KEYENCE

B95GB

# Built-in AI Code Reader
# SR-X Series
# User's Manual Rev.5.0

Read this manual before use.
Keep this manual in a safe place for future reference.

## Symbols

The following symbols alert you 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.

## Introduction

This user's manual describes the connection/wiring procedure, setting instructions, and precautions for using the "SR-X Series Built-in AI Code Reader". Please read this manual thoroughly before using the SR-X Series to ensure optimum performance. Keep this manual handy for quick future reference.

# Table of Contents


General Precautions ..... 2
Safety Precautions ..... 2

## Part 1 Basic Operation

### Chapter 1 Before Using the Product

1-1 Checking the Package Contents ..... 4
1-2 Part Names ..... 5
1-3 System Configuration and Setup Flow ..... 6

### Chapter 2 Connection and Wiring

2-1 Connection and Wiring ..... 8
2-2 Wiring to a PC ..... 9
2-3 Wiring to a PLC or Peripheral ..... 10
2-4 Wiring to a Sensor or Switch ..... 10

### Chapter 3 Mounting

3-1 Before Mounting ..... 12
3-2 Mounting Methods ..... 12
3-3 Mounting Position Adjustment ..... 13

### Chapter 4 Tuning

4-1 Tuning ..... 16
4-2 Reading Check ..... 16
4-3 Initial Power-on Operation ..... 17

### Chapter 5 AutoID Network Navigator (Basic Information)

5-1 Connecting ..... 20
5-2 Application Selection ..... 21
5-3 Reading Settings ..... 22
5-4 Communication Settings ..... 23
5-5 Sending Settings ..... 24
5-6 Saving Settings/Quick Setup Codes ..... 25

## Part 2 Detailed Information

### Chapter 6 AutoID Network Navigator (Practical Information)

6-1 Add Banks ..... 28
6-2 When you want to improve the reading capacity (AI filter) (SR-X300/X300W only) ..... 28
6-3 Increase reading capacity further (X-Link decoding) (SR-X300/X300W only) ..... 29
6-4 Change Reading Behavior ..... 30
6-5 Control Multiple Readers ..... 30
6-6 Edit Read Data ..... 31
6-7 Control the I/O Terminals ..... 31
6-8 Save Captured Images ..... 33
6-9 Compare the Read Data (Preset Data Comparison) ..... 34
6-10 Allocate IP Addresses to Multiple Devices ..... 35
6-11 Check Version ..... 36
6-12 Identify the reader ..... 37

### Chapter 7 Setting Example

7-1 Change Field of View ..... 40
7-2 Read Multiple Codes ..... 40
7-3 Change Sort Order of Multiple Codes ..... 43
7-4 Determine the Success/ERROR of Reading for Each Area ..... 44
7-5 Read Codes in Presentation Mode (Hands-free) ..... 44
7-6 Check Print Quality ..... 45
7-7 Suppress Data Output ..... 46
7-8 Changeover ..... 46
7-9 Change Language or Units Displayed by AutoID Network Navigator ..... 48
7-10 Lock SR-X Series Buttons ..... 48
7-11 Password Lock ..... 49
7-12 Save Read Data in CSV Files ..... 49

7-13 Check Field of View by Mounting Distance (Installation Guide) .... 50
7-14 Read Barcodes in Specific Orientations .... 50
7-15 Output Read Data to Excel (SR-UR1) .... 51
7-16 Read DotCode .... 51

## Chapter 8 Checking Reading Results and Operations

8-1 Check the Read Data .... 54
8-2 Send Commands .... 54
8-3 View Live Images (MultiMonitor) .... 54
8-4 Acquire Images Captured by the SR-X Series .... 54
8-5 Output Read Results as a Report .... 54

## Chapter 9 Checking and Restoring Settings

9-1 Checking SR-X Series Settings .... 56
9-2 Restoring Settings .... 56
9-3 Setting Multiple SR-X Units (Multi-Unit Setting Tool) .... 58
9-4 Comparing Settings of Multiple SR-X Units .... 59

## Chapter 10 Detailed Explanation

10-1 Details of main unit operation .... 62
10-2 AutoID Network Navigator Details .... 64
10-3 List of AutoID Network Navigator Settings .... 65
10-4 Read Behavior .... 68
10-5 Reading Test .... 72
10-6 Code Quality Verification .... 72
10-7 Matching level .... 83
10-8 Master/Slave Function .... 84
10-9 Preset Data Comparison .... 87
10-10 Scripts .... 88
10-11 Command Replacement .... 89

# Part 3 Communication

## Chapter 11 Communication Types

11-1 SR-X Series Communication Types .... 92
11-2 Data Communication Format .... 93

## Chapter 12 SR Web Tool

12-1 Details of SR Web Tool .... 96
12-2 Details of Web Navigator .... 97
12-3 Details of Web Traceability Tool .... 98
12-4 Details of Web Multi Monitor .... 99

## Chapter 13 Serial / Socket Communication

13-1 Serial Communication .... 102
13-2 Socket Communication (TCP, UDP) .... 103

## Chapter 14 Command Communication

14-1 Command Communication .... 106
14-2 Reading and Tuning Commands .... 107
14-3 SR-X Series Configuration Commands .... 109

## Chapter 15 PLC Link

15-1 PLC Link Overview .... 124
15-2 Settings .... 124
15-3 Memory Maps .... 126
15-4 Operation Examples .... 128
15-5 PLC Link Error .... 130

## Chapter 16 EtherNet/IP

16-1 EtherNet/IP Overview .... 132
16-2 Cyclic Communication .... 133
16-3 Message Communication .... 140
16-4 Reference Programs .... 143

## Chapter 17 PROFINET

17-1 PROFINET Overview .... 146
17-2 Cyclic Communication .... 146

# Part 4 Specifications and Application Examples

## Chapter 18 Application Examples

18-1 Reading in Presentation Mode .... 152
18-2 Reading Moving Codes .... 152
18-3 Reading Codes with Unknown Positions .... 152
18-4 Changeover .... 152

## Chapter 19 Specifications

19-1 Specifications .... 156
19-2 Dimensions .... 157
19-3 Troubleshooting .... 160
19-4 ASCII Codes .... 161
19-5 Precautions on Proper Use .... 161
19-6 Software License Agreement .... 162
19-7 Libraries and programs .... 162

# General Precautions

| | |
|---|---|
| DANGER | • **Do not use this product for the purpose to protect a human body or a part of human body.**<br>• **Do not use this product in a hazardous location and/or potentially explosive atmosphere.**<br>• **Do not use this product in an application that may cause death, serious injury or serious property damage due to a failure with this product should occur, such as nuclear power plants, on aircraft, trains, ships, or vehicles, used within medical equipment, playground equipment, roller coasters and other rides, etc.** |
| WARNING | • **If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**<br>• **You must perform a sufficient risk assessment for the machine where this product is to be installed prior to installing this product. Provide appropriate protective fail-safe measures on the machine independent from this product in case a failure with this product should occur.** |
| CAUTION | • **You must verify that the SR-X Series are operating correctly in terms of functionality and performance before the start and the operation of the SR-X Series.** |
| NOTICE | • **KEYENCE never warrants the function or performance of the SR-X Series if it is used in a manner that differs from the SR-X Series specifications contained in this instruction manual of if the SR-X Series are modified by yourself.**<br>• **When the SR-X Series is used in combination with other instruments, functions and performance maybe degraded, depending on operating conditions and the surrounding environment.** |

# Safety Precautions

## Safety Precautions on LED Product

| | |
|---|---|
| CAUTION | • **Do not perform control or adjustment using a procedure other than those specified herein.**<br>**It may result in hazardous radiation exposure. Follow the instruction mentioned below, otherwise, injury to human body (eyes, skin, etc.) may result.**<br>• **Do not stare at the LED light and specular reflected light.**<br>• **LED emission from this product is not automatically stopped when it is disassembled. Never do disassemble, modify, repair this product.**<br>• **Do not view the LED light with optical instruments (for example, eye loupes, magnifiers, microscopes, telescopes, binoculars, etc.). Do not view the LED light directly with optical instruments (for example, eye loupes, magnifiers, microscopes, telescopes, binoculars, etc.) within a distance of 100 mm. It may pose an eye hazard.** |

# 1 Before Using the Product


1-1 Checking the Package Contents 4

Option 4

1-2 Part Names 5

1-3 System Configuration and Setup Flow 6

System Configuration 6

Setup Flow 6

# 1-1 Checking the Package Contents

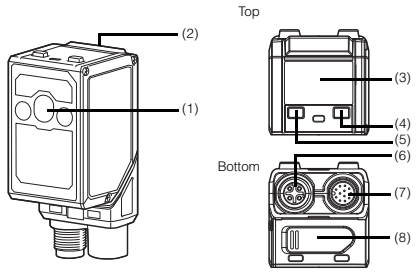
| Model | Name | Package content | Qty. | Appearance |
|---|---|---|---|---|
| SR-X300/X300W<br>SR-X100/X100W | Built-in AI Code Reader | Reader unit | 1 | |
| | | Instruction manual | 1 | |
| | | Ethernet port cover | 1 | |

## Option

| Model | Name | Package content | Qty. | Appearance |
|---|---|---|---|---|
| SR-H8W | Setup software (AutoID Network Navigator) | DVD-ROM | 1 | |
| OP-88678/88679/88680 | Control cable (NFPA-compliant) M12A female - loose wire type | Cable (2 m/5 m/10 m) | 1 | |
| OP-88681/88682/88683 | Control cable (NFPA-compliant) M12A female - D-sub connector type | Cable (2 m/5 m/10 m) | 1 | |
| OP-88684/88685/88686 | L-shaped control cable* (NFPA-compliant) M12A female - loose wire type | Cable (2 m/5 m/10 m) | 1 | |
| OP-88687/88688/88689 | L-shaped control cable* (NFPA-compliant) M12A female - D-sub connector type | Cable (2 m/5 m/10 m) | 1 | |
| OP-87230/87231/87232 | Ethernet cable (NFPA79-compliant) M12D male - RJ45 type | Cable (2 m/5 m/10 m) | 1 | |
| OP-88301/88302/88303 | L-shaped Ethernet cable* (NFPA-compliant) M12D male - RJ45 type | Cable (2 m/5 m/10 m) | 1 | |
| OP-88846 | Interchangeable control cable 1 | Cable (0.45 m) | 1 | |
| OP-88764 | Interchangeable control cable 2 | Cable (0.45 m) | 1 | |
| OP-88569 | USB cable Type A - Type C cable | Cable (1.5 m) | 1 | |
| OP-88696 | Mounting bracket | Mounting bracket | 1 | |
| | | Screw (M3) | 2 | |
| OP-88697 | Adjustable bracket | Mounting bracket | 1 | |
| | | Mounting bracket | 1 | |
| | | Screw (M3) | 2 | |
| OP-88698 | Interchangeable mounting bracket 1 | Mounting bracket | 1 | |
| | | Screw (M3) | 2 | |
| OP-88699 | Interchangeable mounting bracket 2 | Mounting bracket | 1 | |
| | | Screw (M3) | 2 | |
| SR-XESD | ESD attachment | Attachment | 1 | |
| SR-XLP | Laser protector | Attachment | 1 | |
| SR-XHR | High-resolution lens attachment | Attachment | 1 | |

* L-shaped cables can only be used by the SR-X100/100W.

# 1-2 Part Names




| No. | Name | Description |
|---|---|---|
| (1) | Scanner | Section that reads codes. |
| (2) | Status indicating LED | Indicates whether the reading has succeeded or failed, setup software connection status, etc. |
| (3) | Display*1 | Shows reading results or reading data. |
| (4) | ENTER button*2 | Button used to confirm functions. |
| (5) | SELECT button*1 | Button used to select functions. |
| (6) | Ethernet port | Port for connecting the Ethernet cable. |
| (7) | Control port | Port for connecting the control cable. |
| (8) | USB port | Port for connecting USB memory or a USB cable*3. |

*1 Only SR-X300/X300W is equipped
*2 In the SR-X100/X100W, this will be the [TRG] button.
*3 OP-88569

| | |
|---|---|
| NOTICE | **When not using the Ethernet cable, be sure to attach the Ethernet port cover.**<br>**Attach a USB port cover to meet the protective structural specification.** |

## When the unit is normally operating

| Unit state | LED state |
|---|---|
| Powered off | Turned Off |
| Immediately after powered on | □ Lit white |
| IP address unallocated (status BOOTP) | ■□ Blinking blue |
| Connected to AutoID Network Navigator | ■ Lit blue |
| Reads successfully | ■ Lit green |
| Reads unsuccessfully or gets unsuccessful result of verification | ■ Lit red |

## When the unit reads a quick setup code

| Unit state | LED state |
|---|---|
| Reading | ■ Lit blue |
| Configures settings successfully | ■ Lit green |
| Configures settings unsuccessfully | ■ Lit red |

## When the unit has an error

| Error number/message | | LED state (SR-X300/X300W) | | LED state (SR-X100/X100W) | |
|---|---|---|---|---|---|
| E0 | FILE SYSTEM | Blinking yellow | ■□ | Blinking yellow-red | ■■ |
| E1 | FACTPARAM | | | Blinking yellow-red | ■■ |
| E2 | CHECK SUM | | | Blinking yellow-red | ■■ |
| E2 | CONFIG VER | | | Blinking yellow-red | ■■ |
| E3 | PROFINET | | | Blinking yellow | ■□ |
| E4 | BUFFER OVER | | | Blinking yellow | ■□ |
| E5 | IP DUPLICATE | | | Blinking yellow | ■□ |
| E6 | FW UPDATE | | | Blinking yellow-red | ■■ |
| E7 | PLC LINK | | | Blinking yellow | ■□ |
| E8 | SCRIPT | | | Blinking yellow | ■□ |
| E9 | DSP PROG | | | Blinking yellow-red | ■■ |
| E10 | CMOS | | | Blinking yellow-red | ■■ |
| E11 | AUTO FOCUS | | | Blinking yellow-red | ■■ |
| E12 | HOST CONNECT | | | Blinking yellow | ■□ |
| E13 | MOTOR | | | Blinking yellow-red | ■■ |
| E15 | REPLACE FILE | | | Blinking yellow | ■□ |
| E99 | MISC | | | Blinking yellow-red | ■■ |

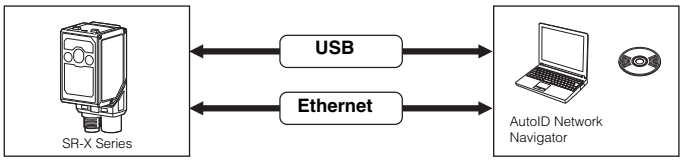
* For details of unit errors, refer to "19-3 Troubleshooting" (Page 160)

# 1-3 System Configuration and Setup Flow

## System Configuration

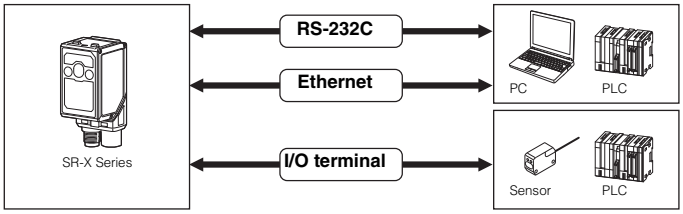
The system configuration of the SR-X series is as shown below.

### During setup




* You cannot connect to AutoID Network Navigator through the RS-232C interface.

### During use




## Setup Flow

**1** Check the package contents.

"1-1 Checking the Package Contents" (Page 4)

**2** Wire the reader and mount it on a surface.

"2-1 Connection and Wiring" (Page 8)

**3** Power the reader.

**4** Use AutoID Network Navigator to set up the SR-X Series.

"5-1 Connecting" (Page 20)

Start operation.

# 2 Connection and Wiring


2-1 Connection and Wiring 8

2-2 Wiring to a PC 9

RS-232C 9
Ethernet 9
USB 9

2-3 Wiring to a PLC or Peripheral 10

RS-232C 10
Ethernet 10

2-4 Wiring to a Sensor or Switch 10

Example of wiring the reader to a photoelectric sensor manufactured by KEYENCE 10
Example of wiring the reader to a switch 10

# 2-1 Connection and Wiring

## Control cable pin arrangement

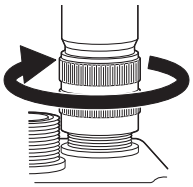
M12A

| Wire color | Name | Description | Signal direction | Initial assignment |
|---|---|---|---|---|
| Brown | 24 V | 24 VDC | Input | - |
| Blue | 0 V | Power GND | - | - |
| Orange | RXD (RD) | RS-232C Receive | Input | - |
| Yellow | TXD (SD) | RS-232C Send | Output | - |
| Purple | SGND | RS-232C GND | - | - |
| Green | IN1 | Input signal 1 | Input | Reading start |
| Gray | IN2 | Input signal 2 | Input | - |
| White and blue | IN COM | Input common | - | - |
| Pink | OUT1 | Output signal 1 | Output | Reading OK |
| Light blue | OUT2 | Output signal 2 | Output | Reading ERROR |
| White | OUT3 | Output signal 3 | Output | BUSY |
| Black | OUT COM | Output common | - | - |
| Black tube | FG | Frame ground | - | - |

## Connecting the control cable and wiring

**1 Align the notch in the cable connector with the protrusion in the control port.**

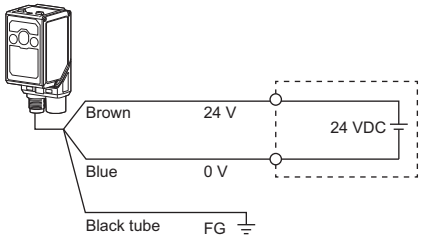
**2 Tighten the connector screw by turning it clockwise.**



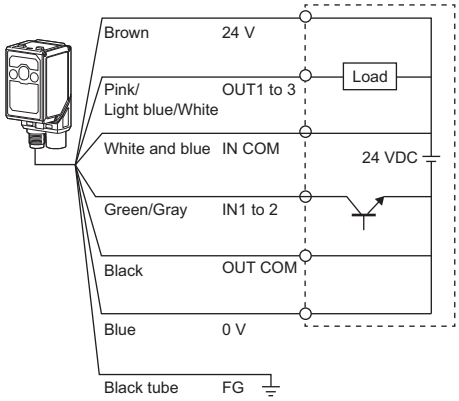
Screw tightening torque:
0.4 to 0.6 N·m

**3 Connect the wires according to usage.**

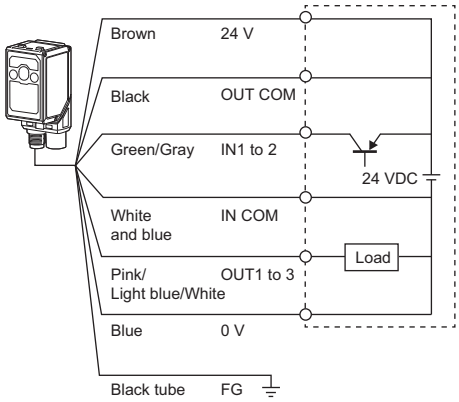
### ● When the I/O terminals are not used




### ● NPN wiring

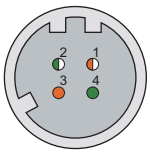



### ● PNP wiring




| | |
|---|---|
| NOTICE | • **Be sure to turn power off before attempting to connect or disconnect the control cable.**<br>• **Insert the connector straight so that it is not tilted and then tighten it securely. Insufficient tightening can lead to a loose connector due to vibrations, resulting in poor contact.**<br>* **After tightening it as much as possible by hand, tighten it further by approximately 90° - 120° using a tool such as pliers.**<br>• **Insulate unused wires individually.**<br>• **Be sure to provide Class D ground for the FG wire.**<br>• **The shield and FG wires of the control cable and the shield wire of the Ethernet cable are electrically connected via the main unit housing. Be sure to provide them with a common ground.** |

## Ethernet cable pin arrangement

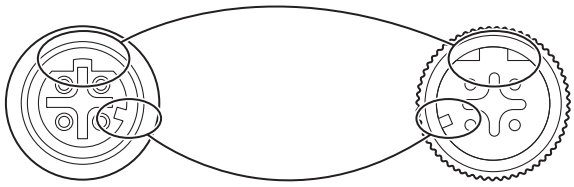



M12D

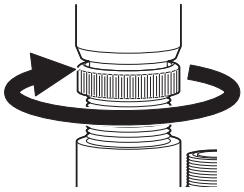
| No. | Signal |
|---|---|
| 1 | TX+ |
| 2 | TX- |
| 3 | RX+ |
| 4 | RX- |

## Connecting the Ethernet cable

**1 Align the notch in the Ethernet port with the protrusion in the cable connector.**



**2** **Tighten the connector screw by turning it clockwise.**

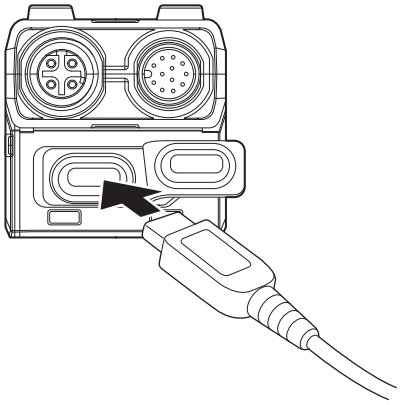


Screw tightening torque:
0.8 to 1.0 N·m

| NOTICE | |
|---|---|
| | • **When connecting the connector, insert it so that it does not tilt, and then push in and tighten the connector securely. Insufficient tightening can lead to a loose connector due to vibrations, resulting in poor contact.**<br>• **After tightening it as much as possible by hand, tighten it further by approximately 5° - 10° using a tool such as pliers.**<br>• **Do not bend the base of the Ethernet cable connector repeatedly. It may cause connection failure.**<br>• **To extend the Ethernet cable, use an Ethernet HUB instead of a connector.** |

### Connecting the USB cable

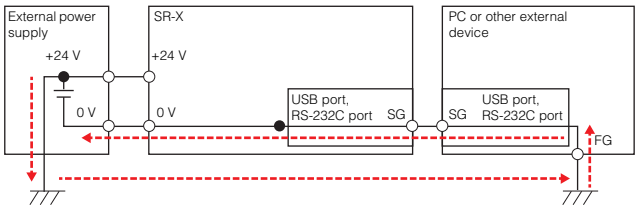
**1** **Confirm the orientation and insert the connector straight so that it is not tilted.**



| NOTICE | |
|---|---|
| | • **Connection may not be possible depending on the specifications of the USB cable. (Example: Type C - Type C cable)**<br>**USB cable whose operation has been confirmed: OP-88569**<br>• **When connecting, insert the connector straight so it does not tilt. Otherwise, the connector pin may be damaged.** |

### Precautions when communicating with external devices via USB

There is continuity between 0 V of the SR-X Series power supply, the USB port SG, and the RS-232C SG. Voltage differences with the SG of external equipment may cause damage to the communication unit and/or the external equipment. For example, when using a positive ground (grounding on the 24 V side), if a voltage difference occurs, current will flow in the following circuit, possibly leading to device damage. Do not wire devices as shown below.



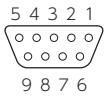

## 2-2 Wiring to a PC

## RS-232C

### OP-88681/88682/88683/88687/88688/88689

Connect the cable to the RS-232C port of the PC.

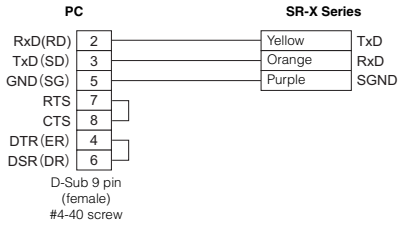
● **OP-88681/88682/88683/88687/88688/88689 pin arrangement**




D-sub 9-pin (female)
DTE (terminal definition)
#-4-40 inch screw (male)

| Pin number | Symbol | Description | Signal direction |
|---|---|---|---|
| 2 | TXD (SD) | RS-232C send | Output |
| 3 | RXD (RD) | RS-232C receive | Input |
| 5 | SGND | RS-232C GND | - |

### OP-88678/88679/88680/88684/88685/88686




## Ethernet

### For the OP-87230/87231/87232/88301/88302/88303

Connect the OP-87230/87231/87232/88301/88302/88303 cable to the Ethernet port of the PC.

For the Ethernet communication settings, refer to "5-4 Communication Settings" (Page 23).

## USB

Connect the OP-88569 cable to the USB port of the PC.

● **Installing the USB driver**

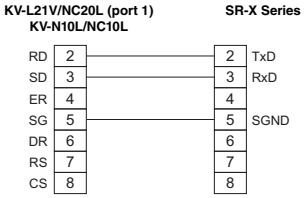
The first time that you connect the SR-X to a PC and turn on the SR-X, you will be prompted to install the driver.
Specify the USB driver inside the "SR-H8W" DVD-ROM to install it.

# 2-3 Wiring to a PLC or Peripheral

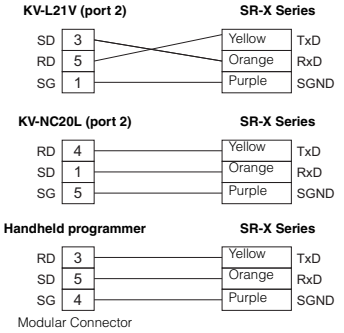
## RS-232C

### Connecting to the KV Series

**OP-88681/88682/88683/88687/88688/88689**

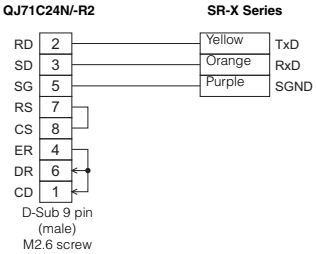



**OP-88678/88679/88680/88684/88685/88686**



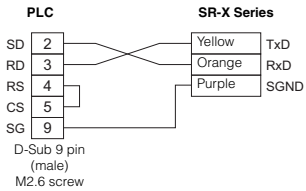

### Connecting to the MELSEC Series

**OP-88678/88679/88680/88684/88685/88686**



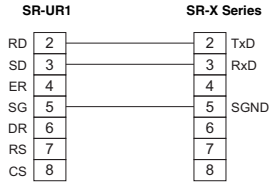

### Connecting to the SYSMAC Series

**OP-88678/88679/88680/88684/88685/88686**

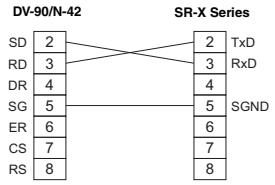



### Connecting to a peripheral manufactured by KEYENCE

**OP-88681/88682/88683/88687/88688/88689**




**OP-88681/88682/88683/88687/88688/88689**




* This connection can be made with the addition of the OP-87533 conversion connector.
* When using the N-42, set the baud rate to 38400 bps or lower.

## Ethernet

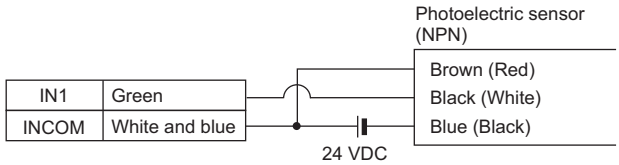
Connect the OP-87230/87231/87232/88301/88302/88303 cable to the Ethernet port of the PLC.

For the Ethernet communication settings, refer to "5-4 Communication Settings" (Page 23).

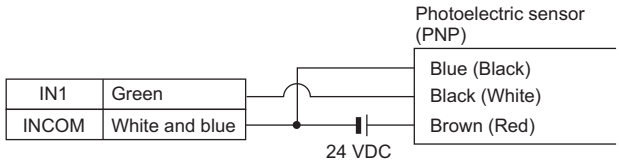
# 2-4 Wiring to a Sensor or Switch

## Example of wiring the reader to a photoelectric sensor manufactured by KEYENCE

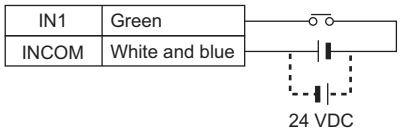
**NPN**




**PNP**




## Example of wiring the reader to a switch



# 3 Mounting


3-1 Before Mounting 12

3-2 Mounting Methods 12

Mounting 12
When using the optional mounting bracket 12
Attaching the OP-88697 12
Mounting of attachment 12
Mounting of ESD attachment (SR-XESD) 13

3-3 Mounting Position Adjustment 13

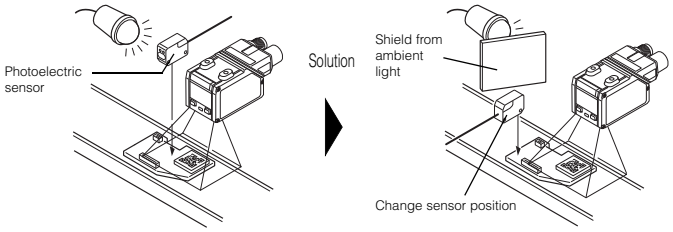
Field of View and Installation Distance 13
Minimum Resolution (Typical) 14

# 3-1 Before Mounting

Check the mounting conditions according to the following precautions.

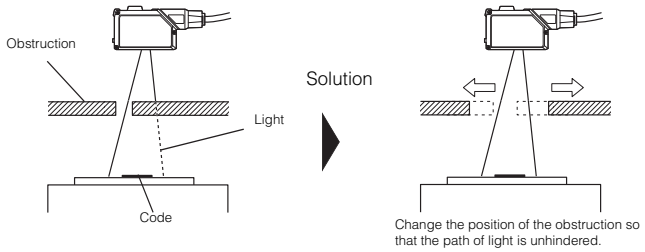
### Confirm that ambient light is not affecting the reader.

Prevent ambient light—from sources such as sunlight, other lights, and photoelectric sensors—from entering the light receiving area of the SR-X Series. Ambient light may lead to unstable readings or incorrect readings.




### Confirm the reader's beam is unobstructed.

If the beams of light are obstructed, the barcode may become undetectable.



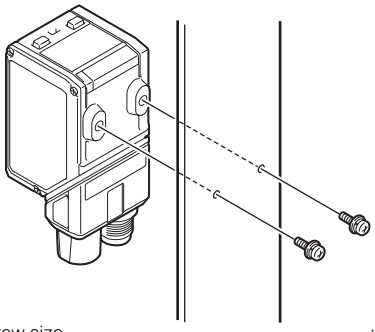

| | |
|---|---|
| NOTICE | **Use a light shield or a similar object to ensure that the SR-X Series does not receive strong light (direct or reflected) output from a laser marker or similar device. The SR-X Series may be damaged if it receives this kind of light.** |

# 3-2 Mounting Methods

## Mounting

**1 Secure the SR-X Series unit with screws.**

Mounting screws are not included.

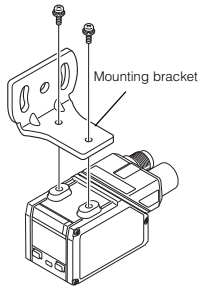
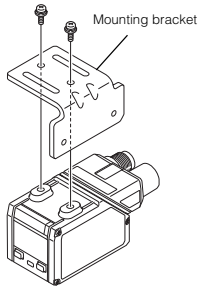
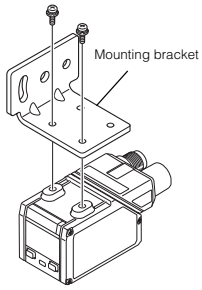


- Mounting screw size : M3
- Tightening torque : 0.4 N·m
- Screw hole depth of the SR-X Series : 3.5 mm

## When using the optional mounting bracket

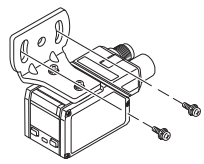
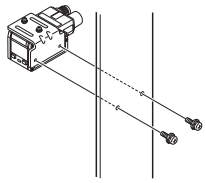
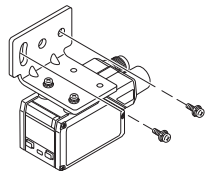
**1 Attach the optional mounting bracket to the SR-X Series.**

- Supplied screw size: M3
- Tightening torque: 0.4 N·m

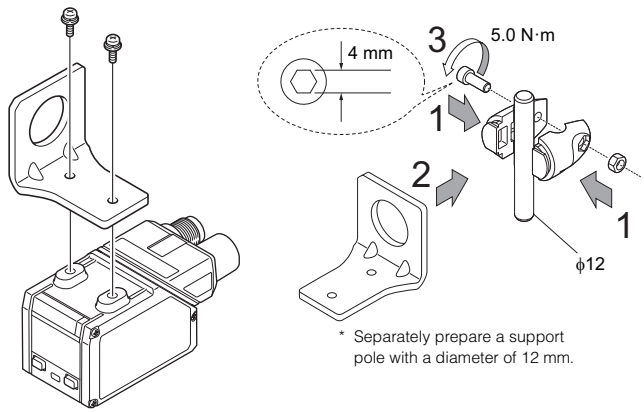
| OP-88696 | OP-88698 | OP-88699 |
|---|---|---|
|   |   |   Install the mounting screws into any 2 of the holes. |

**2 Secure the mounting bracket.**

Mounting screws are not included.

| OP-88696 | OP-88698 | OP-88699 |
|---|---|---|
|  Mounting screw size: M5 x 2 pcs or M6 x 1 pc * Use the single point securing hole in the centre for the M6 screw. |  Mounting screw size: M3 Tightening torque: 0.4 N·m Screw hole depth of the OP-88698: 3.5 mm |  Mounting screw size: M5 x 2 pcs or M6 x 1 pc * Use the single point securing hole in the centre for the M6 screw. |

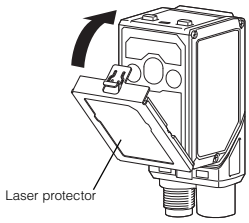
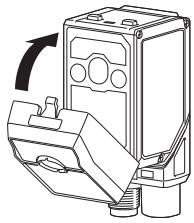
## Attaching the OP-88697




- Mounting screw size : M3
- Tightening torque : 0.4 N·m

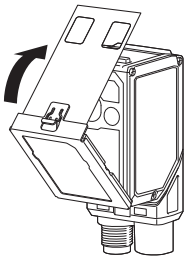
## Mounting of attachment

**1 Hook the claw section at the bottom of the attachment onto the recess at the bottom of the SR-X main unit to mount it.**

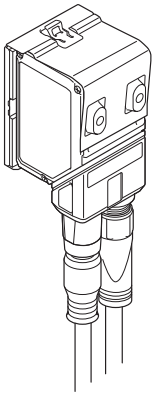
| Laser protector SR-XLP | High-resolution lens attachment SR-XHR |
|---|---|
|   |  |

## Mounting of ESD attachment (SR-XESD)

**1 Insert the clips at the bottom of the ESD attachment into the notch at the bottom of the SR-X main unit to mount it.**



**2 Hook the ESD attachment onto the screw hole area on the SR-X main unit.**



**3 Secure the SR-X Series unit with screws.**

Mounting screws are not included.

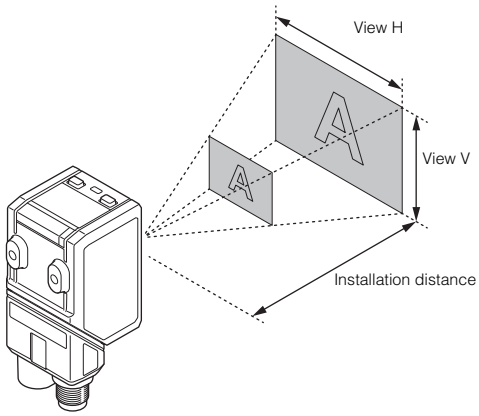
- Mounting screw size: M3
- Tightening torque: 0.4 N·m
- Screw hole depth of the SR-X Series: 3.5 mm

| | |
|---|---|
| NOTICE | **To remove the laser protector (SR-XLP) or the ESD attachment (SR-XESD), lift the top hook.** |

# 3-3 Mounting Position Adjustment

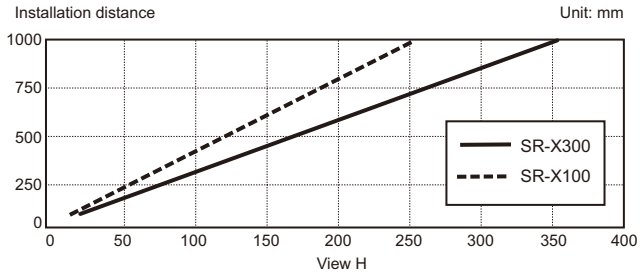
## Field of View and Installation Distance

The SR-X Series provides a range of installation distances and fields of view depending on the type of the reader. Confirm the type of the reader and its field of view.




| | SR-X300/X300W | SR-X100/X100W |
|---|---|---|
| CMOS size (pixels) | 1920 x 1200 | 1360 x 1024 |
| View V | View H x 0.62 | View H x 0.75 |

### Field of view of standard type (SR-X300/X100)



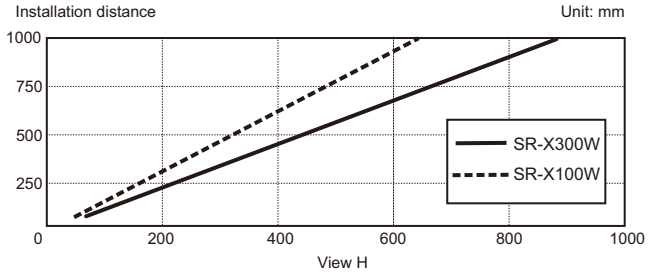

Typical example

Unit: mm

| Installation distance | SR-X300 | | SR-X100 | |
|---|---|---|---|---|
| | View H | View V | View H | View V |
| 70 | 21 | 13 | 15 | 11 |
| 150 | 50 | 31 | 35 | 27 |
| 300 | 104 | 65 | 74 | 55 |
| 400 | 141 | 88 | 99 | 75 |
| 600 | 213 | 133 | 150 | 113 |
| 800 | 285 | 178 | 201 | 152 |
| 1000 | 357 | 223 | 252 | 190 |

| | |
|---|---|
| NOTICE | **The readable distance and angle vary by the print quality or size of a reading target code and the surrounding environment. Use the test mode, etc. to check the installation condition suitable for the environment.** |

## Field of view of wide field of view type (SR-X300W/X100W)

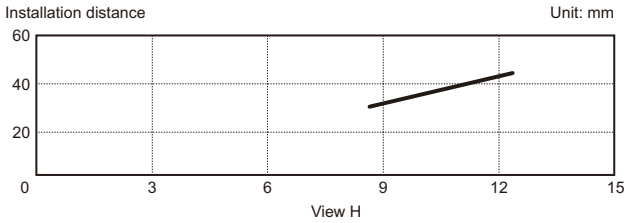



Typical example

Unit: mm

| Installation distance | SR-X300W | | SR-X100W | |
|---|---|---|---|---|
| | View H | View V | View H | View V |
| 50 | 44 | 28 | 31 | 23 |
| 150 | 134 | 83 | 94 | 71 |
| 300 | 267 | 166 | 189 | 142 |
| 400 | 355 | 222 | 251 | 189 |
| 600 | 532 | 333 | 377 | 284 |
| 800 | 710 | 443 | 503 | 378 |
| 1000 | 887 | 554 | 628 | 473 |

## Field of view of high resolution type (SR-X300 + SR-XHR)




Typical example

Unit: mm

| Installation distance | SR-X300 + SR-XHR | |
|---|---|---|
| | View H | View V |
| 32 | 8.7 | 5.4 |
| 40 | 10.7 | 6.6 |
| 47 | 12.3 | 7.7 |

# Minimum Resolution (Typical)

## Applicable code type

| | Symbol A | Symbol B | Symbol C |
|---|---|---|---|
| **2D code** | QR, MicroQR, DataMatrix (ECC200), DMRE, GS1 DataMatrix | PDF417, Micro PDF417, GS1 Composite (CC-A, CC-B, CC-C) | DotCode, MaxiCode, AztecCode, Postal |
| **Barcode** | CODE39, ITF, NW-7 (Codabar), CODE128, GS1-128, JAN/EAN/UPC, CODE39 Full ASCII | GS1 DataBar, CODE93, 2of5 (Industrial 2of5), COOP 2of5, Trioptic CODE39, Pharmacode | - |

## Minimum resolution of standard type (SR-X300/X100)

Typical example

Unit: mm

| Distance | Symbol A | | Symbol B | | Symbol C | |
|---|---|---|---|---|---|---|
| | 2D code | Barcode | 2D code | Barcode | 2D code | Barcode |
| 70 | 0.024 | 0.082 | 0.040 | 0.082 | 0.060 | - |
| 150 | 0.048 | 0.082 | 0.066 | 0.082 | 0.106 | - |
| 300 | 0.099 | 0.082 | 0.137 | 0.082 | 0.219 | - |
| 600 | 0.200 | 0.123 | 0.278 | 0.167 | 0.444 | - |
| 1000 | 0.335 | 0.205 | 0.465 | 0.279 | 0.744 | - |

## Minimum resolution of wide field of view type (SR-X300W/X100W)

Typical example

Unit: mm

| Distance | Symbol A | | Symbol B | | Symbol C | |
|---|---|---|---|---|---|---|
| | 2D code | Barcode | 2D code | Barcode | 2D code | Barcode |
| 50 | 0.060 | 0.082 | 0.100 | 0.082 | 0.150 | - |
| 150 | 0.126 | 0.082 | 0.175 | 0.105 | 0.280 | - |
| 300 | 0.251 | 0.153 | 0.348 | 0.209 | 0.557 | - |
| 600 | 0.500 | 0.306 | 0.694 | 0.417 | 1.111 | - |
| 1000 | 0.832 | 0.509 | 1.156 | 0.694 | 1.849 | - |

## Minimum resolution of high resolution type (SR-X300 + SR-XHR)

Typical example

Unit: mm

| Distance | Symbol A | | Symbol B | | Symbol C | |
|---|---|---|---|---|---|---|
| | 2D code | Barcode | 2D code | Barcode | 2D code | Barcode |
| 32 | 0.010 | 0.082 | 0.020 | 0.082 | 0.030 | - |
| 40 | 0.010 | 0.082 | 0.020 | 0.082 | 0.030 | - |
| 47 | 0.012 | 0.082 | 0.020 | 0.082 | 0.030 | - |

# 4 Tuning


## 4-1 Tuning 16

What Is Tuning? 16
Operation Procedure (SR-X300/X300W) 16
Operation Procedure (SR-X100/X100W) 16

## 4-2 Reading Check 16

Display (SR-X300/X300W only) 16

## 4-3 Initial Power-on Operation 17

Display (SR-X300/X300W only) 17
For the SR-X100/X100W 17

# 4-1 Tuning

## What Is Tuning?

With just a simple operation, the SR-X Series automatically adjusts the reading parameters to the optimal values based on the target codes and stores these parameters in its internal memory. This function is called "Tuning."
This chapter explains how to use the unit's buttons to complete tuning.

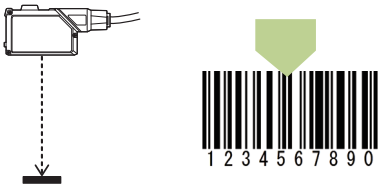
* For details on how to complete tuning using AutoID Network Navigator, refer to "5-3 Reading Settings" (Page 22).

## Operation Procedure (SR-X300/X300W)

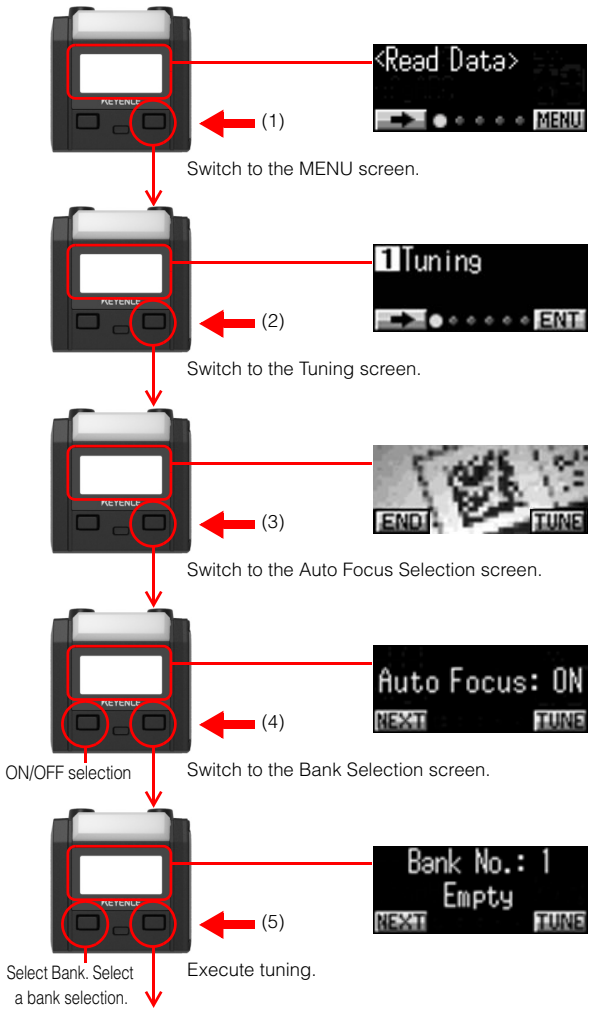
**1 Turn on the SR-X Series.**

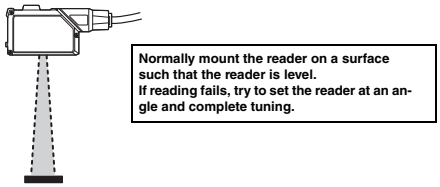
* Refer to "4-3 Initial Power-on Operation" (Page 17) for more information on how to power the reader on for the first time.

**2 Place a code at the end of the projected green pointer.**




**3 Perform the following procedure.**




When tuning is completed, the reading rate test mode screen is displayed.

This completes the tuning procedure.

**Point**

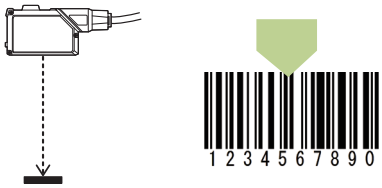
- The pointer position is an approximation of the center position of the field of view. The center may be offset depending on the distance. Make adjustments while watching the unit's display screen.
- If the following screen is displayed when you tune in custom mode, it means that other settings are already being used with the selected bank. To overwrite the existing settings, press the [ENTER] button. If you want to save the new settings to a different bank, press the [NEXT] button to select a bank that displays "Empty," and then press the [ENTER] button.

## Operation Procedure (SR-X100/X100W)

**1 Turn on the SR-X Series.**

* Refer to "4-3 Initial Power-on Operation" (Page 17) for more information on how to power the reader on for the first time.

**2 Place a code at the end of the projected green pointer.**




**3 Press the [TRG] button for 3 sec and let go (the status LED will flash in blue once).**

Execute tuning.

**Point**

- The value will be saved in the bank (default value: 16) set in the [Table] - [Read] - [Details] - [Bank number for tuning from the main unit].

# 4-2 Reading Check

## Display (SR-X300/X300W only)

| | | |
|---|---|---|
| (1) | Reading rate | Displays the reading rate, which indicates the number of times the code could be read among 10 scans |
| (2) | Matching level | Displays the reading stability (0 to 100)*1 |
| (3) | Live View display | If you press the [ENTER] button on this screen, the live view of the SR-X300 Series will be displayed. |

*1 For details on the matching level, refer to "10-7 Matching level" (Page 83).

# 4-3 Initial Power-on Operation

## Display (SR-X300/X300W only)

The SR-X300/X300W Series displays the above information when the power is turned on for the first time.
Use the following methods to configure the IP address.

(1) Press the [ENTER] button twice to select ENT when the device starts up with an IP address of 192.168.100.100.
(2) Refer to 🕮 "5-1 Connecting" (Page 20) to configure the IP addresses via USB.
(3) Refer to 🕮 "6-10 Allocate IP Addresses to Multiple Devices" (Page 35) to configure the IP addresses via Ethernet.

## For the SR-X100/X100W

(1) Press the [TRG] button once when the device starts up with an IP address of 192.168.100.100.
(2) Refer to 🕮 "5-1 Connecting" (Page 20) to configure the IP addresses via USB.
(3) Refer to 🕮 "6-10 Allocate IP Addresses to Multiple Devices" (Page 35) to configure the IP addresses via Ethernet.

# 5 AutoID Network Navigator (Basic Information)


**5-1 Connecting 20**

Installing AutoID Network Navigator 20
Opening AutoID Network Navigator and Connecting to the Reader 20
Ethernet Connection 20
Reset IP Address (SR-X300/X300W only) 20
USB connection 21

**5-2 Application Selection 21**

Configuration Procedure 21
Application Selection 22
Configuration Settings 22

**5-3 Reading Settings 22**

Tuning 22
Reading Check 22

**5-4 Communication Settings 23**

RS-232C Connection 23
Ethernet Connection 23
Setup Wizard 24

**5-5 Sending Settings 24**

Sending Settings 24

**5-6 Saving Settings/Quick Setup Codes 25**

Saving a Configuration File 25
Printing Quick Setup Codes 25

# 5-1 Connecting

## Installing AutoID Network Navigator

Execute "Setup.exe" in [AutoID Network Navigator] - [Setup] folder of the SR-H8W, and then install the program by following the instructions on the screen.
* AutoID Network Navigator specifications: "19-1 Specifications" (Page 156)

Important

- To install the software, log on as a user with Administrator rights.
- Install ".Net Framework 4.6.1" and "Visual C++ 2017 Runtime (x86)" before you install AutoID Network Navigator. You do not have to install them again if they are already installed.
- A screen prompting a restart may be displayed during installation. In this case, execute a restart. After restarting, installation resumes automatically. If installation does not resume, execute [Setup.exe] again.
- If the UAC (User Account Control) dialog box is displayed during the installation, click [Continue].
- Exit all active applications before starting the installation. The installation of the software may be impeded by security software.
- To uninstall AutoID Network Navigator, double-click the corresponding program in the list shown in the following location. From the [Control Panel] screen, click [Uninstall a program].

## Opening AutoID Network Navigator and Connecting to the Reader

- To connect to the reader from AutoID Network Navigator, you can use the following two methods:
  (1) Connect through the Ethernet interface.
  (2) Connect through the USB interface.
- When you connect to the reader through the USB interface, you can only connect to one SR-X Series unit per PC. To set up two or more SR-X Series units, connect to one unit at a time.

## Ethernet Connection

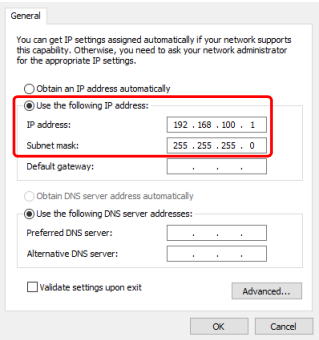
**1 Connect the Ethernet cable of the SR-X Series to a PC.**

**2 Configure the network settings of the PC.**

### ● Configuring Windows 10 network settings

(1) Click [Start] - [System Tools] - [Control Panel].
(2) Click [Network and Internet].
(3) Click [Network and Sharing Center].
(4) Click [Change adapter settings].
(5) Right-click [Ethernet] and then click [Properties(R)].
(6) Click [Internet Protocol Version 4 (TCP/IPv4)] and then click [Properties(R)].
(7) Select [Use the following IP address] and then set the IP address and subnet mask as shown below.

| | |
|---|---|
| IP address | 192.168.100.1 |
| Subnet mask | 255.255.255.0 |

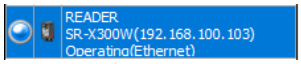



(8) Click [OK] to close all the windows.

* If a firewall or security program is running on the PC, disable them temporarily.

**3 Double-click the "AutoID Network Navigator" shortcut on the desktop.**

If the following information is displayed, the connection has been established.




***If the above procedure doesn't detect the SR-X Series**

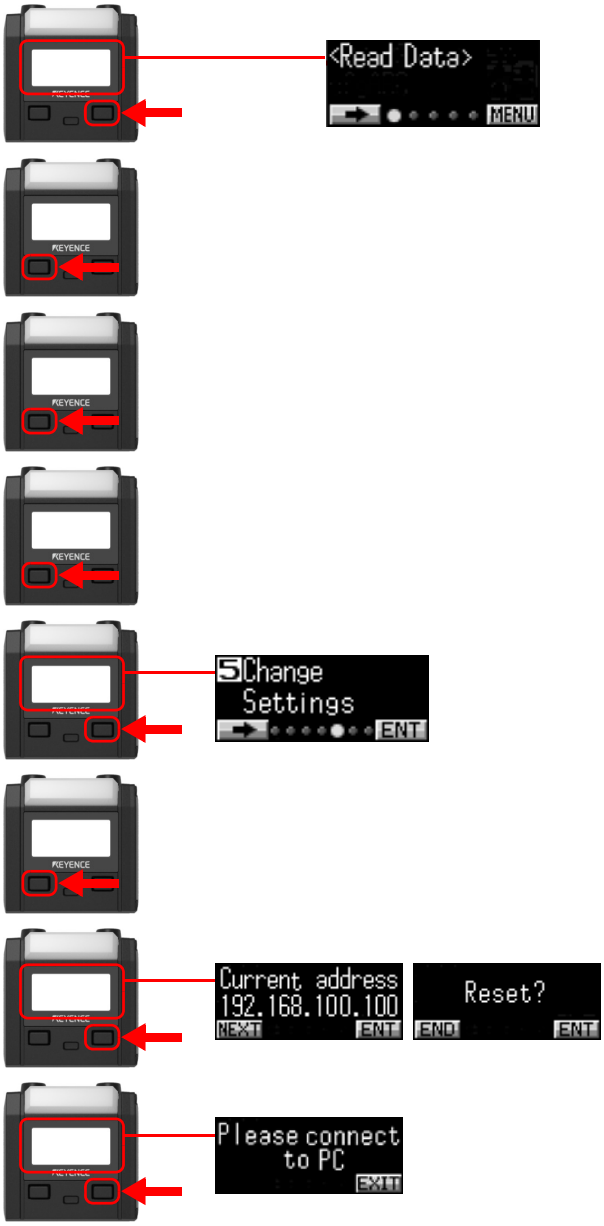
- An IP address other than "192.168.100.xxx" may be assigned to the SR-X Series that you are attempting to connect to. For the SR-X300/X300W, follow the procedure shown below to connect to the reader.

Reference

By connecting the SR-X series and AutoID Network Navigator through a USB connection, you can directly change the IP address of the SR-X series. Refer to " USB connection" (Page 21) for details.

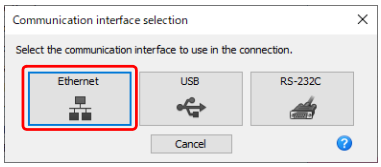
## Reset IP Address (SR-X300/X300W only)

**1 Follow the following button procedure.**

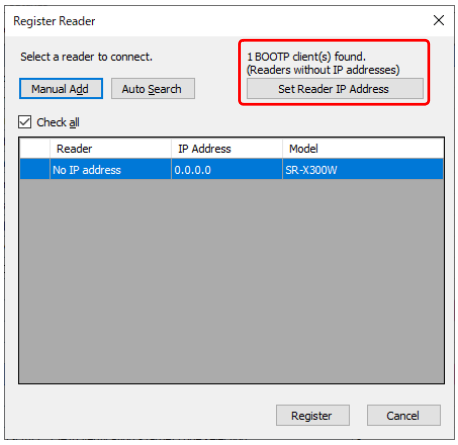



The "Please Connect to PC" message appears after the SR-X Series device is restarted.

**2** **Click the [Register] button and then click [Ethernet].**




**3** **Click [Set Reader IP Address].**




If the following information is displayed, the connection has been established. Click [Edit] to set a desired IP address.

| | MAC Address | Model | IP Address (Available) | | Next Power-On |
|---|---|---|---|---|---|
| ☑ | 00:00:01:01:10:1F | SR-X300W | 192.168.100.2 | Edit | Static IP |

**4** **Click [OK].**

**5** **Click [Register].**

Reference

- Broadcast packets are sent out into the network when "Please Connect to PC" is displayed on the SR-X Series unit.
- When the IP address is reset, the SR-X Series will restart and therefore the RAM information will be deleted.

## USB connection

**1** **Connect the OP-88569 cable to the USB port of the PC.**

**2** **Double-click the "AutoID Network Navigator" shortcut on the desktop.**

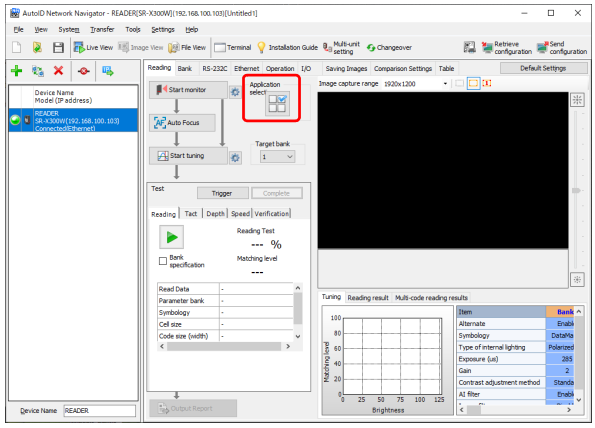
If the following information is displayed, the connection has been established.

# 5-2 Application Selection

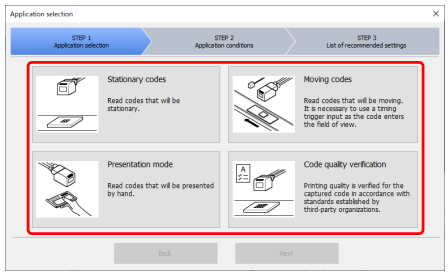
Create optimal reading settings for each application.

## Configuration Procedure

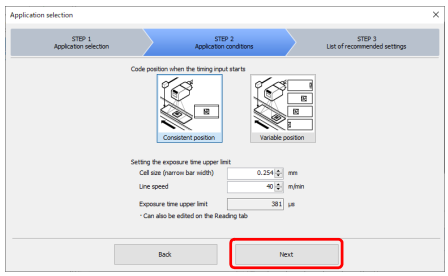
**1** **Click the [Application Selection] button.**



**2** **Select an application and click the [Next] button.**



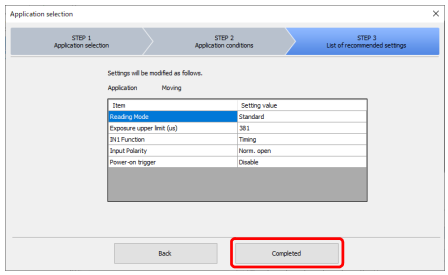

**3** **Set the read condition and click the [Next] button.**



**4** **Check the configuration conditions.**

**5** **Click [Complete] button.**

Configuration is complete.



## Application Selection

Settings can be created for the following 4 types of applications.

| | | |
|---|---|---|
| (1) | Stationary codes | Read codes that will be stationary. |
| (2) | Moving codes | Read codes that will be moving.<br>It is necessary to use a timing trigger input as the code enters the field of view. |
| (3) | Hands free | Read codes that will be presented by hand. |
| (4) | Print quality verification | Printing quality is verified for the captured code in accordance with standards established by third-party organizations. |

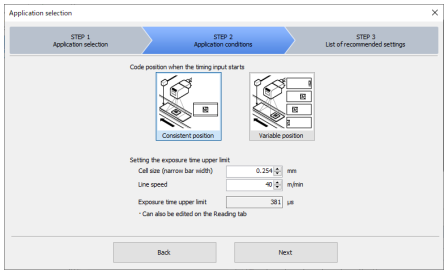
## Configuration Settings

Select and enter the required information for each application.

### (1) Stationary codes

There are no conditions to select for this application.

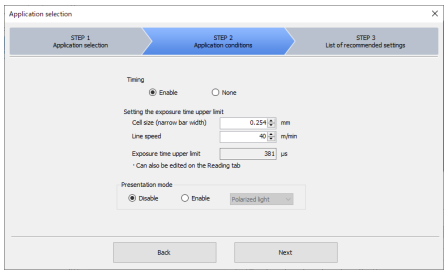
### (2) Moving codes




| | |
|---|---|
| Code position when the timing input starts | Select [Fixed] or [Indefinite]. |
| Cell size (Narrow bar width) | Set the minimum cell size. |
| Line speed | Set the line speed. |
| Exposure upper limit *1 | Automatically calculated from the minimum cell size and line speed. |

*1 Editing can also be done with the [Reading] tab

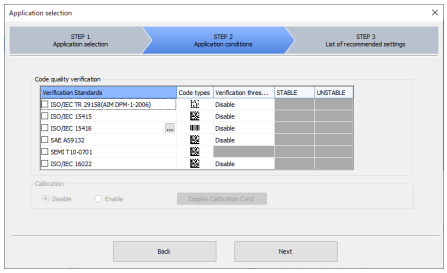
### (3) Hands free




| | |
|---|---|
| Timing | Select [Yes] or [No]. |
| Cell size (Narrow bar width) | Set the minimum cell size. |
| Line speed | Set the code speed. |
| Exposure upper limit *2 | Automatically calculated from the minimum cell size and line speed. |

*2 Editing can also be done with the [Reading] tab

### (4) Print quality verification



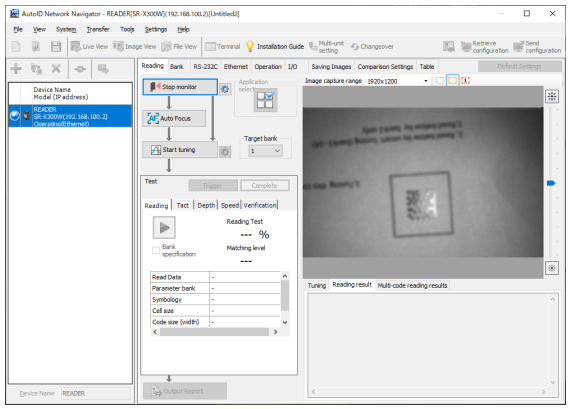

| | |
|---|---|
| Code quality verification | Select the verification standard. |
| Calibration | Select [Disable] or [Enable]. |
| Display of calibration card | Display the calibration card. |

# 5-3 Reading Settings

## Tuning

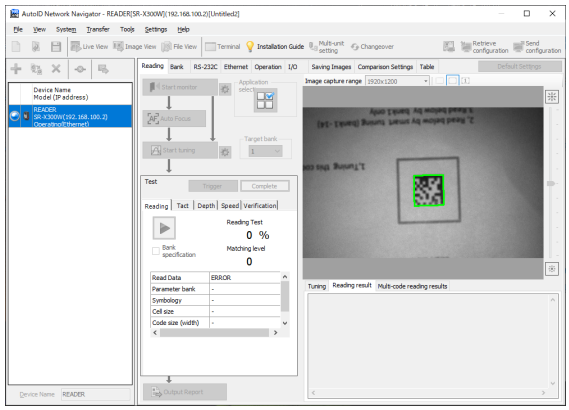
**1 Click [Start monitor].**

The images scanned by the SR-X Series will be displayed in real time. Watch the images to confirm the code positions.



**2 Click [Auto focus].**

The focus of the SR-X Series is adjusted automatically.



**3 Click [Start tuning].**

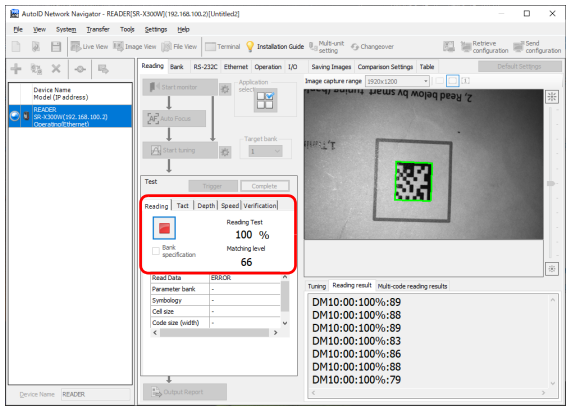
The SR-X Series automatically adjusts the reading parameters to the optimal values based on the target code.
Reading settings are adjusted when the tuning complete message is displayed.

## Reading Check

### Reading rate test

**1 Click the start button ▶ which is accessible from [Test] - [Reading].**

The reading rate is displayed in the location indicated below.



**2** **Move the code within the field of view to check that the code can be read stably.**

**3** **Clicking the end button will finish the reading rate test.**

Point

The "Cell size," "Code size," and "Resolution" displayed during the reading rate test are approximate values calculated from the image data.

### Test modes

| | | |
|---|---|---|
| (1) | Reading rate test | Measures and displays the reading rate, which indicates the number of times the code could be read among 10 scans<br>You can also check the following items.<br>• Code type<br>• Cell size (narrow bar size)<br>• Code size<br>• PPC |
| (2) | Tact Test | Measures and displays the time required for reading |
| (3) | Depth Test | Displays the estimated reading depth by varying the distance virtually from the current installation distance. |
| (4) | Speed test | Represents the traceable target speed based on the successful number of continuous reads. |
| (5) | Code quality verification test | Use the specified parameter bank to display the marking verification result of the captured image. |

Point

If you want to configure the code reading settings, refer to the following topics.

- To widen the field of view:
  "7-1 Change Field of View" (Page 40)
- To read multiple types of codes:
  "7-2 Read Multiple Codes" (Page 40)

Important

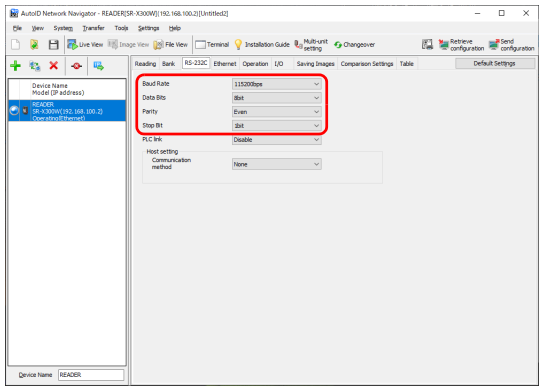
The measurement results of the depth test and speed test should be used as guides. Be sure to check the performance with an actual workpiece before starting operation.

# 5-4 Communication Settings

## RS-232C Connection

**1** **Click the [RS-232C] tab.**

**2** **Configure the following items to match the PC/PLC that you will connect to.**



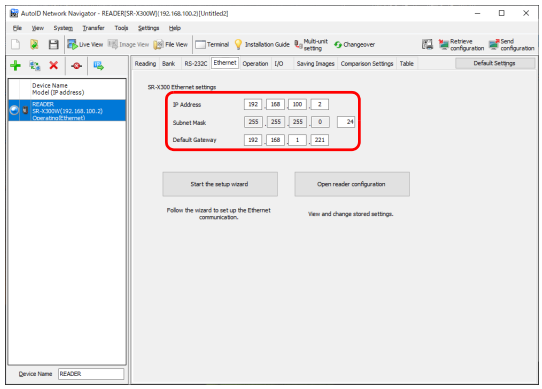
Reference

- For details on RS-232C, refer to "13-1 Serial Communication" (Page 102).
- If you will use the PLC link function, refer to "15-1 PLC Link Overview" (Page 124).

## Ethernet Connection

**1** **Click the [Ethernet] tab.**

**2** **Set the IP address and other values to those assigned to the SR-X Series.**



**3** **Click [Start the setup wizard], and then configure the communication settings by following the instructions on the screen.**

Point

If you want to change the subnet mask, change the following value to one in the range of 8 to 30.

255 . 255 . 255 . 0 24

Example) 24 -> 255.255.255.0
16 -> 255.255.0.0
8 -> 255.0.0.0

Reference

| | |
|---|---|
| IP address | Specify a unique IP address on the network. |
| Subnet mask | Match this value with that of the device that you will connect to. |
| Default Gateway | Normally leave this setting at its default value. Only use this setting in circumstances when you are using a router. |

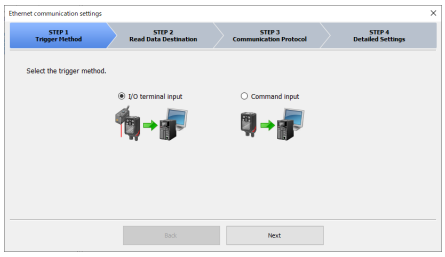
## Setup Wizard

You can easily configure the Ethernet settings by following the instructions in the setup wizard.

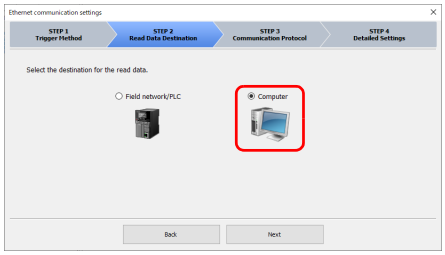
### Example) TCP communication with a PC

**1 Select the reading trigger input method.**

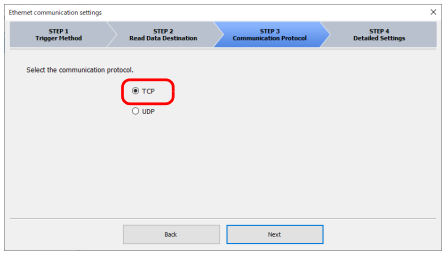
| | |
|---|---|
| I/O terminal input | The trigger input will be provided by a sensor or switch wired to the SR-X Series. |
| Command input | The trigger input will be provided by way of commands sent from the host (PC). |



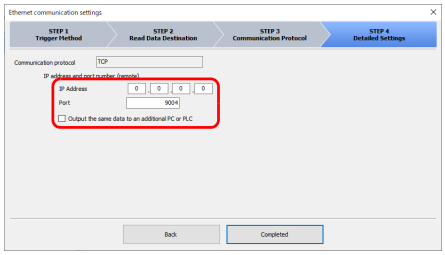

**2 Select the destination for the read data.**




**3 Select the communication protocol.**




**4 Enter the IP address and port number of the PC that you will connect to, and then click [Completed].**




**5 Click [Send Configuration].**

Reference

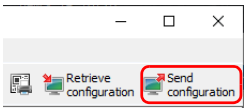
- When you want to change the header or terminator, change it by selecting [Operation Mode] - [Edit Data] or [Table] - [Format].
- For information on communication other than that described above, refer to the following topics.
  - Detailed Ethernet settings
    "13-2 Socket Communication (TCP, UDP)" (Page 103)
  - PLC link
    "15-1 PLC Link Overview" (Page 124)
  - EtherNet/IP
    "16-1 EtherNet/IP Overview" (Page 132)
  - PROFINET
    "17-1 PROFINET Overview" (Page 146)
  - TCP settings

# 5-5 Sending Settings

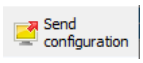
Send the settings that you have selected with AutoID Network Navigator to the SR-X Series. Sending the settings changes the settings on the reader.

## Sending Settings

**1 Click [Send Configuration].**



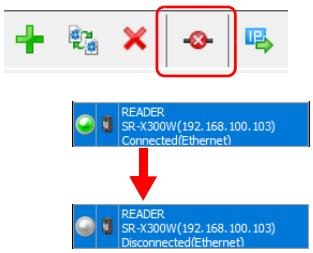

When the settings are being changed, the display of the [Send Configuration] icon changes to that shown below.




**2 When a message indicating that the transmission is complete is displayed, click [OK].**

**3 When you finish configuring the settings, click the following button.**

The communication between AutoID Network Navigator and the SR-X Series will be disconnected.




This completes the setting procedure.

Important

- Communication between the SR-X Series and a PLC or other communication device is enabled when the connection with AutoID Network Navigator is disconnected.
- Note that data cannot be sent to a PLC or similar device while the SR-X Series is connected to AutoID Network Navigator.

# 5-6 Saving Settings/Quick Setup Codes

The AutoID Network Navigator settings can be saved as *.ptc files. This is useful when you want to check the SR-X Series settings at a later time and when you want to configure a newly purchased SR-X Series with the same settings.

## Saving a Configuration File

**1 Click the [Save] button.**

**2 Select the location in which to save the file, enter the file name, and then click [Save].**

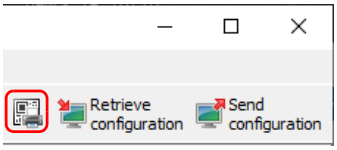
Point

- Reading configuration files "9-2 Restoring Settings" (Page 56)
- If you have configured settings for use in script programming such as the edit data function, edit image file name function, or the OUT terminal control function, a message regarding the saving of the script file will be displayed.

## Printing Quick Setup Codes

Create a quick setup code that is based on the settings changed in AutoID Network Navigator. You can change the settings on the SR-X Series by having it read the printed code.

**1 Click the [Quick Setup Code Creation] button.**

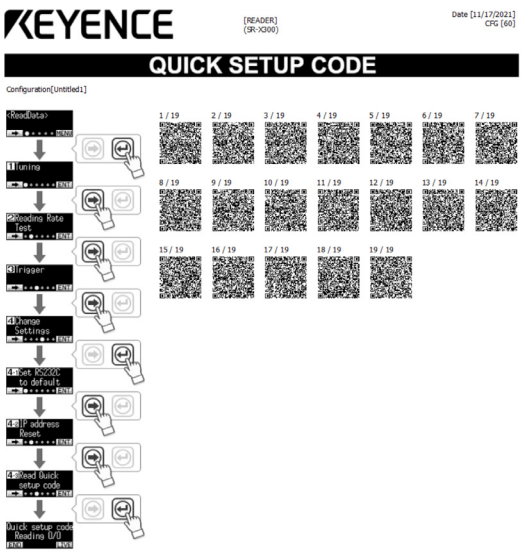



**2 If necessary, enter comments.**

| | |
|---|---|
| Remarks | This comment will be added to the quick setup code printout. |

**3 Click [Print].**

- Printout example




Point

- When a printer with low print quality is used, the cells in the 2D code may bleed and become unreadable. Be sure to use a printer with 300 dpi or greater for printing.
- For details on how to read quick setup codes, refer to "9-2 Restoring Settings" (Page 56).
- "Quick setup code" does not include preset data.
- "Quick setup code" does not include script files.
- "Quick setup code" does not include command replacement file.
- When the SR-X Series firmware version is updated, the quick setup codes created before the update cannot be used.

# 6 AutoID Network Navigator (Practical Information)


6-1 Add Banks 28

Add Banks 28

6-2 When you want to improve the reading capacity (AI filter) (SR-X300/X300W only) 28

Reading with AI Filter 28

6-3 Increase reading capacity further (X-Link decoding) (SR-X300/X300W only) 29

Reading using X-Link Decoding 29

6-4 Change Reading Behavior 30

Reading Mode 30
Duplicate Reading Prevention Interval 30
Timing Mode 30
Data Transmission 30

6-5 Control Multiple Readers 30

Master/Slave 30

6-6 Edit Read Data 31

Additional data 31
Using Scripts 31

6-7 Control the I/O Terminals 31

Input Terminals (IN Terminals) IN1 to IN2 31
Output Terminals (OUT Terminals) OUT1 to OUT3 32

6-8 Save Captured Images 33

Saving Images in Real Time 33
Saving Images in SR-X Series 33
Changing the Image Quality of Saved Images 33
Changing the Image Save Mode 33
Image File Name 34

6-9 Compare the Read Data (Preset Data Comparison) 34

Compare Read and Registered Data 34
Compare Sequential Data 34
Read a Code to Register Comparison Data (Preset Data) 35

6-10 Allocate IP Addresses to Multiple Devices 35

Device Configuration 35
Configuration Procedure 35

6-11 Check Version 36

Check the AutoID Network Navigator Version 36
Check the SR-X Version 36
Update the Firmware 36

6-12 Identify the reader 37

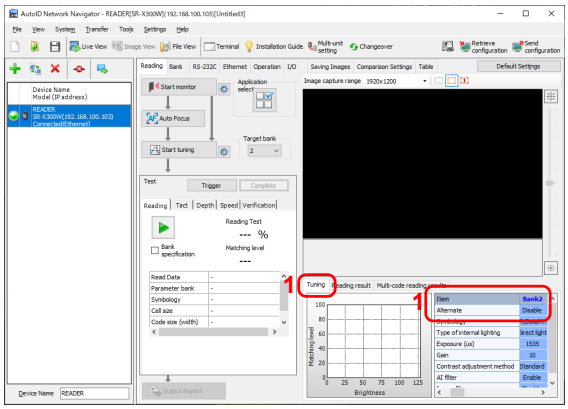
# 6-1 Add Banks

## Add Banks

The addition of banks allows for settings of multiple read conditions. This makes it possible to read codes which cannot be read with a single read condition.

**1 Click [Tuning] and select a bank in which [Alternate] is set to [Disable].**

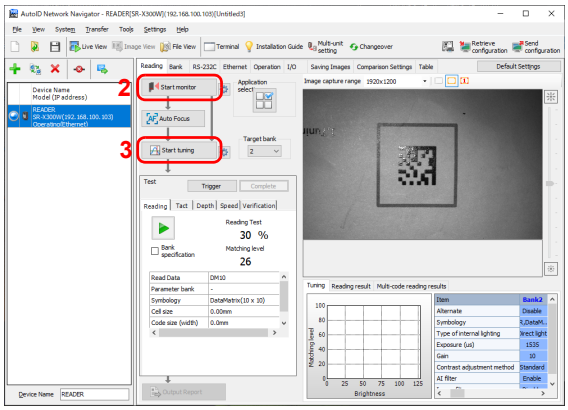
When a bank is selected, [Target bank] will be changed at the same time.



**2 Click [Start monitor].**

**3 Click [Start tuning].**

Addition of the bank is complete when the tuning completion message is displayed.



Point

For details on the tuning, alternate, and bank, refer to the following page.

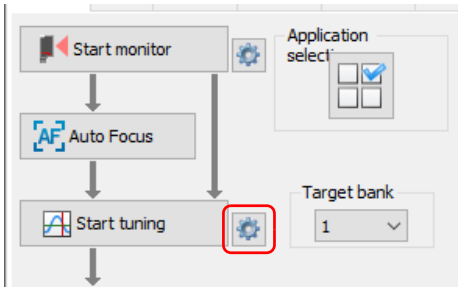
"10-4 Read Behavior" (Page 68)

# 6-2 When you want to improve the reading capacity (AI filter) (SR-X300/X300W only)

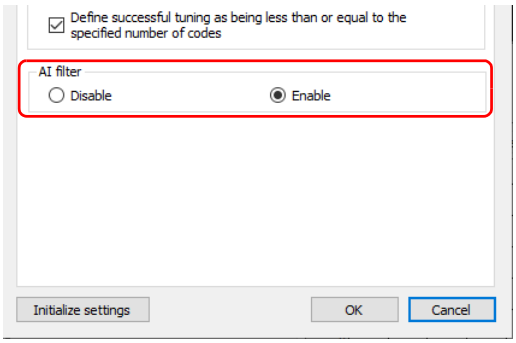
AI filter is a function that the SR-X300/X300W uses to read 2D code (QR, DataMatrix). It can improve the ability to adapt to changes in code quality.

## Reading with AI Filter

**1 Click [ ].**



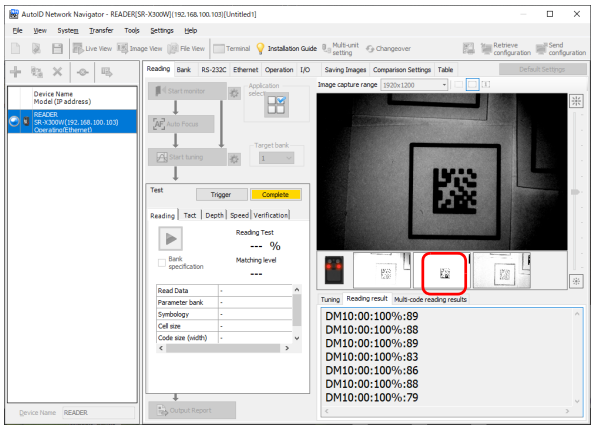

**2 Set the AI filter to [Enable].**




**3 Click [Start tuning].**

**4 Click [Trigger] to read the code.**

If an AI filter is used, the display is as shown below.



Reference

The decode time is longer when the "AI filter" is enabled. Complete tuning after enabling the function or set the decode timeout to the value that is required for reading.
Use the Tact test mode to confirm there are no problems with the read time for operation.

# 6-3 Increase reading capacity further (X-Link decoding) (SR-X300/X300W only)

X-Link decoding is a function that the SR-X300/X300W uses to read 2D codes (QR, DataMatrix). Code pattern information from another SR-X series in the same network is used if the code is corrupted beyond the error correction capability for the code.

**Important**

- The SR-X Series using the X-Link decoding function and the referenced SR-X Series must have the same firmware version.
- The code version and the matching count supported by the X-Link decoding function vary depending on the SR-X Series firmware version.

| | SR-X Series firmware | |
|---|---|---|
| | Earlier than 1.35 | 1.35 or later |
| Supported codes and versions | | |
| DataMatrix (square) | 10 to 80 | 14 to 26 |
| DataMatrix (rectangle) | All | 12x26, 12x36, 16x36, 16x48 |
| Micro QR code | All | (Not supported) |
| QR code (model 1) | All | (Not supported) |
| QR code (model 2) | 21 to 77 | 21(M) to 29 |
| Matching count | Up to 100 | Up to 10,000 |

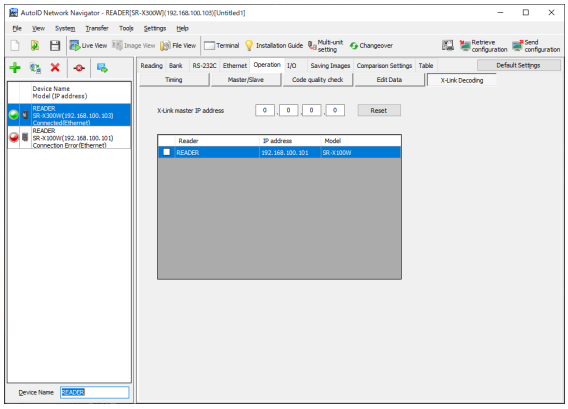
## Reading using X-Link Decoding

**1 Register the SR-X series.**

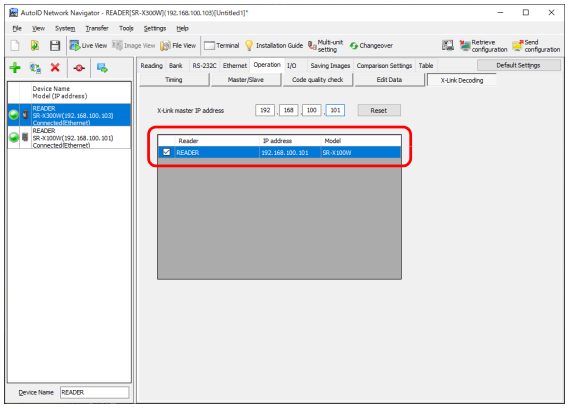
Refer to the following for details on how to register.

"5-1 Connecting" (Page 20)

**2 Select [X-Link Decoding] from the [Operation Mode] tab.**

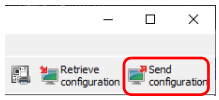


**3 Select a reader to link.**



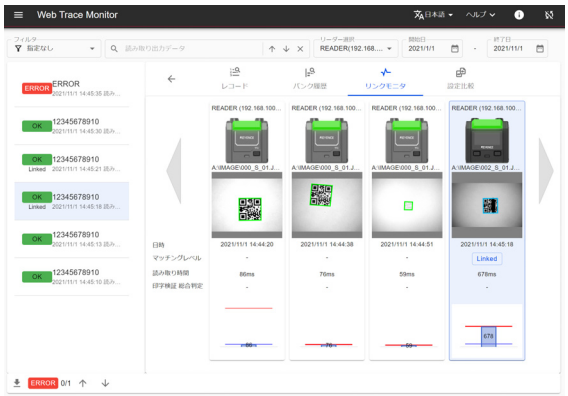
**Reference** To link a reader that is not shown in the list of readers, you can also enter the IP address directly in [X-Link master IP address].

**4 Click [Send Configuration].**




**5 Trigger SR-X series.**

If X-Link decoding is used, the display in the link monitor screen of the Web Traceability Tool will be as shown below.

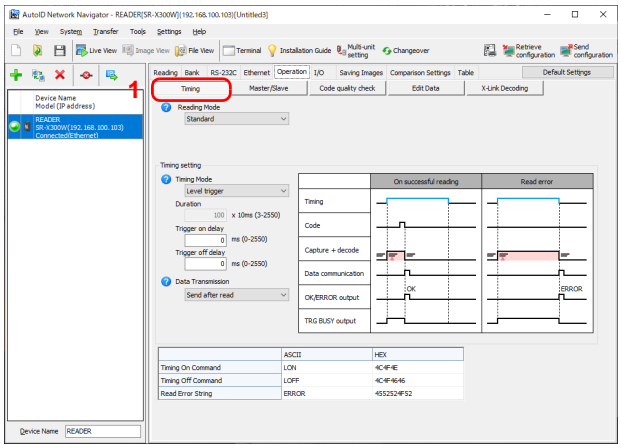


# 6-4 Change Reading Behavior

1 **Click [Timing].**

2 **Select an item to change.**

3 **Click [Send Configuration].**



## Reading Mode

Change the reading behavior for a single trigger input.

| | |
|---|---|
| Standard | In this mode, a single code is read while the trigger input is on. |
| Continuous | In this mode, multiple codes are read consecutively while the trigger input is on.<br>* You cannot specify any bank. Multiple code settings do not apply to the operation. |
| Burst read | In this mode, a single code is read by scanning multiple times while the trigger input is on. |
| Script | In this mode, reading continues according to the script contents while the trigger input is on. |

## Duplicate Reading Prevention Interval

This function is only used when the reading mode is set to "Continuous." This function prevents duplicate reading of the same code.

| | |
|---|---|
| Duplicate Reading Prevention Interval | The same code will not be read until the specified length of time passes. |

Reference Details on the reading behavior: "10-4 Read Behavior" (Page 68)

## Timing Mode

Change the reading behavior according to the input time of the trigger signal.

| | |
|---|---|
| Level trigger | While the trigger input is on, the LED lights and reading is performed. When a code is read, the LED turns off and the data is transmitted. |
| One-shot trigger | On the rising edge of the trigger input, the LED lights only for the specified time. Reading is attempted during this time. When a code is read, the LED turns off and the data is transmitted. |

## Data Transmission

Change the timing in which the read data and the OUT terminal results are output.

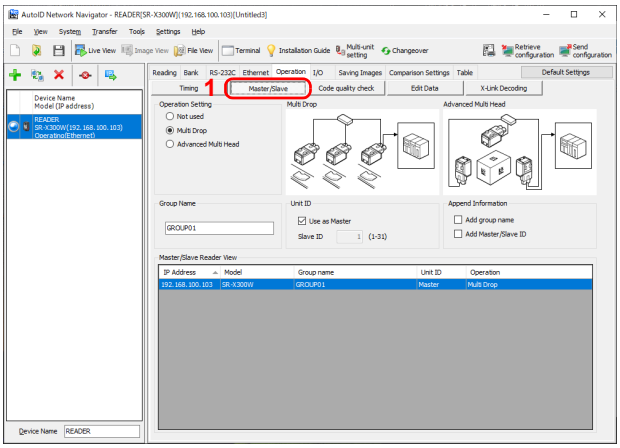
| | |
|---|---|
| Send after read | The read data and the OK/ERROR signal will be output immediately after the code is read. |
| Send after timing off | The read data and the OK/ERROR signal will be output when the trigger input turns off, not immediately after the code is read. |

# 6-5 Control Multiple Readers

1 **Click [Master/Slave].**

2 **Select an item to change.**

3 **Click [Send Configuration].**



## Master/Slave

The master outputs its read data to the host device.
The slaves output their data to the master.

### Operation setting

| | |
|---|---|
| Not used | Use this setting when you will not control multiple readers. |
| Multi Drop | Use this setting when you will install multiple readers on multiple lines and collect all the output data in a single reader. |
| Advanced Multi Head | Usable with the SR-X/SR-5000/SR-2000 Series devices only. This Multi-head mode is capable of reading multiple codes and editing read data scripts for slave units. |

### Group name

Normally do not change this setting.
Only use when you want to configure multiple master/slave groups on the same network.

### Unit ID

| | |
|---|---|
| Use as Master | Check this box to assign the reader as the master unit.<br>Clear this check box to use the reader as a slave unit. |
| Slave ID | You can specify an ID (1 to 31) for use in distinguishing slaves from each other. |

### Append Information

| | |
|---|---|
| Add group name | The "Group name" will be appended to the read data. |
| Add Master/Slave ID | The "Unit ID" will be appended to the read data.<br>Master: 0<br>Slave: 1 to 31 |

Point
- Specify a unique ID for each slave.
- The ID of the master is 0.

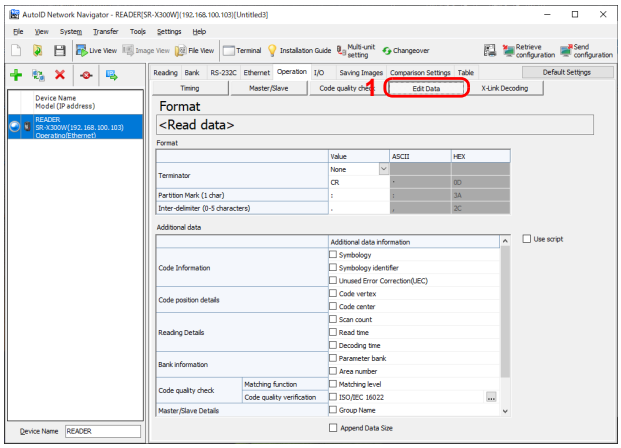
Reference For details on the master/slave function, refer to "10-8 Master/Slave Function" (Page 84).

# 6-6 Edit Read Data

**1 Click [Edit Data].**

**2 Select an item to change.**

**3 Click [Send Configuration].**



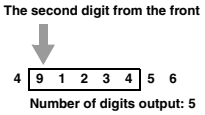
| | |
|---|---|
| Partition mark<br>[1 character] | The character that is used to delimit the blocks of data when data is appended<br>Default value: ":" |
| Inter-delimiter<br>[0 to 5 characters] | The character that is used to delimit the blocks of data when multiple codes are read<br>Default value: "," |

Reference

- Limiting the number of read data output digits
  Enable [Output Length Limitation] under [Code] in the [Bank] tab and then set the following items.
  •"Mode"
  •"Output length"
  •"Starting position"

  Example)
  •"Mode" = Forward
  •"Output length" = 5
  •"Starting position" = 2

**The second digit from the front**




**Number of digits output: 5**

## Additional data

You can append the following items to read data.

| | |
|---|---|
| Code type | The read code type |
| Symbol ID | The AIM symbol identifier |
| Unused Error Correction (UEC) | The unused error correction ratio* 1 |
| Code vertex | The coordinates of the vertex of the read code |
| Code center | The coordinates of the center of the read code |
| Read count | The number of scans from the time when the trigger turned on to the time when reading finished |
| Read time | The length of time from when the trigger turned on to when reading finished |
| Decoding time | The length of time required for decoding within the read time |
| Bank number | The number of the parameter bank that was used when reading succeeded |
| Region number | Region number corresponding to the read data |
| Group Name | This is the master/slave group name. |
| Master/Slave ID | This is the master/slave unit ID. |
| Time | The time when the code was read* 2 |
| Image file name | The file name of the captured image |

*1 The average value will be appended when multiple codes are read for one scan.
*2 The PC time is reflected in the SR-X Series at the time of sending the configuration.

## Using Scripts

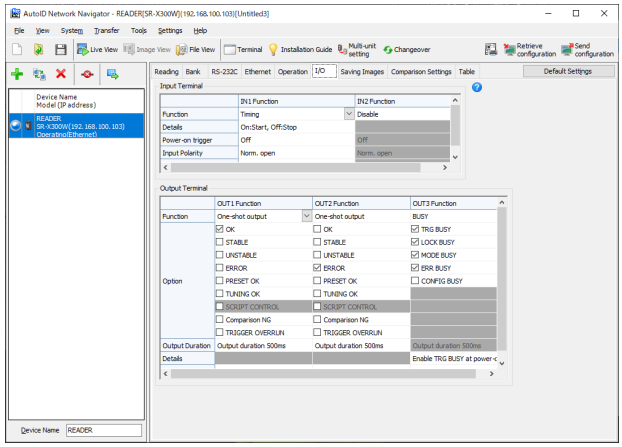
With the SR-X Series, you can edit the read data to output in the desired format by programming scripts.

Reference For details on scripts, refer to "10-10 Scripts" (Page 88).

# 6-7 Control the I/O Terminals

**1 Select an item to change.**

**2 Click [Send Configuration].**



## Input Terminals (IN Terminals) IN1 to IN2

### Function

Set the operation when a signal is applied to the IN terminal.

| | |
|---|---|
| Disable | This terminal's function will be disabled. |
| Timing | Reading start/end will be controlled by turning the signals ON/OFF. |
| Preset | Reading will be executed in order to register master data for use in a preset comparison. |
| Test | The specified test mode will start. |
| Capture | An image will be captured with the SR-X. |
| Clear PLC link error | If a PLC link error has occurred, the reader will recover from the error. |
| Trigger lock | Reading will be locked such that it is not executed even if a trigger signal is applied. |
| Quick setup | A quick setup code will be read.* 1 |
| Tuning | Tuning will be executed.* 1 |
| Command replacement | Operates in accordance with the configuration of the command replacement function. |
| Data output | Outputs the read data when the timing signal rises. |

*1 The trigger signal must be applied continuously until the operation is finished.

### Detailed Settings

Detailed settings are available for some terminal functions.

Reference "10-3 List of AutoID Network Navigator Settings" (Page 65)

### Power-on Trigger

When this setting is ON, the IN terminal signal will be turned on once at power-on of the SR-X Series.
You can use this setting when "Input Polarity" is set to "Norm. closed" to keep the signal turned on continuously when the SR-X Series turns on.

### Input Polarity

| | |
|---|---|
| Norm. open<br>(normally open) | The input is normally off.<br>When a signal is applied, the input turns on. |
| Norm. closed<br>(normally closed) | The input is normally on.<br>When a signal is applied, the input turns off. |

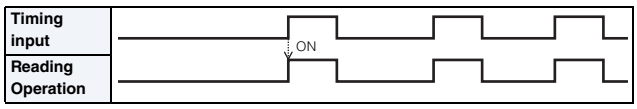
### Required Input Duration

The time from the point when a signal is applied to the IN terminal to the point when operation begins.

● **Norm. open (normally open) and Norm. closed (normally closed) operations**

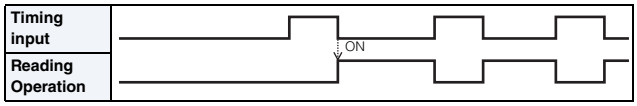
◆ **Norm. open (normally open)**

• Normal

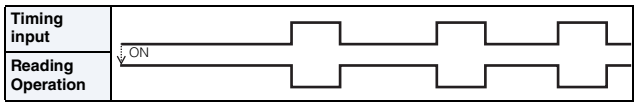



◆ **Norm. closed (normally closed)**

• Normal




• Power-on trigger setting




Point

- To prevent chattering, increase "Required Input Duration."
- Regardless of the "Timing Mode" setting, "Test," "Capture," "Trigger lock," and "Quick setup" input functions always operate as if this setting is "Level trigger."

# Output Terminals (OUT Terminals) OUT1 to OUT3

## Function/Option

The signals turn on under the following conditions.

| [Function] | [Option] | Criteria |
|---|---|---|
| Disable | - | - |
| One-shot output | OK | Reading success |
| | STABLE | At threshold or higher*1 |
| | UNSTABLE | Below threshold*1 |
| | ERROR | Reading error |
| | PRESET OK | Successful reading for the registration of master data for use in preset comparison |
| | TUNING OK | Tuning success |
| | SCRIPT CONTROL | When controlling OUT terminals with scripts |
| | NG (Comparison NG) | NG Comparison in preset comparison |
| | TRIGGER OVERRUN | When a trigger cannot be received |
| BUSY | TRG BUSY | During trigger input*2 |
| | LOCK BUSY | Forced trigger lock/during trigger input or testing by way of main unit button operations |
| | MODE BUSY | While quick setup codes are being read, during test mode, while saving to ROM, during the timing automatic adjustment |
| | ERR BUSY | Error occurrence (buffer full or reader error) |
| | CONFIG BUSY | AutoID Network Navigator control |
| READY | READY | Provides notification that timing input is allowed |
| External lighting | EXT.LIGHT | When reading data with the SR-X series*3 |
| Heartbeat | HEARTBEAT | Specified period<br>Used for life-and-death monitoring of a code reader. |

*1 Used for threshold of "Matching level" or "Code quality verification function"

*2 While this signal is on, the next reading operation will not be accepted. This signal also turns on in the following situations: During the start-up period, during preset data registration, while images are being sent to an FTP server, during tuning, during test mode, while monitoring, while images are being saved, while quick setup codes are being read, and during script execution

*3 Used to synchronize with external lighting. Only OUT3 is assigned.

## Output Duration

Set the duration for which output will be generated from the OUT terminal.
Default value: 500 ms

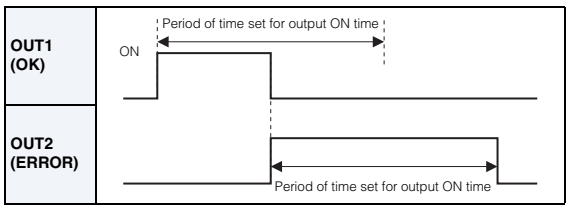
## Detailed Settings

Detailed settings are available for some terminal functions.

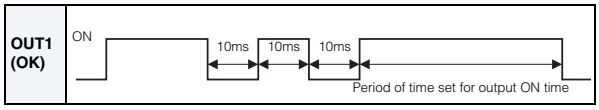
Reference "10-3 List of AutoID Network Navigator Settings" (Page 65)

Point

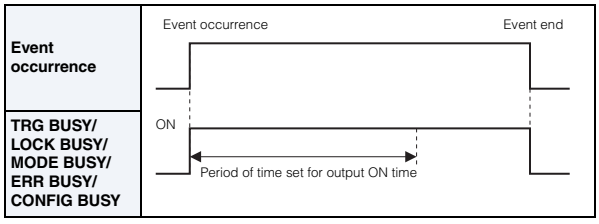
- If a subsequent output instance occurs during the output duration, this output will be given priority.




- If multiple output instances occur during the output duration, the output will be turned off for 10 ms, and then the subsequent signal will be turned on. If output instances occur continuously, the output turns on for at least 10 ms before it turns off and then turns on again.



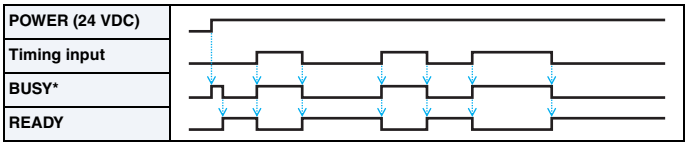

- The BUSY signal (TRG BUSY/LOCK BUSY/ MODE BUSY/ERR BUSY/ CONFIG BUSY) operation is shown below.



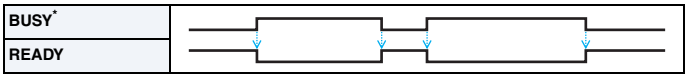

- Regardless of the value set for Output Duration, BUSY signals remain on until the corresponding BUSY operation is finished.
- If multiple BUSY signals are set for a single output terminal, the signal will remain on until all the BUSY operations are finished.

## READY signal

The READY signal notifies of the state in which the timing input is possible (state other than BUSY).



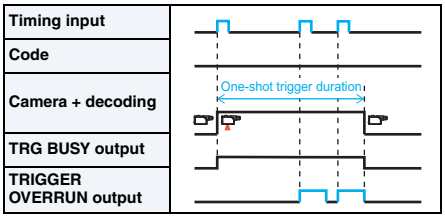

* BUSY : TRG BUSY/ LOCK BUSY/ MODE BUSY/ ERR BUSY/ CONFIG BUSY




* BUSY : TRG BUSY/ LOCK BUSY/ MODE BUSY/ ERR BUSY/ CONFIG BUSY

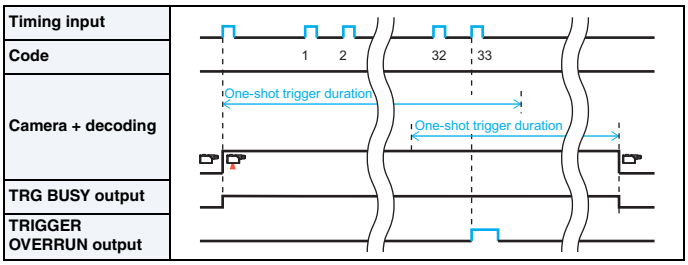
## TRIGGER OVERRUN signal

This signal notifies of the situation that another trigger is input during TRG BUSY and the trigger cannot be received.
The TRIGGER OVERRUN signal turns off when the output duration passes or the next read result is output.
Example) Timing mode: One-shot trigger




## TRIGGER OVERRUN signal while trigger buffering is enabled

When trigger buffering is enabled, a maximum of 32 triggers can be received even in the TRG BUSY state.
In this case, TRIGGER OVERRUN occurs when 33 or more triggers are received.



# 6-8 Save Captured Images

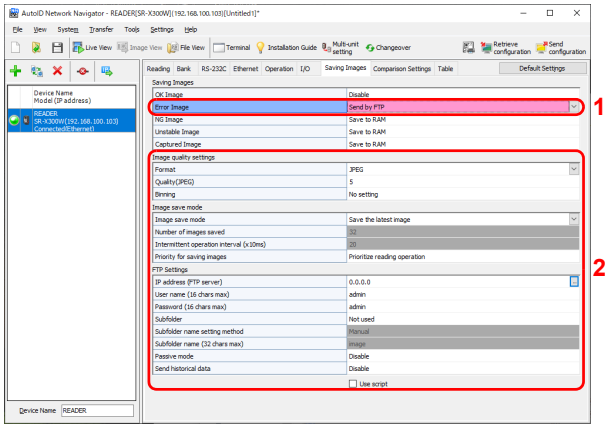
## Saving Images in Real Time

### Send by FTP

Images captured by the SR-X Series will be sent to the FTP server in real time.

**Example) Sending images to the FTP server when a reading error occurs**

1. **Change [Error Image] setting to [Send by FTP].**
2. **Change image quality settings as needed.**
3. **Click [Send Configuration].**




## Saving Images in SR-X Series

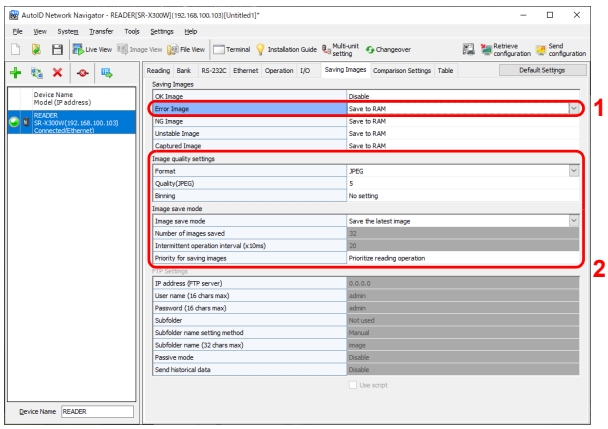
### Save to RAM • Save USB • Save to ROM

Images captured by the SR-X Series will be saved in the SR-X series.

* "Save to ROM" is available for SR-X300/X300W only.

**Example) Saving images to RAM when a reading error occurs**

1. **Change [Error Image] setting to [Save to RAM].**
2. **Adjust image quality settings as needed.**
3. **Click [Send Configuration].**




Reference When you want to save an image in real time and in the SR-X series, use [Save to ROM + Send by FTP] or [Save to USB + Send by FTP].

## Changing the Image Quality of Saved Images

### Format

You can select Bitmap or JPEG.

● **Quality (JPEG)**

Select the JPEG quality. "10" gives the highest quality. "1" gives the lowest quality.

### Binning

You can cut out pixels to reduce the file size.
"No binning" gives the largest image.
"1/64" gives the smallest image.

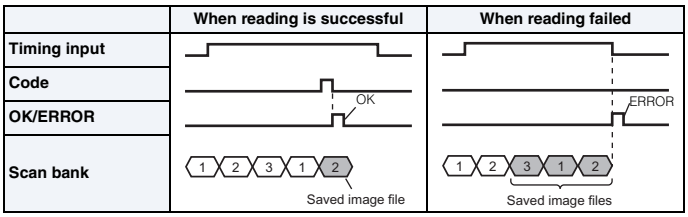
## Changing the Image Save Mode

### Image save mode

| | |
|---|---|
| Save the latest image | The last image captured during reading will be saved. Normally use this mode. |
| Save images after timing input on | The specified number of images will be saved counting from the time when the trigger turns on.* 1 |
| Save images before timing input off | The specified number of images will be saved counting backwards from the time when the trigger turns off.* 1 |
| Save images after timing input on (intermittent operation) | The specified number of images will be saved counting from the time when the trigger turns on. You can specify the interval for acquiring the targeted images for saving. |
| Save images before timing input off (intermittent operation) | The specified number of images will be saved counting from the time when the trigger turns off. You can specify the interval for acquiring the targeted images for saving. |

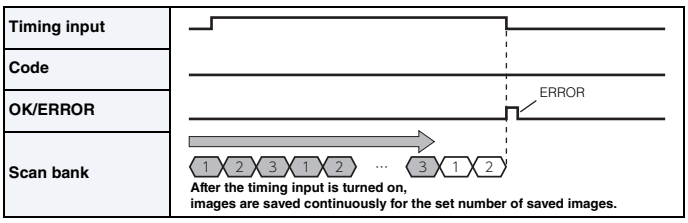
*1 Images will be saved as the "capture image."
The saved image is determined when the reader judges whether reading was successful or a reading error occurred.

● **Save final bank image**

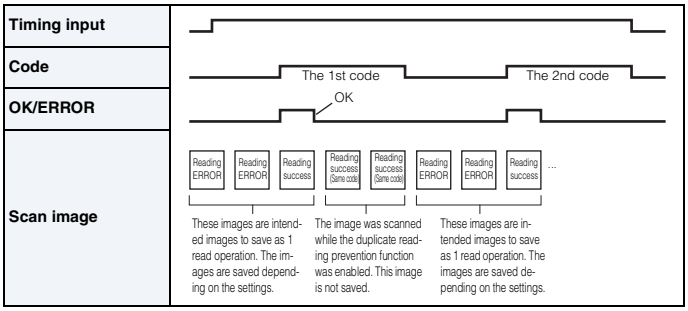



● **Save specified number of images after timing ON**

• Standard/ Specify capture count

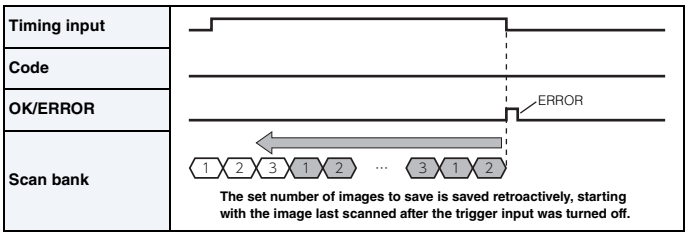



• Continuous

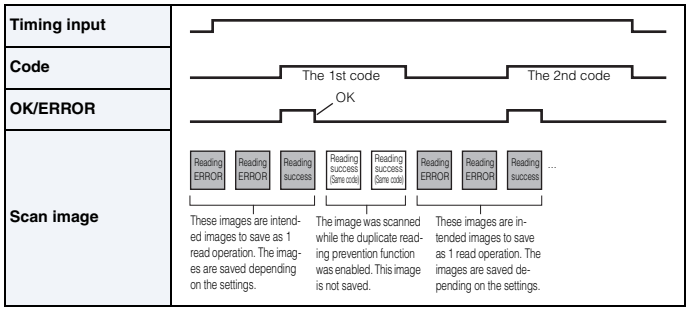



● **Save specified number of images before timing OFF**

• Standard/ Specify capture count



• Continuous




**Point**

- The name of the file saved differs depending on whether reading was successful or a reading error occurred.
- When the settings are configured to read multiple codes, when one code is read successfully, its image is judged to be the OK image.

## Image File Name

The image file name is set in the following format:

| Saved file number | _ | Image type identifier | _ | Bank No. | .bmp |
|---|---|---|---|---|---|

- Saved file number: 3-digit image file serial number
- Image type identifier character : Character that indicates the image type

| | |
|---|---|
| S | Successfully read images |
| N | Comparison NG images |
| E | Read error images |
| W | Unstable Images |
| C | Captured image |

- Bank No: Bank number used to obtain the image.

Example) File name for successful read with bank No. 1
001_S_01.bmp

**Point**

FTP save:
- You can use script programming to change the names of saved image files.
  "10-10 Scripts" (Page 88)

Save to RAM:
- The saved file number is from 000 to 999. The next number after 999 is 000. If you restart the reader, the numbers will start from 000 again.
- If an image is saved with an existing saved file number, the old image will be overwritten with the new one.

Save to USB/Save to ROM:
- A storage folder from “000” to “999” is assigned.
- File no. saved in each folder is from 000 to 099.

# 6-9 Compare the Read Data (Preset Data Comparison)

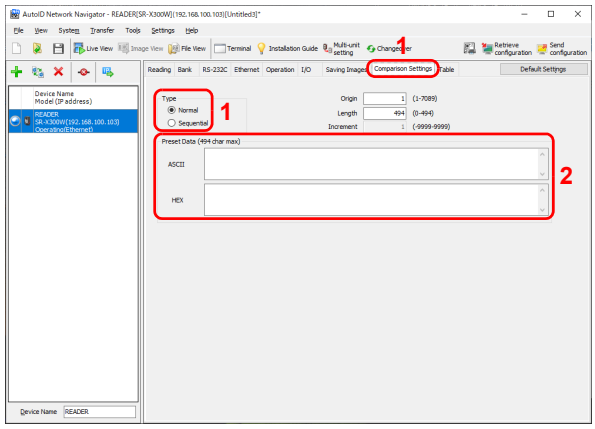
You can compare the read data to give OK and NG outputs.
The master data for this comparison is called "preset data."

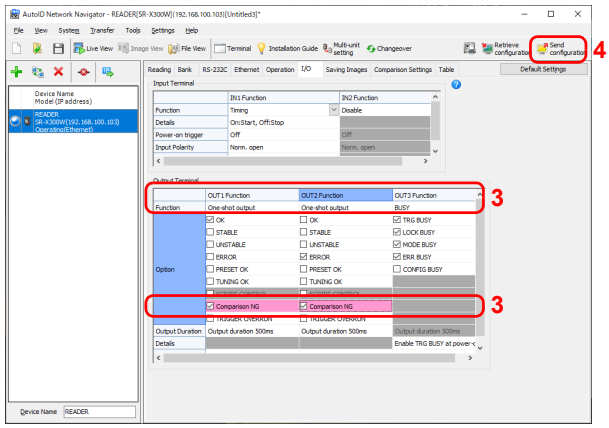
### Output terminal operation

| | |
|---|---|
| Reading successful and the read data matches the "preset data" | OK |
| Reading successful and the read data does not match the "preset data" | Comparison NG |
| Reading error | ERROR |

## Compare Read and Registered Data

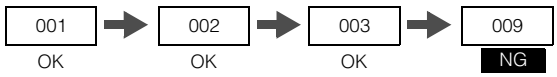
1. **On the [Comparison Settings] tab, change [Type] to [Normal].**
2. **Under [Preset Data], register the master data against which to compare the read data.**
3. **For any of [OUT1] to [OUT3] in the [I/O] tab, select [One-shot output] for [Function] and then select [Comparison NG] for [Option].**
4. **Click [Send Configuration].**
5. **Exit AutoID Network Navigator.**



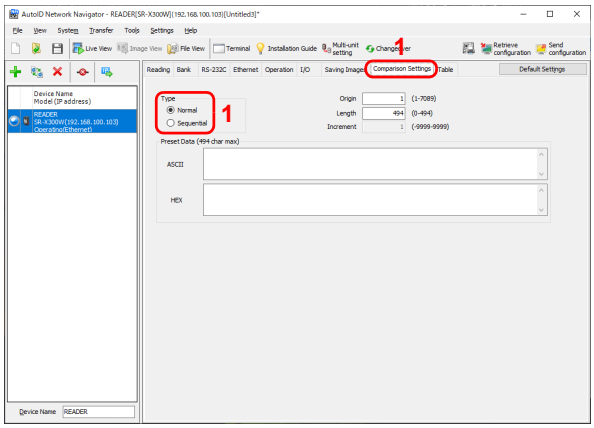

## Compare Sequential Data

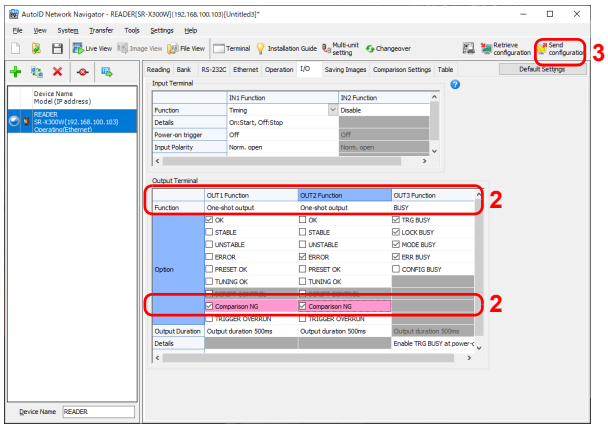
When you are reading codes in a sequence, you can check that numbers in the read data are changing sequentially.




1. **On the [Comparison Settings] tab, change [Type] to [Sequential].**
2. **For any of [OUT1] to [OUT3] in the [I/O] tab, select [One-shot output] for [Function] and then select [Comparison NG] for [Option].**
3. **Click [Send Configuration].**

**4 Exit AutoID Network Navigator.**





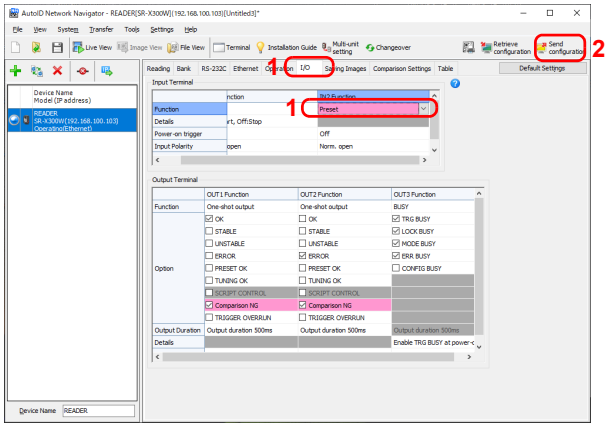
## Read a Code to Register Comparison Data (Preset Data)

**1 On the [I/O] tab, change [IN2 Function] to [Preset Input].**

**2 Click [Send Configuration].**

**3 Exit AutoID Network Navigator.**

**4 Reading starts when a signal is applied to the IN2 terminal, and the code that is read will be registered as the preset data.**



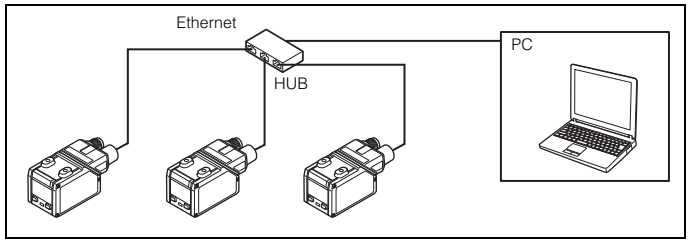
Reference

- Details on the preset data comparison:
  "10-9 Preset Data Comparison" (Page 87)
- You can also use commands to register the preset data.
  "14-2 Reading and Tuning Commands" (Page 107)

# 6-10 Allocate IP Addresses to Multiple Devices

Multiple units of the SR-X Series device can be connected to an Ethernet hub in their default state. IP addresses can be configured as a batch process.

## Device Configuration

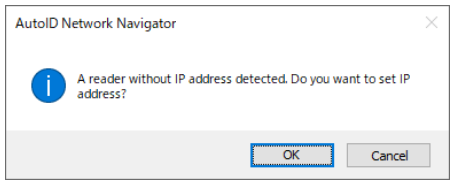



## Configuration Procedure

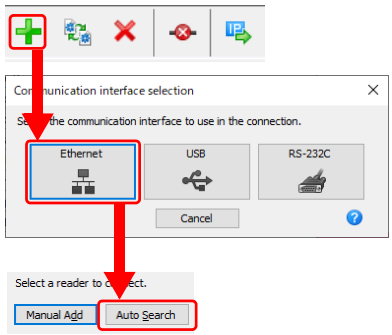
**1 As illustrated in the device configuration figure, connect the SR-X Series devices to a PC.**

**2 Start AutoID Network Navigator.**

The following message appears. Click [Yes].

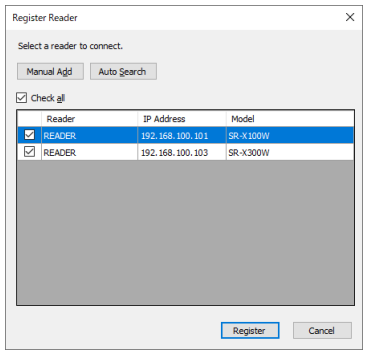



* If a USB device is detected first, click [+ (plus button)] - [Ethernet] - [Auto Search].

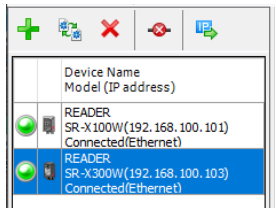



**3 The following message appears. Click [OK].**

Click [Edit] to change an IP address.



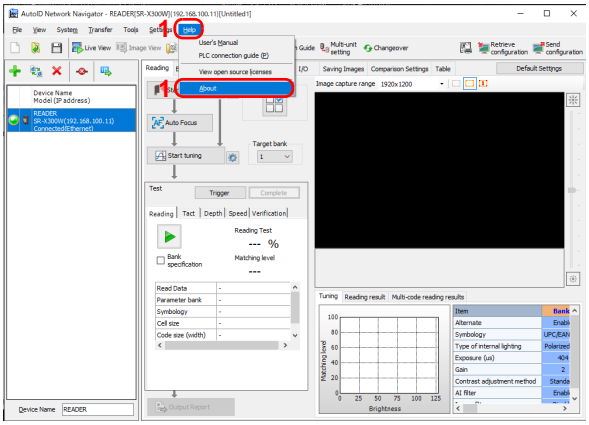

The IP address allocation is complete once the following screen appears.



# 6-11 Check Version

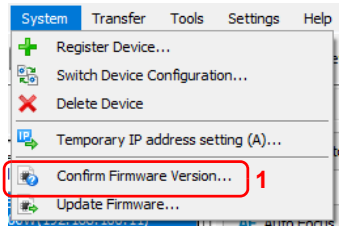
## Check the AutoID Network Navigator Version

**1 Click [Help (H)] - [About] on the menu bar.**



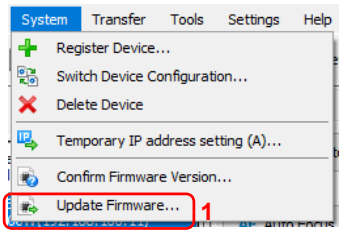
## Check the SR-X Version

**1 Click [System (M)] - [Confirm Firmware Version (V)] on the menu bar.**

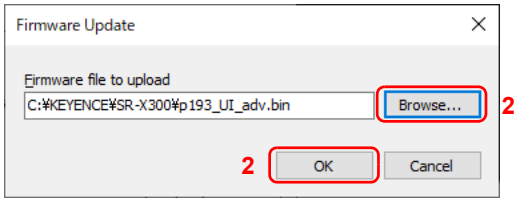



## Update the Firmware

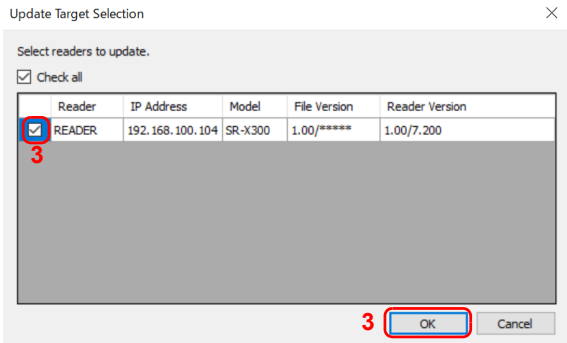
**1 Click [System (M)] - [Update Firmware (U)] on the menu bar.**




**2 Click [Browse], select the firmware file, and then click [OK].**



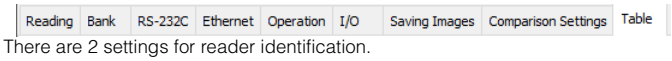

**3 Select the target reader for the firmware update and then click [OK].**




**Important**

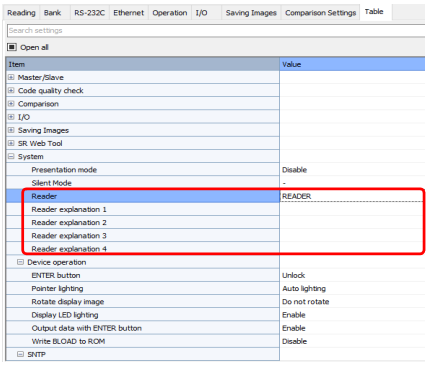
- Do not turn off the power of the reader while the firmware is being updated. Ignoring this may cause a failure.
- Do not update the firmware with the combination of new firmware and old AutoID Network Navigator. An E2 error will occur. Be sure to prepare the new AutoID Network Navigator to update the firmware.

# 6-12 Identify the reader



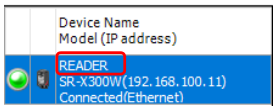

There are 2 settings for reader identification.

- Reader
- Reader explanation




## ● Reader name

Used as the configuration file name of AutoID Network Navigator.




## ● Reader description

Used for the following.

- Identifying the reader with the setting command response
- Appending the reader description with scripts
- Identifying the reader with the SR Web Tool.

# 7 Setting Example

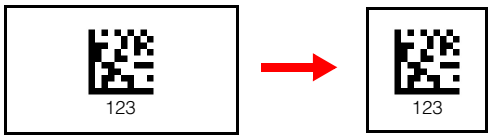

7-1 Change Field of View 40
Limiting the Field of View 40
7-2 Read Multiple Codes 40
Reading Multiple Codes with One Bank 40
Reading Multiple Codes in a Grid with One Bank 41
Read Codes of the Same Type/Data 41
Changing the Sort Order of Region Numbers 42
7-3 Change Sort Order of Multiple Codes 43
7-4 Determine the Success/ERROR of Reading for Each Area 44
7-5 Read Codes in Presentation Mode (Hands-free) 44
Enabling Presentation Reading 44
7-6 Check Print Quality 45
Matching Level 45
Code Quality Verification 45
Code Quality Verification Measurement Test Mode 45
7-7 Suppress Data Output 46
Silent Mode 46
7-8 Changeover 46
Creating Changeover Backup Files 46
Saving Changeover Backup Files 47
Uploading Changeover Backup Files 47
7-9 Change Language or Units Displayed by AutoID Network Navigator 48
Changing the Display Language 48
Changing the Units for Length/Speed 48
7-10 Lock SR-X Series Buttons 48
7-11 Password Lock 49
Setting Password Lock 49
Releasing Lock Temporarily 49
Releasing Password Lock Completely 49
7-12 Save Read Data in CSV Files 49
Appending Read Data to *.CSV Files through the FTP Interface 49
7-13 Check Field of View by Mounting Distance (Installation Guide) 50
Report Output 50
7-14 Read Barcodes in Specific Orientations 50
7-15 Output Read Data to Excel (SR-UR1) 51
Connecting the SR-UR1 to the SR-X Series 51
Configuration Procedure 51
Operation Method 51
7-16 Read DotCode 51

# 7-1 Change Field of View

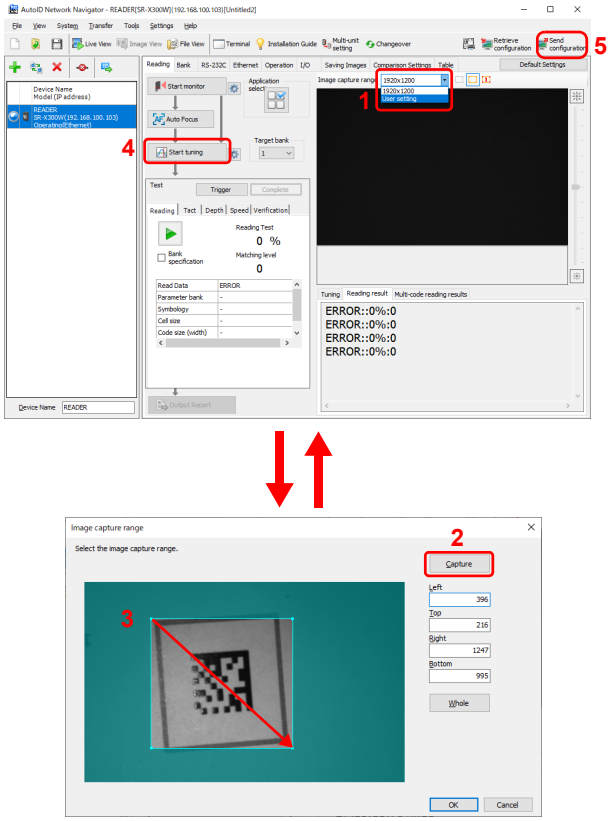
## Image capture range of the SR-X Series

| | SR-X300/X300W | SR-X100/X100W |
|---|---|---|
| Default value | 1920×1200 | 1360×1024 |
| Minimum value | 96×96 | |
| Maximum value | 1920×1200 | 1360×1024 |

## Limiting the Field of View




1. **Change [Image capture range] to "User setting."**
2. **The image capture range window will be displayed. Click [Capture].**
3. **Use the mouse to limit the image capture range by dragging it, and then click [OK].**
4. **Click [Start tuning].**
5. **Click [Send Configuration].**




Reference

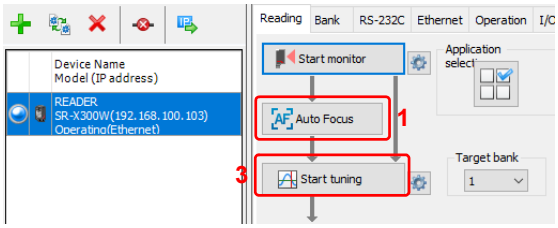
- The wider you make the field of view, the longer the reading time will be.
- The narrower you make the field of view, the shorter the reading time will be.

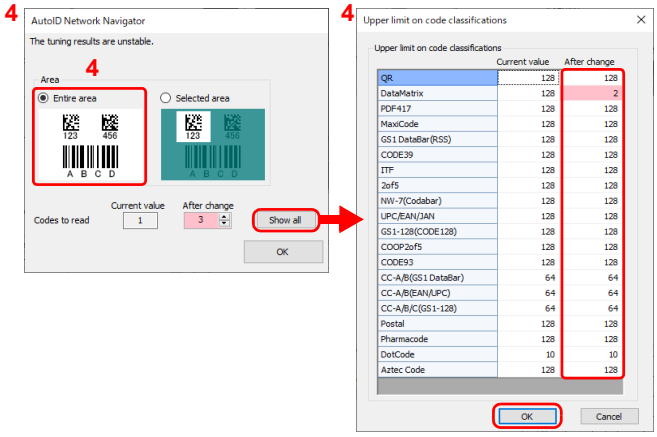
# 7-2 Read Multiple Codes

## Reading Multiple Codes with One Bank

1. **Click [Auto Focus].**
2. **Drag the mouse to draw a region for each code.**
3. **Click [Start tuning].**
4. **The following message appears once the tuning process is completed.**

   Select [Entire area] to read the codes in the entire image region.
   Click [Detailed Display] to display the maximum number of reads for each code. Change the values in the right-most column and click OK to change the maximum number.
5. **Click [Send Configuration].**





## Reading Multiple Codes in a Grid with One Bank

1 **Click [Auto Focus].**

2 **Right-click the on-screen image and click [Add multiple areas].**

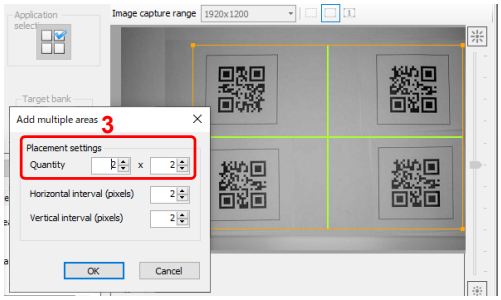
3 **Enter a value into [Quantity] under [Placement settings].**

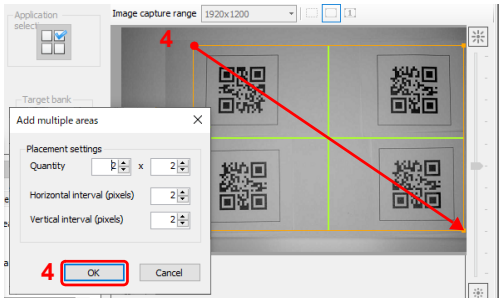
4 **Drag the mouse to adjust the region so that all codes are included. After that, click [OK].**

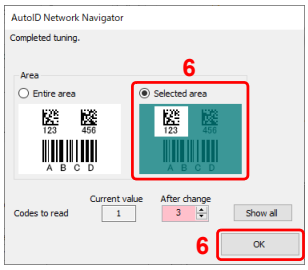
5 **Click [Start tuning].**

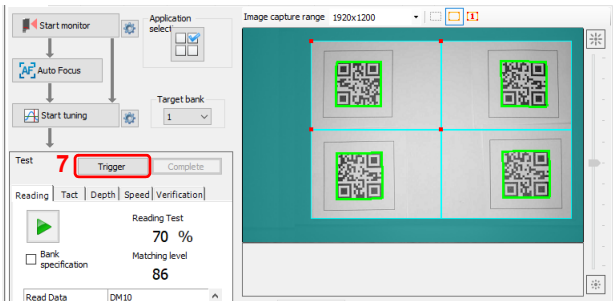
6 **Select [Selected area] and then click [OK].**

7 **Click [Trigger] and check reading.**




## Read Codes of the Same Type/Data

There are following two ways to read codes of the same type/data.

### (1) Distinguish by coordinate

1 **Select the [Table] tab - [Multiple reading operations of the same code type/data] and then select [Allow the same code separated by the specified interval or more].**

2 **Enter a minimum pixel value indicating the distance between codes to allow reading in [Specified interval (pixels)].**

3 **Click [Send Configuration].**

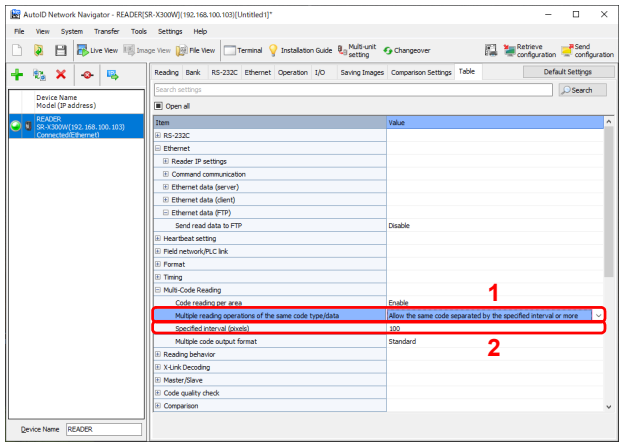
4 **Click the [Reading] tab - [Auto Focus].**

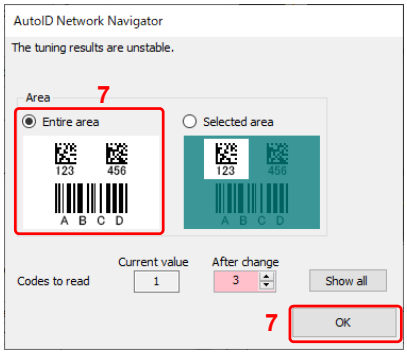
5 **Drag the mouse to draw a region for each code.**

6 **Click [Start tuning].**

7 **Select [Entire area] and then click [OK].**

8 **Click [Trigger] and check reading.**



### (2) Distinguish by decoding region

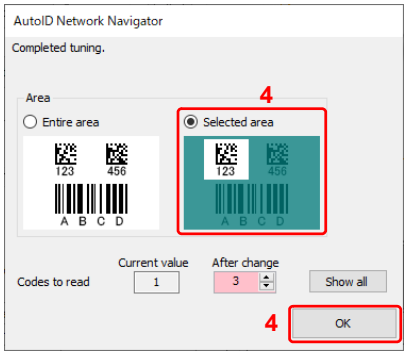
1 **Click [Auto Focus].**

2 **Drag the mouse to draw a region for each code.**

3 **Click [Start tuning].**

4 **Select [Selected area] and then click [OK].**

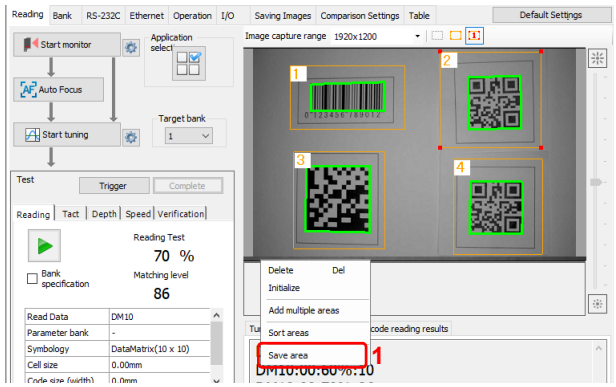
5 **Click [Trigger] and check reading.**




## Changing the Sort Order of Region Numbers

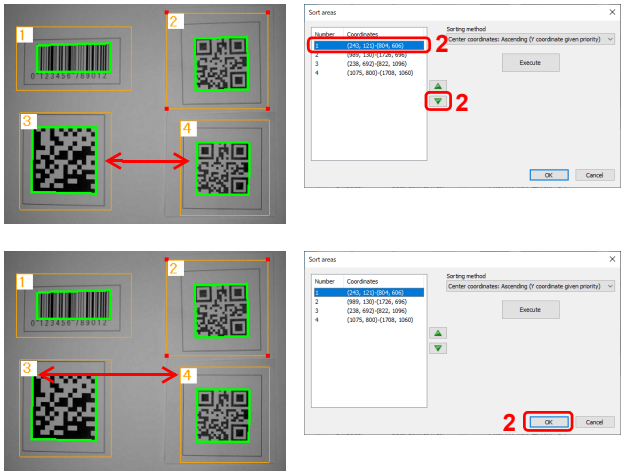
1 **Right-click the on-screen image. Click [Sort areas]. Sort areas using method 2-1 or 2-2 below.**

* Execute this operation when the test mode or trigger is not active.



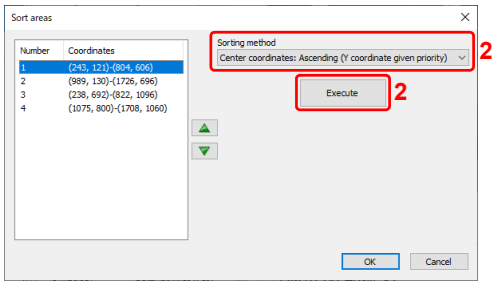

2-1 **Click the desired region number. Click [ △ ] or [ ▽ ] to move to the desired number. Click [OK].**

For example, to change from number 3 to number 4, click [3] and then [ ▽ ].

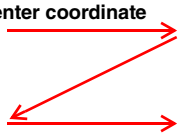



2-2 **Select the sort method and click [Execute] to change the sort order.**

* Use the center coordinate for sorting. You can do this easier by using the procedure described in "Reading Multiple Codes in a Grid with One Bank" (Page 41) together.

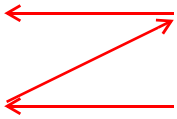



■ **Ascending order using Y center coordinate**



■ **Ascending order using X center coordinate**

■ **Descending order using Y center coordinate**



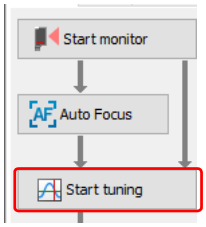
■ **Descending order using X center coordinate**

# 7-3 Change Sort Order of Multiple Codes

**1 Click [Auto Focus].**

**2 Draw a region around each code.**

**3 Click [Start tuning].**

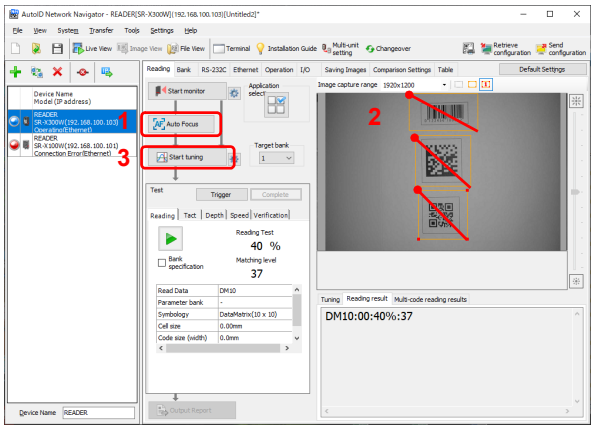



**4 The following message appears once the tuning process is completed.**

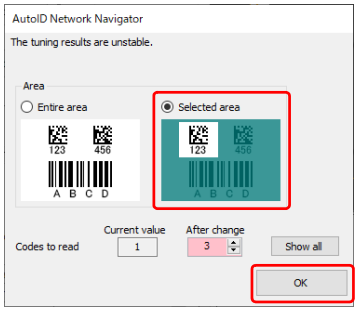
Select [Selected area] and then click [OK].

**5 Select [Multi-code reading results] and click [Trigger].**

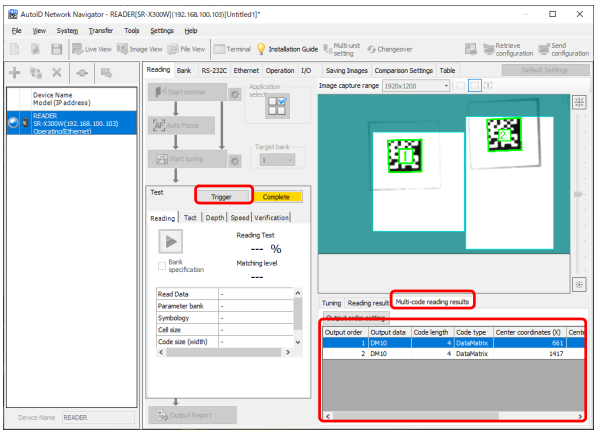
Reading data is displayed in the bottom right.




4




5



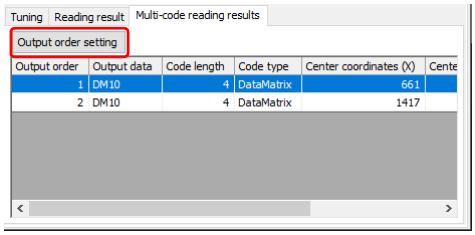
**6 Click [Output order setting].**

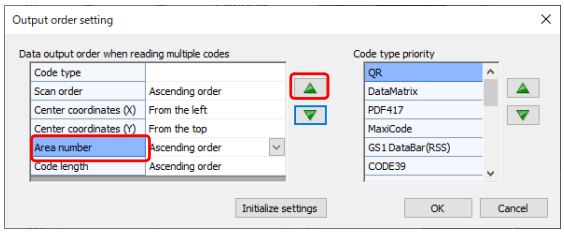
When you want to output data in order of area, click [Area number] -> [△] several times to move [Area number] to the top.

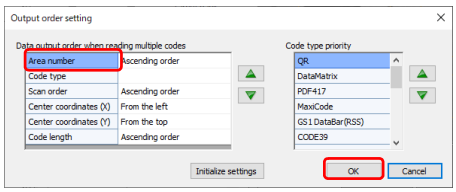
**7 Click [Trigger] to confirm that the sequence has changed.**

**8 Click [Complete].**

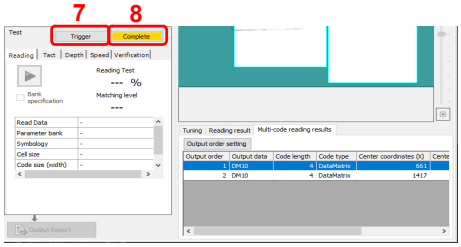
6




7 8



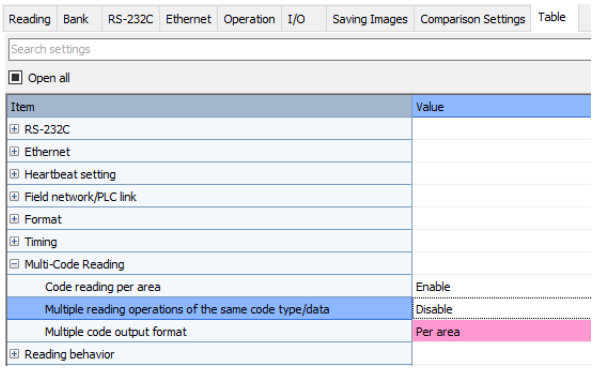
# 7-4 Determine the Success/ ERROR of Reading for Each Area

1 **Enable multiple code reading according to the 7-2 procedure.**

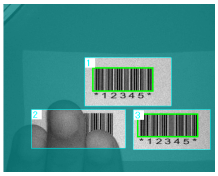
2 **Click** .

3 **Go to the [Table] tab and set [Multi-Code Reading] - [Multiple code output format] to [Per area].**

4 **Click [Send Configuration].**




**Output result**

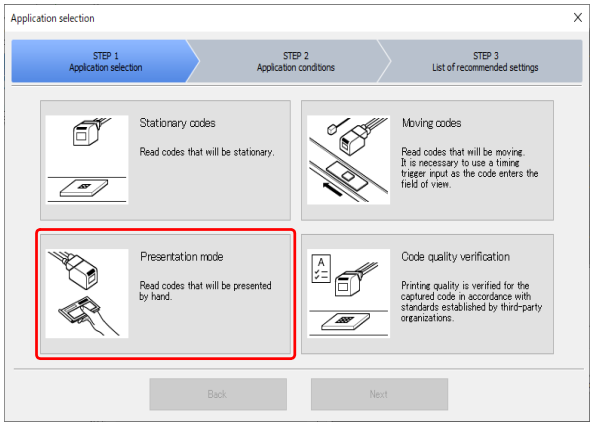
| | |
|---|---|
|  | |
| 12345,ERROR,12345[CR] | 12345,12345,ERROR[CR] |

# 7-5 Read Codes in Presentation Mode (Hands-free)

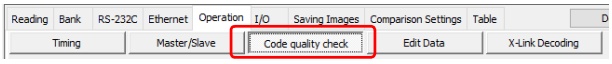
## Enabling Presentation Reading

1 **Click [Presentation Mode] from [Application Selection].**

Refer to "5-2 Application Selection" (Page 21) for details.



# 7-6 Check Print Quality




## Matching Level

The matching level is a numeric value that indicates how easily the SR-X Series read a code. The higher the value, the easier it is to read the code. (The value ranges from 0 to 100.)

98

74

| | |
|---|---|
| Matching Level Judgment | Set whether or not to use the matching level. |
| Verification threshold | Set the matching level threshold. The UNSTABLE signal can be output from the OUT terminal when the reading results are below the threshold. |
| Append matching level | The matching level will be appended to the read data.<br>Example) <Read data>:<matching level> |

Reference For details on the matching level, refer to "10-7 Matching level" (Page 83)

## Code Quality Verification

The code quality verification function verifies the 2D code scanned with the SR-X Series according to a marking quality evaluation specified by a third-party institution.

A

F

### Code quality verification

You can select from the following verification standards:

- ISO/IEC 15415
- ISO/IEC TR 29158 (AIM DPM-1-2006)
- ISO/IEC 29158:2020
- ISO/IEC 15416
- SAE AS9132
- SEMI T10-0701
- ISO/IEC 16022

| | |
|---|---|
| Verification threshold | Set the threshold for the verification result. The UNSTABLE signal can be output from the OUT terminal when the reading results are below the threshold. |
| Append grade | The verification grade will be appended to the read data.<br>Example) <Read data>:<verification grade> |
| Select expression of grades | You can change the verification grade expression.<br>• Alphabet<br>• Numeric |
| Append detailed verification result | You can append the detailed verification result when an "Append grade" check box is selected. |

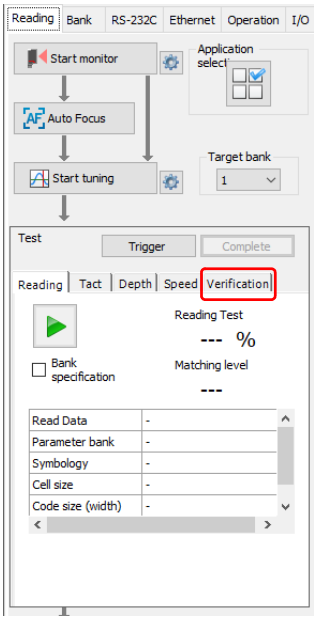
Important Note that the code quality verification function is designed to evaluate the printing quality of the standard-compliant 2D codes in the images scanned with the SR-X Series. This function cannot be used as an official 2D code verification device.

Reference For details on the code quality verification function, refer to "10-6 Code Quality Verification" (Page 72)

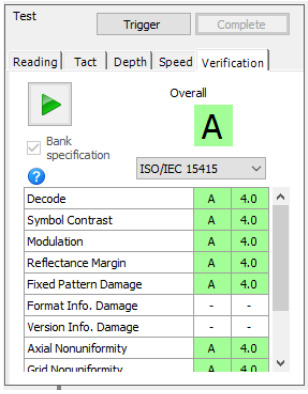
## Code Quality Verification Measurement Test Mode

**1 Select the applicable bank for which the tuning has completed.**

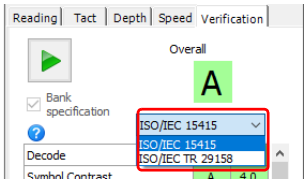
**2 Click [Verification].**




**3 Click [Play]. Once reading is performed, the following display will appear if the code quality verification is successful.**




**4 The verification result display for a DataMatrix code and QR code can be switched to that of a code quality verification standard selected from the following list.**




Point To perform a more accurate code quality verification measurement test, use a bank for which tuning has been performed with the code quality verification function enabled.

Important
- The code quality verification measurement test mode supports the following standards.
  ISO/IEC 15415, ISO/IEC TR 29158(AIM DPM-1-2006), ISO/IEC 29158:2020, ISO/IEC 15416
  Code verification of ethical drugs in Japan
- Code quality verification results vary depending on the settings for the selected bank, installation condition of the SR-X Series, etc.

# 7-7 Suppress Data Output

## Silent Mode

By using "silent mode," you can suppress the output of read data in the following situations.
Output will still turn on from the OUT terminals in the normal manner. The main unit's display will also appear in the normal manner. Use this mode when you do not need the read data.

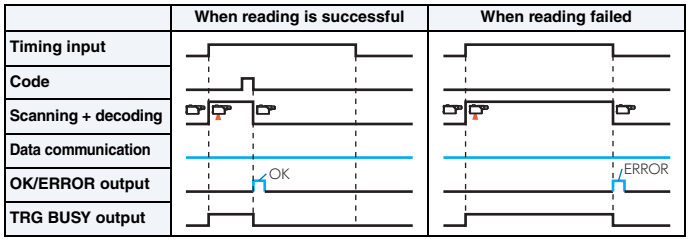
| |
|---|
| Comparison OK, reading success |
| Reading error |
| Stable reading |
| Unstable reading |
| Preset result |
| Test mode |
| Tuning |
| Comparison NG |

**1 On the [Table] tab, select the check boxes under [Silent Mode] that correspond to the situations in which you want to suppress data output.**

**2 Click [Send Configuration].**

**3 Exit AutoID Network Navigator.**

Reference Timing diagram



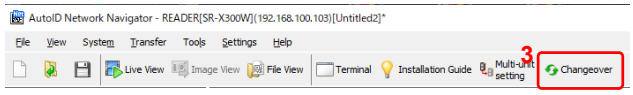

# 7-8 Changeover

## Creating Changeover Backup Files

**1 After completing tuning, check the communication settings and any other settings to be registered in the first file.**

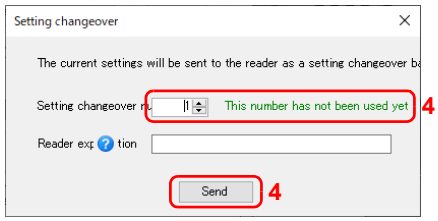
**2 Click [Send Configuration].**

**3 Click [Changeover].**

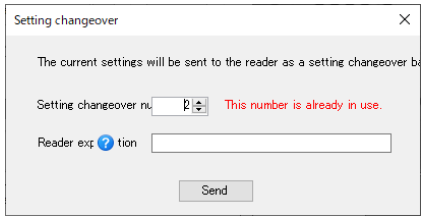



**4 Select an unused number from the setting changeover numbers and click [Send].**

The first file is created at this point.




If the selected setup change number is already in use, the following message will be displayed.




**5 After completing tuning, check the communication settings and any other settings to be registered in the second file.**

Change only the parameters necessary from the first file.

* To change only the bank, select only the [Bank Settings] check box under [Reset settings to defaults] and then click [Yes].

**6 Click [Send Configuration].**

**7 Select an unused number from the setting changeover numbers and click [Send].**

The second file is created at this point.

**8 Repeat the steps 5 to 7.**

Up to 256 files can be created.

## Saving Changeover Backup Files

**1 Open [File View] and then [Configuration file].**

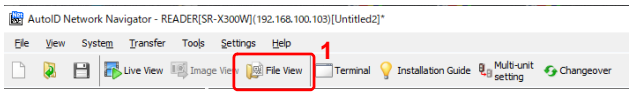
**2 Create a folder to store the files on the PC.**

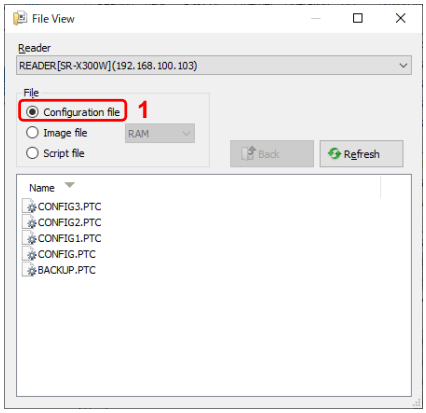
**3 Select [CONFIG1.PTC] through [CONFIG256.PTC] under [File View] - [Configuration file].**

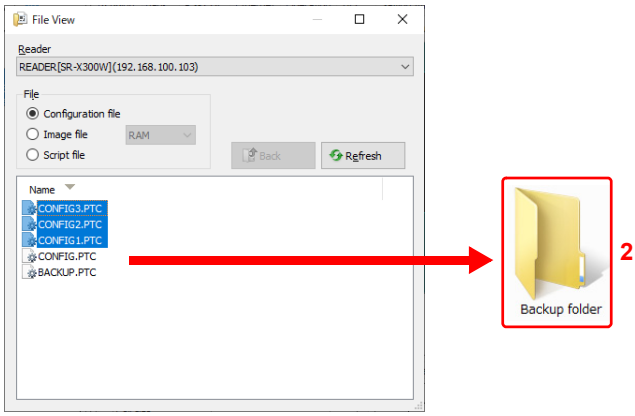
Drag and drop the files to the created folder.

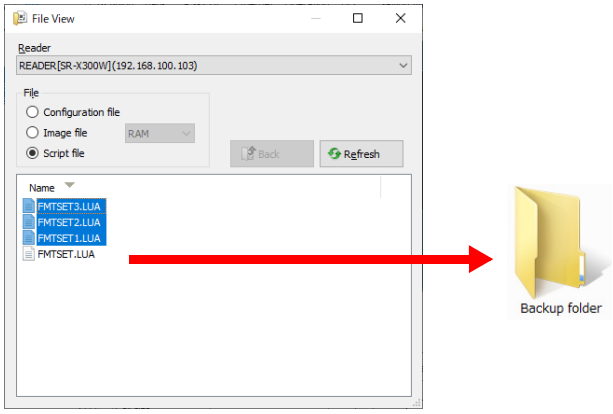
**4 For scripts, select [FMTSET1.LUA] through [FMTSET256.LUA] under [Script file] in the [File View].**

Drag and drop the files to the created folder.




**Important**

Do not change the names of saved files. Manage files through different folders.

## Uploading Changeover Backup Files

**1 Open [File View] and then [Configuration file].**

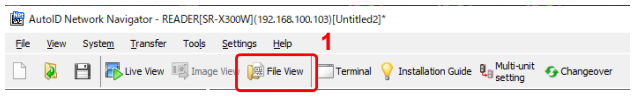
**2 Open the folder on the PC where the files are stored.**

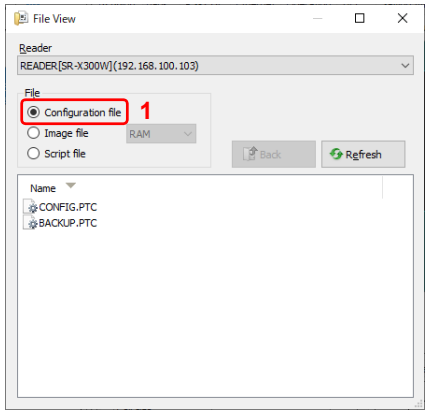
**3 Select [CONFIG1.PTC] through [CONFIG256.PTC] in the folder.**

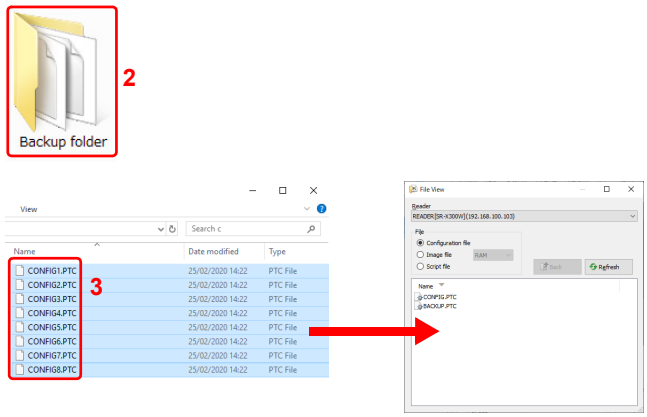
Drag and drop files to the File View.

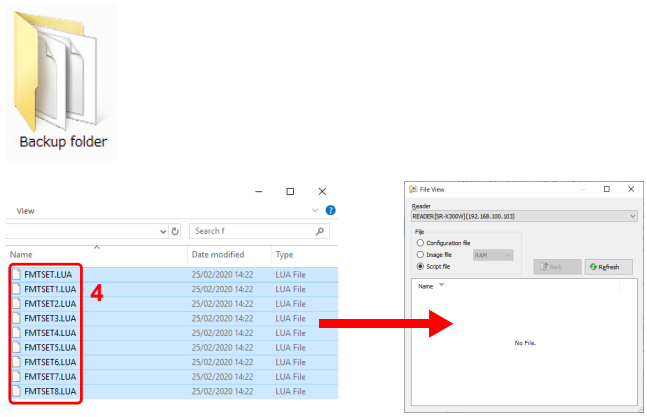
**4 Script files can also be uploaded.**

Select [FMTSET1.LUA] to [FMTSET256.LUA] in the folder.
Drag and drop files to File View.



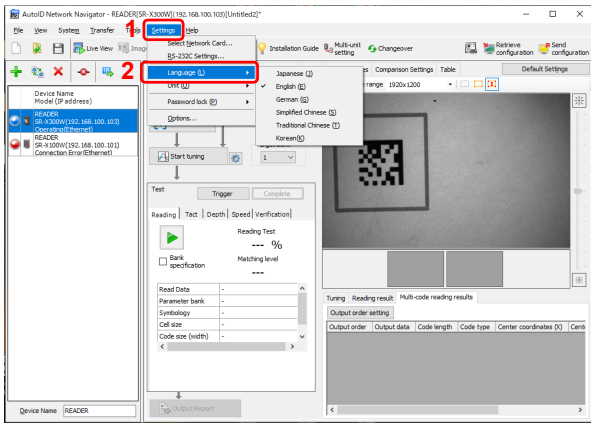
# 7-9 Change Language or Units Displayed by AutoID Network Navigator

## Changing the Display Language

1 **Click [Settings (S)] - [Language (L)] on the menu bar.**

2 **Select a language.**

3 **Restart AutoID Network Navigator.**

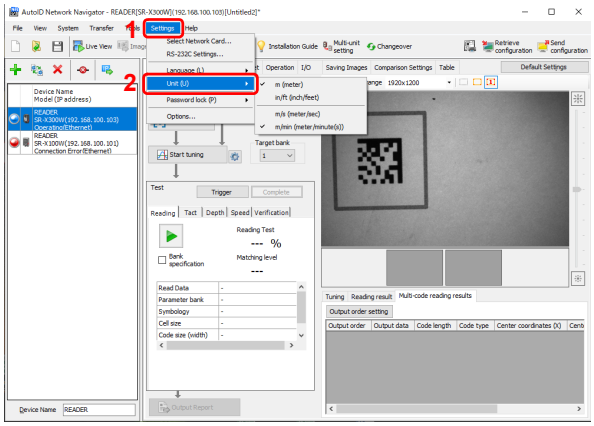


## Changing the Units for Length/Speed

1 **Click [Settings (S)] - [Unit (U)] on the menu bar.**

2 **Select a unit.**

The displayed units will be changed.



# 7-10 Lock SR-X Series Buttons

By locking the [ENTER] button ([TRG] button in the SR-X100/X100W) of the SR-X300/X300W series main unit, you can limit the operation of the main unit.

1 **Set the [Table] - [System] - [Device operation] - [ENTER button] to [Lock].**

2 **Click [Send Configuration].**

3 **Exit AutoID Network Navigator.**

When you specify this setting as shown above, the following image will be shown on the SR-X Series display, and the [ENTER] button (or [TRG] button) will be locked.

**Point**

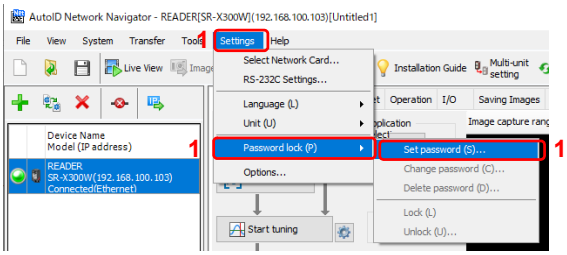
To unlock the button on the SR-X300/X300W Series directly, hold down the [ENTER] button and the [SELECT] button for at least 4 seconds. Hold down the [ENTER] button and the [SELECT] button for at least 4 seconds again to lock the [ENTER] button.

# 7-11 Password Lock

To prevent users other than Administrator from changing the settings of the SR-X Series, a password can be used to restrict the functions.

## Setting Password Lock

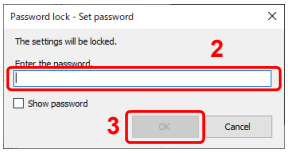
**1 Click [Settings (S)] - [Password lock (P)] - [Set password (S)] on the menu bar.**

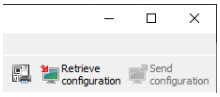



**2 Enter a password.**

**3 Click [OK].**

[Send Configuration] will be grayed out and disabled.




## Releasing Lock Temporarily

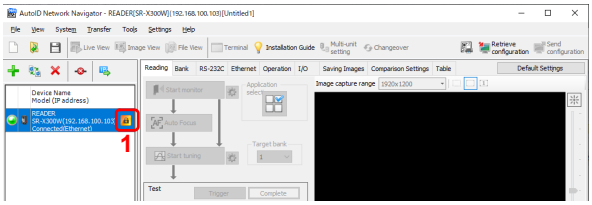
**1 Click [ ] beside the icon of the device to release the lock.**

**2 Enter a password and click [OK].**

The symbol beside the device icon will change to [ ], and [Send Configuration] will be enabled.

**Point**

Restarting the AutoID Network Navigator returns to the state where password lock is enabled.




## Releasing Password Lock Completely

**1 Click [Setting (S)] - [Password lock (P)] - [Delete password (D)] on the menu bar.**

**2 Enter a password and click [OK].**

**3 Click [Yes(Y)].**

The password lock will be released completely.

# 7-12 Save Read Data in CSV Files

## Appending Read Data to *.CSV Files through the FTP Interface

You can use the FTP interface to append read data to files on the server.

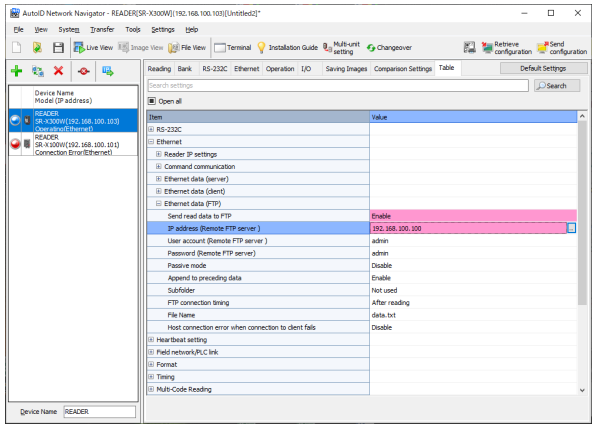
**1 On the [Table] tab, open [Ethernet] - [Ethernet data (FTP)].**

**2 Change [Send read data to FTP] to [On].**

**3 Set [Remote FTP server IP address], [Remote FTP server user account name], [Remote FTP server user account password], and [File name].**

**4 Click [Send Configuration].**

**5 Exit AutoID Network Navigator.**

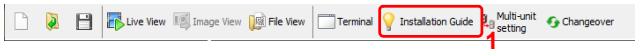


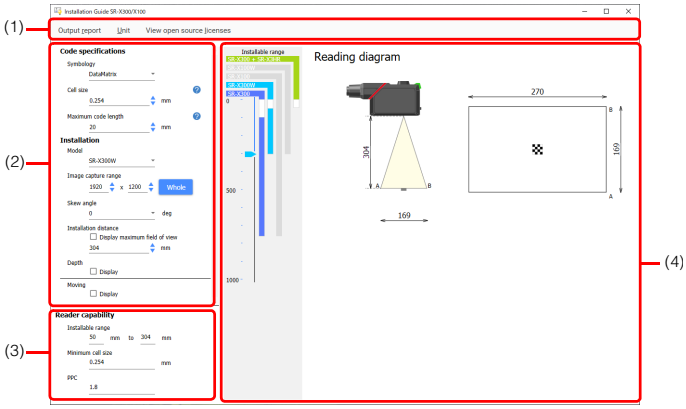
# 7-13 Check Field of View by Mounting Distance (Installation Guide)

**1 Click [Installation Guide].**

**2 Enter parameters.**

The [Installable range] display will be updated.




| | | |
|---|---|---|
| (1) | Menu bar | Used to output a report or change the unit. |
| (2) | Conditions | Input the symbol, mounting, speed and other conditions. |
| (3) | Calculation results | The calculation results under the entered conditions are displayed. |
| (4) | Field of view/depth/distance display | The field of view, depth, and distance under the entered conditions are displayed. |

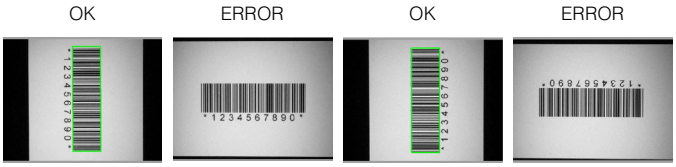
## Report Output

**1 Click [Output report] on the menu bar.**

**2 Select the save location.**

# 7-14 Read Barcodes in Specific Orientations

Ex.: Configure the software to read barcodes only when in a vertical orientation.



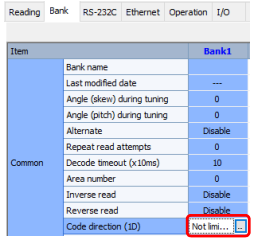

**1 Click [Bank] - [Common] - [Code direction (1D)] for target bank.**

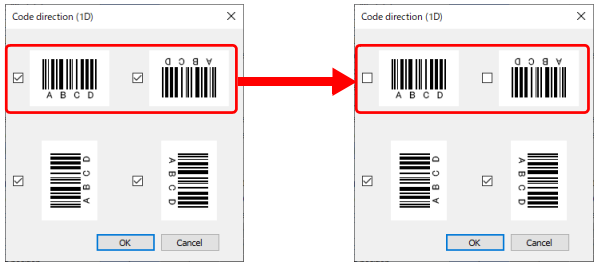
Deselect the horizontal barcode check box.

**2 Click [Send Configuration].**

**Point**

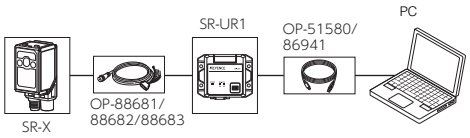
- When 1 to 3 boxes are checked among 4 boxes, reading is performed at ±45° from the setting direction.
- When all 4 boxes are checked, reading is performed at 360°.



# 7-15 Output Read Data to Excel (SR-UR1)

## Connecting the SR-UR1 to the SR-X Series




24 VDC power needs to be supplied to the SR-X Series.

## Configuration Procedure

### SR-X Series settings

The RS-232C communication settings are enabled on the SR-X Series by factory default.
There is no need to change the factory default communication settings.

### SR-UR1 settings

**1 Connect the SR-UR1 to the PC with the USB cable (OP-51580/86941).**

**2 Start AutoID Network Navigator.**

If the following information is displayed, the connection has been established.

**3 Open the [Table] tab - [USB communication] - [USB keyboard] - [Country-specific keyboard] and select the keyboard of target language.**

Default setting: English (US)

* To use a keyboard setting of a language other than English (Japanese, German, etc.), change the country-specific keyboard setting.

**4 Click [Send Configuration].**

**5 Exit AutoID Network Navigator.**

## Operation Method

### Use trigger input to the SR-X Series

Start up an application like Excel and move the cursor to a position where you want to input data.
Input a trigger to the SR-X Series.

### Use the SR-X Series in presentation mode

Refer to 📖 "7-5 Read Codes in Presentation Mode (Hands-free)" (Page 44).

Point

For details on the SR-UR1, refer to its instruction manual.

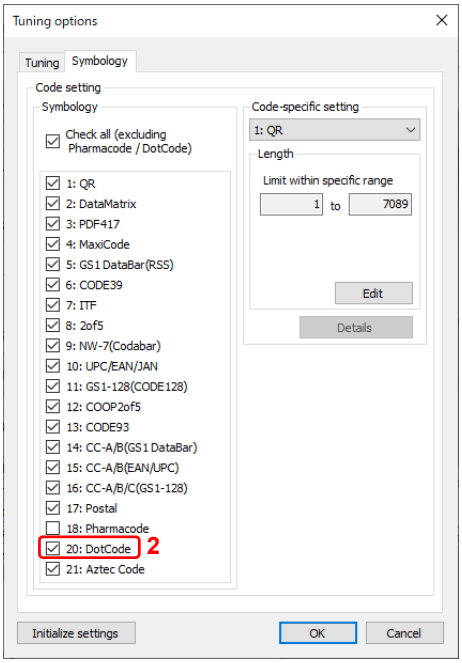
# 7-16 Read DotCode

**1 Click the [ ⚙ ] button and open the [Symbology] tab.**

**2 Select the "20:DotCode" check box and click [OK].**

**3 Execute tuning.**

After tuning, check that the code can be read stably in the test mode.




Point

- If reading multiple DotCodes, up to 10 codes can be read.
- Be sure to specify the area for each code before reading multiple DotCodes ([Selected area]). With [Entire area] selected, reading cannot be performed properly.
- For details on how to read multiple codes, refer to 📖 "7-2 Read Multiple Codes" (Page 40).

# 8 Checking Reading Results and Operations


8-1 Check the Read Data 54

Terminal 54

8-2 Send Commands 54

Terminal 54

8-3 View Live Images (MultiMonitor) 54

Using SR Web Tool 54

8-4 Acquire Images Captured by the SR-X Series 54

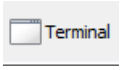
Using SR Web Tool 54

8-5 Output Read Results as a Report 54

Outputting Test Results from AutoID Network Navigator 54

# 8-1 Check the Read Data

## Terminal




**1 Click [Terminal].**

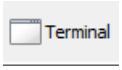
**2 Turn on the sensor (switch) wired to the SR-X Series.*1**

When reading is successful, the read data is displayed.

*1 You can also start reading by clicking [LON] in the terminal.

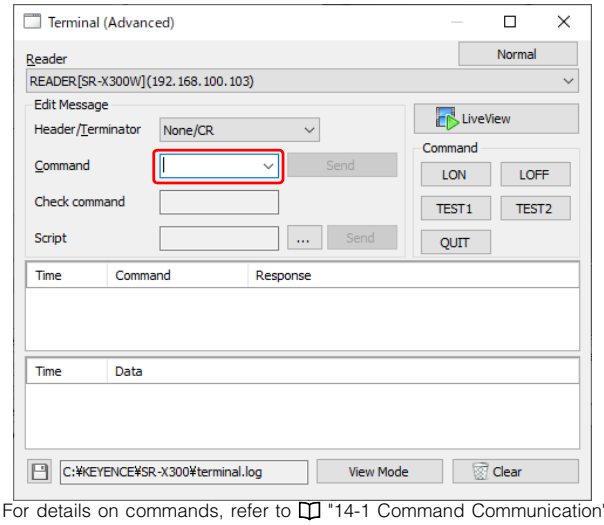
# 8-2 Send Commands

## Terminal




**1 Click [Terminal].**

**2 Type a command in the command input field and then click the [Send] button.**




* For details on commands, refer to "14-1 Command Communication" (Page 106).

# 8-3 View Live Images (Multi-Monitor)

## Using SR Web Tool

By launching the SR Web Tool and using the Web Multi Monitor, you can check Live View images of multiple units of the SR-X series.

Refer to "12-1 Details of SR Web Tool" (Page 96).

# 8-4 Acquire Images Captured by the SR-X Series

## Using SR Web Tool

By launching the SR Web Tool and using the Web Traceability Tool, you can display and save files of images captured by the SR-X series on the SR Web Tool.

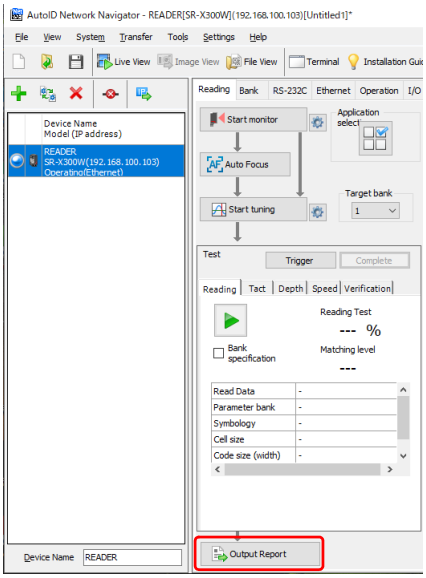
Refer to "12-1 Details of SR Web Tool" (Page 96).

# 8-5 Output Read Results as a Report

## Outputting Test Results from AutoID Network Navigator

### Report output

**1 Start AutoID Network Navigator, connect the SR-X Series and then click [Reading] - [Output Report].**




**2 Select a report to output and then click [OK].**

**3 Select a saving destination and target.**

A report will be output.

# 9 Checking and Restoring Settings


**9-1 Checking SR-X Series Settings 56**

Receiving Settings 56

**9-2 Restoring Settings 56**

Restoring Using a Configuration File 56
Restoring Using Quick Setup Codes (SR-X300/X300W) 56
Restoring Using Quick Setup Codes (SR-X100/X100W) 57

**9-3 Setting Multiple SR-X Units (Multi-Unit Setting Tool) 58**

Duplicating Settings to Multiple SR-X Series Units 58
Master/Slave Settings 58

**9-4 Comparing Settings of Multiple SR-X Units 59**

Export Reader Configuration 59

# 9-1 Checking SR-X Series Settings

## Receiving Settings

### USB connection

**1 Use a USB cable (OP-88569) to connect the SR-X Series and a PC.**

**2 Start AutoID Network Navigator.**

If the following information is displayed, the procedure is finished.
Check the settings.

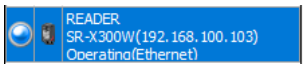
Reference For details on saving settings, refer to "5-6 Saving Settings/Quick Setup Codes" (Page 25).

### Ethernet connection

**1 Use the Ethernet cable to connect the SR-X Series to a PC.**

**2 Start AutoID Network Navigator.**

If the following information is displayed, the procedure is finished.
Check the settings.




Reference For details on the Ethernet connection, refer to "5-1 Connecting" (Page 20).

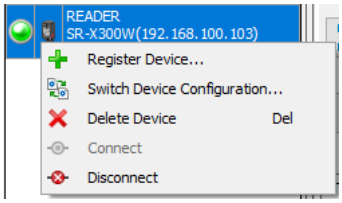
# 9-2 Restoring Settings

## Restoring Using a Configuration File

### Send configuration to a new SR-X Series

**1 Follow steps in [5-1] to connect to the AutoID Network Navigator.**

**2 Right-click the reader, and then click "Switch Reader Configuration" on the menu that appears.**




**3 Select a saved configuration file (*.ptc).**

**4 A confirmation message asking you whether you want to apply the settings will be displayed. Click "Yes."**

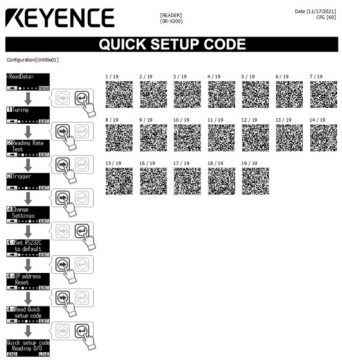
When the completion message is displayed, the configuration is complete.

Reference Refer to "7-9 Change Language or Units Displayed by AutoID Network Navigator" (Page 48) for more information on using the changeover function.

## Restoring Using Quick Setup Codes (SR-X300/X300W)

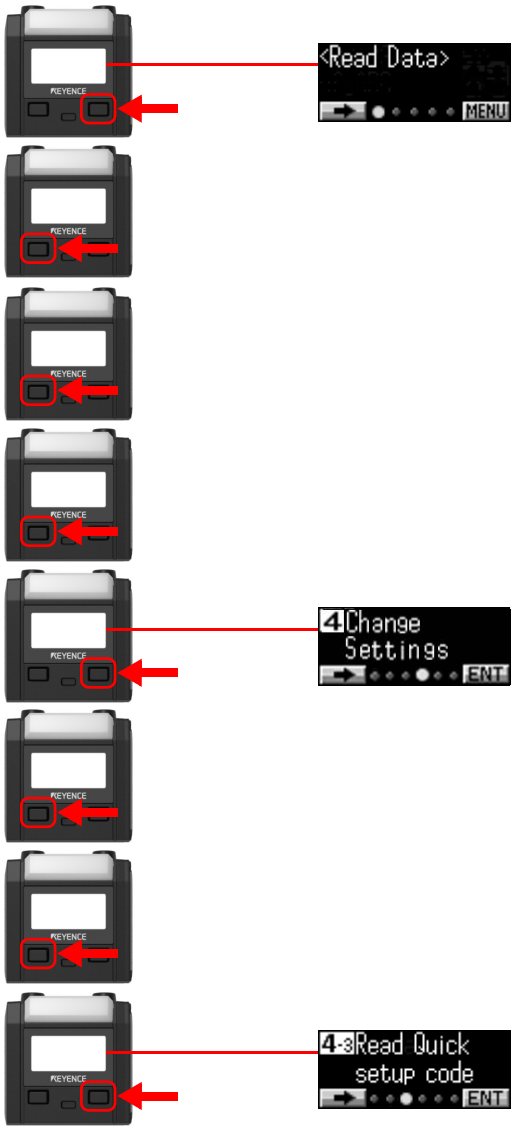
### Reading quick setup codes

**1 Prepare the printed quick setup codes.**



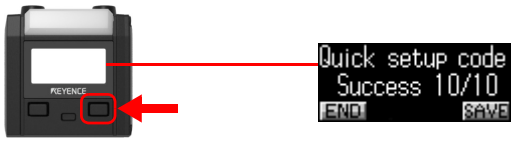

**2 Turn on the SR-X Series.**

**3** **Press the SR-X Series buttons as shown below.**



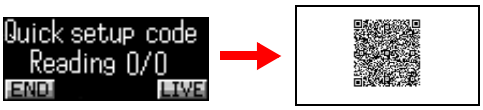

**4** **When the SR-X Series LED lights, scan all the quick setup codes.**

**5** **Select [SAVE] on the following display to finish applying the settings.**




Point

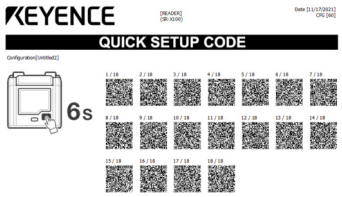
- For details on how to print quick setup codes, refer to "5-6 Saving Settings/Quick Setup Codes" (Page 25).
- If it is difficult to read the codes, select [LIVE] in the step 4, and then configure the settings while viewing the captured images.




# Restoring Using Quick Setup Codes (SR-X100/X100W)

## Reading quick setup codes

**1** **Prepare the printed quick setup codes.**




**2** **Turn on the SR-X Series.**

**3** **Press and hold the [TRG] button on the main unit for 6 sec.**

The blue LED flashes once when 3 sec and 6 sec pass.

**4** **Scan all the quick setup codes.**

When reading ends, the status LED turns green, ending the configuration.

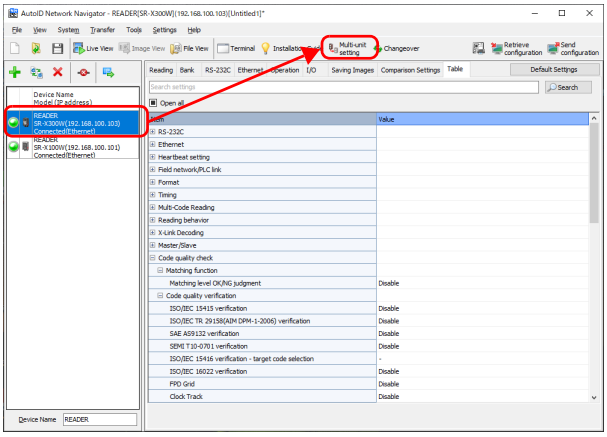
# 9-3 Setting Multiple SR-X Units (Multi-Unit Setting Tool)

## Duplicating Settings to Multiple SR-X Series Units

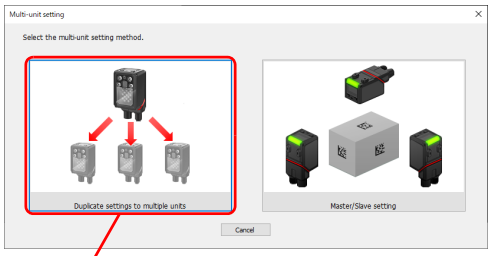
After configuring settings for a single SR-X Series unit, perform the following procedure to copy the settings other than network settings to other SR-X Series units.

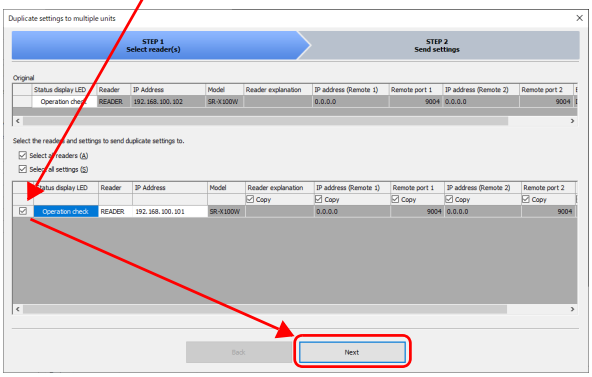
**1 Connect multiple SR-X Series units to AutoID Network Navigator.**

**2 Select the SR-X Series to copy settings from then click [Multi-unit setting].**



**3 Select a setting method.**

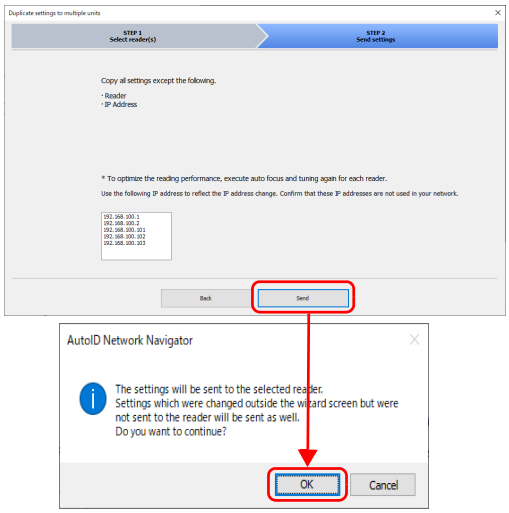



When [Operation check] is clicked, the LED indicator of the corresponding SR-X Series will flash in blue. Click this button to check the selected reader.

**4 Select the reader(s) to send duplicate settings to and then click [Next].**

**5 Click [Send]. When a confirmation message appears, click [Yes].**



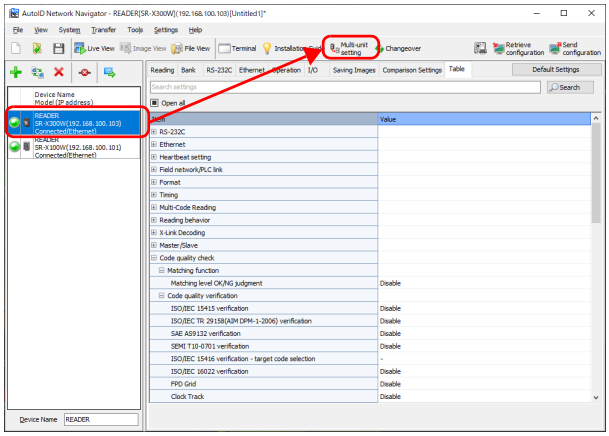

**6 After completing the settings, exit the AutoID Network Navigator.**

## Master/Slave Settings

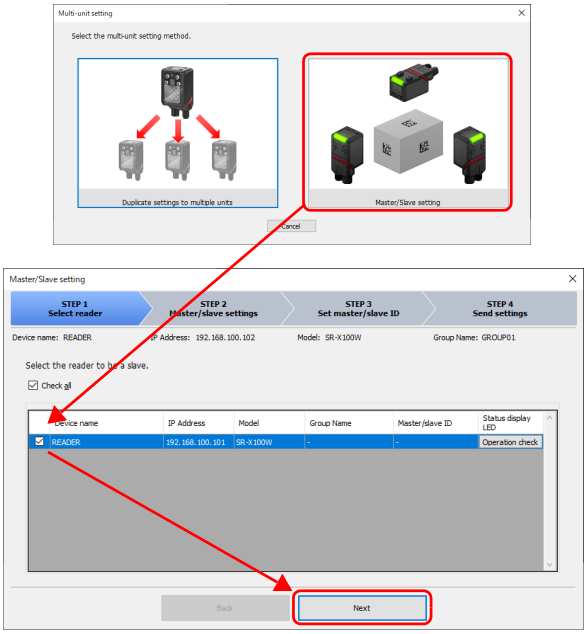
In configuring the master/slave settings, perform the following procedure to set a slave based on the settings of the reader handled as a master unit.

**1 Connect multiple SR-X Series units to AutoID Network Navigator.**

**2 Select the SR-X Series unit to be configured as the master unit and then click the [Multi-unit setting] button.**

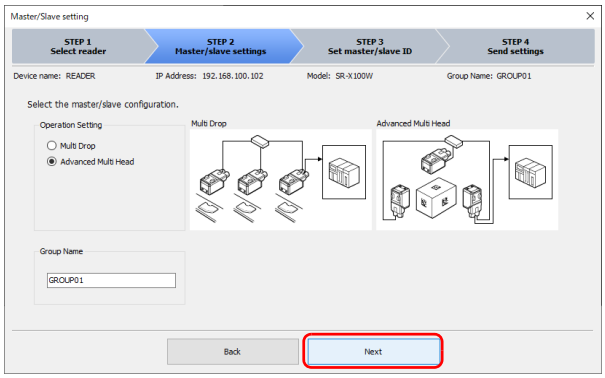


**3** **After selecting the setting method, select the reader(s) to be handled as a slave unit and then click [Next].**

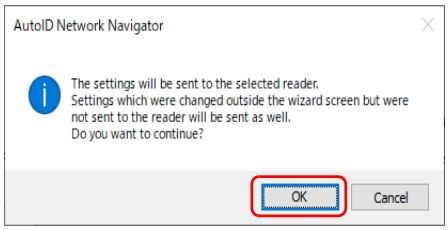



When the [Operation check] button is clicked, the LED indicator of the corresponding SR-X Series will flash in blue. Click this button to check the selected reader.

**4** **Select the master/slave configuration and then click [Next].**




**5** **When a confirmation message appears, click [Yes].**




**6** **After completing the settings, exit the AutoID Network Navigator.**

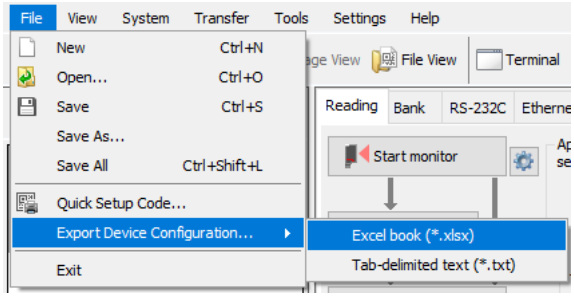
# 9-4 Comparing Settings of Multiple SR-X Units

## Export Reader Configuration

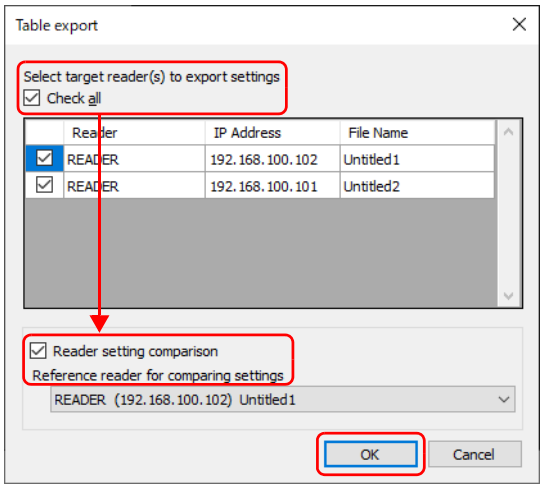
Perform the following procedure to output the settings of multiple SR-X Series units connected to AutoID Network Navigator to Excel file for comparison.

**1** **Connect multiple SR-X Series units to AutoID Network Navigator.**

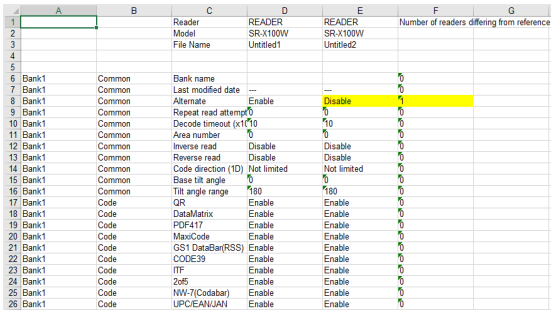
**2** **Click [File] - [Export Reader Configuration] - [Excel book (*xlsx)].**




**3** **Select a target reader, select [Reader setting comparison] and then click [OK].**




**4** **Compare the settings output in the Excel file.**



| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | | | Reader | READER | READER | Number of readers differing from reference | |
| 2 | | | Model | SR-X100W | SR-X100W | | |
| 3 | | | File Name | Untitled1 | Untitled2 | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | Bank1 | Common | Bank name | | | 0 | |
| 7 | Bank1 | Common | Last modified date | --- | --- | 0 | |
| 8 | Bank1 | Common | Alternate | Enable | Disable | 1 | |
| 9 | Bank1 | Common | Repeat read attempt | 0 | 0 | 0 | |
| 10 | Bank1 | Common | Decode timeout (x10 | 10 | 10 | 0 | |
| 11 | Bank1 | Common | Area number | 0 | 0 | 0 | |
| 12 | Bank1 | Common | Inverse read | Disable | Disable | 0 | |
| 13 | Bank1 | Common | Reverse read | Disable | Disable | 0 | |
| 14 | Bank1 | Common | Code direction (1D) | Not limited | Not limited | 0 | |
| 15 | Bank1 | Common | Base tilt angle | 0 | 0 | 0 | |
| 16 | Bank1 | Common | Tilt angle range | 180 | 180 | 0 | |
| 17 | Bank1 | Code | QR | Enable | Enable | 0 | |
| 18 | Bank1 | Code | DataMatrix | Enable | Enable | 0 | |
| 19 | Bank1 | Code | PDF417 | Enable | Enable | 0 | |
| 20 | Bank1 | Code | MaxiCode | Enable | Enable | 0 | |
| 21 | Bank1 | Code | GS1 DataBar(RSS) | Enable | Enable | 0 | |
| 22 | Bank1 | Code | CODE39 | Enable | Enable | 0 | |
| 23 | Bank1 | Code | ITF | Enable | Enable | 0 | |
| 24 | Bank1 | Code | Zof5 | Enable | Enable | 0 | |
| 25 | Bank1 | Code | NW-7(Codabar) | Enable | Enable | 0 | |
| 26 | Bank1 | Code | UPC/EAN/JAN | Enable | Enable | 0 | |

The settings that differ from the reader used as comparison reference will be highlighted.

# 10 Detailed Explanation


**10-1 Details of main unit operation 62**

For the SR-X300/X300W (Reader display) 62
For the SR-X100/X100W 63

**10-2 AutoID Network Navigator Details 64**

Screen 64
Icon Explanation 64
Reader List Display 64
Menu Bar Details 64

**10-3 List of AutoID Network Navigator Settings 65**

[Table] Tab 65
Search Settings 67

**10-4 Read Behavior 68**

Tuning 68
Details of Tuning Results 68
Alternate 68
Read Behavior 70
Timing Mode 70
Data Transmission 70
Reading Mode 71

**10-5 Reading Test 72**

Reading Rate Test Mode 72
Read Time Test Mode 72
Depth Measurement Test Mode 72
Speed Test Mode 72
Code Quality Verification Measurement Test Mode 72

**10-6 Code Quality Verification 72**

What is Code Quality Verification? 72
Code Quality Verification Function Settings 72
Criterion 73
Functions that Use Judgment Results 73
Calibration 73
Procedure to perform the code quality verification 73
Key Points for Installation 74
Data Formats of Code Quality Verification Results 75
Output Order of Code Quality Verification Results 76
Verification Items 77
Precautions 83

**10-7 Matching level 83**

Matching level OK/NG judgment function 83

**10-8 Master/Slave Function 84**

Usable Reading Modes and Protocols 84
Multi Drop 85
Advanced Multi-head 85

**10-9 Preset Data Comparison 87**

Preset Data Function 87
Registering Preset Data 87
Output Terminal Operation 87
Preset Data Wild Cards 87
Sequence Comparison 87

**10-10 Scripts 88**

What Can Scripts Do? 88
Configuration Procedure 88
Handling Script Files 88
Check Information Using Commands 88

**10-11 Command Replacement 89**

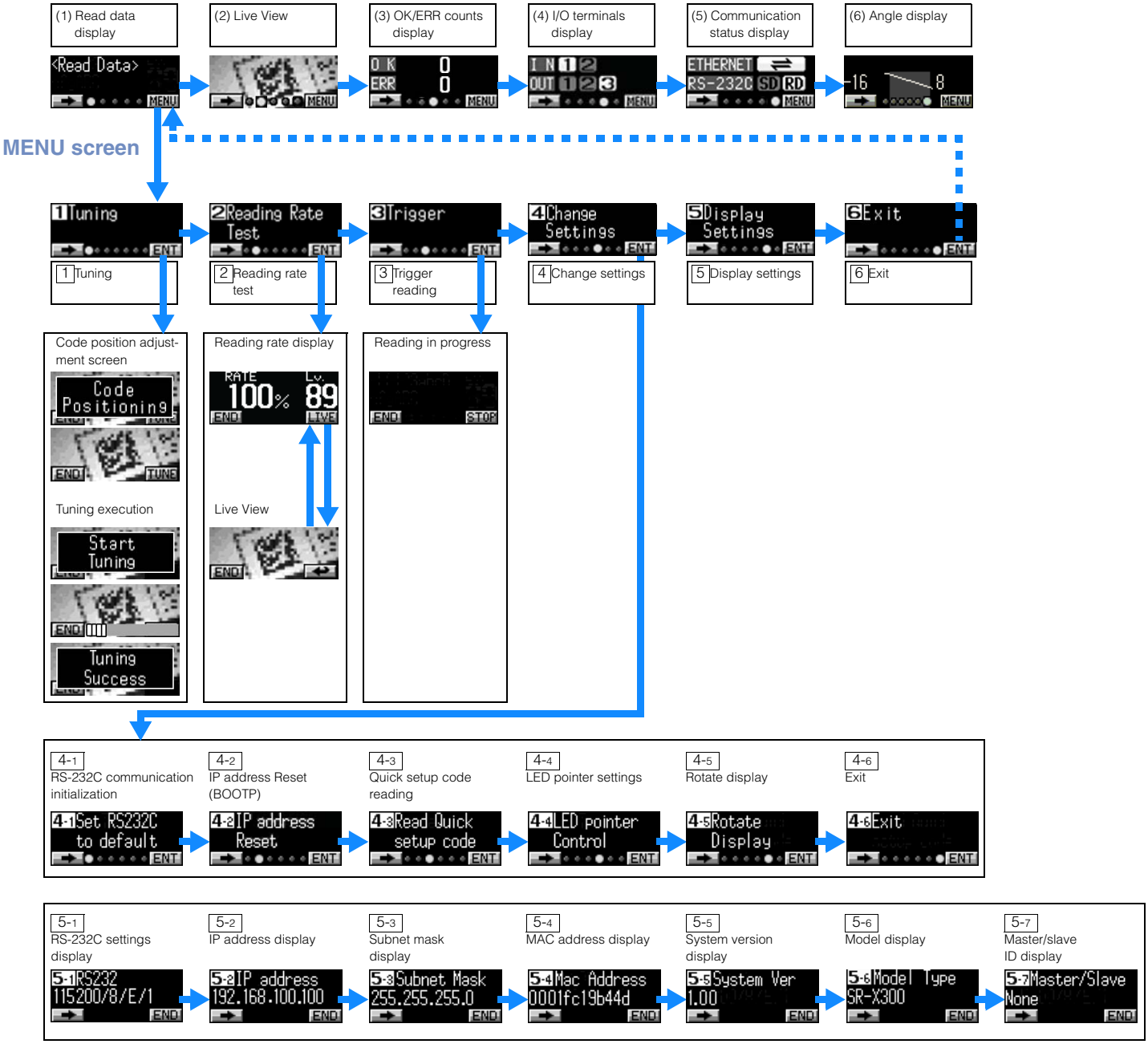
Target Command 89
Configuration Procedure 89
Creating Command Replacement Files 89
Escape Sequence 89
Command Replacement Error Debugging 89

# 10-1 Details of main unit operation

## For the SR-X300/X300W (Reader display)

### Operation screen

When the SR-X300/X300W Series is turned on, the start screen is displayed, and then the read data display (1) appears.




| | |
|---|---|
| (1) Read data display | This is the normal display screen. It displays the read data of the SR-X Series.*1 |
| (2) Live View | This screen displays the captured image of the SR-X Series. The part at the center of the field of view is displayed. |
| (3) OK/ERR counts display | This screen displays the OK and ERROR counts output by the SR-X Series.<br>When the power is turned off, the counts are reset. |
| (4) I/O terminals display | This screen displays the status of the IN terminals and OUT terminals. |
| (5) Communication status display | This screen displays the Ethernet and RS-232C communication status. |
| (6) Angle display | Displays the angle of the SR-X series relative to ground level. |

*1 Data that exceeds 20 bytes in size cannot be displayed. Only alphanumeric characters and some symbols can be displayed. Characters that cannot be displayed are shown as black squares (■).

| | |
|---|---|
| [1] Tuning | Use this menu to execute tuning. |
| [2] Reading rate test | Use this menu to conduct the reading rate test. |
| [3] Trigger reading | Press the ENTER button on this menu to check reading. |
| [4] Configuration change | Use this menu to read quick setup codes or initialize RS-232C communication. |
| [5] Display settings | Use this menu to view settings such as the RS-232C communication settings and the Ethernet IP address. |
| [6] Exit | Exit the menu and return to "(1) Read data display." |

When power is first turned on, the system waits for an IP address to be assigned, and the message “Please connect to PC” appears.
Refer to 📖 "4-3 Initial Power-on Operation" (Page 17) for details on how to assign an IP address.

## For the SR-X100/X100W

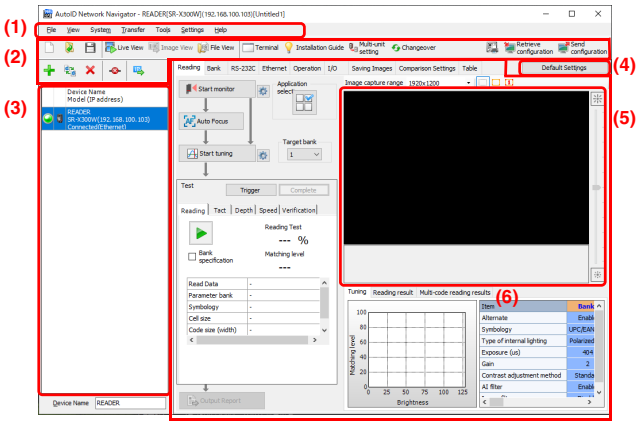
When the SR-X100/X100W is turned on, the status LED is lit in green (once).
The [TRG] button can be used to perform the following operations.

| | |
|---|---|
| [TRG] button (when powering on the reader for the first time) | Sets the IP address to 192.168.100.100. |
| [TRG] button | Check the reading. |
| Press and hold the [TRG] button (3 sec) | Perform tuning. |
| Press and hold the [TRG] button (6 sec) | Reading quick setup codes. |

Reference When power is first turned on, the system standbys for an IP address to be assigned, and the LED flashes in blue (continuously).

# 10-2 AutoID Network Navigator Details

## Screen




| | | |
|---|---|---|
| (1) | Menu bar | Open configuration files and view the version of the SR-X Series. |
| (2) | Icons | Start tools and send/receive configuration files. |
| (3) | Reader list | Displays a list of the readers detected by AutoID Network Navigator. |
| (4) | Setting initialization | Initialize the SR-X Series selected from (3) Reader list. To initialize an SR-X Series reader, click this button, select the items to initialize, and then send the settings. |
| (5) | Settings view | Configure the settings of the SR-X Series selected from (3) Reader list. |
| (6) | Monitor screen | After you click [Start monitor], which displays the live image captured by the SR-X Series, you can perform the following operations.<br>Use the slider on the right to change the brightness.<br>The scaling of the screen can be adjusted with the mouse wheel.<br>Right-click the mouse to edit the area. |

**Point**

While AutoID Network Navigator is running and is connected to the SR-X Series, you cannot communicate between the SR-X Series and a PLC or other PC. If you want to communicate with a PLC or other PC, exit AutoID Network Navigator.

## Icon Explanation

| | | |
|---|---|---|
| | New | Create a new configuration file for the selected model. |
| | Open | Open a configuration file. |
| | Save | Save a configuration file. |
| | Register | Register a reader. |
| | Switch settings | Switch the settings of the selected reader to the settings in a configuration file. |
| | Delete | Delete a registered reader. |
| | Disconnect | Disconnect a reader from AutoID Network Navigator. |
| | Temporary IP address setting | Use the "temporary IP address setting" function to connect to a reader through the Ethernet interface.<br>* This is used only by the SR-1000/750 Series. |
| | Print quick setup code | Print a quick setup code. |

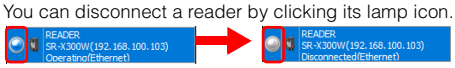
## Reader List Display

| Lamp status | | Description |
|---|---|---|
| | Green | Registered reader |
| | Blue | Registered reader is communicating with AutoID Network Navigator* 1 |
| | Gray | Disconnected |
| | Red | Registered reader is incapable of communicating with AutoID Network Navigator |

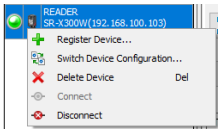
*1 With this status, it is not possible to communicate through the Ethernet or RS-232C interfaces between the SR-X Series and a PLC or other PC.

**Point**

- You can disconnect a reader by clicking its lamp icon.




- Right-click an SR-X Series reader to use a variety of commands such as registering the reader and switching its settings.




## Menu Bar Details

| | | |
|---|---|---|
| **File** | | |
| | New | Create a new configuration file. |
| | Open | Open a configuration file. |
| | Save | Save (overwrite) the existing configuration file. |
| | Save As | Save the existing configuration file with a new name. |
| | Save All | Save all the open configuration files. |
| | Quick Setup Code | Print a quick setup code. |
| | Export Reader Configuration | Output the list of settings to an xlsx/txt file. |
| | Exit | End AutoID Network Navigator. |
| **View** | | |
| | Reader View | Show and hide the reader list. |
| | Highlight Configured Fields | Highlights the settings changed from the factory default configuration. |
| **System** | | |
| | Register Reader | Register a reader. |
| | Switch Reader Configuration | Switch the settings of the selected reader to the details of a configuration file. |
| | Delete Reader | Delete the selected reader from the list. |
| | Temporary IP address setting | Assign a temporary IP address to a reader in order to connect to it. |
| | Confirm Firmware Version | Display the version of the reader. |
| | Update Firmware | Update the reader firmware. |
| **Transfer** | | |
| | Retrieve Configuration | Receive the settings of the reader on the PC. |
| | Send Configuration | Send a configuration to the reader. |
| **Tools** | | |
| | Live View | Display the live view. |
| | Image View | Display the image view. |
| | File View | "8-4 Acquire Images Captured by the SR-X Series" (Page 54) |
| | Terminal | "8-1 Check the Read Data" (Page 54) |
| | Multi-unit setting | Configure settings of multiple SR-X Series units.<br>"9-3 Setting Multiple SR-X Units (Multi-Unit Setting Tool)" (Page 58) |
| | Installation Guide | From the code size, you can check the reading distance and field-of-view size of the reader being used. |
| | Configuration command creation tool | Tool to create configuration commands for the SR-G100 Series. * Not used for the SR-X Series. |
| **Settings** | | |
| | Select Network Card | Select the network card to use when establishing an Ethernet connection with AutoID Network Navigator. |
| | RS-232C settings | Configure the communication settings when connecting the SR-700 Series to the AutoID Network Navigator via RS-232C.<br>* Not used for the SR-X Series. |
| | Language | Change the language displayed on the AutoID Network Navigator. |
| | Unit | Change the unit displayed on the AutoID Network Navigator. |
| | Password lock | Enable password lock on the SR-X Series. On SR-X Series units with password lock enabled, a password needs to be entered to change the settings. |
| | Options | Set the options for AutoID Network Navigator. |
| **Help** | | |
| | Manual | This is a link to the manual. |
| | PLC connection guide | This is a link to the web site where PLC connection guides can be downloaded.<br>* Internet connection is required. |
| | Display open source license | - |
| | Version information | Display version information for AutoID Network Navigator. |

### [Settings] - [Options]

| | |
|---|---|
| Search Readers on Application Startup | Set whether to automatically search for readers when AutoID Network Navigator starts. |
| Automatic Registration | Set whether to automatically register the reader after the "Search Readers on Application Startup" function. |
| Communication Timeout | Set the communication timeout for AutoID Network Navigator. When you cannot establish connections with the "5sec" setting, change this to "10sec." |
| Terminal on Live View Startup | Set whether to start the terminal at the same time that Live View opens. |
| Automatic Reader Disconnection | When the specified time elapses, communication between AutoID Network Navigator and the registered reader will be disconnected. |
| Receive Settings upon Reconnect | Set whether to receive reader settings when communication is resumed after automatic reader disconnection. |
| Multi-byte text string encoding method | Selects the encoding method used when codes contain multi-byte text strings. |
| PC buzzer (SR-X300/X100/5000/2000) | Set whether to make the PC buzzer sound at the time of read operation. (SR-X300/X100/5000/2000 Series only) |
| Notification for report information deletion | Used to notify of the deletion of report information when a reader is changed. |
| Synchronize time at configuration change (SR-X300/X100/5000) | Set the PC time as the reader time when sending the settings. (SR-X300/X100/5000 Series only) |

# 10-3 List of AutoID Network Navigator Settings

## [Table] Tab

### RS-232C

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| RS-232C communication | Enable | Enable or Disable | Select whether to enable or disable RS-232C communication. |
| Baud Rate | 115200bps | 600 to 115200 bps | - |
| Data Bits | 8bit | 7 bit or 8 bit | - |
| Parity | Even parity | None, Even parity, or Odd parity | - |
| Stop Bit | 1bit | 1 bit or 2 bit | - |
| Communication method | None | None, PASS/RTRY, or ACK/NAK | - |
| Heartbeat transmission | Do not send | Do not send or Send | Send a heartbeat message at regular intervals. |

### Ethernet

**Reader IP settings**

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| IP address | 192168100100 | | The IP address of the SR-X Series. |
| Subnet Mask | 24 | 8 to 30 | - |
| Default Gateway | 0.0.0.0 | 0.0.0.0 to 255.255.255.255 | - |
| Keep Alive | Enable | Enable or Disable | Refer to "13-2 Socket Communication (TCP, UDP)" for details. |
| **Command communication** | | | |
| Communication method | TCP | Not used, TCP, or UDP | The communication method used to receive commands. |
| Port (Waiting) | 9004 | 1024 to 65535 *1 | - |
| Login authentication | Disable | Disable or Enable | - |
| User name | admin | | - |
| Password | | | - |
| **Ethernet data (server)** | | | |
| Communication method | TCP | Not used or TCP | The server operation setting for socket communication. |
| Port (Waiting) | 9004 | 1024 to 65535 *1 | - |
| Heartbeat transmission | Do not send | Do not send or Send | Send a heartbeat message at regular intervals. |
| **Ethernet data (client)** | | | |
| Communication method | Not used | Not used, TCP, or UDP | The socket operation setting for socket communication. |
| Remote IP address 1 | 0.0.0.0 | 0.0.0.0 to 255.255.255.255 | The remote IP address. |
| Remote port 1 | 9004 | 1024 to 65535 | - |
| Remote IP address 2 | 0.0.0.0 | 0.0.0.0 to 255.255.255.255 | This setting is used when the same data is output to an additional PC or PLC. |
| Remote port 2 | 9004 | 1024 to 65535 | |
| TCP client connection timing | After reading | After reading, Immediately after power up | |
| Host connection error due to client connection failure | Disable | Disable or Enable | The "Host Connection Error (E12)" appears when a connection fails. |
| Heartbeat | Do not send | Do not send or Send | Send a heartbeat message at regular intervals. |
| **Ethernet data (FTP)** | | | |
| Send read data to FTP | Disable | Disable or Enable | Save the read data as a file on the FTP server. |
| IP address (Remote FTP server) | 0.0.0.0 | | Destination IP address |
| User account (Remote FTP server) | admin | | - |
| Password (Remote FTP server) | admin | | - |
| Passive mode | Disable | Disable or Enable | Enable this function when the FTP server operates passive communication. |
| Append to preceding data | Enable | Disable or Enable | Use this setting to append read data to preceding data sent through the FTP interface within .txt files. |
| Subfolder | Not used | Not used, Use | - |
| Subfolder name | data | | - |
| FTP connection timing | After reading | After reading, Immediately after power up | - |
| File name | data.txt | | - |
| Host connection error due to client connection failure | Disable | Disable or Enable | The "Host Connection Error (E12)" appears when a connection fails. |

*1 9013, 9014, 9015, 9016, 9017, 9018, 9020, 5900, 5920, and 44818 are excluded.

### Heartbeat settings

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Heartbeat send interval (sec) | 30 | 1 to 600 | Interval for sending heartbeat signals and messages. |
| Reset | Reset | Reset, Do not reset | |
| Heartbeat character string | 486561727442656174 (HeartBeat) | (1 to 32 characters) | |
| Heartbeat header | None | | |
| Heartbeat terminator | 0D ([CR]) | | |

### Field network/PLC link

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| PLC communication protocol | Not used | *1 | Select the protocol to use in communicating with the PLC. |
| Remote IP address | 0.0.0.0 | | The remote IP address. |
| Remote port | 5000 | 1024 to 65535 | - |
| DM front address | 0 | *2 | - |
| Control region address | 0 | *2 | - |
| Response region address | 0 | *2 | - |
| PLC link timing input | Do not use | Do not use or Use | Use this setting to operate timing input with the PLC's bits. |
| UDP port number | 5000 | 1024 to 65535 *3 | - |
| Node address | 1 | 0 to 65535 | - |
| Output length | 64 | 1 to 1000 | - |
| Bit Monitoring Period (x10 ms) | 10 | 1 to 99 | - |
| Retry interval (sec) | 5 | 1 to 10 | - |
| Generate PLC Link error when a PLC Link failure occurs | Enable | Disable, Enable | When enabled, after PLC Link error occurs, the error is automatically cleared and recovery is attempted. |
| **EtherNet/IP** | | | |
| Data handshake | Disable | Disable or Enable | - |
| Input assembly data size (send) | 500 | 40 to 1400 | Size of the data to send. |
| Output assembly data size (receive) | 500 | 4 to 1400 | Size of the data to receive. |
| Byte swapping | Disable | Disable or Enable | Setting for use in swapping the DM storage order. |
| **PROFINET** | | | |
| Device name | sr-x1h3h | | - |
| Data handshake | Disable | Disable or Enable | - |

*1 MC protocol (RS-232C), SYSWAY (RS-232C), KV STUDIO (RS-232C), MC protocol (Ethernet), OMRON (Ethernet), KV STUDIO (Ethernet), EtherNet/IP, PROFINET

*2 The setting range varies depending on the PLC link type.

*3 9013, 9014, 9015, 9016, 9017, 9018, 9020, 5900, 5920, and 44818 are excluded.

### Format

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Header | | (0 to 5 characters) | The characters to be added in front of the data |
| Terminator | 0D | (0 to 5 characters) | The characters to be added at the end of the data |
| Delimiter character (for additional data) | 3A | (1 character) | The delimiting characters to use when adding data |
| Intermediate delimiter (for multi-code reading) | 2C | (0 to 5 characters) | The delimiting character to use when multiple codes are read |
| Composite delimiter | | (0 to 5 characters) | - |
| Append data size | Disable | Disable or Enable | - |
| Append checksum | Disable | Disable or Enable | - |
| Edit data by script | Disable | Disable, Enable | Select whether to use scripts. |
| Script data output to 2 destinations | - | * | - |
| **Additional data** | | | |
| Symbology | Disable | Disable or Enable | - |
| Symbology identifier | Disable | Disable or Enable | - |
| Unused Error Correction(UEC) | Disable | Disable or Enable | - |
| Matching level | Disable | Disable or Enable | - |
| ISO/IEC 15415 verification result | Disable | Disable or Enable (Overall Grade) | - |
| ISO/IEC TR 29158(AIM DPM-1-2006) verification result | Disable | Disable or Enable (Overall Grade) | - |
| SAE AS9132 verification result | Disable | Disable or Enable (Overall) | - |
| SEMI T10-0701 verification result | Disable | Disable or Enable | - |
| ISO/IEC 15416 verification results | Disable | Disable or Enable (Overall Grade) | - |
| ISO/IEC 16022 verification result | Disable | Disable or Enable (Overall Grade) | - |
| Code vertex | Disable | Disable or Enable | - |
| Code center | Disable | Disable or Enable | - |
| Scan count | Disable | Disable or Enable | - |
| Read time | Disable | Disable or Enable | - |
| Decoding time | Disable | Disable or Enable | - |
| Parameter bank | Disable | Disable or Enable | - |
| Area number | Disable | Disable or Enable | - |
| Group Name | Disable | Disable or Enable | - |
| Master/Slave ID | Disable | Disable or Enable | - |
| Time | Disable | Disable or Enable | - |
| Image file name | Disable | Disable or Enable | - |
| Filling size | 0 | 0 to 999 | - |
| Filling character | 20 | | - |
| **Specify command response string** | | | |
| Basic command response character string | Not specified | Not specified, Detailed response, User setting, Echo back, Command replacement | - |
| Success response character | 4F4B | (1 to 8 characters) | - |
| Failure response character | 4552 | (1 to 8 characters) | - |

* Check all, RS-232C, Ethernet (Server), Ethernet (Client 1),Ethernet (Client 2), FTP data, PLC (EtherNet/IP, PROFINET, PLC Link)

## Timing

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Test mode on startup | None | None, Reading rate test, or Read time test | - |
| Timing Mode | Level trigger | Level trigger or One-shot trigger | - |
| Duration (x10ms) | 100 | 3 to 2550 | |
| Timing ON command | 4C4F4E(LON) | (1 to 32 characters) | Use hexadecimal characters to specify the command that will be used to start reading. |
| Timing OFF command | 4C4F4646(LOFF) | (1 to 32 characters) | Use hexadecimal characters to specify the command that will be used to stop reading. |
| One-character timing recognition | Disable | Disable or Enable | Use this setting to execute the timing ON command without header and terminator characters. |
| Trigger on delay (×1 ms) | 0 | 0 to 2550 | Configures the delay time from when the timing signal turns on until when the read starts. |
| Trigger off delay (×1 ms) | 0 | 0 to 2550 | Configures the delay time from when the timing signal turns off until when the read stops. |
| Trigger buffering | Disable | Disable or Enable | |

## Multi-Code Reading

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Code reading per area | Enable | Disable, Enable | - |
| Multiple reading operations of the same code type/data | Disable | Disable, Allow the same code within the same capture, Allow the same code separated by the specified interval or more | - |
| Specified interval (pixels) | 100 | | - |
| Multiple code output format | Standard | Standard, Per bank, Per area | - |

## Reading behavior

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Reading Mode | Standard | Standard, Continuous, Burst read, or Script | |
| Data Transmission | Send after read | Send after read or Send after timing off | Set the timing with which to send the data after a code is read. |
| Standard duplicate reading prevention | Do not prevent | Reset by time or Reset by time or another code or Do not prevent | |
| Duplicate reading prevention buffer | Disable | Disable, Enable | - |
| Duplicate Reading Prevention Interval (x 100 ms) | 10 | 0 to 255 | - |
| Duplicate reading prevention buffer release time (x100ms) | 0 | 0 to 255 | - |
| Scan interval (x1ms) | 0 | 0 to 255 | - |
| Capture count | 32 | 1 to 32 | - |
| Read Error String | 4552524F52 (ERROR) | (0 to 32 characters) | The code to output when a reading error occurs. |
| Standard duplicate reading prevention | Do not prevent | *1 | Set whether to read an already read code. |
| **Trigger buffer overrun** | | | |
| Trigger overrun output setting | Disable | Disable or Enable | |
| Trigger overrun string | 4F56455252554E (OVERRUN) | (0 to 32 characters) | |
| **Details** | | | |
| Bank alternate setting | Begin with successful bank | Begin with successful bank, Sequential | - |
| PPC search | Do not limit | Do not limit, Limited | - |
| Auto internal lighting adjustment for tuning | Enable | Disable, Enable | - |
| Contrast adjustment method | Standard | Standard, HDR, HDR2, Contrast zoom | - |
| Auto contrast adjustment | Disable | Disable, Enable | - |
| Code search | Limited | Do not limit, Limited | - |
| Bank number for tuning from the main unit (SR-X100/X100W only) | 16 | 1 to 16 | - |
| Bank alternate setting | Begin with successful bank | Begin with successful bank, Sequential | - |

*1 Reset by time, Reset by time or another code, Do not prevent

## X-Link Decoding

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| X-Link master IP address | 0.0.0.0 | | - |

## Master/slave

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Operation Setting | Not used | Not used, Multi Drop, Advanced Multi Head | Master/slave operation setting. |
| Group name | GROUP01 | (1 to 16 characters) | - |
| Unit ID | 0 | 0 to 31 | - |

## Code quality check

**Matching function**

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Matching function | | | - |
| Matching level OK/NG judgment | Disable | Disable, Enable | - |
| Matching level threshold | 70 | 0 to 99 | - |
| **Code quality verification** | | | |
| ISO/IEC 15415 verification | Disable | Disable, Enable | - |
| ISO/IEC 15415 verification threshold | Disable | Disable, D, C, B, A | |
| ISO/IEC TR 29158(AIM DPM-1-2006) verification | Disable | Disable, Enable | - |
| ISO/IEC 29158 revision | ISO TR 29158:2011 | ISO TR 29158:2011, ISO 29158:2020 | - |
| ISO/IEC TR 29158(AIM DPM-1-2006) verification threshold | Disable | Disable, D, C, B, A | |
| ISO/IEC TR 29158 (AIM DPM-1-2006) minimum reflectance calculation | Disable | Disable, Enable | - |
| SAE AS9132 verification | Disable | Disable, Enable | - |
| SAE AS9132 verification threshold | Disable | Disable, Enable | - |
| SEMI T10-0701 verification | Disable | Disable, Enable | - |
| ISO/IEC 15416 verification - target code selection | - | | - |
| ISO/IEC 15416 verification threshold | Disable | Disable or D or C or B or A | |
| ISO/IEC 16022 verification | Disable | Disable, Enable | - |
| ISO/IEC 16022 verification threshold | Disable | Disable, D, C, B, A | |
| Grade expression | Alphabet | Alphabet or Numeric | |
| Append detailed verification result | Disable | Disable or Enable | |
| Append values | Disable | Disable or Enable | |
| FPD Grid | Disable | Disable, Enable | - |
| Clock Track | Disable | Disable, Enable | - |
| **Code verification calibration** | | | |
| Code verification calibration | Disable | Disable, Polarized light, Direct light, Diffused light | - |
| Calibration brightness | 40 | 0 to 125 | - |

## Comparison

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Type | Normal | Normal, Sequential | - |
| Origin | 1 | 1 to 7089 | |
| Length | 494 | 0 to 494 | - |
| Preset Data | | (0 to 494 characters) | |
| Increment | 1 | '-9999 to 9999 | |

## I/O

**IN1 Function**

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Function | Timing | *1 | - |
| Test mode | Reading rate test | Reading rate test or Read time test | Set this value when "Start test mode" is assigned to the input terminal. |
| Bank used to capture images | 1 | 1 to 16 | Set this value when "Capture" is assigned to the input terminal. |
| Power-on trigger | OFF | OFF, ON | - |
| Input Polarity | Norm. open | Norm. open or Norm. closed | - |
| Required Input Duration | 1ms | 1 ms, 2 ms, or 10 ms | The length of time that trigger input must be left on until reading starts. |
| **IN2 Function** | | | |
| Function | Disable | *1 | - |
| Test mode | Reading rate test | Reading rate test or Read time test | Set this value when "Start test mode" is assigned to the input terminal. |
| Bank used to capture images | 1 | 1 to 16 | Set this value when "Capture" is assigned to the input terminal. |
| Power-on trigger | OFF | OFF, ON | - |
| Input Polarity | Norm. open | Norm. open or Norm. closed | - |
| Required Input Duration | 1ms | 1 ms, 2 ms, or 10 ms | The length of time that trigger input must be left on until reading starts. |
| **Output terminal common** | | | |
| TRG BUSY at Power-On | Enable | Disable or Enable | - |
| Output Duration (x 10 ms) | 50 | 1 to 255 | - |
| Heartbeat transmission interval (sec) | 30 | 1 to 600 | - |
| **OUT1 Function** | | | |
| Function | OK | *2 | - |
| Output polarity | Norm. open | Norm. open or Norm. closed | - |
| **OUT2 Function** | | | |
| Function | ERROR | *2 | - |
| Output polarity | Norm. open | Norm. open or Norm. closed | - |
| **OUT3 Function** | | | |
| Function | TRG BUSY, LOCK BUSY, MODE BUSY, ERR BUSY | *2, *3 | - |
| Output polarity | Norm. open | Norm. open or Norm. closed | - |

*1 Disable, Timing input, Preset input, Test mode startup, Capture image, Clear PLC link error, Trigger lock, Batch reading of codes, Execute tuning, Timing input start, Timing input stop, Command replacement, Data output

*2 OK, STABLE, UNSTABLE, ERROR, PRESET OK, TUNING OK, SCRIPT CONTROL, NG (Comparison NG), TRIGGER OVERRUN, TRG BUSY, LOCK BUSY, MODE BUSY, ERR BUSY, CONFIG BUSY, READY, HEARTBEAT

*3 EXT.LIGHT

## Saving images

### Saving images

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| OK Image | Disable | *1 | Method for saving images with the "OK" output function. |
| Error Image | Save to RAM | *1 | Method for saving images with the "ERROR" output function. |
| NG Image | Save to RAM | *1 | Method for saving images with the "NG" output function. |
| Unstable Image | Save to RAM | *1 | - |
| Captured Image | Save to RAM | *2 | Method for saving images when they are captured. |
| Format | JPEG | Bitmap or JPEG | - |
| Quality (JPEG) | 5 | 1 to 10 | - |
| Binning | Not set | Full, 1/4, 1/16, or 1/64 | - |
| Image save mode | Save the latest image | Save the latest image, Save images after timing input on, Save images before timing input off, Save images after timing input on (intermittent operation), or Save images before timing input off (intermittent operation) | - |
| Number of images saved | 32 | 1 to 32 | |
| Intermittent operation interval (x10ms) | 20 | 2 to 300 | |
| Priority for saving images | Prioritize reading operation | Prioritize saving images or Prioritize reading operation | Set whether to give priority to reading or saving at the time of image save. Prioritize saving images: Reading request is not accepted during image save. Prioritize reading operation: When reading request is received during image save, the image save will be canceled, and the reading operation will be given priority. |
| Edit image file name by script (FTP transmission only) | Disable | Disable or Enable | Select whether to use scripts. |
| Host Connection Error When Image Storage Failed | Disable | Disable, Enable | - |
| **FTP settings** *3 | | | |
| IP address | 0.0.0.0 | 0.0.0.0 to 255.255.255.255 | Destination IP address |
| Username (16 chars max) | admin | | - |
| Password | admin | | - |
| Subfolder | Not used | Not used, Use | - |
| Subfolder name setting method | Manual | Manual or Auto | - |
| Subfolder name | image | 1 to 32 characters | |
| Passive mode | Disable | Disable or Enable | - |
| Send historical data | Disable | Disable or Enable | - |
| FTP connection timing | After reading | After reading, Immediately after power up, Always disconnect after reading + data transmission | |

*1 Disable, Save to RAM, Send by FTP, Save USB (SR-X100/X100W only), Save USB + send FTP (SR-X100/X100W only), Save to ROM (SR-X300/X300W only), Save ROM + send FTP (SR-X300/X300W only)

*2 Save to RAM, Send by FTP, Save USB (SR-X100/X100W only), Save USB + send FTP (SR-X100/X100W only), Save to ROM (SR-X300/X300W only), Save ROM + send FTP (SR-X300/X300W only)

*3 This item is set when you assign "Send by FTP" to one of the image saving methods.

## SR Web Tool

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| SR Web Tool | Enable | Disable, Enable | - |
| Password authentication | Disable | Disable, Enable | |
| Web port number | 80 | | - |
| **Account login settings** | | | |
| Administrator username | admin | | - |
| Administrator password | admin | | |
| User n username | | Specify up to 12 alphanumeric characters | - |
| User n password | | Specify up to 12 alphanumeric characters | - |
| Available applications for User n | | Web Navigator, Web Traceability Tool, Web Multi Monitor | - |
| **Web Traceability Tool** | | | |
| Reader n IP address | 0.0.0.0 | | - |

## System

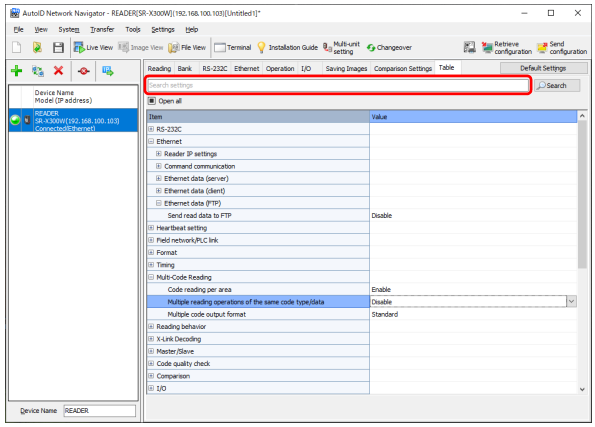
| Item name | Default value | Setting range | Details |
|---|---|---|---|
| Presentation mode | Disable | Disable, Polarized light, Direct light, Diffused light | - |
| Silent Mode | | | - |
| Reader | READER | (1 to 32 characters) | |
| Reader description 1 | | (0 to 32 characters) | Used for the following. • Identifying the reader with the setting command response • Appending the reader description with scripts |
| Reader description 2 | | (0 to 32 characters) | |
| Reader description 3 | | (0 to 32 characters) | |
| Reader description 4 | | (0 to 32 characters) | |
| **Device operation** | | | |
| ENTER button | Unlock | Unlock or Lock | - |
| Pointer lighting | Auto lighting | Manual lighting, Auto lighting, or Only light when capturing images | - |
| Rotated display | Do not rotate | Rotate 0 degrees, Rotate 180 degrees | - |
| Status LED lighting | Enable | Enable or Disable | |
| Output data with ENTER button | Enable | Disable, Enable | - |
| Write BLOAD to ROM | Disable | Disable, Enable | - |
| **SNTP** | | | |
| SNTP server address | 0.0.0.0 | 0.0.0.0 to 255.255.255.255 | IP address of the SNTP server used to synchronize the time. |
| Time zone | +9.00 | -12:00 to +13:00 | - |
| Update cycle (min) | 1 | 1 to 99 | - |
| **LiveView** | | | |
| Displayed image | After image filter | After image filter, Before image filter | - |
| Rotate image | Do not rotate | Rotate 0 degrees, Rotate 180 degrees | - |
| **VNC** | | | |
| VNC server | Enable | Disable, Enable | |

## Security

| Item name | Default value | Setting range | Details |
|---|---|---|---|
| AI-NET connection | Enable | Disable, Enable | - |
| SFTP | Disable | Disable, Enable | - |
| FTP Remote port | 21 | | |
| SFTP Remote port | 22 | | - |

# Search Settings

You can use the search box shown in the following image to search for items in the list of settings.



# 10-4 Read Behavior

## Tuning

### Tuning

This function uses either SR-X Series button operations or AutoID Network Navigator operations or I/O terminal to automatically adjust to the optimal values the parameters for reading the target codes, and then saves these parameters in the internal memory.

### Tuning operation methods

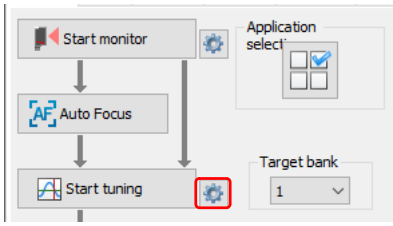
The following three operation methods are available.
(1) SR-X Series button operations: "4-1 Tuning" (Page 16)
(2) AutoID Network Navigator operations: "5-3 Reading Settings" (Page 22)
(3) Operations with the corresponding function assigned to an input terminal: "6-7 Control the I/O Terminals" (Page 31)

**Point**

When an input terminal is used to activate tuning, parameter bank number 1 is automatically overwritten with the tuning result.

### Setting tuning conditions

Use AutoID Network Navigator to set the tuning conditions. Click the following button to display the [Tuning Options] screen.

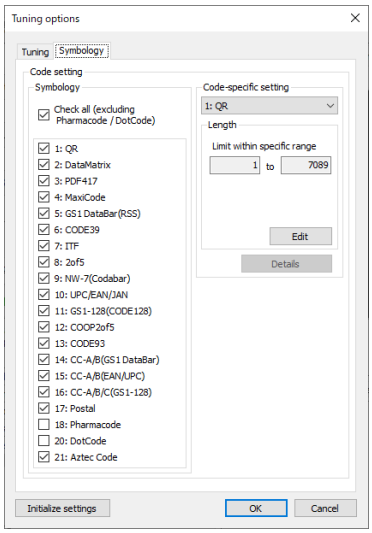



#### Tuning options

[Tuning]

| | |
|---|---|
| Exposure upper limit | Set the upper limit for the exposure time. |
| Image filter | Select whether to use an image filter during tuning.<br>* When you complete tuning for 1D barcodes, there are limits placed on the types of image filters. |
| Inverse Read | Use this setting to read codes with black/white inversion.<br>Normally select "Auto." |
| Internal Lighting | Select whether to use internal lighting.<br>Normally select "Enable." |
| External Lighting | If you will synchronize tuning with external lighting, select "Enable." |
| Criteria | Select the radio button to enable successful tuning determination when the code number is at or less than the specified number. |
| AI filter | When using an AI filter, select [Enable]. |

[Symbology]

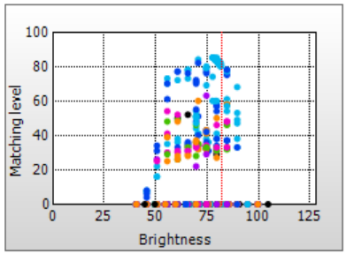



| | |
|---|---|
| Symbology | Select the codes for which the reader will be tuned.<br>You can shorten the tuning time by limiting the types of codes. |
| Code-specific setting | Set the conditions to read during tuning for each type of code.<br>Examples of these conditions are "Length" and "Quiet zone scale factor." |

## Details of Tuning Results

If you use AutoID Network Navigator to tune the reader, the following results will be displayed.

#### Tuning results




#### Image filters and color codes

The plotted points of the tuning results indicate the following filter results.

| Color | Filter name | Color code (RGB) |
|---|---|---|
| ●: Black | Disable | 0,0,0 |
| ●: Yellow-green | Equalize | 68,192,0 |
| ●: Green | Expand | 0,130,58 |
| ●: Light blue | Shrink | 0,183,238 |
| ●: Blue | Open | 0,67,238 |
| ●: Purple | Close | 171,0,242 |
| ●: Pink | Median | 241,0,198 |
| ●: Orange | Unsharp Mask | 255,138,0 |

## Alternate

### Parameter bank

The parameter bank is used to configure read parameters such as the exposure time and enabling/disabling the use of image processing filter. These parameters are stored in items called "parameter banks" or "banks." The SR-X Series has 16 parameter banks.
The following are the main items stored in parameter banks.

- Code type
- Lighting conditions
- Exposure time
- Image filter usage

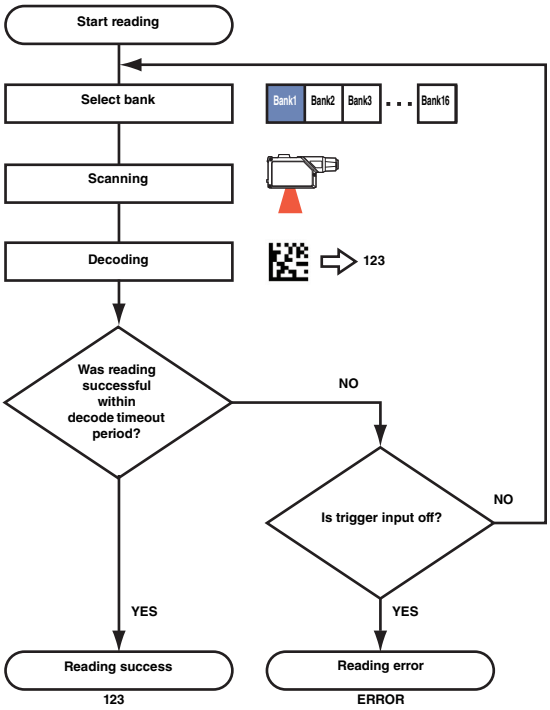
### Alternate function

The SR-X Series automatically switches between and reads multiple registered parameter banks.
With the alternate function, you can stably read codes even if they have varying printing conditions.

**Point**

- The alternate function requires processing time in order to find the optimal parameter bank. (The processing time depends on the decode timeout.)
- The alternate function is disabled when:
  - The alternate function is disabled for all parameter banks.
  - You use commands or a field network to read using a specific parameter bank.

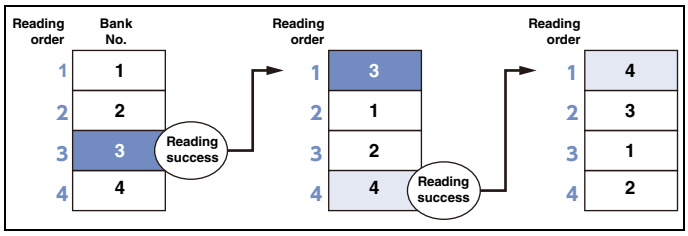
## Alternate function operations




## Alternate order

- **Sequential**
  Codes are read by switching between parameter banks in order starting with number 1.

- **Begin with successfully read bank**
  When reading is successful, the same parameter bank will be the first one used for the next reading operation.
  By using this function, you can shorten the read time when the print quality changes in units of lots.




Point

If you are using the "Begin with successfully read bank" setting, this will be returned to the sequential order when:
- The power supply turns off.
- Test mode starts.
- The reset command (RESET) is sent.
- The alternate settings are changed.

## Parameter bank display

In AutoID Network Navigator, parameter bank settings are displayed as shown below.

| Item | | Bank1 | Bank2 | Bank3 |
|---|---|---|---|---|
| Common | Bank name | | | |
| | Last modified date | 10/29/2021 | --- | --- |
| | Angle (skew) during tuning | -3 | 0 | 0 |
| | Angle (pitch) during tuning | 3 | 0 | 0 |
| | Alternate | Enable | Disable | Disable |
| | Repeat read attempts | 0 | 0 | 0 |
| | Decode timeout (x10ms) | 27 | 10 | 10 |
| | Area number | 0 | 0 | 0 |
| | Inverse read | Disable | Disable | Disable |
| | Reverse read | Auto | Disable | Disable |
| | Code direction (1D) | Not limited | Not limited | Not limited |
| | Base tilt angle | 0 | 0 | 0 |
| | Tilt angle range | 180 | 180 | 180 |
| Code | Code detail setting | UPC/EAN/J... | QR,DataM... | QR,DataM... |
| | Output Length Limitation | Disable | Disable | Disable |
| | Mode | Forward | Forward | Forward |
| | Output length | 7089 | 7089 | 7089 |
| | Starting position | 1 | 1 | 1 |
| | ECI output | Disable | Disable | Disable |
| Light | Use internal lighting | Enable | Enable | Enable |

### Setting name

| | |
|---|---|
| **Common** | |
| Bank name | Give an arbitrary name to a bank. (Up to 32 one-byte alphanumeric characters)<br>Once a bank is named, the name remains after re-executing tuning. |
| Last modified date | The last update date registered in the bank will be displayed. |
| Angle (skew) during tuning | Displays the skew angle. |
| Angle (pitch) during tuning | Displays the pitch angle. |
| Alternate | Set whether to use the alternate function during reading. When Alternate is set to "Disable," the corresponding parameter bank will not be used in reading. |
| Repeat read attempts | For a specific parameter bank, set the number of times to capture images or decode until the alternate function is used. |
| Decode timeout (x10 ms) | Set the upper limit of the decode time. If decoding cannot be completed within this period, the next scan will begin. |
| Region number | Configures the region number used with a bank. If 0 is specified, the bank is use in all regions. |
| Inverse read | Set whether to read codes with black/white inversion. |
| Reverse read | Set whether to read codes that have been flipped right to left. |
| Code orientation (1D) | Configures the orientation in which barcodes are read. |
| Base tilt angle | Set the base angle for a tilt angle range to limit reading. When DataMatrix is set, the finder pattern rotates until it appears as an "L." When the QR code is set, the corner without a finder pattern will become the bottom right corner and 0 degrees. The angle rotates in the clockwise direction (counterclockwise for Reverse read). |
| Tilt angle range | Set the tilt angle range to limit reading. Specify a value within the range of ±0 to 180 degrees relative to the base tilt angle. |
| **Code** | |
| Code detail setting | Advanced configuration of code types, number of read digits, and settings per code type. |
| Output length limitation | Use this setting to limit the number of output digits of the read data. |
| Mode | Select the direction in which to limit the number of output digits. |
| Length of output | Set the number of valid output digits. |
| Starting index of output | Set the starting output digit. |
| ECI output | Add "\" and "ECI (6-digit number)" in the beginning of the read data. |
| **Light** | |
| Use internal lighting | Use the built-in LED of the SR-X Series. |
| Use external lighting | If you connect an external light to the SR-X Series, enable this setting. |
| Type of internal lighting | Select the type of LED lighting to be built into the SR-X series. |
| **Scan** | |
| Exposure (µs) | Set the exposure time that is used when scanning images. |
| Gain | Set the gain that is used when scanning images. |
| Contrast adjustment method | Configures the contrast adjustment method. |
| AI filter | Set the AI filter. |
| Advanced | Configures advanced imaging parameters. |
| **Image filter** | |
| Image filter n | Set the image filter type. |
| Image filter n count | Set the image filter count. |

## Multiple code settings

| | |
|---|---|
| Codes to read | Configures the maximum number of codes to read during one cycle of timing signal input. |
| Detailed settings | Configures the code read limit per code type, successful read determination when the code number is at or less than the specified number. |

## Presentation mode

Enables/disables Always On mode. When enabled, execute tuning after setting.

# Read Behavior

The SR-X Series performs the following processes for read operation:

| | | |
|---|---|---|
| (1) | Trigger input processing | Trigger input is verified and lighting is controlled. |
| (2) | Scanning + image transfer | The image is scanned within the specified exposure time and the image is transferred. |
| (3) | Decoding processing | The captured image is filtered and the code is recognized (decoding processing). |
| (4) | Data communication processing | The decoded results are output as data. |

Since (2) and (3) above are operated based on the settings registered with the parameter bank, operation is repeated using the alternate function until a code is read or an instruction to finish read operation is given (timing OFF).

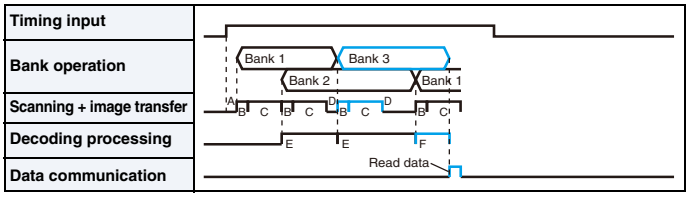
Specify the following operations for the above processing:

| | |
|---|---|
| Timing Mode | Choose from level trigger or one-shot trigger. |
| Timing to send data | Choose from Send after read or Send after trigger input OFF. |
| Read mode | Choose from Standard, Continuous, Burst read, and Script. |

## Timing diagram

This section describes the steps of basic operations of the SR-X Series.
Operating conditions are as follows:

- Timing Mode : Level trigger
- Timing to send data : Send after read
- Read mode : Standard
- Parameter bank : 3 banks




A: Input time constant + Trigger on delay
B: Exposure time for each parameter bank
C: Image transfer time*1
D: Scan interval
E: Decode timeout period set for each parameter bank
F: Decoding time when reading is successful

- The above is the image when reading is successful. For read error, B, C, D, and E are repeated continuously and read error data is output when the trigger input is turned off.
- In modes other than Burst read, the next scan processing starts at the same time as the decoding processing.

To protect the body, there is an operational limit that restricts the exposure time per unit of time to 5% or less.

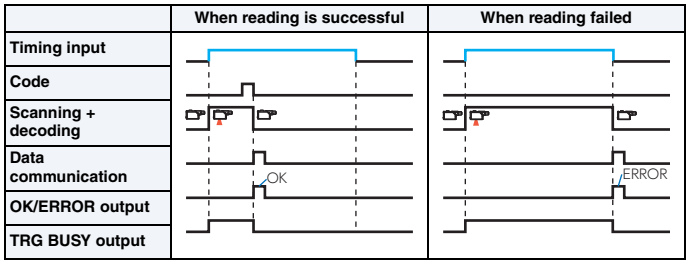
*1 The image transfer time depends on the size of the image capture range.

# Timing Mode

## Level trigger

While the trigger input is on, the LED lights and reading is performed.
When a code is read, the LED turns off and the data is transmitted.
If a code cannot be read before the trigger input turns off, a reading error occurs.

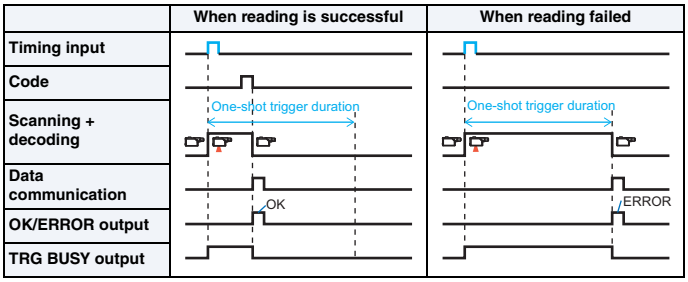
### ● Timing diagram*1




## One-shot trigger

On the rising edge of the trigger input, the LED lights only for the specified time. Reading is attempted during this time.
When a code is read, the LED turns off and the data is transmitted.
If a code cannot be read during the one-shot trigger duration, a reading error occurs.

### ● Timing diagram*1



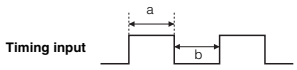

## Differences between the level trigger and the one-shot trigger

| | Reading | Reading success | Reading error |
|---|---|---|---|
| Level trigger | While the trigger input is on | When the code can be read while the trigger input is on | When the code cannot be read before the trigger input turns off |
| One-shot trigger | During the specified time from the rising edge of the trigger input | When the code can be read during the one-shot trigger duration | When the code cannot be read during the one-shot trigger duration |

*1 The timing diagrams indicate examples with the factory default configurations of the "Reading Mode" and "Data Transmission" settings. For the sake of simplicity, the input time constant and the Trigger on delay have been omitted.

**Point**

- When the trigger input is on for a length of time greater than or equal to the input time constant, the SR-X Series starts reading.
- The "TRG BUSY" output turns on when the rising edge of the trigger input is recognized and remains on until the code reading is complete or the trigger input is turned off.
- Ensure that the trigger input remains on for a length of time sufficient to facilitate reading.
- Set the one-shot trigger duration to a length of time sufficient to facilitate reading.
- The one-shot trigger duration can be set to a value from 30 to 25500 ms.
- The one-shot trigger duration is only a setting. The reading time may not match this value due to factors such as the communication load.
- When a code is read at an interval shorter than the OK/NG/ERROR output ON time, the output turns off even if the output ON time of the previous output signal has not elapsed, and a new output signal turns on for the specified output ON time. If the same output terminal operations occur successively, the previous output signal turns off, and then the new output signal turns on 10 ms later.
- In order to recognize the trigger input turning on, it must turn on for a length of time greater than or equal to the input time constant.
- In order to recognize the trigger input turning off, it must turn off for a length of time greater than or equal to the input time constant.
- When using a fast-tact, high-speed pulse signal as the trigger input, set the on/off time of the pulse signal to a value that is greater than or equal to the input time constant.
- Let the input time constant be a and the trigger input off time be b. The trigger input off state is not recognized if a is greater than b. Ensure that a is less than or equal to b.




# Data Transmission

## Send after read

The read data and the OK/ERROR signal will be output immediately after the code is read. Normally use this mode.

### ● Timing diagram

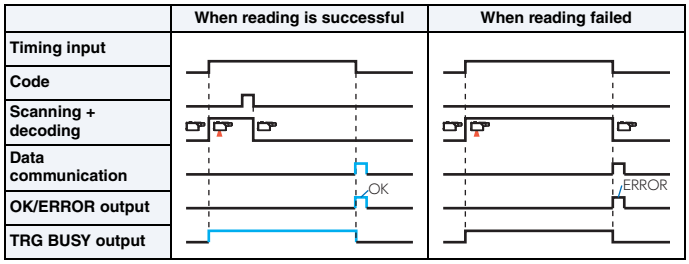
The details are the same as those explained under "Timing Mode."

## Send after timing off

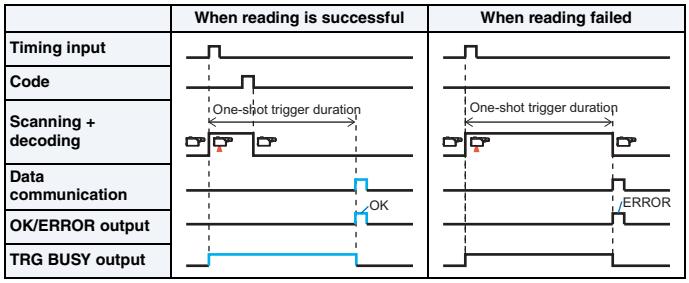
The read data and the OK/ERROR signal will be output when the trigger input turns off, not immediately after the code is read.

### ● Timing diagrams*1

• Level trigger




• One-shot trigger



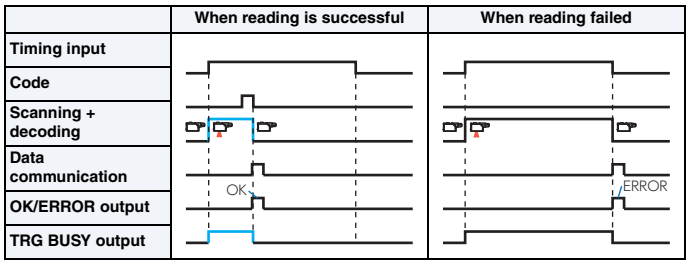

*1 The timing diagrams indicate examples with the factory default configuration of the "Reading Mode" setting. For the sake of simplicity, the input time constant and the Trigger on delay have been omitted.

# Reading Mode

## Standard

In this mode, a single code is read while the trigger input is on.
Normally use this mode.

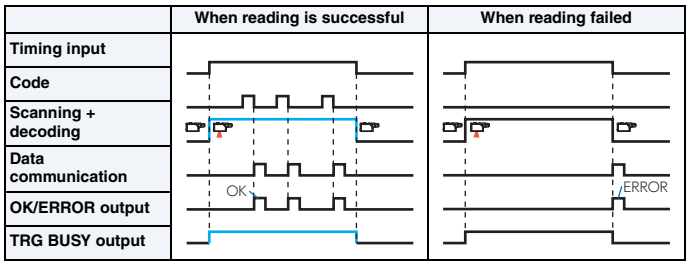
### ● Timing diagram*1




## Continuous

In this mode, multiple codes are read consecutively while the trigger input is on.
Data is transmitted each time that a code is read.

### ● Timing diagram*1




Point

- If codes that have the same symbology and content are being read in series with the "Continuous" setting, adjust the time that codes take to pass the reader so that this time is longer than the "Duplicate Reading Prevention Interval" setting.
- With “Continuous”, reading with bank designation is not allowed.
- With “Continuous”, multiple code settings do not apply to the operation.

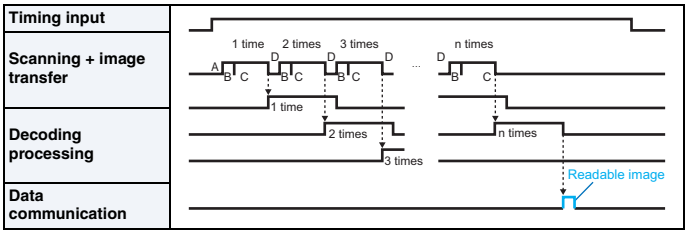
## Burst read

In this mode, multiple codes are first scanned and then processed while the trigger input is on. Use this mode to improve the reading capability of moving codes that require a long decoding processing time.

- Scan count: 32 max.
- Scan interval: Can be set to a value between 0 and 255 ms

* The actual scan interval is the scan interval plus the image transfer time.

### ● Timing diagram*1




A: Input time constant + Trigger on delay
B: Exposure time
C: Time to transfer image
D: Burst interval
E: Pre-decoding image buffer

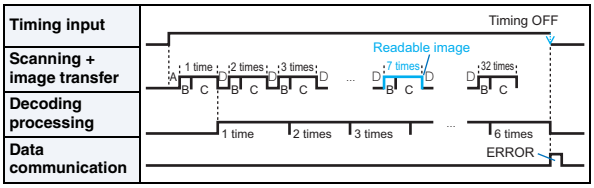
- If multiple parameter banks have been registered, scanning is completed using the alternate function.
- When decoding is completed, scanning processing is stopped even when the number of scans has not reached 32.
- If decoding fails, the processing moves to the next decoding after expiration of the decode timeout period of each parameter bank.

*1 The timing diagrams indicate examples with the factory default configurations of the "Timing Mode" and "Data Transmission" settings. For the sake of simplicity, the input time constant and the Trigger on delay have been omitted.

Reference

Regarding the trigger input time for the "Burst read" read mode.
In the "Burst read" read mode, both scan processing and decoding processing are executed, but decode processing takes more time. Therefore, even when the scan processing is finished, there will be a time period where decoding processing is not yet finished. If the trigger input turns off with the decoding processing unfinished, a reading error will occur even if images of readable codes have been scanned.
Ensure that the trigger input remains on for a length of time sufficient to complete of decoding.

Example)The trigger input turns off prior to the completion of decoding processing. If, as shown below, the trigger input turns off with the decoding processing necessary for scanning unfinished, a reading error will occur even if readable images were present.

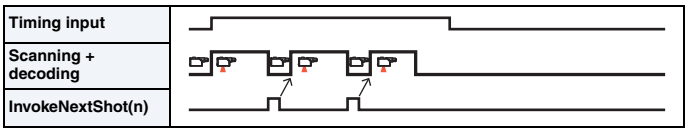



## Script

In this mode, reading continues according to the script contents while the trigger input is on. As an example, use this mode when controlling to continue or stop reading according to the data output.

* A read error is not judged.

### ● Timing diagram




Refer to the attachment “SR-X series Script Reference” for details.

# 10-5 Reading Test

## Reading Rate Test Mode

This test mode scans codes and measures the reading rate according to the number of times that the codes were read correctly.
The result is output once per 10 decodes.

### Output format

| Read data | : | Bank number | : | a% | : | Matching level |
|---|---|---|---|---|---|---|

a = Reading rate as a value from 0 to 100

### Operation

- AutoID Network Navigator [Reading] tab
- Using a command
- Assigning the function to an input terminal

## Read Time Test Mode

This test mode measures the amount of time that it takes to read a code.
The amount of time required from the start of reading until the completion of reading is measured, and then the result is output.
If decoding fails, the result is 0 ms.
The result is output when decoding is completed successfully 10 times or when decoding fails.

### Output format

| Read data | : | Bank number | : | now=ams | : | max=bms | : | min=cms |
|---|---|---|---|---|---|---|---|---|

a: Latest read time
b: Maximum read time
c: Minimum read time

### Operation

- AutoID Network Navigator [Takt] tab
- Using a command
- Assigning the function to an input terminal

## Depth Measurement Test Mode

This test mode performs a pseudo-measurement of a depth approximation by changing the focus from the current installation position.
The measurement result of the depth test is only a guide. Perform performance conformation with actual work before operation certainly.

### Operation

- AutoID Network Navigator [Depth] tab

## Speed Test Mode

This test mode is used to measure the simulated potential target speed by performing continuous reads with the selected bank.
The measurement result of the speed test is only a guide. Perform performance conformation with actual work before operation certainly.

### Operation

- AutoID Network Navigator [Speed] tab

Reference
- When a test mode starts, the data addition function is disabled.

## Code Quality Verification Measurement Test Mode

This test mode is used to perform the code quality verification with the selected bank and display the verification result according to the standard.
Applicable standards: ISO/IEC15415, ISO/IEC TR 29158, ISO/IEC 15416 and Code verification of ethical drugs in Japan

### Operation

- AutoID Network Navigator [Code quality verification] tab

# 10-6 Code Quality Verification

## What is Code Quality Verification?

The Code quality verification function evaluates the level (High/Low) of total grade based on the verification result output and the set threshold by verifying the 2D code scanned with the SR-X Series according to the marking quality evaluation specified by a third-party institution.
The SR-X Series provides the following 2D code verifications according to the Code quality verification standards.

| Standards | Description | Code type |
|---|---|---|
| **ISO/IEC 15415** | This is the 2D code marking quality evaluation standard established by International Organization for Standardization.<br>This is mainly used to evaluate 2D codes printed on labels. | QR<br>DataMatrix<br>PDF417 |
| **ISO/IEC TR 29158 (AIM DPM-1-2006)** | This is the DPM (Direct Part Marking) 2D code marking quality evaluation standard established by Automatic Identification Manufacturers.<br>This is based on ISO/IEC 15415.<br>This was also standardized by International Organization for Standardization in 2011. | QR<br>DataMatrix |
| **ISO/IEC 29158:2020** | Standard for evaluating 2D code print quality of direct parts marking prescribed by the International Organization for Standardization in 2020 based on ISO/IEC TR 29158 (AIM DPM-1-2006). | QR<br>DataMatrix |
| **ISO/IEC 15416** | These standards evaluate barcode print quality as defined by the International Organization for Standardization.<br>These standards are primarily used to evaluate barcodes printed for labels. | CODE39<br>ITF<br>2of5(Industrial 2of5)<br>COOP 2of5<br>NW-7(Codabar)<br>CODE128<br>GS1-128<br>GS1 DataBar<br>CODE93<br>JAN/EAN/UPC<br>Pharmacode<br>GS1 Composite |
| **SAE AS9132** | This is the DataMatrix code marking quality evaluation standard established by SAE (Society of Automotive Engineers) and used by the aerospace industry. | DataMatrix |
| **SEMI T10-0701** | This is the DataMatrix code marking quality evaluation standard established by SEMI (Semiconductor Equipment and Materials International) and printed on semiconductor-related materials. | DataMatrix |
| **ISO/IEC 16022** | This is a DataMatrix code marking quality evaluation function.<br>It makes reference to ISO/IEC 16022:2000. | DataMatrix |

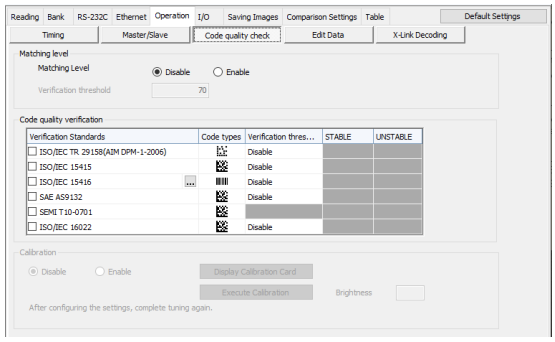
Important
Note that this Code quality verification function is designed to evaluate marking quality of the standards-compliant 2D codes of the images scanned with the SR-X Series, but cannot be used as an official 2D code verification device.

## Code Quality Verification Function Settings

### Configuration procedure

**1 On the [Operation] tab, click [Code quality check].**

**2 Select all the check boxes of the items that you want to verify.**




**3 Click [Send Configuration].**

## Settings

| | |
|---|---|
| Verification threshold | Set the threshold for the verification result. The UNSTABLE signal can be output from the OUT terminal when the reading results are below the threshold. |
| Append grade | The verification grade will be appended to the read data.<br>Example) <Read data>:<verification grade> |
| Select expression of grades | You can change the verification grade expression.<br>• Alphabet<br>• Numeric |
| Append detailed verification result | You can append the detailed verification result when an "Append grade" check box is selected. |

Point

- The decode time is longer when the code quality verification function is enabled.
  Complete tuning after enabling the code quality verification function or set the decode timeout to the value that is required for reading.
  Use the read time test mode to confirm there are no problems with the read time for operation.
- If reading ends with part of the code outside of the SR-X field of view, the verification result grade and the detailed verification result will both be displayed as hyphens (-).
- If you want to add the evaluation values used in the judgment of verification results, select the following check boxes.
  On the [Operation] tab, click [Code quality verification], and then select the [Appended values] check boxes.
- When using code verification function of Japanese Prescription Medications, after enter a check in a verification item, by selecting the subjected code type enables limitation of the code type to be verified.
- When the print verification function is used with the Light always on setting, the print verification grade may deteriorate depending on the read timing.
- When the contrast adjustment is set to a setting other than "standard", print verification output may be incorrect. If tuning is implemented after validation of the print verification function, the contrast adjustment method set to the bank is "Standard"regardless of other settings.

# Criterion

Evaluation by the Code quality verification function is made for the total evaluation grade.
Evaluation standards are as follows.

### ● ISO/IEC 15415, ISO/IEC TR 29158 (AIM DPM-1-2006), ISO/IEC 29158:2020, ISO/IEC 15416, ISO/IEC 16022

| | |
|---|---|
| **STABLE** | Verification result ≥ threshold |
| **UNSTABLE** | Verification result < threshold |

### ● SAE AS9132

| | |
|---|---|
| **STABLE** | Verification result = PASS |
| **UNSTABLE** | Verification result = FAIL |

### ● SEMI T10-0701

There is no overall assessment grade in SEMI T10-0701 so it is not possible to assess the grade. Therefore, functions that can be used by performing an assessment will also not be available in the SEMI T10-0701.

# Functions that Use Judgment Results

## Functions that can use code quality verification evaluation results

| | | |
|---|---|---|
| **[1]** | **I/O terminal output** | Output the OUT terminal according to the STABLE/UNSTABLE status. |
| **[2]** | **Saving images** | Save the image when UNSTABLE. |
| **[3]** | **Silent Mode** | Control the data output according to the STABLE/UNSTABLE status. |
| **[4]** | **Additional data** | Append the marking verification result to the read data. |

Reference

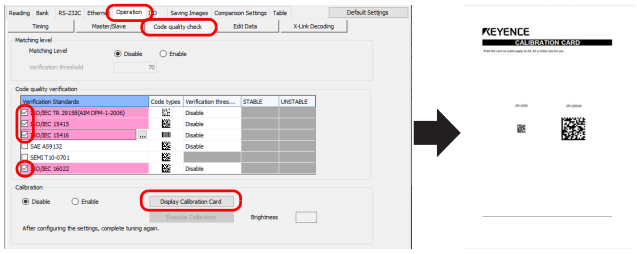

- "6-7 Control the I/O Terminals" (Page 31)
- "6-8 Save Captured Images" (Page 33)
- "7-7 Suppress Data Output" (Page 46)
- "11-2 Data Communication Format" (Page 93)


# Calibration

The calibration is a correction function of the reflectance to acquire an accurate verification result when performing the code quality verification.
Performing the calibration determines the reference values of brightness for black and white. Therefore, tuning suitable for the code quality verification can be performed.

## Preparation of the calibration card

Prepare the card with either of the following methods.
- Purchase a commercially sold calibration card.
- Print the card using AutoID Network Navigator.
  <Printing method>
  1. On the [Operation] tab, click [Code quality check], then select any of the following standards.
     • ISO/IEC 15415 • ISO/IEC TR 29158 • ISO/IEC 15416 • ISO/IEC 16022
  2. Press [Calibration card display], and print the displayed PDF.

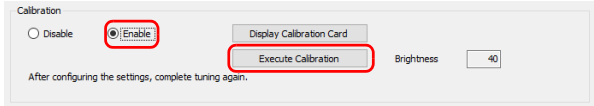



Important

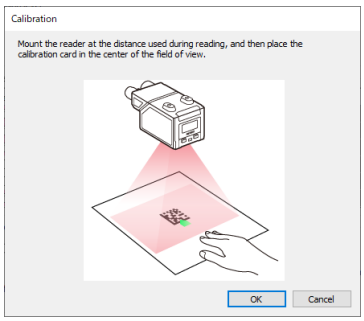
Print the card on matte paper in A4, A5 or letter size for use.

## Performing the calibration

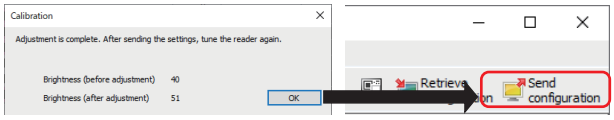
1. Set the calibration to [Enable], and press [Perform calibration].




2. Mount the reader at the appropriate distance at which the code quality verification is performed, and place the code of the calibration card in the center of the field of view.




3. When the calibration has completed, the following display appears. Press [OK] and send the configuration.




# Procedure to perform the code quality verification

**1 Determine the lighting configurations and installation conditions to perform the code quality verification**

- For DPM: Use the SR-X Series main unit only
- For label: Use the SR-X Series main unit only or LDL-S5015/LDL-S7227 (Manufactured by NISSIN ELECTRONICS CO.,LTD.)

* Refer to "Installation Points" in the next paragraph for the installation conditions.

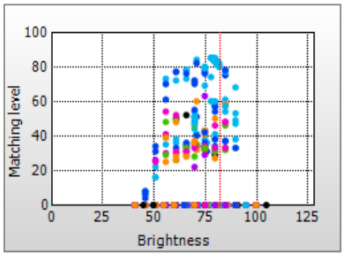
* DPM (Direct Parts Marking) is the technique to directly mark codes on products by using methods such as laser marking or stamping.

**2 Determine the code quality verification standard.**

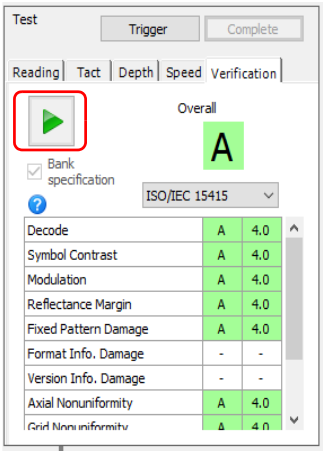
**3 Perform the calibration under the determined installation condition.**

**4** **Execute tuning, and create the parameter bank for the code quality verification.**

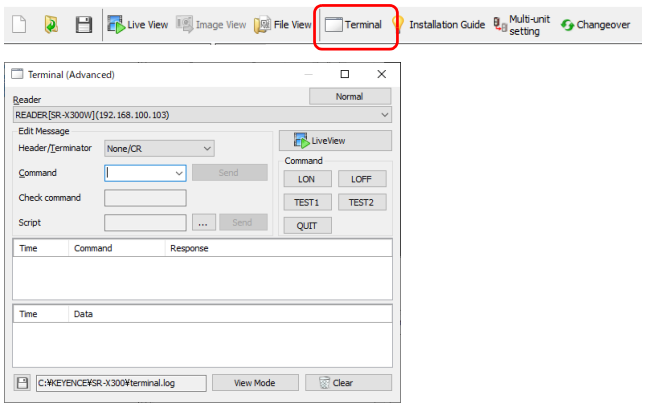
* When the calibration is enabled, the brightness is fixed, and the tuning plot is shown as follows.
Applicable standards: • ISO/IEC 15415 • ISO/IEC 15416 • ISO/IEC 16022




**5** **Use the code quality verification measurement test mode to confirm the verification result.**

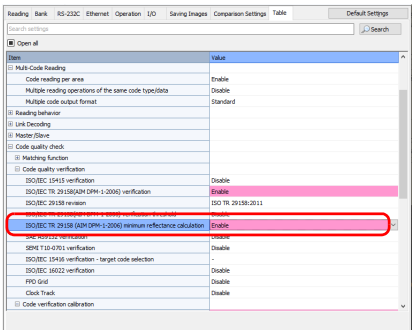



**6** **The output data when the code quality verification result is appended to the read data can be confirmed by pressing the LON button on the Terminal tab and reading the code.**




" Output Order of Code Quality Verification Results" (Page 76)

* When appending MR (Minimum Reflectance) of ISO/IEC TR 29158 (AIM DPM-1-2006), ISO/IEC 29158:2020 to the appended data, enable the calibration, and set [Table]-[Code quality verification]-[ISO/IEC TR 29158 (AIM DPM-1-2006) Minimum reflectance calculation] to [Enable].

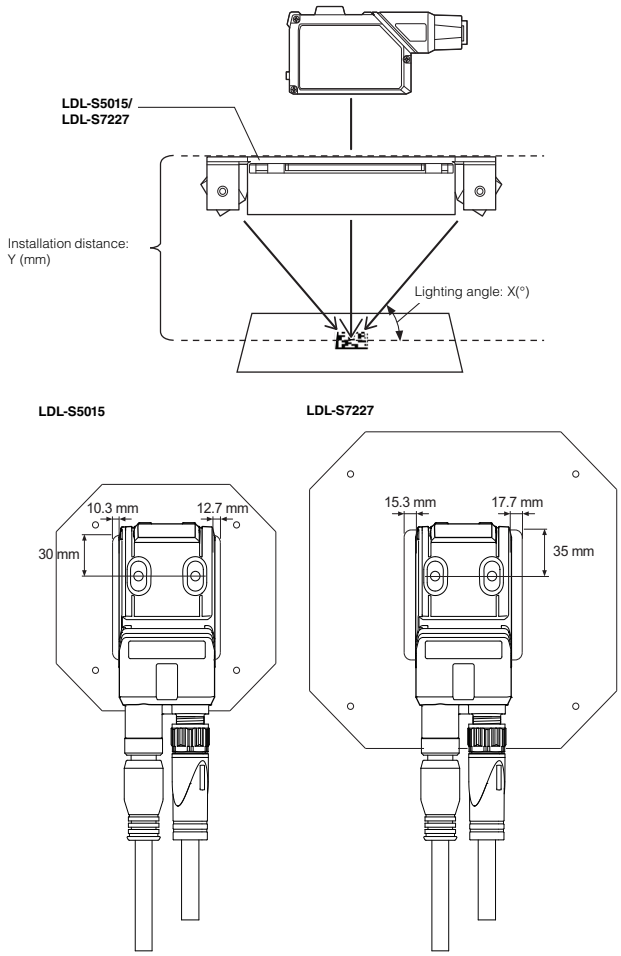


# Key Points for Installation

If you want to use the code verification function of the SR-X Series with precision, note the following points.

## Installation method (LDL-S5015/LDL-S7227)

Use the LDL-S5015/LDL-S7227 (made by NISSIN ELECTRONIC CO., LTD.) and mount lighting at an angle of 45°. (If necessary, you can also mount lighting at an angle of 30° to perform verification.)
In this situation, disable the SR-X Series internal lighting.




## LDL-S5015/LDL-S7227 installation distance: Y mm

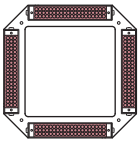
| Lighting angle: X(°) | LDL-S5015 | LDL-S7227 |
|---|---|---|
| 45° | 66 mm | 90 mm |
| 30° | 44.7 mm | 61.2 mm |

## Recommended lighting

Manufacturer: NISSIN ELECTRONIC CO., LTD.

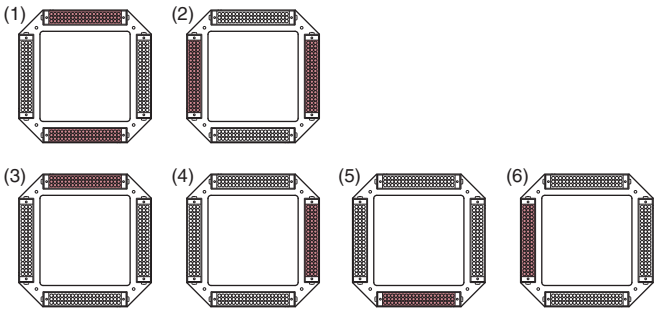
| | Model | Description |
|---|---|---|
| **LED illumination** | LDL-S5015 | 108 mm squared, 26 mm deep |
| | LDL-S7227 | 162 mm squared, 34 mm deep |
| **LED illumination power supply** | LPRD-30W | 24 VDC power supply input, 2 channels |
| **Branch cable** | L-2BK | 2 branches, 1 channel - 2 light |
| | L-4BK | 4 branches, 2 channels- 4 light |

### ● Standard lighting pattern



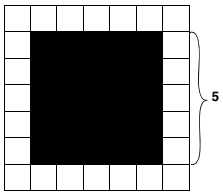
### ● Special lighting patterns

When you have to set the lighting in a fixed direction, such as when reading a DPM code on a hairline background, install the lighting at an angle of 30°, and then use one of the following lighting patterns.

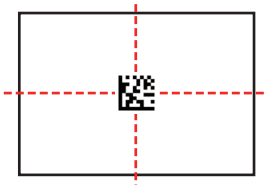



## Other precautions

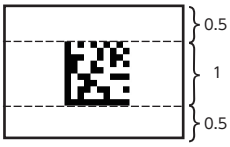
- Ensure that there are five or more pixels per cell.
  If there are less than five pixels per cell, reduce the distance between the SR-X Series and the codes, and then adjust the focus and tune the reader again.



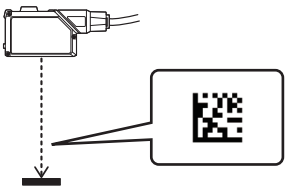

- Position codes so that they are in the center of the field of view.



- Ensure that there are spaces equal to one half the code size or more both above and below the codes.




- Install the reader so that the codes are upright (not rotated) relative to the screen.



- Mount the reader on a surface such that the product is level with, not angled to, the codes.

# Data Formats of Code Quality Verification Results

### ● ISO/IEC 15415

| Setting | | | Data format example |
|---|---|---|---|
| **Append grades** | **Append detailed verification result** | **Append values** | |
| Alphabet | | | Read data: C |
| Alphabet | | ✓ | Read data: C (-) |
| Alphabet | ✓ | | Read data: C/A/C/B/A/B/-/-/A/A/A/B/A |
| Alphabet | ✓ | ✓ | Read data: C(-)/A(-)/A(0.733)/C(-)/C(-)/B(-)/-(-)/-(-)/ A(0.002)/A(0.002)/A(1.000)/B(-0.646)/A(-0.289) |
| Numeric | | | Read data: 2.0 |
| Numeric | | ✓ | Read data: 2.0(-) |
| Numeric | ✓ | | Read data: 2.0/4.0/2.0/3.0/4.0/3.0/-/-/4.0/4.0/4.0/4.0/3.0/4.0 |
| Numeric | ✓ | ✓ | Read data: 2.0(-)/4.0(-)/4.0(0.733)/2.0(-)/2.0(-)/3.0(-)/-(-)/ -(-)/4.0(0.002)/4.0(0.002)/4.0(1.000)/3.0(-0.646)/4.0(-0.289) |

### ● ISO/IEC TR 29158 (AIM DPM-1-2006)

| Setting | | | Data format example |
|---|---|---|---|
| **Append grades** | **Append detailed verification result** | **Append values** | |
| Alphabet | | | Read data: C |
| Alphabet | | ✓ | Read data: C (-) |
| Alphabet | ✓ | | Read data: C/A/C/B/A/B/-/-/A/A/A/B/A |
| Alphabet | ✓ | ✓ | Read data: C(-)/A(-)/A(0.733)/C(-)/C(-)/B(-)/-(-)/-(-)/ A(0.002)/A(0.002)/A(1.000)/B(-0.646)/A(-0.289) |
| Numeric | | | Read data: 2.0 |
| Numeric | | ✓ | Read data: 2.0(-) |
| Numeric | ✓ | | Read data: 2.0/4.0/2.0/3.0/4.0/3.0/-/-/4.0/4.0/4.0/4.0/3.0/4.0 |
| Numeric | ✓ | ✓ | Read data: 2.0(-)/4.0(-)/4.0(0.733)/2.0(-)/2.0(-)/3.0(-)/-(-)/ -(-)/4.0(0.002)/4.0(0.002)/4.0(1.000)/3.0(-0.646)/4.0(-0.289) |

### ● ISO/IEC 29158:2020

| Setting | | | Data format example |
|---|---|---|---|
| **Append grades** | **Append detailed verification result** | **Append values** | |
| Alphabet | | | Read data:C |
| Alphabet | | ✓ | Read data:C(-) |
| Alphabet | ✓ | | Read data:C/A/A/B/C/B/-/-/A/A/C/D/F |
| Alphabet | ✓ | ✓ | Read data:C(-)/A(-)/A(0.846)/B(-)/C(-)/B(-)/-(-)/-(-)/A(0.027)/ A(0.237)/C(0.340)/D(-0.919)/F(-1.834) |
| Numeric | | | Read data:2.0 |
| Numeric | | ✓ | Read data:2.0(-) |
| Numeric | ✓ | | Read data:2.0/4.0/4.0/3.0/2.0/3.0/-/-/4.0/4.0/2.0/1.0/0.0 |
| Numeric | ✓ | ✓ | Read data:2.0(-)/4.0(-)/4.0(0.846)/3.0(-)/2.0(-)/3.0(-)/-(-)/-(- )/4.0(0.027)/4.0(0.237)/2.0(0.340)/1.0(-0.919)/0.0(-1.834) |

* Detailed value is displayed rounded to the third decimal.

### ● ISO/IEC 15416

| Setting | | | Data format example |
|---|---|---|---|
| **Append grades** | **Append detailed verification result** | **Append values** | |
| Alphabet | | | Read data: C |
| Alphabet | | ✓ | Read data: C(-) |
| Alphabet | ✓ | | Read data: A/A/A/A/A/A/A/A/A/A |
| Alphabet | ✓ | ✓ | Read data: A(-)/A(1.000)/A(1.000)/A(0.938)/A(0.059)/ A(0.871)/A(0.930)/A(1.000)/A(0.797)/A(0.031) |
| Numeric | | | Read data: 4.0 |
| Numeric | | ✓ | Read data: 4.0(-) |
| Numeric | ✓ | | Read data: 4.0/4.0/4.0/4.0/4.0/4.0/4.0/4.0/4.0/4.0 |
| Numeric | ✓ | ✓ | Read data: 4.0(-)/4.0(1.000)/4.0(1.000)/4.0(0.934)/4.0(0.063)/ 4.0(0.867)/4.0(0.930)/4.0(1.000)/4.0(0.805)/4.0(0.031) |

### ● SAE AS9132

* Settings for Select expression of grades are not reflected.

| Setting | | | Data format example |
|---|---|---|---|
| **Append grades** | **Append detailed verification result** | **Append values** | |
| | | | Read data: P |
| | | ✓ | Read data: P(-) |
| | ✓ | | Read data: F/P/P/F/P |
| | ✓ | ✓ | Read data: F(-)/P(-)/P(0.632)/F(0.852)/P(0.005) |

### ● SEMI T10-0701

* Settings for Select expression of grades, Append detailed verification result and Append values are not reflected.

| Setting | | | Data format example |
|---|---|---|---|
| **Append grades** | **Append detailed verification result** | **Append values** | |
| | | | Read data: 0.561/0.096/0.490/0.529/3.115/3.136/0.068/ 0.087/0.136/0.087/1.000 |

### ● ISO/IEC 15416 (GS1 Composite)

| Setting | | | Data format example |
|---|---|---|---|
| Append grades | Append detailed verification result | Append values | |
| Alphabet | | | Read data:C:A:C |
| Alphabet | | ✓ | Read data:C(-):A(-):C(-) |
| Alphabet | ✓ | ✓ | Read data:C:A/A/A/A/A/A/A/A/A:C/C/C/A/A/A/A/C/C/A/A/A/A |
| Alphabet | ✓ | ✓ | Read data:B(-):A(-)/A(1.000)/A(1.000)/A(0.938)/A(0.059)/ A(0.871)/A(0.930)/A(1.000)/A(0.797)/A(0.031):B(-)/ B(0.711)/B(0.711)/A(0.945)/A(0.055)/A(0.895)/A(0.945)/ B(0.711)/A(0.633)/A(0.012)/A(0.914)/B(0.750)/A(0.750) |
| Number | | | Read data:2.8:4.0:2.8 |
| Number | | ✓ | Read data:2.8(-):4.0(-):2.8(-) |
| Number | ✓ | | Read data:2.1:4.0/4.0/4.0/4.0/4.0/4.0/4.0/4.0/4.0:2.1/ 3.0/3.0/4.0/4.0/4.0/4.0/3.0/4.0/4.0/4.0/4.0/4.0 |
| Number | ✓ | ✓ | Read data:3.4(-):4.0(-)/4.0(1.000)/4.0(1.000)/4.0(0.934)/ 4.0(0.063)/4.0(0.867)/4.0(0.930)/4.0(1.000)/4.0(0.805)/ 4.0(0.031):3.4(-)/4.0(1.000)/4.0(1.000)/4.0(0.941)/ 4.0(0.055)/4.0(0.793)/4.0(0.840)/4.0(1.000)/4.0(0.832)/ 4.0(0.066)/4.0(0.914)/4.0(0.750)/4.0(0.750) |

### ● ISO/IEC 16022

| Setting | | | Data format example |
|---|---|---|---|
| Append grades | Append detailed verification result | Append values | |
| Alphabet | | | Read data: C |
| Alphabet | | ✓ | Read data: C (-) |
| Alphabet | ✓ | | Read data: C/A/C/B/A/A/A |
| Alphabet | ✓ | ✓ | Read data: C(-)/A(-)/C(0.632)/B(0.069)/A(1.000)/A(0.118)/ A(0.118) |
| Numeric | | | Read data: 2.0 |
| Numeric | | ✓ | Read data: 2.0(-) |
| Numeric | ✓ | | Read data: 2.0/4.0/2.0/3.0/4.0/4.0/4.0 |
| Numeric | ✓ | ✓ | Read data: 2.0(-)/4.0(-)/2.0(0.632)/3.0(0.069)/4.0(1.000)/ 4.0(0.118)/4.0(0.118) |

## Output Order of Code Quality Verification Results

### ● ISO/IEC 15415

| | Evaluation item names | Abbreviated names | |
|---|---|---|---|
| (1) | Overall | ALL | |
| (2) | Decode | DEC | |
| (3) | Symbol Contrast | SC | |
| (4) | Modulation | MOD | |
| (5) | Reflectance Margin | RM | |
| (6) | Fixed Pattern Damage | FPD | |
| (7) | Format Information Damage | FID | *1 |
| (8) | Version Information Damage | VID | *2 |
| (9) | Axial Nonuniformity | AN | |
| (10) | Grid Nonuniformity | GN | |
| (11) | Unused Error Correction | UEC | |
| (12) | Print Growth Horizontal | PGH | *3 |
| (13) | Print Growth Vertical | PGV | *3 |

### ● ISO/IEC TR 29158 (AIM DPM-1-2006)

| | Evaluation item names | Abbreviated names | |
|---|---|---|---|
| (1) | Overall | ALL | |
| (2) | Decode | DEC | |
| (3) | Cell Contrast | CC | |
| (4) | Cell Modulation | CM | |
| (5) | Reflectance Margin | RM | |
| (6) | Fixed Pattern Damage | FPD | |
| (7) | Format Information Damage | FID | *1 |
| (8) | Version Information Damage | VID | *2 |
| (9) | Axial Nonuniformity | AN | |
| (10) | Grid Nonuniformity | GN | |
| (11) | Unused Error Correction | UEC | |
| (12) | Print Growth Horizontal | PGH | *3 |
| (13) | Print Growth Vertical | PGV | *3 |
| (14) | Minimum Reflectance | MR | *4 |

### ● ISO/IEC 29158:2020

| | Evaluation item names | Abbreviated names | |
|---|---|---|---|
| (1) | Overall | ALL | |
| (2) | Decode | DEC | |
| (3) | Cell Contrast | CC | |
| (4) | Cell Modulation | CM | |
| (5) | Reflectance Margin | RM | |
| (6) | Fixed Pattern Damage | FPD | |
| (7) | Format Information Damage | FID | *1 |
| (8) | Version Information Damage | VID | *2 |
| (9) | Axial Nonuniformity | AN | |
| (10) | Grid Nonuniformity | GN | |
| (11) | Unused Error Correction | UEC | |
| (12) | Print Growth Horizontal | PGH | *3 |
| (13) | Print Growth Vertical | PGV | *3 |
| (14) | Minimum Reflectance | MR | *4 |

### ● ISO/IEC 15416

| | Evaluation item names | Abbreviated names |
|---|---|---|
| (1) | Overall | ALL |
| (2) | Decode | DEC |
| (3) | EdgeDetermination | EDGE |
| (4) | Symbol Contrast | SC |
| (5) | Minimum Reflectance | MINR |
| (6) | Minimum Edge Contrast | MINE |
| (7) | Modulation | MOD |
| (8) | Quiet Zone | QZ |
| (9) | Decodability | DCD |
| (10) | Defects | DEF |

### ● SAE AS9132

| | Evaluation item names | Abbreviated names |
|---|---|---|
| (1) | Overall | ALL |
| (2) | Quiet Zone | QZ |
| (3) | Symbol Contrast | SC |
| (4) | Angular Distortion | AD |
| (5) | Module Fill | MF |

### ● SEMI T10-0701

| | Evaluation item names | Abbreviated names | |
|---|---|---|---|
| (1) | Symbol Contrast | SC | |
| (2) | Signal to Noise Ratio | SNR | |
| (3) | Horizontal Mark Growth | HMG | |
| (4) | Vertical Mark Growth | VMG | |
| (5) | DataMatrix Cell Width | DMCW | |
| (6) | DataMatrix Cell Height | DMCH | |
| (7) | Horizontal Mark Move | HMM | |
| (8) | Vertical Mark Move | VMM | |
| (9) | Cell Defects | CD | |
| (10) | Finder Pattern Defects | FPD | |
| (11) | Unused Error Correction | UEC1 to UEC10 | *5 |

### ● ISO/IEC 15416 (GS1 Composite)

| | Evaluation item names | Abbreviated names | |
|---|---|---|---|
| (1) | Overall Composite Symbol | ALL | 1D & 2D |
| (1) | Overall | ALL | 1D |
| (2) | Decode | DEC | 1D |
| (3) | EdgeDetermination | EDGE | 1D |
| (4) | Symbol Contrast | SC | 1D |
| (5) | Minimum Reflectance | MINR | 1D |
| (6) | Minimum Edge Contrast | MINE | 1D |
| (7) | Modulation | MOD | 1D |
| (8) | Quiet Zone | QZ | 1D |
| (9) | Decodability | DCD | 1D |
| (10) | Defects | DEF | 1D |
| (1) | Overall | ALL | 2D |
| (2) | Decode | DEC | 2D |
| (3) | EdgeDetermination | EDGE | 2D |
| (4) | Symbol Contrast | SC | 2D |
| (5) | Minimum Reflectance | MINR | 2D |
| (6) | Minimum Edge Contrast | MINE | 2D |
| (7) | Modulation | MOD | 2D |
| (8) | Quiet Zone | QZ | 2D |
| (9) | Decodability | DCD | 2D |
| (10) | Defects | DEF | 2D |
| (11) | Codeword Yield | CY | 2D |
| (12) | Codeword Print Quality | CPQ | 2D |
| (13) | Unused Error Correction | UEC | 2D |

### ● ISO/IEC 16022

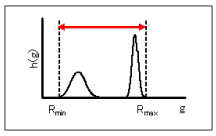
| | Evaluation item names | Abbreviated names |
|---|---|---|
| (1) | Overall | ALL |
| (2) | Decode | DEC |
| (3) | Symbol Contrast | SC |
| (4) | Axial Nonuniformity | AN |
| (5) | Unused Error Correction | UEC |
| (6) | Print Growth Horizontal | PGH |
| (7) | Print Growth Vertical | PGV |

*1 Enabled only for QR and micro QR code "-" is displayed for DataMatrix, PDF417, MicroPDF417.
*2 QR code Model 2 Version 7 and later versions are only enabled. "-" is displayed for others.
*3 This item is not included in the total evaluation.
*4 Appended if both Calibration and Minimum reflectance calculation are set to Enable.
*5 The number of items displayed for UEC, evaluation item for SEMI T10-0701 varies according to the code size.

# Verification Items

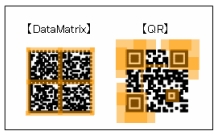
## ISO/IEC 15415

| Decode success/failure | | DEC (Decode) |
|---|---|---|
| **Description** | Evaluates whether decoding is possible or not. | - |
| **Calculation formula** | - | |
| **Criterion** | - | |

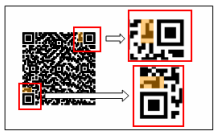
| Symbol contrast | | SC (Symbol Contrast) |
|---|---|---|
| **Description** | Evaluates the difference between the maximum brightness value (Rmax) and minimum brightness value (Rmin) in the code area. |  |
| **Calculation formula** | SC = (Rmax-Rmin)/255<br>Rmax : Maximum brightness value<br>Rmin : Minimum brightness value | |
| **Criterion** | A : more than 0.70<br>B : 0.55 to 0.70<br>C : 0.40 to 0.55<br>D : 0.20 to 0.40<br>F : less than 0.20 | |

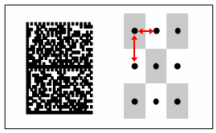
| Modulation | | MOD (Modulation) |
|---|---|---|
| **Description** | Evaluates the variation degree in cell brightness | — |
| **Calculation formula** | Each cell's MOD = 2 ∗ (abs (R-GT)/SC)<br>R : Brightness value<br>GT : Binarization threshold value<br>SC : Symbol contrast | |
| **Criterion** | — | |

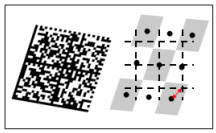
| Reflectance margin | | RM (Reflectance Margin) |
|---|---|---|
| **Description** | Evaluates the variation degree in cell brightness with black and white of the correct cell considered. | — |
| **Calculation formula** | [White cell]<br>R >= GT → MARGIN = 2 ∗ (R-GT)/SC<br>R < GT → MARGIN = 0<br>[Black cell]<br>R < GT → MARGIN = 2 ∗ (GT-R)/SC<br>R > GT = → MARGIN = 0<br>MARGIN : Margin of each cell<br>R : Brightness value<br>GT : Binarization threshold value<br>SC : Symbol contrast | |
| **Criterion** | — | |

| Fixed pattern damage | | FPD (Fixed Pattern Damage) |
|---|---|---|
| **Description** | Evaluates the degree of the fixed pattern damage (area on the right) dependent on the code type. |   |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Format information damage | | FID (Format Information Damage) |
|---|---|---|
| **Description** | Evaluates the format information damage degree of QR code. | |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Version information damage | | VID (Version Information Damage) |
|---|---|---|
| **Description** | Evaluates the version information damage degree of QR code (Model 2, version 7 and later versions). |  |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Axial nonuniformity | | AN (Axial Nonuniformity) |
|---|---|---|
| **Description** | Evaluates the distortion degree in vertical and horizontal size of the code. |  |
| **Calculation formula** | AN = abs (Xavg - Yavg)/((Xavg + Yavg)/2)<br>Xavg : Average cell size in horizontal direction<br>Yavg : Vertical cell size in horizontal direction | |
| **Criterion** | A : less than 0.06<br>B : 0.06 to 0.08<br>C : 0.08 to 0.10<br>D : 0.10 to 0.12<br>F : more than 0.12 | |

| Grid nonuniformity | | GN (Grid Nonuniformity) |
|---|---|---|
| **Description** | Evaluates the maximum position slip of each cell |  |
| **Calculation formula** | GN = Hmax/X<br>Hmax : Maximum position slip amount<br>X : Cell size | |
| **Criterion** | A : less than 0.38<br>B : 0.38 to 0.50<br>C : 0.50 to 0.63<br>D : 0.63 to 0.75<br>F : more than 0.75 | |

| Unused error correction | | UEC (Unused Error Correction) |
|---|---|---|
| **Description** | Evaluates the ratio of error correction unused at the time of decoding. | - |
| **Calculation formula** | UEC = 1.0 - ((e + 2t)/(d - p))<br>e : Number of code words that cannot be read<br>t : Number of error code words<br>d : Number of error corrected code words<br>p : Number of error detected code words | |
| **Criterion** | A : more than 0.62<br>B : 0.50 to 0.62<br>C : 0.37 to 0.50<br>D : 0.25 to 0.37<br>F : less than 0.25 | |

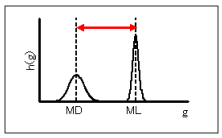
| Print growth (horizontal) | | PGH (Print Growth Horizontal) |
|---|---|---|
| **Description** | Evaluates the mark cell growth in the horizontal direction.<br>This item is not included in the total evaluation. | |
| **Calculation formula** | (D - 0.5)/0.15<br>D : On the horizontal clock pattern Ratio of the number of pixels of mark cell | |
| **Criterion** | A : -0.50 to 0.50<br>B : -0.70 to -0.50 or 0.50 to 0.70<br>C : -0.85 to -0.70 or 0.70 to 0.85<br>D : -1.00 to -0.85 or 0.85 to 1.00<br>F : less than -1.00 or more than 1.00 | |

| Print growth (vertical) | | PGV (Print Growth Vertical) |
|---|---|---|
| **Description** | Evaluates the mark cell growth in the vertical direction.<br>This item is not included in the total evaluation. | |
| **Calculation formula** | (D - 0.5)/0.15<br>D : On the vertical clock pattern Ratio of the number of pixels of mark cell | |
| **Criterion** | A : -0.50 to 0.50<br>B : -0.70 to -0.50 or 0.50 to 0.70<br>C : -0.85 to -0.70 or 0.70 to 0.85<br>D : -1.00 to -0.85 or 0.85 to 1.00<br>F : less than -1.00 or more than 1.00 | |

## ISO/IEC TR 29158 (AIM DPM-1-2006)

| Decode success/failure | DEC (Decode) |
|---|---|
| **Description** | Evaluates whether decoding is possible or not. |
| **Calculation formula** | - |
| **Criterion** | - |

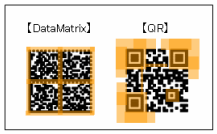
| Cell contrast | CC (Cell Contrast) |
|---|---|
| **Description** | Evaluates the difference between the average brightness value of bright cell (ML) and average brightness value of dark cell (MD). |
| **Calculation formula** | CC = (ML - MD)/ML<br>ML : Average brightness value of bright cell<br>MD : Average brightness value of dark cell |
| **Criterion** | A : more than 0.30<br>B : 0.25 to 0.30<br>C : 0.20 to 0.25<br>D : 0.15 to 0.20<br>F : less than 0.15 |




| Cell modulation | CM (Cell Modulation) |
|---|---|
| **Description** | Evaluates the variation degree in cell brightness |
| **Calculation formula** | [White cell]<br>CM = (R - GT)/(ML - GT) (When R ≥ GT)<br>[Black cell]<br>CM = (GT- R)/(GT- MD) (When R < GT)<br>R : Brightness value<br>GT : Binarization threshold value<br>ML : Average brightness value of bright cell<br>MD : Average brightness value of dark cell |
| **Criterion** | - |

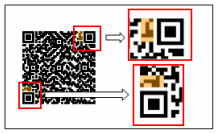
| Reflectance margin | RM (Reflectance Margin) |
|---|---|
| **Description** | Evaluates the variation degree in cell brightness with black and white of the correct cell considered. |
| **Calculation formula** | [White cell]<br>R >=GT → MARGIN = (R-GT)/(ML-GT)<br>R < GT → MARGIN = 0<br>[Black cell]<br>R < GT → MARGIN = (GT-R)/(GT-MD)<br>R >=GT → MARGIN = 0<br>MARGIN : Margin of each cell<br>R : Brightness value<br>GT : Binarization threshold value<br>CC : Cell contrast |
| **Criterion** | - |

| Fixed pattern damage | FPD (Fixed Pattern Damage) |
|---|---|
| **Description** | Evaluates the degree of the fixed pattern damage (area on the right) dependent on the code type. |
| **Calculation formula** | - |
| **Criterion** | - |

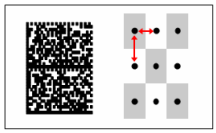



| Format information damage | FID (Format Information Damage) |
|---|---|
| **Description** | Evaluates the format information damage degree of QR code. |
| **Calculation formula** | - |
| **Criterion** | - |

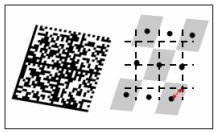
| Version information damage | VID (Version Information Damage) |
|---|---|
| **Description** | Evaluates the version information damage degree of QR code (Model 2, version 7 and later versions). |
| **Calculation formula** | - |
| **Criterion** | - |



| Axial nonuniformity | AN (Axial Nonuniformity) |
|---|---|
| **Description** | Evaluates the distortion degree in vertical and horizontal size of the code. |
| **Calculation formula** | AN = abs (Xavg - Yavg)/((Xavg + Yavg)/2)<br>Xavg : Average cell size in horizontal direction<br>Yavg : Vertical cell size in horizontal direction |
| **Criterion** | A : less than 0.06<br>B : 0.06 to 0.08<br>C : 0.08 to 0.10<br>D : 0.10 to 0.12<br>F : more than 0.12 |



| Grid nonuniformity | GN (Grid Nonuniformity) |
|---|---|
| **Description** | Evaluates the maximum position slip of each cell |
| **Calculation formula** | GN = Hmax/X<br>Hmax : Maximum position slip amount<br>X : Cell size |
| **Criterion** | A : less than 0.38<br>B : 0.38 to 0.50<br>C : 0.50 to 0.63<br>D : 0.63 to 0.75<br>F : more than 0.75 |



| Unused error correction | UEC (Unused Error Correction) |
|---|---|
| **Description** | Evaluates the ratio of error correction unused at the time of decoding. |
| **Calculation formula** | UEC = 1.0 - ((e + 2t)/(d - p))<br>e : Number of code words that cannot be read<br>t : Number of error code words<br>d : Number of error corrected code words<br>p : Number of error detected code words |
| **Criterion** | A : more than 0.62<br>B : 0.50 to 0.62<br>C : 0.37 to 0.50<br>D : 0.25 to 0.37<br>F : less than 0.25 |

—

| Print growth (horizontal) | PGH (Print Growth Horizontal) |
|---|---|
| **Description** | Evaluates the mark cell growth in the horizontal direction.<br>This item is not included in the total evaluation. |
| **Calculation formula** | (D - 0.5)/0.15<br>D : On the horizontal clock pattern Ratio of the number of pixels of mark cell |
| **Criterion** | A : -0.50 to 0.50<br>B : -0.70 to -0.50 or 0.50 to 0.70<br>C : -0.85 to -0.70 or 0.70 to 0.85<br>D : -1.00 to -0.85 or 0.85 to 1.00<br>F : less than -1.00 or more than 1.00 |

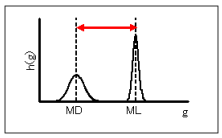
| Print growth (vertical) | PGV (Print Growth Vertical) |
|---|---|
| **Description** | Evaluates the mark cell growth in the vertical direction.<br>This item is not included in the total evaluation. |
| **Calculation formula** | (D - 0.5)/0.15<br>D : On the vertical clock pattern Ratio of the number of pixels of mark cell |
| **Criterion** | A : -0.50 to 0.50<br>B : -0.70 to -0.50 or 0.50 to 0.70<br>C : -0.85 to -0.70 or 0.70 to 0.85<br>D : -1.00 to -0.85 or 0.85 to 1.00<br>F : less than -1.00 or more than 1.00 |

| Minimum reflectance | MR (Minimum Reflectance) |
|---|---|
| **Description** | Evaluates the minimum reflectance of the code. |
| **Calculation formula** | Rcal × (SRcal/SRtarget) × (MItarget/MLcal)<br>Rcal : Reflectance of the calibration card<br>SRcal : Brightness during calibration (Exposure time × Gain)<br>SRtarget : Brightness when reading the actual workpiece<br>MLtarget : Average white level when reading the actual workpiece<br>MLcal : Average white level during calibration |
| **Criterion** | A : ≥5%<br>F : <5% |

* Appended if both Calibration and Minimum reflectance calculation are set to Enable.

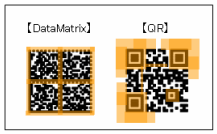
## ISO/IEC 29158:2020

| Decode success/failure | | DEC (Decode) |
|---|---|---|
| **Description** | Evaluates whether decoding is possible or not. | - |
| **Calculation formula** | - | |
| **Criterion** | - | |

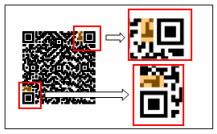
| Cell contrast | | CC (Cell Contrast) |
|---|---|---|
| **Description** | Evaluates the difference between the average brightness value of bright cell (ML) and average brightness value of dark cell (MD). |  |
| **Calculation formula** | CC = (ML - MD)/ML<br>ML : Average brightness value of bright cell<br>MD : Average brightness value of dark cell | |
| **Criterion** | A : more than 0.2725<br>B : 0.2225 to 0.2725<br>C : 0.1725 to 0.2225<br>D : 0.1225 to 0.1725<br>F : less than 0.1225 | |

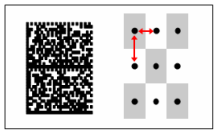
| Cell modulation | | CM (Cell Modulation) |
|---|---|---|
| **Description** | Evaluates the variation degree in cell brightness | - |
| **Calculation formula** | [White cell]<br>CM = (R - GT)/(ML - GT) (When R ≥ GT)<br>[Black cell]<br>CM = (GT- R)/(GT- MD) (When R < GT)<br>R : Brightness value<br>GT : Binarization threshold value<br>ML : Average brightness value of bright cell<br>MD : Average brightness value of dark cell | |
| **Criterion** | - | |

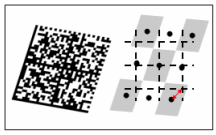
| Reflectance margin | | RM (Reflectance Margin) |
|---|---|---|
| **Description** | Evaluates the variation degree in cell brightness with black and white of the correct cell considered. | - |
| **Calculation formula** | [White cell]<br>R >=GT → MARGIN = (R-GT)/(ML-GT)<br>R < GT → MARGIN = 0<br>[Black cell]<br>R < GT → MARGIN = (GT-R)/(GT-MD)<br>R >=GT → MARGIN = 0<br>MARGIN : Margin of each cell<br>R : Brightness value<br>GT : Binarization threshold value<br>CC : Cell contrast | |
| **Criterion** | - | |

| Fixed pattern damage | | FPD (Fixed Pattern Damage) |
|---|---|---|
| **Description** | Evaluates the degree of the fixed pattern damage (area on the right) dependent on the code type. |  |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Format information damage | | FID (Format Information Damage) |
|---|---|---|
| **Description** | Evaluates the format information damage degree of QR code. | |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Version information damage | | VID (Version Information Damage) |
|---|---|---|
| **Description** | Evaluates the version information damage degree of QR code (Model 2, version 7 and later versions). |  |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Axial nonuniformity | | AN (Axial Nonuniformity) |
|---|---|---|
| **Description** | Evaluates the distortion degree in vertical and horizontal size of the code. |  |
| **Calculation formula** | AN = abs (Xavg - Yavg)/((Xavg + Yavg)/2)<br>Xavg : Average cell size in horizontal direction<br>Yavg : Vertical cell size in horizontal direction | |
| **Criterion** | A : less than 0.071<br>B : 0.071 to 0.091<br>C : 0.091 to 0.111<br>D : 0.111 to 0.131<br>F : more than 0.131 | |

| Grid nonuniformity | | GN (Grid Nonuniformity) |
|---|---|---|
| **Description** | Evaluates the maximum position slip of each cell |  |
| **Calculation formula** | GN = Hmax/X<br>Hmax : Maximum position slip amount<br>X : Cell size | |
| **Criterion** | A : less than 0.44375<br>B : 0.44375 to 0.56875<br>C : 0.56875 to 0.69375<br>D : 0.69375 to 0.81875<br>F : more than 0.81875 | |

| Unused error correction | | UEC (Unused Error Correction) |
|---|---|---|
| **Description** | Evaluates the ratio of error correction unused at the time of decoding. | — |
| **Calculation formula** | UEC = 1.0 - ((e + 2t)/(d - p))<br>e : Number of code words that cannot be read<br>t : Number of error code words<br>d : Number of error corrected code words<br>p : Number of error detected code words | |
| **Criterion** | A : more than 0.55625<br>B : 0.43125 to 0.55625<br>C : 0.30625 to 0.43125<br>D : 0.18125 to 0.30625<br>F : less than 0.18125 | |

| Print growth (horizontal) | | PGH (Print Growth Horizontal) |
|---|---|---|
| **Description** | Evaluates the mark cell growth in the horizontal direction.<br>This item is not included in the total evaluation. | |
| **Calculation formula** | (D - 0.5)/0.15<br>D : On the horizontal clock pattern Ratio of the number of pixels of mark cell | |
| **Criterion** | A : -0.50 to 0.50<br>B : -0.70 to -0.50 or 0.50 to 0.70<br>C : -0.85 to -0.70 or 0.70 to 0.85<br>D : -1.00 to -0.85 or 0.85 to 1.00<br>F : less than -1.00 or more than 1.00 | |

| Print growth (vertical) | | PGV (Print Growth Vertical) |
|---|---|---|
| **Description** | Evaluates the mark cell growth in the vertical direction.<br>This item is not included in the total evaluation. | |
| **Calculation formula** | (D - 0.5)/0.15<br>D : On the vertical clock pattern Ratio of the number of pixels of mark cell | |
| **Criterion** | A : -0.50 to 0.50<br>B : -0.70 to -0.50 or 0.50 to 0.70<br>C : -0.85 to -0.70 or 0.70 to 0.85<br>D : -1.00 to -0.85 or 0.85 to 1.00<br>F : less than -1.00 or more than 1.00 | |

| Minimum reflectance | | MR (Minimum Reflectance) |
|---|---|---|
| **Description** | Evaluates the minimum reflectance of the code. | |
| **Calculation formula** | Rcal × (SRcal/SRtarget) × (MItarget/MLcal)<br>Rcal : Reflectance of the calibration card<br>SRcal : Brightness during calibration (Exposure time × Gain)<br>SRtarget : Brightness when reading the actual workpiece<br>MLtarget : Average white level when reading the actual workpiece<br>MLcal : Average white level during calibration | |
| **Criterion** | A : more than 0.1475<br>B : 0.0975 to 0.1475<br>C : 0.04833 to 0.0975<br>D : 0.015 to 0.04833<br>F : less than 0.015 | |

* Appended if both Calibration and Minimum reflectance calculation are set to Enable.

## ISO/IEC 15416

| Decode success/failure | | DEC(Decode) |
|---|---|---|
| **Description** | Evaluates whether decoding is possible or not. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Success<br>F : Failure | |

| Number of edges | | EDGE (EdgeDetermination) |
|---|---|---|
| **Description** | Determines whether the read number of edges is equal to the assumed number of edges. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Match<br>F : Mismatch | |

| Symbol contrast | | SC (Symbol Contrast) |
|---|---|---|
| **Description** | Evaluates the difference between the maximum brightness value (Rmax) and minimum brightness value (Rmin) in the code area. | - |
| **Calculation formula** | SC = Rmax – Rmin | |
| **Criterion** | A : SC ≥ 70 %<br>B : SC ≥ 55 %<br>C : SC ≥ 40 %<br>D : SC ≥ 20 %<br>F : SC < 20 % | |

| Minimum Reflectance | | MINR (Minimum Reflectance) |
|---|---|---|
| **Description** | Minimum reflectance among scanned waveforms | - |
| **Calculation formula** | - | |
| **Criterion** | A : Rmin ≤ 0.5 Rmax<br>F : Rmin > 0.5 Rmax | |

| Minimum edge contrast | | MINE (Minimum Edge Contrast) |
|---|---|---|
| **Description** | Minimum value of reflectance gap between space (including the quiet zone) and an adjacent bar | - |
| **Calculation formula** | EC = Rs - Rb<br>ECmin = Min(EC)<br>Rs : Reflectance of space<br>Rb : Reflectance of bar | |
| **Criterion** | A : ECmin ≥ 15%<br>F : ECmin < 15% | |

| Modulation | | MOD (Modulation) |
|---|---|---|
| **Description** | Ratio between the minimum edge contrast and the symbol contrast | - |
| **Calculation formula** | MOD = ECmin / SC | |
| **Criterion** | A : MOD ≥ 0.70<br>B : MOD ≥ 0.60<br>C : MOD ≥ 0.50<br>D : MOD ≥ 0.40<br>F : MOD < 0.40 | |

| Minimum quiet zone | | QZ (Quiet Zone) |
|---|---|---|
| **Description** | Evaluates whether the quiet zone width conforms to the standards. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Satisfied<br>F : Not satisfied | |

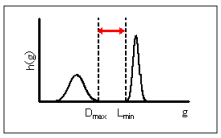
* The evaluation of GS1 DataBar Limited (including CC-A/CC-B) is dependent on the main unit setting.

| Decodability | | DCD (Decodability) |
|---|---|---|
| **Description** | The decode margin is dependent on the code type. Evaluates the level of error between the ideal line width pattern and the actual line width pattern. | - |
| **Calculation formula** | - | |
| **Criterion** | - | |

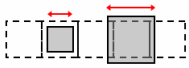
| Defects | | DEF (Defects) |
|---|---|---|
| **Description** | Evaluates color unevenness in an element. | - |
| **Calculation formula** | Defects = ERNmax / SC<br>ERN = (Gap between the maximum and minimum values of reflectance in an element),<br>ERNmax = Max (ERN) | |
| **Criterion** | A : Defects ≤ 0.15<br>B : Defects ≤ 0.20<br>C : Defects ≤ 0.25<br>D : Defects ≤ 0.30<br>F : Defects > 0.30 | |

## SAE AS9132

| Quiet zone | | QZ (Quiet Zone) |
|---|---|---|
| **Description** | Evaluates if multiple cells of quiet zone exist around the code. | |
| **Calculation formula** | - | |
| **Criterion** | - | |

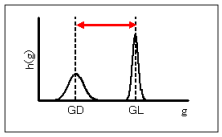
| Symbol contrast | | SC (Symbol Contrast) |
|---|---|---|
| **Description** | Evaluates the difference between the maximum brightness value of dark cell (Dmax) and minimum brightness value of bright cell (Lmin) in the code area. |  |
| **Calculation formula** | (Lmin - Dmax)/255<br>Lmin : Minimum brightness value of bright cell<br>Dmax : Maximum brightness value of dark cell | |
| **Criterion** | Pass : more than 0.20<br>Fail : less than 0.20 | |

| Angular distortion | | AD (Angular Distortion) |
|---|---|---|
| **Description** | Evaluates the distortion degree from 90 degrees of the angle formed by the straight line at L part. | |
| **Calculation formula** | - | |
| **Criterion** | Pass : -7 to 7<br>Fail : less than -7 or more than 7 | |

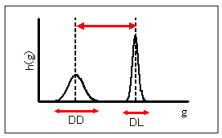
| Module fill | | MF (Module Fill) |
|---|---|---|
| **Description** | Evaluates the distortion from the correct size of the cell size. |  |
| **Calculation formula** | Length of the side of cell/Module size | |
| **Criterion** | Pass : 0.60 to 1.05<br>Fail : less than 0.60 or more than 1.05 | |

## SEMI T10-0701

| Symbol contrast | SC (Symbol Contrast) |
|---|---|
| **Description** | Evaluates the difference between the average brightness value of background (GL) and average brightness value of foreground (GD). |
| **Calculation formula** | (GL - GD)/255<br>GL : Average brightness value of background<br>GD : Average brightness value of foreground |
| **Criterion** | 1 is the best. |



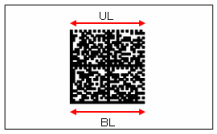

| Signal to noise ratio | SNR (Signal to Noise Ratio) |
|---|---|
| **Description** | Evaluates the symbol contrast size against brightness variation. |
| **Calculation formula** | (GL - GD)/Max (DL, DD)<br>GL : Average brightness value of background<br>GD : Average brightness value of foreground<br>DL : Dispersion of background brightness value<br>DD : Dispersion of foreground brightness value<br>Max() : Maximum value |
| **Criterion** | The greater, the better. |




| Horizontal mark growth | HMG (Horizontal Mark Growth) |
|---|---|
| **Description** | Evaluates the expansion and contraction degree of mark cell width of the timing pattern on the upper part. |
| **Calculation formula** | Med (MCW)/(Med (MCW) + Med (SCW))<br>MCW : Mark cell width<br>SCW : Space cell width<br>Med () : Median value |
| **Criterion** | 0.5 is the best.<br>Small→Thin<br>Large→Thick |

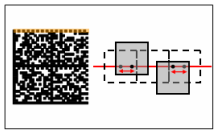
| Vertical mark growth | VMG (Vertical Mark Growth) |
|---|---|
| **Description** | Evaluates the expansion and contraction degree of mark cell height of the timing pattern on the right. |
| **Calculation formula** | Med (MCH)/(Med (MCH) + Med (SCH))<br>MCH : Mark cell height<br>SCH : Space cell height<br>Med () : Median value |
| **Criterion** | 0.5 is the best.<br>Small→Thin<br>Large→Thick |

| Average cell width | DMCW (DataMatrix Cell Width) |
|---|---|
| **Description** | Evaluates the average cell width. |
| **Calculation formula** | (UL + BL)/(2 ∗ N)<br>UL : Number of upper side pixels<br>BL : Number of bottom side pixels<br>N : Number of horizontal cells |
| **Criterion** | - |

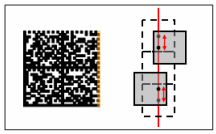



| Average cell height | DMCH (DataMatrix Cell Height) |
|---|---|
| **Description** | Evaluates the average cell height. |
| **Calculation formula** | (RL + LL)/(2 ∗ M)<br>RL : Number of right side pixels<br>LL : Number of left side pixels<br>M : Number of vertical cells |
| **Criterion** | - |

| Horizontal misplacement | HMM (Horizontal Mark Misplacement) |
|---|---|
| **Description** | Evaluates the misplacement of the mark cell center position of the timing pattern on the upper part. |
| **Calculation formula** | ∑MHi/(N ∗ DMCW)<br>MHi : Amount of the horizontal misplacement of each cell on upper TP<br>N : Number of horizontal cells<br>DMCW : Average cell width |
| **Criterion** | 0 is the best.<br>(1 means the 1-cell misplacement.) |



| Vertical misplacement | VMM (Vertical Mark Misplacement) |
|---|---|
| **Description** | Evaluates the misplacement of the mark cell center position of the timing pattern on the right. |
| **Calculation formula** | ∑MVi/(M ∗ DMCH)<br>MVi : Amount of the vertical misplacement of each cell on the right TP<br>M : Number of vertical cells<br>DMCH : Average cell width |
| **Criterion** | 0 is the best.<br>(1 means the 1-cell misplacement.) |



| Cell defects | CD (Cell Defects) |
|---|---|
| **Description** | Evaluates the number of pixels for which white and black judgment was wrong. |
| **Calculation formula** | Number of wrong pixels/All pixels |
| **Criterion** | 0 is the best. |

-

| Finder pattern defects | FPD (Finder Pattern Defects) |
|---|---|
| **Description** | Evaluates the number of pixels for which white and black judgment was wrong at the L part. |
| **Calculation formula** | Number of wrong pixels at the L part/All pixels at the L part |
| **Criterion** | 0 is the best. |

| Unused error correction | UEC (Unused Error Correction) |
|---|---|
| **Description** | Evaluates the ratio of error correction unused at the time of decoding. |
| **Calculation formula** | UEC = 1.0 - ((e + 2t)/(d - p))<br>e : Number of code words that cannot be read<br>t : Number of error code words<br>d : Number of error corrected code words<br>p : Number of error detected code words |
| **Criterion** | 1.00 : Error correction is not used at all.<br>0.00 : Decoding failed or error correction has been used up. |

-

## ISO/IEC 15416 (GS1 composite) and ISO/IEC 15415 (PDF 417, MicroPDF417)

| Decode success/failure | | DEC(Decode) |
|---|---|---|
| **Description** | Evaluates whether decoding is possible or not. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Success<br>F : Failure | |

| Number of edges | | EDGE (EdgeDetermination) |
|---|---|---|
| **Description** | Determines whether the read number of edges is equal to the assumed number of edges. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Match<br>F : Mismatch | |

| Symbol contrast | | SC (Symbol Contrast) |
|---|---|---|
| **Description** | Evaluates the difference between the maximum brightness value (Rmax) and minimum brightness value (Rmin) in the code area. | - |
| **Calculation formula** | SC = Rmax – Rmin | |
| **Criterion** | A : SC ≥ 70 %<br>B : SC ≥ 55 %<br>C : SC ≥ 40 %<br>D : SC ≥ 20 %<br>F : SC < 20 % | |

| Minimum reflectance | | MINR (Minimum Reflectance) |
|---|---|---|
| **Description** | Minimum reflectance among scanned waveforms | - |
| **Calculation formula** | - | |
| **Criterion** | A : Rmin ≤ 0.5 Rmax<br>F : Rmin > 0.5 Rmax | |

| Minimum edge contrast | | MINE (Minimum Edge Contrast) |
|---|---|---|
| **Description** | Minimum value of reflectance gap between space (including the quiet zone) and an adjacent bar | - |
| **Calculation formula** | EC = Rs – Rb<br>ECmin = Min(EC)<br>Rs : Reflectance of space<br>Rb : Reflectance of bar | |
| **Criterion** | A : ECmin ≥15%<br>F : ECmin < 15% | |

| Modulation | | MOD (Modulation) |
|---|---|---|
| **Description** | Ratio between the minimum edge contrast and the symbol contrast | - |
| **Calculation formula** | MOD = ECmin / SC | |
| **Criterion** | A : MOD ≥ 0.70<br>B : MOD ≥ 0.60<br>C : MOD ≥ 0.50<br>D : MOD ≥ 0.40<br>F : MOD < 0.40 | |

| Minimum quiet zone | | QZ (Quiet Zone) |
|---|---|---|
| **Description** | Evaluates whether the quiet zone width satisfies the standards. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Satisfied<br>F : Not satisfied | |

| Decodability | | DCD (Decodability) |
|---|---|---|
| **Description** | Decode margin dependent on the code type Evaluates the level of error between the ideal line width pattern and the actual line width pattern. | - |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Defects | | DEF(Defects) |
|---|---|---|
| **Description** | Evaluates color unevenness in an element. | - |
| **Calculation formula** | Defects = ERNmax / SC<br>ERN = (Gap between the maximum and minimum values of reflectance in an element),<br>ERNmax = Max (ERN) | |
| **Criterion** | A : Defects ≤ 0.15<br>B : Defects ≤ 0.20<br>C : Defects ≤ 0.25<br>D : Defects ≤ 0.30<br>F : Defects > 0.30 | |

| Effective codeword ratio | | CY(Codeword Yield) |
|---|---|---|
| **Description** | Ratio of successfully read codewords | - |
| **Calculation formula** | - | |
| **Criterion** | A : CY ≥ 71%<br>B : CY ≥ 64%<br>C : CY ≥ 57%<br>D : CY ≥ 50%<br>F : CY < 50% | |

| Codeword print quality | | CPQ (Codeword Print Quality) |
|---|---|---|
| **Description** | Evaluates the print quality of codewords. | - |
| **Calculation formula** | - | |
| **Criterion** | - | |

| Unused error correction | | UEC (Unused Error Correction) |
|---|---|---|
| **Description** | Evaluates the ratio of error correction unused at the time of decoding. | - |
| **Calculation formula** | UEC = 1.0 – ((e + 2t) / ( d – p))<br>e : Number of codewords that cannot be read<br>t : Number of error codewords<br>d : Number of error corrected codewords<br>p : Number of error detected codewords | |
| **Criterion** | A : UEC ≥ 0.62<br>B : UEC ≥ 0.50<br>C : UEC ≥ 0.37<br>D : UEC ≥ 0.25<br>F : UEC < 0.25 | |

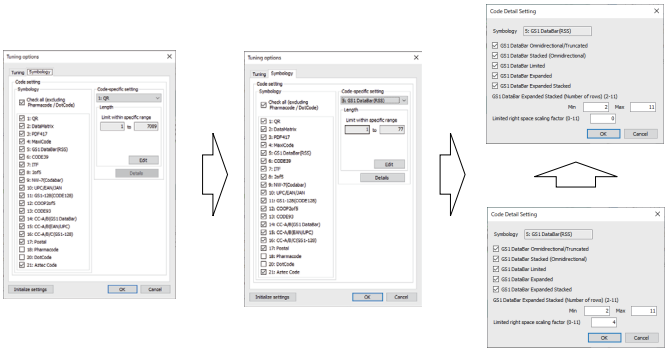
### ● GS1 DataBar Limited and CC-A/B (GS1 DataBar Limited)

GS1 DataBar Limited (including GS1 DataBar Limited as a part of CC-A/B) is characterized by being closely similar to some portion of other barcodes in terms of the bar structure.
Accordingly, the standard regarding GS1 DataBar Limited was amended in 2011.

The amended standard requires that a trailing space five times the width of the narrow bar is maintained to the right of GS1 DataBar Limited.

For materials with a dark surface, if the spaces are is printed with a laser marker, the marker may not comply with the new standard. In this case, the SR-X Series cannot be tuned with the factory default setting.

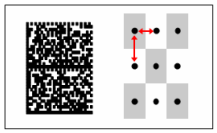
If tuning is not possible with these printed codes, set the Limited right space scaling factor to 0 and retry tuning.



## ISO/IEC 16022 Verification

| Decode | | DEC (Decode) |
|---|---|---|
| **Description** | Evaluates whether decoding is possible or not. | - |
| **Calculation formula** | - | |
| **Criterion** | A : Approved<br>F : Failed | |

| Symbol Contrast | | SC (Symbol Contrast) |
|---|---|---|
| **Description** | Evaluates the difference between the code region brightness top 10% average (RL) and bottom 10% average (RD). | - |
| **Calculation formula** | SC = RL – RD / 255 | |
| **Criterion** | A : SC ≥ 70 %<br>B : SC ≥ 55 %<br>C : SC ≥ 40 %<br>D : SC ≥ 20 %<br>F : SC ≤ 20 % | |

| Axial Nonuniformity | | AN (Axial Nonuniformity) |
|---|---|---|
| **Description** | Evaluate degree of distortion in the vertical and horizontal size of the code. |  |
| **Calculation formula** | AN = abs (Xavg – Yavg) / (Xavg + Xavg) / 2)<br>Xavg: Average cell size in horizontal direction<br>Yavg: Average cell size in vertical direction | |
| **Criterion** | A : less than 0.06<br>B : 0.06 to 0.08<br>C : 0.08 to 0.10<br>D : 0.10 to 0.12<br>F : more than 0.12 | |

| Unused Error Correction | | UEC (Unused Error Correction) |
|---|---|---|
| **Description** | Evaluates percentage of error correction not used during decoding. | - |
| **Calculation formula** | UEC = 1.0 – ((e + 2t) / (d - p))<br>e : Number of code words not read<br>t : Number of error code words<br>d : Number of corrected code words<br>p : Number of code words where error detected | |
| **Criterion** | A : more than 0.62<br>B : 0.50 to 0.62<br>C : 0.37 to 0.50<br>D : 0.25 to 0.37<br>F : less than 0.25 | |

| Print Growth (Horizontal) | | PGH (Print Growth Horizontal) |
|---|---|---|
| **Description** | Evaluates the growth in horizontal direction marked cell. | |
| **Calculation formula** | (D – 0.5) / 0.15<br>D : Proportion of number of pixels in marked cells on horizontal clock pattern | |
| **Criterion** | A : –0.50 to 0.50<br>B : –0.70 to –0.50 or 0.50 to 0.70<br>C : –0.85 to –0.70 or 0.70 to 0.85<br>D : –1.00 to –0.85 or 0.85 to 1.00<br>F : less than –1.00 or more than 1.00 | |

| Print Growth Vertical | | PGV (Print Growth Vertical) |
|---|---|---|
| **Description** | Evaluates the growth in vertical direction marked cell. | |
| **Calculation formula** | (D – 0.5) / 0.15<br>D : Proportion of number of pixels in marked cell on vertical clock pattern | |
| **Criterion** | A : –0.50 to 0.50<br>B : –0.70 to –0.50 or 0.50 to 0.70<br>C : –0.85 to –0.70 or 0.70 to 0.85<br>D : –1.00 to –0.85 or 0.85 to 1.00<br>F : less than –1.00 or more than 1.00 | |

# Precautions

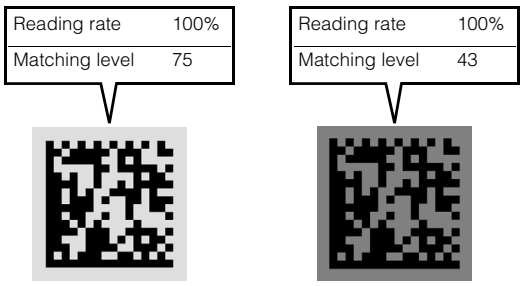
## Notes when using the code quality verification function

The code quality verification results may change according to the reading method and parameter bank.

- If the colors of the code and background change, set the parameter bank used as standard, and then verify code quality.

# 10-7 Matching level

Matching level is a reference value for determining how easy it is for the SR-X to read the code for successful image reading when the SR-X reads the code successfully.
It can be used to check the reading allowance or it can also be used as correlation index of a parameter bank when tuning.




You can see that the code on the left has a higher margin than the code on the right.

# Matching level OK/NG judgment function

Matching level OK/NG judgment function notifies about changes in code marking conditions and changes in read conditions by determining whether the matching level is high or low against the set threshold. Before a serious problem occurs due to reduced stability of reading, this function can be used as information to take an appropriate action.

## Criteria for judging matching level

| | |
|---|---|
| **STABLE** | Matching level ≥ threshold |
| **UNSTABLE** | Matching level < threshold |

## Functions that use matching level OK/NG judgments

| | | |
|---|---|---|
| **[1]** | **I/O terminal output** | Output the OUT terminal according to the STABLE/UNSTABLE status. |
| **[2]** | **Saving images** | Save the image when UNSTABLE. |
| **[3]** | **Silent Mode** | Control the data output according to the STABLE/UNSTABLE status. |
| **[4]** | **Additional data** | Append the matching level to the read data. |

Reference


- "6-7 Control the I/O Terminals" (Page 31)
- "6-8 Save Captured Images" (Page 33)
- "7-7 Suppress Data Output" (Page 46)
- "11-2 Data Communication Format" (Page 93)


## Setting the matching level judgment function

"7-6 Check Print Quality" (Page 45)

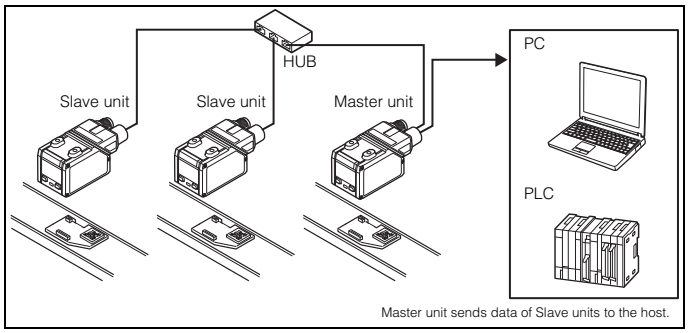
Point

The decode time is longer when the matching level judgment function is enabled. Complete tuning after enabling the function or set the decode timeout to the value that is required for reading.
Use the read time test mode to confirm there are no problems with the read time for operation.

# 10-8 Master/Slave Function

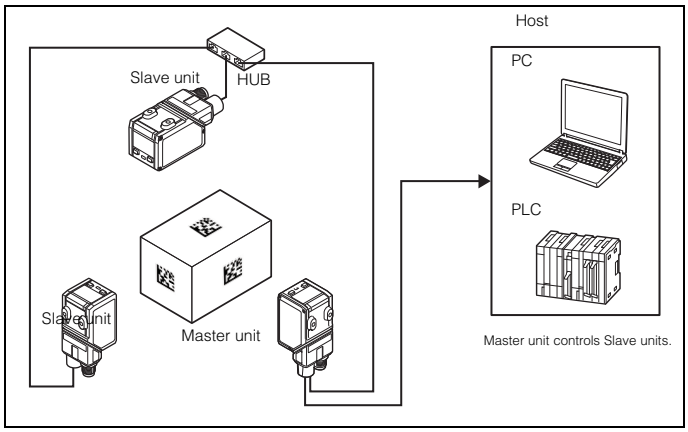
## Multi drop

With this mode, one Master unit collects the read data of multiple units (up to 32 units) of SR-X Series operating with different purposes and sends the data to the host.
Because the host only has to communicate with the SR designated as Master, the host does not need to consider communication with multiple units. Thus, the system load is reduced with the simple program. Also for PLC, only one communication unit is necessary to control multiple units. This enables the simple device configuration.




## Advanced multi-head

Use this mode when you do not know the position of a code on a target or when the target is larger than the field of view and the entire target cannot fit within the field of view using one unit.
Because multiple units (up to 32 units) of SR-X Series can be handled as one device, the host does not need to consider communication with multiple units, and the program becomes simple.




# Usable Reading Modes and Protocols

## Reading modes

| Reading mode | Multi drop | Advanced multi-head |
|---|---|---|
| Standard | ✓ | ✓ |
| Continuous | - | ✓ |
| Burst read | ✓ | ✓ |
| Script | - | ✓ |

## Protocols

| Protocol | Multi drop | Advanced multi-head |
|---|---|---|
| Non-procedure | ✓ | ✓ |
| TCP/UDP | ✓ | ✓ |
| MC protocol | ✓ | ✓ |
| SYSWAY | ✓ | ✓ |
| KV STUDIO | ✓ | ✓ |
| EtherNet/IP | - | ✓ |
| PROFINET | - | ✓ |

## SR Series compatibility chart

| Series | Multi drop | Advanced multi-head |
|---|---|---|
| SR-X | ✓ | ✓ |
| SR-5000 | ✓ | ✓* |
| SR-2000 | ✓ | ✓ |
| SR-1000 | ✓ | - |
| SR-750 | ✓ | - |

* There are restrictions when the advanced multi-head is used with a mixture of SR-5000 and SR-X.

## Restrictions on use with a mixture of SR-X and SR-5000

- The SR-X data cannot be acquired by the SR Management Tool.
- When saving Images by FTP using a SR-X series as the master and a SR-5000 as a slave, images from the slave will not be sent. When saving images, set the SR-5000 series as the master.

**Point**

- Specify a unique ID for each slave.
- The ID for the master is 0.
- When using the "master/slave function," both "Ethernet" and "RS-232C" can be selected for data output from the master. However, Ethernet connections must be made between the master and slaves.
- You can make multiple master/slave groups on the same network by assigning different names to the groups.
- Slave data cannot be received when the master is in the LOCK BUSY state.
  Ex.: MENU screen appears on the display of the master unit
- Delay or packet loss may occur if a network on which many devices are connected is under a large load. Perform a thorough verification before operation.
- When using the master/slave function, the maximum size of the data that can be sent from a slave to the master is 1024 bytes.

**Reference**

- The slave unit settings will not be reflected in the following items. They depend on the master unit settings.
  "Header," "terminator," "data length," and "checksum"
- Protocol used between the master and slave units: UDP
  The units communicate by way of Directed Broadcast.

# Multi Drop

## Control methods

| | | |
|---|---|---|
| (1) | Trigger signal | Turn on the trigger signals for the master and slave units. |
| (2) | Reading start command | Specify the ID number on and send a command to the master. |
| (3) | When using PLC link Trigger area | Specify the ID number on and turn on the trigger area on the master. |

## Data format

- **Normal**

| | | |
|---|---|---|
| Header | Read data | Terminator |

- **When using the additional data settings**

| | | | | | | |
|---|---|---|---|---|---|---|
| Header | Read data | : | Group name | : | ID | Terminator |

## Commands

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Start reading | **%Tm-LON** | m=00-31 : ID | - |
| Start reading (bank specification) | **%Tm-LON,b** | m=00-31 : ID<br>b: 01 to 16 | - |
| Stop reading | **%Tm-LOFF** | m=00-31 : ID | - |
| Version confirmation | **%Tm-KEYENCE** | m=00-31 : ID | %Tm-OK,KEYENCE, x, v<br>m=00-31 : ID<br>x=SR-X100, SR-X300: Model<br>v: Version |
| Cancel reading | **%Tm-CANCEL** | m=00-31 : ID | %Tm-OK,CANCEL<br>m=00-31 : ID |

## Master setting procedure

### (1) Network settings

1. **Open the [Ethernet] tab.**
2. **Enter the [IP address] and [Subnet Mask] settings to assign to the master unit.**

### (2) Destination settings

#### ● Ethernet

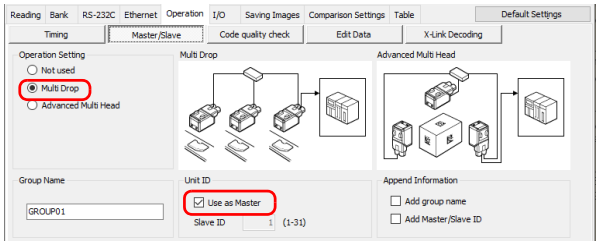
1. **Open the [Ethernet] tab, and then start the [Setup Wizard].**
2. **STEP 1 Select the trigger input method.**
3. **STEP 2 Select the output destination.**
4. **STEP 3 Select the communication protocol.**
5. **STEP 4 Configure connection destination settings such as [IP Address] and [Port].**
6. **Exit [Setup Wizard].**

#### ● RS-232C

1. **Open the [RS-232C] tab.**
2. **Match communication settings such as the "Baud Rate" with those of the host device.**

### (3) Master/slave function settings

1. **On the [Operation] tab, open the [Master/Slave] screen.**
2. **Configure the settings as shown below.**




3. **Click [Send Configuration].**

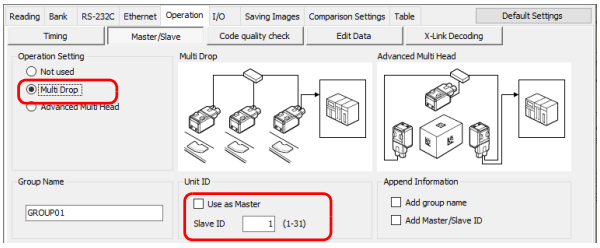
## Slave settings

### (1) Network settings

1. **Open the [Ethernet] tab.**
2. **Enter the "IP address" and "Subnet Mask" settings.**

### (2) Master/slave settings

1. **On the [Operation] tab, open the [Master/Slave] screen.**
2. **Configure the settings as shown below. Specify a unique ID for each slave.**




3. **Click [Send Configuration].**

**Point**

Only read data is sent from slave units to the master unit.
Other data such as test mode and preset registration results is not output.
Communication settings such as TCP and RS-232C are not necessary for slaves.

# Advanced Multi-head

## Control methods

| | | |
|---|---|---|
| (1) | Trigger signal | Turn on the trigger signal for the master unit. |
| (2) | Reading start command | Send a command to the master. |
| (3) | When using PLC link Trigger area | Turn on the trigger area on the master unit. |

## Data format

- **Normal**

| | | |
|---|---|---|
| Header | Read data | Terminator |

- **When using the additional data settings**

| | | | | | | |
|---|---|---|---|---|---|---|
| Header | Read data | : | Group name | : | ID | Terminator |

## Commands

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Start reading | **LON** | - | - |
| Start reading (bank specification) | **LON,b** | b: 01 to 16 | - |
| Stop reading | **LOFF** | - | - |
| Version confirmation | **KEYENCE** | - | OK,KEYENCE, x, v<br>x=SR-X100, SR-X300: Model<br>v: Version |
| Cancel reading | **CANCEL** | - | OK,CANCEL |

## Master setting procedure

### (1) Network settings

1. **Open the [Ethernet] tab.**
2. **Enter the [IP address] and [Subnet Mask] settings to assign to the master unit.**

### (2) Destination settings

#### ● Ethernet

1. **Open the [Ethernet] tab, and then start the [Setup Wizard].**
2. **STEP 1 Select the trigger input method.**
3. **STEP 2 Select the output destination.**
4. **STEP 3 Select the communication protocol.**
5. **STEP 4 Configure connection destination settings such as [IP Address] and [Port].**
6. **Exit [Setup Wizard].**

### ● RS-232C

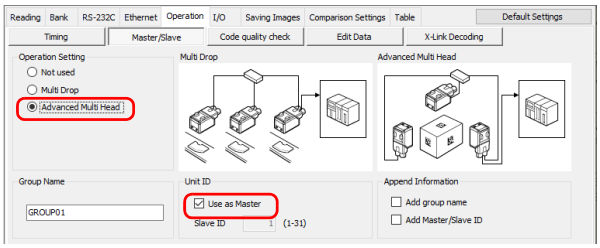
1 **Open the [RS-232C] tab.**

2 **Match communication settings such as the "Baud Rate" with those of the host device.**

## (3) Master/slave function settings

1 **On the [Operation] tab, open the [Master/Slave] screen.**

2 **Configure the settings as shown below.**




3 **Click [Send Configuration].**

# Slave settings

## (1) Network settings

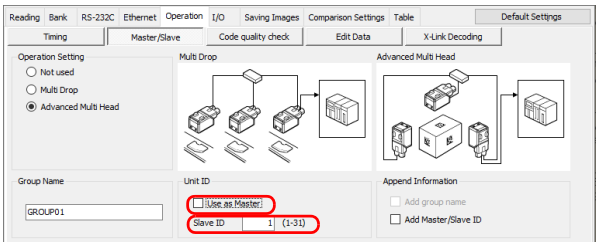
1 **Open the [Ethernet] tab.**

2 **Enter the "IP address" and "Subnet Mask" settings.**

## (2) Master/slave settings

1 **On the [Operation] tab, open the [Master/Slave] screen.**

2 **Configure the settings as shown below. Specify a unique ID for each slave.**



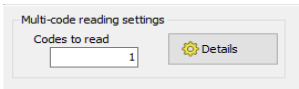

3 **Click [Send Configuration].**

**Point**

- OUT terminal when using multi head mode
  If only one of multiple units successfully performs reading, that one unit will output OK and all other units will output ERROR.
- Communication settings such as TCP and RS-232C are not necessary for slaves.
- When using Advanced Multi-head mode, the following data cannot be obtained from slaves.
  Image file name
  Read time
  Time

### ● Multiple code read setting

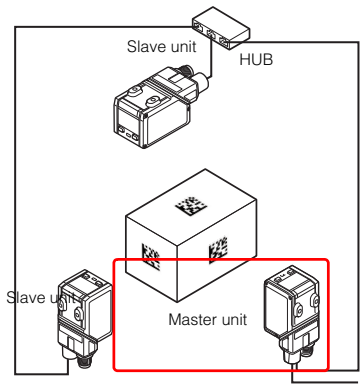
The total number of codes to be read by master and slave units must be configured on the master only with the Codes to read setting.




The read data is output when the reading finishes (operation same as that by a single unit reading more than one code).

### ● Scripts

Configure script settings on the master only. Slave data can be edited on the master.




### ● PLC links

Read data will be in the same region for both master and slave units.

| | | | | |
|---|---|---|---|---|
| D+04 | Digits 1 and 2 of output data *4 | 2 ASCII code characters *2 *3 | ✓ | |
| D+05 | Digits 3 and 4 of output data *4 | 2 ASCII code characters *2 *3 | ✓ | |
| … | | | | |
| D+503 | Digits 999 and 1000 of output data *4 | 2 ASCII code characters *2 *3 | ✓ | |

### ● OUT terminal (OK/ERROR)

OK/ERROR judgment set in the Advanced Multi-head mode on the master unit can be output from the OUT terminal.

# 10-9 Preset Data Comparison

## Preset Data Function

This function allows the SR-X Series to compare the read code data against the registered code data (preset data), and output an OK/NG signal to indicate whether or not they match. This allows the SR-X Series to detect different codes simply without a trigger sensor or other devices.
One set of preset data can be stored in the SR-X Series (maximum 494 digits).
The starting digit (starting position) and range (number of digits) for the comparison can be set in the preset data, so even codes with more than 494 digits can be verified.

Point

- The comparison starts at the specified starting position on the preset data and continues for the specified number of digits. Data cannot be verified at multiple points.
- You cannot use the preset data comparison function when reading multiple codes.

## Registering Preset Data

Use one of the following three methods to register to the SR-X Series preset data for comparison.

**(1) Use AutoID Network Navigator to register the data.**

"6-9 Compare the Read Data (Preset Data Comparison)" (Page 34)

**(2) Use commands to register the data.**

Example) Registering "123" as the data
Send the following command.

WP,402,313233[CR]

"14-3 SR-X Series Configuration Commands" (Page 109)

**(3) Read a code to register the data.**

You can read a code to register its read results as the preset data.

- **Results output when reading a code to register as the preset data**

| PR | nn | : | Result data |
|---|---|---|---|

nn = Preset registration result (00 to 05)

| nn | Description | Result data |
|---|---|---|
| 00 | Preset registration success | Read data |
| 01 | Preset read failure | Read error data |
| 02 | The preset effective digit is specified as 0. | [null] |
| 03 | The number of digits of read data is less than the number of digits for preset start. | |
| 04 | The preset registration is not possible because the operation mode is set to multi 2 or multiple read. | |
| 05 | Two or more "!" exist in preset data. | |

## Output Terminal Operation

When you make a comparison against preset data, the results output from the output terminal are shown below.

### Output terminal operation

| | |
|---|---|
| Reading successful and the read data matches the preset data | OK |
| Reading successful and the read data does not match the preset data | NG (Comparison NG) |
| Reading error | ERROR |

To assign the above functions to an output terminal, refer to "6-7 Control the I/O Terminals" (Page 31).

## Preset Data Wild Cards

You can use "!" and "?" as wild cards in the preset data.

### Meanings of "!" and "?" in the preset data

| | |
|---|---|
| ! | This indicates an arbitrary character string.<br>You can only use this wild card once within the preset data. |
| ? | This indicates an arbitrary character.<br>You can use this wild card multiple times within the preset data. |

Example)

| Preset data | Read data | Output result |
|---|---|---|
| 123! | 1234 | OK |
| | 12345 | OK |
| | 1111 | NG (Comparison NG) |
| 123? | 1234 | OK |
| | 12345 | NG (Comparison NG) |
| | 1111 | NG (Comparison NG) |
| 1234 | 1234 | OK |
| | 12345 | NG (Comparison NG) |
| | 1111 | NG (Comparison NG) |

Reference

If no preset data is registered, "!" is automatically registered for the preset data.

## Sequence Comparison

This function checks sequencing of numeric values.
You can make comparisons in situations where the numeric values within the code change one by one, such as checking serial numbers.

### Operation

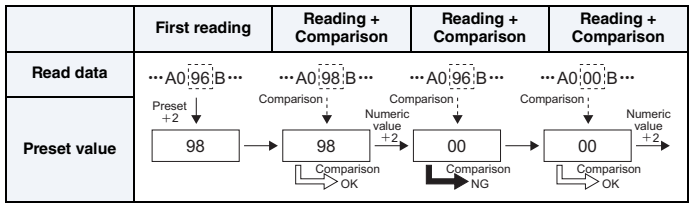
If the comparison is successful, the numeric value of the comparison data is incremented (or decremented).
If the comparison is not successful, the numeric value of the comparison data is not incremented (or decremented) until the correct sequence value is checked.
The first numeric value registered as a preset after the power is turned on is treated as the basis for incrementing (or decrementing) in the comparison.
When a code is read to be registered as the preset data, the operation will be the same as that for the first reading.

### Settings

Configure the following settings.

| | |
|---|---|
| Comparison method | "Sequential." |
| Origin | Specify the digit at which to start the comparison. |
| Length | Specify how many digits to compare starting at the "Origin." |
| Increment | Set the increment (or decrement) of a single operation. |

Example) Operation with the following settings
Origin: 3
Length: 2
Increment: 2




Point

The following restrictions are placed on the sequence comparison function:

- The comparison results in NG when a value other than a numerical value is read.
- The preset data cannot be registered through communication.

# 10-10 Scripts

With the SR-X Series, you can use a simple programming language known as "scripts" to operate with a higher degree of freedom than is available with the setup software (AutoID Network Navigator).
This function is aimed at those who have programming experience.
Refer to the attachment “SR-X series Script Reference” for details.

## What Can Scripts Do?

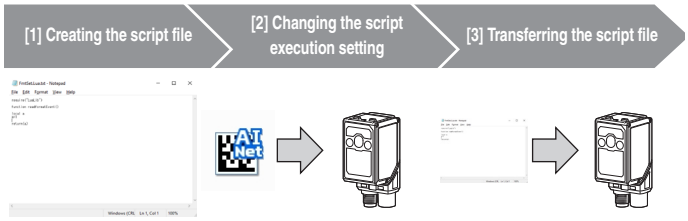
**(1) Edit data.**
- Cutting arbitrary locations from the read data
- Adding arbitrary character strings to the read data
- Comparing data and outputting result data
- Four arithmetic operations (add, subtract, multiply, and divide)
- Adding code rotation angles

**(2) Control the output from the output terminals.**
- Comparing data and generating output from the output terminals

**(3) Edit image file names.**
- Changing the name of the image file to send over FTP
- Adding time stamps to image file names

**(4) Control triggers**
- Continuous scanning is possible according to conditions.

## Configuration Procedure



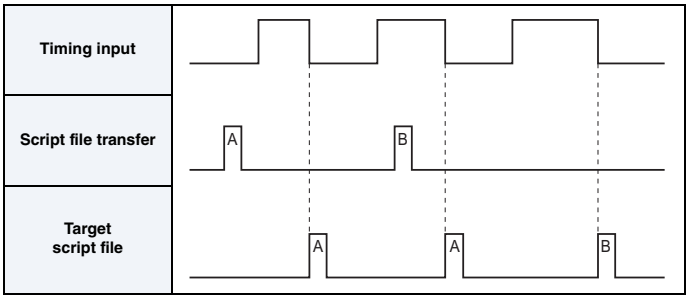

**[1] Creating the script file**
Create the script file (FmtSet.Lua) and write the program using a text editor such as notepad.exe.

**[2] Changing the script execution setting**
Using AutoID Network Navigator, enable the script execution setting of the SR-X Series.
- **Setting locations**
  **(1) Edit data.**
  On the [Operation] tab, click [Edit Data], and then select the "Use script" check box.
  **(2) Control the output from the output terminals.**
  On the [Operation] tab, click [Edit Data], and then select the "Use script" check box.
  * On the [I/O] tab, select the "SCRIPT CONTROL" check box under [OUT1 Function], [OUT2 Function], or [OUT3 Function].
  **(3) Edit image file names.**
  On the [Saving Images] tab, select the "Use script" check box under [Edit Image File Name].
  * You have to configure the FTP transmission settings.

**[3] Transferring the script file**
Transfer the script file (FmtSet.Lua) to the SR-X Series.
- **Transfer methods**
  - Use [Send Configuration] in AutoID Network Navigator to transfer the script file.
  - Use the [Terminal] in AutoID Network Navigator to transfer the script file.
  - Transfer the script file through the FTP interface.

### Script file application timing

Even while the SR-X Series is running, you can transfer script files at any time through the FTP interface.
In this situation, the script program will be applied after the trigger turns on after the file is transferred.




Point
- When transferring a script file using the FTP interface, you have to set the file name to "FmtSet.Lua."
- If config.ptc or FmtSet.Lua is transferred to the SR-X through the FTP interface while the SR-X is operating, its reading operation will be canceled.

## Handling Script Files

This section describes how to handle script files when restoring the SR-X to its factory default configuration or when using the changeover function.

| Operation contents | | FmtSet.lua |
|---|---|---|
| AutoID Network Navigator "Retrieve Configuration" | | Receives with the configuration file at the same time. |
| AutoID Network Navigator "Send Configuration" | | Sends with the configuration file at the same time. |
| AutoID Network Navigator "Default Settings" | | Remains. |
| Reading quick setup codes | | Remains. |
| Send command | SAVE | Remains. |
| | LOAD | Remains. |
| | DFLT | Remains. |
| | BSAVE | Creates backup files. |
| | BLOAD | Loads backup files. |

## Check Information Using Commands

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Obtaining the script processing time*1 | **SCPTIME** | - | OK,SCPTIME,now=Aus, maxBus,min=Cus<br>A: The most recent script processing time<br>B: The maximum processing time<br>C: The minimum processing time |
| Script debug setting*2 | **SCPDBG,n** | n = 1: Debugging on<br>0: Debugging off | OK,SCPDBG |
| Obtaining the script error results | **SCPERR** | - | OK,SCPERR,m<br>m: Script error details |
| Obtaining the script file version | **SCPVER** | - | OK,SCPVER,m,n<br>m: Script library version<br>n: Version written in FmtSet.Lua |

*1 Returns the processing time of scripts that have been executed since the power turned on
*2 If you turn debugging on, the "print(str)" commands within the script file will be executed.

# 10-11 Command Replacement

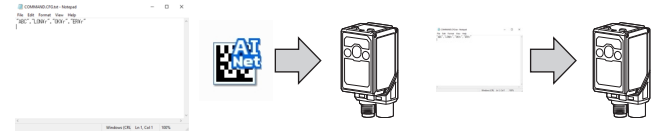
This function replaces commands (text strings) received by SR-X Series units.

## Target Command

| | Target command |
|---|---|
| (1) Replacing a received text string with another command | All commands |
| (2) Replacing IN terminal input with a command | RESET<br>BCLR<br>HCLR<br>LON (LON, [Bank number])<br>LOFF |

## Configuration Procedure

[1] Create command replacement files → [2] Change the response text string configuration → [3] Transfer command replacement files



**[1] Create command replacement files.**

Use notepad.exe or some other text editor to create COMMAND.CFG command replacement files and corresponding program files.

**[2] Change the response text string configuration.**

Use AutoID Network Navigator to change the [Response Text String Configuration] setting in the SR-X Series unit to "Command Replacement."

To replace the IN terminal input, change the [IN* Terminal Function] to [Command Replacement].

- **Setting locations**

  **(1) Response text string configuration**

  [Table] – [Format] – [Specify command response string] – [Basic command response string] – [Command replacement]

  **(2) IN* terminal settings**

  [I/O] – [IN* Function] – [Function] – [Command replacement]

**[3] Transfer command replacement files.**

Send the COMMAND.CFG command replacement file to the SR-X Series unit.

- **Transfer methods**
  - Send using the [Send Configuration] option in "AutoID Network Navigator."
  - Send via FTP.

## Creating Command Replacement Files

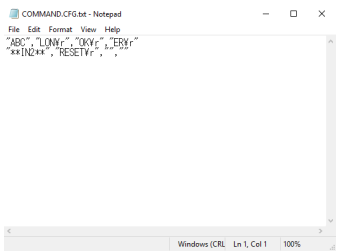
### Format

"[Custom command string]","[SR's command string]","[OK response]","[Error response]"

Ex.1: Replace "ABC" with "LON[CR]."
"ABC","LON\r","OK\r","ER\r"

Ex.2: Assign "RESET[CR]" to the IN 2 terminal.
"**IN2**","RESET\r","","",""

- **Configuration file example**




Point

Save the character codes of command replacement files in ANSI format.

### Syntax

- Each command replacement is separated with one of the following line break codes: [CR], [LF], or [CR][LF].
- The [Custom command string] can be up to a maximum of 128 bytes in size.
- [STX], [ETX], and [CR] codes cannot be used in the [Custom command string].
- The [Custom command string] has priority if it includes standard SR-X Series commands.
- If there are two or more [Custom command string] statements, the top statement is enabled.
- Use the syntax "**IN[?]**" to assign the [Custom command string] to the IN terminal. (Enclose the parameter in double asterisks.)
- Up to 64 statements can be registered.
- The [SR's command string] must include termination codes.
- The [Custom command string] must be defined for suffix matching.
  Ex.: The text string "ABC" is the [Custom command string].
  If the text string received is "123ABC", the matching text is "123ABC". The "123" text is discarded.
- Comments are made by enclosing text between two hyphens and a line break code.
- [OK response] and [Error response] can be disabled by enclosing them in double quotation marks.
- Adding an asterisk to the end of a statement causes the command function specified in the [SR's command string] to operate only for the [Custom command string].

## Escape Sequence

| Pattern | Meaning |
|---|---|
| \r | [CR](0x0D) |
| \n | [LF](0x0A) |
| \a | [BEL](0x07) |
| \b | [BS](0x08) |
| \f | [CL](0x0C) |
| \t | [HT](0x09) |
| \v | [HM](0x0B) |
| \\ | \ |
| \" | " |
| \000 | Specifies character codes in decimal numbers |

## Command Replacement Error Debugging

The "CMDCFG_ERR" message can be sent from the terminal for error confirmation when command replacement files are not recognized correctly.

| Response | Meaning |
|---|---|
| No Error | No error |
| error: file COMMAND.CFG line xxx | Error in row xxx |
| error: file COMMAND.CFG not found | File error or no file exists |
| error: Command not supported. | Command not supported by IN terminal command replacement was specified. |

Point

- The changeover function is not supported.
- This function is applicable only to the master when using the master-slave function.
- The single character recognition setting for the timing of the ON/OFF command operates exclusively.
- This function is disabled when RS-232C communication is initialized by pressing the corresponding button on the device.
- This function is disabled by the AutoID Network Navigator terminal.

# 11 Communication Types


## 11-1 SR-X Series Communication Types 92

(1) I/O Communication 92
(2) RS-232C 92
(3) Ethernet 92
Ethernet Communication Port Numbers 92
Port Number Details 92

## 11-2 Data Communication Format 93

Communication Format for Read Data 93
Read Error Codes 93
Appending Data 93
Details of Appended Data 93

# 11-1 SR-X Series Communication Types

The SR-X Series is equipped with the following three communication paths.
**(1) I/O communication**
**(2) RS-232C**
**(3) Ethernet**

## (1) I/O Communication

You can perform the operations listed below by assigning functions to the I/O terminals.

| | |
|---|---|
| Input terminals | Start reading or tuning by applying signals from an external sensor or switch. |
| Output terminals | Turn signals on to activate an external buzzer or LED when reading is successful or fails. |

### Wiring the I/O terminals

"2-1 Connection and Wiring" (Page 8)

### Assigning functions to the I/O terminals

"6-7 Control the I/O Terminals" (Page 31)

## (2) RS-232C

With the RS-232C interface of the SR-X Series, you can use the following types of communication.

### Serial communication

You can communicate with devices that have RS-232C interfaces. You can transfer the read data of the SR-X Series in a procedureless manner and use commands to start reading.
"13-1 Serial Communication" (Page 102)
"14-1 Command Communication" (Page 106)

| | |
|---|---|
| Protocol | None, PASS/RTRY, or ACK/NAK |

### PLC link

You can communicate with PLCs that support the "PLC link function." Because the SR-X Series directly controls the memory in the PLC, communication programs are not necessary. This leads to a reduction in man-hours spent creating programs.
"15-1 PLC Link Overview" (Page 124)

| | |
|---|---|
| Protocol | KV Studio, MC protocol, or SYSWAY |

## (3) Ethernet

With the Ethernet interface of the SR-X Series, you can use the following types of communication.

### Socket communication (TCP/UDP)

You can use socket communication to transfer the read data of the SR-X Series. You can use commands to control the operations and change the settings of the SR-X Series.
"13-2 Socket Communication (TCP, UDP)" (Page 103)
"14-1 Command Communication" (Page 106)

| | |
|---|---|
| Protocol | TCP, UDP |

### PLC link

You can communicate with PLCs that support the "PLC link function." Because the SR-X Series directly controls the memory in the PLC, communication programs are not necessary. This leads to a reduction in man-hours spent creating programs.
"15-1 PLC Link Overview" (Page 124)

| | |
|---|---|
| Protocol | KV Studio, MC protocol, or OMRON PLC Link |

### EtherNet/IP

"16-1 EtherNet/IP Overview" (Page 132)

| | |
|---|---|
| Protocol | EtherNet/IP |

### PROFINET

"17-1 PROFINET Overview" (Page 146)

| | |
|---|---|
| Protocol | PROFINET |

### FTP

The SR-X Series can perform the following operations through the FTP interface.
- Transferring captured images
- Receiving configuration files and script files
- Appending read data to text files on the FTP server

| | |
|---|---|
| Protocol | FTP |

When using the SR-X Series as an FTP server, operate the FTP server in anonymous mode.

### SNTP

The SR-X Series can obtain time information from SNTP servers and can synchronize its time with that of these servers.

| | |
|---|---|
| Protocol | SNTP |

Reference
- The following functions use the protocols shown here.
  Master/slave function: UDP

Point
When you use EtherNet/IP or PROFINET, you cannot use the "master/slave function's" multi drop link.

## Ethernet Communication Port Numbers

| Communication name | Listen/remote port | Protocol | Port number |
|---|---|---|---|
| Command communication | Listen port | TCP, UDP | 23, 1024 to 65535*1 |
| Ethernet data (server) | Listen port | TCP | 23, 1024 to 65535*1 |
| Ethernet data (client) | Remote port | TCP, UDP | 1024 to 65535 |
| PLC link | Remote port | UDP | 1024 to 65535 |
| FTP communication | - | FTP | 20: FTP data port (ACTIVE mode)<br>21: FTP service port |

*1 9013, 9014, 9015, 9016, 9017, 9018, 9020, 5900, 5920, and 44818 cannot be set as they are reserved for the reader system.

## Port Number Details

The following table shows the port numbers used by the AutoID Network Navigator. Use this for reference when a specific port needs to be opened by security software, etc.

| Protocol | Port number | | Communication direction | Description |
|---|---|---|---|---|
| | SR-X | PC/Host | | |
| **UDP** | 9015 | any | SR <- | Reader search |
| **UDP** | 9015 | any | SR -> | Reader search |
| **TCP** | 9017 | any | SR <- | Reserved |
| **TCP** | 9017 | any | SR -> | Reserved |
| **UDP** | 9020 | any | SR -> | Reserved |
| **FTP** | any | 21 | SR <- | AutoID Network Navigator |
| **FTP** | 21 | any | SR -> | AutoID Network Navigator |
| **TCP, UDP** | 9013 | any | SR <- | AutoID Network Navigator |
| **TCP, UDP** | 9013 | any | SR -> | AutoID Network Navigator |
| **TCP** | 9014 | any | SR -> | AutoID Network Navigator |
| **TCP** | 5900 | any | SR -> | AutoID Network Navigator |
| **TCP** | 5920 | any | SR -> | AutoID Network Navigator |
| **UDP** | 9016 | - | SR -> | For SR communication |
| **UDP** | 9018 | - | SR -> | For SR communication |
| **NTP** | any | 123 | SR -> | When using SNTP |
| **HTTP** | 80 *1 | any | SR <- | SR WEB Monitor |

*1 This can be changed.

# 11-2 Data Communication Format

The SR-X data communication format is common for both RS-232C and Ethernet.

## Communication Format for Read Data

Read data is sent using the ASCII code with the header and terminator added, as shown below.

| Header | Read data | Terminator |
|---|---|---|

Various types of data can be appended to read data.
Header and terminator can be selected from the following options using AutoID Network Navigator. They also can be set to any string up to 5 characters.

### ● Header

None / STX (0x02) / ESC (0x1B)

### ● Terminator

CR (0x0D) / CR LF(0x0D) (0x0A) / ETX(0x03)

## Read Error Codes

If the code cannot be read, the SR-X Series will send a read error code to the host device.

**Read error code default setting: ERROR**

| Header | ERROR | Terminator |
|---|---|---|

Read error codes can be changed to any string of text, up to 32 characters, using AutoID Network Navigator.
Additionally, the device can be set to not send error codes.

## Appending Data

Various types of data can be appended to read data.

### Read data format

| (1) | (2) | : | (3) | : | (4) | Read data |
|---|---|---|---|---|---|---|

| : | (5) | : | (6) | : | (7) | : | (8) | : | (9) | : | (10) | : | (11) | : | (12) | : | (13) | : | (14) | : | (15) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| : | (16) | : | (17) | : | (18) | (19) |
|---|---|---|---|---|---|---|

(1) Data size
(2) Time
(3) Code type
(4) Symbol ID
(5) Bank number
(6) Scan count
(7) Decoding time
(8) Region number
(9) Code vertex coordinates
(10) Code center coordinates
(11) Unused ECC ratio
(12) Matching level
(13) Code quality verification result
(14) Image file name
(15) Group name*1
(16) Master/Slave ID*1
(17) Read time
(18) Angle (skew/pitch)
(19) Checksum

*1 When the advanced Multi-head is valid, the order is "Master Slave ID":"Group name."

**Delimiter characters**

- The colon (:) as a delimiting character can be changed via AutoID Network Navigator (one character).
- No delimiter character is inserted after "Data size" and "Symbol ID", and before "Checksum."

**Precautions when appending data**

- Appended data can be set via a command or from AutoID Network Navigator.
- Only the selected data will be appended to the read data. The data size changes because of this.
- Checksum defers by the contents of the appended data.

## Details of Appended Data

### Data size

The data size is the total size of parts (1), (2), and (3), plus 4 bytes.

| | (1) | (2) | (3) | |
|---|---|---|---|---|
| Header | Data size | Read data + appended data | Checksum | Terminator |

### Time

Appends the time the data was output.
Appended data range: YYYYMMDDhhmmss
(Year-Month-Day-Hour-Minute-Second)

- Data format

| YYYYMMDDhhmmss | : | Read data |
|---|---|---|

### Code type

You can append the read code type number to the read data.

| Number | Code type |
|---|---|
| 1 | QR |
| 2 | DataMatrix |
| 3 | PDF417 |
| 4 | MaxiCode |
| 5 | GS1 DataBar(RSS) |
| 6 | CODE39 |
| 7 | ITF |
| 8 | 2of5 |
| 9 | NW-7 (Codabar) |
| 10 | JAN/EAN/UPC |
| 11 | CODE128 |
| 12 | COOP 2 of 5 |
| 13 | CODE93 |
| 14 | CC-A/B(GS1 DataBar) |
| 15 | CC-A/B(EAN/UPC) |
| 16 | CC-A/B/C(GS1-128) |
| 17 | Postal |
| 18 | Pharmacode |
| 20 | DotCode |
| 21 | Aztec Code |

### Symbol ID

Appends the symbology identifier, specified by AIM, before the read data.
It is not appended when a reading fails.

- Data format

| Symbol ID | Read data |
|---|---|

| Code type | Detail | Symbol ID |
|---|---|---|
| QR | : Model 1 | ]Q0 |
| | : Model 2, ECI not applied | ]Q1 |
| | : Model 2, ECI applied | ]Q2 |
| | : Model 2, ECI not applied, FNC1 (1st) | ]Q3 |
| | : Model 2, ECI applied, FNC1 (1st) | ]Q4 |
| | : Model 2, ECI not applied, FNC1 (2nd) | ]Q5 |
| | : Model 2, ECI applied, FNC1 (2nd) | ]Q6 |
| DataMatrix | : ECC 200 | ]d1 |
| | : ECC 200, FNC1 (1st), GS1 DataMatrix | ]d2 |
| | : ECC 200, FNC1 (2nd) | ]d3 |
| | : ECC 200, ECI applied | ]d4 |
| | : ECC 200, ECI applied, FNC1 (1st) | ]d5 |
| | : ECC 200, ECI applied, FNC1 (2nd) | ]d6 |
| | DMRE | ]d7 |
| | DMRE, FNC1 (1st or 5th) | ]d8 |
| | DMRE, FNC1 (2nd or 6th) | ]d9 |
| | DMRE, ECI | ]dA |
| | DMRE, ECI, FNC1 (1st or 5th) | ]dB |
| | DMRE, ECI, FNC1 (2nd or 6th) | ]dC |
| MaxiCode | Mode 4 or Mode 5 | ]U0 |
| | Mode 2 or Mode 3 | ]U1 |
| | Mode 4 or Mode 5, ECI | ]U2 |
| | Mode 2 or Mode 3, ECI | ]U3 |
| CODE39 | No check digit validation | ]A0 |
| | Check digit is validated and transmitted. | ]A1 |
| | Check digit is validated but not transmitted. | ]A3 |

| Code type | Detail | Symbol ID |
|---|---|---|
| ITF | No check digit validation | ]I0 |
| | Check digit is validated and transmitted. | ]I1 |
| | Check digit is validated but not transmitted. | ]I3 |
| NW-7 (Codabar) | | ]F0 |
| JAN/EAN/UPC | UPC-A, UPC-E, JAN/EAN13 | ]E0 |
| | JAN/EAN8 | ]E4 |
| | UPC-A, UPC-E, JAN/EAN13<br>Addon 2, addon 5 | ]E3 |
| CODE128 | FNC1 not included. | ]C0 |
| | FNC1 on the first digit (GS1-128). | ]C1 |
| | FNC1 on the second digit. | ]C2 |
| GS1 Databar | | ]e0 |
| PDF417,<br>MicroPDF417 | Standard | ]L0 |
| | Extended channel interpretation | ]L1 |
| | Basic channel interpretation | ]L2 |
| CODE93 | | ]G0 |
| 2of5 | | ]S0 |
| COOP2of5 | | ]X0 |
| Trioptic CODE39 | | ]A8 |
| Postal | | ]X0 |
| DotCode | Generic data | ]J0 |
| | GS1 format (GS1 DotCode) | ]J1 |
| | Application Specific | ]J2 |
| | Generic data + ECI | ]J3 |
| | GS1 format (GS1 DotCode) + ECI | ]J4 |
| | Application Specific + ECI | ]J5 |
| Aztec Code | | ]z0 |
| | FNC1(1st) | ]z1 |
| | FNC1(An initial letter or pair of digits) | ]z2 |
| | ECI | ]z3 |
| | FNC1(1st) + ECI | ]z4 |
| | FNC1(An initial letter or pair of digits) + ECI | ]z5 |
| | Aztec Rune | ]zC |

### Data format for composite codes

- Composite code (GS1/CODE128 + PDF)

| | | | |
|---|---|---|---|
| ]e0 | Barcode data | a | 2D code data |

- Composite code (JAN/EAN/UPC + PDF)

| | | | |
|---|---|---|---|
| ]Em | Barcode data | a | 2D code data |

* m = Numeric value
* a = Composite delimiter: Can be changed by way of the settings.
(Default: Not set. You can use up to 5 characters to set the value.)

## Bank number

Appends the bank number that was read.
It is not appended when a reading fails.
- Data format

| | | |
|---|---|---|
| **Read data** | **:** | **nn** |

nn = Parameter bank number (01 - 16)

## Scan count

Appends the number of reading attempts of the SR-X Series while the timing input is turned ON.
Failed reading operations are also counted.
- Data format

| | | |
|---|---|---|
| **Read data** | **:** | **nnnnn** |

nnnnn = Scan count (1 - 65535)

## Region number

The region number used for the read can be added.
This information cannot be added if the read fails.
- Data format

| | | |
|---|---|---|
| **Read data** | **:** | **nnn** |

nnn = 000 - 128
* 000: No region specification

## Code vertex coordinates/Code center coordinates

Appends the coordinates of the vertexes and center position of the read code.
- Data format

Code vertex coordinates:

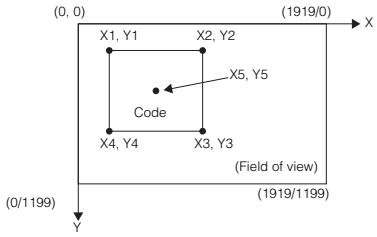
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Read data** | **:** | **X1/Y1** | **:** | **X2/Y2** | **:** | **X3/Y3** | **:** | **X4/Y4** |

Code center coordinates:

| | | |
|---|---|---|
| **Read data** | **:** | **X5/Y5** |

- SR-X300/X300W
  X1/Y1 to X4/Y4: Code vertex coordinates (Xn = 0 - 1919, Yn = 0 - 1199)
  X5/Y5: Code center coordinates (X5 = 0 - 1919, Y5 = 0 - 1199)
- SR-X100/X100W
  X1/Y1 to X4/Y4: Code vertex coordinates (Xn = 0 - 1359, Yn = 0 - 1023)
  X5/Y5: Code center coordinates (Xn = 0 - 1359, Yn = 0 - 1023)

Coordinates are specified for code positions in an image as below:




Reference

Output of the code vertex coordinate when executing multiple readings of the same code.
When multiple readings are executed for 1 scan, the coordinates are output in the following order:
- Coordinates with code center coordinates higher in the field of view (smaller in Y) are prioritized.
- If 2 coordinates have the same Y coordinates, the center coordinates of the code further to the left in the field of view (smaller in X) are prioritized.

Output format for multi read is as follows:

| | | | | |
|---|---|---|---|---|
| **Read data 1,<br>Read data 2,<br>... ,<br>Read data n** | **:** | **Read data 1 corner coordinates:<br>Read data 2 corner coordinates:<br>... :<br>Read data n corner coordinates** | **:** | **Read data 1 center coordinates:<br>Read data 2 center coordinates:<br>... :<br>Read data n center coordinates** |

Point

If the vertex coordinate is out of the capture range, the coordinate value is minus displayed.
(Even though all vertexes are not in the capture range, reading is possible.)

## Unused ECC ratio

Appends the unused error correction ratio.
The average value will be appended when several codes are read for 1 scan (multi read).
It is not appended when a reading fails.
- Data format

| | | | |
|---|---|---|---|
| **Read data** | **:** | **nnn** | **%** |

nnn = Unused ECC ratio (0 - 100)

## Matching level

Appends the matching level value of the read code.
- Matching levels of each code will be appended for the multi read.
- Value is not appended when a reading fails.
- Data format

| | | |
|---|---|---|
| **Read data** | **:** | **nnn** |

nnn = matching level value (0 - 100)

## Code quality verification results

For details on the code quality verification results, refer to "10-6 Code Quality Verification" (Page 72)

# 12 SR Web Tool


12-1 Details of SR Web Tool 96

Operating Environment 96
Connecting with an Ethernet Cable 96
Connecting with a USB Cable (RNDIS) 96
Screens 96

12-2 Details of Web Navigator 97

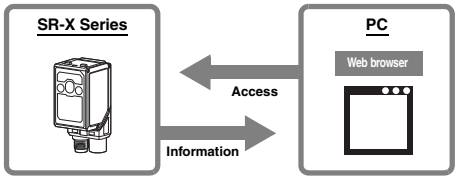
Create New 97
Edit Settings 98

12-3 Details of Web Traceability Tool 98

12-4 Details of Web Multi Monitor 99

# 12-1 Details of SR Web Tool

SR Web Tool is a tool that can manage multiple units of the SR-X series centrally by using a Web browser.




## Operating Environment

| | |
|---|---|
| **Web browser** | Google Chrome 84 or higher<br>Microsoft Edge 93 or higher<br>Safari 15 or higher |
| **Communication port** | Ethernet<br>USB (only supported on units whose version is 1.35 or later) |
| **Maximum number of simultaneous connections** | 5 units |

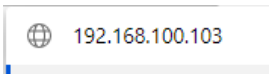
* Log in with Administrator rights to use.

## Connecting with an Ethernet Cable

**1 Use the Ethernet cable to connect the SR-X Series to a PC.**

**2 Launch the Web browser.**

**3 Input the IP address of the SR-X series in the URL input field of the Web browser.**




**4 The SR Web Tool starts.**

Reference To restrict the number of users and applications used, set [Password authentication] to [Enable] by selecting [Table] followed by [SR Web Tool] from the AutoID Network Navigator, then configure the [Account login settings].

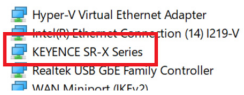
## Connecting with a USB Cable (RNDIS)

**1 Connect the SR-X Series to the PC with a USB cable. When the connection is established, the SR-X is recognized as a USB drive as shown in the following figure.**

**2 Move the .zip file from the USB drive to the local drive and unzip the file.**

**3 Run the .exe file in the RNDIS folder under SR_X_Series_USB_Driver to install the driver.**

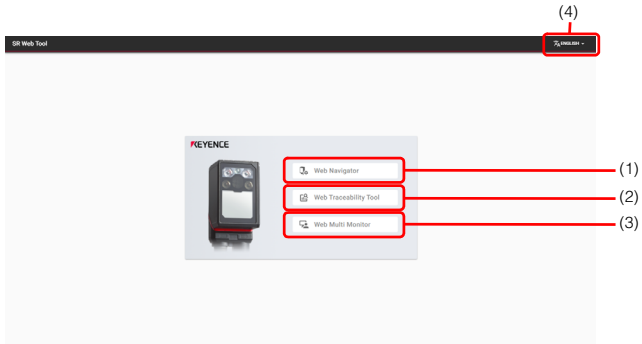
**4 Disconnect and reconnect the USB cable. The SR-X is recognized as a network adapter as shown in the following figure.**




**5 Launch a web browser and enter "http://keyenceautoid" to start SR Web Tool.**

## Screens

### Launch screen

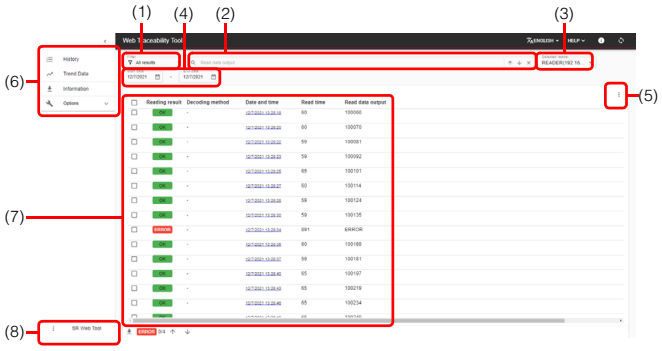



| | |
|---|---|
| (1) | Configure the settings of the SR-X series. |
| (2) | Check the history of the most recent reading results in the SR-X series. |
| (3) | Check the screens of multiple SR-X series at the same time. |
| (4) | Change the language. |

### Web Navigator

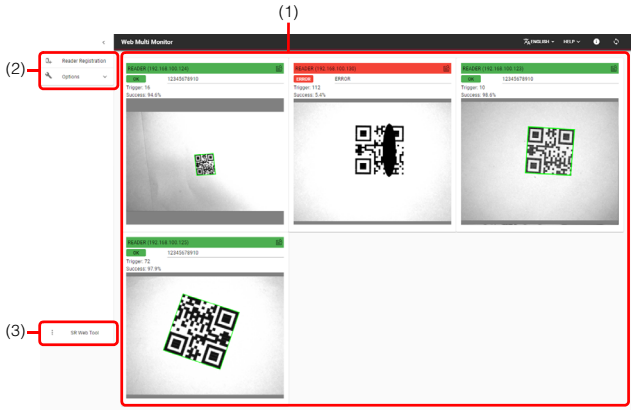
| | | |
|---|---|---|
| (1) | Follow the navigator to create optimal settings according to the objective. | |
| (2) | Partially edit the details already configured in the reader. | |
| (3) | Check the various manuals. | |
| (4) | Check the reader information. | |
| (5) | Home | Return to the home screen of the Web Navigator. |
| | Multiple code settings | Configure the setting to read multiple codes at one go. |
| | Bank | Configure the read parameter. |
| | Table | Configure the other parameters. |
| | Terminal | Read data can be verified. Command log can be verified. |
| | Utility | Upload and download configuration files inside the main unit. |
| | Options | Configure the optional settings of the Web Navigator. |
| (6) | Move to another function. | |

## ● Web Traceability Tool




| | | |
|---|---|---|
| (1) | Extract a history of the reading results matching the following conditions. “Not specified”, “Successful reading(AI)”“Successful reading(Linked)”, “Error” | |
| (2) | Jump to a history of the reading results having read output data including the entered keyword. | |
| (3) | Select a reader to check the reading result. | |
| (4) | Filter a history of the reading results by the specified date. | |
| (5) | Select an item to display. | |
| (6) | History | Check the history of the most recent reading results. |
| | Trend Data | Displays the change in the number of readings, time and bank usage ratio over time. |
| | Utility | Download the configuration file in the main unit, and get or delete a variety of logs. |
| | Options | Configure the optional settings of the Web Traceability Tool. |
| (7) | Displays the data of the reading results. Click the date and time to check the detailed information. | |
| (8) | Move to another function. | |

## ● Web Multi Monitor



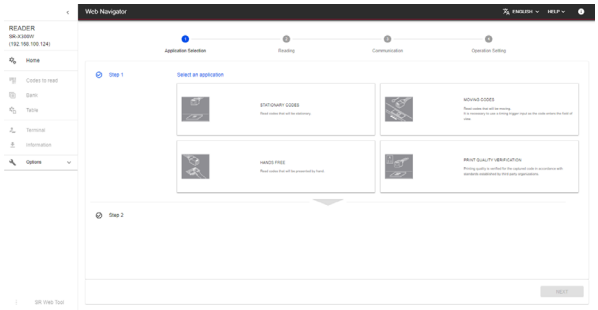

| | | |
|---|---|---|
| (1) | Displays the screen of the registered reader. | |
| (2) | Reader Registration | Register a reader. |
| | Options | Configure the optional settings of the Web Multi Monitor. |
| (3) | Move to another function. | |

# 12-2 Details of Web Navigator

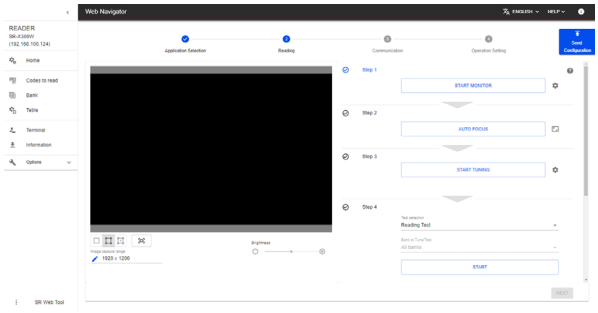
Use the Web browser to configure the settings of the SR-X series.

## Create New

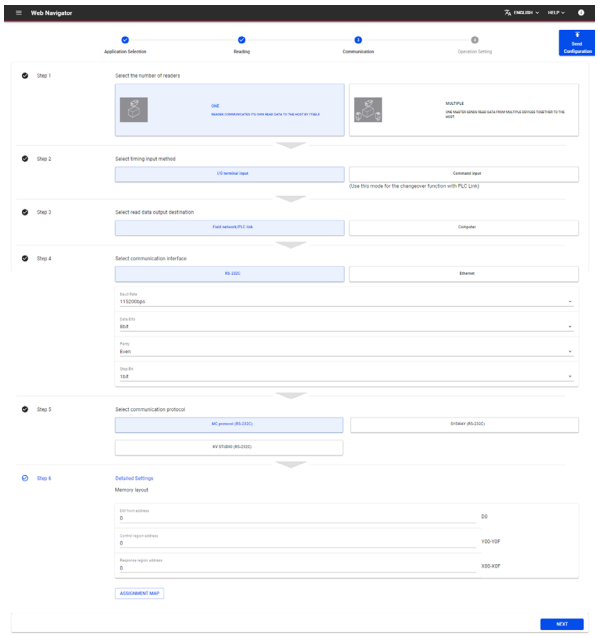
### 1 Select an application.



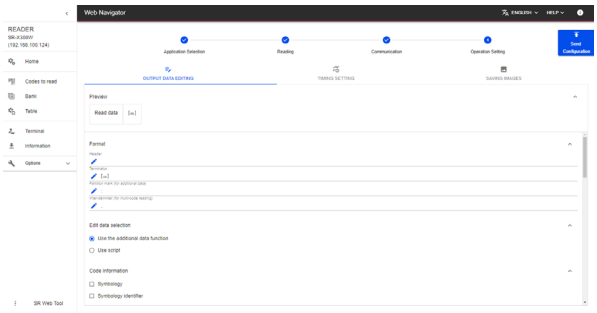
### 2 Configure the read setting.



### 3 Select a communication method.

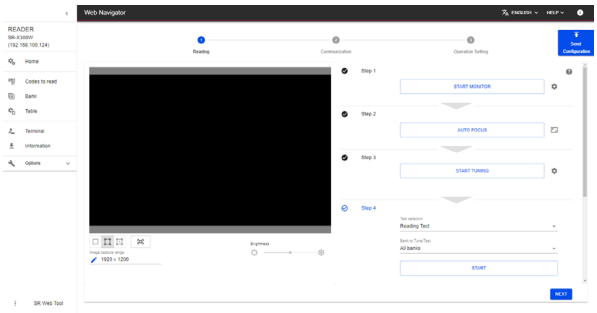


**4** **Configure the various operation settings.**

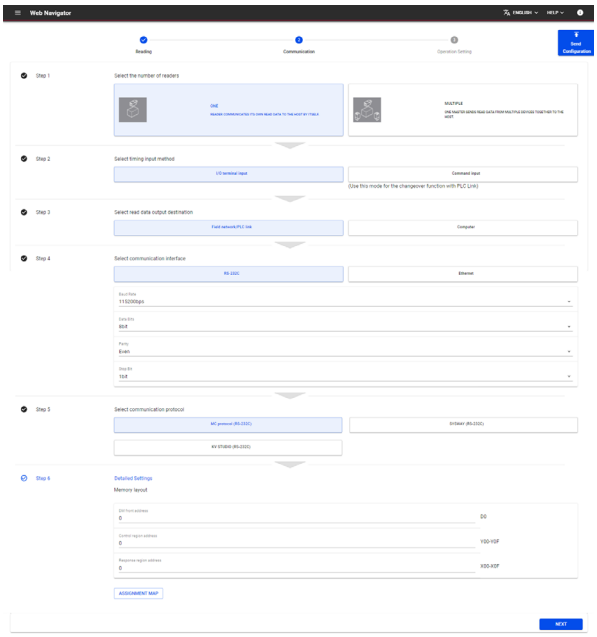


## Edit Settings

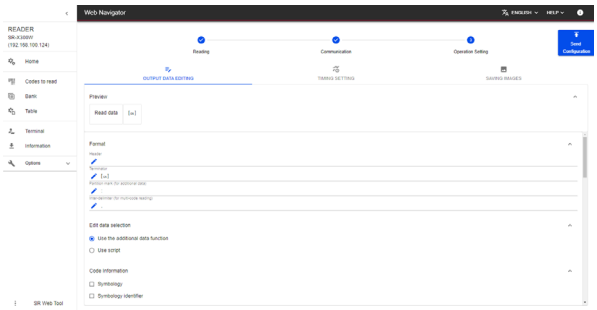
**1** **Configure the read setting.**



**2** **Select a communication method.**



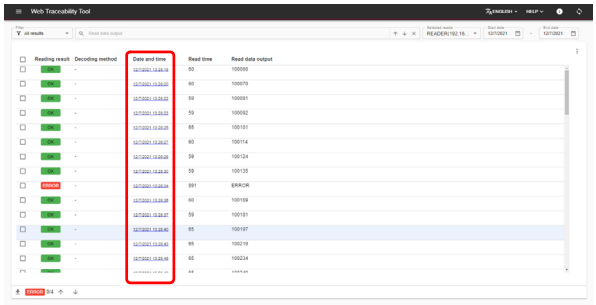
**3** **Configure the various operation settings.**



# 12-3 Details of Web Traceability Tool

Use a Web browser to check a history of the most recent reading results in the SR-X series.

**1** **Click the [Date Time] of the data that you wish to check the reading result.**

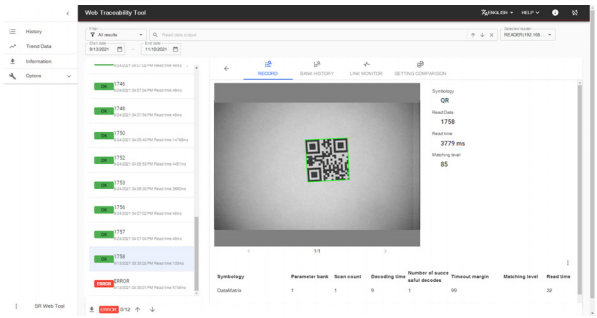


**2** **Check each type of data.**

### ● [Record] screen

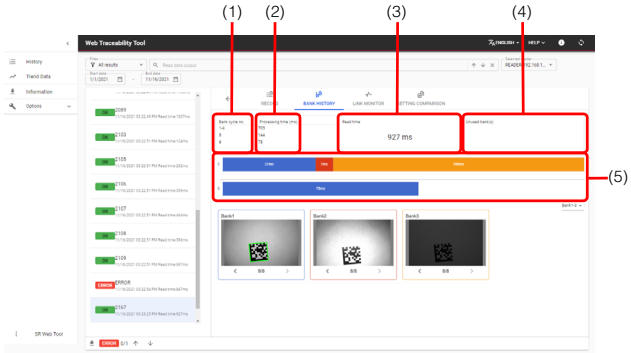
Displays the details of the selected reading result.

| | |
|---|---|
| **Maximum record count** | 4000 |



### ● [Bank history] screen

Displays the bank details of the selected reading result.

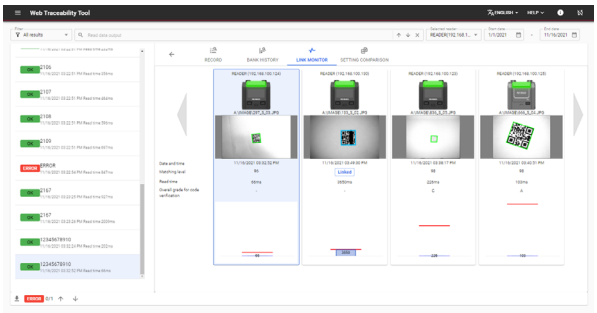



| | |
|---|---|
| (1) | Displays how many cycles the registered bank has switched. |
| (2) | Displays the time for every cycle that the registered bank has switched. |
| (3) | Displays the time required for reading. |
| (4) | Displays the banks that are not in use, if any, among the registered banks. |
| (5) | Displays the switching order and time of the registered bank. |

### ● [Link monitor] screen

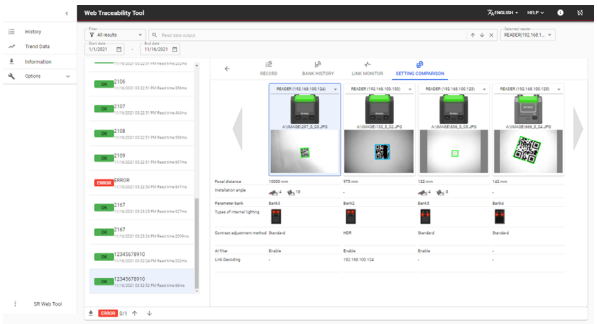
Multiple registered SR-X series can be used to read the same code.
Sort and display multiple SR-X series. Check the details of the selected reading result.

| | |
|---|---|
| **Registration upper limit** | 16 |



### ● [Setting Comparison] screen

Sort and display multiple SR-X series that have been registered. Check the read setting.



**Point**

To sort and display multiple SR-X series,
- At least 1 unit of SR-X300/X300W needs to exist inside the same network.
- The following settings need to be configured in the SR-X300/X300W. [Table] - [SR Web Tool] - [Web Traceability Tool] - [Reader 1 IP address] - [Reader 16 IP address]
- The Web Traceability Tool of the SR-X300/X300W configured as shown above needs to be launched.

For the following combination of settings, data will not be displayed correctly in the Web Traceability Tool.
- Advanced Multi-head mode
- Reading Mode: “Continuous”

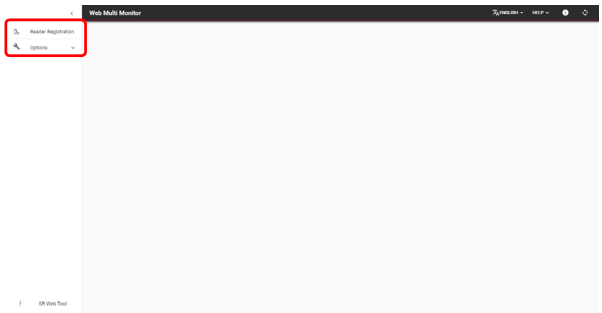
Use Reading Mode “Standard”.

## 12-4 Details of Web Multi Monitor

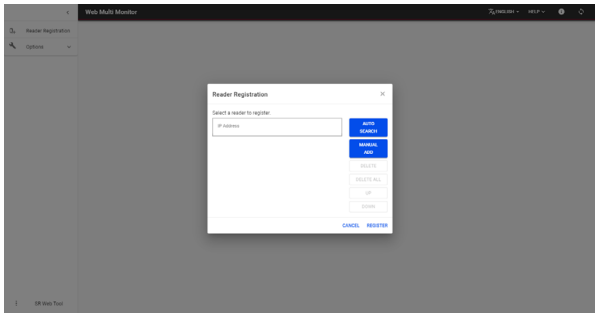
Use a Web browser to check multiple screens of the SR-X series at the same time.

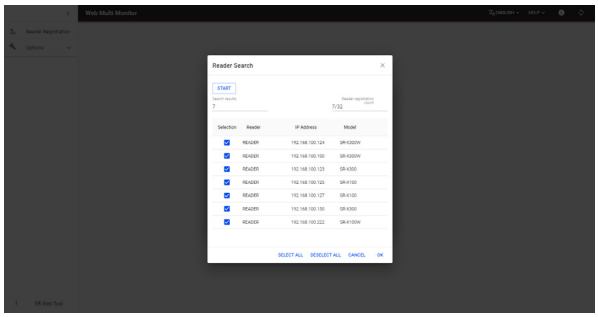
### 1 Click [Register Reader].

| | |
|---|---|
| **Registration upper limit** | 32 |



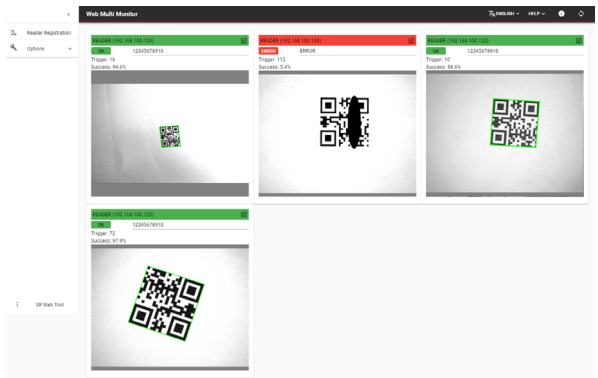
### 2 Register a reader.





### 3 Check the screen of the registered reader.

To check the details, click [ ].



# 13 Serial / Socket Communication


**13-1 Serial Communication 102**

RS-232C Communication Settings Defaults 102
Serial Communication (RS-232C) Settings 102

**13-2 Socket Communication (TCP, UDP) 103**

Ethernet Communication Settings Defaults 103
TCP Settings 103
UDP Settings 103
Settings During Socket Communication 103

# 13-1 Serial Communication

You can communicate with devices that have RS-232C interfaces. You can transfer the read data of the SR-X Series in a procedureless manner and use commands to start reading.

## RS-232C Communication Settings Defaults

| | |
|---|---|
| Baud Rate | 115200bps |
| Data Bits | 8bit |
| Parity | Even parity |
| Stop bit length | 1bit |

## Serial Communication (RS-232C) Settings

**1 Open the [RS-232C] tab.**

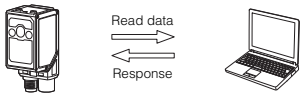
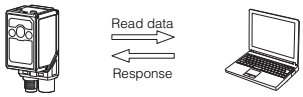
**2 Set the following items to match the device that you will connect to.**

- Baud Rate
- Data Bits
- Parity
- Stop Bit

**3 Select the communication protocol.**

**4 Click [Send Configuration].**

### ● Communication protocols

| Protocol | Operation |
|---|---|
| None | The read data will be output as-is.<br> |
| PASS/RTRY | 1. The read data is transferred to the host device.<br>2. The SR-X Series waits for a response from the host device. (PASS: Normal completion. RTRY: Resend request.)<br>3. PASS or RTRY is sent from the host.<br>• PASS: Transmission complete.<br>• RTRY: Resend the same read data to the host device and wait for a PASS response.<br>  |
| ACK/NAK (0x06/0x15) | *1<br>  |

*1 This protocol uses ACK/NAK (0x06/0x15) instead of "PASS" in the PASS/RTRY protocol. Other than the differences in the character strings to send, this protocol is identical to the PASS/RTRY protocol.

- PASS/RTRY communication format

| | |
|---|---|
| PASS[CR] | RTRY[CR] |
| [STX]PASS[ETX] | [STX]RTRY[ETX] |

* You can also add [ESC] at the front and [LF] at the end.

- ACK/NAK communication format

| | |
|---|---|
| [ACK] | [NAK] |

* Do not add headers or terminators.

Point

- **Precautions for using PASS/RTRY and ACK/NAK**
  - The SR-X Series can read codes while it is waiting for a response. Data read in this situation is stored in the send buffer.
  - The SR-X Series can receive commands while it is waiting for a response.
  - A send buffer overflow will occur if the SR-X Series attempts to store more data than its send buffer can hold.
- **Send buffer capacity**

| | |
|---|---|
| Send buffer capacity | 20 KB |

- **Operation when a send buffer overflow occurs**
  - "E4 BUFFER OVER" is shown on the SR-X Series display.
  - ERR BUSY is output.
  - All data stored in the buffer is discarded.
- **Recovering from a send buffer overflow**
  - Restart the SR-X Series.
  - Send the buffer clear command "BCLR" to the SR-X Series.
  - Send the reset command "RESET" to the SR-X Series.
  - Send PASS (ACK) to the SR-X Series. If PASS (ACK) is sent to the SR-X Series when a buffer error occurs, the character string "OVER" is output, resulting in an error. Restore the operation by sending the next PASS (ACK).
  - If you restart the SR-X Series, send the buffer clear command, or send the reset command it when a buffer overflow has not occurred, all the data in the send buffer will be cleared.

# 13-2 Socket Communication (TCP, UDP)

The SR-X Series supports the following types of Ethernet socket communication.
- TCP
- UDP

## Ethernet Communication Settings Defaults

BOOTP state
The following are the default settings when BOOTP is disabled.

| | |
|---|---|
| IP address | 192168100100 |
| Subnet Mask | 255.255.255.0 (24 bits) |
| Default Gateway | 0.0.0.0 |

## TCP Settings

1. **Open the [Ethernet] tab.**
2. **Enter the [IP address] and [Subnet Mask] settings to assign to the SR-X Series.**
3. **Start [Setup Wizard].**
4. **STEP 1 Select the trigger input method.**
5. **STEP 2 Select the device to connect to.**
6. **STEP 3 Select [TCP].**
7. **STEP 4 Configure connection destination settings such as [IP Address] and [Port].**
8. **Exit [Setup Wizard].**
9. **Click [Send Configuration].**

## UDP Settings

1. **Open the [Ethernet] tab.**
2. **Enter the [IP address] and [Subnet Mask] settings to assign to the SR-X Series.**
3. **Start [Setup Wizard].**
4. **STEP 1 Select the trigger input method.**
5. **STEP 2 Select the device to connect to.**
6. **STEP 3 Select [UDP].**
7. **STEP 4 Configure connection destination settings such as [IP Address] and [Port].**
8. **Exit [Setup Wizard].**
9. **Click [Send Configuration].**

## Settings During Socket Communication

### TCP client connection timing

| | |
|---|---|
| After reading | TCP communication does not start when power is turned on.<br>After reading, TCP connections are established. |
| Immediately after power up | TCP communication starts when power is turned on.<br>If TCP communication is not established, try to establish TCP communication at a period of 10 sec. |

### Keep Alive

This function checks whether the connection established with a remote device is still alive. This is used to discard the old communication session when a half-open connection state is entered.

#### ● Operating condition

This function activates when no communication is made for 60 seconds.

#### ● Operation details

A Keep packet is sent to the remote device and the response is checked.
- Response: Keep the connection established.
- No response: If there is no response to the Keep packet, a retry is performed at an interval of 10 sec. If no response is received after 2 retries, the connection is cut off.

# 14 Command Communication


**14-1 Command Communication 106**

What Is Command Communication? 106
Command Communication Format 106
Command Communication Process 106
Return of Command Error Code 106

**14-2 Reading and Tuning Commands 107**

Operation Commands 107

**14-3 SR-X Series Configuration Commands 109**

Configuration Commands 109
Parameter Bank Configuration Commands (WB/RB) 109
Tuning Code Setting Command Format (WC/RC) 112
Operation Configuration Commands (WP/RP) 113
Region Configuration Commands (WD/RD) 117
Communication Configuration Commands (WN/RN) 117
Setting/Confirmation Command Batch Transmission (WA/RA) 121
Each Setting/Confirmation Command Format 121

# 14-1 Command Communication

## What Is Command Communication?

By sending commands from a PLC or PC, you can start reading and change the settings of the SR-X Series.

### Command communication interfaces

The following two command communication paths are available.
- RS-232C (serial communication)
- Ethernet (TCP socket communication)

### Types of commands

The following two types of commands are available.
- Operation commands: Commands used to control operations such as reading and tuning.
- Configuration commands: Commands used to change or check the settings.

## Command Communication Format

### Format

| Header | Command | Terminator |
|---|---|---|

When formatting commands, the following three combinations of headers and terminators are available.

| | Command format | | Response format | |
|---|---|---|---|---|
| | Header | Terminator | Header | Terminator |
| (1) | None | [CR] | None | [CR] |
| (2) | None | [CR] + [LF] | None | [CR] |
| (3) | [STX] | [ETX] | [STX] | [ETX] |

Example) Sending the command to turn on the OUT1 terminal (OUTON,1)

| | |
|---|---|
| Command | OUTON,1[CR] |
| Response | OK,OUTON[CR] |

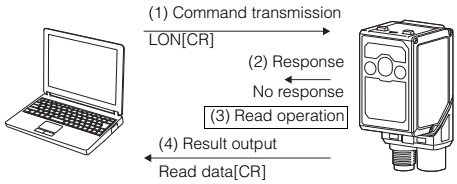
Point
- Commands are sent and received in ASCII code.
- If ESC is appended at the beginning of the command, ESC will clear the receive buffer of the SR-X Series. If communication cannot be completed correctly due to the presence of unnecessary characters in the receive buffer of the SR-X Series, append ESC to the command and send it.
  Example) [ESC]LON[CR]
- Set the character interval to less than 10 seconds when sending commands to the SR-X Series. If 10 seconds elapse, the SR-X Series will delete all received characters from the buffer.

## Command Communication Process

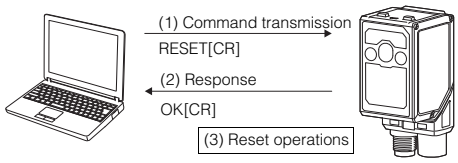
**1 The host (PC or PLC) sends a command to the SR-X Series.**

The SR-X Series sends a response and operates according to the command.

Example 1) Operation command "LON"




Example 2) Operation command "RESET"




## Return of Command Error Code

After receiving a command, if the corresponding processing fails, the SR-X Series returns an error code in response.

### Response format

| Header | ER, | Command name | , | Error code | Terminator |
|---|---|---|---|---|---|

Example) When an undefined command is received.

| | |
|---|---|
| Command | ABCD[CR] |
| Response | ER,ABCD,00[CR] |

### Command error codes

| Error code | Explanation |
|---|---|
| 00 | Undefined command received |
| 01 | Mismatched command format<br>(Invalid number of parameters) |
| 02 | The parameter 1 value exceeds the set value |
| 03 | The parameter 2 value exceeds the set value |
| 04 | Parameter 2 is not set in HEX (hexadecimal) code |
| 05 | Parameter 2 set in HEX (hexadecimal) code but exceeds the set value |
| 10 | There are 2 or more ! marks in the preset data<br>Preset data is incorrect |
| 11 | Area specification data is incorrect |
| 12 | Specified file does not exist |
| 13 | "mm" for the %Tmm-LON,bb command exceeds the setting range. |
| 14 | Communication cannot be checked with the %Tmm-KEYENCE command. |
| 20 | This command is not executable in the current status<br>(execution error) |
| 21 | The buffer has overflowed, so commands cannot be executed |
| 22 | An error occurred while loading or saving parameters,<br>so commands cannot be executed |
| 23 | Commands cannot be received because reader is connected to AutoID Network Navigator. |
| 99 | SR-X Series may be faulty. Please contact your nearest KEYENCE sales office. |

Point
- For the following commands, no response is returned when the command is received or if an error occurs. Only the reading results are output.
  "LON," "LOFF," "PRON," and "PROFF"
- If you want to receive responses to the above commands, configure the following setting.
  On the [Table] tab, click [Format], and then set "Basic command response string."
- For the following commands, the response is "OK" if the command is processed successfully or "ER" if an error occurs.
  "TUNE," "QUIT," "RESET," and "BCLR"

# 14-2 Reading and Tuning Commands

## Operation Commands

### Starting/finishing reading

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Start reading | **LON** | - | - |
| Start reading (bank specification) | **LON,b (LONb)** | b=01 to 16 | - |
| Stop reading | **LOFF** | - | - |

When reading is successful, the read data is output.
When reading fails, "ERROR" is output.

### Tuning

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Focus adjustment | **FTUNE** | - | OK,FTUNE*1 |
| Start tuning | **TUNE,b (TUNEb)** | b=01 to 16 Bank number | OK*2 |
| Finish tuning | **TQUIT** | - | OK |

*1 When the focus adjustment is complete, the result is output in the following formats. The result is saved in the ROM.
Success: Focus Tuning SUCCEEDED
Failure: Focus Tuning FAILED

*2 When the tuning operation is complete, the result is output in the following formats.
When tuning is successful: Tuning SUCCEEDED,tms,00000x00
When tuning fails: Tuning FAILED,tms,00000x0y
t: Tuning time
x: Advice
0: None
1: Use an image filter. 2: Consider the installation, lighting, and printing conditions.
4: The brightness is insufficient.
y: Failure reason
1: Code detection impossible. 2: Unstable reading.

### Preset data registration

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Start reading for preset data registration | **PRON** | - | * |
| Finish reading for preset data registration | **PROFF** | - | * |

* For details on responses during preset registration, refer to "10-9 Preset Data Comparison" (Page 87).

### Reading quick setup codes

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Start quick setup code reading | **RCON** | - | OK,RCON |
| Finish quick setup code reading | **RCOFF** | - | OK,RCOFF |
| Quick setup code reading status check | **RCCHK** | - | (Obtained value) |

### Test mode

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Reading rate test | **TEST1** | - | OK,TEST1 |
| Reading rate test (bank specification) | **TEST1,b** | b=01 to 16 | OK,TEST1 |
| Read time test | **TEST2** | - | OK,TEST2 |
| Read time test (bank specification) | **TEST2,b** | b=01 to 16 | OK,TEST2 |
| Quit test mode | **QUIT** | - | OK,QUIT |

### I/O terminal control

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Input terminal status check | **INCHK,n** | n=1 :IN1<br>2 :IN2 | OK,INCHK,m<br>m = OFF: The terminal is off.<br>ON: The terminal is on. |
| Turn on an output terminal | **OUTON,n** | n=1 :OUT1<br>2 :OUT2<br>3 :OUT3 | OK,OUTON |
| Turn off an output terminal | **OUTOFF,n** | n=1 :OUT1<br>2 :OUT2<br>3 :OUT3 | OK,OUTOFF |
| Turn on OUT1 to OUT3 | **ALLON** | - | OK,ALLON |
| Turn off OUT1 to OUT3 | **ALLOFF** | - | OK,ALLOFF |

### Reset

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Reset | **RESET** | - | OK |

The SR-X Series is reset after it outputs a response.

### Send buffer clear

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Send buffer clear | **BCLR** | - | OK |

Clear the send buffer of the SR-X Series.

### Checking the reading history

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Check the reading history | **NUM** | - | OK,NUM,a,b,c,d,e<br>a: OK count<br>b: NG count<br>c: ERROR count<br>d: STABLE count<br>e: Trigger input count (0 to 65535) |
| Bank usage count history | **NUMB** | - | OK,NUMB,b1,b2,..., b16,n<br>b1 to b16: Reading count of bank 1 to bank 16<br>n: Trigger input count (0 to 4294967295) |

Acquire the counts corresponding to the time from when the reader turned on to the present point in time.
Turning the power off or sending a RESET command resets the counts to 0.
If the trigger input count reaches its upper limit, all values will be reset to 0.

### Image scanning control

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Capture execution | **SHOT,b (SHOTb)** | b: 01 to 16 Bank number | OK,SHOT,A:¥IMAGE¥a<br>a: Image file name |

Capture an image (only one time) for the specified bank.

### Forced control of reading and scanning

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Cancel operation*1 | **CANCEL** | - | OK,CANCEL |
| Trigger lock*2 | **LOCK** | - | OK,LOCK |
| Lock release*2 | **UNLOCK** | - | OK,UNLOCK |
| Obtain the trigger lock status*2 | **RLOCK** | - | OK,RLOCK,m<br>m:LOCK<br>UNLOCK |

*1 You will not receive reading error codes when you execute a CANCEL command.

*2 If you send the LOCK command, reading operations will be locked until you send the UNLOCK command.

### Pointer control

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Turn the pointer on | **AMON** | - | OK,AMON |
| Turn the pointer off | **AMOFF** | - | OK,AMOFF |

## Time settings

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Set the time | **TMSET,t** | t* | OK,TMSET |
| Check the time | **TMGET** | - | OK,TMGET,t* |

* t: YYYY = Year (4 bytes) MM = Month (2 bytes) DD = Day (2 bytes)
hh = Hour (2 bytes) mm = Minute (2 bytes) ss = Second (2 bytes)

## Confirmation during script file execution

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Script processing time | **SCPTIME** | - | OK,SCPTIME,<br>now=Aus,<br>max=Bus,<br>min=Cus<br>A: The execution time of the immediately previous script<br>B: The maximum processing time<br>C: The minimum processing time |
| Script debugging | **SCPDBG,n** | n=0: Debugging off<br>1: Debugging on | OK,SCPDBG |
| Obtain the script error | **SCPERR** | - | OK,SCPERR,m<br>m: Error character string |
| Obtain the script version | **SCPVER** | - | OK,SCPVER,m,n<br>m: Script library version<br>n: Version written in FmtSet.Lua |

## Saving/loading settings

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Save settings* | **SAVE** | - | OK,SAVE |
| Load saved settings | **LOAD** | - | OK,LOAD |
| Initialize settings | **DFLT** | - | OK,DFLT |

* If you turn the power off before executing the SAVE command, the settings that you have configured will be discarded.

## Other commands

| Function | Command name | Parameter | Response |
|---|---|---|---|
| Version confirmation | **KEYENCE** | - | OK,KEYENCE,x,y<br>x = SR-X100, SR-X300: Model<br>y: Version |
| Obtain the command status | **CMDSTAT** | - | OK,CMDSTAT,m<br>m = none: No processing<br>wait: Wait for setting application<br>update: Updating |
| Obtain the MAC address | **EMAC** | - | OK,EMAC,n<br>n = MAC address (12 bytes) |
| Obtain the error status | **ERRSTAT** | - | OK,ERRSTAT,m<br>m = none: No error<br>system: System error<br>update: Update error<br>cfg: Set value error<br>ip: IP address duplication<br>over: Buffer overflow<br>plc: PLC link error<br>profinet: PROFINET error<br>lua: Script error<br>hostconnect:Host connection error |
| Obtain the BUSY status | **BUSYSTAT** | - | OK,BUSYSTAT,m<br>m = none: No processing<br>trg:TRG BUSY<br>update: Update processing<br>file: Saving the file<br>af: Moving the autofocus lens |
| Clear the PLC link error | **PCLR** | - | OK,PCLR |
| Clear the FTP communication error | **HCLR** | - | OK,HCLR |
| Save backup settings | **BSAVE,n** | n: 1 - 256 (SR-X300/X300W)<br>n: 1 - 8 (SR-X100/X100W)<br>(config1.ptc - config256.ptc) | OK,BSAVE |
| Load backup settings | **BLOAD,n** | n: 1 - 256 (SR-X300/X300W)<br>n: 1 - 8 (SR-X100/X100W)<br>(config1.ptc - config256.ptc) | OK,BLOAD |
| Copy bank configuration | **BCOPY,m,n** | m: Copy source<br>n: Copy destination | OK,BCOPY |
| Set the calibration brightness value | **VCALIB,m** | m=1:Polarized light<br>2:Direct light<br>3:Diffused light<br>(SR-X300/X300W only) | OK,VCALIB*1 |

*1 Executing this command will output the result in the following formats.
Success:VCALIB SUCCEEDED,m,n
Failure:VCALIB FAILED,m,n
n:Calibration brightness

# 14-3 SR-X Series Configuration Commands

## Configuration Commands

The following six types of configuration commands are available.

- Parameter bank configuration commands (WB/RB)
- Code configuration commands for tuning (WC/RC)
- Region setting commands (WD/RD)
- Operation configuration commands (WP/RP)
- Communication configuration commands (WN/RN)
- Batch transmission of setting/confirmation commands (WA/RA)

Point

- Send the SAVE command to save the contents changed by configuration commands in the memory. If you do not send the SAVE command, when the power is turned off or the RESET command is received, the settings will return to the state that they were in before they were changed.
- The setting contents sent during SR-X operations are applied when the current operation finishes, not after the response to the command is sent.

## Parameter Bank Configuration Commands (WB/RB)

Parameter bank configuration command is sent in the following format:

### Configuration changes

| Send command | | WB,bm,n |
|---|---|---|
| Response | Successful | OK,WB |
| | Error | ER,WB,ee |

### Settings confirmation

| Send command | | RB,bm |
|---|---|---|
| Response | Successful | OK,RB,n |
| | Error | ER,RB,ee |

b: Parameter bank (01-16)
m: Command number, n: Setting
ee: Error code

Example) Setting the Exposure of the parameter bank 1 to 300 µs.

Configuration change

| Send command | WB,01100,0300 |
|---|---|
| Response (Normal process) | OK,WB |

Configuration confirmation

| Send command | RB,01100 |
|---|---|
| Response (Normal process) | OK,RB,0300 |

### Bank name

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Bank name | 625 | aaaa... | ASCII setting (max. 32 characters) | |

### Scan condition setting

| Function | | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|---|
| Lighting | Internal lighting use | 000 | 0, 1 | 0: Do not use<br>1: Use | 1 |
| | External lighting use | 004 | 0, 1 | 0: Do not use<br>1: Use | 0 |
| Type of internal lighting | | 010 | 0 to 2 | 0: Direct light<br>1: Polarized light<br>2: Diffused light<br>(SR-X300/X300W only) | 0 |
| Scanning | Exposure time | 100 | 12 to 10000 | Exposure time (µs) | 1535 |
| | Gain | 101 | 0 to 50 | - | 10 |
| Contrast adjustment method | | 108 | 0 to 3 | 0: Standard<br>1: HDR<br>2: HDR2<br>3: Contrast zoom | 0 |
| AI filter | | 519 | 0, 1 | 0: Disable<br>1: Enable | 1 |
| Contrast threshold correction | | 506 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Filter setting | 1st filter type | 200 | 0 to 7 | 0: Disable<br>1: Equalize<br>2: Expand<br>3: Shrink<br>4: Open<br>5: Close<br>6: Median<br>7: Unsharp Mask | 0 |
| | 2nd filter type | 201 | | | |
| | 3rd filter type | 202 | | | |
| | 4th filter type | 203 | | | |
| | 1st filter count | 210 | 1to 7 | Specify with count | 1 |
| | 2nd filter count | 211 | | | |
| | 3rd filter count | 212 | | | |
| | 4th filter count | 213 | | | |

### Code settings

| Function | | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|---|
| Code type | | 300 | 1 to 11FFFF | Specify codes using bit assignment and set as HEX values<br>1st bit: QR<br>2nd bit: Data Matrix<br>3rd bit: PDF417 (microPDF 417)<br>4th bit: MaxiCode<br>5th bit: GS1 DataBar(RSS)<br>6th bit: CODE 39 (Trioptic CODE 39)<br>7th bit:: ITF<br>8th bit: 2 of 5<br>9th bit: NW-7 (Codebar)<br>10th bit: JAN/EAN/UPC<br>11th bit: CODE 128<br>12th bit: COOP 2 of 5<br>13th bit: CODE 93<br>14th bit: CC-A/B (GS1 DataBar)<br>15th bit: CC-A/B (EAN/UPC)<br>16th bit: CC-A/B/C (GS-128)<br>17th bit: Postal<br>18th bit: Pharmacode<br>20th bit: DotCode<br>21st bit: Aztec Code | 11FFFF |
| Output length limitation | | 306 | 0,1 | 0: Disable<br>1: Enable | 0 |
| Direction of output | | 307 | 0,1 | 0: Forward<br>1: Backward | 0 |
| Length of output | | 308 | 1 to 7089 | | 7089 |
| Starting index of output | | 309 | 1 to 7089 | | 1 |
| ECI output | | 310 | 0,1 | 0: Disable<br>1: Enable | 0 |
| QR code length limitation method | | 700 | 0,1 | 0: Specify range<br>1: Specify value | 0 |
| QR code length limitation value specification | | 701 | a:b:c:d:e | a: 0 (Disable), 1 to 7089<br>b: 0 (Disable), 1 to 7089<br>c: 0 (Disable), 1 to 7089<br>d: 0 (Disable), 1 to 7089<br>e: 0 (Disable), 1 to 7089 | 0:0:0:0:0 |
| QR code setting | | 321 | 1 to 7089 | Maximum read length | 7089 |
| | | 322 | 1 to 7089 | Minimum read length | 1 |
| QR code version settings | Model 1 | 400 | 0000 to 3FFF | Specifies version 1 to 14 with bit assign and set with HEX. | 3FFF |
| | Model 2 (1 - 20) specification | 401 | 00000 to FFFFF | Specifies version 1 to 20 with bit assign and set with HEX. | FFFFF |
| | Model 2 (21 - 40) specification | 402 | 00000 to FFFFF | Specifies version 21 to 40 with bit assign and set with HEX. | FFFFF |
| | Micro QR (M1 - M4) | 403 | 0 to F | Specifies version M1 to M4 with bit assign and set with HEX. | F |
| Grid correction | | 500 | 0, 1 | 0: Disable<br>1: Enable<br>2: Automatic | 2 |
| DataMatrix length limitation method | | 702 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| DataMatrix length limitation value specification | | 703 | a:b:c:d:e | a: 0 (Disable), 1 to 3116<br>b: 0 (Disable), 1 to 3116<br>c: 0 (Disable), 1 to 3116<br>d: 0 (Disable), 1 to 3116<br>e: 0 (Disable), 1 to 3116 | 0:0:0:0:0 |
| Data Matrix setting | | 323 | 1 to 3116 | Maximum read length | 3116 |
| | | 324 | 1 to 3116 | Minimum read length | 1 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Specify the reading target size of DataMatrix code | 410 | 0000000 to 3FFFFFFF | Specifies the code size of DataMatrix code with bit assign and set with HEX.<br>■Square<br>1st bit: 10x10<br>2nd bit: 12x12<br>3rd bit: 14x14<br>4th bit: 16x16<br>5th bit: 18x18<br>6th bit: 20x20<br>7th bit: 22x22<br>8th bit: 24x24<br>9th bit: 26x26<br>10th bit: 32x32<br>11th bit: 36x36<br>12th bit: 40x40<br>13th bit: 44x44<br>14th bit: 48x48<br>15th bit: 52x52<br>16th bit: 64x64<br>17th bit: 72x72<br>18th bit: 80x80<br>19th bit: 88x88<br>20th bit: 96x96<br>21st bit: 104x104<br>22nd bit: 120x120<br>23rd bit: 132x132<br>24th bit: 144x144<br>■Rectangle<br>25th bit: 8x18<br>26th bit: 8x32<br>27th bit: 12x26<br>28th bit: 12x36<br>29th bit: 16x36<br>30th bit: 16x48 | 3FFFFFFF |
| DMRE code reading target size specification | 820 | 0 to 3FFFF | Specify the code size of DMRE code using bit assignment and set as HEX values<br>1st bit: 8x48<br>2nd bit: 8x64<br>3rd bit: 8x80<br>4th bit: 8x96<br>5th bit: 8x120<br>6th bit: 8x144<br>7th bit: 12x64<br>8th bit: 12x88<br>9th bit: 16x64<br>10th bit: 20x36<br>11th bit: 20x44<br>12th bit: 20x64<br>13th bit: 22x48<br>14th bit: 24x48<br>15th bit: 24x64<br>16th bit: 26x40<br>17th bit: 26x48<br>18th bit: 26x64 | 0 |
| PDF417 length limitation method | 704 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| PDF417 length limitation value specification | 705 | a:b:c:d:e | a: 0 (Disable), 1 to 2710<br>b: 0 (Disable), 1 to 2710<br>c: 0 (Disable), 1 to 2710<br>d: 0 (Disable), 1 to 2710<br>e: 0 (Disable), 1 to 2710 | 0:0:0:0:0 |
| PDF417 settings | 420 | 1 to 3 | PDF417 read code type settings<br>1: PDF417 only<br>2: MicroPDF only<br>3: PDF417 and MicroPDF | 3 |
| | 325 | 1 to 2710 | Maximum read length | 2710 |
| | 326 | 1 to 2710 | Minimum read length | 1 |
| | 658 | 2 to 8 | Number of decode matches | 2 |
| MaxiCode length limitation method | 734 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| MaxiCode length limitation value specification | 735 | a:b:c:d:e | a: 0 (Disable), 1 to 138<br>b: 0 (Disable), 1 to 138<br>c: 0 (Disable), 1 to 138<br>d: 0 (Disable), 1 to 138<br>e: 0 (Disable), 1 to 138 | 0:0:0:0:0 |
| MaxiCode settings | 475 | 1 to 138 | Maximum read length | 138 |
| | 476 | 1 to 138 | Minimum read length | 1 |
| GS1 DataBar length limitation method | 706 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| GS1 DataBar length limitation value specification | 707 | a:b:c:d:e | a: 0 (Disable), 1 to 77<br>b: 0 (Disable), 1 to 77<br>c: 0 (Disable), 1 to 77<br>d: 0 (Disable), 1 to 77<br>e: 0 (Disable), 1 to 77 | 0:0:0:0:0 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| GS1 DataBar settings | 327 | 1 to 77 | Maximum read length | 77 |
| | 328 | 1 to 77 | Minimum read length | 1 |
| | 659 | 2 to 8 | Number of decode matches | 2 |
| | 681 | 0 to 11 | Limited right space ratio | 4 |
| | 390 | 0.1 | GS1 DataBar Omnidirectional/ Truncated<br>0: Disable<br>1: Enable | 1 |
| | 391 | 0.1 | GS1 DataBar Stacked/ StackedOmnidirectional<br>0: Disable<br>1: Enable | 1 |
| | 392 | 0.1 | GS1 DataBar Limited<br>0: Disable<br>1: Enable | 1 |
| | 393 | 0.1 | GS1 DataBar Expanded<br>0: Disable<br>1: Enable | 1 |
| | 394 | 0.1 | GS1 DataBar ExpandedStacked<br>0: Disable<br>1: Enable | 1 |
| | 395 | 2 to 11 | GS1 DataBar Expanded Stacked (Number of rows) minimum | 2 |
| | 396 | 2 to 11 | GS1 DataBar Expanded Stacked (Number of rows) maximum | 11 |
| CODE39 length limitation method | 708 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| CODE39 length limitation value specification | 709 | a:b:c:d:e | a: 0 (Disable), 3 to 50<br>b: 0 (Disable), 3 to 50<br>c: 0 (Disable), 3 to 50<br>d: 0 (Disable), 3 to 50<br>e: 0 (Disable), 3 to 50 | 0:0:0:0:0 |
| CODE39 settings | 329 | 3 to 50 | Maximum read length | 50 |
| | 330 | 3 to 50 | Minimum read length | 3 |
| | 660 | 2 to 8 | Number of decode matches | 2 |
| | 682 | 1 to 11 | Quiet zone ratio | 4 |
| | 375 | 0.1 | Send start/stop characters<br>0: Disable<br>1: Enable | 0 |
| | 376 | 0.1 | Inspect check-digit<br>0: Disable<br>1: Enable | 0 |
| | 377 | 0.1 | Send check-digit<br>0: Disable<br>1: Enable | 1 |
| | 378 | 0.1 | Trioptic CODE39 reading<br>0: Disable<br>1: Enable | 1 |
| | 379 | 0.1 | Full ASCII conversion<br>0: Disable<br>1: Enable | 0 |
| ITF length limitation method | 710 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| ITF length limitation value specification | 711 | a:b:c:d:e | a: 0 (Disable), 2 to 50<br>b: 0 (Disable), 2 to 50<br>c: 0 (Disable), 2 to 50<br>d: 0 (Disable), 2 to 50<br>e: 0 (Disable), 2 to 50 | 0:0:0:0:0 |
| ITF settings | 331 | 2 to 50 | Maximum read length | 50 |
| | 332 | 2 to 50 | Minimum read length | 6 |
| | 661 | 2 to 8 | Number of decode matches | 3 |
| | 683 | 1 to 11 | Quiet zone ratio | 5 |
| | 385 | 0.1 | Inspect check-digit<br>0: Disable<br>1: Enable | 0 |
| | 386 | 0.1 | Send check-digit<br>0: Disable<br>1: Enable | 1 |
| 2of5 length limitation method | 712 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| 2of5 length limitation value specification | 713 | a:b:c:d:e | a: 0 (Disable), 1 to 50<br>b: 0 (Disable), 1 to 50<br>c: 0 (Disable), 1 to 50<br>d: 0 (Disable), 1 to 50<br>e: 0 (Disable), 1 to 50 | 0:0:0:0:0 |
| 2 of 5 settings | 333 | 1 to 50 | Maximum read length | 50 |
| | 334 | 1 to 50 | Minimum read length | 4 |
| | 662 | 2 to 8 | Number of decode matches | 3 |
| | 684 | 1 to 11 | Quiet zone ratio | 4 |
| NW7 (CodaBar) length limitation method | 714 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| NW7 (CodaBar) length limitation value specification | 715 | a:b:c:d:e | a: 0 (Disable), 3 to 50<br>b: 0 (Disable), 3 to 50<br>c: 0 (Disable), 3 to 50<br>d: 0 (Disable), 3 to 50<br>e: 0 (Disable), 3 to 50 | 0:0:0:0:0 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| NW-7 (Codabar) settings | 335 | 3 to 50 | Maximum read length | 50 |
| | 336 | 3 to 50 | Minimum read length | 4 |
| | 663 | 2 to 8 | Number of decode matches | 2 |
| | 685 | 1 to 11 | Quiet zone ratio | 5 |
| | 380 | 0.1 | Send start/stop characters<br>0: Disable<br>1: Enable | 1 |
| | 381 | 0.1 | Send start/stop characters letter type<br>0: as lowercase<br>1: as UPPERCASE | 0 |
| | 382 | 0.1 | Inspect check-digit<br>0: Disable<br>1: Enable | 0 |
| | 383 | 0.1 | Send check-digit<br>0: Disable<br>1: Enable | 1 |
| | 384 | 0 to 6 | Check-digit type<br>0: : Modulus 16<br>1: : Modulus 11<br>2: : Modulus 10/Weight 2<br>3: : Modulus 10/Weight 3<br>4: : Check DR<br>5: : Modulus 11<br>6: : Luhn | 0 |
| JAN/EAN/UPC settings | 664 | 2 to 8 | Number of decode matches | 2 |
| | 686 | 1 to 11 | Quiet zone ratio | 3 |
| | 350 | 0.1 | UPC-E reading<br>0: Disable<br>1: Enable | 1 |
| | 351 | 0.1 | EAN/JAN 8 digits reading<br>0: Disable<br>1: Enable | 1 |
| | 352 | 0.1 | EAN/JAN 13 digits reading<br>0: Disable<br>1: Enable | 1 |
| | 353 | 0.1 | UPC-A Output<br>0: Output in 13 digits<br>1: Output in 12 digits | 0 |
| | 354 | 0.1 | Add "number system" to UPC-E<br>0: Disable<br>1: Enable | 0 |
| | 355 | 0.1 | 2-digit supplemental<br>0: Disable<br>1: Enable | 1 |
| | 356 | 0.1 | 5-digit supplemental<br>0: Disable<br>1: Enable | 1 |
| | 357 | 0.1 | Ignore UPC without supplemental<br>0: Disable<br>1: Enable | 0 |
| | 358 | 0.1 | GTIN compatible 14-digit output<br>0: Disable<br>1: Enable | 0 |
| CODE128 length limitation method | 716 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| CODE128 length limitation value specification | 717 | a:b:c:d:e | a: 0 (Disable), 1 to 100<br>b: 0 (Disable), 1 to 100<br>c: 0 (Disable), 1 to 100<br>d: 0 (Disable), 1 to 100<br>e: 0 (Disable), 1 to 100 | 0:0:0:0:0 |
| CODE128 settings | 337 | 1 to 100 | Maximum read length | 100 |
| | 338 | 1 to 100 | Minimum read length | 1 |
| | 665 | 2 to 8 | Number of decode matches | 2 |
| | 687 | 1 to 11 | Quiet zone ratio | 3 |
| | 366 | 0.1 | GS1-128<br>0 : Disable<br>1 : Enable | 1 |
| COOP 2of5 length limitation method | 718 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| COOP 2of5 length limitation value specification | 719 | a:b:c:d:e | a: 0 (Disable), 1 to 50<br>b: 0 (Disable), 1 to 50<br>c: 0 (Disable), 1 to 50<br>d: 0 (Disable), 1 to 50<br>e: 0 (Disable), 1 to 50 | 0:0:0:0:0 |
| COOP 2 of 5 settings | 339 | 1 to 50 | Maximum read length | 50 |
| | 340 | 1 to 50 | Minimum read length | 4 |
| | 666 | 2 to 8 | Number of decode matches | 3 |
| | 688 | 1 to 11 | Quiet zone ratio | 4 |
| CODE93 length limitation method | 720 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| CODE93 length limitation value specification | 721 | a:b:c:d:e | a: 0 (Disable), 1 to 50<br>b: 0 (Disable), 1 to 50<br>c: 0 (Disable), 1 to 50<br>d: 0 (Disable), 1 to 50<br>e: 0 (Disable), 1 to 50 | 0:0:0:0:0 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| CODE 93 settings | 341 | 1 to 50 | Maximum read length | 50 |
| | 342 | 1 to 50 | Minimum read length | 1 |
| | 667 | 2 to 8 | Number of decode matches | 2 |
| | 689 | 1 to 11 | Quiet zone ratio | 4 |
| GS1 composite CC-A/B (GS1 DataBar) length limitation method | 722 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| GS1 composite CC-A/B (GS1 DataBar) length limitation value specification | 723 | a:b:c:d:e | a: 0 (Disable), 1 to 338<br>b: 0 (Disable), 1 to 338<br>c: 0 (Disable), 1 to 338<br>d: 0 (Disable), 1 to 338<br>e: 0 (Disable), 1 to 338 | 0:0:0:0:0 |
| GS1 composite CC-A/B (GS1 DataBar) settings | 343 | 1 to 338 | Maximum read length | 338 |
| | 344 | 1 to 338 | Minimum read length | 1 |
| GS1 composite CC-A/B (EAN/UPC) length limitation method | 724 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| GS1 composite CC-A/B (EAN/UPC) length limitation value specification | 725 | a:b:c:d:e | a: 0 (Disable), 1 to 338<br>b: 0 (Disable), 1 to 338<br>c: 0 (Disable), 1 to 338<br>d: 0 (Disable), 1 to 338<br>e: 0 (Disable), 1 to 338 | 0:0:0:0:0 |
| GS1 composite CC-A/B (EAN/UPC) settings | 345 | 1 to 338 | Maximum read length | 338 |
| | 346 | 1 to 338 | Minimum read length | 1 |
| GS1 composite CC-A/B (GS1-128) length limitation method | 726 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| GS1 composite CC-A/B (GS1-128) length limitation value specification | 727 | a:b:c:d:e | a: 0 (Disable), 1 to 2361<br>b: 0 (Disable), 1 to 2361<br>c: 0 (Disable), 1 to 2361<br>d: 0 (Disable), 1 to 2361<br>e: 0 (Disable), 1 to 2361 | 0:0:0:0:0 |
| GS1 composite CC-A/B/C (GS1-128) settings | 347 | 1 to 2361 | Maximum read length | 2361 |
| | 348 | 1 to 2361 | Minimum read length | 1 |
| CC-A/B/C (GS1-128) reading | 437 | 0.1 | CC-C code reading<br>0: Disable<br>1: Enable | 1 |
| Postal length limitation method | 728 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| Postal length limitation value specification | 729 | a:b:c:d:e | a: 0 (Disable), 1 to 31<br>b: 0 (Disable), 1 to 31<br>c: 0 (Disable), 1 to 31<br>d: 0 (Disable), 1 to 31<br>e: 0 (Disable), 1 to 31 | 0:0:0:0:0 |
| Postal settings | 447 | 1 to 31 | Maximum read length | 31 |
| | 448 | 1 to 31 | Minimum read length | 1 |
| | 446 | 0.1 | Japan Postal code reading<br>0: Disable<br>1: Enable | 1 |
| | 443 | 0.1 | Intelligent Mail Barcode reading<br>0: Disable<br>1: Enable | 1 |
| Maximum number of Pharmacode bars | 440 | 2 to 16 | Specified by the number of bars | 16 |
| Minimum number of Pharmacode bars | 441 | 2 to 16 | Specified by the number of bars | 9 |
| Pharmacode settings | 669 | 2 to 8 | Number of decode matches | 2 |
| | 690 | 1 to 11 | Quiet zone ratio | 9 |
| | 530 | 0 to 3 | Read direction<br>0: Left to right<br>1: Right to left<br>2: Downward<br>3: Upward | 0 |
| | 442 | 0.1 | Output in binary format<br>0: Disable<br>1: Enable | 0 |
| DotCode length limitation method | 730 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| DotCode length limitation value specification | 731 | a:b:c:d:e | a: 0 (Disable), 1 to 1124<br>b: 0 (Disable), 1 to 1124<br>c: 0 (Disable), 1 to 1124<br>d: 0 (Disable), 1 to 1124<br>e: 0 (Disable), 1 to 1124 | 0:0:0:0:0 |
| DotCode | 460 | 1 to 1124 | Maximum read length | 1124 |
| | 461 | 1 to 1124 | Minimum read length | 1 |
| | 462 | 5 to 124 | Number of rows (maximum) | 124 |
| | 463 | 5 to 124 | Number of rows (minimum) | 6 |
| | 464 | 5 to 124 | Number of columns (maximum) | 124 |
| | 465 | 5 to 124 | Number of columns (minimum) | 6 |
| Aztec Code length limitation method | 732 | 0.1 | 0: Specify range<br>1: Specify value | 0 |
| Aztec Code length limitation value specification | 733 | a:b:c:d:e | a: 0 (Disable), 1 to 3832<br>b: 0 (Disable), 1 to 3832<br>c: 0 (Disable), 1 to 3832<br>d: 0 (Disable), 1 to 3832<br>e: 0 (Disable), 1 to 3832 | 0:0:0:0:0 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Aztec Code settings | 470 | 1 to 3832 | Maximum read length | 3832 |
| | 471 | 1 to 3832 | Minimum read length | 1 |

## Reading operation settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Alternate | 600 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Internal bank retry count | 601 | 0 to 32 | | 0 |
| Decode timeout duration | 602 | 1 to 1000 | Specify in units of 10 ms | 10 |
| Region number specification | 604 | 0 to 128 | Specifies the region number for decoding<br>0: Entire region<br>1 to 128: Region number | 0 |
| Inverse | 605 | 0 to 2 | 0: Disable<br>1: Enable<br>2: Automatic | 0 |
| Reverse | 606 | 0 to 2 | 0: Disable<br>1: Enable<br>2: Automatic | 0 |
| Base tilt angle | 607 | 0 to 359 | Unit: 1 degree | 0 |
| Tilt angle range | 608 | 0 to 180 | Unit: 1 degree<br>* Base tilt angle ± Tilt angle range will be enabled. | 180 |
| Code orientation (1D) | 613 | 0 to F | Allows reads in the following orientations.<br>First bit: * S R *<br>Second bit: * R S *<br>Third bit: * S R *<br>Fourth bit: * R S * | F |

# Tuning Code Setting Command Format (WC/RC)

Send the code setting command for tuning in the following formats.

### ● Configuration changes

| Send command | | WC,m,n |
|---|---|---|
| Response | Successful | OK,WC |
| | Error | ER,WC,ee |

### ● Settings confirmation

| Send command | | RC,m |
|---|---|---|
| Response | Successful | OK,RC,n |
| | Error | ER,RC,ee |

m: Command number, n: Setting
ee: Error code

Example) Setting the maximum read length to 1000 digits

Configuration change

| Send command | WC,0100,1000 |
|---|---|
| Response (Normal process) | OK,WC |

Configuration confirmation

| Send command | RC,0100 |
|---|---|
| Response (Normal process) | OK,RC,1000 |

## Tuning target code settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| QR code settings | 0100 | 1 to 7089 | Maximum read length | 7089 |
| | 0101 | 1 to 7089 | Minimum read length | 1 |
| DataMatrix code settings | 0200 | 1 to 3116 | Maximum read length | 3116 |
| | 0201 | 1 to 3116 | Minimum read length | 1 |
| | 1926 | 0,1 | DMRE read | 1 |
| PDF417 settings | 0300 | 1 to 2710 | Maximum read length | 2710 |
| | 0301 | 1 to 2710 | Minimum read length | 1 |
| | 0303 | 1 to 3 | Target code<br>1: PDF417<br>2: MicroPDF417<br>3: PDF417, MicroPDF417 | 3 |
| MaxiCode settings | 1924 | 1 to 138 | Maximum read length | 138 |
| | 1925 | 1 to 138 | Minimum read length | 1 |
| GS1 DataBar settings | 0500 | 1 to 77 | Maximum read length | 77 |
| | 0501 | 1 to 77 | Minimum read length | 1 |
| | 0502 | 0 to 11 | GS1 Data Bar Limited right quiet zone scale factor setting | 4 |
| | 0503 | 0.1 | GS1 DataBar Omnidirectional/ Truncated<br>0: Disable<br>1: Enable | 1 |
| | 0504 | 0.1 | GS1 DataBar Stacked/ StackedOmnidirectional<br>0: Disable<br>1: Enable | 1 |
| | 0505 | 0.1 | GS1 DataBar Limited<br>0: Disable<br>1: Enable | 1 |
| | 0506 | 0.1 | GS1 DataBar Expanded<br>0: Disable<br>1: Enable | 1 |
| | 0507 | 0.1 | GS1 DataBar ExpandedStacked<br>0: Disable<br>1: Enable | 1 |
| | 0508 | 2 to 11 | GS1 DataBar Expanded Stacked (Number of rows) minimum | 2 |
| | 0509 | 2 to 11 | GS1 DataBar Expanded Stacked (Number of rows) maximum | 11 |
| CODE39 settings | 0600 | 3 to 50 | Maximum read length | 50 |
| | 0601 | 3 to 50 | Minimum read length | 3 |
| | 0602 | 1 to 11 | Quiet zone ratio | 4 |
| | 0603 | 0.1 | Send start/stop characters<br>0: Disable<br>1: Enable | 0 |
| | 0604 | 0.1 | Inspect check-digit*<br>0: Disable<br>1: Enable | 0 |
| | 0605 | 0.1 | Send check-digit*<br>0: Disable<br>1: Enable | 1 |
| | 0606 | 0.1 | Trioptic CODE39 reading<br>0: Disable<br>1: Enable | 1 |
| | 0607 | 0.1 | Full ASCII conversion*<br>0: Disable<br>1: Enable | 0 |
| ITF settings | 0700 | 2 to 50 | Maximum read length | 50 |
| | 0701 | 2 to 50 | Minimum read length | 2 |
| | 0702 | 1 to 11 | Quiet zone ratio | 5 |
| | 0703 | 0.1 | Inspect check-digit<br>0: Disable<br>1: Enable | 0 |
| | 0704 | 0.1 | Send check-digit<br>0: Disable<br>1: Enable | 1 |
| NW-7 (Codabar) settings | 0900 | 3 to 50 | Maximum read length | 50 |
| | 0901 | 3 to 50 | Minimum read length | 3 |
| | 0902 | 1 to 11 | Quiet zone ratio | 5 |
| | 0903 | 0.1 | Send start/stop characters<br>0: Disable<br>1: Enable | 1 |
| | 0904 | 0.1 | Send start/stop characters letter type<br>0: as lowercase<br>1: as UPPERCASE | 0 |
| | 0905 | 0.1 | Inspect check-digit<br>0: Disable<br>1: Enable | 0 |
| | 0906 | 0.1 | Send check-digit<br>0: Disable<br>1: Enable | 1 |
| | 0907 | 0 to 6 | Check-digit type<br>0: Modulus 16<br>1: Modulus 11<br>2: Modulus 10/Weight 2<br>3: Modulus 10/Weight 3<br>4: Check DR<br>5: Modulus 11-A<br>6: Luhn | 0 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| JAN/EAN/UPC settings | 1002 | 1 to 11 | Quiet zone ratio | 3 |
| | 1003 | 0.1 | UPC-E reading<br>0: Disable<br>1: Enable | 1 |
| | 1004 | 0.1 | EAN/JAN 8 digits reading<br>0: Disable<br>1: Enable | 1 |
| | 1005 | 0.1 | EAN/JAN 13 digits reading<br>0: Disable<br>1: Enable | 1 |
| | 1006 | 0.1 | UPC-A Output<br>0: Output in 13 digits<br>1: Output in 12 digits | 0 |
| | 1007 | 0.1 | Add "number system" to UPC-E<br>0: Disable<br>1: Enable | 0 |
| | 1008 | 0.1 | 2-digit supplemental<br>0: Disable<br>1: Enable | 1 |
| | 1009 | 0.1 | 5-digit supplemental<br>0: Disable<br>1: Enable | 1 |
| | 1010 | 0.1 | Ignore UPC without supplemental<br>0: Disable<br>1: Enable | 0 |
| | 1011 | 0.1 | GTIN compatible 14-digit output<br>0: Disable<br>1: Enable | 0 |
| CODE128 | 1100 | 1 to 100 | Maximum read length | 100 |
| | 1101 | 1 to 100 | Minimum read length | 1 |
| | 1102 | 1 to 11 | Quiet zone ratio | 3 |
| | 1103 | 0.1 | GS1-128<br>0: Disable<br>1: Enable | 1 |
| 2 of 5 (Industrial 2of5) settings | 0800 | 1 to 50 | Maximum read length | 50 |
| | 0801 | 1 to 50 | Minimum read length | 1 |
| | 0802 | 1 to 11 | Quiet zone ratio | 4 |
| COOP 2 of 5 settings | 1200 | 1 to 50 | Maximum read length | 50 |
| | 1201 | 1 to 50 | Minimum read length | 1 |
| | 1202 | 1 to 11 | Quiet zone ratio | 4 |
| CODE 93 settings | 1300 | 1 to 50 | Maximum read length | 50 |
| | 1301 | 1 to 50 | Minimum read length | 1 |
| | 1302 | 1 to 11 | Quiet zone ratio | 4 |
| Postal settings | 1909 | 1 to 31 | Maximum read length | 31 |
| | 1910 | 1 to 31 | Minimum read length | 1 |
| | 1908 | 0.1 | Japan Postal code reading<br>0: Disable<br>1: Enable | 1 |
| | 1905 | 0.1 | Intelligent Mail Barcode reading<br>0: Disable<br>1: Enable | 1 |
| DotCode | 1920 | 1 to 1124 | Maximum read length | 1124 |
| | 1921 | 1 to 1124 | Minimum read length | 1 |
| Pharmacode settings | 1800 | 2 to 16 | Maximum number of bars | 16 |
| | 1801 | 2 to 16 | Minimum number of bars | 9 |
| | 1802 | 1 to 11 | Quiet zone ratio | 9 |
| | 1803 | 0 to 3 | Code direction<br>0: Left to right<br>1: Right to left<br>2: Downward<br>3: Upward | 0 |
| | 1805 | 0.1 | Binary output<br>0: Disable<br>1: Enable | 0 |
| Aztec Code settings | 1903 | 1 to 3832 | Maximum read length | 3832 |
| | 1904 | 1 to 3832 | Minimum read length | 1 |

* With the settings for reading Trioptic CODE39, this setting does not function.

Important

If you set the "Quiet zone scale factor" setting to a value that is smaller than the default value, erroneous or poor quality reading may occur. Normally use this setting with its default value.

# Operation Configuration Commands (WP/RP)

Operation configuration command is sent in the following format:

## Configuration changes

| Send command | | WP,m,n |
|---|---|---|
| Response | Successful | OK,WP |
| | Error | ER,WP,ee |

## Settings confirmation

| Send command | | RP,m |
|---|---|---|
| Response | Successful | OK,RP,n |
| | Error | ER,RP,ee |

m: Command number, n: Setting
ee: Error code

Example) When setting the timing mode to "One-shot trigger" (one-shot signal trigger)

Configuration change

| Send command | WP,101,1 |
|---|---|
| Response (Normal process) | OK,WP |

Configuration confirmation

| Send command | RP,101 |
|---|---|
| Response (Normal process) | OK,RP,1 |

## IN terminal settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| IN1 terminal function | 000 | 0 to 20 | 0: Disable<br>1: Trigger input (start and stop)<br>2: Preset input<br>3: Start test mode.<br>4: Capture<br>5: Clear PLC link error<br>6: Trigger lock<br>7: Read the quick setup code<br>8: Tuning operation<br>9: Timing input start<br>10: Timing input stop<br>14: Command replacement<br>15: Data output | 1 |
| IN2 terminal function | 001 | | | 0 |
| IN1 terminal test mode assignment | 002 | 1 to 2 | 1: Reading rate test<br>2: Tact test | 1 |
| IN2 terminal test mode assignment | 003 | | | 1 |
| Bank to assign to the IN1 terminal captured image | 004 | 1 to 16 | Bank number | 1 |
| Bank to assign to the IN2 terminal captured image | 005 | | | 1 |
| IN1 terminal input at power-on | 006 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| IN2 terminal input at power-on | 007 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| IN1 terminal Input polarity | 040 | 0.1 | 0: Normal open point<br>1: Normal close point | 0 |
| IN2 terminal Input polarity | 041 | 0.1 | 0: Normal open point<br>1: Normal close point | 0 |
| IN1 terminal input pulse width | 043 | 0 to 2 | 0: 1 ms<br>1: 2 ms<br>2: 10 ms | 0 |
| IN2 terminal input pulse width | 044 | 0 to 2 | 0: 1 ms<br>1: 2 ms<br>2: 10 ms | 0 |

## OUT terminal settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| OUT1 terminal function | 020 | 0 to 65536 | 0: Disable<br>1: OK<br>2: Verification NG<br>4: ERROR<br>8: STABLE<br>16: PRESET_OK<br>32: TRG_BUSY<br>64: LOCK_BUSY<br>128: MODE_BUSY<br>256: ERROR_BUSY<br>512: EXT.LIGHT *1<br>1024: UNSTABLE<br>2048: TUNING OK<br>4096: SCRIPT CONTROL<br>8192: CONFIG BUSY<br>16384: READY<br>32758: Trigger overrun error<br>65536: Heartbeat signal | 1 |
| OUT2 terminal function | 021 | | | 4 |
| OUT3 terminal function | 022 | | | 480 |
| BUSY output on startup | 024 | 0, 1 | 0: Disable<br>1: Enable | 1 |
| Output duration | 025 | 1 to 255 | Specify in units of 10 ms | 50 |
| OUT1 terminal Input polarity | 050 | 0.1 | 0: Normal open point<br>1: Normal close point | 0 |
| OUT2 terminal Input polarity | 051 | 0.1 | 0: Normal open point<br>1: Normal close point | 0 |
| OUT3 terminal Input polarity | 052 | 0.1 | 0: Normal open point<br>1: Normal close point | 0 |
| Heartbeat send interval (sec) | 027 | 1 to 600 | | 30 |

*1 EXT.LIGHT can be assigned only to the OUT3 terminal.

## Timing mode settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Test mode on startup | 100 | 0 to 2 | 0: None<br>1: Reading rate test<br>2: Read time test | 0 |
| Timing mode | 101 | 0, 1 | 0: Level trigger<br>1: One-shot trigger | 0 |
| One-shot trigger duration | 102 | 3 to 2550 | Specify in units of 10 ms | 100 |
| Trigger input ON command character string | 103 | hhhhhhhh... | Specify up to 32 characters (16 HEX bytes) from HEX (0x00 to 0xFF). | 4C4F4E (LON) |
| Trigger input OFF command character string | 104 | hhhhhhhh... | Specify up to 32 characters (16 HEX bytes) from HEX (0x00 to 0xFF). | 4C4F4646 (LOFF) |
| Trigger input ON/OFF recognition with one character | 105 | 0, 1 | 0: Disable<br>1: Enable<br>*1 | 0 |
| Trigger on delay (x 1 ms) | 106 | 0 to 2550 | Specified in increments of 1 ms | 0 |
| Trigger off delay (x 1 ms) | 107 | 0 to 2550 | Specified in increments of 1 ms | 0 |

*1 When enabled, you can specify the following characters as the trigger on/off commands.

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 0 | NUL | DLE | SP | 0 | @ | ' | ' | p |
| 1 | SOH | DC1 | ! | 1 | | | a | q |
| 2 | STX | DC2 | " | 2 | | | b | r |
| 3 | ETX | DC3 | | 3 | | | c | s |
| 4 | EOT | DC4 | $ | 4 | | | d | t |
| 5 | ENQ | | | 5 | | | e | u |
| 6 | | SYN | & | 6 | | | f | v |
| 7 | BEL | ETB | | 7 | | | g | w |
| 8 | BS | CAN | ( | 8 | | | h | x |
| 9 | HT | EM | ) | 9 | | | i | y |
| A | | SUB | * | : | | | j | z |
| B | VT | | + | ; | | [ | k | { |
| C | CL | FS | , | < | | \ | l | \| |
| D | | GS | - | = | | ] | m | } |
| E | SO | RS | . | > | | ^ | n | ~ |
| F | SI | US | / | ? | | | o | del |

If you specify STX or ETX, it will no longer be possible to recognize commands in the <STX> command <ETX> format.

## Reading behavior settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Reading mode setting | 200 | 0 to 4 | 0: Standard<br>1: Continuous<br>3: Burst read<br>4: Script | 0 |
| Data transmission | 201 | 0, 1 | 0: Send after read<br>1: Send after timing off | 0 |
| Standard duplicate reading prevention | 239 | 0 to 2 | 0: Reset by time<br>1: Reset by time or another code<br>2: Do not prevent | 2 |
| Duplicate reading prevention buffer | 247 | 0.1 | 0: Disable<br>1: Enable | 0 |
| Duplicate reading prevention buffer release time | 296 | 0 to 255 | Specify by the 100 ms | 0 |
| Duplicate reading prevention interval | 202 | 0 to 255 | Specify by the 100 ms | 10 |
| Specifying alternate order | 204 | 0, 1 | 0: Order of parameter bank number<br>1: Begin with successful bank | 1 |
| Read error character string | 205 | hhhhhhhh... | Specify a maximum of 32 characters (HEX 16 bytes) with HEX (0x00 to 0x7F).<br>Set FF if error codes are not output. | 4552524F52 (ERROR) |
| Matching level OK/NG judgment | 206 | 0, 1 | 0: Not use<br>1: Enable | 0 |
| Matching level threshold | 207 | 0 to 99 | | 70 |
| Automatic pointer lighting setting | 209 | 0 to 2 | 0: Do not light automatically<br>1: Light automatically<br>2: Only light when capturing images | 1 |
| Capture interval | 208 | 0 to 255 | Specified in increments of 1 ms | 0 |
| Capture count | 210 | 1 to 32 | Capture count | 32 |
| Shorten bank transition | 214 | 0, 1 | 0: Disable<br>1: Enable<br>Set whether to execute the next scan without waiting for the decode timeout to elapse if it is judged that no code is present in the scanned image. | 1 |
| Image capture range specification | 215 | abcd | Depends on the model.<br>• The number of pixels in the x direction must be a multiple of 4. The number of pixels in the y direction must be a multiple of 4.<br>• "a" and "b" are multiples of 4. Example) If a = 0000 and c = 0319, the number of dots is 320, which is a multiple of 4.<br>(a, b)<br>(c, d) | *2 |
| Code reading per area | 241 | 0, 1 | 0: Disable<br>1: Enable | 1 |
| Multiple reading operations of the same code type/data | 243 | 0 to 2 | 0: Disable<br>1: Allow the same code within the same capture<br>2: Allow the same code separated by specified interval or more | 0 |
| Specified interval | 246 | 1 to 1000000 | Specify by pixel | 100 |
| Trigger overrun string | 361 | hhhhh... | Specify a maximum of 32 characters (HEX 16 bytes) with HEX (0x00 to 0x7F). | 4F56455252554E (OVERRUN) |
| Trigger overrun output | 362 | 0.1 | 0: Disable<br>1: Enable | 0 |

*2 Image capture range specification

| | SR-X300/X300W | SR-X100/X100W |
|---|---|---|
| a | 0000-1919 | 0000-1359 |
| b | 0000-1199 | 0000-1023 |
| c | 0000-1919 | 0000-1359 |
| d | 0000-1199 | 0000-1023 |
| Default | 0000000019191199 | 0000000013591023 |

## Settings for the number of read codes

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Codes to read | 250 | 1 to 128 | - | 1 |
| Allow reduced detection count | 251 | 0.1 | 0: Do not allow<br>1: Allow | 0 |

## Maximum number of read codes

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| QR | 252 | 1 to 128 | - | 128 |
| DataMatrix | 253 | 1 to 128 | - | 128 |
| PDF417 (micro PDF) | 254 | 1 to 128 | - | 128 |
| MaxiCode | 452 | 1 to 128 | - | 128 |
| GS1 DataBar | 255 | 1 to 128 | - | 128 |
| CODE39 | 256 | 1 to 128 | - | 128 |
| ITF | 257 | 1 to 128 | - | 128 |
| 2of5 | 258 | 1 to 128 | - | 128 |
| NW-7 (Codabar) | 259 | 1 to 128 | - | 128 |
| JAN/EAN/UPC | 260 | 1 to 128 | - | 128 |
| CODE128 | 261 | 1 to 128 | - | 128 |
| COOP2of5 | 262 | 1 to 128 | | 128 |
| CODE93 | 263 | 1 to 128 | - | 128 |
| CC-A/B (GS1 DataBar) | 264 | 1 to 64 | - | 64 |
| CC-A/B (EAN/UPC) | 265 | 1 to 64 | - | 64 |
| CC-A/B (GS1 128) | 266 | 1 to 64 | - | 64 |
| Postal | 269 | 1 to 128 | - | 128 |
| Pharmacode | 267 | 1 to 128 | | 128 |
| DotCode | 278 | 1 to 10 | - | 10 |
| Aztec Code | 451 | 1 to 128 | - | 128 |

## Output data order settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Code type number order priority | 270 | 1 to 6 | Priority = 1 (high), Priority = 6 (low)*1 | 2 |
| Scanning order priority | 271 | | | 3 |
| Code center X coordinate priority | 272 | | | 4 |
| Code center Y coordinate priority | 273 | | | 5 |
| Region priority | 274 | | | 1 |
| Code digits priority | 275 | | | 6 |
| Code type number order setting | 280 | 0.1 | 0: Ascending<br>1: Descending | 0 |
| Scanning order setting | 281 | | | 0 |
| Code center X coordinate order setting | 282 | | | 0 |
| Code center Y coordinate order setting | 283 | | | 0 |
| Region sequence setting | 284 | | | 0 |
| Code digits sequence setting | 285 | | | 0 |
| Multiple-code output format | 290 | 0 to 2 | 0: Standard<br>1: Per bank<br>2: Per area *2 | 0 |
| Code type number sequence setting | 286 | - | 01: QR<br>02: DM<br>03: PDF417 (Micro PDF)<br>04: MaxiCode<br>05: GS1DataBar(RSS)<br>06: CODE39(Trioptic CODE 39)<br>07: ITF<br>08: 2of5<br>09: NW7(Codebar)<br>0A: JAN/EAN/UPC<br>0B: CODE128<br>0C: COOP2of5<br>0D: CODE93<br>0E: CC-A/B(GS1 DataBar)<br>0F: CC-A/B(EAN/UPC)<br>10: CC-A/B/C(GS-128)<br>11: Postal<br>12: Pharmacode<br>13: Reserved<br>14: DotCode<br>15: Aztec Code | 010203040<br>506070809<br>0A0B0C0D<br>0E0F1011<br>12131415 |

*1 If priorities are the same, the order will be assigned as follows: code type number > scanning order > code center X coordinate > code center Y coordinate > region > number of code digits.

*2 Read data is output in ascending order of the bank number or the region number. Error codes are output for banks that were not read successfully.

## Data appending function setting

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Time appending | 300 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Code type appending | 301 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Symbol ID appending | 302 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Bank number appending | 303 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Scan count appending | 305 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Read time appending | 306 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Decoding time | 304 | 0.1 | 0: Do not append<br>1: Append | 0 |
| Number of successful decodes | 370 | 0.1 | 0: Do not append<br>1: Append | 0 |
| Code vertex appending | 308 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Code center appending | 309 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Unused ECC ratio appending | 310 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| File name appending (full path display) | 313 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Add region number | 318 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Setting for Master/Slave group name addition | 320 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Setting for Master/Slave ID addition | 321 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Angle (skew/pitch) addition | 371 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Data edit function (Data edit by script) | 360 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Script data output to 2 destinations | 365 | 0 to 63 | 0: Disable<br>1: RS-232C<br>2: Ethernet (Server)<br>4: Ethernet (Client 1)<br>8: Ethernet (Client 2)<br>16: FTP data<br>32: PLC (EtherNet/IP, PROFINET, PLC Link) | 0 |

## Preset data comparison settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Number of verification start digits | 400 | 1 to 7089 | | 1 |
| Number of verification digits | 401 | 0 to 494 | Maximum value for sequential value verification = 9 | 494 |
| Preset data registration | 402 | hhhhhhhh... | Up to 494 characters (HEX 988 bytes) can be specified from HEX (0x00 to 0xFF).<br>Not set | FF |
| Verification method | 403 | 0, 1 | 0: Normal<br>1: Sequential value verification | 0 |
| Incremental setting for sequential value verification | 404 | -9999 to +9999 | -9999 to +9999 | +0001 |

## Image saving function settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Saving destination of read OK images | 500 | 0 to 6 | 0: Disable<br>1: Save to RAM<br>2: Save to ROM (SR-X300/X300W only)<br>3: Send by FTP<br>4: Save USB (SR-X100/X100W only)<br>5: Save ROM + send FTP (SR-X300/X300W only)<br>6: Save USB + send FTP (SR-X100/X100W only) | 0 |
| Saving destination of verification NG images | 501 | | | 1 |
| Saving destination of read error images | 502 | | | 1 |
| Saving destination of unstable images | 503 | | | 1 |
| Saving destination of capture images | 504 | 1 to 6 | | 1 |
| Image saving mode | 505 | 0 to 4 | 0: Latest bank image<br>1: Specified number of images after trigger input ON<br>2: Specified number of images after trigger input OFF<br>3: Specified number of images after trigger input ON (intermittent operation)<br>4: Specified number of images after trigger input OFF (intermittent operation) | 0 |
| Intermittent operation interval (x10 ms) | 514 | 2 to 300 | | 20 |
| Specify the number of images to save from trigger input ON/OFF | 506 | 1 to 32 | | 32 |
| Image save priority | 530 | 0.1 | 0: Prioritize saving images<br>1: Prioritize reading operation | 1 |
| Image saving continuation | 458 | 0.1 | 0: Disable<br>1: Enable | 0 |
| Edit image file name function (Edit image file name by script) | 510 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Image format specification | 511 | 0, 1 | 0: BMP<br>1: JPG | 1 |
| Quality (JPEG) | 512 | 1 to 10 | "10" gives the highest quality. | 5 |
| Binning | 513 | 0,1,3.4 | 0: Full<br>1: 1/4<br>3: 1/16<br>4: 1/64 | 0 |

## Other settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Output data with ENTER button | 600 | 0.1 | 0: Disable<br>1: Enable | 1 |
| Delimiter character | 601 | hh | Specify 1 character (2 HEX characters) from (0x00 to 0x7F) | 3A |
| Inter delimiter | 602 | hhhhhhhh··· | Specify up to 5 characters (10 HEX bytes) from HEX (0x00 to 0x7F).<br>FF: Not set | 2C |
| Data filling size | 603 | 0 to 999 | | 0 |
| Data filling character | 604 | hh | Specify 1 character (2 HEX characters) from HEX (0x00 to 0x7F) | 20 |
| Composite delimiter | 605 | hhhhhhhh··· | Specify up to 5 characters (10 HEX bytes) from HEX (0x00 to 0x7F). | FF |
| Silent Mode | 606 | 0 to 255 | 0: Not set<br>1: Verification OK, Read OK<br>2: Verification NG<br>4: Read ERROR<br>32: Preset result<br>64: Test Mode<br>128: Tuning<br>Specify the setting by sum of the values of the items. | 0 |
| Reader name | 607 | hhhhhhhh... | Specify up to 32 characters (64 HEX bytes) from UNICODE (UTF-16 BigEndian).<br>FFFF: Not set | 005200450041004400450052 (READER) |
| Reader description 1 | 620 | ssssss... | Specify up to 32 characters with ASCII codes<br>(Characters that can be specified: 0x20 to 0x7E) | (Not set) |
| Reader description 2 | 621 | | | |
| Reader description 3 | 622 | | | |
| Reader description 4 | 623 | | | |
| Trigger command response string | 610 | 0 to 4 | 0: Not specified<br>1: Detailed response<br>2: User setting<br>3: Echo back<br>4: Command replacement | 0 |
| ENTER button lock | 611 | 0, 1 | 0: Disable lock<br>1: Enable lock | 0 |
| Trigger command success response string | 613 | hhhh... | Up to 8 characters can be specified. Specify characters with HEX (0x00 to 0x7F).<br>* This is valid when the trigger command response setting is User setting. | 4F4B |
| Trigger command failure response string | 614 | hhhh... | | 4552 |
| Rotate display image (SR-X300/X300W only) | 615 | 0, 1 | 0: Do not rotate<br>1: 180 degrees rotation | 0 |
| Presentation mode | 616 | 0 to 3 | 0: Disable<br>1: Polarized light<br>2: Direct light<br>3: Diffused light (SR-X300/X300W only) | 0 |
| Status LED lighting | 721 | 0.1 | 0: Disable<br>1: Enable | 1 |
| LiveView display image | 900 | 0, 1 | 0: Before image filter<br>1: After image filter | 1 |
| LiveView display rotation | 901 | 0, 1 | 0: Do not rotate<br>1: 180 degrees rotation | 0 |
| Write BLOAD to ROM | 630 | 0, 1 | 0: Disable<br>1: Enable | 0 |

## Tuning options

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Exposure time | 802 | 15 to 10000 | Exposure time (μs) | 10000 |
| Image filter | 805 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Allow reduced detection count while tuning | 806 | 0, 1 | 0: Do not allow<br>1: Allow | 1 |
| Type of internal lighting | 811 | 0 to 2 | 0: Direct light<br>1: Polarized light<br>2: Diffused light (SR-X300/X300W only) | 1 |
| Automatic adjustment of internal lighting | 812 | 0, 1 | 0: Disable*1<br>1: Enable | 1 |
| Code search | 813 | 0, 1 | 0: Do not limit<br>1: Limit | 1 |
| Bank number for tuning from the main unit (SR-X100/X100W only) | 816 | 0 to 16 | Parameter bank | 16 |
| Tuning target code | 820 | 1 to 11FFFF | Specify codes using bit assignment and set as HEX values<br>1st bit: QR<br>2nd bit: Data Matrix<br>3rd bit: PDF417 (microPDF 417)<br>4th bit: MaxiCode<br>5th bit: GS1 DataBar(RSS)<br>6th bit: CODE 39 (Trioptic CODE 39)<br>7th bit:: ITF<br>8th bit: 2 of 5<br>9th bit: NW-7 (Codebar)<br>10th bit: JAN/EAN/UPC<br>11th bit: CODE 128<br>12th bit: COOP 2 of 5<br>13th bit: CODE 93<br>14th bit: CC-A/B (GS1 DataBar)<br>15th bit: CC-A/B (EAN/UPC)<br>16th bit: CC-A/B/C (GS-128)<br>17th bit: Postal<br>18th bit: Pharmacode<br>20th bit: DotCode<br>21st bit: Aztec Code | 11FFFF |
| Black/white inversion setting when tuning | 823 | 0 to 2 | 0: Disable<br>1: Enable<br>2: Automatic | 2 |
| Internal lighting when tuning | 821 | 0, 1 | 0: Not used<br>1: Used | 1 |
| External lighting when tuning | 822 | 0, 1 | 0: Not used<br>1: Used | 0 |
| Contrast adjustment method | 825 | 0 to 3 | 0: Standard<br>1: HDR<br>2: HDR2<br>3: Contrast zoom | 0 |
| Auto contrast adjustment | 826 | 0, 1 | 0: Disable<br>1: Enable | 1 |

*1 "0: Enable" mode. Execute tuning under the conditions set in WP,811

## Code quality verification function

| Function | Command Number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Code quality verification standard selection | 230 | 0 to F | 0 : No selected<br>1 : ISO/IEC 15415<br>2 : ISO/IEC TR 29158 (AIM DPM-1-2006)<br>4 : SAE AS9132<br>8 : SEMI T10-0701<br>Specify the setting with HEX using sum of each item. | 0 |
| ISO/IEC 15415 verification threshold | 231 | 0 to 4 | 0 : Disable<br>1 : D<br>2 : C<br>3 : B<br>4 : A | 0 |
| ISO/IEC TR 29158 (AIM DPM-1-2006) verification threshold | 232 | 0 to 4 | 0 : Disable<br>1 : D<br>2 : C<br>3 : B<br>4 : A | 0 |
| SAE AS9132 verification threshold | 233 | 0,1 | 0 : Disable<br>1 : Enable | 0 |
| Execution of ISO/IEC 15416 verification | 234 | 0 to 3F | 0: Not set<br>1: GS1-128<br>2: GS1 DataBar Limited<br>4: GS1 DataBar Stacked<br>8: CC-A(GS1-DataBar Limited)<br>16: CC-A(GS1-DataBar Stacked)<br>32: All code types<br>This setting is handled as a HEX value. Use a HEX value that is the sum of the items in order to specify the setting. | 0 |
| Threshold for ISO/IEC 15416 verification result | 235 | 0 to 4 | 0: Disable<br>1: D<br>2: C<br>3: B<br>4: A | 0 |
| ISO/IEC 16022 code quality verification execution | 236 | 0,1 | 0 : Disable<br>1 : Enable | 0 |
| ISO/IEC 16022 code quality verification execution | 237 | 0 to 4 | 0: Disable<br>1: D<br>2: C<br>3: B<br>4: A | 0 |
| ISO/IEC 15415 code quality verification result appending setting | 340 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| ISO/IEC TR 29158 (AIM DPM-1-2006) code quality verification result appending setting | 341 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| SAE AS9132 code quality verification result appending setting | 342 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| SEMI T10-0701 code quality verification result appending setting | 343 | 0, 1 | 0: Do not append<br>1: Append | 0 |
| Japanese pharmaceutical code quality verification result appending setting | 344 | 0,1 | 0: Do not append<br>1: Append | 0 |
| ISO/IEC 16022 code quality verification result appending setting | 345 | 0,1 | 0 : Do not append<br>1 : Append | 0 |
| Grade expression setting when appending values to verification result | 350 | 0,1 | 0 : Alphabet<br>1 : Numerical value | 0 |
| Detailed item addition setting when appending values to verification result | 351 | 0,1 | 0 : Do not append<br>1 : Append | 0 |
| Evaluation value addition setting when appending values to verification result | 352 | 0,1 | 0 : Do not append<br>1 : Append | 0 |

## Code quality verification calibration

| Function | Command Number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Code verification calibration | 890 | 0 to 3 | 0 : Disable<br>1 : Polarized light<br>2 : Direct light<br>3 : Diffused light (SR-X300/X300W only) | 0 |
| Calibration brightness (Polarized light) | 891 | 0 to 125 | - | 40 |
| Calibration brightness (Direct light) | 892 | 0 to 125 | - | 40 |
| Calibration brightness (Diffused light) (SR-X300/X300W only) | 893 | 0 to 125 | - | 40 |

# Region Configuration Commands (WD/RD)

Send region configuration commands in the following format.

### ● Configuration changes

| Send command | | **WD**,m,n |
|---|---|---|
| **Response** | **Successful** | OK,WD |
| | **Error** | ER,WD,ee |

### ● Settings confirmation

| Send command | | **RD**,m |
|---|---|---|
| **Response** | **Successful** | OK,RD,n |
| | **Error** | ER,RD,ee |

m : Command number, n: Setting
ee : Error code

## Region configuration commands

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Region | 001 to 128 | abcd | *1<br>• Minimum size: 96 dot x 96 dot<br>(a, b)<br>(c, d) | 0000000000000000 |

*1

| | SR-X300/X300W | SR-X100/X100W |
|---|---|---|
| a | 0000-1919 | 0000-1359 |
| b | 0000-1199 | 0000-1023 |
| c | 0000-1919 | 0000-1359 |
| d | 0000-1199 | 0000-1023 |
| Default | 0000000019191199 | 0000000013591023 |

The command number represents the region number.

Example) Configuring the region corresponding to region number 2 to (a,b)=(0,0) and (c,d)=(239,239):

Configuration change

| Send command | WD,002,0000000002390239 |
|---|---|
| Response (Normal process) | OK,WD |

Configuration confirmation

| Send command | RD,002 |
|---|---|
| Response (Normal process) | OK,RD,0000000002390239 |

# Communication Configuration Commands (WN/RN)

Communication configuration command is sent in the following format:

### ● Configuration changes

| Send command | | **WN**,m,n |
|---|---|---|
| **Response** | **Successful** | OK,WN |
| | **Error** | ER,WN,ee |

### ● Settings confirmation

| Send command | | **RN**,m |
|---|---|---|
| **Response** | **Successful** | OK,RN,n |
| | **Error** | ER,WN,ee |

m : Command number, n: Setting
ee: Error code
Example) Changing SR-X Series IP address to "192.168.100.1"

Configuration change

| Send command | WN,200,192.168.100.1 |
|---|---|
| Response (Normal process) | OK,WN |

Configuration confirmation

| Send command | RN,200 |
|---|---|
| Response (Normal process) | OK,RN,192.168.100.1 |

▶ Important

To change and apply the communication configuration, make sure to send a SAVE command.

## Common communication settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Append checksum | 003 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Append data size | 004 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Header settings | 005 | hhhh... | Specify up to 5 characters (16 HEX bytes) from HEX (0x00 to 0x7F).<br>FF: Not set | FF |
| Terminator settings | 006 | hhhh... | Specify up to 5 characters (16 HEX bytes) from HEX (0x00 to 0x7F).<br>FF: Not set | 0D |

## RS-232C communication settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Baud rate setting | 105 | 0 to 4 | 0: Disable<br>1: 600 bps<br>2: 1200 bps<br>3: 2400 bps<br>4: 4800 bps | 0 |
| Baud rate setting | 100 | 0 to 4 | 0: 9600 bps<br>1: 19200 bps<br>2: 38400 bps<br>3: 57600 bps<br>4: 115200 bps | 4 |
| Data length setting | 101 | 0, 1 | 0: 7 bit<br>1: 8 bit | 1 |
| Parity check setting | 102 | 0 to 2 | 0: Disable<br>1: Even<br>2: Odd | 1 |
| Stop bit length setting | 103 | 0, 1 | 0: 1 bit<br>1: 2 bit | 0 |
| Communication protocol setting | 104 | 0 to 2 | 0: No Handshaking<br>1: PASS/RTRY<br>2: ACK/NAK | 0 |
| RS-232C communication | 109 | 0, 1 | 0: Not used<br>1: Used | 1 |
| Heartbeat send | 111 | 0.1 | 0: Do not send<br>1: Send | 0 |

## Ethernet communication settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| IP address setting | 200 | a. b. c. d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255 | 192. 168. 100. 100 |
| Subnet mask setting | 201 | 8 to 30 | Specify with bit length<br>255. 255. 255. 0 ... 24<br>255.0.0.0 ... 8 | 24 |
| Default gateway setting | 202 | a. b. c. d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255 | 0.0.0.0 (Not set) |
| Ethernet command | 203 | 0 to 2 | 0: Not used<br>1 : TCP<br>2 : UDP | 1 |
| Command standby port number | 204 | 23, 1024 to 65535 *1 | - | 9004 |
| Login authentication | 220 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| User name | 221 | aaaa... | ASCII setting (max. 32 characters) | admin |
| Password | 222 | aaaa... | ASCII setting (max. 32 characters) | |
| Ethernet data (server) setting | 205 | 0.1 | 0: Not used<br>1 : TCP | 1 |
| Ethernet data (server) standby port number | 206 | 23, 1024 to 65535 *1 | - | 9004 |
| Ethernet data (client) setting | 207 | 0 to 2 | 0: Not used<br>1 : TCP<br>2 : UDP | 0 |
| Ethernet data (client) remote IP address 1 | 208 | a.b.c.d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255 | 0.0.0.0 |
| Ethernet data (client) remote port number 1 | 209 | 1024 to 65535 | - | 9004 |
| Ethernet data (client) remote IP address 2 | 210 | a.b.c.d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255 | 0.0.0.0 |
| Ethernet data (client) remote port number 2 | 211 | 1024 to 65535 | | 9004 |
| TCP client connection timing | 213 | 0.1 | 0: After reading<br>1: Immediately after power up | 0 |
| Keep alive setting | 214 | 0.1 | 0: Disable<br>1: Enable | 1 |
| Host connection error due to client connection failure | 215 | 0.1 | 0: Disable<br>1: Enable | 0 |
| Heartbeat send Ethernet data (server) | 225 | 0.1 | 0: Do not send<br>1: Send | 0 |
| Heartbeat send Ethernet data (client) | 226 | 0.1 | 0: Do not send<br>1: Send | 0 |
| RNDIS | 120 | 0.1 | 0: Not used<br>1: Used | 0 |

*1 You cannot specify 9013, 9014, 9015, 9016, 9017, 9018, 9020, 5900, 5920, or 44818.

## Heartbeat settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Heartbeat send interval (sec) | 230 | 1 to 600 | | 30 |
| Reset heartbeat send interval at data transmission | 231 | 0.1 | 0: Do not reset<br>1: Reset | 1 |
| Heartbeat string | 232 | hhhhh... | Specify a maximum of 32 characters (HEX 16 bytes) with HEX (0x00 to 0x7F). | 486561727 442656174 (HeartBeat) |
| Heartbeat header | 233 | hhhhh... | Specify a maximum of 5 characters (HEX 16 bytes) with HEX (0x00 to 0x7F). | FF |
| Heartbeat terminator | 234 | hhhhh... | Specify a maximum of 5 characters (HEX 16 bytes) with HEX (0x00 to 0x7F). | 0D |

## PLC communication settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Remote IP address (TCP communication) | 300 | a.b.c.d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255<br>Use when the protocol is TCP. | 0.0.0.0 (Not set) |
| Remote port (TCP communication) | 301 | 1024 to 65535 | Use only for TCP protocol. | 5000 |
| Port number setting for this device | 302 | 1024 to 65535 | - | 5000 |
| Protocol setting | 303 | 0 to 8 | 0: Not used<br>1: MC protocol (RS-232C)<br>2: SYSWAY<br>3: KV Studio(RS-232C)<br>4: MC protocol (Ethernet)<br>5: OMRON PLC Link<br>6: KV Studio<br>7: EtherNet/IP<br>8: PROFINET | 0 |
| DM front address | 304 | MC:<br>0 to 65534<br>SYSWAY:<br>0 to 65534<br>KV:<br>0 to 65534 | | 0 |
| Control region address | 305 | MC:<br>0 to 599<br>SYSWAY:<br>0 to 6143<br>KV:<br>1 to 599 | | 0 |
| Response region address | 306 | MC:<br>0 to 599<br>SYSWAY:<br>0 to 6143<br>KV:<br>1 to 599 | | 0 |
| Output length | 307 | 1 to 1000 | 1000<br>* Set the upper limit of writing length. | 64 |

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| PLC link timing input | 308 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Bit Monitoring Period | 309 | 1 to 99 | by the 10 ms | 10 |
| Retry interval (sec) | 310 | 1 to 10 | by the second | 5 |
| Generate PLC link error when a PLC link failure occurs | 334 | 0, 1 | 0: Disable<br>1: Enable | 1 |
| EtherNet/IP data handshake setting | 321 | 0, 1 | 0: Do not handshake<br>1: Handshake | 0 |
| EtherNet/IP Input assembly data size setting | 322 | 40 to 1400 | by 1 | 500 |
| EtherNet/IP Output assembly data size setting | 323 | 4 to 1400 | by 1 | 500 |
| EtherNet/IP Byte swapping setting | 324 | 0, 1 | 0: Disable (ROCKWELL)<br>1: Enable (KEYENCE/OMRON) | 0 |
| PROFINET device name | 330 | nnn... | Up to 240 characters<br>Specify with ASCII codes<br>* Device naming rule<br>1: PROFINET device name length: 1 to 240 characters<br>2: 1 label length: 1 to 63 characters<br>3: Only [a to z] (alphabet lower case), [0 to 9] (numbers), [-] (hyphen), [.] (period) can be used for a device name.<br>4: [-] (hyphen) cannot be used at the beginning of the label.<br>5: [-] (hyphen) cannot be used at the end of the label.<br>6: port-xyz, port-xyz-abcde cannot be the name of the first label. abcde and xyz mean [0 to 9] (numbers).<br>7: Device names cannot be made in the IP address format. (n.n.n.n n=0.....999)<br>8: Labels cannot start with xn-.<br>9: The first character of labels cannot be a number.<br>If these rules are not observed, an error occurs. | sr-x1h3h |
| PROFINET handshake | 331 | 0, 1 | 0: Do not handshake<br>1: Handshake | 0 |

## FTP communication settings

• Image transmission

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| IP address of the connection destination Remote FTP server IP | 400 | a.b.c.d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255<br>For 0.0.0.0., the FTP client does not operate. | 0.0.0.0 (Not set) |
| User name of the connection destination FTP server | 401 | aaaa... | ASCII setting (max. 16 characters) | admin |
| Password of the connection destination FTP server | 402 | aaaa... | ASCII setting (max. 16 characters) | admin |
| Subfolder | 403 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Subfolder name | 404 | aaaa... | ASCII setting (max. 32 characters) | image |
| FTP connection timing | 405 | 1 to 2 | 0: After reading<br>1: Immediately after power-up<br>2: Always disconnect after reading + data transmission | 0 |
| Passive mode | 408 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| Host connection error when image storage failed | 409 | 0.1 | 0: Disable<br>1: Enable | 0 |

• FTP transmission of read data

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| FTP transmission of Send by FTP | 420 | 0.1 | 0: Disable<br>1: Enable | 0 |
| Remote IP address | 421 | a.b.c.d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255 | 0.0.0.0 |
| User name | 422 | | ASCII setting (max. 16 characters) | admin |
| Password | 423 | | ASCII setting (max. 16 characters) | admin |
| Subfolder | 424 | 0.1 | 0: Disable<br>1: Enable | 0 |
| Subfolder name | 425 | | ASCII setting (max. 32 characters) | data |
| FTP connection timing | 426 | 0.1 | 0: After reading<br>1: Immediately after power-up | 0 |
| Passive mode | 429 | 0.1 | 0: Disable<br>1: Enable | 0 |
| Append to preceding data | 430 | 0.1 | 0: Disable<br>1: Enable | 1 |
| File name | 431 | | File name (max. 128 characters) | data.txt |
| Host connection error due to client connection failure | 432 | 0.1 | 0: Disable<br>1: Enable | 0 |

• FTP folder settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Subfolder name setting method | 411 | 0.1 | 0: Manual<br>1: Auto | 0 |
| FTP history data transmission | 412 | 0.1 | 0: Disable<br>1: Enable | 0 |

## Master/slave function

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Master/Slave operation configuration | 500 | 0 to 3 | 0: Disable<br>1: Multi drop link<br>3: Advanced Multi-head | 0 |
| Master/Slave ID during operation | 501 | 0 to 31 | If 0 is set, it operates as Master. | 0 |
| Master/Slave function group name | 503 | nnnn... | Up to 16 characters<br>Specify with ASCII codes<br>* 0x20 to 0x7E of ASCII codes can be used. | GROUP01 |

## SR Web Tool settings

| Function | | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|---|
| SR Web Tool | | 530 | 0,1 | 0: Disable<br>1: Enable | 1 |
| Password authentication | | 535 | 0,1 | 0: Disable<br>1: Enable | 0 |
| Port number | | 536 | 80, 1024 to 65535 | | 80 |
| Administrator | Username | 560 | ssssss... | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | admin |
| | Password | 561 | ssssss... | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | admin |
| User 1 | Username | 562 | ssssss... | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Password | 563 | ssssss... | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Available applications | 564 | 0 to 7 | Specify Application using bit assignment and set as HEX values<br>1st bit: Web Multi Monitor<br>2nd bit: Web Traceability Tool<br>3rd bit: Web Navigator | 0 |
| User 2 | Username | 565 | ssssss... | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Password | 566 | ssssss... | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Available applications | 567 | 0 to 7 | Specify Application using bit assignment and set as HEX values<br>1st bit: Web Multi Monitor<br>2nd bit: Web Traceability Tool<br>3rd bit: Web Navigator | 0 |

| Function | | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|---|
| User 3 | Username | 568 | ssssss… | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Password | 569 | ssssss… | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Available applications | 570 | 0 to 7 | Specify Application using bit assignment and set as HEX values<br>1st bit: Web Multi Monitor<br>2nd bit: Web Traceability Tool<br>3rd bit: Web Navigator | 0 |
| User 4 | Username | 571 | ssssss… | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Password | 572 | ssssss… | Specify up to 12 characters with ASCII codes (Characters that can be specified:0x20 to 0x7E) | (No setting) |
| | Available applications | 573 | 0 to 7 | Specify Application using bit assignment and set as HEX values<br>1st bit: Web Multi Monitor<br>2nd bit: Web Traceability Tool<br>3rd bit: Web Navigator | 0 |

## SNTP settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| Remote SNTP server address | 520 | a. b. c. d | a: 0 to 255<br>b: 0 to 255<br>c: 0 to 255<br>d: 0 to 255<br>If 0.0.0.0 is set, the SNTP server is not accessed. | 0.0.0.0 |
| Time zone | 521 | 0 to 33 | 0-32<br><br>0: GMT-12:00<br>1: GMT-11:00<br>2: GMT-10:00<br>3: GMT-9:00<br>4: GMT-8:00 PSD<br>5: GMT-7:00<br>6: GMT-6:00 CST, Mexico City, Central America<br>7: GMT-5:00 EST<br>8: GMT-4:30<br>9: GMT-4:00 AST<br>10: GMT-3:30<br>11: GMT-3:00 Brasilia<br>12: GMT-2:00 Central Atlantic<br>13: GMT-1:00<br>14: GMT London, UTC<br>15: GMT+1:00 Berlin, Brussels, Rome, Paris, Berne<br>16: GMT+2:00 Athens, Jerusalem<br>17: GMT+3:00 Kuwait<br>18: GMT+3:30<br>19: GMT+4:00 Moscow<br>20: GMT+4:30<br>21: GMT+5:00<br>22: GMT+5:30 New Delhi<br>23: GMT+5:45<br>24: GMT+6:00<br>25: GMT+6:30<br>26: GMT+7:00 Bangkok<br>27: GMT+8:00 Kuala Lumpur, Singapore, Taipei, Beijing<br>28: GMT+9:00 Japan, Seoul<br>29: GMT+9:30<br>30: GMT+10:00 Canberra, Sydney<br>31: GMT+11:00<br>32: GMT+12:00<br>33: GMT+13:00 | 28 |
| Update cycle (min) | 522 | 1 to 99 | | 1 |

## VNC settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| VNC server | 550 | 0, 1 | 0: Disable<br>1: Enable | 1 |

## Security settings

| Function | Command number | Setting value | Explanation | Default |
|---|---|---|---|---|
| AI-NET connection | 010 | 0, 1 | 0: Enable<br>1: Disable | 0 |
| SFTP | 440 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| SFTP Remote port | 441 | 1 to 65535 | | 22 |
| FTP Remote port | 442 | 1 to 65535 | | 21 |
| HTTPS | 538 | 0, 1 | 0: Disable<br>1: Enable | 0 |
| HTTPS Remote port | 536 | 1 to 65535 | | 80 |

# Setting/Confirmation Command Batch Transmission (WA/RA)

The SR-X Series has a dedicated command for batch transmission of multiple setting/confirmation commands (WB/RB, WC/RC, WD/RD, WP/RP, WN/RN). Use this to reduce the number of setting commands to send.

## Batch transmission command format

### ● Configuration changes

| | | |
|---|---|---|
| **Send command** | | **WA**,command1,command2, ... |
| **Response** | **Successful** | OK,WA |
| | **Error** | ER,WA,n,ec,ee |

### ● Settings confirmation

| | | |
|---|---|---|
| **Send command** | | RA,command1,command2, ... |
| **Response** | **Successful** | OK,RA,Response of command1,Response of command2, ... |
| | **Error** | ER,RA,n,ec,ee |

n: Number of command with error (beginning with 1)
ec: Type of command with error, ee: Error code

Point

- When using the batch transmission command, the reflecting order of the setting is the same as the sending order of the setting commands.
- Make sure to send the SAVE command after sending the batch transmission command containing the communication setting command.
- The batch transmission command can send up to 2048 bytes of number of characters (excluding header and terminator).
- The location (n) of the error command returns the location first confirmed from the head of the transmission command.

# Each Setting/Confirmation Command Format

When using the batch transmission command, link each setting/confirmation command in the following format after deleting W/R from each command.

## Parameter bank configuration commands

### ● Configuration changes

| | |
|---|---|
| **Send command** | **B**,bm,n |

### ● Settings confirmation

| | | |
|---|---|---|
| **Send command** | | **B**,bm |
| **Response** | **Successful** | **B**,bn |

b: Parameter bank (01-16)
m: Command number, n: Setting

## Tuning configuration command

### ● Configuration changes

| | |
|---|---|
| **Send command** | **C**,m,n |

### ● Settings confirmation

| | | |
|---|---|---|
| **Send command** | | **C**,m |
| **Response** | **Successful** | **C**,n |

m: Command number, n: Setting

## Region configuration commands

### ● Configuration changes

| | |
|---|---|
| **Send command** | **D**,m,n |

### ● Settings confirmation

| | | |
|---|---|---|
| **Send command** | | **D**,m |
| **Response** | **Successful** | **D**,n |

m: Command number, n: Setting

## Operation configuration command

### ● Configuration changes

| | |
|---|---|
| **Send command** | **P**,m,n |

### ● Settings confirmation

| | | |
|---|---|---|
| **Send command** | | **P**,m |
| **Response** | **Successful** | **P**,n |

m: Command number, n: Setting

## Communication command

### ● Configuration changes

| | |
|---|---|
| **Send command** | **N**,m,n |

### ● Settings confirmation

| | | |
|---|---|---|
| **Send command** | | **N**,m |
| **Response** | **Successful** | **N**,n |

m: Command number, n: Setting

[Ex.] Sending of WB and WP commands together

Configuration change

| | |
|---|---|
| Send command | WA,B,01700,2,P,200,0,P,201,1 |
| Response (Normal process) | OK,WA |

Configuration confirmation

| | |
|---|---|
| Send command | RA,B,01700,P,200,P,201 |
| Response (Normal process) | OK,RA,B,2,P,0,P,1 |

# 15 PLC Link


**15-1 PLC Link Overview** 124

PLC Link 124
List of Supported PLCs 124

**15-2 Settings** 124

SR-X Series Settings 124
PLC Settings Examples 125
Devices That Can Be Used 126

**15-3 Memory Maps** 126

Assignment of Functions 126
Device Assignment Function Details 127

**15-4 Operation Examples** 128

Reference Program 129

**15-5 PLC Link Error** 130

When a PLC Link Error Occurs 130
Check Points 130
Recovering from PLC Link Errors 130

# 15-1 PLC Link Overview

## PLC Link

The PLC link enables the SR-X Series to directly write data into the internal memory of the PLC (data memory and data registers) by way of the RS-232C and Ethernet interfaces.
Since the SR-X Series directly controls memory in the PLC, it eliminates the need for a communication program. Therefore, man-hours needed to create programs can be reduced.

**Important**

The changeover function can be used through the PLC link.
The following restrictions are imposed regarding the use of the PLC link:

- You cannot use the PLC link to change the SR-X settings.
- You cannot use the PLC link to activate test modes.
- You cannot use the PLC link to send operation commands and configuration commands.
- Due to long communication time, it is not suitable for a line that requires high-speed processing.
- The amount of data that can be processed depends on the output data length. A maximum number of digits is 1000. (Default output data length is 64 digits.)
- No header and terminator are output.

## List of Supported PLCs

### RS-232C

**KEYENCE**

| Series name | Connection method | Model |
|---|---|---|
| KV Series | CPU built-in port | KV-7300/3000, KV Nano Series |
| | Communication unit | KV-L21V/L20V/L20R<br>KV-N10L/NC10L/NC20L |

**Mitsubishi Electric**

| Series name | Connection method | Model |
|---|---|---|
| MELSEC Series | Serial communication unit | QJ71C24N/-R2 |
| | | LJ71C24/-R2 |

**OMRON**

| Series name | Connection method | Model |
|---|---|---|
| SYSMAC Series | CPU built-in port | CS1 Series |
| | | CJ1 Series |
| | | CJ2 Series* |
| | | CP1 Series* |
| | Serial option board | CP1W-CIF01/11/12 |
| | Serial communication unit | CJ1W-SCU□□(-V1) |
| | Communication board | CS1-SUB□□-V1 |

* A serial option board is necessary, depending on the model.

### Ethernet

**KEYENCE**

| Series name | Connection method | Model |
|---|---|---|
| KV Series | CPU built-in port | KV-5000/5500/7500/8000 |
| | Ethernet unit | KV-LE21V/LE20V, KV-NC1EP |

**Mitsubishi Electric**

| Series name | Connection method | Model |
|---|---|---|
| MELSEC Series | CPU built-in port | Q03UDECPU, Q04/06/10/13/20/26/50/100UDEHCPU<br>Q03/04/06/13/26UDVCPU<br>L02CPU/06CPU/26CPU-BT<br>R04/08/16/32/120CPU<br>iQ-F FX5U |
| | Ethernet unit | QJ71E71-100/-B5/-B2 |

**OMRON**

| Series name | Connection method | Model |
|---|---|---|
| SYSMAC Series | CPU built-in port | CJ2M-CPU3 Series |

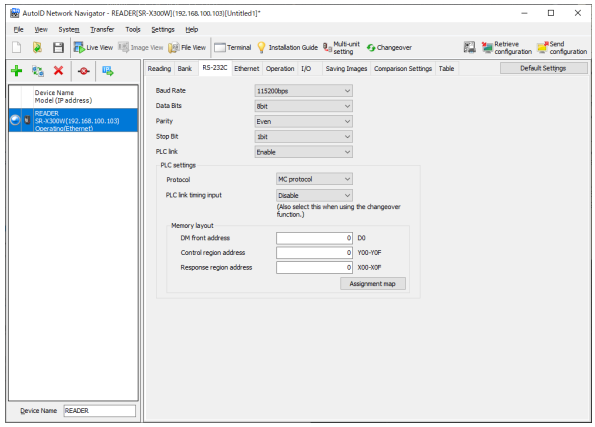
# 15-2 Settings

We have prepared information regarding connecting PLCs to the SR Series. Download the information from the KEYENCE website.

## SR-X Series Settings

### RS-232C

1. **Open the [RS-232C] tab.**
2. **Set the [Baud Rate], [Data Bits], [Parity], and [Stop Bit] settings to match the PLC.**
3. **Under [PLC link], select [Enable].**
4. **Select [Protocol].**
5. **Set [PLC link timing input] to "Enable."**
   * This is not necessary when you are using the IN1 terminal of the SR-X Series to apply triggers.
6. **Click [Send Configuration].**




### Ethernet

1. **Open the [Ethernet] tab.**
2. **Enter the [IP address] and [Subnet Mask] settings to assign to the SR-X Series.**
3. **Start [Setup Wizard].**
4. **STEP 1 Select the trigger input method.**
5. **STEP 2 Select [Field network/PLC].**
6. **STEP 3 Select the communication protocol.**
7. **STEP 4 Configure connection destination settings such as [IP Address] and [Port].**
8. **Exit [Setup Wizard].**
9. **Click [Send Configuration].**

**Point**

When you are using the PLC link, you can only use the RS-232C interface or the Ethernet interface.

# PLC Settings Examples

## KV Series

### ● RS-232C

| | |
|---|---|
| Operation | KV BUILDER/KV STUDIO mode |
| Interface | RS-232C*1 |
| Division | 0 |
| Baud rate | Automatic*2 |
| Data bit length | 8 bits*2 |
| Parity | Even (e)*2 |
| Stop bit length | 1 bit*2 |
| Checksum | None*2 |
| RS/CS flow control | Disable |

*1 To use the port 2, set the interface to "RS-232C."
*2 For KV BUILDER/KV STUDIO mode, a fixed value is used.

### ● Ethernet

| | |
|---|---|
| IP address | 192.168.100.10 |
| Subnet mask | 255.255.255.0 (default) |
| Port (VT) | 8502 (default) |

## MELSEC Series

### ● RS-232C

**• QJ71C24N/-R2**

Set communication conditions with the GX-Developer.
("I/O assignment configuration" in "PC parameters")

| | |
|---|---|
| Type | Intelligent |
| Type name | Name of the unit to be installed |
| Points | 32 points |
| First XY | First output signal of the target unit (hexadecimal number) |

("Option configuration" under "I/O assignment settings" in "PC parameters")

| | |
|---|---|
| Unit type | Serial communication/modem interface unit |
| Unit type name | Name of the unit to be installed |

("Switch configuration" under "I/O assignment configuration" in "PC parameters")

| | |
|---|---|
| Settings | Value |
| Operation configuration | Independent |
| Data bit length | 8bit |
| Parity bit | Present |
| Odd/even parity | Odd (o) |
| Stop bit length | 1bit |
| Checksum code | Present |
| Writing during RUN | Allowed |
| Configuration change | Allowed |
| Communication rate configuration | 9600bps |
| Communication protocol configuration | MC protocol (format 5) |
| Division configuration | 0 |

### ● Ethernet

**• QJ71E71-100/-B5/-B2**

Set communication conditions with the GX-Developer.
("I/O assignment configuration" in "PC parameters")

| | |
|---|---|
| Type | Intelligent |
| Type name | Name of the unit to be installed |
| Points | 32 points |
| First XY | First output signal of the target unit (hexadecimal number) |

(Target unit number for "Ethernet/CC IE/MELSECNET" in "Network parameters")

| | |
|---|---|
| Network type | Ethernet |
| First I/O No. | Number specified in "I/O assignment configuration" in PC parameters |
| Network No. | Any number |
| Group No. | Any number |
| Division | Any number |
| Mode | Online |

("Operation configuration" for "Ethernet/CC IE/MELSECNET" in "Network parameters")

| | |
|---|---|
| Communication data code configuration | Binary code communication |
| Initial timing configuration | Always waiting for OPEN (Communication possible during STOP) |
| IP address | 192.168.100.10 *1 |
| Writing permitted during RUN | Check |
| Send frame configuration | Ethernet (V2.0) |
| Communication data code configuration | Binary code communication |
| TCP living confirmation configuration | KeepAlive is used. |

*1 Configure so that it matches the network.
* The port number is 5000.

**• CPU built-in port**

Set communication conditions with the GX-Developer.
("Built-in Ethernet port configuration" in "PC parameters")

| | |
|---|---|
| IP address | 192.168.100.10 *1 |
| Subnet mask patterns | 255.255.255.0 *1 |
| Default router IP address | 192.168.100.254 *1 |
| Communication data code configuration | Binary code communication |
| Writing permitted during RUN (FTP and MC protocol) | Check |

*1 Configure so that it matches the network.

("Built-in Ethernet port configuration" in "PC parameters")

| | |
|---|---|
| Protocol | UDP |
| Open system | MC protocol |
| Port number with Ethernet module installed | 232C (hexadecimal number) * Any number |

* The port number of the SR-X Series must be specified in decimal number while the Q Series port number with Ethernet module installed is specified in hexadecimal number.

Example)

| Hexadecimal number | ⇨ | Decimal number |
|---|---|---|
| 232C | | 9004 |

**• L02CPU/26CPU-BT**

Set communication conditions with the GX-Works2.
("Built-in Ethernet port configuration" in "PC parameters")

| | |
|---|---|
| IP address | 192.168.100.10 *1 |
| Subnet mask patterns | 255.255.255.0 *1 |
| Default router IP address | 192.168.100.254 *1 |
| Communication data code configuration | Binary code communication |
| Writing permitted during RUN (FTP and MC protocol) | Check |

*1 Configure so that it matches the network.

("Built-in Ethernet port configuration" in "PC parameters")

| | |
|---|---|
| Protocol | UDP |
| Open system | MC protocol |
| Port number with Ethernet module installed | 232C (hexadecimal number) * Any number |

**Point**

When using MELSEC, ASCII code communication cannot be used for the communication data code configuration.

## SYSMAC Series

### ● RS-232C

Set communication conditions with the CX-Programmer.

**• CPU built-in port**

PLC system configuration→Upper link port (serial port)

| | |
|---|---|
| Communication configuration | User setting |
| Baud rate | 9600bit/s |
| Parameter | 7,2,E |
| Mode | Upper link |
| ID No. | 0 |

* When communication configuration is established as a standard, baud rate and parameters are fixed as above.

**• Serial communication unit/board**

I/O table/unit configuration

| | |
|---|---|
| Presence or absence of optional configuration | Optional configuration |
| Communication mode | Upper link |
| Data length | 7bit |
| Stop bit | 2bit |
| Parity | Even |
| Transmission rate | 9600bps |
| CTS control | None |
| Upper link ID No. | 0 |

### Ethernet

Set communication conditions with the CX-Programmer.

- **CPU built-in port**

[Rotary switch]

| | |
|---|---|
| Unit number | 0 |
| Node address | 1 *1 |

[TCP/IP]

| | |
|---|---|
| IP address | 192.168.100.10 |
| Subnet mask | 255.255.255.0 |

[FINS/UDP]

| | |
|---|---|
| FINS/UDP port | 9600 (default) |
| IP address conversion | IP address table method |
| Remote IP address dynamic conversion | Do not perform dynamic conversion of the remote IP address. |
| Destination node address | 2 |
| IP address | 192.168.100.100 *2 |

*1 Set the node address to a value that is different from that of the SR-X Series.
*2 Specify the IP address of the SR-X Series.

## Devices That Can Be Used

The devices that can be accessed with the PLC link are shown below.

| PLC | Specified area | Device name | Available range |
|---|---|---|---|
| KV Series | Control region | Input relay, output relay | R100 to R59915 *1 |
| | Response region | | |
| | Data region | Data memory | DM0 to DM65534 |
| MELSEC Series | Control region | Input device | Y0 to Y599F *2 |
| | Response region | Output device | X0 to X599F *2 |
| | Data region | Data register | D0 to D65534 |
| SYSMAC Series | Control region | CIO, internal auxiliary relay | 0 to 6143ch |
| | Response region | | |
| | Data region | Data memory | D0 to D65534 |

- The available range indicates the maximum value of the device accessible when the PLC link function is used. When you set the DM front address, control region address, or response region address, do so by taking into account the number of necessary devices.
- Even with the same PLC model, depending on the specifications and the configuration, it may not be possible to specify the maximum value for the device region that can actually be used and there may be regions that cannot be used. For more information on the available regions, refer to the appropriate PLC manual.

*1 In the AutoID Network Navigator entry field, the range is 1 to 599.
*2 In the AutoID Network Navigator entry field, the range is 0 to 599.

- Specifying the front addresses of the control region and response region
  If you enter the value 2 in the AutoID Network Navigator entry field, the shaded area indicated below will be specified.

| | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | ← Front address |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |

# 15-3 Memory Maps

To use the SR-X Series over the PLC link, the functions of the SR-X Series need to be assigned to the PLC devices. For the SR-X Series, assign the front address of each device to match the target functions.

| | |
|---|---|
| Control region | Device used to write commands from the PLC |
| Response region | Device used to write responses from the SR-X Series |
| Data region | Device used to write the reading result data of the SR-X Series* |

* It is also used to specify parameter banks.

## Assignment of Functions

### Control region

When the control region address A is specified, functions are assigned in order as shown below starting with the specified beginning address.

| A+15 | A+14 | A+13 | A+12 | A+11 | A+10 | A+9 | A+8 | A+7 | A+6 | A+5 | A+4 | A+3 | A+2 | A+1 | A+0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reserved area | | | | | | | | | | | | | | | |

| Address | Description | Data description | SR-X Write | PLC Write |
|---|---|---|---|---|
| A+00 | PLC timing area | 0: Instruction for timing OFF<br>1: Instruction for timing ON | | ✓ |
| A+01 | Data write processing method | 0: Real time processing<br>1: Sequential processing | | ✓ |
| A+02 | Sequential processing Data write enabled | 0: Data write disabled<br>1: Data write enabled | | ✓ |
| A+03 | BLOAD request | 0: -<br>1: BLOAD start | | ✓ |
| A+04 | BLOAD complete clear | 0: -<br>1: BLOAD completed or failed, bit clear | | ✓ |

* Set the Timing Signal Input via PLC Link to On to turn the timing signal on and off using the PLC timing area and BLOAD request.
* Make sure the file number "m" is added to D+00 Bank/BLOAD File Number before turning A+03 on. The BLOAD process will fail if the number is outside the range or the corresponding file does not exist.
* B+06 and B+07 are set to 0 when A+04 is turned on.
* BLOAD requests cannot be manually stopped before completion once started.

Reference m=1-8 (SR-X100/X100W), 1-256 (SR-X300/X300W)

### Response region

When the response region address B is specified, functions are assigned in order as shown below starting with the specified beginning address.

| B+15 | B+14 | B+13 | B+12 | B+11 | B+10 | B+9 | B+8 | B+7 | B+6 | B+5 | B+4 | B+3 | B+2 | B+1 | B+0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reserved area | | | | | | | | | | | | | | | |

| Address | Description | Data description | SR-X Write | PLC Write |
|---|---|---|---|---|
| B+00 | PLC timing input response area | 0: Timing OFF<br>1: Instruction for timing ON | ✓ | |
| B+01 | Reserved area | - | - | - |
| B+02 | Sequential processing Data write request | 0: No data<br>1: Data write request | ✓ | |
| B+03 | Sequential processing Data write complete | 0: Data write incomplete<br>1: Data write complete | ✓ | |
| B+04 | Real time processing Data being written | 0: No data being written<br>1: Data being written | ✓ | |
| B+05 | BLOAD response | 0: BLOAD request off<br>1: BLOAD request on | ✓ | |
| B+06 | BLOAD completion | 0: -<br>1: BLOAD complete | ✓ | |
| B+07 | BLOAD failure | 0: -<br>1: BLOAD fail | ✓ | |

* Do not use reserved areas.
* Focus will be adjusted when B+06 is turned on. Wait at least 5 seconds after turning on B+06 before turning on the timing signal input.
* The D+00 Bank/BLOAD File Number remains the same even when B+06 is on. Set D+00 Bank/BLOAD File Number to 0 when alternating banks.

## Data region (single/advanced multi-head)

When the data region address D is specified, functions are assigned in order as shown below starting with the specified beginning address.

| Address | Description | Data description | SR-X Write | PLC Write |
|---|---|---|---|---|
| D+00 | Read bank instruction/ BLOAD file number (single/master only) | 0: Do not specify bank (Alternate)<br>1 to 16: Specify bank n<br>1 to 256 (SR-X300/X300W): BLOAD file number<br>1 to 8 (SR-X100/X100W): BLOAD file number | | ✓ |
| D+01 | Reserved area | | | |
| D+02 | Output data length | Length of data (read data + append data) output from the SR-X Series | ✓ | |
| D+03 | Data writing process count | The count of read data written to the PLC from the SR-X Series.*1 | ✓ | |
| D+04 | 1st and 2nd digits of output data*4 | ASCII code 2 characters*2 *3 | ✓ | |
| D+05 | 3rd and 4th digits of output data*4 | ASCII code 2 characters*2 *3 | ✓ | |
| … | | | | |
| D+503 | 999th and 1000th digits of output data*4 | ASCII code 2 characters*2 *3 | ✓ | |

*1 When the next data reaches at the count of 65535, the value of count returns to 1.

*2 When the output data length is an odd number, [NUL] (0x00) is written in the "Output data length + 1."

*3 The order in which data of each PLC is stored is as follows:
KV :High order byte -> Low order byte
SYSMAC : High order byte -> Low order byte
MELSEC : Low order byte -> High order byte

*4 The data length output from the SR-X Series depends on the data output length set in the SR-X Series. (Default: 64 digits, Maximum value with up to 1,000 digits)
0-byte data is output as data with a length of 0.

Point
- If output data cannot fit in the output data region, starting with that digit, the remaining data will be discarded.
- The output data length of SR-X is written in the data length of D+02.

## Data region (used with multi-drop)

When you use the multi-drop function, the following functions are assigned.

| Address | Description | Data description | SR-X Write | PLC Write | |
|---|---|---|---|---|---|
| D+00 | Read bank instruction/ BLOAD file number (master only) | 0: Do not specify bank (Alternate)<br>1 to 16: Specify bank n<br>1 to 8: BLOAD file number | | ✓ | |
| D+01 | Specify ID | Specify the ID that will supply the trigger input.<br>0 to 31: ID | | ✓ | |
| D+02 | Output data length | Previously output data length | ✓ | | |
| D+03 | Data writing process count | The count of read data written to the PLC from the SR-X Series.*1 | ✓ | | |
| D+04 to D+53 | 1st to 100th digits of output data*4 | Read data of ID: 0*2 *3 | ✓ | | ID:0 |
| D+54 | Data writing ID | ID of the reader to which the most recent data was written | ✓ | | |
| D+55 | Trigger input count for the master unit (ID: 0) | Trigger input count for ID: 0 | ✓ | ? | |
| D+56 to D+59 | Reserved area | | | | |
| D+60 to D+109 | 1st to 100th digits of output data*4 | Read data of ID: 1*2 *3 | ✓ | | ID:1 |
| D+110 to D+159 | 1st to 100th digits of output data*4 | Read data of ID: 2*2 *3 | ✓ | | ID:2 |
| …. | | | | | |
| D+1560 to D+1609 | 1st to 100th digits of output data*4 | Read data of ID: 31*2 *3 | ✓ | | ID:31 |

*1 When the next data reaches at the count of 65535, the value of count returns to 1.

*2 When the output data length is an odd number, [NUL] (0x00) is written in the "Output data length + 1."

*3 The order in which data of each PLC is stored is as follows:
KV : High order byte -> Low order byte
SYSMAC : High order byte -> Low order byte
MELSEC : Low order byte -> High order byte

*4 The data length output from the SR-X Series depends on the data output length set in the SR-X Series. (Default: 64 digits, Maximum value with up to 100 digits)
0-byte data is output as data with a length of 0.

# Device Assignment Function Details

## Read trigger area

This bit is used to start and stop reading.

| Address | Description | Data description |
|---|---|---|
| A+00 | PLC timing area | 0: Instruction for timing OFF<br>1: Instruction for timing ON |
| B+00 | PLC timing input response area | 0: Timing OFF<br>1: Instruction for timing ON |

A+00: When this bit is set to ON (1), the SR-X Series starts reading.
B+00: When the SR-X Series recognizes that A+00 has been set to ON, it sets "B+00" to ON.

## Data write processing method

You can select from two data writing processing methods: "real time processing" and "sequential processing." Switch between the processing methods by setting the value of [A+01] to "0" or "1."

### Real time processing

Data will be sent immediately after reading.

| Address | Description | Data description |
|---|---|---|
| A+01 | Data write processing format | **0: Real time processing**<br>1: Sequential processing |
| B+04 | Real time processing Data being written | 0: No data being written<br>1: Data being written |

A+01: Set this bit to OFF (0) in advance.
B+04: While this bit is set to ON, data is being written. It is set to OFF when writing finishes.

### Sequential processing

After reading, data is stored in the send buffer of the SR-X Series until the writing of data to the PLC is enabled.

| Address | Description | Data description |
|---|---|---|
| A+01 | Data write processing method | 0: Real time processing<br>**1: Sequential processing** |
| A+02 | Sequential processing Data write enabled | 0: Data write disabled<br>1: Data write enabled |
| B+02 | Sequential processing Data write request | 0: No data<br>1: Data write request |
| B+03 | Sequential processing Data write complete | 0: Data write incomplete<br>1: Data write complete |

A+01: Set this bit to ON (1) in advance.
A+02: When this bit is set to ON (1), the SR-X Series writes read data into "D+04 to D+503."
When this bit is set to OFF (0), the SR-X Series stores data in the send buffer without writing new data.
B+02: This bit is set to ON when read data is present in the send buffer.
B+03: This bit is set to ON when the writing of data is finished.

## Reading bank specification

Use this to specify banks of the SR-X Series.

| Address | Description | Data description | Data format |
|---|---|---|---|
| D+00 | Specify read bank | 0: Bank not specified (alternate)<br>1 to 16: Bank n specified | Binary code |

D+00: When a bank number has been entered in this address, setting "A+00" to ON (1) starts reading with this bank specified.

## Output data length

| Address | Description | Data description | Data format |
|---|---|---|---|
| D+02 | Output data length | Length of data output from the SR-X Series | Binary code |

## Output data

| Address | Description | Data description | Data format |
|---|---|---|---|
| D+04 to D+503 | Output data | 2 characters of ASCII code/ address *1 *2 *3 | ASCII code |

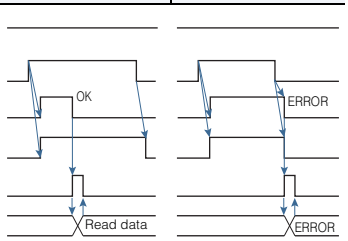
Point

- If "A+00" is switched between ON and OFF at high speed, the SR-X Series will miss the changes in "A+00," which will prevent the trigger input from turning on or off normally. In this situation, write the program so that "B+00" is used to check whether the SR-X Series has recognized the change in "A+00."
- If the code reading interval is shorter than the PLC link communication time, data that cannot be written to the PLC will be stored in the send buffer of the SR-X Series.
- The SR-X Series can hold up to 100 pieces of data. If this limit is exceeded, all data in the send buffer is erased and "OVER" is written into "D+04 to D+503." (This is a send buffer overflow.)
- When a send buffer overflow occurs, the SR-X Series stops operation, writes "OVER" to the PLC, and then recovers to an operating state.
- When you are using "sequential processing," be sure to set "A+02" to ON (1) after you have prepared the PLC to receive the data.

# 15-4 Operation Examples

**Example 1) Trigger method: Level trigger, Data writing method: Real time processing.**

| Memory layout | Signal name | Address | When reading is successful | When reading failed |
|---|---|---|---|---|
| Control region | Data write processing method | A+01 | | |
| | Trigger area | A+00 | | |
| Read operation (light is lit) | | | | |
| Response region | Trigger response area | B+00 | | |
| | Writing data | B+04 | | |
| Data region | Output data | D+02... | | |




### When reading is successful

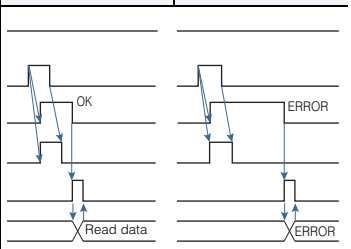
1. "A+00," "A+01," and "B+00" are set to OFF (0).
2. "A+00" is set to ON (1).
3. When the SR-X Series recognizes that "A+00" has been set to ON (1), "B+00" is set to ON (1) and reading starts.
4. When the code is read, its data is written into "D+04 to D+503."
5. "A+00" is set to OFF (0).
6. When the SR-X Series recognizes that "A+00" has been set to OFF (0), "B+00" is set to OFF (0).

### When reading fails

1. "A+00," "A+01," and "B+00" are set to OFF (0).
2. "A+00" is set to ON (1).
3. When the SR-X Series recognizes that "A+00" has been set to ON (1), "B+00" is set to ON (1) and reading starts.
4. "A+00" is set to OFF (0).
5. When the SR-X Series recognizes that "A+00" has been set to OFF (0), "B+00" is set to OFF (0) and reading stops.
6. The code could not be read, so "ERROR" is written to "D+04 to D+503."

**Example 2) Trigger method: One-shot trigger, Data writing method: Real time processing.**

| Memory layout | Signal name | Address | When reading is successful | When reading failed |
|---|---|---|---|---|
| Control region | Data write processing method | A+01 | | |
| | Trigger area | A+00 | | |
| Read operation (light is lit) | | | | |
| Response region | Trigger response area | B+00 | | |
| | Writing data | B+04 | | |
| Data region | Output data | D+02... | | |




### When reading is successful

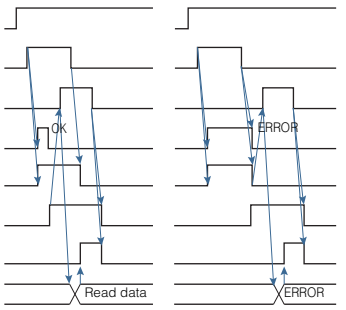
1. "A+00," "A+01," and "B+00" are set to OFF (0).
2. "A+00" is set to ON (1).
3. When the SR-X Series recognizes that "A+00" has been set to ON (1), "B+00" is set to ON (1) and reading starts.
4. When the "One-shot trigger duration" elapses, "B+00" is set to OFF (0) and reading stops.
5. When the code is read, its data is written into "D+04 to D+503."
6. When the "One-shot trigger duration" elapses, "B+00" is set to OFF (0) and reading stops.

### When reading fails

1. "A+00," "A+01," and "B+00" are set to OFF (0).
2. "A+00" is set to ON (1).
3. When the SR-X Series recognizes that "A+00" has been set to ON (1), "B+00" is set to ON (1) and reading starts.
4. "A+00" is set to OFF (0).
5. When the "One-shot trigger duration" elapses, "B+00" is set to OFF (0) and reading stops.
6. The code could not be read, so "ERROR" is written to "D+04 to D+503."

**Example 3) Trigger method: Level trigger, Data writing method: Sequential processing.**

| Memory layout | Signal name | Address | When reading is successful | When reading failed |
|---|---|---|---|---|
| Control region | Data write processing method | A+01 | | |
| | Trigger area | A+00 | | |
| | Data write enabled | A+02 | | |
| Read operation (light is lit) | | | | |
| Response region | Trigger response area | B+00 | | |
| | Data write request | B+02 | | |
| | Data write complete | B+03 | | |
| Data region | Output data | D+02... | | |




### When reading is successful

1. "A+00" and "B+00" are set to OFF (0).
2. "A+01" is set to ON (1).
3. "A+00" is set to ON (1).
4. When the SR-X Series recognizes that "A+00" has been set to ON (1), "B+00" is set to ON (1) and reading starts.
5. When a code is read, "B+02" is set to ON (1).
6. "A+00" is set to OFF (0).
7. When "A+02" is set to ON (1), the data is written into "D+04 to D+503."
8. When data writing is complete, "B+03" is set to ON (1).
9. When "A+02" is set to OFF (0), "B+03" is set to OFF (0).

### When reading fails

1. "A+00" and "B+00" are set to OFF (0).
2. "A+01" is set to ON (1).
3. "A+00" is set to ON (1).
4. When the SR-X Series recognizes that "A+00" has been set to ON (1), "B+00" is set to ON (1) and reading starts.
5. "A+00" is set to OFF (0).
6. When the code cannot be read, "ERROR" is written to the send buffer, so "B+02" is set to ON (1).
7. When "A+02" is set to ON (1), "ERROR" is written into "D+04 to D+503."
8. When data writing is complete, "B+03" is set to ON (1).
9. When "A+02" is set to OFF (0), "B+03" is set to OFF (0).

* Complete processing so that "A+02" is set to ON (1) when "B+03" is set to OFF (0) and "B+02" is set to ON (1). This makes it possible to obtain all the data even when multiple pieces of data are stored in the send buffer.

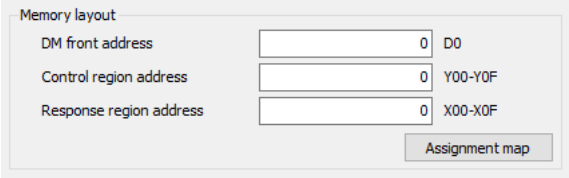
Point

- The read data stored in the "D+04 to D+503" data region is overwritten with the new read data.
- If the number of digits in the read data changes, parts of the previous read data may remain in "D+04 to D+503." If necessary, delete the data stored in "D+04 to D+503" after this data is sent.
- Timing with which to transfer the data stored in "D+04 to D+503" to a different block of data memory
  "Real time processing:" Transfer the data when "B+04" is set to OFF (0).
  "Sequential processing:" Transfer the data when "B+03" is set to ON (1).

**Example 4) Using the changeover function**

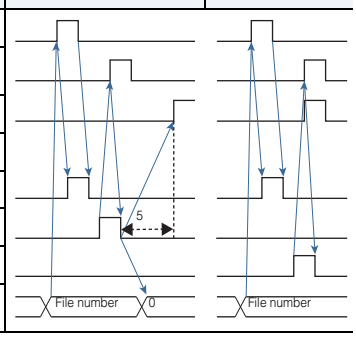
■ **Configuration**

Set the Timing Signal Input via PLC Link to On.




■ **Timing chart**

| Memory layout | Signal name | Address |
|---|---|---|
| Control region | BLOAD request | A+03 |
| | BLOAD complete clear | A+04 |
| | PLC timing area | A+00 |
| Response region | BLOAD response | B+05 |
| | BLOAD completion | B+06 |
| | BLOAD failure | B+07 |
| Data region | BLOAD file number | D+00 |




### ● BLOAD completion

1. D+00 describes the file number in binary.
2. A+03 is turned on (1).
3. B+05 is turned on (1) to enable the SR-X Series units to recognize BLOAD requests.
   * B+05 remains off (0) when not using BLOAD.
4. B+06 (1) is turned on after the configuration file has been successfully switched.
5. A+04 is turned on, which turns off B+06 (0).
6. D+00 is set to 0.
7. B+06 is turned on (1) and then A+00 is turned on (1) after 5 seconds.

### ● BLOAD fails

1. D+00 describes the file number in binary.
2. A+03 is turned on (1).
3. Turn on B+05 (1) to enable the SR-X Series units to recognize BLOAD instructions.
   * B+05 remains off (0) when not using BLOAD.
4. B+07 is turned on (1) if the configuration file fails to be switched.
5. A+04 is turned on, which turns off B+07 (0).

**Point**

- Turn on (1) BLOAD request"A+03"when the DATA write request"B+02" is a state of 0 (a state of no data).
- After completion of BLOAD, if the network setting (IP address setting) is edited, Turn off BLOAR completion "B+06" at the same time when BLOAD request "A+03" is turned off.

# Reference Program

This is a reference program for the use of the KV Series. In this program, error handling is not considered, thus program by taking into account error handling and test in actual operation.

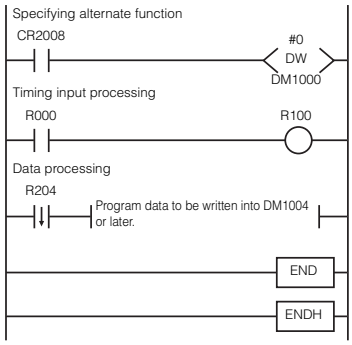
## SR-X Series configuration

It is assumed that the SR-X Series is configured as follows:

- Timing : Level trigger
- Read mode : Standard
- Memory assignment : DM front address: DM1000
  Control region address: R100
  Response region address: R200
- PLC link timing input : Yes

* To use on a trial basis, specify the PLC communication interface to the SR-X Series and configure communication for the KV Series.

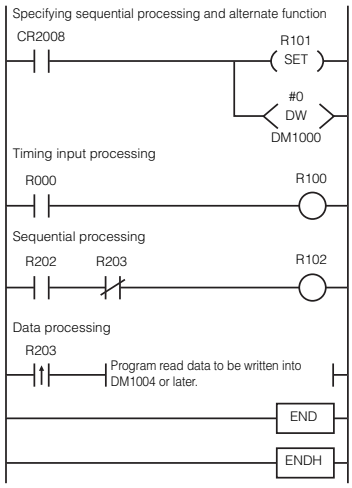
## Real time processing




Write "0" into DM1000 and set to use the alternate function.

Input R000 as read timing.

## Sequential processing




Set up the R101 and set it to sequential processing.

Write "0" into DM1000 and set to use the alternate function.

Input R000 as read timing.

Use the data write request flag (R202), data write enabled flag (R102), data write complete flag (R203) to execute sequential processing.

# 15-5 PLC Link Error

## When a PLC Link Error Occurs

When a PLC link error occurs, the SR-X Series exhibits the following behavior:
- "E7 PLC LINK" is shown on the SR-X300 Series display.
- For the SR-X100 series, the status LED will flash in yellow.
- "ERR BUSY" is output from the output terminals.
- The status LED flashes in yellow.

## Check Points

When a PLC link error occurs, check the following points:

### Wiring
- Is the cable between the SR-X Series and the PLC connected correctly?
- Are there any breaks in the cable?
- If you are communicating via RS-232C, is the wiring correct?

### Settings
- Do the communication settings of the SR-X Series match those of the PLC?
- Are the "memory layout" settings within the range of use of the PLC?

### Operation
- After the PLC settings were configured, was the PLC restarted?

## Recovering from PLC Link Errors

- Restart the SR-X Series.
- For the SR-X300/X300W series, press and hold the [SELECT] button on the main unit for 3 sec.
- When "Clear PLC link error" is assigned to IN terminal, turn on the IN terminal.
- Send the clear PLC link error command (PCLR) to the SR-X Series.
- Send the reset command (RESET) to the SR-X Series.

Point
- While a PLC link error is occurring, trigger input signals are not accepted.
- When PLC link errors are cleared, all the data stored in the send buffer is cleared.
- When you have specified to use a PLC, this setting may not be applied until you restart the PLC. After you specify this setting, be sure to restart the PLC.

# 16 EtherNet/IP


## 16-1 EtherNet/IP Overview 132

What Is EtherNet/IP? 132
Cyclic and Message Communication 132
List of Supported PLCs 132
SR-X Series EtherNet/IP Communication Specifications 132
Usable Functions 132

## 16-2 Cyclic Communication 133

Cyclic Communication 133
SR-X Series Settings 133
PLC Settings 133
Memory Maps 134
Details of Result Data (Input Assemblies) 135
Details of Control Data (Output Assemblies) 137
List of Error Codes 137
Operation Examples 138

## 16-3 Message Communication 140

Message Communication 140
SR-X Series Settings 140
Service Objects 141
Operation Examples 143

## 16-4 Reference Programs 143

For the KV Series 143
Control Logix/Compact Logix (RSLogix 5000) 144

# 16-1 EtherNet/IP Overview

## What Is EtherNet/IP?

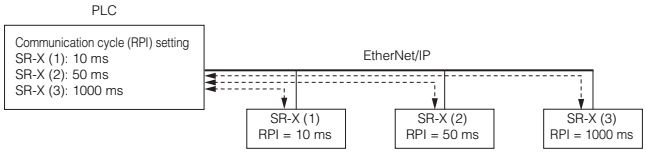
EtherNet/IP is an industrial communications network managed by the ODVA (Open DeviceNet Vendor Association, Inc.). EtherNet/IP communication can share the network with normal Ethernet communication.

## Cyclic and Message Communication

In EtherNet/IP, there is cyclic communication (Implicit message) that handles periodic sending and receiving of data, and there is also message communication (Explicit message) which handles sending and receiving of commands/responses arbitrarily. Typically cyclic communication is used.

### Cyclic communication

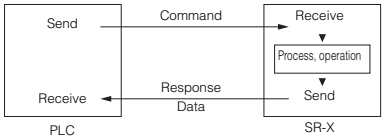
In cyclic communication, RPI (communication cycle) can be set according to the priority of data that is sent and received. Overall communication load adjusted data can be sent and received.




The communication cycle (RPI) put together in order of priority can be set and network load can be adjusted.

### Message communication

In message communication, timing is controlled through commands/responses.




## List of Supported PLCs

### PLC manufactured by KEYENCE

| PLC model | EtherNet/IP Communication unit | Software used |
|---|---|---|
| KV-3000 | KV-EP21V | KV STUDIO |
| KV-5000 | KV-EP21V | |
| KV-8000/7500/5500 | - (built-in port or KV-EP21V) | |
| KV-N24/N40/N60/NC32T | KV-NC1-EP | |

### PLC manufactured by Rockwell Automation

- Control Logix / Compact Logix

| PLC model | EtherNet/IP Communication unit | Firmware version | Software used | Version of software used |
|---|---|---|---|---|
| 1756 ControlLogix | 1756-ENBT | Ver. 13 or later | RsLogix5000 | Ver. 13 or later |
| 1769 ConpactLogix | - (built-in) | | | |

- Micro Logix1100/1400

| PLC model | EtherNet/IP Communication unit | Firmware version | Software used | Version of software used |
|---|---|---|---|---|
| 1761/1766 MicroLogix | - (built-in port)/ 1761-NET-ENI | Series A, Revision A, FRN1 | RsLogix500 | Ver. 7.10 or later |
| 1762/1763/1764 MicroLogix | 1761-NET-ENI | | | |

### PLC manufactured by OMRON

| PLC model | EtherNet/IP Communication unit | Software used |
|---|---|---|
| SYSMAC CJ2 | - (built-in port or CJ1W-EIP21) | Cx-One |
| SYSMAC CJ1 | CJ1W-EIP21 | |
| SYSMAC CS1 | CS1W-EIP21 | |

## SR-X Series EtherNet/IP Communication Specifications

| | | | |
|---|---|---|---|
| Cyclic communication (Implicit message) | Number of connections | 16* | |
| | Communication size | KEYENCE KV Series | 4 to 1444 bytes |
| | | Rockwell Automation ControlLogix CompactLogix | 4 to 496 bytes |
| | | OMRON CJ/CS Series | 4 to 1436 bytes |
| Message communication (Explicit message) | Number of connections | 16* | |
| | Applicable messaging methods | UCMM (unconnected type), Class 3 (connected type) | |

* In total, there are 16 connections in cyclic communication and message communication.

## Usable Functions

The functions that the SR-X Series can use with EtherNet/IP are shown below.

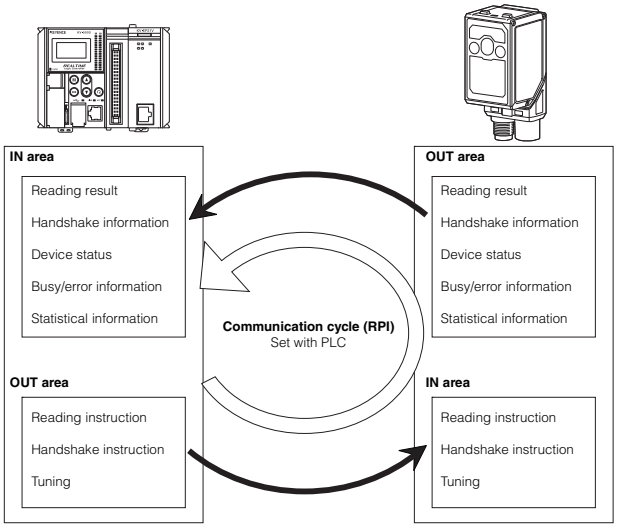
| Function | Description |
|---|---|
| Reading instruction | Begins reading operation.<br>Also executes reading end, bank setting reading, etc. |
| Preset instructions | Records successfully read data as preset data.<br>Also registers or deletes preset data from the PLC. |
| Tuning instructions | Execute tuning. Can save tuning results in the set bank. |
| Error-handling | Checks the cause of the error that occurred in the main unit, and returns the error.<br>(Example: Buffer overflow check/cancellation) |
| Main unit status acquisition | Checks the main unit status (BUSY status). |
| Operation results acquisition | Acquires read data. When set to silent mode, the read data is not updated. |
| Terminal status acquisition | Acquires input terminal and output terminal status. |
| Main unit reset instructions | Displays the SR-X Series software reset. |

| | |
|---|---|
| NOTICE | **About the exclusion process**<br>**The SR-X Series can simultaneously give control instructions to multiple interfaces (I/O terminal, RS-232C, Ethernet Communication (TCP/IP), EtherNet/IP communication, test key operation). However, when a control instruction is being received from one interface, instructions from other interfaces cannot be received.** |

# 16-2 Cyclic Communication

## Cyclic Communication

This communication can be used to execute reading or tuning by setting bits to ON or OFF.

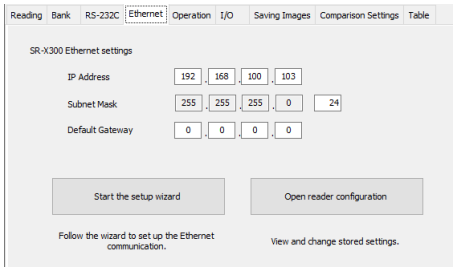



| NOTICE | • **Communication settings such as the communication cycle and data size are set in the PLC.<br>When there is a large load in the network which connects many devices including EtherNet/IP devices, delays or packet loss may occur. Perform a thorough verification before operation.**<br>• **When communicating via EtherNet/IP with PLCs (MicroLogix Series manufactured by Rockwell, etc.) that do not support cyclic communication, use message communication.** |
|---|---|

## SR-X Series Settings

**1 Open the [Ethernet] tab.**

**2 Enter the [IP address] and [Subnet Mask] settings to assign to the SR-X.**




**3 Start [Setup Wizard].**

**4 STEP 1 Select the trigger input method.**

**5 STEP 2 Select [Field network/PLC].**

**6 STEP 3 Select [EtherNet/IP].**

**7 STEP 4 Configure the detailed EtherNet/IP settings.**

| | |
|---|---|
| Data handshake | Set whether to implement handshake processing. |
| Input assembly data size (send) | Set this to a value that is the maximum amount of read data + 45 bytes or higher. *1 |
| Output assembly data size (receive) | Specify a value of 12 bytes or higher.* 1 |
| Byte swapping | You can change the order in which data is stored in memory (read data or preset data).<br>Disable: Low order to high order<br>Enable: High order to low order |

*1 Increase the value according to the number of digits in the read data or pre-set data.

**8 Exit [Setup Wizard].**

**9 Click [Send Configuration].**

## PLC Settings

When you use cyclic communication, configure the following settings on the PLC.
(1) Connection settings
(2) Settings of the device to communicate with by way of EtherNet/IP

For setting details, refer to the PLC's manual.

### Connection type

Open a connection from the PLC to the SR-X Series during EtherNet/IP cyclic communication. The types of usable connections vary depending on the device. The connections that can be used by the SR-X Series are shown below.

| Connection type | Data type | Instance ID | Size (byte) | RPI (ms) |
|---|---|---|---|---|
| Exclusive Owner (Data transmission + control) | Result data (Input Assemblies) | 0x64 (100) | 40 to 1400 | 10-10000 |
| | Control data (Output Assemblies) | 0x65 (101) | 8 to 1400 | |
| Input Only (Data transmission only) | Result data (Input Assemblies) | 0x64 (100) | 40 to 1400 | 10-10000 |
| | Control data (Output Assemblies) | 0xFE (254) | 0 | |

| | |
|---|---|
| Exclusive Owner | • SR-X -> PLC: Data transmission<br>• PLC -> SR-X: Control instruction<br>Use this connection to send data from the SR-X Series and to enable the PLC to send control instructions, such as starting reading, to the SR-X. |
| Input Only | • SR-X -> PLC : Data transmission<br>Use this connection to only send data from the SR-X Series. You can use multiple connections with a single SR-X Series. (To a maximum of 16 connections.) |

Point

- When you use "Input Only," you have to set the RPIs of all the devices for "Exclusive Owner" and "Input Only" to the same values.
- Multiple "Exclusive Owner" connections cannot be used with a single SR-X Series unit.
- The trigger timing of each connection is executed in a cyclic manner.
- When using the KV series, the connection names are assigned as shown below.
  1: Exclusive Owner -> Result data/control data class 1
  2: Input Only -> Result data class 1 (Input Only)

#### ● KV-8000/7500/5500 Series settings

We have prepared information regarding connecting the KV-8000/7500/5500 and the SR Series.
Download the information from the KEYENCE website.

#### ● CJ Series settings

We have prepared information regarding connecting the CJ Series and the SR Series.
Download the information from the KEYENCE website.

**1 Set the PLC network communication.**

Using the CX-Developper, make the communication settings of PLC's IP address, etc.

**2 Set the EtherNet/IP network configuration for PLC and SR-X.**

Using Network Configurator, set the network configuration.
* The EDS file for SR-X is in the EDS folder on disc1 of SR-H8W.

**3 Register the transmission area tag and the reception area tag for PLC.**

Right-click the PLC icon on Network Configurator, select [Parameter] – [Edit], enter the [Edit device parameter] setting screen, and edit the tag.

**4 Make the setting to relate the PLC tag with the SR-X tag.**

Register the device on the [Edit device parameter] setting screen and make the connection assignment setting.
Transfer the configuration parameters to the PLC to complete the setting.

[Setting example]
Connection I/O type: Class1

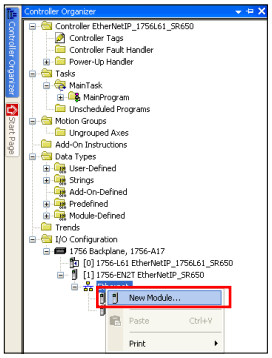
| Originator device (PLC) | | | Target device (SR-X) | |
|---|---|---|---|---|
| Input tag set | E0_00000 - [500byte] | ⇦ | Output tag set | Input_100 - [500byte] |
| Connection type | Multi-cast connection | | | |
| Output tag set | D00000 - [500byte] | ⇨ | Input tag set | Output_101 - [500byte] |
| Connection type | Point to Point connection | | | |

* For operation details of CX-Developper and Network Configurator, refer to "SYSMAC CS/CJ Series EtherNet/IP Unit User's Manual" published by Omron.

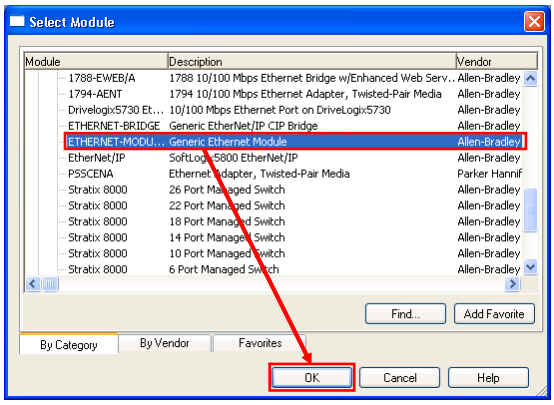
### ● Control Logix/Compact Logix Series settings

We have prepared information regarding connecting the Control Logix/Compact Logix Series and the SR Series.
Download the information from the KEYENCE website.

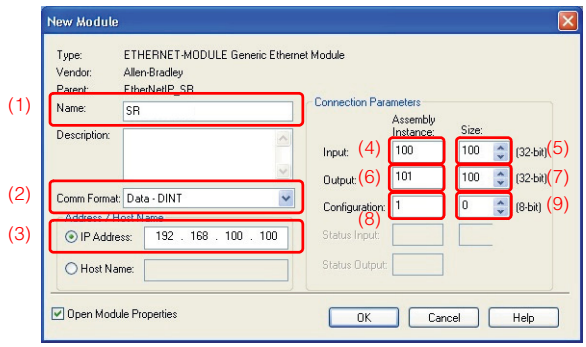
**1 Right-click the EtherNet/IP enabled device on the RSLogix5000 and select New Module.**




**2 Click the Communications' [+] button, select ETHERNET-MODULE (Generic Ethernet Module), and click OK.**




**3 Set the ETHERNET-MODULE as follows:**




| | | |
|---|---|---|
| (1) | Name | Arbitrary value |
| (2) | Comm Format | Arbitrary value<br>Data - DINT (double integer, 4 bytes)<br>Data - INT (integer, 2 bytes)<br>Data - SINT (single integer, 1 byte) |
| (3) | IP Address | IP address of the SR-X Series |
| (4) | Input Assembly Instance | 100 |
| (5) | Input Size | Input assembly size of the SR-X Series*1 |
| (6) | Output Assembly Instance | 101*2 |
| (7) | Output Size | Output assembly size of the SR-X Series*1 |
| (8) | Configuration | 1*3 |
| (9) | Configuration Size | 0*3 |

*1 In AutoID Network Navigator, the input assembly size and output assembly size are set with 8 bits, but these are set with 32 bits on the RSLogix5000.

| 8-bit notation | 32-bit notation |
|---|---|
| 100 | 25 |

*2 When operating with the "Input Only" connection type, set (6) to 254 and (7) to 0.

*3 The SR-X Series does not use the Configuration setting. However, enter the above value since failing to do so will result in an incomplete input error.

# Memory Maps

## Result data (Input Assemblies)

Input Assemblies write responses from the SR-X Series to the PLC. When using this device, each device function is assigned as follows. Device status, Result Data, etc. are written to the Input Assemblies.

### ● Input Assemblies memory map (Instance ID: 0x64)

SR-X → PLC

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | READY | | ERR BUSY | MODE BUSY | LOCK BUSY | TRG BUSY | BUSY | General Error | Buffer Overflow Error | | | | Read Data Update Complete | Read Data Update Available | Error |
| 1 | External Instruction Operation Failure | | | BLOAD Failure | Tuning Failure | Preset Data Registration Failure | Preset Reading Failure | Reading Error | External Instruction Operation Complete | | | BLOAD Complete | Tuning Complete | Preset Data Registration Complete | Preset Reading Complete | Reading Complete |
| 2 | | | ISO/IEC 15416 Unstable | SAE AS9132 Unstable | AIM DPM Unstable | ISO/IEC 15415 Unstable | Matching Level Unstable | Unstable | | OUT3 Status | OUT2 Status | OUT1 Status | | | IN2 Status | IN1 Status |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | Matching Level | | | | | | | |
| 5 | | | | | | | | | ISO/IEC15415 Grade | | | | | | | |
| 6 | | | | | | | | | AIM DPM Grade | | | | | | | |
| 7 | | | | | | | | | ISO/IEC 15416 | | | | | | | |
| 8 | Reading Error Cause | | | | | | | | | | | | | | | |
| 9 | Preset Reading Failure Cause | | | | | | | | | | | | | | | |
| 10 | Preset Data Registration Failure Cause | | | | | | | | | | | | | | | |
| 11 | Tuning Failure Cause | | | | | | | | | | | | | | | |
| 12 | BLOAD Failure Cause | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | |
| 15 | External Instruction Operation Error Cause | | | | | | | | | | | | | | | |
| 16 | General Error Cause | | | | | | | | | | | | | | | |
| 17 | Slave ID | | | | | | | | | | | | | | | |
| 18 | Read Data Ready Count | | | | | | | | | | | | | | | |
| 19 | Read Data Update Count | | | | | | | | | | | | | | | |
| 20 | Trigger Input Count for Master | | | | | | | | | | | | | | | |
| 21 | Read Data Size | | | | | | | | | | | | | | | |
| 22 and above | Read Data | | | | | | | | | | | | | | | |

* Gray parts are reserved areas for the system.

## Control data (Output Assemblies)

Output Assemblies write instructions from the PLC to the SR-X Series. When using this device, each device function is assigned as follows. Output Assemblies operate device control instructions, error clear, handshake process, etc.

### ● Output Assemblies memory map (Instance ID: 0x65)

PLC → SR-X

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | BLOAD Request | Tuning Start Request | Preset Data Registration Start Request | Preset Reading Start Request | Reading Start Request | Error Clear Transmission Buffer Clear | | | | | | Read Data Update Permitted | |
| 1 | | | | | | | | | External Instruction Operation Complete Clear | | | BLOAD Complete Clear | Tuning Complete Clear | Preset Data Registration Complete Clear | Preset Reading Complete Clear | Reading Complete Clear |
| 2 | Bank Number/BLOAD File Number | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | |
| 5 | Preset Data Size | | | | | | | | | | | | | | | |
| 6 and above | Preset Data | | | | | | | | | | | | | | | |

* Gray parts are reserved areas for the system.

# Details of Result Data (Input Assemblies)

### Address 0 Bit 0 to Bit 7 Handshake and error status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 0 | 0 | Error | This Bit turns ON when either "6 Buffer Overflow Error" or "7 General Error" Bit is ON. | 0: No error<br>1: Error |
| 0 | 1 | Read Data Update Available | This Bit is used when using handshake.*<br>This displays whether read data exists or not. | 0: No read data<br>1: Read data available |
| 0 | 2 | Read Data Update Complete | This Bit is used when using handshake.*<br>This turns ON when read data update is complete. | 0→1: Result data update complete |
| 0 | 6 | Buffer Overflow Error | This turns ON when buffer overflow error occurs. | 0: No error<br>1: Error |
| 0 | 7 | General Error | This turns ON when a communication or main unit error occurs. It does not turn ON when a buffer overflow error occurs.<br>If this turns ON, the error code is output to "Address 16 General Error Cause." | 0: No error<br>1: Error |

* Handshake is a communication procedure to make the permission system for read data writing.

### Address 0 Bit 8 to Bit 14 BUSY status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 0 | 8 | BUSY | This Bit turns ON when any of the following BUSY Bits (9 to 13) is ON. | 0: -<br>1: BUSY status |
| 0 | 9 | TRG BUSY | TRG BUSY | 0: -<br>1: TRG BUSY status |
| 0 | 10 | LOCK BUSY | LOCK BUSY | 0: -<br>1: LOCK BUSY status |
| 0 | 11 | MODE BUSY | MODE BUSY | 0: -<br>1: MODE BUSY status |
| 0 | 12 | ERR BUSY | ERR BUSY | 0: -<br>1: ERR BUSY status |
| 0 | 14 | READY | READY<br>This continues to be ON in non-"BUSY" status. | 0: -<br>1: Ready state |

### Address 1 Bit 0 to Bit 7 Completion status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Reading Complete | This turns ON when reading is complete.*1 | 0: -<br>1: Complete*2 |
| 1 | 1 | Preset Reading Complete | This turns ON when preset reading is complete. | 0: -<br>1: Complete*2 |
| 1 | 2 | Preset Data Registration Complete | This turns ON when preset data registration is complete. | 0: -<br>1: Complete*2 |
| 1 | 3 | Tuning Complete | This turns ON when tuning is complete. | 0: -<br>1: Complete*2 |
| 1 | 4 | BLOAD Complete | This turns ON when BLOAD is complete. | 0: -<br>1: Complete*2 |
| 1 | 7 | External Instruction Operation Complete | This turns ON when "Reading", "Preset reading" or "Tuning" is executed with the IN terminal or command and the operation is complete. | 0: -<br>1: Complete*2 |

*1 This Bit also turns ON when the character string of "ERROR" is output when reading error occurs.

*2 This returns to 0 when the applicable clear bit is set to ON or when the Output Assemblies "Reading Start Request" bit is set to ON.

**Point**

Check that "BUSY" is set to OFF before starting processing such as reading and tuning. When "BUSY" is set to ON, reading and tuning processing cannot start even if you provide instructions to do so.

### Address 1 Bit 8 to Bit 15 Error status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 8 | Reading Error | This turns ON when reading error or comparison NG occurs. | 0: -<br>1: Reading error, Comparison NG* |
| 1 | 9 | Preset Reading Failure | This turns ON when preset reading fails. | 0: -<br>1: Preset reading failure* |
| 1 | 10 | Preset Data Registration Failure | This turns ON when preset data registration fails. | 0: -<br>1: Preset data registration failure* |
| 1 | 11 | Tuning Failure | This turns ON when tuning fails. | 0: -<br>1: Tuning failure* |
| 1 | 12 | BLOAD Failure | This turns ON when BLOAD fails. | 0: -<br>1: BLOAD failure* |
| 1 | 15 | External Instruction Operation Failure | This turns ON when "Reading", "Preset reading" or "Tuning" is executed with the IN terminal or command and the operation fails. | 0: -<br>1: External instruction operation failure* |

* If any of the above errors occurs, the error code is output to "Failure cause status (Input Assemblies address 8 to 16)."

### Address 2 Bit 0 to Bit 7 Terminal status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 2 | 0 | IN1 Status | This represents IN1 terminal status. | 0: OFF<br>1: ON |
| 2 | 1 | IN2 Status | This represents IN2 terminal status. | 0: OFF<br>1: ON |
| 2 | 4 | OUT1 Status | This represents OUT1 terminal status. | 0: OFF<br>1: ON |
| 2 | 5 | OUT2 Status | This represents OUT2 terminal status. | 0: OFF<br>1: ON |
| 2 | 6 | OUT3 Status | This represents OUT3 terminal status. | 0: OFF<br>1: ON |

* The above chart shows the contents when the input polarity setting of the SR-X is Norm. open (normally open). For Norm. closed (normally closed), the data is reversed as 0: ON 1: OFF.
* When checking the writing of read data, do not use OUT1 to 4 statuses, but use the "Reading Complete" bit or "External Instruction Operation Complete" bit. Depending on the communication load, the ON statuses of the OUT terminals and reading completion may not be synchronized.

### Address 2 Bit 8 to Bit 12 Judgment result status for matching level and code quality verification function

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data contents |
|---|---|---|---|---|
| 2 | 8 | Unstable | This Bit turns ON when any of the following Unstable Bits (9 to 12) are ON. | 0 : Stable<br>1 : Unstable |
| 2 | 9 | Matching Level Unstable | Matching level judgment result | 0 : Stable<br>1 : Unstable |
| 2 | 10 | ISO/IEC15415 Unstable | ISO/IEC 15415 verification judgment result | 0 : Stable<br>1 : Unstable |
| 2 | 11 | AIM DPM Unstable | ISO/IEC TR 29158 (AIM DPM-1-2006) verification judgment result | 0 : Stable<br>1 : Unstable |
| 2 | 12 | SAE AS9132 Unstable | SAE AS9132 Unstable verification judgment result | 0 : Stable<br>1 : Unstable |
| 2 | 13 | ISO/IEC 15416 Unstable | ISO/IEC 15416 verification judgment result | 0 : Stable<br>1 : Unstable |

* Use this status when the code quality verification function of SR-X is enabled. For the code quality verification function settings, refer to "10-6 Code Quality Verification" (Page 72).
* In the multi head mode of the master/slave function, the matching level and the status of the code quality verification function cannot be used.

### Address 4 to 7 Total evaluation grade for matching level and code quality verification function

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data contents | Data type |
|---|---|---|---|---|---|
| 4 | | Matching Level | Matching Level<br>* If multiple codes are read, the minimum value is output. | 0 to 100*1 | UINT |
| 5 | | ISO/IEC15415 Grade | Total evaluation grade for ISO/IEC 15415 verification | 4 : A*1<br>3 : B<br>2 : C<br>1 : D<br>0 : F | UINT |
| 6 | | AIM DPM Grade | Total evaluation grade for ISO/IEC TR 29158 (AIM DPM-1-2006) | 4 : A*1<br>3 : B<br>2 : C<br>1 : D<br>0 : F | UINT |
| 7 | | ISO/IEC 15416 Grade | Total evaluation grade for ISO/IEC 15416 | 4 : A*1<br>3 : B<br>2 : C<br>1 : D<br>0 : F | UINT |

* Use this status when the code quality verification function of SR-X is enabled. For the code quality verification function settings, refer to "10-6 Code Quality Verification" (Page 72).
*1 This returns to 0 when the Output Assemblies "Reading Complete Clear" bit is set to ON.

### Address 8 to 16 Failure cause status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description | Data type |
|---|---|---|---|---|---|
| 8 | | Reading Error Cause | When any of the error statuses (Input Assemblies Address 1, Bit 8 to Bit 15) turns on, the error code is output to the applicable location. | Error code* | UINT |
| 9 | | Preset Reading Failure Cause | | | UINT |
| 10 | | Preset Data Registration Failure Cause | | | UINT |
| 11 | | Tuning Failure Cause | | | UINT |
| 12 | | BLOAD Failure Cause | | | UNIT |
| 15 | | External Instruction Operation Error Cause | | | UINT |
| 16 | | General Error Cause | | | UINT |

* For error codes, refer to "List of Error Codes" (Page 137).

### Address 18 to 19 Read data status

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description | Data type |
|---|---|---|---|---|---|
| 18 | | Read Data Ready Count | Read data ready count | 0 to 65535* | UINT |
| 19 | | Read Data Update Count | Read data update count | 0 to 65535* | UINT |

* When the count number reaches 65535 and the next data arrives, the count number returns to 0.

### Address 21 or above Read data

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | |
| ⋮ | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description | Data type |
|---|---|---|---|---|---|
| 21 | | Read Data Size | Read data length | 0 and above* | UINT |
| 22 and above | | Read Data | Read data | Read data* | BYTE[] |

* When the header, terminator and append data are set to the read data of SR-X, the header, terminator, append data and inter-delimiter are also output.
[CR] has been set to the terminator as the default setting. Accordingly, [CR] is appended after the read data for output.
* If the silent mode is set for SR-X, read data is not output.
* The read data is cleared each time that a code is read.

### Address 17, 20 Master/slave

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description | Data type |
|---|---|---|---|---|---|
| 17 | | Slave ID | Displays the ID number of the reader which sent the most recent data. | 0 to 31 | UINT |
| 20 | | Trigger Input Count for Master | The trigger input count for the master unit (ID: 0) is displayed. | 0 to 65535* | UINT |

* When the count number reaches 65535 and the next data arrives, the count number returns to 0.

# Details of Control Data (Output Assemblies)

### Address 0 Bit 1 to Bit 7 Handshake/Clear bit

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 0 | 1 | Read Data Update Permitted | This Bit is used when using handshake.<br>This displays whether read data exists or not. | 0→1: Writing read data is permitted.<br>1→0: - |
| 0 | 7 | Error clear Transmission Buffer Clear | The following Bits of Input Assemblies are cleared.<br>• Buffer Overflow Error<br>• General Error<br>• Read Result Ready Count<br>• Result Data Update Count<br>• Read data stored in the transmission buffer of the SR-X Series | 0 -> 1: Clear<br>1 -> 0: - |

### Address 0 Bit 8 to Bit 12 Reading start request/Each operation instruction

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 0 | 8 | Read Start Request | The SR-X Series starts reading. *1 | 0→1: Reading start<br>1→0: Reading stop |
| 0 | 9 | Preset Reading Start Request | Preset reading starts. | 0→1: Preset reading start<br>1→0: Preset reading stop |
| 0 | 10 | Preset Data Registration Start Request | Specified preset data is registered to Address 5, 6 and above. *2 | 0→1: Preset data registration start<br>1→0: - |
| 0 | 11 | Tuning Start Request | Tuning starts. *3 | 0→1: Tuning start<br>1→0: Tuning stop |
| 0 | 12 | BLOAD Request | BLOAD starts. *4 | 0 -> 1: BLOAD start<br>1 -> 0: - |

*1 When specifying a bank, specify "Address 2 Bank number"
*2 Preset data can be deleted by setting "1" for Address 5, setting "0xFF" for Address 6 and then registering the preset data.
*3 Before starting tuning, specify "Address 2 Bank number."
If the bank number is illegal, a tuning error occurs.
*4 Before starting BLOAD, enter the file number "m" in "Address 2 Bank number."

**Point**

Exclusive control of reading start/each operation instruction
For reading start/each operation instruction, priority is given to the operation executed first. An error will occur if another operation is executed during operation.

**Reference**

m=1-8 (SR-X100/X100W), 1-256 (SR-X300/X300W)

### Address 1 Bit 0 to Bit 7 Completion bit clear

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Reading Complete Clear | "Reading Complete" Bit of Input Assemblies is cleared.* | 0→1: Bit clear |
| 1 | 1 | Preset Reading Complete Clear | "Preset Reading Complete" Bit of Input Assemblies is cleared.* | 0→1: Bit clear |
| 1 | 2 | Preset Data Registration Complete Clear | "Preset Data Registration Complete" Bit of Input Assemblies is cleared.* | 0→1: Bit clear |
| 1 | 3 | Tuning Complete Clear | "Tuning Complete" Bit of Input Assemblies is cleared.* | 0→1: Bit clear |
| 1 | 4 | BLOAD Complete Clear | "BLOAD Complete" Bit of Input Assemblies is cleared.* | 0→1: Bit clear |
| 1 | 7 | External Instruction Operation Complete Clear | "External Instruction Operation Complete" Bit of Input Assemblies is cleared.* | 0→1: Bit clear |

* When Complete Bits are cleared, Error/Failure Bits of each operation are also cleared.

### Address 2 Bank number/BLOAD file number

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description | Data type |
|---|---|---|---|---|---|
| 2 | | Bank number/ BLOAD file number | Input a bank number here and then start reading. Then, reading is completed with the parameter bank specified.<br>Input a bank number here and then start tuning. Then, the tuning result is stored to the specified parameter bank.<br>Input a file number here and then start BLOAD to switch the settings. | 1 to 16: bank number<br>1 to 256 (SR-X300/X300W): BLOAD file number<br>1 to 8 (SR-X100/X100W): BLOAD file number | UINT |

* If inputting a parameter bank number other than 1 to 16 to start reading, then the alternate reading function operates.
* If inputting a parameter bank number other than 1 to 16 to start tuning, then an error occurs.

### Address 5 and above Preset data

| Address | Bit 15 | Bit 14 | Bit 13 | Bit 12 | Bit 11 | Bit 10 | Bit 9 | Bit 8 | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | |
| ⋮ | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

| Address | Bit | Name | Description | Data description | Data type |
|---|---|---|---|---|---|
| 5 | | Preset Data Size | Preset data length | 0 to | UINT |
| 6 and above | | Preset Data | Preset data is specified.<br>(Terminator is not necessary.) | Preset data | BYTE[] |

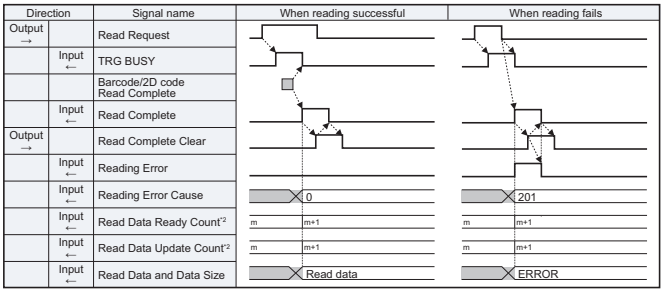
# List of Error Codes

| Error code | Type of error | Error description |
|---|---|---|
| 0 | No error | - |
| 100 to 199 | Command error | Values with 100 added to "14 Command Communication" (Page 105) are applicable. |
| 201 | Reading error | Reading failed. |
| 202 | Comparison error | The read data did not match the preset data. |
| 210 | Tuning failure | The code could not be found within the field of view while tuning. |
| 213 | Tuning failure | Tuning was aborted. |
| 120 | Operation instruction error | Another operation instruction was received during operation. In this case, the incoming instruction is not completed. |
| 102 | Bank number error | The parameter bank number specification is invalid.<br>Example: A number other than 01 to 16 is specified in tuning operation. |
| 112 | File number error | The specified file number does not exist. |
| 220 | Preset data error | The preset data specification is invalid.<br>Example: The specified preset data size is invalid when preset data is registered. |
| 230 | EIP data update error | Read data larger than the specified size in the cyclic communication was received. |

# Operation Examples

**Example 1) Trigger method: Level trigger, Handshaking: Disabled.**

Input ← : PLC ← SR-X
Output → : PLC → SR-X



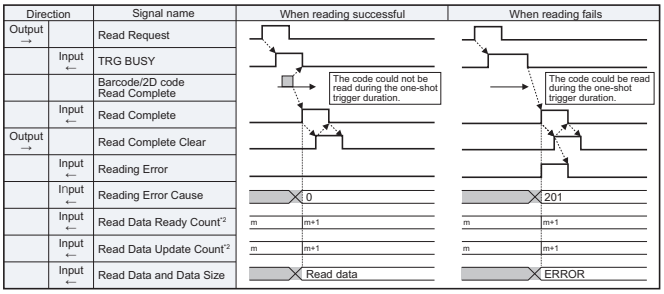

## ● When reading is successful

1 "Read Request" is set to ON (1).
2 When "Read Request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3 When the code is read, its data is written into "Read data." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
4 "Read Request" is set to OFF (0).
5 It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6 When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7 It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

## ● When reading fails

1 "Read Request" is set to ON (1).
2 When "Read Request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3 "Read Request" is set to OFF (0).
4 The code could not be read, so "ERROR" is written to "Read data." "201" is written to "Reading Error Cause." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
5 It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6 When "Read Complete Clear" is set to ON (1), "Read Complete" and "Reading Error" are set to OFF (0).
7 It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

**Example 2) Trigger method: One-shot trigger, Handshaking: Enabled.**



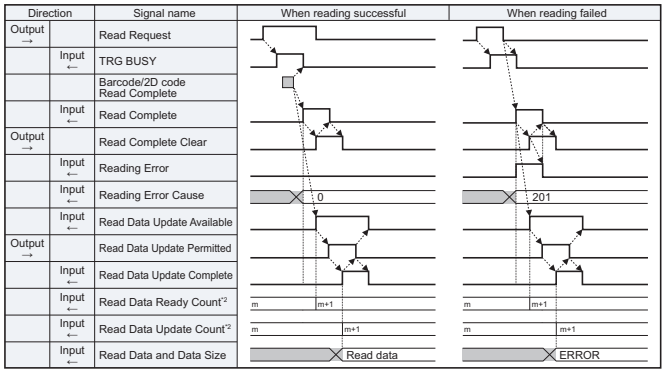

## ● When reading is successful

1 "Read Request" is set to ON (1).
2 When "Read Request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3 When the code is read, its data is written into "Read data." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
4 "Read Request" is set to OFF (0).
5 It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6 When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7 It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

## ● When reading fails

1 "Read Request" is set to ON (1).
2 When "Read Request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3 When the "One-shot trigger duration" elapses, reading stops.
4 The code could not be read, so "ERROR" is written to "Read data." "201" is written to "Reading Error Cause." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
5 It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6 When "Read Complete Clear" is set to ON (1), "Read Complete" and "Reading Error" are set to OFF (0).
7 It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

**Example 3) Trigger method: Level trigger, Handshaking: Enabled.**



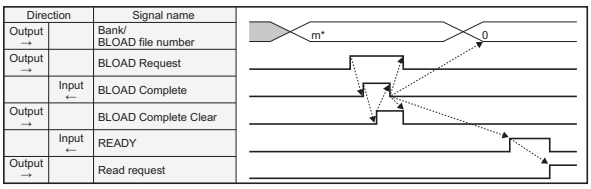

## ● When reading is successful

1 "Read Request" is set to ON (1).
2 When "Read Request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3 When the code is read, "TRG BUSY" is set to OFF (0), and "Read Complete" and "Read Data Update Available" are set to ON (1).
4 "Read Request" is set to OFF (0).
5 It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6 When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7 It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).
8 It is confirmed that "Read Data Update Available" is ON (1), and then "Read Data Update Permitted" is set to ON (1).
9 When "Read Data Update Permitted" is set to ON (1), the data is written into "Read data." "Read Data Update Complete" is set to ON (1).
10 It is confirmed that "Read Data Update Complete" is ON (1), and then "Read Data Update Permitted" is set to OFF (0).
11 When "Read Data Update Permitted" is set to OFF (0), "Read Data Update Available" and "Read Data Update Complete" are set to OFF (0).

## ● When reading fails

1 "Read Request" is set to ON (1).
2 When "Read Request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3 "Read Request" is set to OFF (0).
4 When the code cannot be read, "ERROR" is written to the send buffer, so "Read Complete" and "Read Data Update Available" are set to ON (1). "201" is written to "Reading Error Cause." "TRG BUSY" is set to OFF (0).
5 It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6 When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7 It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).
8 It is confirmed that "Read Data Update Available" is ON (1), and then "Read Data Update Permitted" is set to ON (1).
9 When "Read Data Update Permitted" is set to ON (1), "ERROR" is written into "Read data." "Read Data Update Complete" is set to ON (1).
10 It is confirmed that "Read Data Update Complete" is ON (1), and then "Read Data Update Permitted" is set to OFF (0).
11 When "Read Data Update Permitted" is set to OFF (0), "Read Data Update Available" and "Read Data Update Complete" are set to OFF (0).

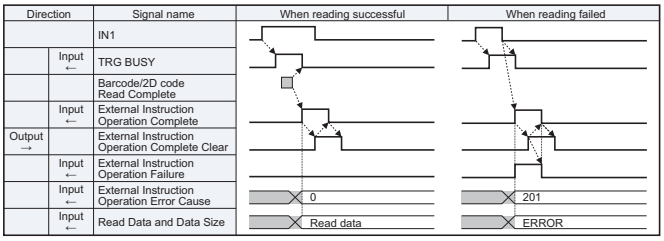
**Example 4) Using the changeover function**




* m=1-8 (SR-X100/X100W), 1-256 (SR-X300/X300W)

1. The file number is added to "Bank/BLOAD File Number."
2. "BLOAD Request" is turned on (1), which changes the file number setting and turns on "BLOAD Complete."
3. It is confirmed that "BLOAD Complete" is on (1), and then "BLOAD Complete Clear" is turned on (1).
4. "BLOAD Complete Clear" is turned on (1), which turns off (0) "BLOAD Complete."
5. It is confirmed that "BLOAD Complete" is off (0), and then "BLOAD Request" is turned off (0).
6. "Bank/BLOAD File Number" is set to 0.
7. It is confirmed that "READY" is on (1), and then "Read Request" is turned on (1).

**Example 5) Reading with the IN terminal. IN1: Trigger input, Trigger method: Level trigger, Handshaking: Disabled.**




## ● When reading is successful

1. The signal of the IN terminal is set to ON.
2. When the signal of the IN terminal is set to ON, the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. When the code is read, its data is written into "Read data." Then "TRG BUSY" is set to OFF (0), and "External Instruction Operation Complete" is set to ON (1).
4. The signal of the IN terminal is set to OFF.
5. It is confirmed that "External Instruction Operation Complete" is ON (1), and then "External Instruction Operation Complete Clear" is set to ON (1).
6. When "External Instruction Operation Complete Clear" is set to ON (1), "External Instruction Operation Complete" is set to OFF (0).
7. It is confirmed that "External Instruction Operation Complete" is OFF (0), and then "External Instruction Operation Complete Clear" is set to OFF (0).

## ● When reading fails

1. The signal of the IN terminal is set to ON.
2. When the signal of the IN terminal is set to ON, the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. The signal of the IN terminal is set to OFF (0).
4. The code could not be read, so "ERROR" is written to "Read data." "201" is written to "External Instruction Operation Error Cause." Then "TRG BUSY" is set to OFF (0), and "External Instruction Operation Complete" is set to ON (1).
5. It is confirmed that "External Instruction Operation Complete" is ON (1), and then "External Instruction Operation Complete Clear" is set to ON (1).
6. When "External Instruction Operation Complete Clear" is set to ON (1), "External Instruction Operation Complete" and "External Instruction Operation Failure" are set to OFF (0).
7. It is confirmed that "External Instruction Operation Complete" is OFF (0), and then "External Instruction Operation Complete Clear" is set to OFF (0).

**Point**

- The signal directions are indicated as shown below.

  Input ← : PLC <- SR-X

  Output → : PLC -> SR-X

- The "Read Data Ready Count" and "Read Data Update Count" values may differ depending on the operation status and communication frequency.
  For example, when a code is read and then the reading of the next code finishes before the updating of the PLC data finishes, the result data ready count will be larger than the expected value by one.

**NOTICE**

- **If "Read Request" is set to ON/OFF at high speed while the EtherNet/IP cyclic cycle (RPI) is slow, the SR-X Series may not be able to detect the change between the rising and falling edge of "Read Request."**
- **The SR-X Series is equipped with a 20KB send buffer.**
- **Because a send buffer is present, even if the data processing on the PLC is unfinished during handshake processing, the next reading operation can be completed.**
- **When read data is still present in the SR-X Series during handshake processing, even if "Read Data Update Permitted" of the PLC is OFF (0), "Read Data Update Available" of the SR-X Series remains in the ON (1) state.**
  **Until "Read Data Update Available" is set to OFF (0), repeatedly switch "Read Data Update Permitted" of the PLC between ON (1) and OFF (0).**
- **If the data stored on the SR-X Series is unnecessary during handshake processing, you can delete all the data from the send buffer by sending the send buffer clear command (BCLR) from the command port.**

# 16-3 Message Communication

## Message Communication

Message communication is a function that uses objects and services (Service Code) prepared in the EtherNet/IP device and then issues and transmits commands arbitrarily. Message communication is used for applications such as reading and writing adapter device settings.
There are established standard items, as well as device specific items in the objects and services in message communication.
The SR-X Series uses specific objects and services and can perform operations such as parameter reading/writing and resetting.

Reference The SR-X Series message communication function is compatible with UCMM (unconnected type) and CLASS 3 (connected type).

### Objects and services

In message communication, data are sent and received using objects and services.
When services for SR-X Series objects are executed, data output, settings reading, and specified operations are executed.

### Message communication basic format

During message communication, the PLC and the SR-X Series communicate by sending and receiving Explicit messages. When an Explicit message command is sent from the PLC, the SR-X Series sends a response to the PLC.

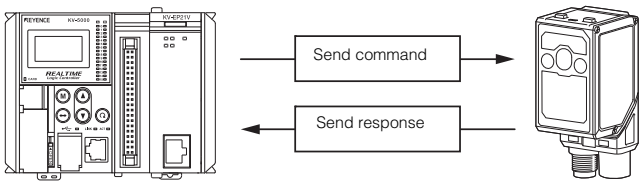
#### ● Commands

| Item | Description |
|---|---|
| Service code | Specifies the Service. |
| Class ID | Specifies the Class ID according to service. |
| Instance ID | Specifies the Instance ID according to service. |
| Attribute ID | Specifies the Attribute ID according to service. |
| Service data | Specifies the Service Data according to service. |

#### ● Responses

| Item | Description |
|---|---|
| General status (1 byte) | Returns the General Status in response to the command.<br>Returns 00H when operation is successful. |
| Additional status (2 bytes) | Returns Additional Status. |
| Service response | Returns the result data in response to the command. |

### Message communication operation




Commands are sent from the PLC to execute services on the SR-X Series. The SR-X Series sends back responses as service execution results. The service code, class ID, instance ID, and attribute ID are specified in the commands that are sent. The setting value (service data) is necessary when writing parameters.

**Command**
- Service code
- Class ID
- Instance ID
- Attribute ID
- Service data

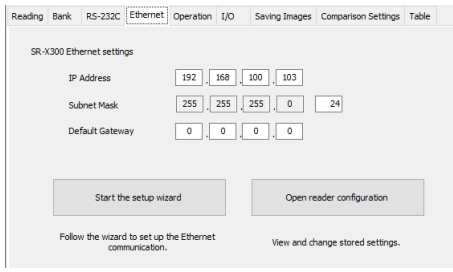
**Response**
- General status
- Additional status
- Service response data

* The attribute ID and service data may not be necessary depending on the command used.
Service response data may not be generated depending on the command used.

## SR-X Series Settings

**1 Open the [Ethernet] tab.**

**2 Enter the [IP address] and [Subnet Mask] settings to assign to the SR-X.**



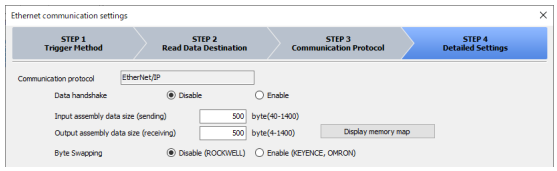

**3 Start [Setup Wizard].**

**4 STEP 1 Select the trigger input method.**

**5 STEP 2 Select [Field network/PLC].**

**6 STEP 3 Select [EtherNet/IP].**

**7 STEP 4 Configure the detailed EtherNet/IP settings.**




| | |
|---|---|
| Data handshake | Set whether to implement handshake processing. |
| Input assembly data size (send) | Set this to a value that is the maximum amount of read data + 44 bytes or higher. *1 |
| Output assembly data size (receive) | Specify a value of 6 bytes or higher. *1 |
| Byte swapping | You can change the order in which data is stored in memory.<br>Disable: Low order to high order<br>Enable: High order to low order |

*1 Increase the value according to the number of digits in the read data or preset data.

**8 Exit [Setup Wizard].**

**9 Click [Send Configuration].**

# Service Objects

## Object configuration

| Class ID | Object name | Description |
|---|---|---|
| 105 (0x69) | SR AutoID Reader Object* | Object which delivers the SR-X Series status and parameter writing/reading. |
| 1 (0x01) | Identity Object | Object which delivers general information, main unit reset, etc. |

* The [SR AutoID Reader Object] is not an object within EtherNet/IP standards but rather it is an object that KEYENCE developed to make the SR-X Series easier to operate.

## Reading the object table

### Attribute

(1) (2) (3) (4)

| Instance ID | Attribute ID | Name | Response parameter | |
|---|---|---|---|---|
| | | | Data type | Description |
| 1 (0x01) | 108 (0x6C) | IN/OUT Status | UINT | bit0: IN1 Status<br>bit1: IN2 Status<br>bit4: OUT1 Status<br>bit5: OUT2 Status<br>bit6: OUT3 Status |

| Item | Description |
|---|---|
| (1) Instance ID | The instance ID is shown in decimal (hexadecimal). |
| (2) Attribute ID | The attribute ID is shown in decimal (hexadecimal). |
| (3) Name | Denotes the attribute name. |
| (4) Response parameter | Displays the receiving parameter's data type and each parameters description. |

### Service

(1) (2) (3) (4) (5)

| Instance ID | Service code | Service data | | Name | Description |
|---|---|---|---|---|---|
| | | Data type | Data | | |
| 1 (0x01) | 0x4B | UINT | Bank Number | Read Start | Starts reading. |

| Item | Description |
|---|---|
| (1) Instance ID | The instance ID is shown in decimal (hexadecimal). |
| (2) Service code | The service code is shown in decimal (hexadecimal). |
| (3) Service data | Displays the type of the service data and service data description. |
| (4) Name | Displays the service name. |
| (5) Description | Displays the service function description. |

### Data type

| Data type | Description | Range | |
|---|---|---|---|
| | | Min. | Max. |
| BOOL | Boolean | 0:FALSE | 1:TRUE |
| SINT | Short integer | -128 | 127 |
| INT | Integer | -32768 | 32767 |
| DINT | Double precision integer | $-2^{31}$ | $2^{31}-1$ |
| LINT | Long integer | $-2^{63}$ | $2^{63}-1$ |
| USINT | Unsigned short integer | 0 | 255 |
| UINT | Unsigned integer | 0 | 65535 |
| UDINT | Unsigned double precision integer | 0 | $2^{32}-1$ |
| ULINT | Unsigned long integer | 0 | $2^{64}-1$ |
| String | String (1 byte/character) | - | - |
| SSTRING | String (1 byte/character) | - | - |
| BYTE | Bit sequence: 8-bit | - | - |
| WORD | Bit sequence: 16-bit | - | - |
| DWORD | Bit sequence: 32-bit | - | - |
| LWORD | Bit sequence: 64-bit | - | - |

## Object details

**SR AutoID Reader ObjectClass ID: 105 (0x69)**

### Attributes

| Instance ID | Attribute ID | Name | Response parameter | |
|---|---|---|---|---|
| | | | Data | Description |
| 1 (0x01) | 100 (0x64) | Read Status | UINT | bit0: Error<br>bit1: Result Data Available<br>bit2: Result Data Strobe<br>bit3 to 5: Reserved<br>bit6: Buffer Overflow Error<br>bit7: General Error<br>bit8: BUSY<br>bit9: TRG BUSY<br>bit10: LOCK BUSY<br>bit11: MODE BUSY<br>bit12: ERR BUSY<br>bit13: Reserved<br>bit14: READY<br>bit15: Reserved |
| | | | UINT | bit0: Read Complete<br>bit1: Read Failure |
| | | | UINT | Reserved |
| | | | UINT | Read Result Code |
| | 101 (0x65) | Preset Status | UINT | bit0: Error<br>bit1: Result Data Available<br>bit2: Result Data Strobe<br>bit3 to 5: Reserved<br>bit6: Buffer Overflow Error<br>bit7: General Error<br>bit8: BUSY<br>bit9: TRG BUSY<br>bit10: LOCK BUSY<br>bit11: MODE BUSY<br>bit12: ERR BUSY<br>bit13: Reserved<br>bit14: READY<br>bit15: Reserved |
| | | | UINT | bit0: Preset Complete<br>bit1: Preset Failure<br>bit2 to 15: Reserved |
| | | | UINT | Reserved |
| | | | UINT | Preset Result Code |
| | 102 (0x66) | Register Preset Data Status | UINT | bit0: Error<br>bit1: Result Data Available<br>bit2: Result Data Strobe<br>bit3 to 5: Reserved<br>bit6: Buffer Overflow Error<br>bit7: General Error<br>bit8: BUSY<br>bit9: TRG BUSY<br>bit10: LOCK BUSY<br>bit11: MODE BUSY<br>bit12: ERR BUSY<br>bit13: Reserved<br>bit14: READY<br>bit15: Reserved |
| | | | UINT | bit0: Register Preset Data Complete<br>bit1: Register Preset Data Failure<br>bit2 to 15: Reserved |
| | | | UINT | Reserved |
| | | | UINT | Register Preset Data Result Code |
| | 103 (0x67) | Tune Status | UINT | bit0: Error<br>bit1: Result Data Available<br>bit2: Result Data Strobe<br>bit3 to 5: Reserved<br>bit6: Buffer Overflow Error<br>bit7: General Error<br>bit8: BUSY<br>bit9: TRG BUSY<br>bit10: LOCK BUSY<br>bit11: MODE BUSY<br>bit12: ERR BUSY<br>bit13: Reserved<br>bit14: READY<br>bit15: Reserved |
| | | | UINT | bit0: Tune Complete<br>bit1: Tune Failure<br>bit2 to 15: Reserved |
| | | | UINT | Reserved |
| | | | UINT | Tune Result Code |

| Instance ID | Attribute ID | Name | Response parameter | |
|---|---|---|---|---|
| | | | Data | Description |
| 1 (0x01) | 107 (0x6B) | EXT. Request Status | UINT | bit0: Error<br>bit1: Result Data Available<br>bit2: Result Data Strobe<br>bit3 to 5: Reserved<br>bit6: Buffer Overflow Error<br>bit7: General Error<br>bit8: BUSY<br>bit9: TRG BUSY<br>bit10: LOCK BUSY<br>bit11: MODE BUSY<br>bit12: ERR BUSY<br>bit13: Reserved<br>bit14: READY<br>bit15: Reserved |
| | | | UINT | bit0: EXT. Request Complete<br>bit1: EXT. Request Failure<br>bit2 to 15: Reserved |
| | | | UINT | Reserved |
| | | | UINT | EXT. Request Result Code |
| | 108 (0x6C) | IN/OUT Status | UINT | bit0: IN1 Status<br>bit1: IN2 Status<br>bit2 to 3: Reserved<br>bit4: OUT1 Status<br>bit5: OUT2 Status<br>bit6: OUT3 Status<br>bit7 to 15: Reserved |
| | 109 (0x6D) | Statistics | UINT | Read (Comparison) OK Count |
| | | | UINT | Comparison NG Count |
| | | | UINT | Read Error Count |
| | | | UINT | Reserved |
| | | | UINT | Read Input Count |
| | | | UINT | Reserved |
| | 110 (0x6E) | Result Data Count | UINT | Result Data Ready Count |
| | | | UINT | Result Data Update Count |
| | 111 (0x6F) | General Error Code | UINT | General Error Code |
| | 112 (0x70) | Read (Comparison) OK Count | UINT | Read (Comparison) OK Count |
| | 113 (0x71) | Comparison NG Count | UINT | Comparison NG Count |
| | 114 (0x72) | Read Error Count | UINT | Read Error Count |
| | 116 (0x74) | Read Input Count | UINT | Read Input Count |
| | 128 (0x80) | Result Data Ready Count | UINT | Result Data Ready Count |
| | 129 (0x81) | Result Data Update Count | UINT | Result Data Update Count |

## Service

| Instance ID | Service code | Service data | Name | Description |
|---|---|---|---|---|
| | | Data type: Data | | |
| 1 (0x01) | 14 (0x0E) | - | Get_Attribute_Single | Obtains the attribute's one item. |
| | 16 (0x10) | - | Set_Attribute_Single | Sets the attribute's one item. |
| | 75 (0x4B) | UINT: Bank Number | Read Start | Starts reading. |
| | 76 (0x4C) | - | Read Stop | Stops reading. |
| | 77 (0x4D) | - | Preset Start | Starts preset data reading. |
| | 78 (0x4E) | - | Preset Stop | Stops preset data reading. |
| | 79 (0x4F) | UINT: Preset Data Size<br>BYTE[]: Preset Data | Register Preset Data | Registers preset data.<br>Preset data can be deleted when Size is (1) and Data is (0xFF). |
| | 80 (0x50) | UINT: Bank Number | Tune Start | Starts tuning. |
| | 81 (0x51) | - | Tune Stop | Stops tuning. |
| | 83 (0x53) | - | Error Clear | Clears the error. |
| | 84 (0x54) | - | EXT. Request Complete Clear | Clears the operation status from the external command. |
| | 85 (0x55) | UINT: Result Data Size<br>UINT: Offset | Get Result Data | Acquires read data.<br><br>Response data<br>UINT: Result Data Size<br>UINT: Rest Result Data Size<br>BYTE[]: Result Data |
| | 86 (0x56) | - | Sequence Reset | Clears the following information:<br>• Result Data Ready Count<br>• Result Data Update Count<br>• Main unit statistical information<br>• Buffering data<br>• Sequence bit |
| | 87 (0x57) | - | Lock | Sets the operation lock command. |
| | 88 (0x58) | - | Unlock | Sets the operation unlock command. |
| | 90 (0x5A) | - | Read Complete Clear | Clears the Read Complete and Read Failure bits. |
| | 91 (0x5B) | - | Preset Complete Clear | Clears the Preset Complete and Preset Failure bits. |
| | 92 (0x5C) | - | Preset Preset Data Complete Clear | Clears the Register Preset Data Complete and Register Preset Data Failure bits. |
| | 93 (0x5D) | - | Tune Complete Clear | Clears the Tune Complete and Tune Failure bits. |

### Identity Object Class ID: 1 (0x01)

## Service

| Instance ID | Service code | Service data | Name | Description |
|---|---|---|---|---|
| | | Data (Data type) | | |
| 1 | 5 (0x05) | 0 | Reset | Executes hardware reset. |

## Operation Examples

**(1) Start reading (Read Start)**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 75 (0x4B) |
| Attribute ID | - |
| Service data | UINT: Bank number |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(2) Stop reading (Read Stop)**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 76 (0x4C) |
| Attribute ID | - |
| Service data | |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(3) Preset reading start (Preset Start)**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 77 (0x4D) |
| Attribute ID | - |
| Service data | |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(4) Preset reading stop (Preset Stop)**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 78 (0x4E) |
| Attribute ID | - |
| Service data | |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(5) Preset data registration**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 79 (0x4F) |
| Attribute ID | - |
| Service data | UINT: Data size<br>BYTE[494]: Data |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(6) Tuning instructions**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 80 (0x50) |
| Attribute ID | - |
| Service data | UINT: Bank number |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(7) Tuning stop**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 81 (0x51) |
| Attribute ID | - |
| Service data | - |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | - |

**(8) Get result data**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 85 (0x55) |
| Attribute ID | - |
| Service data | UINT: Data size<br>UINT: Offset |

• **Response**

| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | UINT: Result Data Size<br>UINT: Rest Result Data Size<br>BYTE[]: Result Data |

**(9) Get attribute (Get Attribute Single)**

• **Command**

| | |
|---|---|
| Class ID | 105 (0x69) |
| Instance ID | 1 |
| Service code | 14 (0x0E) |
| Attribute ID | Attribute ID |
| Service data | - |

• **Response**

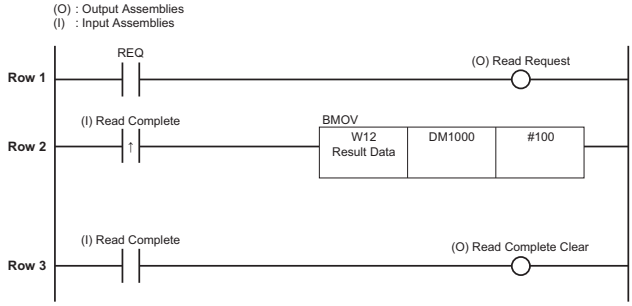
| | |
|---|---|
| General response | - |
| Additional status | - |
| Service data | Attribute parameters |

# 16-4 Reference Programs

## For the KV Series

### Cyclic communication

#### ● Without handshaking

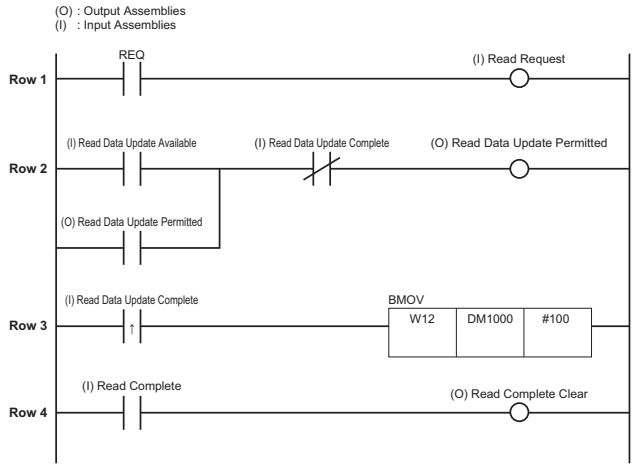



**Row 1**: This starts Read Request and starts reading.

**Row 2**: When Result Complete is ON, the data written to Result Data are copied to DM1000.

**Row 3**: When Read Complete is ON, Read Complete Clear turns ON.

#### ● With handshaking




**Row 1**: When the trigger (REQ) signal turns ON, Read Request turns ON.

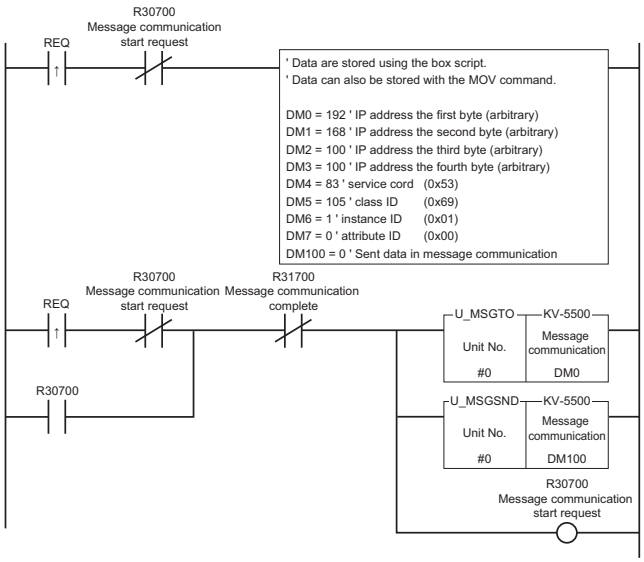
**Row 2**: When Read Data Update Available turns ON and Read Data Update Complete turns OFF, Read Data Update Permitted turns ON.
Read Data Update Permitted is self-retained.
* Read Data Update Available turns ON when read data is buffered in the SR-X.

**Row 3**: When Read Data Reception Complete turns ON, the data for the specified bytes are transferred from the read data to DM1000.
* Read Data Update Complete turns ON when the writing of read data from the SR-X to the PLC is complete.

**Row 4**: When Read Complete is ON, Read Complete Clear turns ON.

## Message communication

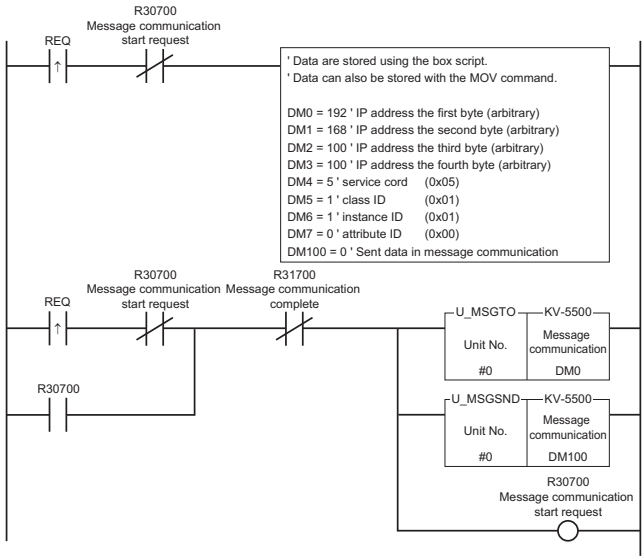
- **Error clear operation**




The errors on the SR-X Series are cleared. The following items are cleared.

- Buffer overflow
- General errors
- Result Data Available
- Read data

- **Software reset operation**

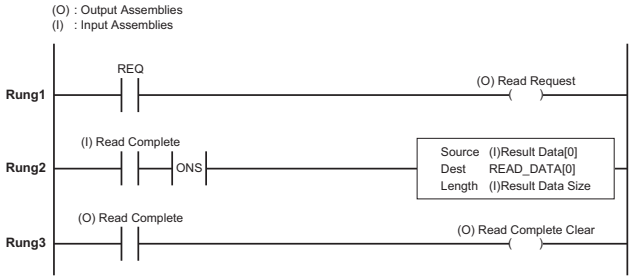



The SR-X Series restarts.

# Control Logix/Compact Logix (RSLogix 5000)

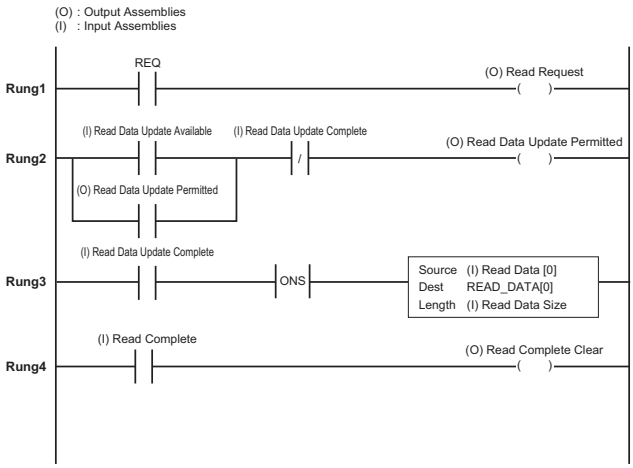
## Cyclic communication

### Without handshaking




**Rung1**: This starts Read Request and starts reading.
**Rung2**: With the rising of Result Complete, the data written to Result Data are copied to READ_DATA.
**Rung3**: When Read Complete is ON, Read Complete Clear turns ON.

### With handshaking




**Rung 1**: When the trigger (REQ) signal turns ON, Read Request turns ON.
**Rung 2**: When Read Data Update Available turns ON and Read Data Update Complete turns OFF, Read Data Update Permitted turns ON.
Read Data Update Permitted is self-retained.
* Read Data Update Available turns ON when read data is buffered in the SR-X.
**Rung3**: When Read Data Update Complete turns ON, the read data is transferred to READ_DATA.
* Read Data Update Complete turns ON when the writing of read data from the SR-X to the PLC is complete.
**Rung 4**: When Read Complete turns ON, Read Complete Clear turns ON.

**Description of tags used in the sample**

| Name | Data type | Description |
|---|---|---|
| REQ | BOOL | Bit to order to start/stop reading |
| READ_DATA | SINT[256] | Memory to store read data |

# 17 PROFINET


## 17-1 PROFINET Overview 146

What Is PROFINET? 146
List of Supported PLCs 146
SR-X Series PROFINET Communication Specifications 146
Usable Functions 146

## 17-2 Cyclic Communication 146

SR-X Series Settings 146
PLC Settings 146
Memory Maps 147
Error List 149
Operation Examples 149

# 17-1 PROFINET Overview

## What Is PROFINET?

PROFINET is the open communication standard specified by PI (PROFIBUS & PROFINET International). PROFINET compatible devices can communicate with each other regardless of vendor. The SR-X Series is compliant with Conformance Class B.

## List of Supported PLCs

### Siemens PLCs

| PLC series | Software | Version |
|---|---|---|
| S7-1500/1200/400/300 | TIA Portal | Ver. 16.0 and later |

## SR-X Series PROFINET Communication Specifications

| Communication type | PROFINET IO |
|---|---|
| Communication cycle | 8 ms or more |
| GSDML file version | 2.4 |

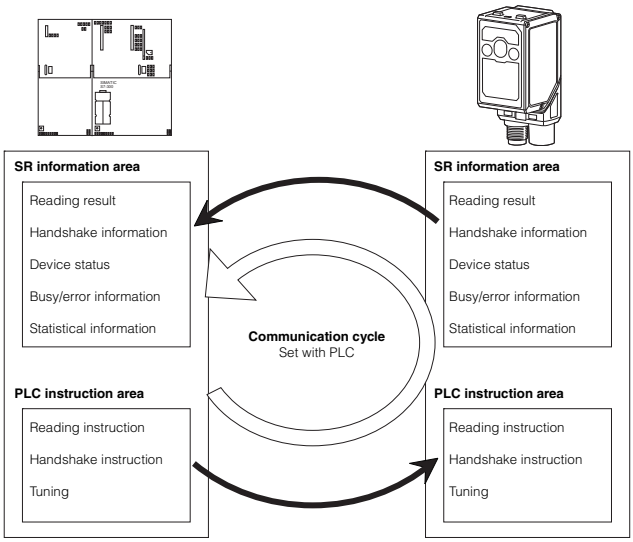
## Usable Functions

| Function | Description |
|---|---|
| Timing input control | Controls timing input ON/OFF.<br>Timing input with the parameter bank specified is possible. |
| Preset data control | Read OK data can be set as preset data.<br>Also, preset data can be registered or deleted from PLC. |
| Tuning | Tuning can be executed by specifying the parameter bank. |
| Data handshake | Whether to write read data to PLC can be controlled. |
| Error handling | Errors that occurred on the main unit can be checked.<br>After eliminating error factors, the SR-X Series can be restored from the error state. |
| Statistical information acquisition | Read count and read data update count can be checked. |
| Operation status acquisition | I/O status can be checked as well as read data. |

# 17-2 Cyclic Communication

### Cyclic communication

Cyclic communication is a high-speed communication method in which data is sent and received periodically at intervals ranging from milliseconds to hundreds of milliseconds. Also, you can control the SR-X Series by referencing and updating variables and devices within the PLC. This makes it easy to write PLC-side programs.
When communicating cyclically via PROFINET with the SR-X Series, SR-X Series functions are assigned to the PLC devices.



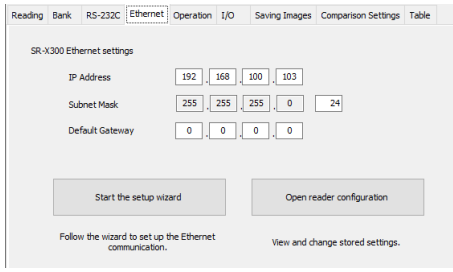

▶ Important

- Communication settings such as the communication cycle and data size are set in the PLC. When there is a large load in the network which connects many devices including PROFINET devices, delays or packet loss may occur. Perform thorough verification before operation.
- The maximum read length is 1008 digits.

## SR-X Series Settings

**1 Open the [Ethernet] tab.**

**2 Enter the [IP address] and [Subnet Mask] settings to assign to the SR-X.**



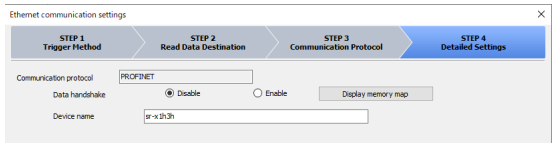

**3 Start [Setup Wizard].**

**4 STEP 1 Select the trigger input method.**

**5 STEP 2 Select [Field network/PLC].**

**6 STEP 3 Select [PROFINET].**

**7 STEP 4 Configure the detailed PROFINET settings.**




| | |
|---|---|
| Data handshake | Set whether to implement handshake processing. |
| Device name | Set the device name used with PROFINET. |

**8 Exit [Setup Wizard].**

**9 Click [Send Configuration].**

### PROFINET device name rules

- You cannot use the same device name for multiple devices on the same network.
- Device name length is from 1 to 240 characters.
- Only [a to z] (lowercase alphabet characters), [0 to 9] (numbers), [-] (hyphen), and [.] (period) can be used for device names.
- You cannot use device names in IP address format. (n.n.n.n, n = 0 to 999)
- The length of one label is from 1 to 63 characters.
- The [-] (hyphen) cannot be used at the beginning of labels.
- The [-] (hyphen) cannot be used at the end of labels.
- The first label cannot be named "port-xyz" or "port-xyz-abcde."
  (a, b, c, d, e, x, y, z = [0 to 9] (numbers)).
- You cannot use labels that start with "xn-."
- You cannot use labels that start with a number.

## PLC Settings

### ● S7 Series configuration

We have prepared information regarding connecting the S7 Series and the SR Series.
Download the information from the KEYENCE website.

# Memory Maps

**I address Input address PLC <- SR-X**

## Bit area

In the following areas, information is divided by bit.
Information is represented with 0 or 1.

**Slot: 1**
**Module name: Handshake and General Error Status Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Error | This bit turns ON when either "Buffer Overflow Error" or "General Error" bit turns ON. | 0: No error<br>1: Error |
| | 1 | Result Data Available | This displays whether read data exists or not.* 1 | 0: No read data<br>1: Read data available |
| | 2 | Result Data Strobe | This turns ON when read data update is complete.* 1 | 0 -> 1: Read data update complete<br>1 -> 0: - |
| | 6 | Buffer Overflow Error | This turns ON when buffer overflow error occurs. | 0: No error<br>1: Error |
| | 7 | General Error | This turns ON when a communication or main unit error occurs. It does not turn ON when a buffer overflow error occurs. When this turns ON, an error code is output to "Slot: 8 General Error Code." | |

*1 Used only when handshake is enabled.
- Handshake is a communication procedure to make the permission system for read data writing.

**Slot: 2**
**Module name: BUSY Status Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | BUSY | This bit turns ON when any of the following BUSY bits (1 to 4) are ON. | 0: -<br>1: BUSY state |
| | 1 | TRG BUSY | TRG BUSY | 0: -<br>1: TRG BUSY state |
| | 2 | LOCK BUSY | LOCK BUSY | 0: -<br>1: LOCK BUSY state |
| | 3 | MODE BUSY | MODE BUSY | 0: -<br>1: MODE BUSY state |
| | 4 | ERR BUSY | ERR BUSY | 0: -<br>1: ERR BUSY state |
| | 6 | READY | READY<br>This continues to be ON in non-"BUSY" state. | 0: -<br>1: READY state |

**Slot: 3**
**Module name: Completion Status Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Read Complete | This turns ON when reading is complete.* 1 | 0: -<br>1: Complete*2 |
| | 1 | Preset Complete | This turns ON when preset reading is complete. | 0: -<br>1: Complete*2 |
| | 2 | Register Preset Data Complete | This turns ON when preset data registration is complete. | 0: -<br>1: Complete*2 |
| | 3 | Tune Complete | This turns ON when tuning is complete. | 0: -<br>1: Complete*2 |
| | 4 | BLOAD Complete | This turns ON when BLOAD is complete. | 0: -<br>1: Complete*2 |
| | 7 | EXT. Request Complete | This turns ON when "Reading", "Preset reading" or "Tuning" is executed with the IN terminal or command and the operation is complete. | 0: -<br>1: Complete*2 |

*1 This bit also turns ON when the character string of "ERROR" is output when reading error occurs.
*2 This returns to 0 when the applicable clear bit is set to ON or when the Output Assemblies "Reading Start Request" bit is set to ON.

**Slot: 4**
**Module name: Error Status Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Read Failure | This turns ON when reading error or comparison NG occurs. | 0: -<br>1: Reading error, Comparison NG*1 |
| | 1 | Preset Failure | This turns ON when preset reading fails. | 0: -<br>1: Preset reading failure *1 |
| | 2 | Register Preset Data Failure | This turns ON when preset data registration fails. | 0: -<br>1: Preset data registration failure*1 |
| | 3 | Tune Failure | This turns ON when tuning fails. | 0: -<br>1: Tuning failure*1 |
| | 4 | BLOAD Failure | This turns ON when BLOAD fails. | 0: -<br>1: BLOAD failure*1 |
| | 7 | EXT. Request Failure | This turns ON when "Reading", "Preset reading" or "Tuning" is executed with the IN terminal or command and the operation fails. | 0: -<br>1: External instruction operation failure*1 |

*1 If any of the above errors occurs, the error code is output to "Slot: 8 Operation Result Status."

**Slot: 5**
**Module name: Terminal Status Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | IN1 Status | This represents IN1 terminal status. | 0: OFF<br>1: ON |
| | 1 | IN2 Status | This represents IN2 terminal status. | 0: OFF<br>1: ON |
| | 4 | OUT1 Status | This represents OUT1 terminal status. | 0: OFF<br>1: ON |
| | 5 | OUT2 Status | This represents OUT2 terminal status. | 0: OFF<br>1: ON |
| | 6 | OUT3 Status | This represents OUT3 terminal status. | 0: OFF<br>1: ON |

- The above chart shows the contents when the input polarity setting of the SR-X is Norm. open (normally open). For Norm. closed (normally closed), the data is reversed as 0: ON 1: OFF.
- When checking the writing of read data, do not use OUT1 to 3 statuses, but use the "Read Complete" bit or "EXT. Request Complete" bit. Depending on the communication load, the ON statuses of the OUT terminals and reading completion may not be synchronized.

**Slot: 6**
**Module name: Unstable Read Status Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Unstable | Unstable reading status OR of each Unstable | 0: Stable<br>1: Unstable |
| | 1 | Matching Level Unstable | Matching level judgment result unstable | 0: Stable<br>1: Unstable |
| | 2 | ISO/IEC 15415 Unstable | ISO/IEC 15415 verification result unstable | 0: Stable<br>1: Unstable |
| | 3 | AIM DPM Unstable | ISO/IEC TR 29158 (AIM DPM) verification result unstable | 0: Stable<br>1: Unstable |
| | 4 | SAE AS9132 Unstable | SAE AS9132 verification result unstable | 0: Stable<br>1: Unstable |
| | 5 | ISO/IEC 15416 Unstable | ISO/IEC 15416 verification result unstable | 0: Stable<br>1: Unstable |

## Word area/byte area

In the following areas, information is represented with the following units.

**Slot: 7**
**Module name: Matching Level and Total Evaluation Grade Status**

| Size (Byte) | Word address | Name | Description | Data description | |
|---|---|---|---|---|---|
| 8 | 0 | Matching Level | Matching level | 100 to 0*1 | If multiple codes are read, the smallest value is displayed. |
| | 1 | ISO/IEC 15415 Grade | ISO/IEC 15415 total evaluation grade | 4: A*1<br>3: B<br>2: C<br>1: D<br>0: F | |
| | 2 | AIM DPM Grade | ISO/IEC TR 29158 (AIM DPM) total evaluation grade | 4: A*1<br>3: B<br>2: C<br>1: D<br>0: F | |
| | 3 | ISO/IEC 15416 Grade | 15416 total evaluation grade | 4: A*1<br>3: B<br>2: C<br>1: D<br>0: F | |

*1 When multiple codes are read, the minimum value is shown.
When the "Read Complete Clear" bit in Output Assemblies is turned ON, the value returns to 0.

**Slot: 8**
**Module name: Operation Result Status**

| Size (Byte) | Word address | Name | Description | Data description |
|---|---|---|---|---|
| 20 | 0 | Read Result Code | When "Slot: 4 Error Status Bits" turns ON, the error code is output to the applicable location. | Error code* |
| | 1 | Preset Result Code | | |
| | 2 | Register Preset Data Result Code | | |
| | 3 | Tune Result Code | | |
| | 4 | BLOAD Result Code | | |
| | 7 | EXT. Request Result Code | | |
| | 8 | General Error Code | | |
| | 9 | Slave ID | The ID of the reader to which the most recent data was written is displayed. | 0 to 31 |

* For error codes, refer to " Error List" (Page 149).

**Slot: 9**
**Module name: Read Data *** Byte*1**

| Size (Byte) | Word address | Name | Description | Data description |
|---|---|---|---|---|
| 8 + Data size | 0 | Result Data Ready Count | Read Data Ready Count | 0 to 65535*2 |
| | 1 | Result Data Update Count | Read Data Update Count | 0 to 65535*2 |
| | 2 | Trigger Input Count for Master | The trigger input count for the master unit (ID: 0) is displayed. | 0 to 65535*2 |
| | 3 | Result Data Size | Read data length | 0 and above*3 |
| | Byte area<br>32Byte<br>64Byte<br>128Byte<br>246Byte | Result Data | Read data | Read data *3 |

*1 Select one from Read Data 32 Byte, Read Data 64 Byte, Read Data 128 Byte and Read Data 246 Byte.
*2 If the count is 65535, it will be reset to 0 when the next read data arrives.
*3 When the header, terminator and append data are set to the read data of SR-X, the header, terminator, append data and inter-delimiter are also output. [CR] has been set to the terminator as the default setting. Accordingly, [CR] is appended after the read data for output.
- If the silent mode is set for SR-X, read data is not output.
- The read data is cleared each time that a code is read.

When handling the read data exceeding 246 bytes, use Slot: 9 "Read Data 246 Byte" and also use Slots 10 to 12. Using all of the Slots 9 to 12 enables handling of data up to 1008 bytes.

**Slot: 10**
**Module name: Read Data Ex 254 Byte**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 254 | 254Byte | Result Data | Read data (247 to 500 bytes) | Read data |

**Slot: 11**
**Module name: Read Data Ex 254 Byte**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 254 | 254Byte | Result Data | Read data (501 to 754 bytes) | Read data |

**Slot: 12**
**Module name: Read Data Ex 254 Byte*4**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 254 | 254Byte | Result Data | Read data (755 to 1008 bytes) | Read data |

*4 This module cannot be used when the S7-1200 Series is used.
It can be used with the S7-1500/300/400.

## Q address Output address PLC -> SR-X

### Bit area

In the following areas, information is divided by bit.
Information is represented with 0 or 1.

**Slot: 10**
**Module name: Latch and Error Clear Control Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 1 | Result Data Latch | Result data update permitted*1 | 0 -> 1: Writing to result data device permitted<br>1 -> 0: - |
| | 7 | Error Clear | Error Clear*2 | 0 -> 1: Error clear<br>1 -> 0: - |

*1 This functions only when handshake is enabled.
*2 The following error statuses and data are cleared.
- Buffer overflow error
- General error
- Result data acquisition count
- Result data update count
- Result data stored in the transmission buffer

**Slot: 11**
**Module name: Operation Instruction Control Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Read Request | Reading start request*1 | 0 -> 1: Start reading<br>1 -> 0: Stop reading |
| | 1 | Preset Request | Preset reading start request*2 | 0 -> 1: Preset read start<br>1 -> 0: Preset read stop |
| | 2 | Register Preset Data Request | Preset data registration request*3 | 0 -> 1: Preset data registration<br>1 -> 0: - |
| | 3 | Tune Request | Tuning start request*4 | 0 -> 1: Start tuning<br>1 -> 0: Stop tuning |
| | 4 | BLOAD Request | BLOAD request*4 | 0 -> 1: Start BLOAD<br>1 -> 0: - |

*1 When specifying a bank, specify a value in the Parameter Bank Number module.
*2 Reading with the specified bank is not available.
*3 Turn this bit ON after specifying a value in the User Data Size and User Data modules.
*4 Turn this bit ON after specifying a value in the Parameter Bank Number module.

**Slot: 12**
**Module name: Completion Clear Control Bits**

| Size (Byte) | Bit address | Name | Description | Data description |
|---|---|---|---|---|
| 1 | 0 | Read Complete Clear | Reading complete clear*1 | 0 -> 1: Complete clear<br>1 -> 0: - |
| | 1 | Preset Complete Clear | Preset reading complete clear*1 | 0 -> 1: Complete clear<br>1 -> 0: - |
| | 2 | Register Preset Data Complete Clear | Preset data registration complete clear*1 | 0 -> 1: Complete clear<br>1 -> 0: - |
| | 3 | Tune Complete Clear | Tuning complete clear*1 | 0 -> 1: Complete clear<br>1 -> 0: - |
| | 4 | BLOAD Complete Clear | BLOAD complete clear*1 | 0 -> 1: Complete clear<br>1 -> 0: - |
| | 7 | EXT. Request Complete Clear | External instruction operation complete clear*1 | 0 -> 1: Complete clear<br>1 -> 0: - |

*1 When Complete bits are cleared, Error/Failure bits of each operation are also cleared.

### Word area/byte area

In the following areas, information is represented with the following units.

**Slot: 13**
**Module name: Parameter Bank Number*1**

| Size (Byte) | Word address | Name | Description | Data description |
|---|---|---|---|---|
| 2 | 0 | Bank Number/ BLOAD File Number | Bank number/BLOAD file number | 1 to 16: Bank number<br>1 to 256 (SR-X300/X300W): BLOAD file number<br>1 to 8 (SR-X100/X100W): BLOAD file number |

- Input a bank number here and then start reading. Then, reading is completed with the bank number specified.
  If reading is started with a value other than 1 to 16 input, the alternate reading will be performed.
- Input a bank number here and then start tuning. Then, the tuning result is stored to the specified bank number. If tuning is started with a value other than 1 to 16 input, an error occurs.
- Input a file number here and then start BLOAD to switch the settings.
  If BLOAD is started with a value other than "m" input, an error occurs.

Reference m=1-8 (SR-X100/X100W), 1-256 (SR-X300/X300W)

**Slot: 14**
**Module name: User Data *** byte*1**

| Size (Byte) | Word address | Name | Description | Data description |
|---|---|---|---|---|
| 2+User Data Size | 0 | User Data Size | Preset data size*2 | |
| | Byte area<br>32Byte<br>64Byte<br>128Byte<br>246Byte | User Data | 1: Preset data*2 | |

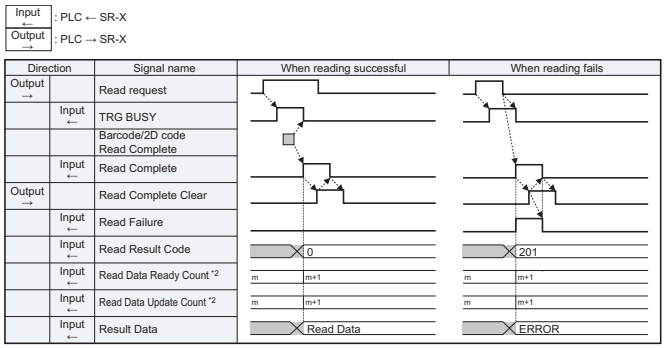
*1 Select one from User Data 32 Byte, User Data 64 Byte, User Data 128 Byte and User Data 252 Byte.
*2 Terminator is not necessary.

## Error List

| Error code | Error | Meaning |
|---|---|---|
| 0 | No error | Reading success/operation success |
| 201 | Reading error | Reading error |
| 202 | Comparison error | The read code does not match the preset data. |
| 210 | Tuning failure (Symbol unclear) | The code could not be found within the field of view while tuning. |
| 213 | Tuning failure (Aborted) | Tuning was aborted midway. |
| 120 | Control instruction reception error | Another operation instruction was received during operation. (Operation instruction is not completed.) |
| 102 | Bank No. error | The bank number specification is invalid (other than 1 to 16). |
| 112 | File number error | The specified file number does not exist. |
| 220 | Preset data error | Preset data specification is invalid. (Specified size is outside the range.) |
| 230 | PROFINET data update error | Shortage of specified size (Result data and present data size is beyond the limit.) |

## Operation Examples

**Example 1) Trigger method: Level trigger, Handshaking: Disabled.**



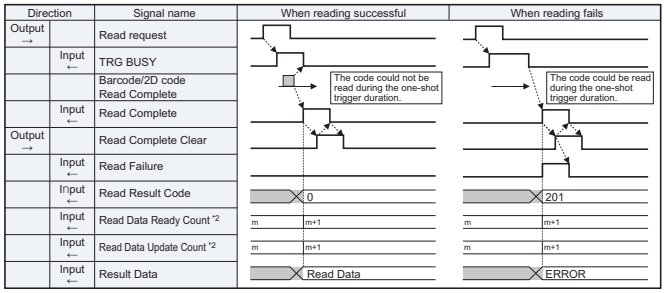

### When reading is successful

1. "Read request" is set to ON (1).
2. When "Read request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. When the code is read, its data is written into "Result Data." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
4. "Read request" is set to OFF (0).
5. It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6. When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7. It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

### When reading fails

1. "Read request" is set to ON (1).
2. When "Read request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. "Read request" is set to OFF (0).
4. The code could not be read, so "ERROR" is written to "Result Data." "201" is written to "Read Result Code." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
5. It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6. When "Read Complete Clear" is set to ON (1), "Read Complete" and "Read Failure" are set to OFF (0).
7. It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

**Example 2) Trigger method: One-shot trigger, Handshaking: Enabled.**



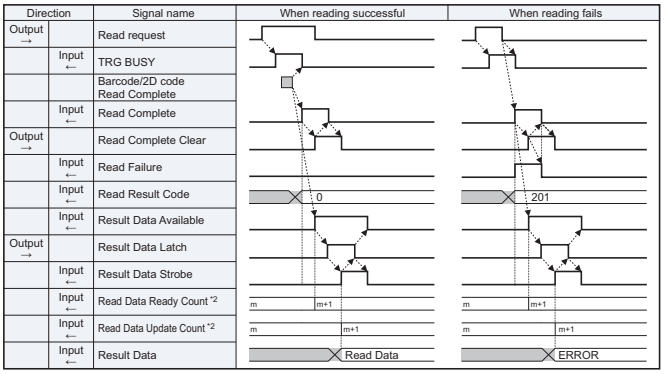

### When reading is successful

1. "Read request" is set to ON (1).
2. When "Read request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. When the code is read, its data is written into "Result Data." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
4. "Read request" is set to OFF (0).
5. It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6. When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7. It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

### When reading fails

1. "Read request" is set to ON (1).
2. When "Read request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. When the "One-shot trigger duration" elapses, reading stops.
4. The code could not be read, so "ERROR" is written to "Result Data." "201" is written to "Read Result Code." "TRG BUSY" is set to OFF (0), and "Read Complete" is set to ON (1).
5. It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6. When "Read Complete Clear" is set to ON (1), "Read Complete" and "Read Failure" are set to OFF (0).
7. It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).

**Example 3) Trigger method: Level trigger, Handshaking: Enabled.**



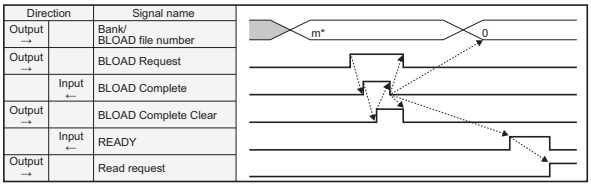

## ● When reading is successful

1. "Read request" is set to ON (1).
2. When "Read request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. When the code is read, "TRG BUSY" is set to OFF (0), and "Read Complete" and "Result Data Available" are set to ON (1).
4. "Read request" is set to OFF (0).
5. It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6. When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7. It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).
8. It is confirmed that "Result Data Available" is ON (1), and then "Result Data Latch" is set to ON (1).
9. When "Result Data Latch" is set to ON (1), the data is written into "Result Data." "Result Data Strobe" is set to ON (1).
10. It is confirmed that "Result Data Strobe" is ON (1), and then "Result Data Latch" is set to OFF (0).
11. When "Result Data Latch" is set to OFF (0), "Result Data Available" and "Result Data Strobe" are set to OFF (0).

## ● When reading fails

1. "Read request" is set to ON (1).
2. When "Read request" is set to ON (1), the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. "Read request" is set to OFF (0).
4. When the code cannot be read, "ERROR" is written to the send buffer, so "Read Complete" and "Result Data Available" are set to ON (1). "201" is written to "Read Result Code." "TRG BUSY" is set to OFF (0).
5. It is confirmed that "Read Complete" is ON (1), and then "Read Complete Clear" is set to ON (1).
6. When "Read Complete Clear" is set to ON (1), "Read Complete" is set to OFF (0).
7. It is confirmed that "Read Complete" is OFF (0), and then "Read Complete Clear" is set to OFF (0).
8. It is confirmed that "Result Data Available" is ON (1), and then "Result Data Latch" is set to ON (1).
9. When "Result Data Latch" is set to ON (1), "ERROR" is written into "Result Data." "Result Data Strobe" is set to ON (1).
10. It is confirmed that "Result Data Strobe" is ON (1), and then "Result Data Latch" is set to OFF (0).
11. When "Result Data Latch" is set to OFF (0), "Read Complete Clear" and "Result Data Strobe" are set to OFF (0).

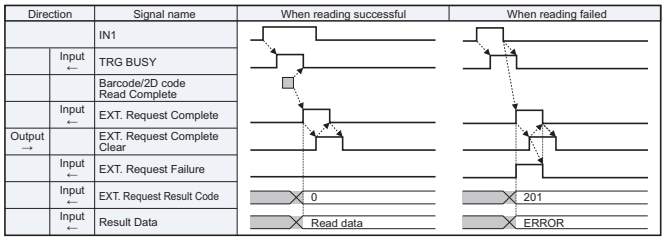
**Example 4) Using the changeover function**




* m=1-8 (SR-X100/X100W), 1-256 (SR-X300/X300W)

1. The file number is added to "Bank/BLOAD File Number."
2. "BLOAD Request" is turned on (1), which changes the file number setting and turns on "BLOAD Complete."
3. It is confirmed that "BLOAD Complete" is on (1), and then "BLOAD Complete Clear" is turned on (1).
4. "BLOAD Complete Clear" is turned on (1), which turns off (0) "BLOAD Complete."
5. It is confirmed that "BLOAD Complete" is off (0), and then "BLOAD Request" is turned off (0).
6. "Bank/BLOAD File Number" is set to 0.
7. It is confirmed that "READY" is on (1), and then "Read Request" is turned on (1).

**Example 5) Reading with the IN terminal. IN1: Trigger input, Trigger method: Level trigger, Handshaking: Disabled.**




## ● When reading is successful

1. The signal of the IN terminal is set to ON.
2. When the signal of the IN terminal is set to ON, the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. When the code is read, its data is written into "Result Data." Then "TRG BUSY" is set to OFF (0), and " EXT. Request Complete" is set to ON (1).
4. The signal of the IN terminal is set to OFF.
5. It is confirmed that "EXT. Request Complete" is ON (1), and then "EXT. Request Complete Clear" is set to ON (1).
6. When "EXT. Request Complete Clear" is set to ON (1), "EXT. Request Complete" is set to OFF (0).
7. It is confirmed that "EXT. Request Complete" is OFF (0), and then "EXT. Request Complete Clear" is set to OFF (0).

## ● When reading fails

1. The signal of the IN terminal is set to ON.
2. When the signal of the IN terminal is set to ON, the SR-X Series starts reading, and then "TRG BUSY" is set to ON (1).
3. The signal of the IN terminal is set to OFF (0).
4. The code could not be read, so "ERROR" is written to "Result Data." "201" is written to "EXT. Request Result Code." Then "TRG BUSY" is set to OFF (0), and " EXT. Request Complete Clear" is set to ON (1).
5. It is confirmed that "EXT. Request Complete" is ON (1), and then "EXT. Request Complete Clear" is set to ON (1).
6. When "EXT. Request Complete Clear" is set to ON (1), "EXT. Request Complete" and "EXT. Request Failure" are set to OFF (0).
7. It is confirmed that "EXT. Request Complete" is OFF (0), and then "EXT. Request Complete Clear" is set to OFF (0).

**Point**

- The signal directions are indicated as shown below.

  Input ← :PLC <- SR-X

  Output → :PLC -> SR-X

- The "Read Data Ready Count" and "Read Data Update Count" values may differ depending on the operation status and communication frequency.
  For example, when a code is read and then the reading of the next code finishes before the updating of the PLC data finishes, the result data ready count will be larger than the expected value by one.

# 18 Application Examples


18-1 Reading in Presentation Mode 152

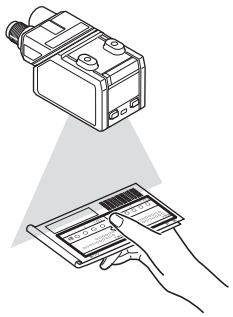
18-2 Reading Moving Codes 152

18-3 Reading Codes with Unknown Positions 152

18-4 Changeover 152

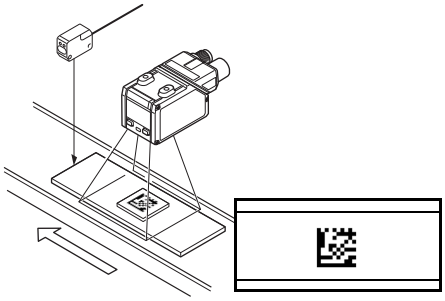
Configuration File Switch Commands 152

# 18-1 Reading in Presentation Mode



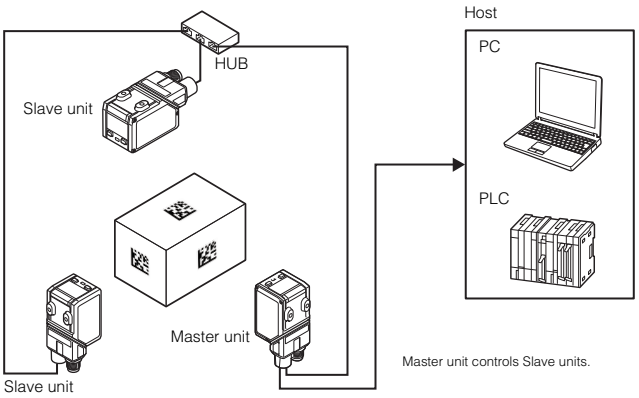
With this operation, read codes by presenting them by hand in front of the SR-X Series.
The configuration procedure and operations vary depending on whether a trigger sensor will be used.
Refer to Presentation mode in "5-2 Application Selection" (Page 21)

# 18-2 Reading Moving Codes



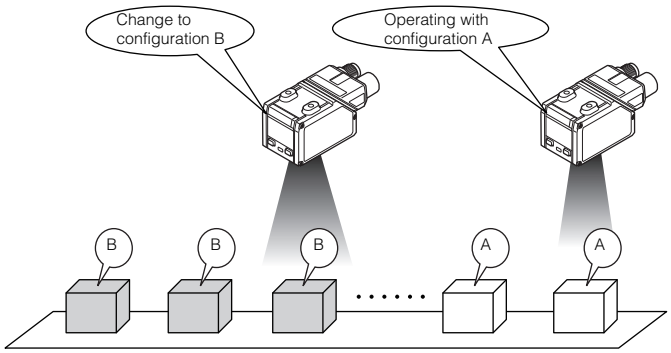
With this operation, the SR-X reads codes that are in motion.
Refer to Moving Codes in "5-2 Application Selection" (Page 21)

# 18-3 Reading Codes with Unknown Positions




Use this operation when you do not know the vertical or horizontal position of the codes but you want to read them with multiple readers.
Refer to the advanced multi-head mode in "10-8 Master/Slave Function" (Page 84).

# 18-4 Changeover



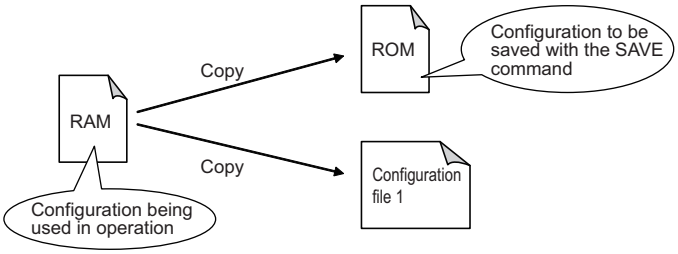

When the product on the line is switched to a different product, the code type may also change. The changeover operation changes the reading settings required when the product is switched.

## Configuration File Switch Commands

You can switch the settings that are used to operate the SR-X Series (for a changeover) by sending commands to the SR-X. This makes it possible to operate the SR-X Series with settings dedicated for reading the product, to read using only the required bank, and to match the data format with the product.

### Creating changeover configuration files

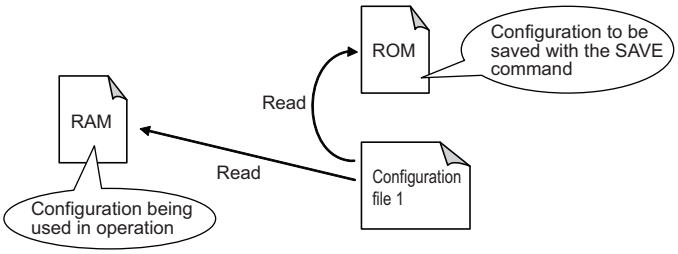
This command creates the configuration file and script file.
The settings in RAM are saved to a configuration file to be saved in ROM.




| | |
|---|---|
| Command | BSAVE,m |
| Parameter | m=1-256 (SR-X300/X300W)<br>1-8 (SR-X100/X100W)<br>ROM configuration file number at copy destination (config1.ptc, config2.ptc ...)<br>ROM script file number at copy destination (FmtSet1.Lua, FmtSet2.Lua ...) |
| Response | OK,BSAVE |

### Loading changeover configuration files

This command reads the contents of the retained configuration file into RAM and ROM.
Use this command to switch the configuration used by the reader.




| | |
|---|---|
| Command | BLOAD,m |
| Parameter | m=1-256 (SR-X300/X300W)<br>1-8 (SR-X100/X100W)<br>Configuration file number to read (config1.ptc, config2.ptc …)<br>Script file number to read (FmtSet1.Lua, FmtSet2.Lua …) |
| Response | OK,BLOAD |

## Setting procedure

**1 Use AutoID Network Navigator to send the first configuration file to the SR-X.**

**2 Use the terminal to send "BSAVE,1."**

The files config1.ptc and FmtSet1.Lua (the first configuration file) are created.

**3 Use AutoID Network Navigator to send the second configuration file to the SR-X.**

**4 Use the terminal to send "BSAVE,2."**

The files config2.ptc and FmtSet2.Lua (the second configuration file) are created.

**5 Repeat the same procedure to create the required number of configuration files.**

**6 Send "BLOAD,m" during operation to use the target settings.**

Reference

- The SR-X Series can save up to "m" configuration file and script file pairs.
- A separate focus position is saved for each configuration file.
- The BLOAD function can be used in conjunction with PLC Link, Ethernet/IP, and PROFINET.
- By disabling [Table]-[System]-[Device operation]-[Write BLOAD to ROM], writing to ROM can be disabled. It does not affect the number of times the system ROM is rewritten. However, since it is not saved in ROM by the SAVE command, if the power is cycled to the SR-X series, it will operate with the configuration from before the changeover.
- m=1-8 (SR-X100/X100W), 1-256 (SR-X300/X300W)

# 19 Specifications


19-1 Specifications 156

19-2 Dimensions 157

19-3 Troubleshooting 160

Error Shown on the SR-X Series Display 160
Unable to Install AutoID Network Navigator or the SR-X Series Driver 160
Unable to Connect to AutoID Network Navigator 160
SR-X Series Does Not Turn ON 160
Unable to Read Codes with the SR-X Series 160
Data Is Not Output Through the RS-232C Interface 160
Data Is Not Output Through the Ethernet Interface 160
"ERROR" in the Output Data 160
"ER,**" in the Output Data 160

19-4 ASCII Codes 161

19-5 Precautions on Proper Use 161

19-6 Software License Agreement 162

19-7 Libraries and programs 162

Revision History 167
WARRANTIES AND DISCLAIMERS 167

# 19-1 Specifications

## Code readers

| Model | | | SR-X300 | SR-X300W | SR-X300 + SR-XHR | SR-X100 | SR-X100W |
|---|---|---|---|---|---|---|---|
| Type | | | Standard type (2.3 megapixels) | Wide range type (2.3 megapixels) | High resolution type | Standard type (1.4 megapixels) | Wide range type (1.4 megapixels) |
| Receiver | Sensor | | CMOS Image Sensor | | | | |
| | Number of pixels | | 1920 x 1200 | | | 1360 x 1024 | |
| | Focus adjustment | | Automatic*1 | | | | |
| Light emitter | Light source | | High-intensity red LED/White LED*2 | | | High-intensity red LED*2 | |
| | Pointer light source | | High-intensity green LED*2 | | | | |
| Reading specifications | Supported symbol | 2D code | QR, MicroQR, DataMatrix(ECC200), DMRE, GS1 DataMatrix, PDF417, MicroPDF417, GS1 Composite(CC-A/CC-B/CC-C), DotCode, MaxiCode, Aztec Code | | | | |
| | | Barcode | CODE39, ITF, 2of5(Industrial 2of5), COOP 2of5, NW-7(Codabar), CODE128, GS1-128, GS1 DataBar, CODE93, JAN/EAN/UPC, Trioptic CODE39, CODE39 Full ASCII, Pharmacode, Postal(Japan Postal, IMB) | | | | |
| | Minimum resolution | 2D code | 0.024 mm | 0.060 mm | 0.010 mm | 0.024 mm | 0.060 mm |
| | | Barcode | 0.082 mm | 0.082 mm | 0.082 mm | 0.082 mm | 0.082 mm |
| | Reading distance | | 70-1000 mm | 50-1000 mm | 32-47 mm | 70-1000 mm | 50-1000 mm |
| | Reading view range | | 104 mm x 65 mm (Distance: 300 mm) | 267 mm x 166 mm (Distance: 300 mm) | 12.3 mm x 7.7 mm (Distance: 47 mm) | 74 mm x 55 mm (Distance: 300 mm) | 189 mm x 142 mm (Distance: 300 mm) |
| I/O specifications | Control input | Points | 2 | | | | |
| | | Input type | Bidirectional voltage input | | | | |
| | | Maximum rating | 30 VDC | | | | |
| | | Minimum ON voltage | 15 VDC | | | | |
| | | Maximum OFF current | 0.2 mA | | | | |
| | Control output | Points | 3 | | | | |
| | | Output type | Photo MOS relay output | | | | |
| | | Maximum rating | 30 VDC | | | | |
| | | Maximum load current | 1 output: 50 mA or less, 3-output total: 100 mA or less | | | | |
| | | Leakage current when OFF | 0.1 mA or less | | | | |
| | | Residual voltage when ON | 1 V or less | | | | |
| | Ethernet | Communication standard | IEEE 802.3 compliant, 100BASE-TX | | | | |
| | | Supported protocol | TCP/IP, SNTP, FTP, SFTP, HTTP, BOOTP, EtherNet/IP™, PROFINET, KV STUDIO, MC Protocol, OMRON PLC Link | | | | |
| | Serial communication | Communication standard | RS-232C compliant | | | | |
| | | Communication speed | 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps | | | | |
| | | Supported protocol | None, KV STUDIO, MC Protocol, SYSWAY | | | | |
| | USB | Communication standard | USB 2.0 High Speed compliant | | | | |
| Environmental resistance | Enclosure rating | | IP65 / IP67 (IEC60529)*3 | | | | |
| | Operating ambient temperature | | 0 to +45°C | | | | |
| | Storage ambient temperature | | -10 to +50°C | | | | |
| | Operating ambient humidity | | 35 to 85%RH (No condensation) | | | | |
| | Storage ambient humidity | | 35 to 85%RH (No condensation) | | | | |
| Rating | Power supply voltage | | 24 VDC+25%/-20% | | | | |
| | Current consumption | | Approx. 750 mA | | | Approx. 650 mA | |
| Weight | | | Approx. 200 g | | Approx. 225 g | Approx. 180 g | |

ROM rewrites: 100,000

*1 The focus position can be automatically adjusted during installation or tuning.

*2 The degree of risk of this product is shown below.

| Light source | Risk Group* |
|---|---|
| Aimer LED (Green) | Risk Group 1 |
| Lighting LED (Red) | Risk Group 1 |
| Lighting LED (White) * only for SR-X300/X300W | Risk Group 1 |

* LED/Lamp product is classified as shown below according to IEC 62471.

- Exempt Group
  Does not pose any photobiological hazard
- Risk Group 1 (Low-Risk)
  Does not pose a hazard due to normal behavioral limitations on exposure.
- Risk Group 2 (Moderate-Risk)
  Does not pose a hazard due to the aversion response to very bright light sources or due to thermal discomfort.
- Risk Group 3 (High-Risk)
  May pose a hazard even for momentary or brief exposure.

*3 Attach a USB port cover to meet the protective structural specification.

## Setup software (AutoID Network Navigator)

| Model | SR-H8W |
|---|---|
| Supported operating system | Windows 11 Professional or higher<br>Windows 10 Professional or higher 32-bit/64-bit<br>Windows 8 Professional or higher 32-bit/64-bit (excluding Windows RT) |
| Running environment | Processor 2.0 GHz or higher, Memory 8 GB or more,<br>Required free space on hard disk 1 GB or more<br>(space is also required for saving data)<br>DVD-ROM drive (required for installation), Screen resolution 1440 x 1080 or higher |

- .NET Framework 4.6.1 or higher is installed.
- Microsoft Visual C++ redistributable packages (x86) for Visual Studio 2015, 2017, and 2019 are installed.
- Windows, Visual Studio, Microsoft Edge, Internet Explorer, and Excel are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

## Control Cable

| Model | OP-88678<br>OP-88681<br>OP-88684<br>OP-88687 | OP-88679<br>OP-88682<br>OP-88685<br>OP-88688 | OP-88680<br>OP-88683<br>OP-88686<br>OP-88689 | OP-88764 | OP-88846 |
|---|---|---|---|---|---|
| Cable length | 2 m | 5 m | 10 m | Approx. 0.45 m | 0.45 m |
| Weight | Approx. 250 g | Approx. 450 g | Approx. 800 g | Approx. 100 g | Approx. 80 g |

## Ethernet Cable

| Model | OP-87230<br>OP-88301 | OP-87231<br>OP-88302 | OP-87232<br>OP-88303 |
|---|---|---|---|
| Cable length | 2 m | 5 m | 10 m |
| Weight | Approx. 200 g | Approx. 350 g | Approx. 500 g |

* Category 5

## Option

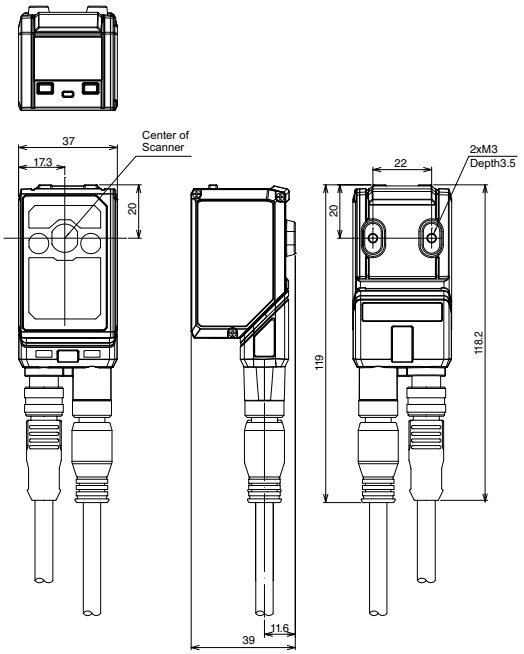
| Model | SR-XESD | SR-XLP | SR-XHR |
|---|---|---|---|
| Weight | Approx. 10 g | Approx. 15 g | Approx. 30 g |

| Model | OP-88696 | OP-88697 | OP-88698 | OP-88699 |
|---|---|---|---|---|
| Weight | Approx. 30 g | Approx. 90 g | Approx. 30 g | Approx. 30 g |

# 19-2 Dimensions

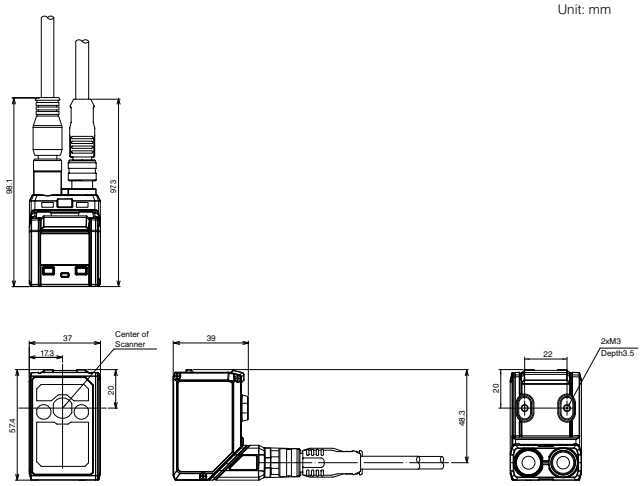
## SR-X300/X300W

Unit: mm



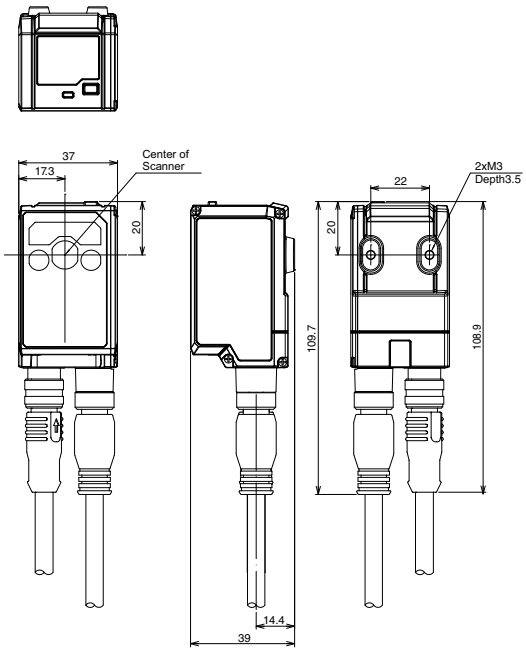

## SR-X300/X300W (rotating connector)

Unit: mm




## SR-X100/X100W

Unit: mm




- **Cable bending radius**
  Ensure that the cable bending radius when mounted is greater than or equal to the values show below.

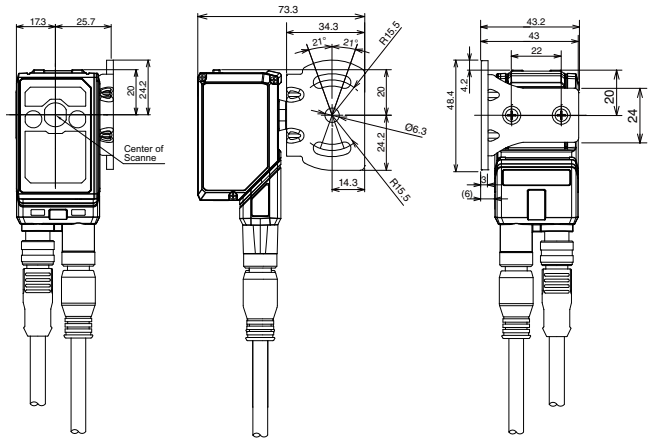
Unit: mm

| | Moving | Not moving |
|---|---|---|
| Control cable | 20 | 15 |
| Ethernet cable | 50 | 15 |

## When the mounting bracket is used

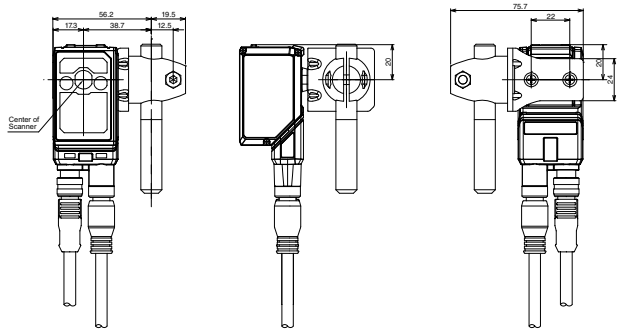
### ● SR-X300+OP-88696

Unit: mm



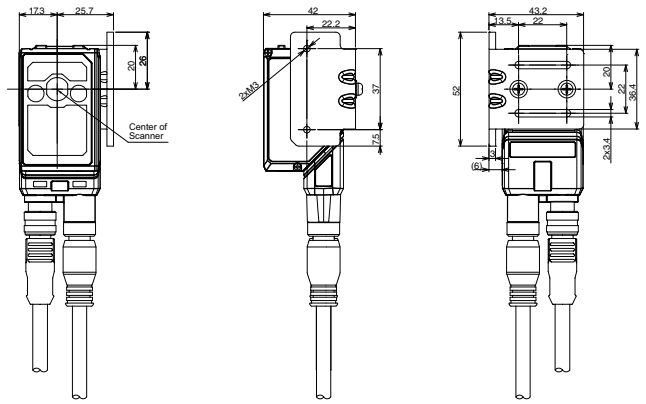

### ● SR-X300+OP-88697

Unit: mm



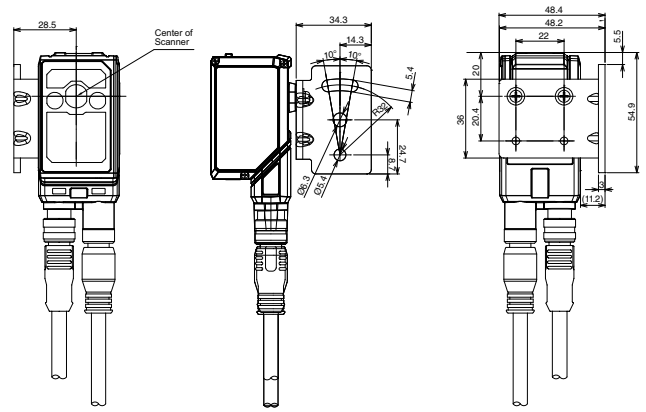
● SR-X300+OP-88698

Unit: mm



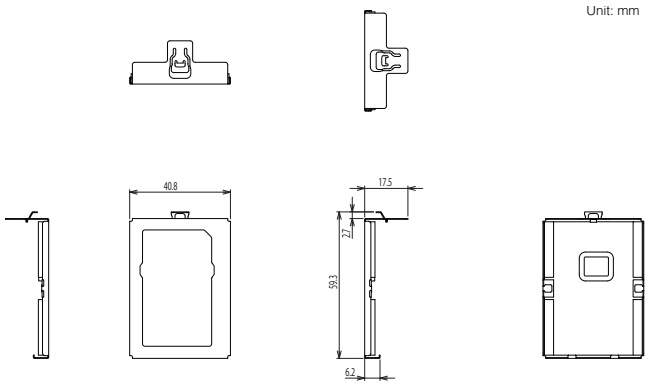

● SR-X300+OP-88699

Unit: mm



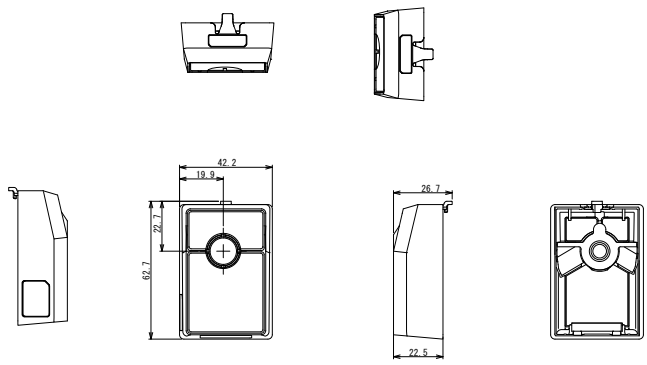

## SR-XLP

Unit: mm



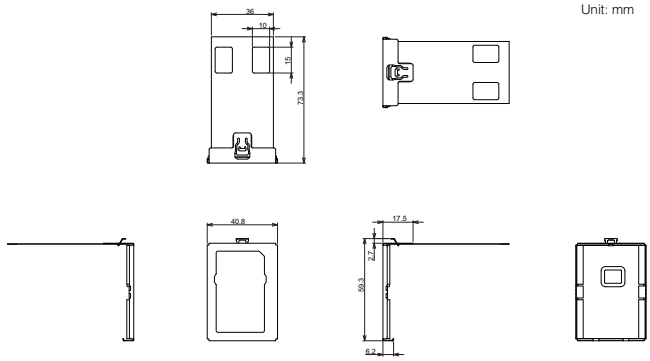

## SR-XHR

Unit: mm



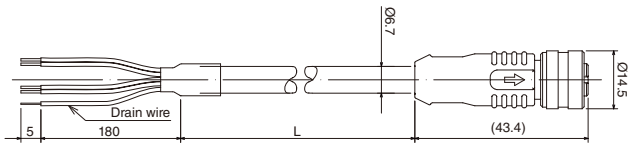

## SR-XESD

Unit: mm




## OP-88678/88679/88680

Unit: mm

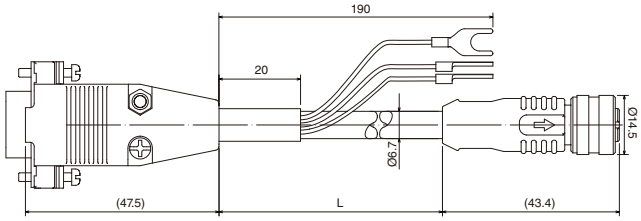



| Model | L |
|---|---|
| OP-88678 | 2 m |
| OP-88679 | 5 m |
| OP-88680 | 10 m |

| | |
|---|---|
| 180 mm | Black, pink, light blue, white, yellow and blue, black tube |
| 120 mm | Gray, green, orange, yellow, purple, pink and blue, white and blue |

## OP-88681/88682/88683

Unit: mm

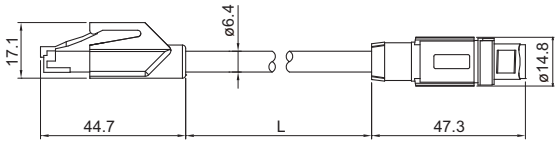



| Model | L |
|---|---|
| OP-88681 | 2 m |
| OP-88682 | 5 m |
| OP-88683 | 10 m |

| | |
|---|---|
| 150 mm | Black, pink, light blue, white, yellow and blue, black tube |
| 90 mm | Gray, green, orange, yellow, purple, pink and blue, white and blue |

## OP-87230/87231/87232

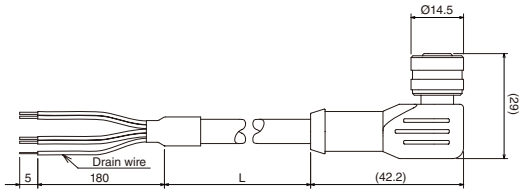
Unit: mm




| Model | L (mm) |
|---|---|
| OP-87230 | 2000 |
| OP-87231 | 5000 |
| OP-87232 | 10000 |

## OP-88684/88685/88686

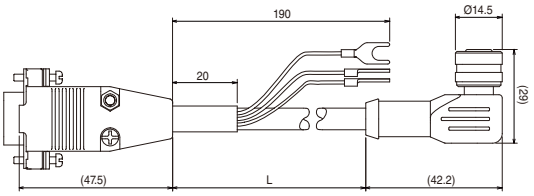
Unit: mm




| Model | L (mm) |
|---|---|
| OP-88684 | 2000 |
| OP-88685 | 5000 |
| OP-88686 | 10000 |

## OP-88687/88688/88689

Unit: mm

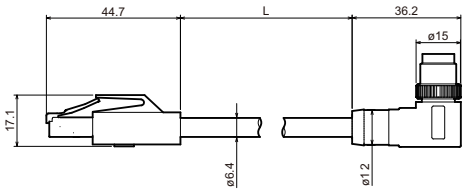



| | |
|---|---|
| 180 mm | Brown, blue, black tube |
| 150 mm | Black, pink, light blue, white |
| 120 mm | Gray, green, white and blue |

| Model | L (mm) |
|---|---|
| OP-88687 | 2000 |
| OP-88688 | 5000 |
| OP-88689 | 10000 |

## OP-88301/88302/88303

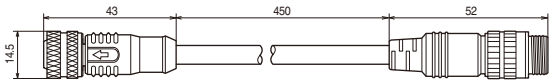
Unit: mm




| Model | L (mm) |
|---|---|
| OP-88301 | 2000 |
| OP-88302 | 5000 |
| OP-88303 | 10000 |

## OP-88764

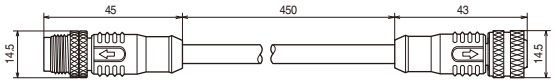
Unit: mm




| Model | L (mm) |
|---|---|
| OP-88764 | 450 |

## OP-88846

Unit: mm




| Model | L (mm) |
|---|---|
| OP-88846 | 450 |

# 19-3 Troubleshooting

## Error Shown on the SR-X Series Display

Refer to the following table to troubleshoot the error.

### ● List of errors displayed on the reader

| Error number/message | | Remedy |
|---|---|---|
| E0 | FILE SYSTEM | Contact your nearest KEYENCE office. |
| E1 | FACTPARAM | Contact your nearest KEYENCE office. |
| E2 | CHECK SUM | A mismatch of the internal memory information occurred.<br>• Hold down the [SELECT] button for at least 4 seconds to clear the error.<br>• If the error cannot be cleared, contact your nearest KEYENCE office. |
| E2 | CONFIG VER | A configuration file of a different version has been set in the SR main unit.<br>• Hold down the [SELECT] button for at least 4 seconds to clear the error.<br>• Send a correct configuration file again from the AutoID Network Navigator.<br>• Update the SR firmware. |
| E3 | PROFINET | An error occurred during PROFINET communication. To reconfigure settings, hold down the [SELECT] button for at least 4 seconds to clear the error. Alternatively, send the DFLT command to initialize the settings, and then configure the settings again.<br>Check the communication between the SR-X Series and the PLC. |
| E4 | BUFFER OVER | An error occurred because the upper limit of the send buffer was exceeded.<br>Cycle power to the SR-X Series or hold down the [SELECT] button for at least 4 seconds to clear the error. |
| E5 | IP DUPLICATE | A duplicate IP address is present on the network.<br>Configure the network settings so that no duplicate IP addresses are present. |
| E6 | FW UPDATE | An error occurred during an SR-X Series firmware update.<br>Cycle power to the SR-X Series, and then execute update again. |
| E7 | PLC LINK | A PLC link error occurred.<br>Check the communication between the SR-X Series and the PLC. |
| E8 | SCRIPT | An error occurred during script execution.<br>Check the SR-X Series settings and the script file. |
| E9 | DSP PROG | Contact your nearest KEYENCE office. |
| E10 | CMOS | Contact your nearest KEYENCE office. |
| E11 | AUTO FOCUS | Cycle power to the SR-X Series. If the error still occurs, contact your nearest KEYENCE office. |
| E12 | HOST CONNECT | An error occurred during communication with a host device.<br>Check for causes of unstable communication.<br>To reconfigure settings, hold down the [SELECT] button for at least 4 seconds to clear the error. |
| E13 | MOTOR | Contact your nearest KEYENCE office. |
| E15 | REPLACE FILE | An error occurred with the command replacement.<br>Refer to sections on SR-X Series configuration and command replacement files. |
| E99 | MISC | Contact your nearest KEYENCE office. |

## Unable to Install AutoID Network Navigator or the SR-X Series Driver

Check the following points, and then install the software again.

- **Administrator rights**
  To install the software, log on as a user with Administrator rights.
- **Security software**
  The installation may be impeded by security software. Temporarily disable the security software.

## Unable to Connect to AutoID Network Navigator

- **USB connection**
  "5-1 Connecting" (Page 20)
- **Ethernet connection**
  "5-1 Connecting" (Page 20)

## SR-X Series Does Not Turn ON

- **When connecting 24 VDC directly to the power cable**
  Check the power cable and confirm that 24 VDC power is supplied to the SR-X Series.

## Unable to Read Codes with the SR-X Series

- **Tuning options**
  You have to tune the SR-X Series to read codes.
  Tuning execution:
  Using the reader "4-1 Tuning" (Page 16)
  Using the setup software "5-3 Reading Settings" (Page 22)
  Configuration confirmation: "9-1 Checking SR-X Series Settings" (Page 56)
- **Print quality**
  It may not be possible to read codes that have a large amount of cracks, chips, stains, or blurring. You may be able to improve the situation by performing maintenance on the printer or marker.
- **Mounting distance**
  It may not be possible to read codes that have small cell sizes when the reader is installed too far away from the codes. Reduce the distance between the reader and the codes, and then adjust focus and tune the reader again.

## Data Is Not Output Through the RS-232C Interface

- **Communication settings confirmation**
  Check that the communication settings of the SR-X Series match those of the host device.
  "5-4 Communication Settings" (Page 23)
- **Wiring**
  To communicate via RS-232C, the pin arrangement of the SR-X Series must match that of the host device. Check that a cable correctly matching the pin arrangement is being used.
  "2-2 Wiring to a PC" (Page 9)
  "2-3 Wiring to a PLC or Peripheral" (Page 10)

## Data Is Not Output Through the Ethernet Interface

- **Communication settings confirmation**
  Check that the settings for communication between the SR-X Series and the host device are correct.
  "5-4 Communication Settings" (Page 23)
- **Wiring**
  If you are using a hub or other intermediary device between the SR-X Series and the host device, remove the intermediary device to establish a direct connection, and then check if it is possible to communicate.
- **Security settings**
  Check whether communication is being blocked by the security settings of the network devices.

## "ERROR" in the Output Data

A reading error has occurred on the SR-X Series. Check the following points.

- **Trigger input time**
  If the time for receiving trigger input from a switch or sensor is too short, a reading error will occur. Check if making the trigger input time longer improves reading.
  If you want to start reading on the rising edge of the trigger input for a specific amount of time, use the "One-shot trigger" setting.
  "6-4 Change Reading Behavior" (Page 30)
- **Tuning options**
  You have to tune the SR-X Series to read codes.
  Tuning execution:
  Using the reader "4-1 Tuning" (Page 16)
  Using the setup software "5-3 Reading Settings" (Page 22)
  Configuration confirmation: "9-1 Checking SR-X Series Settings" (Page 56)
- **Line speed**
  If the reader cannot read the codes moving on the line, the reading settings may not be correct.

## "ER,**" in the Output Data

This is displayed when the PC or PLC sends a command to the SR-X Series and the processing of the command fails.

- **Error details**
  "14-1 Command Communication" (Page 106)

# 19-4 ASCII Codes

| | | | High-order 4 bits | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hexadecimal | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | Binary | 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| Low-order 4 | 0 | 0000 | | DLE | (SP) | 0 | @ | P | ‘ | p |
| | 1 | 0001 | SOH | DC1 | ! | 1 | A | Q | a | q |
| | 2 | 0010 | STX | DC2 | “ | 2 | B | R | b | r |
| | 3 | 0011 | ETX | DC3 | # | 3 | C | S | c | s |
| | 4 | 0100 | EOT | DC4 | $ | 4 | D | T | d | t |
| | 5 | 0101 | ENQ | NAK | % | 5 | E | U | e | u |
| | 6 | 0110 | ACK | SYN | & | 6 | F | V | f | v |
| | 7 | 0111 | BEL | ETB | ‘ | 7 | G | W | g | w |
| | 8 | 1000 | BS | CAN | ( | 8 | H | X | h | x |
| | 9 | 1001 | HT | EM | ) | 9 | I | Y | i | y |
| | A | 1010 | LF | SUB | * | : | J | Z | j | z |
| | B | 1011 | VT | ESC | + | ; | K | [ | k | { |
| | C | 1100 | FF | FS | , | < | L | \ | l | \| |
| | D | 1101 | CR | GS | - | = | M | ] | m | } |
| | E | 1110 | SO | RS | . | > | N | ^ | n | ~ |
| | F | 1111 | SI | US | / | ? | O | _ | o | del |

# 19-5 Precautions on Proper Use

## CE and UKCA Markings

Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EU Directive(s) and UK regulations, based on the following specifications. Be sure to consider the following specifications when using this product in the Member States of European Union and in the United Kingdom.

### ● EMC Directive (CE) and Electromagnetic Compatibility Regulations (UKCA)

- Applicable standards (BS) EN61326-1, Class A
  (BS) EN61326-1
- The length of cable connected to the power supply connector must be less than or equal to 30 m.
- Wrap the USB cable around a ferrite core close to the device to connect to. Ferrite core: TDK ZCAT1730-0730A-BK equivalent
- This product is intended to be used in an industrial electromagnetic environment.

Remarks: These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of EMC Directive and Electromagnetic Compatibility Regulations. The manufacturer of the end-product is solely responsible for the compliance on the end-product itself according to EMC Directive and Electromagnetic Compatibility Regulations.

## UL Certificate

This product is a UL/c-UL certified product.
- UL File No.: E222809
- Category: QUYX,QUYX7

Be sure to consider the following specifications when using this product as an UL/c-UL Listed product.
- Overvoltage category
- Use this product under pollution degree 3.
- Use this product at the altitude of 2500 m or less.
- Indoor use only.
- Ensure the external circuits to be connected to the SR-X Series are SELV circuits.
- CSA or UL certified power supply that provides Class 2 output as defined in the CEC (Canadian Electrical Code) and NEC (National Electrical Code).
- Only USB memory or designated devices* can be connected to the USB port.

* OP-88569

## KC mark (Republic of Korea)

**사용자안내문**

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하 는 경우 전파간섭의 우려가 있습니다 .

## North American Regulations

This product complies with the following North American regulations.
- Applicable regulation FCC Part15 Subpart B, Class A Digital Device
  ICES-003, Class A Digital Apparatus
- Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- FCC CAUTION
  Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

## 19-6 Software License Agreement

NOTICE TO USER: PLEASE READ THIS SOFTWARE LICENSE AGREEMENT (THIS “AGREEMENT”) CAREFULLY. BY USING ALL OR ANY PORTION OF THE [SR-H8W] (THIS “SOFTWARE”), YOU ARE AGREEING TO BE BOUND BY ALL THE TERMS AND CONDITONS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO ANY TERMS OF THIS AGREEMENT, DO NOT USE THIS SOFTWARE.

1. Definition
   - 1.1 “use” or “using” means to access, install, download, copy or otherwise benefit from using the functionality of this Software.
   - 1.2 “This Software” means the software and all associated documentation provided by KEYENCE.

2. Grant of License.
   Conditioned upon compliance with all of the terms and conditions of this Agreement, KEYENCE grants you a nonexclusive and nontransferable license to install this Software on all computers used by your entity in order to use the KEYENCE product. You may make one copy of this Software for backup or archive purposes only.

3. Restrictions.
   - 3.1 Except for installation of updates or new functions provided by KEYENCE, you may not modify or add any function to this Software.
   - 3.2 You may not reverse engineer, decompile or disassemble this Software.
   - 3.3 You may not create derivative works based on this Software.
   - 3.4 Other than expressly stated by KEYENCE, you may not resell, retransfer, rent or otherwise redistribute this Software to any third parties.

4. Intellectual Property Rights.
   Except as expressly stated herein, KEYENCE reserves all right, title and interest in this Software, and all associated copyrights, trademarks, and other intellectual property rights therein.

5. Disclaimer.
   Keyence is licensing this Software to you “AS IS” and without any warranty of any kind. In no event will KEYENCE or its suppliers be liable to you for any damages, claims, costs or any lost profits caused by using this Software.

6. Termination.
   - 6.1 Your license under this Agreement will terminate automatically if you destroy this Software and the copy of this Software in your possession or voluntarily return this Software to us.
   - 6.2 Your license under this Agreement will terminate automatically without any notice from KEYENCE if you fail to comply with any of the terms and conditions of this Agreement. Promptly upon termination, you shall cease all use of this Software and destroy all copies, full or partial, of this Software in your possession or control.
   - 6.3 You will compensate KEYENCE for costs or any lost profits caused by your violation or breach of any term of this Agreement.

7. Governing Law.
   - 7.1 This Agreement will be governed by and construed in accordance with the substantive laws of Japan without regards to the principles of conflicts of law.
   - 7.2 If any part of this Agreement is found void and unenforceable, it will not affect the validity of the balance of this Agreement, which shall remain valid and enforceable according to its terms and conditions.

## 19-7 Libraries and programs

The newlib subdirectory is a collection of software from several sources.

Each file may have its own copyright/license that is embedded in the source file. Unless otherwise noted in the body of the source file(s), the following copyright notices will apply to the contents of the newlib subdirectory:

(1) Red Hat Incorporated

Copyright (c) 1994-2009 Red Hat, Inc. All rights reserved.

This copyrighted material is made available to anyone wishing to use, modify, copy, or redistribute it subject to the terms and conditions of the BSD License. This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY expressed or implied, including the implied warranties of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. A copy of this license is available at http://www.opensource.org/licenses. Any Red Hat trademarks that are incorporated in the source code or documentation are not subject to the BSD License and may only be used or replicated with the express permission of Red Hat, Inc.

(2) University of California, Berkeley

Copyright (c) 1981-2000 The Regents of the University of California.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
* Neither the name of the University nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(3) David M. Gay (AT&T 1991, Lucent 1998)

The author of this software is David M. Gay.

Copyright (c) 1991 by AT&T.

Permission to use, copy, modify, and distribute this software for any purpose without fee is hereby granted, provided that this entire notice is included in all copies of any software which is or includes a copy or modification of this software and in all copies of the supporting documentation for such software.

THIS SOFTWARE IS BEING PROVIDED "AS IS", WITHOUT ANY EXPRESS OR IMPLIED WARRANTY. IN PARTICULAR, NEITHER THE AUTHOR NOR AT&T MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND CONCERNING THE MERCHANTABILITY OF THIS SOFTWARE OR ITS FITNESS FOR ANY PARTICULAR PURPOSE.

---

The author of this software is David M. Gay.

Copyright (c) 1998-2001 by Lucent Technologies
All Rights Reserved

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that the copyright notice and this permission notice and warranty disclaimer appear in supporting documentation, and that the name of Lucent or any of its entities not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

LUCENT DISCLAIMS ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. IN NO EVENT SHALL LUCENT OR ANY OF ITS ENTITIES BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

(4) Advanced Micro Devices

Copyright 1989, 1990 Advanced Micro Devices, Inc.

This software is the property of Advanced Micro Devices, Inc (AMD) which specifically grants the user the right to modify, use and distribute this software provided this notice is not removed or altered. All other rights are reserved by AMD.

AMD MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS SOFTWARE. IN NO EVENT SHALL AMD BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING FROM THE FURNISHING, PERFORMANCE, OR USE OF THIS SOFTWARE.

So that all may benefit from your experience, please report any problems or suggestions about this software to the 29K Technical Support Center at 800-29-29-AMD (800-292-9263) in the USA, or 0800-89-1131 in the UK, or 0031-11-1129 in Japan, toll free. The direct dial number is 512-462-4118.

Advanced Micro Devices, Inc.
29K Support Products
Mail Stop 573
5900 E. Ben White Blvd.
Austin, TX 78741
800-292-9263

(5)

(6)

(7) Sun Microsystems

Copyright (c) 1993 by Sun Microsystems, Inc. All rights reserved.

Developed at SunPro, a Sun Microsystems, Inc. business. Permission to use, copy, modify, and distribute this software is freely granted, provided that this notice is preserved.

(8) Hewlett Packard

(c) Copyright 1986 HEWLETT-PACKARD COMPANY

To anyone who acknowledges that this file is provided "AS IS" without any express or implied warranty: permission to use, copy, modify, and distribute this file for any purpose is hereby granted without fee, provided that the above copyright notice and this notice appears in all copies, and that the name of Hewlett-Packard Company not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission. Hewlett-Packard Company makes no representations about the suitability of this software for any purpose.

(9) Hans-Peter Nilsson

Copyright (c) 2001 Hans-Peter Nilsson

Permission to use, copy, modify, and distribute this software is freely granted, provided that the above copyright notice, this notice and the following disclaimer are preserved with no changes.

THIS SOFTWARE IS PROVIDED "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

(10) Stephane Carrez (m68hc11-elf/m68hc12-elf targets only)

Copyright (c) 1999, 2000, 2001, 2002 Stephane Carrez (stcarrez@nerim.fr)

The authors hereby grant permission to use, copy, modify, distribute, and license this software and its documentation for any purpose, provided that existing copyright notices are retained in all copies and that this notice is included verbatim in any distributions. No written agreement, license, or royalty fee is required for any of the authorized uses. Modifications to this software may be copyrighted by their authors and need not follow the licensing terms described here, provided that the new terms are clearly indicated on the first page of each file where they apply.

(11) Christopher G. Demetriou

Copyright (c) 2001 Christopher G. Demetriou
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(12) SuperH, Inc.

Copyright 2002 SuperH, Inc. All rights reserved

This software is the property of SuperH, Inc (SuperH) which specifically grants the user the right to modify, use and distribute this software provided this notice is not removed or altered. All other rights are reserved by SuperH.

SUPERH MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS SOFTWARE. IN NO EVENT SHALL SUPERH BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING FROM THE FURNISHING, PERFORMANCE, OR USE OF THIS SOFTWARE.

So that all may benefit from your experience, please report any problems or suggestions about this software to the SuperH Support Center via e-mail at softwaresupport@superh.com.

SuperH, Inc.
405 River Oaks Parkway
San Jose
CA 95134
USA

(13) Royal Institute of Technology

Copyright (c) 1999 Kungliga Tekniska Högskolan (Royal Institute of Technology, Stockholm, Sweden). All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of KTH nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY KTH AND ITS CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL KTH OR ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(14) Alexey Zelkin

Copyright (c) 2000, 2001 Alexey Zelkin <phantom@FreeBSD.org>
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(15) Andrey A. Chernov

Copyright (c) 1997 by Andrey A. Chernov, Moscow, Russia. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(16) FreeBSD

Copyright (c) 1997-2002 FreeBSD Project. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(17) S. L. Moshier

Author: S. L. Moshier.

Copyright (c) 1984,2000 S.L. Moshier

Permission to use, copy, modify, and distribute this software for any purpose without fee is hereby granted, provided that this entire notice is included in all copies of any software which is or includes a copy or modification of this software and in all copies of the supporting documentation for such software.

THIS SOFTWARE IS BEING PROVIDED "AS IS", WITHOUT ANY EXPRESS OR IMPLIED WARRANTY. IN PARTICULAR, THE AUTHOR MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND CONCERNING THE MERCHANTABILITY OF THIS SOFTWARE OR ITS FITNESS FOR ANY PARTICULAR PURPOSE.

(18) Citrus Project

Copyright (c)1999 Citrus Project,
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(19) Todd C. Miller

Copyright (c) 1998 Todd C. Miller <Todd.Miller@courtesan.com> All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the author may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,

SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(20) DJ Delorie (i386)
Copyright (c) 1991 DJ Delorie
All rights reserved.

Redistribution, modification, and use in source and binary forms is permitted provided that the above copyright notice and following paragraph are duplicated in all such forms.

This file is distributed WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

(21) Free Software Foundation LGPL License (*-linux* targets only)

Copyright (c) 1990-1999, 2000, 2001 Free Software Foundation, Inc. This file is part of the GNU C Library. Contributed by Mark Kettenis <kettenis@phys.uva.nl>, 1997.

The GNU C Library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

The GNU C Library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details.

You should have received a copy of the GNU Lesser General Public License along with the GNU C Library; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA.

(22) Xavier Leroy LGPL License (i[3456]86-*-linux* targets only)

Copyright (c) 1996 Xavier Leroy (Xavier.Leroy@inria.fr)

This program is free software; you can redistribute it and/or modify it under the terms of the GNU Library General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Library General Public License for more details.

(23) Intel (i960)

Copyright (c) 1993 Intel Corporation

Intel hereby grants you permission to copy, modify, and distribute this software and its documentation. Intel grants this permission provided that the above copyright notice appears in all copies and that both the copyright notice and this permission notice appear in supporting documentation. In addition, Intel grants this permission provided that you prominently mark as "not part of the original" any modifications made to this software or documentation, and that the name of Intel Corporation not be used in advertising or publicity pertaining to distribution of the software or the documentation without specific, written prior permission.

Intel Corporation provides this AS IS, WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Intel makes no guarantee or representations regarding the use of, or the results of the use of, the software and documentation in terms of correctness, accuracy, reliability, currentness, or otherwise; and you rely on the software, documentation and results solely at your own risk.

IN NO EVENT SHALL INTEL BE LIABLE FOR ANY LOSS OF USE, LOSS OF BUSINESS, LOSS OF PROFITS, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND. IN NO EVENT SHALL INTEL'S TOTAL LIABILITY EXCEED THE SUM PAID TO INTEL FOR THE PRODUCT LICENSED HEREUNDER.

(24) Hewlett-Packard (hppa targets only)

(c) Copyright 1986 HEWLETT-PACKARD COMPANY

To anyone who acknowledges that this file is provided "AS IS" without any express or implied warranty: permission to use, copy, modify, and distribute this file for any purpose is hereby granted without fee, provided that the above copyright notice and this notice appears in all copies, and that the name of Hewlett-Packard Company not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission. Hewlett-Packard Company makes no representations about the suitability of this software for any purpose.

(25) Henry Spencer (only *-linux targets)

Copyright 1992, 1993, 1994 Henry Spencer. All rights reserved. This software is not subject to any license of the American Telephone and Telegraph Company or of the Regents of the University of California.

Permission is granted to anyone to use this software for any purpose on any computer system, and to alter it and redistribute it, subject to the following restrictions:

1. The author is not responsible for the consequences of use of this software, no matter how awful, even if they arise from flaws in it.
2. The origin of this software must not be misrepresented, either by explicit claim or by omission. Since few users ever read sources, credits must appear in the documentation.
3. Altered versions must be plainly marked as such, and must not be misrepresented as being the original software. Since few users ever read sources, credits must appear in the documentation.
4. This notice may not be removed or altered.

(26) Mike Barcroft

Copyright (c) 2001 Mike Barcroft <mike@FreeBSD.org> All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(27) Konstantin Chuguev (--enable-newlib-iconv)

Copyright (c) 1999, 2000
Konstantin Chuguev. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

iconv (Charset Conversion Library) v2.0

(28) Artem Bityuckiy (--enable-newlib-iconv)

Copyright (c) 2003, Artem B. Bityuckiy, SoftMine Corporation. Rights transferred to Franklin Electronic Publishers.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(29) IBM, Sony, Toshiba (only spu-* targets)

(c) Copyright 2001,2006,
International Business Machines Corporation,
Sony Computer Entertainment, Incorporated,
Toshiba Corporation,

All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
* Neither the names of the copyright holders nor the names of their contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(30) - Alex Tatmanjants (targets using libc/posix)

Copyright (c) 1995 Alex Tatmanjants <alex@elvisti.kiev.ua>
at Electronni Visti IA, Kiev, Ukraine.
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(31) - M. Warner Losh (targets using libc/posix)

Copyright (c) 1998, M. Warner Losh <imp@freebsd.org> All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(32) - Andrey A. Chernov (targets using libc/posix)

Copyright (c) 1996 by Andrey A. Chernov, Moscow, Russia. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(33) - Daniel Eischen (targets using libc/posix)

Copyright (c) 2001 Daniel Eischen <deischen@FreeBSD.org>. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE REGENTS OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(34) - Jon Beniston (only lm32-* targets)

Contributed by Jon Beniston <jon@beniston.com>

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(35) - ARM Ltd (arm and thumb variant targets only)

Copyright (c) 2009 ARM Ltd All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. The name of the company may not be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY ARM LTD "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL ARM LTD BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(36) - Xilinx, Inc. (microblaze-* and powerpc-* targets)

Copyright (c) 2004, 2009 Xilinx, Inc. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
3. Neither the name of Xilinx nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDER AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(37) Texas Instruments Incorporated (tic6x-*, *-tirtos targets)

Copyright (c) 1996-2010,2014 Texas Instruments Incorporated
http://www.ti.com/

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.

Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

Neither the name of Texas Instruments Incorporated nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(38) National Semiconductor (cr16-* and crx-* targets)

Copyright (c) 2004 National Semiconductor Corporation

The authors hereby grant permission to use, copy, modify, distribute, and license this software and its documentation for any purpose, provided that existing copyright notices are retained in all copies and that this notice is included verbatim in any distributions. No written agreement, license, or royalty fee is required for any of the authorized uses. Modifications to this software may be copyrighted by their authors and need not follow the licensing terms described here, provided that the new terms are clearly indicated on the first page of each file where they apply.

(39) - Adapteva, Inc. (epiphany-* targets)

Copyright (c) 2011, Adapteva, Inc. All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
* Neither the name of Adapteva nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(40) - Altera Corportion (nios2-* targets)

Copyright (c) 2003 Altera Corporation All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

- Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
- Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.
- Neither the name of Altera Corporation nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY ALTERA CORPORATION, THE COPYRIGHT HOLDER, AND ITS CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(41) Ed Schouten - Free BSD

Copyright (c) 2008 Ed Schouten <ed@FreeBSD.org>
All rights reserved.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:
1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer.
2. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON

ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

LLVM==========
Copyright (c) 2003-2014 University of Illinois at Urbana-Champaign. All rights reserved.

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

* Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers.
* Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
* Neither the names of the LLVM Team, University of Illinois at Urbana-Champaign, nor the names of its contributors may be used to endorse or promote products derived from this Software without specific prior written permission.

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

u-boot==========

GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

Copyright (c) 1989, 1991 Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Lesser General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

GNU GENERAL PUBLIC LICENSE
TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

==========

This software uses the following libraries:
Lua: Copyright 1994–2021 Lua.org, PUC-Rio.
Jansson: Copyright (c) 2009-2021 Petri Lehtinen petri@digip.org
SSH: Copyright (c) 2009-2021 Cypherbridge Systems, LLC. www.cypherbridge.com
Snmp: Copyright (c) 2015-2021 by HCC Embedded www.hcc-embedded.com
Jpeg: This software is based in part on the work of the Independent JPEG Group.

# Revision History

| Date of printing | Version | Revision contents |
|---|---|---|
| January 2022 | 1st edition | |
| February 2022 | 2nd edition | |
| May 2022 | 3rd edition | |
| September 2022 | 4th edition | |
| April 2023 | 5th edition | |

# WARRANTIES AND DISCLAIMERS

(1) KEYENCE warrants the Products to be free of defects in materials and workmanship for a period of one (1) year from the date of shipment. If any models or samples were shown to Buyer, such models or samples were used merely to illustrate the general type and quality of the Products and not to represent that the Products would necessarily conform to said models or samples. Any Products found to be defective must be shipped to KEYENCE with all shipping costs paid by Buyer or offered to KEYENCE for inspection and examination. Upon examination by KEYENCE, KEYENCE, at its sole option, will refund the purchase price of, or repair or replace at no charge any Products found to be defective. This warranty does not apply to any defects resulting from any action of Buyer, including but not limited to improper installation, improper interfacing, improper repair, unauthorized modification, misapplication and mishandling, such as exposure to excessive current, heat, coldness, moisture, vibration or outdoors air. Components which wear are not warranted.

(2) KEYENCE is pleased to offer suggestions on the use of its various Products. They are only suggestions, and it is Buyer's responsibility to ascertain the fitness of the Products for Buyer's intended use. KEYENCE will not be responsible for any damages that may result from the use of the Products.

(3) The Products and any samples ("Products/Samples") supplied to Buyer are not to be used internally in humans, for human transportation, as safety devices or fail-safe systems, unless their written specifications state otherwise. Should any Products/Samples be used in such a manner or misused in any way, KEYENCE assumes no responsibility, and additionally Buyer will indemnify KEYENCE and hold KEYENCE harmless from any liability or damage whatsoever arising out of any misuse of the Products/Samples.

(4) **OTHER THAN AS STATED HEREIN, THE PRODUCTS/SAMPLES ARE PROVIDED WITH NO OTHER WARRANTIES WHATSOEVER. ALL EXPRESS, IMPLIED, AND STATUTORY WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF PROPRIETARY RIGHTS, ARE EXPRESSLY DISCLAIMED.**
**IN NO EVENT SHALL KEYENCE AND ITS AFFILIATED ENTITIES BE LIABLE TO ANY PERSON OR ENTITY FOR ANY DIRECT, INDIRECT, INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, ANY DAMAGES RESULTING FROM LOSS OF USE, BUSINESS INTERRUPTION, LOSS OF INFORMATION, LOSS OR INACCURACY OF DATA, LOSS OF PROFITS, LOSS OF SAVINGS, THE COST OF PROCUREMENT OF SUBSTITUTED GOODS, SERVICES OR TECHNOLOGIES, OR FOR ANY MATTER ARISING OUT OF OR IN CONNECTION WITH THE USE OR INABILITY TO USE THE PRODUCTS, EVEN IF KEYENCE OR ONE OF ITS AFFILIATED ENTITIES WAS ADVISED OF A POSSIBLE THIRD PARTY'S CLAIM FOR DAMAGES OR ANY OTHER CLAIM AGAINST BUYER.** In some jurisdictions, some of the foregoing warranty disclaimers or damage limitations may not apply.

## BUYER'S TRANSFER OBLIGATIONS:

If the Products/Samples purchased by Buyer are to be resold or delivered to a third party, Buyer must provide such third party with a copy of this document, all specifications, manuals, catalogs, leaflets and written information provided to Buyer pertaining to the Products/Samples.

E 1101-3

● **BarcodeReader.com**

http://www.barcodereader.com/

You can download technical documents useful for BL/SR/RF introduction and operation.
Download the latest manual from this Web page.

## KEYENCE CORPORATION

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

www.keyence.com/glb

**AUSTRIA**
Ph: +43 (0)2236 378266 0

**BELGIUM**
Ph: +32 (0)15 281 222

**BRAZIL**
Ph: +55-11-3045-4011

**CANADA**
Ph: +1-905-366-7655

**CHINA**
Ph: +86-21-3357-1001

**CZECH REPUBLIC**
Ph: +420 220 184 700

**FRANCE**
Ph: +33 1 56 37 78 00

**GERMANY**
Ph: +49-6102-3656-0

**HONG KONG**
Ph: +852-3104-1010

**HUNGARY**
Ph: +36 1 802 7360

**INDIA**
Ph: +91-44-4963-0900

**INDONESIA**
Ph: +62-21-2966-0120

**ITALY**
Ph: +39-02-6688220

**KOREA**
Ph: +82-31-789-4300

**MALAYSIA**
Ph: +60-3-7883-2211

**MEXICO**
Ph: +52-55-8850-0100

**NETHERLANDS**
Ph: +31 (0)40 206 6100

**PHILIPPINES**
Ph: +63-(0)2-8981-5000

**POLAND**
Ph: +48 71 368 61 60

**ROMANIA**
Ph: +40 (0)269 232 808

**SINGAPORE**
Ph: +65-6392-1011

**SLOVAKIA**
Ph: +421 (0)2 5939 6461

**SLOVENIA**
Ph: +386 (0)1 4701 666

**SWITZERLAND**
Ph: +41 (0)43 455 77 30

**TAIWAN**
Ph: +886-2-2721-1080

**THAILAND**
Ph: +66-2-078-1090

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

**USA**
Ph: +1-201-930-0100

**VIETNAM**
Ph: +84-24-3772-5555


Specifications are subject to change without notice.

A6WW1-MAN-2033

Copyright (c) 2022 KEYENCE CORPORATION. All rights reserved.

193201GB 2043-5 B95GB Printed in Japan

*B95GB-5*