	DWORD	OK count (standard mode) Total sort count (sorting mode)	Displays the total number of issued triggers whose total status result was “OK” or with which the product type was determined.	0-999999999
16 to 19	DWORD	Number of NGs (standard mode/sorting mode)	Displays the total number of issued triggers whose total status result was “NG” or with which the product type was not determined.	0-999999999
20 to 23	DWORD	Number of trigger errors	Number of triggers issued that generated a trigger error	0-999999999
24 to 27	---	Reserved by system	---	---

* WORD : Unsigned 16-bit integer
DWORD : Unsigned 32-bit integer

Reference

- The unit of processing time is msec.
- The maximum number of triggers is 999999999. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- The maximum value for the number of OK triggers, number of NG triggers, and the number of trigger errors is 999999999. The value will stop updating when the upper limit value is reached.
- A reset will occur in the following conditions:
  - When [Statistics reset] is input
  - When a tool is added/deleted/copied
  - When the sensor is switched OFF
  - When the program is switched
  - When a correction for the sensor is started
  - When the sensor is initialized

Tool Result Modules parameter details

■ Position Adjust Result Address 0 to 19 (Position correction information)

The Bits at Address 0 to 19 of the Position Adjust Result (slot No.: 6) have the following functions:

Address	Data type*	Item	Content	Data content
0 to 1	WORD	Position adjustment tool matching rate	Stores the matching rate of the position adjustment tool.	0 to 100
2 to 3	WORD	Position adjustment tool Matching rate MAX	Stores the maximum matching rate value of the position adjustment tool.	0 to 100
4 to 5	WORD	Position adjustment tool Matching rate MIN	Stores the minimum matching rate value of the position adjustment tool.	0 to 100
6 to 7	WORD	Position adjustment tool Threshold value	Stores the threshold value of the position adjustment tool.	0 to 100
8 to 19	---	Reserved by system	---	---

* WORD : Unsigned 16-bit integer
DWORD : Unsigned 32-bit integer

Reference

Maximum and minimum matching rate values of the position adjustment tool will be reset in the same manner as the statistics information.

■ Tool Result Address 0 to 19 (Tool information : other than OCR tool)

The Bits at Address 0 to 19 of the Tool Result (slot No.: 7 to 70) have the following functions:

Address	Data type*	Item	Content	Data content
0 to 1	WORD	Tool matching rate	Stores the matching rate of the Tool.	0 to 9999
2 to 3	WORD	Tool matching rate MAX	Stores the maximum matching rate value of the Tool.	0 to 9999
4 to 5	WORD	Tool matching rate MIN	Stores the minimum matching rate value of the Tool.	0 to 9999
6 to 7	WORD	Tool lower threshold	Stores the lower threshold value of the Tool.	0 to 9999
8 to 9	WORD	Tool upper threshold	Stores the upper threshold value of the Tool.	0 to 9999
10 to 11	WORD	Tool decimal point position	Stores the decimal point position of matching rate when scaling is enabled with the Width/ Diameter/Pitch tool.	0: No decimal point 1: 1 digit after decimal point 2: 2 digits after decimal point 3: 3 digits after decimal point
12 to 13	WORD	Tool pitch present value MAX, color average H (hue)	Maximum value of all pitches	0 to 9999
			Color Average tool H (hue)	0 to 359
14 to 15	WORD	Tool pitch present value MIN, color average S (saturation)	Minimum value of all pitches	0 to 9999
			Color Average tool S (saturation)	0 to 255
16 to 17	WORD	Tool number of pitches, color average V (brightness), brightness average	Number of pitches	0 to 9999
			Color Average tool V (brightness)	0 to 255
			Brightness Average tool brightness	0 to 255
18 to 19	---	Reserved by system	---	---

* WORD : Unsigned 16-bit integer
DWORD : Unsigned 32-bit integer

The information of tools 1, 2, ... 64 will be assigned for each slot No. (7 to 70).

Reference

- Maximum and minimum matching rate values of the tool will be reset in the same manner as the statistics information.
- If the upper threshold value of the tool is not set, the data content of the tool's upper limit value will be "65535".
- The decimal point position when scaling is enabled is applied to the data results of matching rate, matching rate MAX, matching rate MIN, lower threshold, upper threshold, pitch present value MAX, pitch present value MIN.
  (Example): When the "Tool 1 matching rate" is 505 and "Tool 1 decimal point position" is 1, the matching rate of Tool 1 is "50.5".
- The information for tools (other than the learning tool) in sorting mode outputs the information of the tool that was determined as the master image registered to the judged product type. If the status of sorting is NG, the information of product type M0 is output. However, MAX, MIN, and the thresholds are invalid values.

■ Tool Result Address 0 to 19 (Tool information: for the OCR tool)

The Bits at Address 0 to 19 of the Tool Result (slot No.: 7 to 70) have the below functions.

Address	Data type*1	Items	Content	Data content*2
0 to 1	WORD	Tool matching rate	Stores the matching rate of the Tool.	Shade contrast setting Disable: 0, 100 Enable: 0 to 100
2 to 3	WORD	Tool lower threshold	Stores the lower threshold value of the Tool.	Shade contrast setting Disable: 50 (fixed value) Enable: 0 to 100
4 to 19	----	Tool text read	Stores text read (up to 16 letters) by the Tool. If the number of letters is less than 16, the remaining devices are stored as NULL.	ASCII

*1: WORD: Unsigned 16-bit integer

*2: 0 is stored for all devices (20 byte) for data for which a tool is not set.

● Example of tool 1 text read

Number of triggers	Text read	Address															
		76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91
1st	ABCDEF	A (0x41)	B (0x42)	C (0x43)	D (0x44)	E (0x45)	F (0x46)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
2nd	ABF	A (0x41)	B (0x42)	F (0x46)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
3rd	ABCDEFGHIJKLMNOP	A (0x41)	B (0x42)	C (0x43)	D (0x44)	E (0x45)	F (0x46)	G (0x47)	H (0x48)	I (0x49)	J (0x4A)	K (0x4B)	L (0x4C)	M (0x4D)	N (0x4E)	O (0x4F)	P (0x50)
4th	2019.3.28	2 (0x32)	0 (0x30)	1 (0x31)	9 (0x39)	. (0x2E)	3 (0x33)	. (0x2E)	2 (0x32)	8 (0x38)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
5th	---- (No text read)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)

Point

- All addresses (0 to 19) are simultaneously updated at each trigger. The previous data is discarded.
- Data with no read text is stored as NULL (0x00).
- Read text is output as ASCII code.
- Correctly set byte swap in accordance with the PLC specifications.
  “Setting the IV3 Series” (Page 5-3)
- If outputting the data type of STRING, use 15 or fewer characters of the read text. As NULL cannot be stored for the 16th letter, the text may not be output correctly.

Extended Modules parameter details

■ Device Results Bits Address 0 to 7: status result (Tools 17 to 64), master number/ total status product type

The Bits at Address 0 to 7 of the Classify Result Bits have the following functions:

Standard mode

Address	Data type	Item	Content	Data content
0 to 1	UINT	Master number	With multiple master registration enabled: Stores the master number (00 to 07) from the total status result obtained from the results of each tool when “total status result is OK” is OK (1).	0: 00 or NG 1 to 7: 01 to 07
2	BOOL	Tools 17 to 24	Assigns to Bit 0 to Bit 7 the results of Tools 17 to 24 and stores these results.	0: NG, 1: OK
3	BOOL	Tools 25 to 32	Assigns to Bit 0 to Bit 7 the results of Tools 25 to 32 and stores these results.	0: NG, 1: OK
4	BOOL	Tools 33 to 40	Assigns to Bit 0 to Bit 7 the results of Tools 33 to 40 and stores these results.	0: NG, 1: OK
5	BOOL	Tools 41 to 48	Assigns to Bit 0 to Bit 7 the results of Tools 41 to 48 and stores these results.	0: NG, 1: OK
6	BOOL	Tools 49 to 56	Assigns to Bit 0 to Bit 7 the results of Tools 49 to 56 and stores these results.	0: NG, 1: OK
7	BOOL	Tools 57 to 64	Assigns to Bit 0 to Bit 7 the results of Tools 57 to 64 and stores these results.	0: NG, 1: OK

Point

- Check that “total status result is NG” is OK (1), and then check the master number. If the master number cannot be determined (the result is NG), the value becomes 0.
- When obtaining the master number, set [Total status condition] as shown below. Failing to do so will prevent you from obtaining correct master numbers.
  - Total status condition: Logic n (n = 1 to 4)
  - Logic n setting
    - Logic: OR
    - Set master number (Master00 to Master07): Use

  For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- If there are multiple master numbers whose status is OK, the lowest master number is output.

Sorting mode

Address	Data type	Item	Content	Data content
0 to 1	UINT	Total status product type	Stores the product type (M0 to M7) from the total status result obtained from the results of each tool when “total status result is OK” is OK (1).	0: M0 or NG 1 to 7: M1 to M7
2 to 3	UINT	Tool 1 status product type	Stores the product type (M0 to M7) determined by Tool 1 when the Tool 1 status result is OK (1).	0: M0 or NG 1 to 7: M1 to M7
4 to 5	UINT	Tool 2 status product type	Stores the product type (M0 to M7) determined by Tool 2 when the Tool 2 status result is OK (1).	0: M0 or NG 1 to 7: M1 to M7
6 to 7	UINT	Tool 3 status product type	Stores the product type (M0 to M7) determined by Tool 3 when the Tool 3 status result is OK (1).	0: M0 or NG 1 to 7: M1 to M7

Point

- Check that “total status result is NG” is OK (1) or that each tool’s status result is OK, and then check the product type. If the product type cannot be determined (the result is NG), the value becomes 0.
- The product types determined by Tools 4 to 8 in sorting mode cannot be displayed.

Error code list

The following shows the list of error codes that are generated in the IV3 Series.

Error code	Content	Cause	Countermeasure
0	No error	---	---
1 - 32	Program No. xx corruption error	• A data error has occurred in program No. xx. • Data corruption may have occurred due to a power-off while writing settings data and/or due to noise.	• Initialize the program No. xx. • Cycle power to the sensor. • Do not switch off the unit while the settings are being saved. • If the error persists, contact your nearest KEYENCE office.
52	Program switching error (on startup; external input)	On startup, a program switching error (external input) occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Use external input to select a value from P000 to P031.
53	Program switching error (on startup; Panel/PC/Network/ Automatic Switching)	On startup, a program switching error (Panel/ PC/Network/Automatic Switching) occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup or operation mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Select a value from P000 to P031. • You can select whether to continue operation with P000 or to change to setup mode when the error message is cleared.
55	Program switching error (in [RUN] status)	While the unit was in [RUN] status, a program switching error occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Select a value from P000 to P031.
79	System error	No sensor head is connected to the sensor amplifier.	Connect a sensor head to the sensor amplifier, and then cycle power to the sensor. If the error persists, contact your nearest KEYENCE office.
95 - 96 100 - 128	System error	An error may have occurred in the sensor.	• Cycle power to the sensor. • If the error persists, contact your nearest KEYENCE office.

Error code	Content	Cause	Countermeasure
97 - 99	Non-volatile memory error	• A data error has occurred. • Data corruption may have occurred due to a power-off while writing settings data and/or due to noise.	• Initialize the settings of this unit. • Cycle power to the sensor. • Do not switch off the unit while the settings are being saved. • If the error persists, contact your nearest KEYENCE office.

Reference

If two or more errors are occurring at the same time, the error code of the highest priority will be displayed.
The greater the error code, the higher the priority of the error will be.

Warning code list

The following shows the list of warning codes that are generated in the IV3 Series.

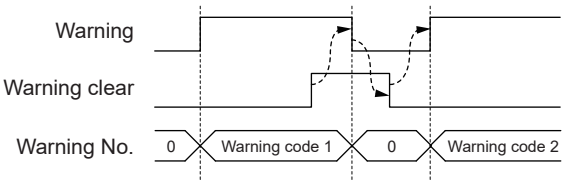
Warning code	Content	Cause	Countermeasure
0	No error	---	---
54	Expansion program setting mismatch error (normal)	While the unit was in [Setting] status, a program setting error occurred in the expansion program.	Identify the SD card containing the correct expansion program once more.
58	External master registration error (OCR)	For the new master image, the characters and date cannot be read with the OCR tool.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
60	Field Network Error, Invalid request (OCR/threshold)	• A change to the master text/date, threshold, or character count has been requested from PROFINET while the unit is in “Setting” status. • A threshold change for a tool whose threshold cannot be changed has been requested. • A parameter that is not valid has been entered.	• Make requests while the device is running. • Input a valid parameter. • When changing the master text or date, the following situations are invalid: - The settings number is outside of the range of the data content - The specified tool is not being used - The specified tool is not the OCR tool - The specified OCR tool detection operation (character/date/character count) does not match the change request - When only judging the number of characters, the number of characters is outside of the data content range • Threshold changes are not valid for the following tools. - In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool - In sorting mode, tools other than the learning tool
61	Field network bad request error (FTP/SD)	• A change to an FTP/SD-saved file name has been requested from PROFINET while the unit is in “Setting” status. • A parameter that is not valid has been entered.	• Make requests while the device is running. • When saving to the SD card, set a file name with 16 characters or less before making the request. Character 17 and later are not valid. • Only use valid characters—listed below—in the file name. 0,1,2,3,,,,7,8,9 a,b,c,,d,,,,x,y,z A,B,C,D,,,,X,Y,Z ␣ (space symbol) (,),+,-,=,.,’,!,#,$,%,&,@, _

Warning code	Content	Cause	Countermeasure
62	Field network overrun error	An overrun of the status result has occurred.	• Request a result acquisition completion notice to permit the updating of the status result. • Refer to the operation procedure and reference program when setting the handshake control to [Enable]. • Set the handshake control to [Disable].
63	Field Network Error, Invalid request (Save Master)	External master registration has been requested from PROFINET while the unit is in “Setting” status.	Do not request an external master registration while the unit is in “Setting” status.
64	Field Network Error, Invalid request (Change Program)	• Program switching has been requested from PROFINET while the unit is in “Setting” status. • A program switching request to a non-existent program No. was made from PROFINET. • A program switching requested was made from PROFINET while the program switching method was set to [External input].	• Do not request a program switching while the unit is in “Setting” status. • Specify the correct program number. When SD card program expansion is set to [Disable], specify a number between 0 and 31. When it is set to [Enable], specify a number between 0 and 127. • If you are switching programs from PROFINET, set the [Switching method] option to [Monitor/PC/Network].
65	Trigger error	A trigger was applied while the busy bit was ON or the trigger ready bit was OFF. (If you have set the trigger error option to [Enable].)	Do not apply triggers while the unit is in the busy or not in trigger ready status.
66	External master registration error (Insufficient outline)	The outline tool is unable to extract the outline of the new master image.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
67	External master registration error (Insufficient area)	The color area/area tool is unable to extract the area of the new master image.	
68	External master registration error (Brightness correction failed)	The brightness of the new master image cannot be corrected appropriately.	
69	External master registration error (Insufficient edge faild)	The edge tool is unable to extract the edge of the new master image.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
70	FTP Transfer Error (Insufficient Data Buffer)	Transfer has failed because a volume of data exceeding the remaining FTP buffer capacity has been generated.	• Modify the trigger cycle of this unit. • Check the load status of the network.

Warning code	Content	Cause	Countermeasure
71	FTP Transfer Error (Transfer Failed)	Data transfer to the destination folder has failed.	Check the access permissions of the destination folder.
72	FTP Connection Error	Connection to the FTP server has failed.	• Check the IP address of the FTP server. • Check the port number of the FTP server. • Check the user name for logging into the FTP server. • Check the password for logging into the FTP server.
73	External master registration error (Insufficient work memory)	There is insufficient work memory.	Delete one or more detection tools.
74	External master registration error (No images)	There are no registered images for master registration.	Perform the master image registration after having captured the image to be used for the registration.
75	SD Card Transfer Error (Insufficient Transfer Buffer)	An SD card transfer error occurred because the data buffer was insufficient.	• Set the sensor trigger cycle to a longer value. • Use the result update complete bit to control the trigger. In this situation, set the busy output timing to “Until Data Transfer Is Complete”.
76	SD Card Transfer Error (Transfer Failed)	An SD card transfer error occurred because the transfer failed.	• Check the free space. • Remove the SD card from its slot, reinsert the SD card, and then close the cover. Check that the SD card indicator lights.
77	External master registration error (learning tool/sorting mode)	An external master registration request occurred when the learning tool or sorting mode was in use.	External master image registration cannot be used when the learning tool or sorting mode is in use.

Reference

• When two or more warnings are issued, all subsequent warnings after the first warning will be saved in the history.
If you clear the warnings, the warning code of the highest priority warning will be displayed.



• The greater the warning code, the higher the priority of the warning will be.
• The SD card saving stop failed warning will not occur.

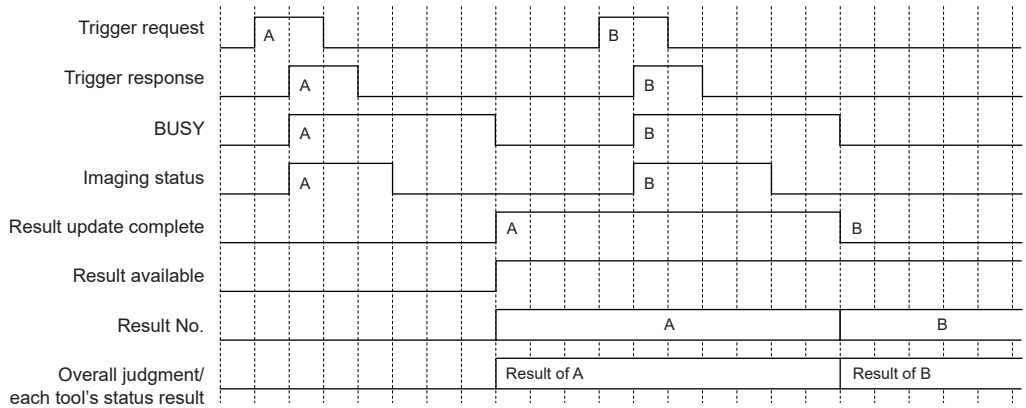
Operating procedure of the data I/O communication

This section explains the method for communicating from the PLC to the IV3 Series using cyclic communication.
It also introduces reference programs. When making use of the reference programs, give thought to items such as error processing during programming.

Reading out the status result (handshake control: [Disable])

The operation procedure when the data handshake control is set to [Disable] is shown below.

■ When a trigger is successful



(1) Execute a [Trigger request]. (0 → 1) Trigger request is retained until trigger response is set to ON
(2) If the trigger is valid, [Trigger response] will change from 0 to 1.
(3) Once the judgment process ends, the [Result update complete] Bit will switch and [Overall judgment]/ [Each tool's status result] will be updated. The read text will be updated for the OCR tool.

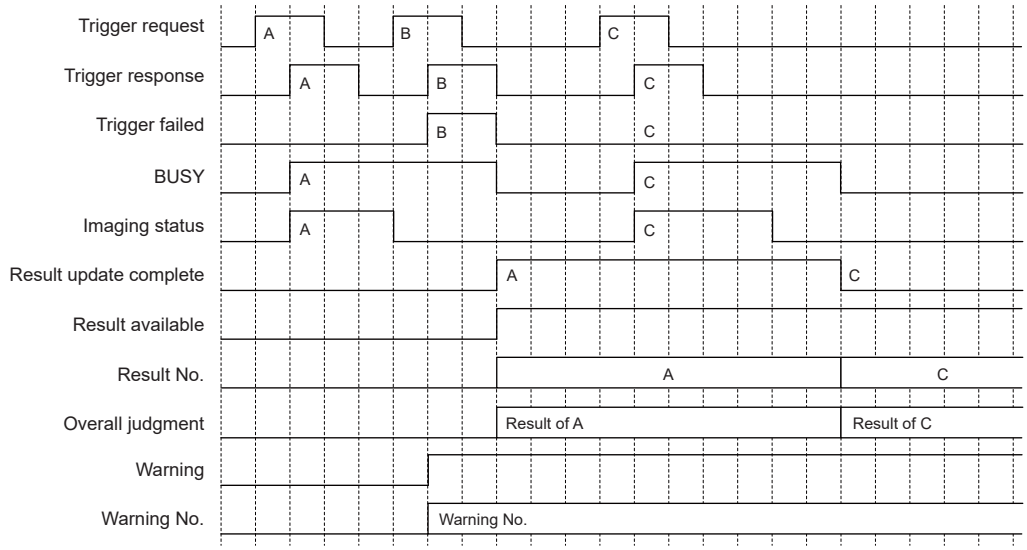
Point

Do not cancel (1 → 0) [Trigger request] before [Trigger response] changes from 0 to 1. The trigger may not be able to be requested correctly.

Reference

- [Result update complete] will switch (toggle) to "1" if its value was "0" after the previous judgment update or switch to "0" if its value was "1".
- [Result available] will switch from 0 to 1 at the timing when the first judgment process has been confirmed; and the new value will be retained thereafter.
- [Result available] will be reset in the following conditions:
  - If handshake control is set to [Disabled]
    - When the program is switched
    - When the unit's status is switched from "Setting" to "RUN"
    - When a buffer clear request is issued
  - If handshake control is set to [Enabled]
    - When a buffer clear request is issued
- [Result No.] will be counted up each time the status result is updated. The upper limit value is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- [Result No.] will also count the judgment process counts that were skipped due to the cdata I/O cycle setting.
- [Busy] and [Imaging] may be skipped in some data I/O cycle settings. It is therefore necessary to take the imaging condition into consideration when setting the data I/O cycle.

■ When a trigger is unsuccessful



(1) Execute a [Trigger request]. (0 → 1) Trigger request is retained until trigger response is set to ON
(2) If the trigger is valid, [Trigger response] will change from 0 to 1.
(3) When the judgment process ends, the [Result update complete] bit will be switched and the [Overall judgment] will be updated.
(4) If you wish to output trigger errors, set the trigger error option to [Enabled].
If a trigger has been input while the trigger error option is set to [Enabled] and the unit is in "BUSY" status, [Trigger failed] will change from 0 to 1 ignoring the trigger input. No judgment process will be performed for trigger B.
(5) If the trigger input is unsuccessful, [Warning] will switch from "0" to "1" and [Warning No.] will be updated to "65". For details, refer to "Warning code list" (Page 5-38).

Point

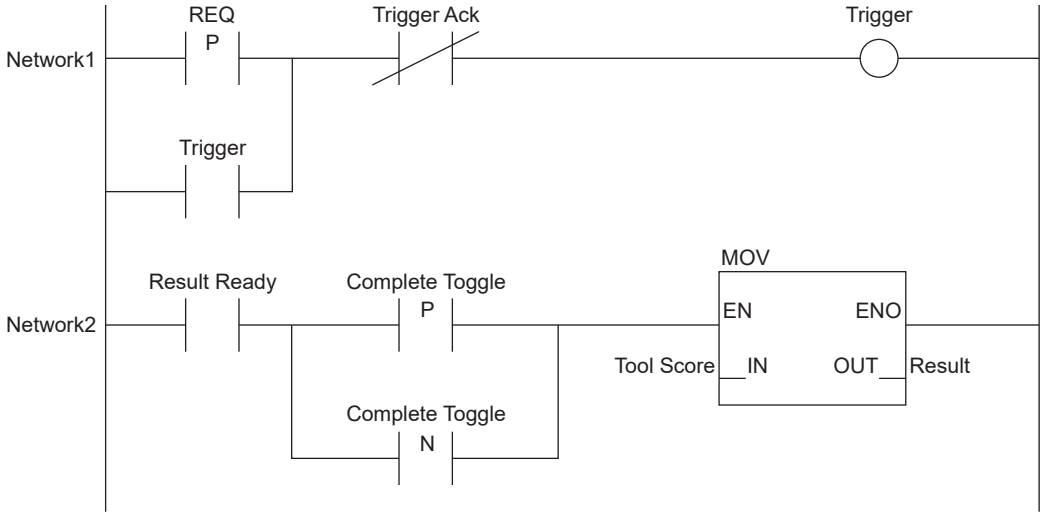
Do not cancel (1 → 0) [Trigger request] before [Trigger response] changes from 0 to 1. The trigger may not be able to be requested correctly.

Reference

- [Result update complete] will switch to "1" if its value was "0" after the previous judgment update (or from "0" to "1" if the previous value was "1").
- [Result available] will switch from 0 to 1 at the timing when the first judgment process has been confirmed; and the new value will be retained thereafter.
- [Result No.] will be counted up each time the status result is updated. The upper limit value is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- [Result No.] will also count the judgment process counts that were skipped due to the data I/O cycle setting.
- [BUSY] and [Imaging] may be skipped due to the data I/O cycle setting. It is therefore necessary to take the imaging condition into consideration when setting the data I/O cycle.
- [Number of trigger errors] will be counted up at the timing when the [Result updated] BIT is switched.

Reference programs

■ Siemens PLC



Description of the reference program

● Network1

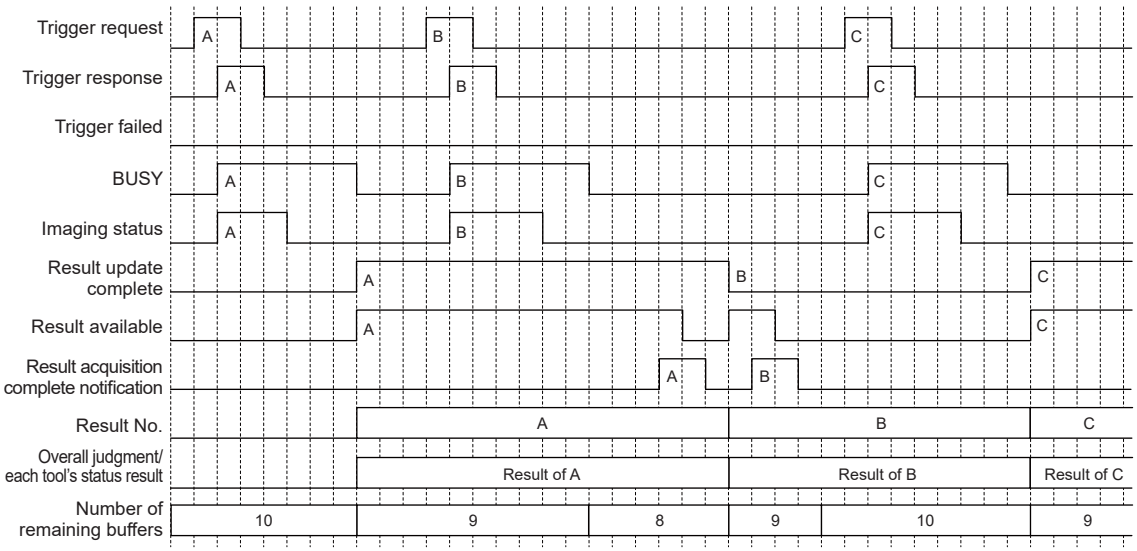
Sets “REQ” to ON and executes “Trigger”.
“Trigger Ack” ON will set “Trigger” to OFF (“Trigger” will be retained until “Trigger Ack” becomes ON).

● Network2

“Result Ready” ON + Rising or falling of “Complete Toggle” will copy the data that have been written to “Tool Score” to “Result”.

Reading out the status result (handshake control: [Enable])

The following describes the operating procedure when the data handshake control is set to [Enabled].
You can acquire all status results without fail by setting the data handshake control to [Enabled].



(1) Execute a [Trigger request]. (0 → 1) Trigger request is retained until trigger response is set to ON
(2) If the trigger is valid, [Trigger response] will change from 0 to 1.
(3) Once the judgment process ends, the [Result update complete] Bit will switch, [Result available] will switch from 0 to 1, and [Overall judgment]/[Each tool's status result] will be updated. The read text will be updated for the OCR tool.
(4) [Number of remaining buffers] will be reduced by 1 when the status result is updated.
(5) Executes [Result acquisition complete notice] (0 → 1). [Number of remaining buffers] will be incremented by 1.

Point

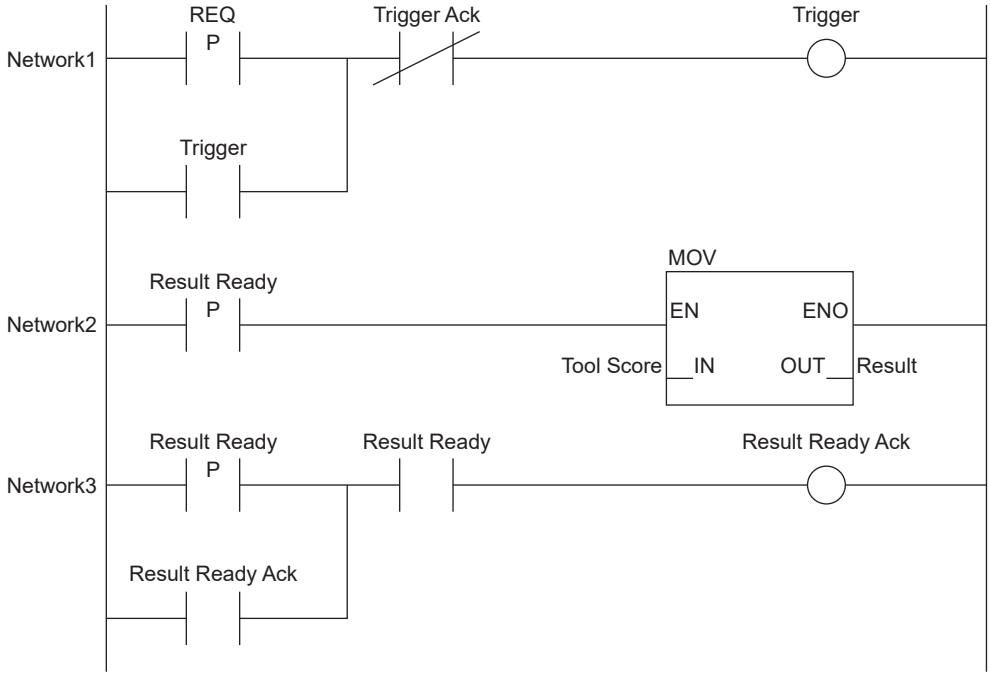
Do not cancel (1 → 0) [Trigger request] before [Trigger response] changes from 0 to 1. The trigger may not be able to be requested correctly.

Reference

- [Result update complete] will switch (toggle) to "1" if its value was "0" after the previous judgment update or switch to "0" if its value was "1".
- [Result No.] will be counted up each time the status result is updated. The upper limit value is 32767. If the maximum value is exceeded, it will go back to 0 and start counting up again.
- [Result No.] will also count the judgment process counts that were skipped due to the data I/O cycle setting.
- [Busy] and [Imaging] may be skipped in some data I/O cycle settings. It is therefore necessary to take the imaging condition into consideration when setting the data I/O cycle.
- [Number of trigger errors] will be counted up at the timing when the [Result updated] BIT is switched.
- If handshake control has been set to [Enabled], the status result will not be updated until [Result acquisition complete notice] is set ON/OFF (0 → 1 → 0), even if the next trigger has been input and a judgment process has been executed.
- If a new trigger is input when [Number of remaining buffers] is "0", [Buffer overrun] will switch from "0" to "1". The status result from the new trigger will be ignored.
- [Buffer overrun] can be cleared using [Warning clear].

Reference programs

■ Siemens PLC



Description of the reference program

● Network1

Sets “REQ” to ON and executes “Trigger”.
“Trigger Ack” ON will set “Trigger” to OFF (“Trigger” will be retained until “Trigger Ack” becomes ON).

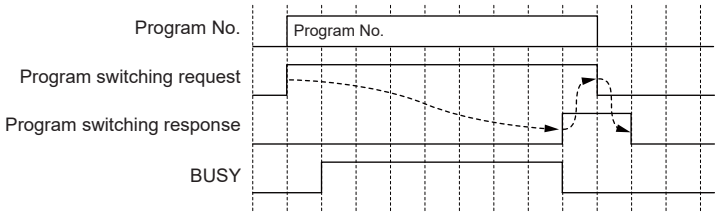
● Network2

“Result Ready” ON will copy the data written in “Tool Score” to “Result”.

● Network3

“Result Ready” ON will execute “Result Ready Ack”.
“Result Ready” OFF will set “Result Ready Ack” to OFF (“Result Ready Ack” will be retained until “Result Ready” becomes OFF).

Switching the programs



(1) Write the program No. to be set to [Program No.].
(2) Execute [Program switching request], maintaining the state (0 → 1) until [Program switching response] is received.
(3) When the program switch is complete, [Program switching response] (0 → 1) is received.
(4) Once [Program switching response] is received, clear [Program switching request] (1 → 0). When [Program switching request] is cleared, [Program switching response] is cleared.

Point

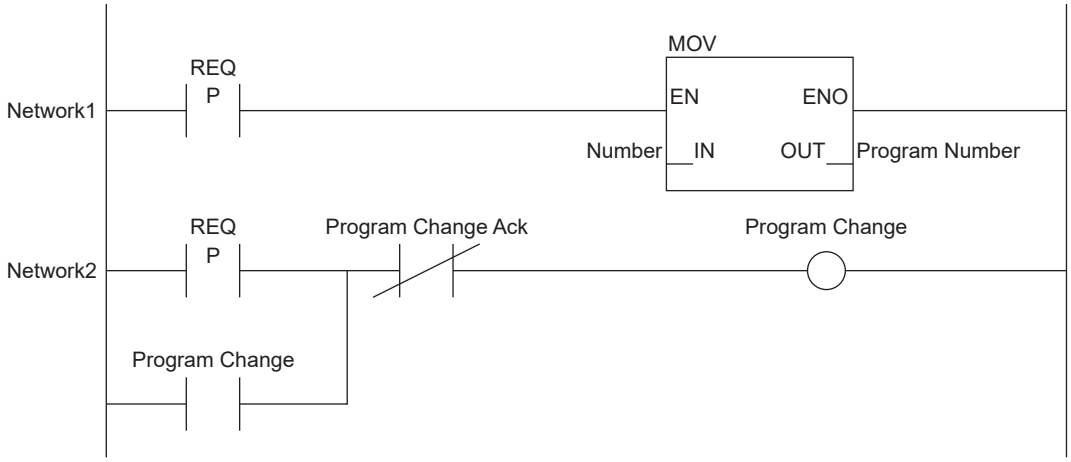
- Do not cancel (1 → 0) [Program switching request] before [Program switching response] changes from 0 to 1. The program may not be able to switch correctly.
- When [Program switching request] was canceled (1 → 0) before [Program switching response] changes from 0 to 1, execute (0 → 1) [Program switching request] and cancel (1 → 0) it again.

Reference

- [BUSY] will change from 0 to 1 while the program switching is in progress.
- If the program switching fails, [Program switching failed] will change from “0” to “1”.
- If the program switching is unsuccessful, [Warning] will switch from “0” to “1” and [Warning No.] will be updated to “64”. For details, refer to “Warning code list” (Page 5-38).
- You cannot switch programs using PROFINET communication while the unit is in [Setting] status.
- If you are switching programs using PROFINET communication, set the [Switching method] option to [Monitor/PC/Network]. For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- The program No. switched to from PROFINET communication will be deleted when the power is turned off.

Reference programs

■ Siemens PLC



Description of the reference program

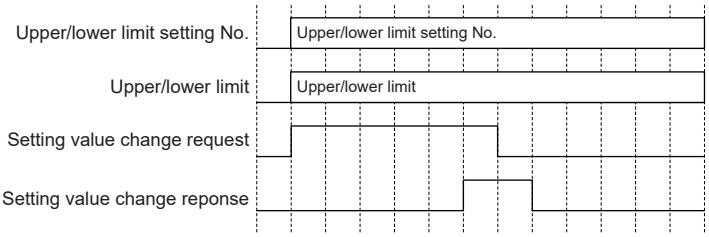
● Network1

This line sets “REQ” to ON and copies the Number data, which contains the program No. to be set, to the program No.

● Network2

Sets “REQ” to ON and executes “Program Change”.
“Program Change Ack” ON will set “Program Change” to OFF (“Program Change” will be retained until “Program Change Ack” becomes ON).

Changing the tool adjustment threshold



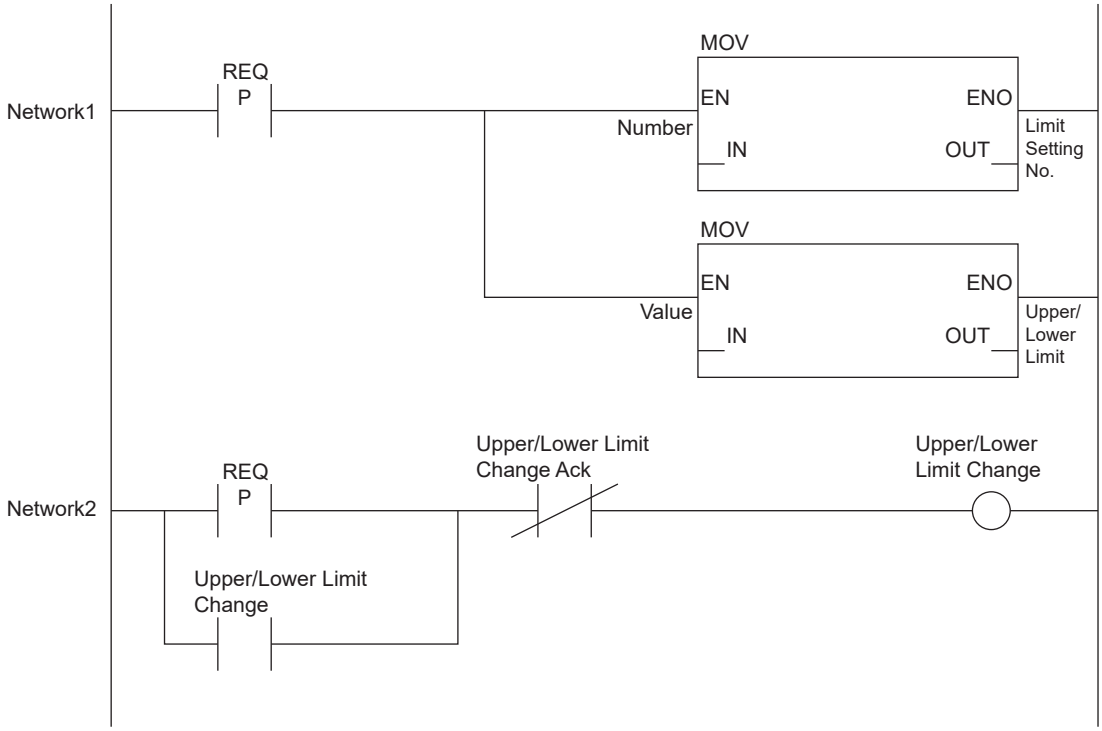
(1) Write the tool number and threshold type of the threshold to be changed to [Upper/lower limit setting No.].
(2) Write the threshold to be changed to [Upper/lower limit].
(3) Execute [Setting value change request]. (0→1)
(4) You can check the input status in [Setting value change response].

Reference

- If the setting value change fails, [Setting value change failed] will switch from “0” to “1”.
- If the setting value change fails, [Warning] will switch from “0” to “1” and [Warning No.] will be updated to 60. For details, refer to “Warning code list” (Page 5-38).
- Thresholds cannot be changed for the following tools.
  - In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool
  - In sorting mode, tools other than the learning tool

Reference programs

■ Siemens PLC



Description of the reference program

● Network1

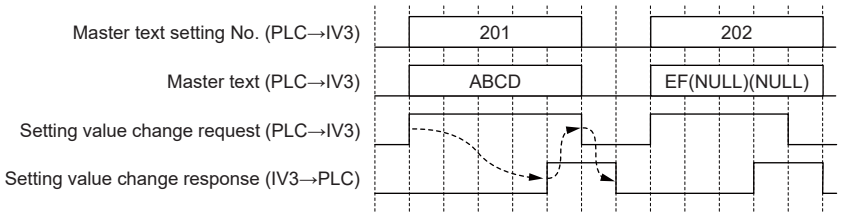
This line sets “REQ” to ON and copies the Number data, which contains the Limit Setting No. to be set, to the Limit Setting No. This line also copies the Value data, which contains the Upper/Lower Limit to be set, to the Upper/Lower Limit.

● Network2

Sets “REQ” to ON and executes “Upper/Lower Limit Change”.
“Upper/Lower Limit Change Ack” ON will set “Upper/Lower Limit Change” to OFF (“Upper/Lower Limit Change” will be retained until “Upper/Lower Limit Change Ack” becomes ON).

Changing the master text

This section shows the master text for Tool 1 changing to [ABCDEF] as an example. The text is overwritten twice in groups of four letters.



(1) Overwrite [Master text setting No.: Address 6 to 7] with 201 (master text (first to fourth letter) when the read text settings are set with Tool 1).
(2) Overwrite [Master text: Address 8] with A (0x41), [Master text: Address 9] with B (0x42), [Master text: Address 10] with C (0x43), and [Settings value: Address 11] with D (0x44).
(3) Execute [Setting value change request] (0→1). The request is retained until [Setting value change response] can be confirmed.
(4) Once the change is complete, [Setting value change response] changes from 0 to 1.
(5) Setting [Setting value change request] to 0 sets [Setting value change response] to 0.
(6) Overwrite [Master text setting No.: Address 6 to 7] with 202 (master text (fifth to eighth letter) when the read text settings are set with Tool 1).
(7) Overwrite [Master text: Address 8] with E (0x45), [Master text: Address 9] with F (0x46), [Master text: Address 10] with NULL (0x00), and [Master text: Address 11] with NULL (0x00).
(8) Execute [Setting value change request] (0→1). The request is retained until [Setting value change response] can be confirmed.
(9) Once the change is complete, [Setting value change response] changes from 0 to 1.
(10) Setting [Setting value change request] to 0 sets [Setting value change response] to 0.

Point

Append NULL text to the end of the text.
If you change “ABCDEFG” to “1234” and did not write NULL, the text is changed to “1234EFG”.

Example of a failure	Master text/date							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Master text/date before change	A	B	C	D	E	F	G	NULL
Text to be written	1	2	3	4	None			
Master text/date after change	1	2	3	4	E	F	G	

Example of a success	Master text/date							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Master text/date before change	A	B	C	D	E	F	G	NULL
Text to be written	1	2	3	4	NULL (0x00)	NULL (0x00)	NULL (0x00)	NULL (0x00)
Master text/date after change	1	2	3	4				

Point

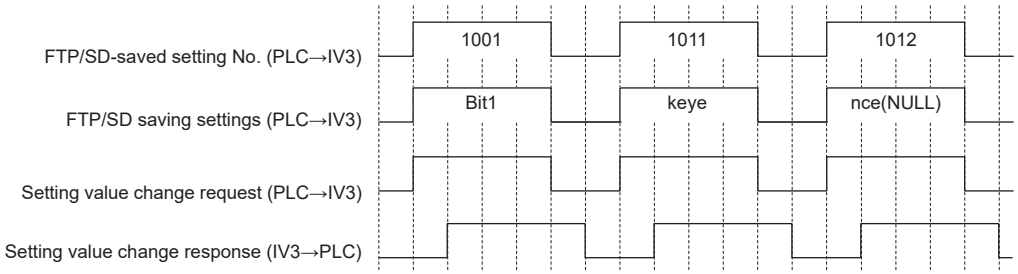
- Arbitrary text can be changed in groups of four letters.
  To change “2019.4.5” to “2019.4.6”, you can change only 202 for [Setting value setting No.: Address 6 to 7] (master text (fifth to eighth letter) when the read text settings are set with Tool 1).

	Master text/date							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Master text/date before change	2	0	1	9	.	4	.	5
Text to be written	None				.	4	.	6
Master text/date after change	2	0	1	9	.	4	.	6

- Changes in groups of four are applied immediately. Do not execute a trigger until all text changes are complete.

Changing the FTP/SD-saved file name

This section shows an example in which the transfer condition 2 file name is changed to “keyence”. No data is written to non-volatile memory.
The text is overwritten twice in groups of four letters.

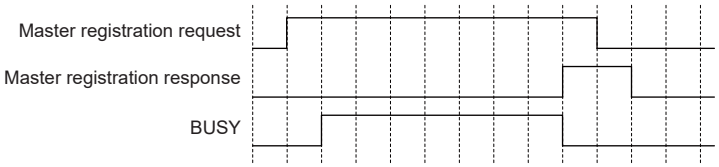


(1) Write 1001 to [FTP/SD-saved setting No.: Addresses 6 to 7] to enable the specification of the transfer condition number.
(2) Set [FTP/SD saving settings: Address 8 Bit 1] to ON (1). (Specify transfer condition 2.)
Set [FTP/SD saving settings: Address 9 Bit 0] to OFF (0). (No writing to non-volatile memory)
(3) Execute [Setting value change request: Address 0 Bit 7] (0→1). The request is retained until [Setting value change response] can be confirmed.
(4) Once the transfer condition number specification is complete, [Setting value change response] changes from 0 to 1.
(5) Setting [Setting value change request: Address 0 Bit 7] to 0 sets [Setting value change response] to 0.
(6) Overwrite [FTP/SD-saved setting No.: Addresses 6 to 7] with 1011 (first to fourth letter of the FTP/SD-saved file name).
(7) Overwrite [FTP/SD saving settings: Address 8] with k (0x6B), [FTP/SD saving settings: Address 9] with e (0x65), [FTP/SD saving settings: Address 10] with y (0x79), and [FTP/SD saving settings: Address 11] with e (0x65).
(8) Execute [Setting value change request: Address 0 Bit 7] (0→1). The request is retained until [Setting value change response] can be confirmed.
(9) Once the transfer condition number specification is complete, [Setting value change response] changes from 0 to 1.
(10) Setting [Setting value change request: Address 0 Bit 7] to 0 sets [Setting value change response] to 0.
(11) Overwrite [FTP/SD-saved setting No.: Addresses 6 to 7] with 1012 (fifth to eighth letter of the FTP/SD-saved file name).
(12) Overwrite [FTP/SD saving settings: Address 8] with n (0x6E), [FTP/SD saving settings: Address 9] with c (0x63), [FTP/SD saving settings: Address 10] with e (0x65), and [FTP/SD saving settings: Address 11] with NULL (0x00).
(13) Execute [Setting value change request: Address 0 Bit 7] (0→1). The request is retained until [Setting value change response] can be confirmed.
(14) Once the transfer condition number specification is complete, [Setting value change response] changes from 0 to 1.
(15) Setting [Setting value change request: Address 0 Bit 7] to 0 sets [Setting value change response] to 0.

Point

- Append the NULL character to the end of the text.
  If you change “ABCDEF” to “1234” and did not write NULL, the text is changed to “1234EF”.
- Arbitrary text can be changed in groups of four letters.
  To change “ABCDEF” to “ABCDGH”, you can change only 1012 for [FTP/SD-saved setting No.: Addresses 6 to 7] (the fifth to eighth letters of the FTP file name).
- Changes in groups of four letters are applied immediately. Do not execute a trigger until all text changes are complete.
- If multiple transfer condition numbers are specified, the condition with the smallest number is used.
- If data is not written to non-volatile memory, the set transfer condition number and file name will be deleted when the power is turned off.

Registering a master image externally



(1) Execute a [Master registration request]. (0 → 1)
(2) You can check the input status in [Master registration response].

Reference

- [BUSY] will change from 0 to 1 while the master image registration is in progress.
- If the master image registration is unsuccessful, [Master registration failed] will change from 0 to 1.
- If the master image registration is unsuccessful, [Warning] will switch from “0” to “1” and [Warning No.] will be updated according to the failure details. For details, refer to “Warning code list” (Page 5-38).
- You cannot register a master image from PROFINET communication while the unit is in [Setting] status.
- If you wish to write the master registration data to the sensor ROM, set the [Write to ROM at external master reg.] option to [Yes]. For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- Master images cannot be registered externally when the learning tool is in use or in sorting mode.

6

TCP/IP No Procedure Communication

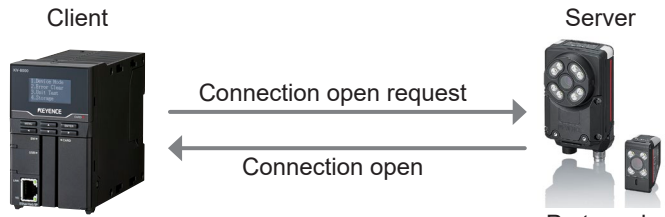
This chapter provides an overview of the IV3 Series TCP/IP no procedure communication and describes the specifications, functions, setting methods, commands, and responses.

Overview of TCP/IP No Procedure Communication

TCP/IP no procedure communication is a function that transmits and receives data between Ethernet devices using the TCP/IP protocol. This makes it possible to communicate not only with PCs or PLCs but also with various devices that support Ethernet.
External devices such as PCs and PLCs use socket communication function to perform TCP/IP no procedure communication with the IV3 Series.

Establishing the connection

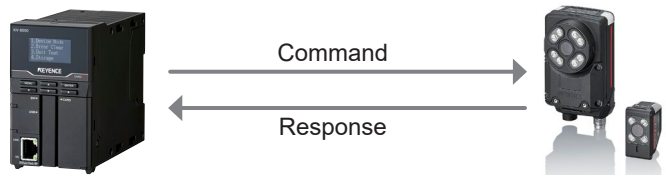
When communicating with TCP/IP, a connection must be established between the devices. A connection is established when the device on the server side performs passive open processing and is in a standby state and the device on the client side makes an open request (active open processing) to the server and is accepted. When a connection is established, a transmission path is created between the devices, making it possible to send and receive control information and data.



Port number: 8500 (default value)

Overview of commands and responses

A request (command) is transmitted from a PLC, PC, or other such external device to the IV3 Series, and then the IV3 Series sends a response. The code format for both commands and responses is ASCII.



■ Command format

aa　Use the first 2 or 3 characters to specify the type of command on the basis of the control details.

bb、cc　Specify the parameters according to the command type. The number of parameters and the number of characters vary depending on the command.
Use a comma (0x2C) to separate the parameters.

d　Specify [CR(0x0D)] as the delimiter.

Command example

D	R	,	0	3	,	1	CR
0x44	0x52	0x2C	0x30	0x33	0x2C	0x31	0x0D

■ Response format

The response when the command was processed successfully.

aa　The same command as the one received is returned.

bb、cc　Parameters are appended according to the command type and returned. The number of parameters and the number of characters vary depending on the response.
A comma (0x2C) is used as the parameter delimiter.

d　[CR(0x0D)] is appended as the delimiter.

Response example

P	R	,	0	6	4	CR
0x50	0x52	0x2C	0x30	0x36	0x34	0x0D

■ Error response format

The response when the command was not processed successfully.

The first 2 characters of the response are set to [ER].

aa　The same command as the one received is returned in 18 characters or less.

bb　An error number corresponding to the error details is returned. Fixed to 2 characters.
02: No corresponding command exists.
03: The command cannot be executed under these settings or conditions.
22: The number of parameters or the range is incorrect.

Point

When creating a control program, confirm that this unit has received the response before transmitting the next command to this unit.

■ Automatic status result transmission

Judgment processing can be performed during internal triggers or input signals (external triggers) from an external device such as a PLC or photoelectric switch, and status results can be transmitted automatically. This eliminates the need to transmit the status result read command.

Point

Use the OE command (Page 6-18) in advance to enable the automatic transmission function.

Point

If the next status result is confirmed while the initial status result is being transmitted, the new data will be discarded. (The status result will not be transmitted.)

Communication Specifications and Functions

IV3 Series TCP/IP no procedure communication specifications

Number of connections	1
Port*	8500 (default value) 1024 to 65535
Transmission code	ASCII
Data delimiter	CR (0x0D)

*Normally, there is no need to change this setting. The port number assigned for use with IV3-CP50/IV3-Navigator (default value: 63000) cannot be used.

IV3 Series TCP/IP no procedure communication function overview

Functions that can be used to control the IV3 Series via TCP/IP no procedure communication are listed below.

Function	Description
Trigger input	Executes a trigger input for the sensor.
Change Program	Executes a program switch for the sensor.
Ext. Master Save	Executes an external master registration for the sensor.
Setting value (judgment threshold) rewriting	Rewrites the threshold that is used as the reference for tool judgment.
Master text/master date rewriting	Rewrites the master text/master date that is used as the reference for OCR tool judgment.
Rewrite FTP/SD-saved file name	Rewrites the name of the image file to transfer to the FTP server or SD card.
Warning clear input	Executes a warning clear.
Read status	Allows you to check the unit status (Imaging, RUN, BUSY, Error, etc.).
Read overall status result	Reads the overall status result.
Read processing time	Reads the processing time of the judgment.
Read each tool's status result	Reads each tool's status result and matching rate.
Read statistical information	Reads out the number of triggers issued and the number of trigger errors.

Point

- If you are switching programs using TCP/IP no procedure communication, set the [Switching method] option to [Panel/PC/Network/Automatic Switching]. For details on the setting method, refer to the "IV3 Series User's Manual (Control Panel/PC Software)".
- If the external master registration will be executed frequently using TCP/IP no procedure communication, set the [Write to ROM when using Ext. Master Save] option to [No] to protect the non-volatile memory in the sensor. For details on the setting method, refer to the "IV3 Series User's Manual (Control Panel/PC Software)".
- If the FTP/SD-saved file name will be rewritten frequently using TCP/IP no procedure communication, configure the settings to prevent writing to non-volatile memory (set the corresponding bit to 0) in order to protect the non-volatile memory within the sensor. For details, refer to "FTP/SD-saved file name changing" (Page 6-15).
- When using standard mode and setting multiple position adjustment tools, the information of each position adjustment tool starting with the second one is assigned to a tool from Tool 1 to Tool 64.

Setting the IV3 Series

This section explains how to configure the settings when using TCP/IP no procedure communication.

Point

If you have changed the protocol settings, the connection with the sensor will be terminated, and then the sensor will be restarted.

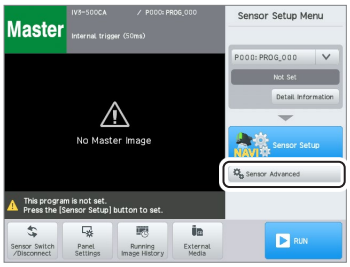
Setting the IV3 Series

You can configure the following settings for the IV3 Series using the control panel (IV3-CP50) or IV3-Navigator (IV3-H1).

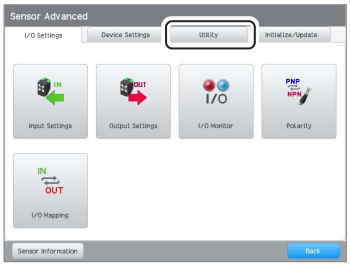
Configuring settings using the control panel (IV3-CP50)

Set the field network setting of the sensor to [Nonprocedural command].

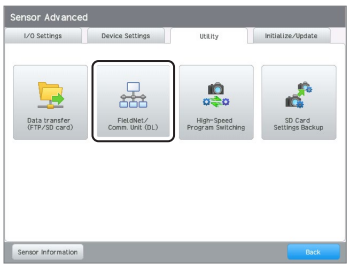
1 Tap [Sensor Advanced] on the Sensor Setup Menu screen.



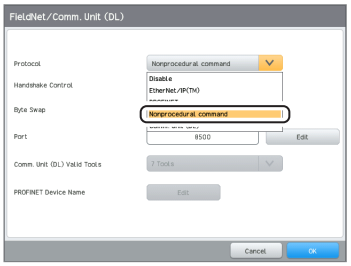
2 Tap the [Utility] tab.



3 Tap [FieldNet/Comm. Unit (DL)].



4 Select [Nonprocedural command] for the Protocol.



Point

- The port number is the TCP/IP no procedure communication function port number of this unit. Specify this value when opening a connection to this unit from an external device.
- Normally, you do not need to change the port number.
- The port number assigned for use with IV3-CP50/IV3-Navigator (default value: 63000) cannot be used.

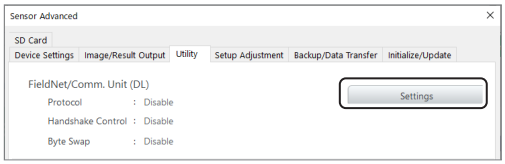
5 When the settings are complete, tap [OK].

When setting by IV3-Navigator (IV3-H1)

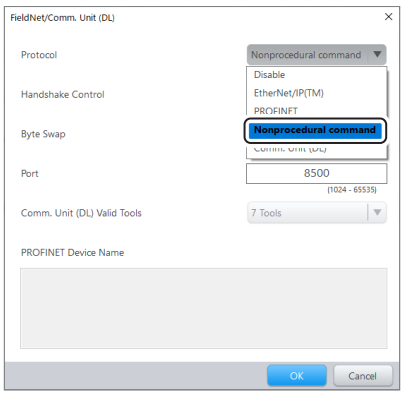
Set the field network setting of the sensor to [Nonprocedural command].

1 Display the Sensor Advanced screen.

2 Select the [Utility] tab, and then click [Settings] under [FieldNet/Comm. Unit (DL)].



3 Select [Nonprocedural command] for the field network [Protocol].



Point

- The port number is the TCP/IP no procedure communication function port number of this unit. Specify this value when opening a connection to this unit from an external device.
- Normally, you do not need to change the port number.
- The port number assigned for use with IV3-CP50/IV3-Navigator (default value: 63000) cannot be used.

4 When the settings are complete, click [OK].

The system returns to the Sensor Advanced screen.

5 Click [OK].

List of Commands Supported by the IV3 Series

List of commands

Control details	Command	Response	Reception possible with the unit in [Setting] status	Reference page
Trigger	T1 [CR]	T1 [CR]	-	Page 6-9
Status result reading	RT [CR]	🕮"Reading the status result" (Page 6-9)	-	Page 6-9
Trigger + status result reading	T2 [CR]	🕮"Trigger + status result reading" (Page 6-9)	-	Page 6-9
Program number reading	PR [CR]	PR, nnn [CR]	✓	Page 6-10
Program number switching	PW, nnn [CR]	PW [CR]	-	Page 6-10
Threshold reading	DR, nn, a [CR]	DR, nn, a, bbbbbbb [CR]	✓	Page 6-11
Threshold changing	DW, nn, a, bbbb [CR]	DW, nn [CR]	-	Page 6-12
Master text/date reading	CR, nn [CR]	CR, nn, ssss [CR]	✓	Page 6-13
Changing the master text/date	CW, nn, ssss [CR]	CW, nn [CR]	-	Page 6-13
Master text reading	CNR, nn [CR]	CNR, nn, aa, bb [CR]	✓	Page 6-14
Master text number changing	CNW, nn, aa, bb [CR]	CNW, nn [CR]	-	Page 6-14
FTP/SD-saved file name reading	FNR,n,m[CR]	FNR,n,m,ssss[CR]	✓	Page 6-15
FTP/SD-saved file name changing	FNW,n,m,ssss[CR]	FNW,n,m[CR]	-	Page 6-15
Master image registration	MR [CR]	MR [CR]	-	Page 6-16
Operating status reading	RM [CR]	RM, n [CR]	✓	Page 6-16
Sensor status reading	SR [CR]	SR, a, b, c, d, e, f [CR]	-	Page 6-16
Error number reading	RER [CR]	RER, nnn [CR]	-	Page 6-16
Warning number reading	WR [CR]	WR, nnn [CR]	-	Page 6-17
Warning clearing	WC [CR]	WC [CR]	-	Page 6-17
SD card free space reading	SDR [CR]	SDR, nnnnn[CR]	-	Page 6-18
SD card saving stopping	SDS [CR]	SDS [CR]	-	Page 6-18
Automatic status result transmission	OE, n [CR]	OE [CR]	✓	Page 6-18
Status result output format changing	OF, nn [CR]	OF [CR]	✓	Page 6-19
Statistical information reading	STR [CR]	🕮"Statistical information reading" (Page 6-20)	-	Page 6-20
Statistics resetting	STC [CR]	STC [CR]	-	Page 6-21
Version reading	VI [CR]	VI, nnn, vvv [CR]	✓	Page 6-21
Setting checksum reading	CSR [CR]	CSR, aaaaa [CR]	-	Page 6-21
Unit time changing	TC,yy,mm,dd,hh,mm,ss[CR]	TC[CR]	✓	Page 6-22

Details of commands and responses

Trigger

Command

T	1	C R

0x31

Response

T	1	C R

Explanation

Issues a trigger to start judgment processing.
The response is returned immediately. It does not wait until the judgment processing is finished.

Reading the status result

Command

R	T	C R

Response

Standard format

R	T	,	Tool result (standard)	C R

"Standard format" (Page 6-23)

Detailed format

R	T	,	Tool result (detailed)	C R

"Detailed format" (Page 6-24)

Explanation

Reads the confirmed status result when this command is received. The standard and detailed read formats are available. Use the OF command "Status result output format changing" (Page 6-19) to switch between standard and detailed format.

ER,RT,03[CR] is returned when:

- The judgment processing is not executed after the power is turned on/the program number is switched.
- "Automatic status result transmission (OE command)" is enabled.

Trigger + status result reading

Command

T	2	C R

Response

Standard format

R	T	,	Tool result (standard)	C R

"Standard format" (Page 6-23)

Detailed format

R	T	,	Tool result (detailed)	C R

"Detailed format" (Page 6-24)

Explanation

When this command is received, a trigger is issued to start judgment processing. When judgment processing is finished, the result is returned as a response.
The status result can be read in either standard or detailed format. Use the OF command (Page 6-19) to switch between standard and detailed format.

ER, T2, 03 [CR] is returned when:

- "Automatic status result transmission (OE command)" is enabled.

Program number reading

Command

P	R	C R

Response

P	R	,	n	n	n	C R

Parameter

nnn Program number (000 to 127)
Fixed to 3 characters

Explanation

Reads the current program number.

Response example

PR, 099 [CR]

Program number switching

Command

P	W	,	n	n	n	C R

Response

P	W	C R

Parameter

nnn Program number (000 to 127)
Up to 3 characters

Explanation

Switches the program number.
After the program number is switched, the response is returned.

Point

- Set the program's [Switching method] option to [Panel/PC/Network/Automatic Switching].
- The program No. switched to from TCP/IP no procedure communication will be deleted when the power is turned off.

Command example

Switching to P099 (PROG099)
PW, 099 [CR]

Response example (success)

PW [CR]

Response example (failure)

ER, PW, 03 [CR]
ER, PW, 22 [CR]

Threshold reading

Command

D	R	,	n	n	,	a	C R

Response

D	R	,	n	n	,	a	,	b	b	b	b	b	b	b	C R

Parameters

nn	00: Position adjustment tool 01 to 64: Tool number
a	0: Lower limit 1: Upper Limit
bbbbbbb	Threshold Fixed to 7 characters 0000000 to 9999999

Explanation

Reads the threshold of the specified tool.
When 00 is specified, the threshold of the position adjustment tool is read.
Reading is not possible in the following situation. (Error 03)

- In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool
- In sorting mode, tools other than the learning tool

Examples

Response when the lower limit of Tool 1 is 80
DR, 01, 0, 0000080 [CR]

Response when the lower limit of Tool 3 is 23.25 mm
DR, 03, 0, 0023250 [CR]

Threshold changing

Command

D	W	,	n	n	,	a	,	b	b	b	b	CR

Response

D	W	,	n	n	CR

Parameters

nn 00: Position adjustment tool
01 to 64: Tool number

a 0: Lower limit
1: Upper Limit

bbbb Threshold
Up to 7 characters
0 to 9999999
Only 2 characters can be specified when this parameter is 2 characters long.

Explanation

Changes the threshold of the specified tool.
If you specify 00, the threshold of the position adjustment tool will be changed.
After the threshold is changed, the response is returned.
If the number of threshold characters to transmit is a fixed length and the number of characters in the threshold changes, fill in the remaining characters with 0.
This cannot be changed in the following situation. (Error 03)

- In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool
- In sorting mode, tools other than the learning tool

Examples

Change the lower limit of Tool 1 to 80.
DW, 01, 0, 80 [CR]
Fill a threshold made of 4 characters with 0.
DW, 01, 0, 0080 [CR]
Change the lower limit of Tool 2 to 23.25 mm.
DW, 02, 0, 0023250 [CR]

Master text/date reading

Command

C	R	,	n	n	CR

Response

C	R	,	n	n	,	s	s	s	・	・	s	s	s	CR

Parameters

nn	Tool number (01 to 64)
sss‥sss	Master text/date Fixed to 16 characters

Explanation

This is an OCR tool command. The master text/date is fixed to 16 characters.
If there are less than 16 characters, the remaining characters are filled with SP (0x20).
If only the number of characters is judged, all characters will be SP (0x20).

Response example

When the master text is 14 characters
CR, 01, 123456789ABCDE [SP] [SP] [CR]

Changing the master text/date

Command

C	W	,	n	n	,	s	s	s	・	・	s	s	s	CR

Response

C	W	,	n	n	CR

Parameters

nn	Tool number (01 to 64)
sss‥sss	Master text/date Up to 16 characters

Explanation

This is an OCR tool command. The master text/date can be up to 16 characters in length.
After the master text/date is changed, the response is returned.
Only 10 characters can be specified when this parameter is 10 characters long.
If the number of characters to transmit changes to a fixed length and the number of characters in the master text changes, fill the preceding characters with NULL (0x00).
This cannot be changed in the following situations. (Error 03)

- When judgment only for the number of characters is enabled
- When calendar synchronization is enabled

Command examples

CW, 01, 123456789 [CR]
CW, 01, 1234567[NULL][NULL]

Master text reading

Command

C	N	R	,	n	n	CR

Response

C	N	R	,	n	n	,	a	a	,	b	b	CR

Parameters

nn Tool number (01 to 64)
aa Minimum number of characters (01 to 16)
Fixed to 2 characters
bb Maximum number of characters (01 to 16)
Fixed to 2 characters

Explanation

This is an OCR tool command.
It is used when judgment only for the number of characters is enabled.
Reading is not possible in the following situation. (Error 03)

- When judgment only for the number of characters is disabled

Response example

CNR, 01, 06, 10 [CR]

Master text number changing

Command

C	N	W	,	n	n	,	a	a	,	b	b	CR

Response

C	N	W	,	n	n	CR

Parameters

nn Tool number (01 to 64)
aa Minimum number of characters (01 to 16)
1 to 2 characters
bb Maximum number of characters (01 to 16)
1 to 2 characters

Explanation

This is an OCR tool command.
It is used when judgment only for the number of characters is enabled.
This cannot be changed in the following situations. (Error 03)

- When judgment only for the number of characters is disabled

Command example

CNW, 01, 06, 10 [CR]

FTP/SD-saved file name reading

Command

F	N	R	,	n	,	m	C R

Response

F	N	R	,	n	,	m	,	s	s	• •	s	s	C R

Point

- When this unit starts, the file name is read from non-volatile memory to volatile memory.
- During operation, FTP/SD card transferring is performed with the file name saved in volatile memory.
- The correct file name cannot be checked if the end of this name is SP (0x20).

Parameters

n	Transfer condition number (1 to 4)
m	0: Read from volatile memory. 1: Read from non-volatile memory.
sss .. sss	FTP/SD-saved file name Fixed to 64 characters

Explanation

Checks the FTP/SD-saved file name of the specified transfer condition.
The file name is fixed to 64 characters. If it uses less characters, the remainder are filled with SP (0x20).

Response example

When the FTP/SD-saved file name is 10 characters
FNR,1,0,123456789A[SP][SP]...[SP][CR]
54 characters

FTP/SD-saved file name changing

Command

F	N	W	,	n	,	m	,	s	s	• •	s	s	C R

Response

F	N	W	,	n	,	m	C R

Parameters

n	Transfer condition number (1 to 4)
m	0: Write to volatile memory. 1: Write to volatile and non-volatile memory.
sss .. sss	FTP/SD-saved file name Up to 64 characters

Explanation

Changes the FTP/SD-saved file name of the specified transfer condition.
Overwriting fails if a condition other than 1 to 4 is specified.
Only 10 characters can be specified when this parameter is 10 characters long.
If the number of characters to transmit changes to a fixed length and the number of characters in the file name changes, fill the preceding characters with NULL (0x00).

Command examples

FNW, 1, 0, 123456789 [CR]
FNW, 1, 0, 1234567 [NULL] [NULL] [CR]

Master image registration

Command

M	R	C R

Response

M	R	C R

Explanation

Registers the captured image as a master image. When the master image registration is complete, a response is returned.

Point

- Set the [Write to ROM when using Ext. Master Save] option when frequently using the Master Image Registration command. For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.
- Master images cannot be registered externally when the learning tool is in use or in sorting mode.

Operating status reading

Command

R	M	C R

Response

R	M	,	n	C R

Explanation

You can check the operating status (Run or Program).

Parameter

n 0: Program, 1: Run

Response example

RM, 1 [CR]

Sensor status reading

Command

S	R	C R

Response

S	R	,	a	,	b	,	c	,	d	,	e	,	f	,	g	C R

Explanation

You can check the operating status of the sensor.

Parameters

a BUSY (0 : OFF、1 : ON)

b 0: Reserved by system

c Image capture (0: Stopped, 1: Imaging)

d SD card (0: Not identified, 1: Identified)

e Insufficient free space on SD card (0: None, 1: Insufficient free space [100 MB or less] on SD card error occurring)

f Warning (0: None, 1: Warning occurring)
You can use the WR command (Page 6-17) to check the details of the warning.

g Error (0: None, 1: Error occurring)
You can use the RER command (Page 6-16) to check the details of the error.

Response example

SR, 1, 0, 1, 1, 0, 0 [CR]

Error number reading

Command

R	E	R	C R

Response

R	E	R	,	n	n	n	C R

Explanation

Reads the error number.

Parameter

nnn Fixed to 3 characters
000: No error
For details on error codes, see “Error code list” (Page 6-27).

Response example

RER, 079 [CR]

Warning number reading

Command

W	R	C R

Response

W	R	,	n	n	n	C R

Explanation

Reads the warning number.

Parameter

nnn Fixed to 3 characters
000: No warning
For details on warning codes, see “Warning code list” (Page 6-29).

Response example

WR, 065 [CR]

Warning clearing

Command

W	C	C R

Response

W	C	C R

Explanation

Clears the warning.

SD card free space reading

Command

S	D	R	C R

Response

S	D	R	,	n	n	n	n	n	C R

Explanation

Reads the free space on the SD card.

Parameter

nnnnn Fixed to 5 characters
Free space [MB]
If no SD card has been loaded, 00000 is returned.

SD card saving stopping

Command

S	D	S	C R

Response

S	D	S	C R

Explanation

Removes the SD card. After normal completion, the SD card can be safely removed from the sensor amplifier. Alternatively, the sensor amplifier can be turned off.
You can use the SR command (Page 6-16) to check the SD card identification status.

Automatic status result transmission

Command

O	E	,	n	C R

0x4F

Response

O	E	C R

Explanation

Selects whether to automatically transmit the status result.
When [Enable] is selected, the status result is automatically transmitted when the camera processes an inspection with an external trigger or internal trigger. The status result can be obtained without requiring the RT command.
“Use the automatic status result transmission.” (Page 6-35)
When set to [Disable], read the status result using the RT command.
This function is set to [Disable] when the power is turned on. To use the automatic transmission function, change this to [Enable] after the power is turned on. The change is retained until the power is turned off.

Parameter

n 0: Disabled
1: Enabled

Command example

OE, 1 [CR]

Status result output format changing

Command

O	F	,	n	n	C R

0x4F

Response

O	F	C R

Explanation

Changes the format of the status result output.
The change is retained until the power is turned off.
The default value when the power is turned on is [00: Standard].

Parameter

nn 00: Standard
Use 00 in the following situations.
- In standard mode with multiple master registration disabled
- In sorting mode

02: Standard (master number)
Use 02 in the following situations.
- In standard mode with multiple master registration enabled

For details on the format, refer to “Standard format” (Page 6-23).

01: Detailed
Use 01 in the following situations.
- In standard mode with multiple master registration disabled
- In sorting mode

03: Detailed (master number)
Use 03 in the following situations.
- In standard mode with multiple master registration enabled

For details on the format, refer to “Detailed format” (Page 6-24).
Fixed to 2 characters

Command example

OF, 01 [CR]

Point

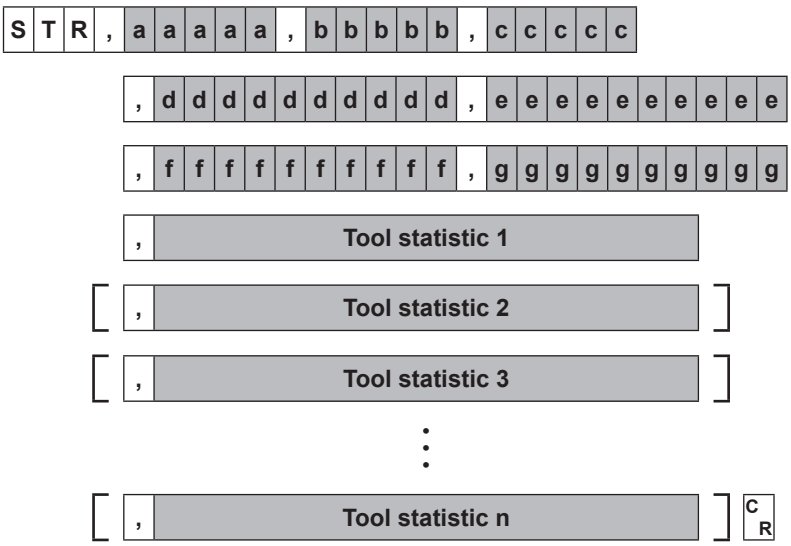
When specifying [02: Standard (master number)] or [03: Detailed (master number)], set [Total status condition] as shown below. Failing to do so will prevent you from obtaining correct master numbers.
- Total status condition: Logic n (n = 1 to 4)
- Logic n setting
  - Logic: OR
  - Set master number (Master00 to Master07): Use

For details on the setting method, refer to the “IV3 Series User’s Manual (Control Panel/PC Software)”.

Statistical information reading

Command

Response



Explanation

Reads the confirmed statistical information when this command is received.

Parameters

aaaaa	MAX processing time [ms], fixed to 5 characters
bbbbb	MIN processing time [ms], fixed to 5 characters
ccccc	AVE processing time (ms), fixed to 5 characters
ddddddddd	Trigger count, fixed to 10 characters
eeeeeeeee	OK count (standard mode), total sort count (sorting mode), fixed to 10 characters
fffffffff	NG count, fixed to 10 characters
ggggggggg	Trigger error count, fixed to 10 characters

Tool statistics details

Standard mode: The number of tools being used (n, up to 65) is output.

Sorting mode: The number of tools being used (n, up to 9) is output.

However, the MAX and MIN of tools other than the position adjustment tool are disabled.

hh	00: Position adjustment tool 01 to 64: Tool number Fixed to 2 characters
iiiiiii	MAX matching rate, fixed to 7 characters
jjjjjjj	MIN matching rate, fixed to 7 characters

Statistics resetting

Command

S	T	C	C R

Response

S	T	C	C R

Explanation

Resets the statistical information.

Version reading

Command

V	I	C R

0x49

Response

V	I	,	n	n	•	•	n	n	,	v	v	•	•	v	v	C R

Parameters

nn‥nn Sensor head model, variable length
vv‥vv Sensor version, variable length

Response example

VI, IV3-G500CA, R1.10.00 [CR]

Setting checksum reading

Command

C	S	R	C R

Response

C	S	R	,	a	a	a	a	a	C R

Explanation

Acquires the sensor setting status as a 5-digit integer This allows you to check whether the sensor settings have been changed by a third party. This also allows you to check whether the program is switched.
In the following situations, the checksum will not be changed.
• When the network settings are changed (such as the IP address)

Parameter

aaaaa 00000 to 65535
Decimal, unsigned integer
Fixed to 5 characters

Unit time changing

Command

T	C	,	y	y	,	m	m	,	d	d	,	h	h	,	m	m	,	s	s	C R

Response

T	C	C R

Explanation

Changes the date and time information of the sensor.

Parameters

yy	Year (20yy)	00 to 99, up to 2 characters
mm	Month	01 to 12, up to 2 characters
dd	Day	01 to 31, up to 2 characters
hh	Hour	00 to 23, up to 2 characters
mm	Minute	00 to 59, up to 2 characters
ss	Second	00 to 59, up to 2 characters

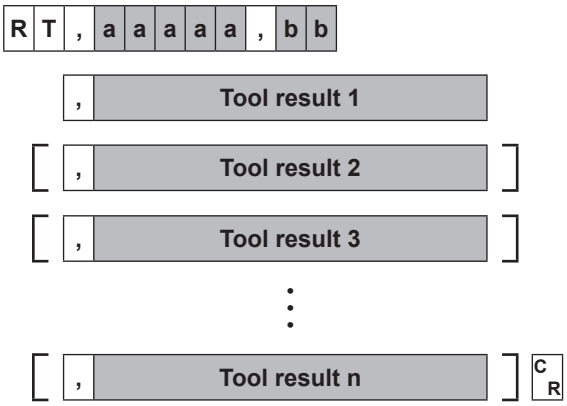
Reference

If a day (dd) that does not exist in the specified month (mm) is specified, the next month and day that do exist are used. For example, if April 31 is specified, the date is changed to May 1.

Status result output formats

Standard format

This is the format when the power is turned on or when 00 is specified with the OF command.



Parameters

aaaaa Result number, fixed to 5 characters
0 to 32767
The count is incremented each time the status result is updated. If the maximum value is exceeded, the count is returned to 0 and is incremented again. By comparing the result number, you can also confirm that no status results have been missed (that they have all been obtained).

bb **When the output format is 00: standard**
Use this parameter in the following situations.
• In standard mode with multiple master registration disabled
• In sorting mode
Total status result, fixed to 2 characters
OK: Total status is OK (standard mode).
00 to 07: Product types M0 to M7 from the total status (sorting mode).
NG: Total status/total sorting status is NG.
--: Status not possible

When the output format is 02: standard (master number)
Use this parameter in the following situation.
• In standard mode with multiple master registration enabled
Master status result, fixed to 2 characters
00 to 07: Master numbers 00 to 07 from the total status.*
99: Master status result is NG.
--: Status not possible
* If there are multiple master numbers whose status is OK, the lowest master number is output.

Tool result details

The number of tools being used (n, up to 65 in standard mode and up to 9 in sorting mode) is output.

c	c	,	d	d	,	e	e	e	e	e	e	e

cc Tool number, fixed to 2 characters
00: Position adjustment tool
01 to 64 (standard mode)/01 to 08 (sorting mode): Tool number

dd Status result, fixed to 2 characters
OK: Status OK (standard mode)
NG: Status/sorting status is NG.
- -: Status not possible
00 to 07: Product types M0 to M7 determined by each tool (sorting mode)

eeeeeee Matching rate, fixed to 7 characters
Example of a matching rate of 80: 0000080
Example of a matching rate of 21.5 mm: 0021500
When the status result is - -: 0000000
Number of BLOBs for the BLOB count tool. Example of 5 BLOBs: 0000005

Reference

The matching rate (other than that of the learning tool) in sorting mode outputs the matching rate of the tool that was determined as the master image registered to the judged product type. If the status of sorting is NG, the matching rate of product type M0 is output.

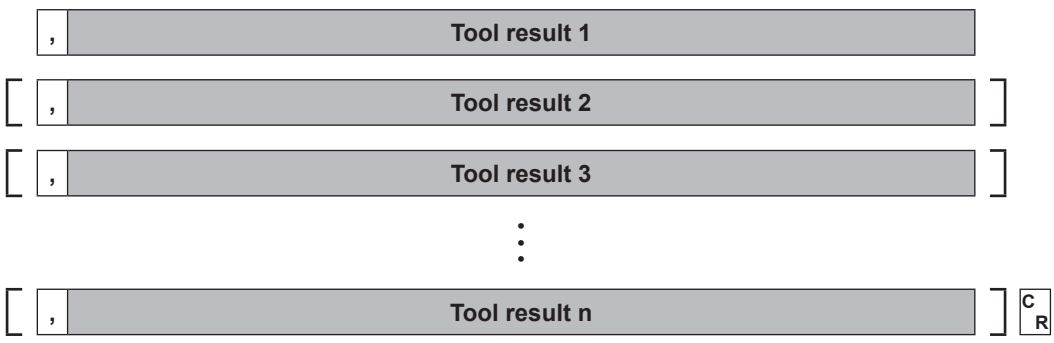
Output example

Result number 1234, total status NG
Tool 1: Area tool, result OK, matching rate 80
Tool 2: Diameter tool, result NG, matching rate: 21.5 mm
RT, 01234, NG, 01, OK, 0000080, 02, NG, 0021500 [CR]

Detailed format

This is the format when 01 is specified with the OF command.

R	T	,	a	a	a	a	a	,	b	b	,	v	w	x	y	,	d	d	d	d	d	,	e	e	e



Parameters

aaaaa Result number, fixed to 5 characters
0 to 32767
The count is incremented each time the status result is updated. If the maximum value is exceeded, the count is returned to 0 and is incremented again. By comparing the result number, you can also confirm that no status results have been missed (that they have all been obtained).

bb **When the output format is 01: detailed**
Use this parameter in the following situations.
• In standard mode with multiple master registration disabled
• In sorting mode
Total status result, fixed to 2 characters
OK: Total status is OK (standard mode).
00 to 07: Product types M0 to M7 from the total status (sorting mode).
NG: Total status/total sorting status is NG.
--: Status not possible
When the output format is 03: detailed (master number)
Use this parameter in the following situation.
• In standard mode with multiple master registration enabled
Master status result, fixed to 2 characters
00 to 07: Master numbers 00 to 07 from the total status.*
99: Master status result is NG.
--: Status not possible
* If there are multiple master numbers whose status is OK, the lowest master number is output.

vwxy Logic result, fixed to 4 characters
v: logic 1, w: logic 2, x: logic 3, y: logic 4
0: OFF
1: ON

ddddd Processing time [ms], fixed to 5 characters

eee Program number, 000 to 127, fixed to 3 characters

Tool result details

The number of tools being used (n, up to 65 in standard mode and up to 9 in sorting mode) is output. The format varies depending on the type of target tool.

Formats of tools other than the pitch/OCR/color average/brightness average tool, fixed to 32 characters, SP (0x20) for unused areas

f	f	,	g	g	,	h	h	h	h	h	h	h	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP	SP

Format of the pitch tool, fixed to 32 characters

f	f	,	g	g	,	h	h	h	h	h	h	h	,	i	i	i	i	i	i	i	,	j	j	j	j	j	j	j	,	k	k

Format of the OCR tool, fixed to 32 characters, SP (0x20) for unused areas

f	f	,	g	g	,	h	h	h	h	h	h	h	,	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	SP	SP

Format of the color average/brightness average tool, fixed to 32 characters, SP (0x20) for unused areas

f	f	,	g	g	,	h	h	h	h	h	h	h	,	n	n	n	,	o	o	o	,	p	p	p	SP	SP	SP	SP	SP	SP	SP

ff	Tool number, fixed to 2 characters 00: Position adjustment tool 01 to 64 (standard mode)/01 to 08 (sorting mode): Tool number
gg	Status result, fixed to 2 characters OK: Status OK (standard mode) NG: Status/sorting status is NG. - -: Status not possible 00 to 07: Product types M0 to M7 determined by each tool (sorting mode)
hhhhhhh	Matching rate, fixed to 7 characters Example of a matching rate of 80: 0000080 Example of a matching rate of 21.5 mm: 0021500 When the status result is - -: 0000000 Number of BLOBs for the BLOB count tool. Example of 5 BLOBs: 0000005
iiiiiii	MAX current pitch value, fixed to 7 characters Maximum value of all pitches
jjjjjjj	MIN current pitch value, fixed to 7 characters Minimum value of all pitches
kk	Number of pitches, fixed to 2 characters
mm・・mm	OCR tool reading text, fixed to 16 characters When the number of read characters is less than 16, SP (0x20) is entered for each missing character. Example of 14 characters: 123456789ABCDE[SP][SP]
nnn	Color average tool H (hue), fixed to 3 characters, 000 to 359, fixed to 000 for the brightness average tool
ooo	Color average tool S (saturation), fixed to 3 characters, 000 to 255, fixed to 000 for the brightness average tool
ppp	Color average tool V (brightness)/brightness average tool brightness, fixed to 3 characters, 000 to 255

Reference

The matching rate (other than that of the learning tool) in sorting mode outputs the matching rate of the tool that was determined as the master image registered to the judged product type. If the status of sorting is NG, the matching rate of product type M0 is output.

Error code list

The following shows the list of error codes that are generated in the IV3 Series.

Error code	Content	Cause	Countermeasure
0	No error	---	---
1 - 32	Program No. xx corruption error	• A data error has occurred in program No. xx. • Data corruption may have occurred due to a power-off while writing settings data and/or due to noise.	• Initialize the program No. xx. • Cycle power to the sensor. • Do not switch off the unit while the settings are being saved. • If the error persists, contact your nearest KEYENCE office.
52	Program switching error (on startup; external input)	On startup, a program switching error (external input) occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Use external input to select a value from P000 to P031.
53	Program switching error (on startup; Panel/PC/Network/ Automatic Switching)	On startup, a program switching error (Panel/ PC/Network/Automatic Switching) occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup or operation mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Select a value from P000 to P031. • You can select whether to continue operation with P000 or to change to setup mode when the error message is cleared.
55	Program switching error (in [RUN] status)	While the unit was in [RUN] status, a program switching error occurred in the expansion program.	Use the control panel or a PC (IV3-Navigator) to clear the error message. The error is cleared, and the sensor changes to setup mode. After that, perform the following operations. • Identify the SD card containing the correct expansion program once more. • Select a value from P000 to P031.
97-99	Non-volatile memory error	• A data error has occurred. • Data corruption may have occurred due to a power-off while writing settings data and/or due to noise.	• Initialize the settings of this unit. • Cycle power to the sensor. • Do not switch off the unit while the settings are being saved. • If the error persists, contact your nearest KEYENCE office.

Error code	Content	Cause	Countermeasure
95-96 100-128	System error	An error may have occurred in the sensor.	• Cycle power to the sensor. • If the error persists, contact your nearest KEYENCE office.
79	System error	No sensor head is connected to the sensor amplifier.	Connect a sensor head to the sensor amplifier, and then cycle power to the sensor. If the error persists, contact your nearest KEYENCE office.

Reference

If two or more errors are occurring at the same time, the error code of the highest priority will be displayed.
The greater the error code, the higher the priority of the error will be.

Warning code list

The following shows the list of warning codes that are generated in the IV3 Series.

Warning code	Content	Cause	Countermeasure
0	No error	---	---
54	Expansion program setting mismatch error (normal)	While the unit was in [Setting] status, a program setting error occurred in the expansion program.	Identify the SD card containing the correct expansion program once more.
58	External master registration error (OCR)	For the new master image, the characters and date cannot be read with the OCR tool.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
60	Field Network Error, Invalid request (OCR/threshold)	• A change to the master text/date, threshold, or character count has been requested from TCP/IP communication while the unit is in “Setting” status. • A threshold change for a tool whose threshold cannot be changed has been requested. • A parameter that is not valid has been entered.	• Make requests while the device is running. • Input valid parameters. • When changing the master text or date, the following situations are invalid: - The specified tool is not the OCR tool - The specified OCR tool detection operation (character/date/character count) does not match the change request - When only judging the number of characters, the number of characters is outside of the data content range • Threshold changes are not valid for the following tools. - In standard mode or sorting mode, the position adjustment tool, which corrects the position of the learning tool - In sorting mode, tools other than the learning tool
61	Field network bad request error (FTP/SD)	A parameter that is not valid has been entered.	• Make requests while the device is running. • Set the transfer condition before making the request. • When saving to the SD card, set a file name with 16 characters or less before making the request. Character 17 and later are not valid. • Only use valid characters—listed below—in the file name. 0,1,2,3,,,,7,8,9 a,b,c,,d,,,,x,y,z A,B,C,D,,,,X,Y,Z ␣ (space symbol) (,),+,-,=,.,’,!,#,$,%,&,@, _

Warning code	Content	Cause	Countermeasure
62	Field network overrun error	An overrun of the status result has occurred.	• Request a result acquisition completion notice to permit the updating of the status result. • Refer to the operation procedure and reference program when setting the handshake control to [Enable]. • Set the handshake control to [Disable].
63	Field Network Error, Invalid request (Save Master)	External master registration has been requested using TCP/IP while the unit is in “Setting” status.	Do not request an external master registration while the unit is in “Setting” status.
64	Field Network Error, Invalid request (Change Program)	• Program switching has been requested using TCP/IP while the unit is in “Setting” status. • A program switching request to a non-existent program No. was made using TCP/IP. • A program switching requested was made using TCP/IP while the program switching method was set to [External input].	• Do not request a program switching while the unit is in “Setting” status. • Specify the correct program number. When SD card program expansion is set to [Disable], specify a number between 0 and 31. When it is set to [Enable], specify a number between 0 and 127. • If you are switching programs using TCP/IP, set the [Switching method] option to [Monitor/PC/Network].
65	Trigger error	A trigger was applied while the busy bit was ON. (If you have set the trigger error option to [Enable].)	Do not apply triggers while the unit is in the busy status.
66	External master registration error (Insufficient outline)	The outline tool is unable to extract the outline of the new master image.	• Check if there are any problems with the registered image and the detection tool or the position correction setting. • Adjust the brightness of the image to be registered.
67	External master registration error (Insufficient area)	The color area/area tool is unable to extract the area of the new master image.	
68	External master registration error (Brightness correction failed)	The brightness of the new master image cannot be corrected appropriately.	
69	External master registration error (Insufficient edge faild)	The edge tool is unable to extract the edge of the new master image.	
70	FTP Transfer Error (Insufficient Data Buffer)	Transfer has failed because a volume of data exceeding the remaining FTP buffer capacity has been generated.	• Modify the trigger cycle of this unit. • Check the load status of the network.
71	FTP Transfer Error (Transfer Failed)	Data transfer to the destination folder has failed.	Check the access permissions of the destination folder.

Warning code	Content	Cause	Countermeasure
72	FTP Connection Error	Connection to the FTP server has failed.	• Check the IP address of the FTP server. • Check the port number of the FTP server. • Check the user name for logging into the FTP server. • Check the password for logging into the FTP server.
73	External master registration error (Insufficient work memory)	There is insufficient work memory.	Delete one or more detection tools.
74	External master registration error (No images)	There are no registered images for master registration.	Perform the master image registration after having captured the image to be used for the registration.
75	SD Card Transfer Error (Insufficient Transfer Buffer)	An SD card transfer error occurred because the data buffer was insufficient.	• Set the sensor trigger cycle to a longer value. • Use the result update complete bit to control the trigger. In this situation, set the busy output timing to “Until Data Transfer Is Complete”.
76	SD Card Transfer Error (Transfer Failed)	An SD card transfer error occurred because the transfer failed.	• Check the free space. • Remove the SD card from its slot, reinsert the SD card, and then close the cover. Check that the SD card indicator lights.
77	External master registration error (learning tool/sorting mode)	An external master registration request occurred when the learning tool or sorting mode was in use.	External master image registration cannot be used when the learning tool or sorting mode is in use.

Reference

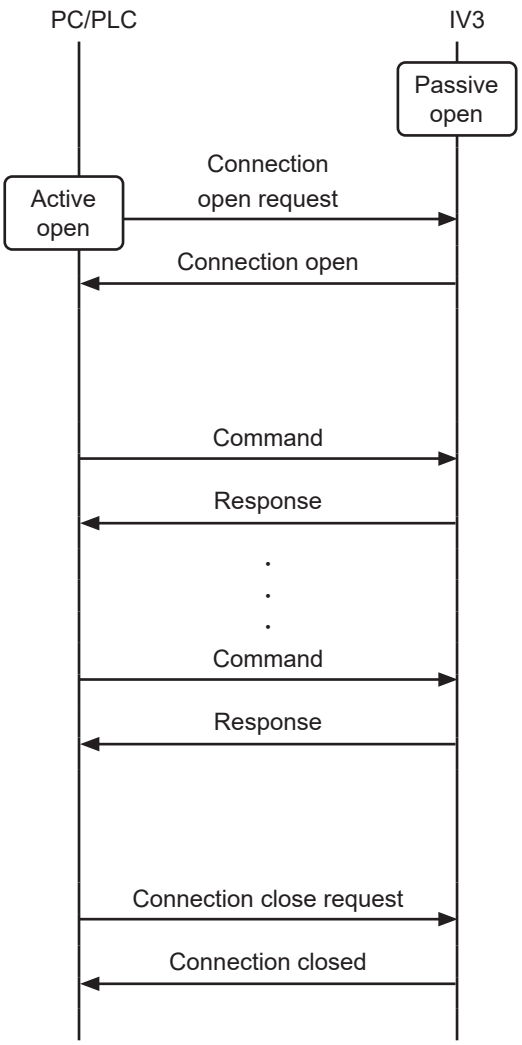
- When two or more warnings are issued, all subsequent warnings after the first warning will be saved in the history.
  If you clear the warnings, the warning code of the highest priority warning will be displayed.
- The greater the warning code, the higher the priority of the warning will be.
- The SD card saving stop failed warning will not occur.

ASCII code table (reference)

Lower four bits \ Upper four bits	0	1	2	3	4	5	6	7
0	$^{N}U_{L}$	$^{D}L_{E}$	S_{P}	0	@	P	`	p
1	$^{S}O_{H}$	$^{D}C_{1}$	!	1	A	Q	a	q
2	$^{S}T_{X}$	$^{D}C_{2}$	”	2	B	R	b	r
3	$^{E}T_{X}$	$^{D}C_{3}$	#	3	C	S	c	s
4	$^{E}O_{T}$	$^{D}C_{4}$	$	4	D	T	d	t
5	$^{E}N_{Q}$	$^{N}A_{K}$	%	5	E	U	e	u
6	$^{A}C_{K}$	$^{S}Y_{N}$	&	6	F	V	f	v
7	$^{B}E_{L}$	$^{E}T_{B}$	’	7	G	W	g	w
8	B_{S}	$^{C}A_{N}$	(	8	H	X	h	x
9	H_{T}	E_{M}	)	9	I	Y	i	y
A	L_{F}	$^{S}U_{B}$	*	:	J	Z	j	z
B	V_{T}	$^{E}S_{C}$	+	;	K	[	k	{
C	F_{F}	→	,	<	L	¥	I	|
D	C_{R}	←	—	=	M	]	m	}
E	S_{O}	↑	.	>	N	^	n	~
F	S_{I}	↓	/	?	O	_	o	$^{D}E_{L}$

Communication Methods

Communication flow



Opens a connection from the PC/PLC to port number 8500 (default value) of the IV3.

Transmits a command according to the control details and receives a response.

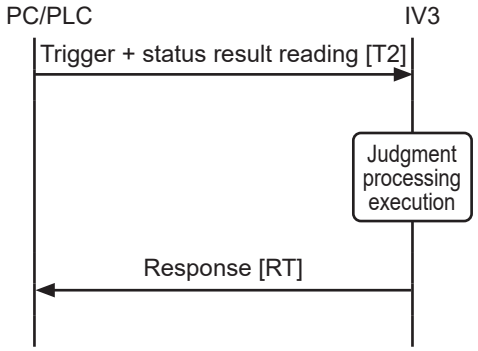
Point

When creating a control program, confirm that this unit has received the response before transmitting the next command to this unit.

Closes and ends the connection.

Judgment processing communication methods

■ Use the [T2] command.

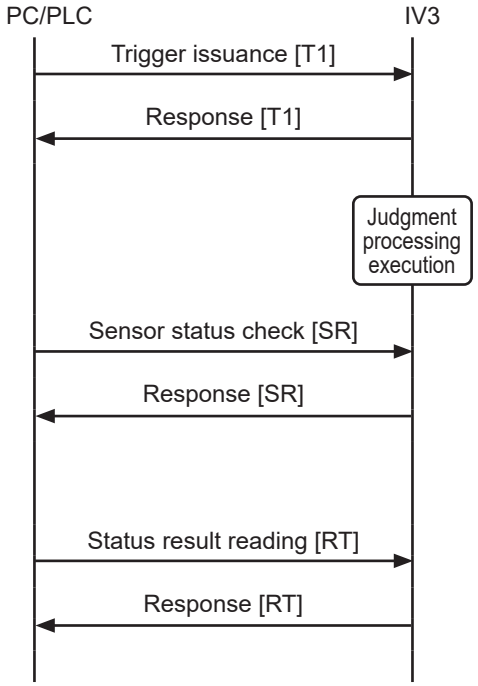


Transmits the [T2] command.

Issues a trigger to perform the judgment processing.

When the judgment processing is complete, the status result is returned.
“Status result output formats” (Page 6-23)

■ Use the [T1] command and [RT] command.



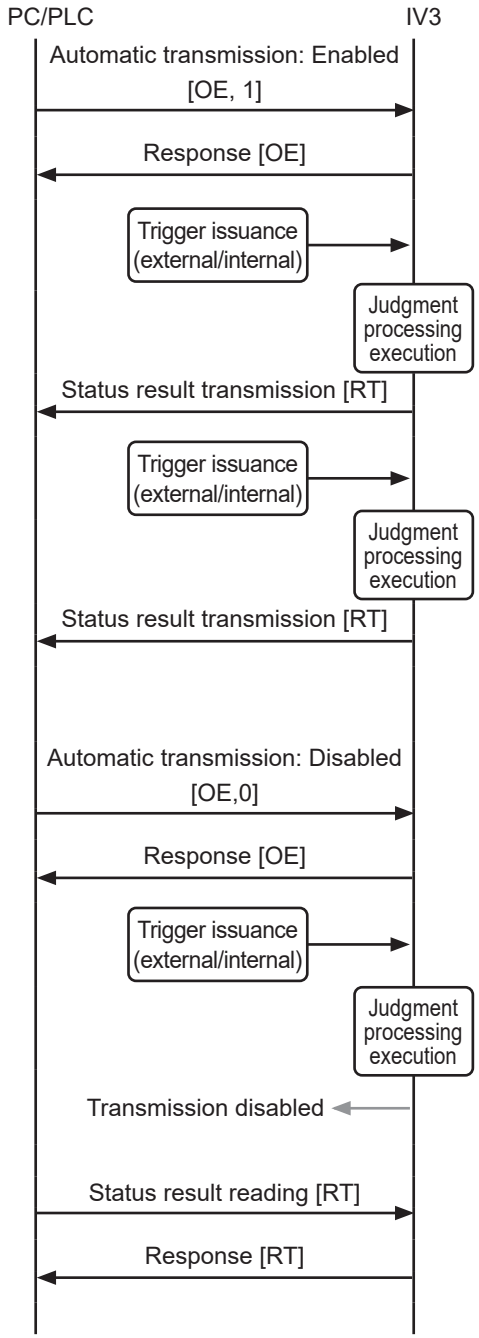
Transmits the [T1] command.

Issues a trigger to perform the judgment processing.

Uses the [SR] command to check the busy status.

When the judgment processing is complete, the [RT] command is transmitted.
Returns the status result.
“Status result output formats” (Page 6-23)

■ Use the automatic status result transmission.



Use the [OE] command to change the automatic transmission function to [Enable].

Point

This function is set to [Disable] when the power is turned on. Change this to [Enable] each time the power is turned on.

Issues an external trigger or an internal trigger to perform the judgment processing.

When the judgment processing is complete, the status result is automatically transmitted.
"Status result output formats" (Page 6-23)

Point

If the next status result is confirmed while the prior status result is being transmitted, the new data will be discarded. (The status result will not be transmitted.)

When the automatic transmission function is set to [Disable], the status result will not be transmitted.

Reference

The [RT] command can be used to obtain the status result.

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Copyright notice

Revision history

Revision history	Edition number	Revision details
April 2021	1st edition	
August 2021	2nd edition	
February 2022	Revised 1st edition	Compliance with version R1.20
February 2022	Revised 2nd edition	
September 2022	Revised 3rd edition	
June 2023	2nd revision 1st edition	

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KEYENCE CORPORATION

www.keyence.com/glb

1-3-14, Higashi-Nakajima, Higashi-Yodogawa-ku, Osaka, 533-8555, Japan PHONE: +81-6-6379-2211

AUSTRIA
Phone: +43 (0)2236 378266 0

BELGIUM
Phone: +32 (0)15 281 222

BRAZIL
Phone: +55-11-3045-4011

CANADA
Phone: +1-905-366-7655

CHINA
Phone: +86-21-3357-1001

CZECH REPUBLIC
Phone: +420 220 184 700

FRANCE
Phone: +33 1 56 37 78 00

GERMANY
Phone: +49-6102-3689-0

HONG KONG
Phone: +852-3104-1010

HUNGARY
Phone: +36 1 802 7360

INDIA
Phone: +91-44-4963-0900

INDONESIA
Phone: +62-21-2966-0120

ITALY
Phone: +39-02-6688220

KOREA
Phone: +82-31-789-4300

MALAYSIA
Phone: +60-3-7883-2211

MEXICO
Phone: +52-55-8850-0100

NETHERLANDS
Phone: +31 (0)40 206 6100

PHILIPPINES
Phone: +63-(0)2-8981-5000

POLAND
Phone: +48 71 368 61 60

ROMANIA
Phone: +40 (0)269 232 808

SINGAPORE
Phone: +65-6392-1011

SLOVAKIA
Phone: +421 (0)2 5939 6461

SLOVENIA
Phone: +386 (0)1 4701 666

SWITZERLAND
Phone: +41 (0)43 455 77 30

TAIWAN
Phone:+886-2-2721-1080

THAILAND
Phone: +66-2-078-1090

UK & IRELAND
Phone: +44 (0)1908-696-900

USA
Phone: +1-201-930-0100

VIETNAM
Phone: +84-24-3772-5555

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