YRC1000 OPTIONS INSTRUCTIONS
FOR EtherNet/IP SAFETY FUNCTION
(FOR STANDARD LAN PORT)

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS
MOTOMAN-□□□ INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR'S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

The YRC1000 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.
The YRC1000 operator’s manual above consists of “GENERAL” and “SUBJECT SPECIFIC”.
The YRC1000 alarm codes above consists of “MAJOR ALARMS” and “MINOR ALARMS”.

Please have the following information available when contacting Yaskawa Customer Support:
• System
• Primary Application
• Software Version (Located on Programming Pendant by selecting:
  (Main Menu) - (System Info) - (Version))
• Robot Serial Number (Located on robot data plate)
• Robot Sales Order Number (Located on controller data plate)

Part Number: 179321-1CD
Revision: 0
DANGER

- This manual explains the EtherNet/IP Safety of the YRC1000 system. Read this manual carefully and be sure to understand its contents before handling the YRC1000. Any matter, including operation, usage, measures, and an item to use, not described in this manual must be regarded as "prohibited" or "improper".
- General information related to safety are described in "Chapter 1. Safety" of the YRC1000 INSTRUCTIONS. To ensure correct and safe operation, carefully read "Chapter 1. Safety" of the YRC1000 INSTRUCTIONS.

CAUTION

- In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the YRC1000.

In this manual, the Notes for Safe Operation are classified as “DANGER”, “WARNING”, “CAUTION”, or “NOTICE”.

DANGER
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

WARNING
Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

CAUTION
Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

NOTICE
NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

NOTE
To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “WARNING” and “CAUTION”.
**NOTICE**

- Do not use or keep the board in the following environmental conditions.
  - Where exposed to direct sunshine
  - Where vibration or impact occurs
  - Where high humidity exists
  - Where a strong magnetic field exists
  - Where much dust exists
  - Where a sudden change in the temperature occurs
  - Where corrosive gases occur
  - Where condensation occurs

Improper usage of the board may damage the board.
Before operating the manipulator, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

- Press the emergency stop buttons on the front door of the YRC1000, on the programming pendant, on the external control device, etc.
- Disconnect the safety plug of the safety fence.

If operation of the manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.

Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.

Failure to observe this instruction may cause unintended movement of the manipulator, which may result in personal injury.

Observe the following precautions when performing a teaching operation within the manipulator’s operating range:

- Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
- View the manipulator from the front whenever possible.
- Always follow the predetermined operating procedure.
- Always keep in mind emergency response measures against the manipulator’s unexpected movement toward a person.
- Ensure a safe place to retreat in case of emergency.

Failure to observe this instruction may cause improper or unintended movement of the manipulator, which may result in personal injury.

Confirm that no person is present in the manipulator’s operating range and that the operator is in a safe location before:

- Turning ON the YRC1000 power
- Moving the manipulator by using the programming pendant
- Running the system in the check mode
- Performing automatic operations

Personal injury may result if a person enters the manipulator’s operating range during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop buttons are located on the front panel of the YRC1000 and on the right of the programming pendant.

Read and understand the Explanation of the Warning Labels before operating the manipulator.
**WARNING**

- Do not touch any part inside the YRC1000 for at least five minutes after turning OFF the power supply.

Failure to observe this instruction may result in electric shock and/or personal injury due to residual voltage in the capacitor.

- Be sure to close the door and install the protection cover while the power is turned ON.

Failure to observe this warning may result in a fire or an electric shock.

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.

- Always return the programming pendant to the hook on the cabinet of the YRC1000 after use.

If the programming pendant is left unattended on the manipulator, on a fixture, or on the floor, etc., the Enable Switch may be activated due to surface irregularities of where it is left, and the servo power may be turned ON. In addition, in case the operation of the manipulator starts, the manipulator or the tool may hit the programming pendant left unattended, which may result in personal injury and/or equipment damage.

- The wiring and mounting must be performed by authorized and qualified personnel.

Failure to observe this caution may result in a fire or an electric shock.

**CAUTION**

- Make sure that there is no foreign matter such as metal chips on the board.

In case of malfunction, etc. it may result in an injury or damage the board.

- Make sure that there is no damage or deflection of parts on the board.

In case of malfunction, etc. it may result in an injury or damage the board.

- Correctly connect each cable and connector.

Failure to observe this caution may result in a fire or damage the board.

- Set the switches, etc. correctly.

Malfunction, caused by an incorrect setting, may result in an injury or damage the board.

- Never touch the soldered surfaces of the board directly with fingers.

Protrusions on the soldered surface may result in an injury.
NOTICE

- Never touch the mounting surfaces of the board parts directly with fingers.
The generated static electricity may damage the IC.
- No shock to the board.
The shock may damage the board.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and supply cables.

In this manual, the equipment is designated as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRC1000 Controller</td>
<td>YRC1000</td>
</tr>
<tr>
<td>YRC1000 Programming Pendant</td>
<td>Programming Pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td>Character Keys /Symbol Keys</td>
</tr>
<tr>
<td></td>
<td>Axis Keys /Numeric Keys</td>
</tr>
<tr>
<td></td>
<td>Keys pressed simultaneously</td>
</tr>
<tr>
<td></td>
<td>Displays</td>
</tr>
</tbody>
</table>

Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select • • • " means that the cursor is moved to the object item and [SELECT] is pressed, or that the item is directly selected by touching the screen.

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and ™ are omitted.
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1 Outline

1.1 System Configuration

This manual explains settings and other information required for EtherNet/IP Safety communication.

EtherNet/IP Safety communication uses the EtherNet/IP communication function using the standard LAN port of ACP01 board (CN106 connector) (hereinafter, referred to as EtherNet/IP (CPU board)).

The use of the EtherNet/IP Safety enables safety signals to be transferred to and from the safety PLC.

NOTE

This manual explains the setting procedures when communicating the EtherNet/IP Safety to the safety PLC manufactured by Rockwell Automation, Inc. For settings, "RSLogix 5000" which is manufactured by Rockwell Automation, Inc., is necessary.

1.1 System Configuration

The safety PLC will be the safety scanner for EtherNet/IP Safety communication. The YRC1000 safety circuit board will be the safety adapter. The EtherNet/IP (CPU board) relays data between the safety scanner and the safety adapter as the standard adapter for EtherNet/IP communication. In addition, the standard scanner for EtherNet/IP communication usually works within the safety PLC which is the safety scanner.

The YRC1000 can activate a non-safety adapter and a non-safety scanner at the same time as the safety adapter. For the details of the non-safety adapter and the non-safety scanner, refer to "YRC1000 OPTIONS INSTRUCTIONS EtherNet/IP COMMUNICATION FUNCTION (FOR STANDARD LAN PORT)".

Safety scanner (Standard scanner)
Safety PLC (Sequencer)

YRC1000 Controller

Standard adapter
Safety adapter
Safety circuit board

ACP01
CN106

ASF01

EtherNet Cable

HUB
1.2 Restrictions

EtherNet IP Safety communication function and CIP message communication function cannot be used simultaneously.
2 Board Specifications

2.1 EtherNet/IP

<table>
<thead>
<tr>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface to external devices</td>
<td>EtherNet/IP</td>
</tr>
<tr>
<td>Transmission I/O points (max.)</td>
<td>Input: 4040 points/Output: 4040 points</td>
</tr>
<tr>
<td>Processing capacity (max. number of packets)</td>
<td>3000 packets/sec</td>
</tr>
<tr>
<td>Connection type</td>
<td>Star (Connection by HUB)</td>
</tr>
<tr>
<td>Communication speed</td>
<td>10 Mbps/100 Mbps (Detected automatically during startup)</td>
</tr>
<tr>
<td>Communication media</td>
<td>Use category 5 or higher shielded Ethernet cables.</td>
</tr>
</tbody>
</table>

**NOTE**
The above mentioned maximum transmission I/O points (input: 4040 points/output: 4040 points) is a limitation by EtherNet/IP communication specification. Because the upper limit of the I/O points in the YRC1000 system is 4096 points when using this board with other board simultaneously, the upper limit of the total of the I/O points and the communication status used by this function or other functions is also 4096 points. The communication status occupies either 8 points or 16 points per network. For the details, refer to the instructions of the I/O circuit board.

**NOTE**
Use this board within the above mentioned processing capacity (3000 packets/sec). If it is used process beyond its processing capacity, the alarm 100 “COMMUNICATION ERROR (SV#1)” or 500 “SEGMENT PROC NOT READY” may occur so that it won’t work properly.
Reference: Solution to reduce the packet numbers

A packet carrying the large data in the network might be caused by the communication station performing a broadcast (a message or signal is sent to all connected devices) or a multicast (one device communicates with several devices with a single transmission). Perform the following measures to reduce the packet numbers in the network.

1) Limits the packet transmission route by Managed HUB

Install the Managed HUB instead of the Switching HUB, and set it to send the packets to the necessary route. In addition, refer to a guide book of installing the Managed HUB for installation procedures.

Fig. 2-1: Description of the Processing Capacity

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Use of the Switching HUB transmits the packets to all devices

Use of the Managed HUB transmits the packets with a single transmission
(2) Change the packet transmission method

Change the packet transmission method of communication station from broadcast/multicast to the unicast (point-to-point transmission from one device to another). Refer to a guide book of each device for setup procedures.

**Fig. 2-3: Limits the Packet Transmission Route by Unicast**

Broadcast/multicast transmits the packets to all devices. Unicast transmits the packets to a specified device.

### 2.2 EtherNet IP Safety

<table>
<thead>
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</table>

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2-3 HW1483562
3 Connecting of the Communication Cable

**WARNING**

- Before wiring, be sure to turn OFF the power supply and put up a warning sign, such as “DO NOT TURN ON THE POWER.”

Failure to observe this warning may result in an electric shock or an injury.

- Do not touch the inside of the panel for 5 minutes after the power is turned OFF.

The remaining charged voltage in the capacitor may cause an electric shock or an injury.

- Be sure to close the door and install the protection cover while the power is turned ON.

Failure to observe this warning may result in a fire or an electric shock.

- The wiring and mounting must be performed by authorized and qualified personnel.

Failure to observe this caution may result in a fire or an electric shock.

**CAUTION**

- Make sure that there is no foreign matter such as metal chips on the board.

In case of malfunction, etc. it may result in an injury or damage the board.

- Make sure that there is no damage or deflection of parts on the board.

In case of malfunction, etc. it may result in an injury or damage the board.

- Correctly connect each cable and connector.

Failure to observe this caution may result in a fire or damage the board.

- Set the switches, etc. correctly.

In case of malfunction, etc. it may result in an injury or damage the board.

- Never touch the soldered surfaces of the board directly with fingers.

Protrusions on the soldered surface may result in an injury.
NOTICE

- Never touch the mounting surfaces and the soldered surfaces of the board parts directly with fingers.
  The generated static electricity may damage the IC, and protrusions on the soldered surface may result in an injury.
- Never give any shock to the board.
  The shock may damage the board.
3 Connecting of the Communication Cable
3.1 Operating the Front Door of the YRC1000 (Controller)

3.1 Operating the Front Door of the YRC1000 (Controller)

Take the following procedure to connect the communication cable of the EtherNet/IP (CPU board).

1. Open the front door of the YRC1000.
   (1) Using a coin or a flathead screwdriver, rotate the door lock on the front of the YRC1000 (one place) 90 degrees to clockwise.

   *Fig. 3-1: Door Unlock*

   ![Door Unlock Diagram]

   - Clockwise 90°
   - Door lock
   - Flathead screwdriver

   (2) Rotate the main power supply switch to the “OFF” position and open the door gently.

   *Fig. 3-2: Open the Door “OFF” Position (Horizontal)*

   ![Open the Door Diagram]
3.2 Mounting the EtherNet/IP (CPU board) to YRC1000

Connect the Ethernet cable (shielded cable: category 5 or higher) to the LAN connector, CN106 (LAN2) which is located on the front panel of the ACP01 board inside the CPU rack.

**NOTE**

Three LAN connectors (RJ45) are mounted on the front side of the ACP01 board.

Among these connectors, CN106 (the middle connector) is available in the EtherNet/IP communication function.

Do not use CN105 connector (the lower connector) since it is for the programming pendant.

Fig. 3-3: Front View of CPU Rack

When a switching hub is used for connecting communication cables, it is highly recommended to use an industrial switching hub which is recommended by YASKAWA.

Recommended switching hub
Type: EDS-205 (MOXA Inc. made)
3.3 Closing the Front Door of the YRC1000

1. Close the front door of the YRC1000.
   (1) Close the door gently.
   (2) Using a coin or a flathead screwdriver, rotate the door lock on the front of the YRC1000 (one place) 90 degrees to counterclockwise.

**Fig. 3-4: Lock the Door**

![Diagram of door lock and flathead screwdriver]

**WARNING**

Make sure to close the door and close all the door locks of the YRC1000 whenever it is used, except for maintenance.

Failure to observe this instruction may cause the ingress of dust, dirt, or water, which may result in electric shock and/or mechanical failure.
4 Setting for EtherNet/IP Safety

4.1 Settings for YRC1000 Side

4.1.1 LAN Interface Setting

Perform the settings for the TCP/IP communication.

For details, refer to “YRC1000 OPTIONS INSTRUCTIONS FOR ETHERNET FUNCTION”.

4.1.2 Displaying the EtherNet/IP (CPU Board) Setting Window

For the switching of whether to use an EtherNet/IP (CPU board) or not, customers cannot change it.

Contact your YASKAWA representative.

Perform the following settings in the management mode.

The settings cannot be performed in the operation mode or the edit mode.

For using an EtherNet/IP (for CPU board) in EtherNet/IP communication for the YRC1000, the optional function settings and the I/O module settings should be performed according to the following procedures.

1. Turn ON the power supply while pressing (Main Menu) simultaneously.
   – The maintenance mode starts-up.

2. Change the security mode to management mode.
3. Select {SYSTEM} under the main menu.
   – The sub menu appears.

4. Select {SETUP}.
   – The SETUP window appears.
4 Setting for EtherNet/IP Safety
4.1 Settings for YRC1000 Side

5. Select {OPTION FUNCTION}.
   - The OPTION FUNCTION window appears.

6. Select {EtherNet/IP(CPU Board)}.
   - The EtherNet/IP(CPU Board) window appears.
7. Select “DETAIL” for EtherNet/IP(CPU Board).

- The EtherNet/IP(CPU Board) setting window appears.

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- Description of each setting items

1. EtherNet/IP(CPU Board)
   Set whether to use the EtherNet/IP (CPU board) or not. The setting of this item cannot be changed.

2. IO SIZE(IN/OUT)
   Displays the total of the IO size set for the adapter and the scanner. The IO size cannot be set in this window.

3. ADAPTER
   Perform the adapter settings. For details, refer to chapter 4.1.5 “Adapter Settings”.

4. SCANNER
   Perform the scanner settings. For details, refer to chapter 4.1.6 “Scanner Settings”.

5. EtherNet/IP Safety
   Indicates whether to use safety communication using EtherNet/IP Safety or not. The setting of this item cannot be changed. (Fixed to “USED”)

6. SAFETY IO SIZE
   Displays the IO size for the YRC1000 (safety adapter) used for EtherNet/IP Safety communication. When setting this item, change the security mode to the safety mode.

7. VIRTUAL COMM
   This item is the mode which is used when the robot performs the test operation. When starting the YRC1000 without connecting the standard LAN port to the safety PLC, set this item as “VIRTUAL”.
   When setting this item, change the security mode to the safety mode.
4 Setting for EtherNet/IP Safety

4.1 Settings for YRC1000 Side

4.1.3 Device Information List Settings

For the device information list settings, refer to “Chap. 4.2.2 Setting the Device Information List” in “YRC1000 OPTIONS INSTRUCTIONS EtherNet/IP COMMUNICATION FUNCTION (FOR STANDARD LAN PORT) (HW1483560)”. 

4.1.4 General Settings for EtherNet/IP (CPU Board)

1. Confirm that EtherNet/IP (CPU Board) is set to “USED”.

2. Confirm that EtherNet/IP Safety is set to “USED”.

4.1.5 Adapter Settings

For the adapter settings, refer to “Chap. 4.2.4 Adaptor Setting” in “YRC1000 OPTIONS INSTRUCTIONS EtherNet/IP COMMUNICATION FUNCTION (FOR STANDARD LAN PORT) (HW1483560)”. 

4.1.6 Scanner Settings

For the scanner settings, refer to “Chap. 4.2.5 Scanner Setting” in “YRC1000 OPTIONS INSTRUCTIONS EtherNet/IP COMMUNICATION FUNCTION (FOR STANDARD LAN PORT) (HW1483560)”. 

4.1.7 IO Module Settings

If the EtherNet/IP (CPU board) settings are changed, the IO module also needs to be set once again. Perform the IO module settings following the procedures below.
4 Setting for EtherNet/IP Safety
4.1 Settings for YRC1000 Side

1. (the continuation of the EtherNet/IP (CPU board) settings)
   - The IO module window (the first half) appears.

   ![IO Module Window](image1)

   - Make sure the allocated values are calculated by adding 8 to the IO size (unit: bit) which is set to DI and DO of ST#15.
   - However, the data size for the safety signals is not included.

2. Press [ENTER].
   - The IO module window (the latter half) appears.

   ![IO Module Window](image2)

   - Make sure the allocated values are calculated by adding 8 to the IO size (unit: bit) which is set to DI and DO of ST#15.
   - However, the data size for the safety signals is not included.
3. Press [ENTER].
   - The confirmation dialog box appears.

4. Select {YES}.
   - If the IO module is properly installed, select {YES}. The IO module settings will be updated, and the external IO setup window appears.
### 4.1.8 External IO Settings

1. The EXTERNAL IO SETUP window appears.

2. Select “AUTO” or “MANUAL” for the allocation mode.
   - After “AUTO”/“MANUAL” is selected, the selection menu appears.

**NOTE**
If the allocation mode is changed from “MANUAL” to “AUTO”, the allocation data that has been set will be lost, and re-allocating will be executed in the auto mode. If the set allocation data needs to be kept, save the data in the external memory menu in advance.
3. Select an allocation mode to be set.
   - When allocating the I/O signal automatically, select “AUTO”. When allocating the I/O signal manually, select “MANUAL”.
   - The selected allocation mode will be set.

4. Select “DETAIL” of {EXTERNAL IO ALLOCATION}.
   - When selecting “AUTO” for the allocation mode, the following steps 5 to 7 are not necessary. Perform the operation from step 8.
   - When selecting “MANUAL” for the allocation mode, perform the following steps 5 to 7 for the items necessary for manual settings.
5. Select an external I/O signal number to be changed from the original. (*#20060* is selected in the setting example.)

   - The select menu appears.

6. Select “MODIFY” and enter a desired external input signal number to replace with the original. (*'20200' is entered in the setting example.*)

   - The external input signal number will be changed.

7. Select and change the external input signal number with the same steps.

   - Repeat the selecting and changing operation for the desired allocation.
8. Press [ENTER].
   – The external output signal allocation window appears.

9. Select and change an external output signal number by the same procedure as the external input signal number.
   – Repeat the selecting and changing operation for the desired allocation.

10. Press [ENTER].
    – The confirmation dialog box appears.
11. Select {YES}.

- Return to the setting window after the setting contents are confirmed.

Settings for YRC1000 side are completed here.
Proceed to create an ESD file.
4.2 Creating an EDS File

When setting the communication of EtherNet/IP Safety, the EDS file (Electronic Data Sheet) may be required. (It depends on the safety scanner to be used.) Use the EDS file created in the following procedures. For the details of the EDS file, refer to the specifications of EtherNet/IP and CIP. For how to use the communication master, the communication setting tool (network configurator), and the created EDS file, refer to the instruction manual of each equipment.

4.2.1 Creating Procedures of EDS File

1. Turn ON the power supply while pressing {Main Menu} simultaneously.
   – The maintenance mode starts-up.

2. Select {EX. MEMORY} in the Main Menu.
   – The sub menu appears.

3. Select {SAVE}.
   – The SAVE window appears.

   ![Screen capture of the SAVE window]

   Please select a Main Menu.

   ![Screen capture of the main menu]

   Main Menu  Simple Menu  Maintenance mode

   SAVE
   UN-USED MEMORY 2.20 GB
   FOLDER:
   [ ] CONTROLLER INFORMATION
   [ ] EDS/OSD FILE SAVE
   [ ] SYSTEM UPLOAD
   [ ] SYSTEM FILE + CMOS

   Main Menu  Simple Menu  Maintenance mode
4. Select “EDS/GSD FILE SAVE”.
   - The EDS/GSD FILE LIST window appears.

5. Select “Ethernet/IP CPU(Resolutes).
   - “★” appears to the selected board.
6. Press [Enter].
   - The confirmation dialog box appears.

   ![Confirmation Dialog Box]

7. Select {YES}.
   - An EDS file is created in the currently valid device (SD Card or USB memory).

   ![Confirmation Dialog Box With YES Selected]
4.3 Settings for PLC side

For performing EtherNet/IP communication settings for EtherNet/IP Safety, the following softwares are necessary.

- RSLogix 5000 programming software (manufactured by Rockwell Automation, Inc.)
- RSLinx software (manufactured by Rockwell Automation, Inc.)

The software which is used as an example in this section is “RSLogix 5000 (V20.01.00 (CPR 9 SR 5))” manufactured by Rockwell Automation, Inc. For more information of the setting procedures, refer to the instruction manual for software manufactured by Rockwell Automation, Inc.

4.3.1 Setting Environment

As shown in the figure below, confirm that the PC, PLC, and YRC1000 are connected using Ethernet cables, and after performing the procedure described in chapter 4.1 “Settings for YRC1000 Side”, confirm that the YRC1000 is operating in Online mode.

4.3.2 Safety PLC Settings

When setting the safety scanner, the EDS file for YRC1000 EtherNet/IP Safety (for standard LAN port) may be required. (Depending on the safety scanner used.) Use the EDS file created in chapter 4.2 “Creating an EDS File”.

This section explains the setting procedures when using the safety PLC manufactured by Rockwell Automation, Inc. “Logix 5572S Automation Controller 4M/2M 1756-L72S” + “Logix L7SP SIL3 Ple Safety Partner 1756-L7SP” + “CLX HI-CAP ENET/IP MODULE-TP 1756-EN2T” as the safety scanner as an example.

When using equipment which is not manufactured by Rockwell Automation, Inc., refer to the instruction manual of each equipment.

At the time of creating this instructions, the settings for “CLX HI-CAP ENET/IP MODULE-TP 1756-EN2T” used in this section are as follows:

IP address 192.168.1.xxx
Subnet mask 255.255.255.0
Gateway address 0.0.0.0

Before performing settings, check the network environment to use and the information on equipment to use.
4. Setting for EtherNet/IP Safety
4.3 Settings for PLC side

1. Start RSLogix 5000.
2. Select {File} - {New…}, and then create a new project.
3. Enter a project name in {Name}, and then select {OK}.

4. Right-click {I/O Configuration}, and then select {New Module…}.
4. Setting for EtherNet/IP Safety

4.3 Settings for PLC side

5. Select 1756-EN2T, and then select {Create}.

6. Enter a module name in {Name} and an IP address in {IP Address}, and then select {OK}.

7. Select {Close}.
4 Setting for EtherNet/IP Safety
4.3 Settings for PLC side

8. Right-click {Ethernet}, and then select {New Module...}.

9. Select ETHERNET-SAFETYMODULE, and then select {Create}.

10. Select {Change...}. 
4 Setting for EtherNet/IP Safety
4.3 Settings for PLC side

11. In the {Module} tab, perform the following settings.
   - Vendor: 44
   - Product Type: 140
   - Product Code: 1284
   - Major Revision: 1
   - Minor Revision: 1
   - Electric Keying: Compatible Module

12. When the above settings are completed, select {Connection}.

13. In the {Connection} tab, perform the following settings.
   Safety Input:
   - Input Assembly Instance: 776
   - Output Assembly Instance: 1024
   - Size(8-bit): 8

   Safety Output:
   - Input Assembly Instance: 1024
   - Output Assembly Instance: 904
   - Size(8-bit): 8
   - Configuration Assembly Instance: 1024
14. After settings, select {OK}.

15. When the following dialog box appears, select {Yes}.

16. Enter a module name in {Name} and an IP address in {IP Address}, and then select the {Safety} tab.
17. Uncheck {Configuration Signature} in {Safety} tab, set the value of {Requested Packet Interval(RPI)(ms)} in {Safety Input} to 16 or more and multiple of 4, and then select {OK}.

18. Press {Close}. 

![Image of configuration settings](image-url)
19. The value of \{Requested Packet Interval (RPI) (ms)\} in \{Safety Output\} can be set in Safety Task. Right-click \{Safety Task\}, and then select \{Properties\}.

20. Select \{Configuration\} tab.
21. The value set in {Period} means the value of {Requested Packet Interval(RPI)(ms)} in {Safety Output}. Set 16 or more and multiple of 4 for the value. After setting, press {OK}.

22. When the following dialog box appears, press {Yes}.

NOTE

For the values of {Requested Packet Interval(RPI)(ms)} in {Safety Input}/{Safety Output}, set 16 or more and multiple of 4.

24. Press (Date/Time) tab.
25. Check {Enable Time Synchronization}, and then press {OK}.

![Enable Time Synchronization]

26. Turn ON the power supply of PLC, and then select {Communications} - {Who Active} while the Ethernet cable is connected.
4 Setting for EtherNet/IP Safety

4.3 Settings for PLC side

27. Select PLC which is to be connected to the Ethernet network, and then select \{Go Online\}.

28. When the following dialog box appears, select \{Download\}.
29. When the following dialog box appears, select {Download}.

30. When the following dialog box appears, select {No}. 

![Download dialog box]

![Change controller mode to Remote Run dialog box]
4 Setting for EtherNet/IP Safety
4.3 Settings for PLC side

31. Right-click {ETHERNET-SAFETYMODULE}, and then select {Properties}.

32. Select {...}.
33. When {Set} cannot be pressed as shown below, select {Cancel}.
When {Set} can be pressed, the performing of steps 34 to 44 is not required. Perform the procedure from step 43.

![Safety Network Number](image)

34. Select {Connection} tab.

![Module Properties](image)

35. Check {Inhibit Connection}, and then select {Apply}.

![Module Properties](image)
36. When the following dialog box appears, select {Yes}.

After selecting {Yes}, if the alarm "AL1871 M-SAF SEQUENCE WATCH ERROR" occurs at the YRC1000, cycle the control power of the YRC1000 OFF/ON, start in Online mode, and then perform the following operations.

37. Select {Safety} tab.

38. Select {Reset Ownership}.
39. When the following dialog box appears, select {Yes}.

And then, when the following dialog box appears, select {Yes}.

40. Select {Connection} tab.

41. Uncheck {Inhibit Connection}, and then select {Apply}. 
42. When the following dialog box appears, select {Yes}.

43. Select {General} tab.

44. Select {...}. 
45. Select {Set}, and then set a TUNID (Target Unique Network Identifier) for the YRC1000 safety adapter. The TUNID is generated by the safety adapter's SNN (Safety Network Number: the unique number allocated to each node of the safety network) and IP address. The value of the SNN specified in this step can be confirmed on the screen of the programming pendant. For confirming procedures, refer to chapter 4.4 “Confirming SNN”.

46. Select {YES}.
4. Setting for EtherNet/IP Safety
4.3 Settings for PLC side

47. Select {Tools} - {Safety} - {Generate Signature}, and then create Safety Signature.

48. Select "Communications" - "Run Mode" to change the operation mode to {Run Mode}.

49. Select {Yes}.

51. Select {Lock}.

52. When settings are complete, the following window appears.
4.4 Confirming SNN

The procedures of confirming the SNN specified in the step 45 of chapter 4.3.2 “Safety PLC Settings” are described below.

1. Start up the YRC1000 in the online mode.
2. Select {SYSTEM} under the main menu.
3. Select {FIELDBUS INFORMATION}.
   - The value of the SNN currently set is shown in hexadecimal notation.
5 Safety Signals

5.1 Safety Signal Specifications

Among safety signals handled by EtherNet/IP Safety, there are an 8-byte (max) safety output signal output from the safety PLC to the YRC1000, and an 8-byte (max) safety input signal input from the YRC1000 to the safety PLC. These signals can be used for safety logic circuits and for functional safety.

Specifications for the safety signals are as follows.

- When communication between the safety PLC and the YRC1000 has not been established, or when a communication error has occurred, the value of the YRC1000 safety output signal will be set to OFF (0) regardless of the safety PLC output signal.
- The safety PLC output signal is duplicated within the safety circuit board. When a duplicated signal value mismatch is detected, the value of the YRC1000 safety output signal will be set to OFF (0) regardless of the safety PLC output signal.
- When a major alarm occurs at the safety circuit board, the safety output signal and safety input signal values are set to OFF (0) regardless of their actual values.
- When allocating safety signals to safety logic circuits etc., the safety IO size is changed to a smaller value and the allocation definition is not changed even if the allocation in use falls outside the range of the safety IO. For allocation definitions outside the range, the safety output signal and safety input signal values are set to OFF (0) regardless of the actual values.
5.2 Safety Signal Allocation

The data for safety signals is allocated to concurrent I/O Internal Control Status Signals. Control status signals are allocated as follows.

### 5.2.1 Output Signal from Safety PLC (8 byte)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80527</td>
<td>80526</td>
<td>80525</td>
<td>80524</td>
<td>80523</td>
<td>80522</td>
<td>80521</td>
<td>80520</td>
</tr>
</tbody>
</table>

Safety signal (Byte 0)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80537</td>
<td>80536</td>
<td>80535</td>
<td>80534</td>
<td>80533</td>
<td>80532</td>
<td>80531</td>
<td>80530</td>
</tr>
</tbody>
</table>

Safety signal (Byte 1)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80547</td>
<td>80546</td>
<td>80545</td>
<td>80544</td>
<td>80543</td>
<td>80542</td>
<td>80541</td>
<td>80540</td>
</tr>
</tbody>
</table>

Safety signal (Byte 2)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80557</td>
<td>80556</td>
<td>80555</td>
<td>80554</td>
<td>80553</td>
<td>80552</td>
<td>80551</td>
<td>80550</td>
</tr>
</tbody>
</table>

Safety signal (Byte 3)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80567</td>
<td>80566</td>
<td>80565</td>
<td>80564</td>
<td>80563</td>
<td>80562</td>
<td>80561</td>
<td>80560</td>
</tr>
</tbody>
</table>

Safety signal (Byte 4)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80577</td>
<td>80576</td>
<td>80575</td>
<td>80574</td>
<td>80573</td>
<td>80572</td>
<td>80571</td>
<td>80570</td>
</tr>
</tbody>
</table>

Safety signal (Byte 5)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80587</td>
<td>80586</td>
<td>80585</td>
<td>80584</td>
<td>80583</td>
<td>80582</td>
<td>80581</td>
<td>80580</td>
</tr>
</tbody>
</table>

Safety signal (Byte 6)

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>80597</td>
<td>80596</td>
<td>80595</td>
<td>80594</td>
<td>80593</td>
<td>80592</td>
<td>80591</td>
<td>80590</td>
</tr>
</tbody>
</table>

Safety signal (Byte 7)
## 5.2.2 Input Signal to Safety PLC (8 byte)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>80607</td>
</tr>
<tr>
<td>1</td>
<td>80606</td>
</tr>
<tr>
<td>2</td>
<td>80605</td>
</tr>
<tr>
<td>3</td>
<td>80604</td>
</tr>
<tr>
<td>4</td>
<td>80603</td>
</tr>
<tr>
<td>5</td>
<td>80602</td>
</tr>
<tr>
<td>6</td>
<td>80601</td>
</tr>
<tr>
<td>7</td>
<td>80600</td>
</tr>
</tbody>
</table>

Safety signal (Byte 0)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80617</td>
</tr>
<tr>
<td>2</td>
<td>80616</td>
</tr>
<tr>
<td>3</td>
<td>80615</td>
</tr>
<tr>
<td>4</td>
<td>80614</td>
</tr>
<tr>
<td>5</td>
<td>80613</td>
</tr>
<tr>
<td>6</td>
<td>80612</td>
</tr>
<tr>
<td>7</td>
<td>80611</td>
</tr>
<tr>
<td>8</td>
<td>80610</td>
</tr>
</tbody>
</table>

Safety signal (Byte 1)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>80627</td>
</tr>
<tr>
<td>3</td>
<td>80626</td>
</tr>
<tr>
<td>4</td>
<td>80625</td>
</tr>
<tr>
<td>5</td>
<td>80624</td>
</tr>
<tr>
<td>6</td>
<td>80623</td>
</tr>
<tr>
<td>7</td>
<td>80622</td>
</tr>
<tr>
<td>8</td>
<td>80621</td>
</tr>
<tr>
<td>9</td>
<td>80620</td>
</tr>
</tbody>
</table>

Safety signal (Byte 2)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>80637</td>
</tr>
<tr>
<td>4</td>
<td>80636</td>
</tr>
<tr>
<td>5</td>
<td>80635</td>
</tr>
<tr>
<td>6</td>
<td>80634</td>
</tr>
<tr>
<td>7</td>
<td>80633</td>
</tr>
<tr>
<td>8</td>
<td>80632</td>
</tr>
<tr>
<td>9</td>
<td>80631</td>
</tr>
<tr>
<td>10</td>
<td>80630</td>
</tr>
</tbody>
</table>

Safety signal (Byte 3)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>80647</td>
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<tr>
<td>5</td>
<td>80646</td>
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<tr>
<td>6</td>
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<tr>
<td>7</td>
<td>80644</td>
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<tr>
<td>8</td>
<td>80643</td>
</tr>
<tr>
<td>9</td>
<td>80642</td>
</tr>
<tr>
<td>10</td>
<td>80641</td>
</tr>
<tr>
<td>11</td>
<td>80640</td>
</tr>
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</table>

Safety signal (Byte 4)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>80657</td>
</tr>
<tr>
<td>6</td>
<td>80656</td>
</tr>
<tr>
<td>7</td>
<td>80655</td>
</tr>
<tr>
<td>8</td>
<td>80654</td>
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<tr>
<td>9</td>
<td>80653</td>
</tr>
<tr>
<td>10</td>
<td>80652</td>
</tr>
<tr>
<td>11</td>
<td>80651</td>
</tr>
<tr>
<td>12</td>
<td>80650</td>
</tr>
</tbody>
</table>

Safety signal (Byte 5)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>80667</td>
</tr>
<tr>
<td>7</td>
<td>80666</td>
</tr>
<tr>
<td>8</td>
<td>80665</td>
</tr>
<tr>
<td>9</td>
<td>80664</td>
</tr>
<tr>
<td>10</td>
<td>80663</td>
</tr>
<tr>
<td>11</td>
<td>80662</td>
</tr>
<tr>
<td>12</td>
<td>80661</td>
</tr>
<tr>
<td>13</td>
<td>80660</td>
</tr>
</tbody>
</table>

Safety signal (Byte 6)

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>80677</td>
</tr>
<tr>
<td>8</td>
<td>80676</td>
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<tr>
<td>9</td>
<td>80675</td>
</tr>
<tr>
<td>10</td>
<td>80674</td>
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<td>11</td>
<td>80673</td>
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<td>12</td>
<td>80672</td>
</tr>
<tr>
<td>13</td>
<td>80671</td>
</tr>
<tr>
<td>14</td>
<td>80670</td>
</tr>
</tbody>
</table>

Safety signal (Byte 7)
5.2 Safety Signal Allocation

5.2.3 Output Signal Status from Safety PLC (1 byte)

<table>
<thead>
<tr>
<th>80847</th>
<th>80846</th>
<th>80845</th>
<th>80844</th>
<th>80843</th>
<th>80842</th>
<th>80841</th>
<th>80840</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Init_Complete_Out</td>
<td>S_Con_Flt_C_Out</td>
<td>S_Run_Idle_Out</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **S_Run_Idle_Out**: It notifies execution status of the safety adapter. (0:Idle 1:Run)
- **S_Con_Flt_C_Out**: It notifies failure detection in the safety adapter. (0:Fault 1:OK)
- **Init_Complete_Out**: It notifies initialization completion status of the safety adapter. (0: Not completed 1: Completed)

5.2.4 Input Signal Status to Safety PLC (1 byte)

<table>
<thead>
<tr>
<th>80857</th>
<th>80856</th>
<th>80855</th>
<th>80854</th>
<th>80853</th>
<th>80852</th>
<th>80851</th>
<th>80850</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Run_Idle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Run_Idle**: It notifies input connection status. (0:Idle 1:Run)
### 5.2.5 Status Information (43 byte)

<table>
<thead>
<tr>
<th>Control Input</th>
<th>Name</th>
<th>Description</th>
<th>Valid States</th>
<th>Size (bytes)</th>
</tr>
</thead>
</table>
| 80860 to 80867 | Input Connection Status     | Value indicating run status of the software's safety input connection.       | 0x00 - Unallocated: no connection established  
0x01 - Initializing: connection started, but not fully established  
0x02 - Established: connection fully established  
0x03 - Closed (Fail): connection failed                                                                 | 1            |
| 80870 to 80877 | Input Connection Error      | If Input Connection Status is in 'Closed (Error)' state, then this value indicates the reason for the dropped connection. | 0x00 - No Error: no error detected  
0x01 - Timeout: final consumer timed out  
0x02 - CRC Error: final consumer dropped due to CRC error.  
0x03 - Packet Error: final consumer dropped due to error received in Time Coordination Message (other than CRC check failure).  
0x04 - Data Error: all consumers dropped due to inconsistencies in the DATA_IN_A and DATA_IN_B buffers.  
0x05 - General Stack Error: all consumers dropped due to error encountered inside CIP stack or layers below (Network Control Process or interface firmware). | 1            |
| 80880 to 80887 | Input Connection Consumer Count | The number of consumers the input connection is currently servicing (read only). | 0x00 - 0x0F: Valid number of consumers.                                                                                                       | 1            |
| 80890 to 80897 | Input Connection Data Size  | The number of safety data bytes the input connection is currently servicing (read only). | 0x00 - 0x08: Valid number of data bytes.                                                                                                       | 1            |
| 80900 to 81047 | Producing Connection Status Bytes (one byte for each possible consumer, 1 through 15) | Bit 0: Consumer_Active_Idle  
Indicates to the Customer Safety Application if valid Time Coordination Message information has been received for this consumer. | 0x00:Idle  
0x01:Active                                                                                                                        | 15           |
|               |                             | Bit 1: S_Connection_Fault  
Indicates to the Customer Safety Application if the safety connection to the consumer is OK or Faulted. | 0x00:Fault  
0x02:OK                                                                                                                           |              |
|               |                             | Bit 2,3,4,5,6 and 7: Reserved                                                                                                           | 0x00: Reserved                                                                                                                          |              |
| 81050 to 81057 | Output Connection New Data Flag | CIP Safety Stack shall set this value (write a 1) only if it is read as zero. Customer Safety Application can set this to any zero to determine when data has been updated by the CIP Safety Stack. | 0x00: Output data has not been updated  
0x01: Output data has been updated                                                                                                     | 1            |
<table>
<thead>
<tr>
<th>Control Input</th>
<th>Name</th>
<th>Description</th>
<th>Valid States</th>
<th>Size (bytes)</th>
</tr>
</thead>
</table>
| 81060 to 81067 | Output Connection Status      | Value indicating run status of the software's safety output connection.                                                                        | 0x00 - Unallocated : no connection established  
0x01 - Initializing : connection started, but not fully established  
0x02 - Established : connection fully established  
0x03 - Closed (Fail) : connection failed                                                                 | 1            |
| 81070 to 81077 | Output Connection Error       | If Output Connection Status is in 'Closed (Error)' state, then this value indicates the reason for the dropped connection.                 | 0x00 - No Error : no error detected  
0x01 - Timeout : final consumer timed out  
0x02 - CRC Error : final consumer dropped due to CRC error.  
0x03 - Packet Error : final consumer dropped due to error received in Time Coordination Message (other than CRC check failure).  
0x04 - Data Error : all consumers dropped due to inconsistencies in the DATA_IN_A and DATA_IN_B buffers.  
0x05 - General Stack Error : all consumers dropped due to error encountered inside CIP stack or layers below (Network Control Process or interface card/ firmware). | 1            |
| 81080 to 81087 | Output Connection Data Size   | The number of safety data bytes the output connection is currently servicing (read only).                                                  | 0x00 - 0x08 : Valid number of data bytes.                                                        | 1            |
| 81090 to 81097 | Safety Supervisor Device Status | Safety Supervisor device status                                                                                                               | 0x00:Undefined  
0x01:Self-Testing  
0x02:Idle  
0x03:Self-Test Exception  
0x04:Executing  
0x05:Abort  
0x06:Critical Fault  
0x07:Configuring  
0x08:Waiting for TUNID | 1            |
| 81100 to 81117 | General Stack Status          | Bits indicating status of various software attributes. If bit is set then attribute is TRUE, if bit is reset then FALSE.                   | Bits shall be included for the following:  
Interface Card Detected Bit 0 (0x0001)  
Network Cable Detected Bit 1 (0x0002)  
Network-level stack Loaded OK Bit 2 (0x0004)  
Network-level stack Asserted Bit 3 (0x0008) | 2            |
| 81120 to 81137 | General Stack Error           | Error code noting which stack element caused a general error. Software shall write a new error code only if this value is read as 0. Customer Safety Application must clear this value (to 0) for any new error code to appear. | File ID Code.                                                                                     | 2            |
| 81140 to 81157 |                                |                                                                                                                                             | Function ID Code.                                                                                | 2            |
| 81160 to 81197 |                                |                                                                                                                                             | Specific Error Code.                                                                             | 4            |
| 81200 to 81217 | Firmware Assertion MainCode   | Main code of the firmware assertion                                                                                                         | N/A                                                                                              | 2            |
| 81220 to 81237 | Firmware Assertion AddCode    | Additional code of the firmware assertion                                                                                                    | N/A                                                                                              | 2            |
5 Safety Signals

5.3 Standard I/O Signal Allocation

<table>
<thead>
<tr>
<th>Control Input</th>
<th>Name</th>
<th>Description</th>
<th>Valid States</th>
<th>Size (bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>81240 to 81257</td>
<td>Safety Message Tx Count</td>
<td>Counter value of the sent safety I/O message</td>
<td>N/A</td>
<td>2</td>
</tr>
<tr>
<td>81260 to 81277</td>
<td>Safety Message Rx Count</td>
<td>Counter value of the received safety I/O message</td>
<td>N/A</td>
<td>2</td>
</tr>
<tr>
<td>81280 to 81287</td>
<td>Activity Check</td>
<td>A flag for checking the execution status of the software</td>
<td>N/A</td>
<td>1</td>
</tr>
</tbody>
</table>

5.2.6 Communication Status (1 Byte)

<table>
<thead>
<tr>
<th>Control Input</th>
<th>Name</th>
<th>Description</th>
<th>Valid States</th>
<th>Size (bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>81317</td>
<td>EtherNet/IP Safety processing status</td>
<td>EtherNet/IP Safety communication establishment status between the safety scanner (safety PLC) and the safety adapter (safety circuit board). (0: establishment failure 1: establishment completion)</td>
<td>EtherNet/IP Safety communication status</td>
<td>EtherNet/IP Safety communication establishment</td>
</tr>
<tr>
<td>81315</td>
<td>Virtual communication execution status</td>
<td>Safety communication status after establishing communication between the safety scanner (safety PLC) and the safety adapter (safety circuit board). (0: not during communication 1: during communication)</td>
<td>EtherNet/IP Safety communication status</td>
<td>EtherNet/IP Safety communication establishment</td>
</tr>
<tr>
<td>81314</td>
<td>Specifying virtual communication mode</td>
<td>Specifying the virtual communication mode which is set in the maintenance mode (0: not used 1: used)</td>
<td>EtherNet/IP Safety communication status</td>
<td>EtherNet/IP Safety communication establishment</td>
</tr>
<tr>
<td>81313</td>
<td>Virtual communication execution status</td>
<td>Actual communication mode (0: during virtual communication 1: during safety communication)</td>
<td>EtherNet/IP Safety processing status</td>
<td>EtherNet/IP Safety processing status</td>
</tr>
</tbody>
</table>

The concurrent I/O is not the function for the safety product. For this reason, the signals allocated to the Internal Control Status Signal cannot be used as the safety-related signals.

5.3 Standard I/O Signal Allocation

For how to allocate the standard I/O signal, refer to "YRC1000 OPTIONS INSTRUCTIONS EtherNet/IP COMMUNICATION FUNCTION (FOR STANDARD LAN PORT) (HW1483560)".
6 LED Status Display

6.1 Status Display Pattern

As EtherNet/IP Safety does not have LEDs that indicate board status (module status and network status), these statuses are indicated using specific output signals.

The specific output signals can be displayed as quasi-LEDs on the programming pendant screen by using the interface panel function.

NOTE Interface panel function is a purchased option. Contact your YASKAWA representative when using this function.

<table>
<thead>
<tr>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module Status</td>
</tr>
<tr>
<td>Network Status</td>
</tr>
<tr>
<td>When the power supply is off (cannot display)</td>
</tr>
<tr>
<td>Off</td>
</tr>
<tr>
<td>Off</td>
</tr>
<tr>
<td>Self-diagnostic underway</td>
</tr>
<tr>
<td>Alternating red and green blinking (0.5 sec intervals)</td>
</tr>
<tr>
<td>Off</td>
</tr>
<tr>
<td>TUNID waiting status</td>
</tr>
<tr>
<td>Alternating red and green blinking (0.5 sec intervals)</td>
</tr>
<tr>
<td>Undefined</td>
</tr>
<tr>
<td>TUNID waiting status (After receiving Propose_TUNID service)</td>
</tr>
<tr>
<td>Alternating red and green blinking (0.5 sec intervals)</td>
</tr>
<tr>
<td>Alternating red and green blinking (0.25 sec intervals)</td>
</tr>
<tr>
<td>Idle status (Waiting for establishment of communication)</td>
</tr>
<tr>
<td>Green blinking (0.5 sec intervals)</td>
</tr>
<tr>
<td>Undefined</td>
</tr>
<tr>
<td>Communication occurring</td>
</tr>
<tr>
<td>Green lights up</td>
</tr>
<tr>
<td>Green lights up</td>
</tr>
<tr>
<td>For example, when the YRC1000 IP address was changed after setting the TUNID</td>
</tr>
<tr>
<td>Red blinking (0.5 sec intervals)</td>
</tr>
<tr>
<td>Undefined</td>
</tr>
<tr>
<td>Duplicate IP address with other device</td>
</tr>
<tr>
<td>Red blinking (0.5 sec intervals)</td>
</tr>
<tr>
<td>Red lights up</td>
</tr>
<tr>
<td>EtherNet/IP Safety major alarm occurring</td>
</tr>
<tr>
<td>Red lights up</td>
</tr>
<tr>
<td>Undefined</td>
</tr>
</tbody>
</table>

6.2 Specific Output Signal Allocation

<table>
<thead>
<tr>
<th>51227</th>
<th>51226</th>
<th>51225</th>
<th>51224</th>
<th>51223</th>
<th>51222</th>
<th>51221</th>
<th>51220</th>
</tr>
</thead>
<tbody>
<tr>
<td>EtherNet/IP Safety LED status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS red LED</td>
<td>NS green LED</td>
<td>MS red LED</td>
<td>MS green LED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NS: Network Status  MS: Module Status
6.3 Interface Panel Setting Method (Purchased Option)

In order to perform the following signal allocation, use the procedure below to make the settings.

<table>
<thead>
<tr>
<th>I/F Panel Display Contents</th>
<th>Specific Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS(RED)</td>
<td>#51223</td>
</tr>
<tr>
<td>NS(GREEN)</td>
<td>#51222</td>
</tr>
<tr>
<td>MS(RED)</td>
<td>#51221</td>
</tr>
<tr>
<td>MS(GREEN)</td>
<td>#51220</td>
</tr>
</tbody>
</table>

1. Turning ON the YRC1000 Power
2. Change the security mode to management mode.
3. Select {SYSTEM} under the main menu.
   – The sub menu appears.
4. Select {I/F PANEL SETUP}.
   – The I/F PANEL SETUP window appears.

![I/F Panel Display Contents Specific Output Signal](image)
5. Check that the following settings have been made.

- **GROUP NAME**: Panel 1
- **ARRANGE**: 1A

6. Perform settings using the following procedure. (Use the initial values for settings other than those described below.)

1. **PANEL COLOR**: RED
2. **PANEL NAME**: NS(RED)
3. **INPUT(DISP)**: SIGNAL #51223 A
4. **SETUP**: VALID
6  LED Status Display
6.3  Interface Panel Setting Method (Purchased Option)

7. Select "ARRANGE: 1A" to display the arrangement selection screen, and then select "1B".

8. Perform settings using the following procedure. (Use the initial values for settings other than those described below.)

   (1) PANEL COLOR : RED
   (2) PANEL NAME : MS(RED)
   (3) INPUT(DISP) : SIGNAL #51221 A
   (4) SETUP : VALID
6 LED Status Display
6.3 Interface Panel Setting Method (Purchased Option)

9. Select "ARRANGE: 1B" to display the arrangement selection screen, and then select "2A".

10. Perform settings using the following procedure. (Use the initial values for settings other than those described below.)

   (1) PANEL COLOR : GREEN
   (2) PANEL NAME : NS(GREEN)
   (3) INPUT(DISP) : SIGNAL #51222 A
   (4) SETUP : VALID
11. Select "ARRANGE: 2A" to display the arrangement selection screen, and then select "2B".

12. Perform settings using the following procedure. (Use the initial values for settings other than those described below.)

(1) PANEL COLOR : GREEN

(2) PANEL NAME : MS(GREEN)

(3) INPUT(DISP) : SIGNAL #51220 A

(4) SETUP : VALID
13. Press \{I/F Panel\} at the lower left of the programming pendant display to display the interface panel.
7 Requirements for CIP Safety

EtherNet/IP is a function to secure safety as an entire system including the YRC1000 and peripheral safety devices. Each device has a different setting method for safety. This chapter shows notes and reminders to configure the safety system with the YRC1000 as the main component.

Normally, setting for safety of the YRC1000 is performed by using the programming pendant and saved in the YRC1000. It is impossible to make settings for the YRC1000 by using Safety Network Configuration Tool (SNCT).

Please keep in mind following items when you use the YRC1000:

- The replacement of safety devices requires that the replacement device be configured properly and operation of the replacement device shall be user verified.

- If you choose to configure safety connections with an SCID=0, you are responsible for ensuring that originators (data senders) and targets (data receivers) have the correct configurations. SCID (Safety Configuration Identifier) enables to identify the safety configuration. SCID is not used in the YRC1000.

- The user should assign SNNs (Safety Network Numbers) for each safety network or safety sub-net that are unique system-wide. An SNN is a unique number allocated to each node on the safety network.

- Please clear any pre-existing configuration from any safety device before installing it onto the safety network. For the clearing procedures, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 5 “Add, Configure, Monitor, and Replace CIP Safety I/O.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.

- Please confirm a valid and unique IP address is assigned for each safety device before installing it onto the safety network. For the IP address confirming procedures, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 5 “Add, Configure, Monitor, and Replace CIP Safety I/O.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.

- Please test safety connection configurations after they are applied in an originator to confirm the target safety connection is operating as intended.

- Please note that LEDs are NOT reliable indicators and cannot be guaranteed to provide accurate information. They should ONLY be used for general diagnosis during commissioning or troubleshooting. Do not attempt to use LEDs as operational indicators.

- Please note that originators that have an “automatic” SNN setting feature can use that feature only when the safety system does not rely on the feature to secure safety.
The following points about the safety system are described for informational purposes:

- When a SIL3 device is configured directly from a workstation, please compare the transferred SCID and safety setting data with the SCID and safety setting data originally viewed in the workstation.

- Please note that user testing is the means by which all downloads are validated. Also, before using the system, confirm that all safety functions are operating as intended.

- Please note that the signature should only be considered “verified” (and configuration locked) after user testing. For information on safety signatures, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 6 “Develop Safety Applications.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.

- Please note that when the originator configures communication setting data and/or target setting data, these data must be downloaded to the target and be tested and verified. Only when the verification result is valid, SCIDs from the target can be confirmed. For the downloading procedures, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 7 “Go Online with the Controller.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.

- Please completely test a device’s operation before setting the Lock Attribute. For information on the Lock Attribute, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 6 “Develop Safety Applications.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.

- Please upload the setting data from each safety device and compare those with the data sent from the SNCT for verification before setting the Lock Attribute in each device. For the uploading procedure, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 7 “Go Online with the Controller.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.

- Please lock the safety device which can be configured via the SNCT interface after verification has been completed.

- Please verify that all originator-configured safety devices which can be configured by a Type 1 SafetyOpen have their ownership assignments as part of the final verification process.

- Please visually verify that all configuration data was downloaded correctly. For the downloading procedures, refer to the Rockwell Automation, Inc. manual “GuardLogix Controllers User Manual (1756-UM020I-EN-P – August 2012),” chapter 7 “Go Online with the Controller.” When using a safety PLC manufactured by a company other than Rockwell Automation, Inc., refer to that manufacturer’s manual.
YRC1000 OPTIONS
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FOR EtherNet/IP SAFETY FUNCTION
(FOR STANDARD LAN PORT)

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