YAMAHA
YAMAHA MOTOR CO., LTD.

YAMAHA Robot Controller

RCX Series

CC-Link UNIT

OWNER'S MANUAL

Introduction

Thank you for purchasing the CC-Link compatible module. This CC-Link compatible module is an option module that enables connection of the YAMAHA robot controller RCX Series as a CC-Link system remote device station.

The CC-Link compatible module with CC-Link label is compatible with CC-Link Ver. 1.10. CC-Link compatible modules without the CC-Link label are compatible with Ver. 1.00.

The robot controller explained in this manual refers to the RCX Series.

This manual describes the flow of operations from wiring the CC-Link compatible module to programming, and includes setting examples.

For details on other devices such as connecting the master station PLC and PLC programming, refer to the manual for the respective product.

Refer to the manual enclosed with the YAMAHA controller for details on operating the robot controller and on the robot program.

Safety Precautions (Always read before starting use)

Always read this manual, the robot controller instruction manual and programming manual before using this product. Take special care to safety, and correctly handle the product. The cautions given in this manual are related to this product. Refer to the robot controller instruction manual for details on the cautions to be taken with the robot controller system using this product.
* The safety precautions are ranked as "WARNING" and "CAUTION" in this manual.

WARNING
Failure to follow WARNING instructions could result in serious injury or death to the operator or person servicing the product.

CAUTION
Failure to follow CAUTION instructions may result in injury to the operator or person servicing product, or damage to the product or peripheral equipment.

NOTE
Explains the key point in the operation in a simple and clear manner.

Note that some items described as "CAUTION" may lead to serious results depending on the situation. In any case, important information that must be observed is explained. Store this manual where it can be easily referred to, and make sure that it is delivered to the end user.

CC-Link is a registered trademark of CC-Link partner association.
The CC-Link compatible module provided with a CC-Link label is compatible with CC-Link Ver 1.10.

[Precautions for design]

WARNING
- **Refer to the CC-Link system Master Module User's Manual and this manual for details on the state of the CC-Link system and robot controller when a communication error occurs with the CC-Link system, etc.**
  Configure an interlock circuit in the sequence program so that the system, including the robot controller will work safely using the communication status information.
- **The SAFETY connector of the robot controller has an emergency stop terminal to trigger emergency stop. Using this terminal, prepare a physical interlock circuit so that the system including the robot controller will work safety.**

CAUTION
- ***The control line and communication cable must not be bound with or placed near the main circuit or power line. Separate these by at least 100mm.***
  Failure to observe this could lead to malfunctions caused by noise.
- ***The dedicated input of the STD.DIO connector provided on the controller will be disabled except for an interlock signal (DI 11). When the external 24V monitor control of system parameters is disabled, the interlock signal (DI 11) will also be disabled.***

[Precautions for installation]

WARNING

- **Always crimp, press-fit or solder the connector wire connections with the maker-designated tool, and securely connect the connector to the module.**
- **Always shut off all phases of the power supply externally before starting installation or wiring work.**
  Failure to shut off all phases could lead to electric shocks or product damage.

CAUTION

- ***Use the robot controller within the environment specifications given in the manual.***
  Use in an environment outside the environment specification range could lead to electric shocks, fires, malfunctioning, product damage or deterioration.
- ***Install the CC-Link compatible module into the robot controller, and securely fix with screws.***
- ***Never directly touch the conductive sections or electronic parts other than the rotary switch on the CC-Link compatible module.***
- ***Never directly touch the conductive sections or electric parts inside the controller.***
- ***Accurately connect each connection cable connector to the mounting section.***
  Failure to observe this could lead to malfunctions caused by a connection fault.

[Precautions for wiring]

WARNING

- **Always shut off all phases of the power supply externally before starting installation or wiring work.**
  Failure to shut off all phases could lead to electric shocks or product damage.
- **Always install the terminal covers enclosed with the product before turning ON the power or operating the product after installation or wiring work.**
  Failure to install the terminal cover could lead to malfunctions.

CAUTION

- ***Tighten the terminal screws within the specified torque range.***
  A loose terminal screw could lead to short-circuiting or malfunctioning.
  If the terminal screw is too tight, short-circuiting or malfunctioning could occur due to screw damage.
- ***Make sure that foreign matter, such as cutting chips or wire scraps, do not enter the robot controller.***
- ***The communication cables connected to the CC-Link compatible module must be placed in a conduit or fixed with a clamp.***
  If the cable is not placed in a conduit or fixed with a clamp, the module or cable could be damaged by the cable shifting, movement or unintentional pulling leading to malfunctioning caused by an improper cable connection.
- ***Do not disconnect the communication cable connected to the CC-Link compatible module by pulling on the cable section.***
  Loosen the screws on the connector, and then disconnect the cable.
  Pulling on the cable fixed with screws could lead to module or cable damage, or malfunctioning caused by an improper cable connection.

[Precautions for starting and maintenance]

WARNING

- **Do not touch the terminals while the power is ON.**
  Failure to observe this could lead to malfunctioning.
- **Always shut off all phases of the power supply externally before cleaning or tightening the terminal screws.**
  Failure to shut off all phases could lead to electric shocks, product damage or malfunctioning.
  A loose screw could lead to dropping, short-circuiting or malfunctioning.
  If the screw is too tight, short-circuiting or malfunctioning could occur due to screw damage.
- **Never disassemble or modify any of the robot controller modules.**
  Failure to observe this could lead to trouble, malfunctioning, injuries or fires.
- **Always shut off all phases of the power supply externally before installing or removing the CC-Link compatible module.**
  Failure to shut off all phases could lead to robot controller trouble or malfunctioning.
- **When using the robot controller with the CC-Link compatible module mounted, always mount the enclosed ferrite core for noise measures on the power cable as close to the robot controller as possible.**
  Failure to mount this ferrite core could lead to malfunctioning caused by noise.

CAUTION

- ***If the master station PLC and robot controller are simultaneously turned on, the CC-Link system may not operate correctly. Always first turn on the master PLC before turning on the robot controller.***

[Precautions for disposal]

CAUTION

- ***Dispose of this product as industrial waste.***

Warranty

The YAMAHA robot and/or related product you have purchased are warranted against the defects or malfunctions as described below.

Warranty description:
If a failure or breakdown occurs due to defects in materials or workmanship in the genuine parts constituting this YAMAHA robot and/or related product within the warranty period, then YAMAHA will repair or replace those parts free of charge (hereafter called "warranty repair").

Warranty Period:
The warranty period ends when any of the following applies:

(1) After 18 months (one and a half year) have elapsed from the date of shipment
(2) After one year has elapsed from the date of installation
(3) After 2,400 hours of operation

Exceptions to the Warranty:
This warranty will not apply in the following cases:

(1) Fatigue arising due to the passage of time, natural wear and tear occurring during operation (natural fading of painted or plated surfaces, deterioration of parts subject to wear, etc.)
(2) Minor natural phenomena that do not affect the capabilities of the robot and/or related product (noise from computers, motors, etc.).
(3) Programs, point data and other internal data that were changed or created by the user.

Failures resulting from the following causes are not covered by warranty repair.

1) Damage due to earthquakes, storms, floods, thunderbolt, fire or any other natural or man-made disasters.
2) Troubles caused by procedures prohibited in this manual.
3) Modifications to the robot and/or related product not approved by YAMAHA or YAMAHA sales representatives.
4) Use of any other than genuine parts and specified grease and lubricants.
5) Incorrect or inadequate maintenance and inspection.
6) Repairs by other than authorized dealers.

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YAMAHA MOTOR CO., LTD. SOLE LIABILITY SHALL BE FOR THE DELIVERY OF THE EQUIPMENT AND YAMAHA MOTOR CO., LTD. SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES (WHETHER ARISING FROM CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY). YAMAHA MOTOR CO., LTD. MAKES NO WARRANTY WHATSOEVER WITH REGARD TO ACCESSORIES OR PARTS NOT SUPPLIED BY YAMAHA MOTOR CO., LTD.

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Chapter 1 Outline

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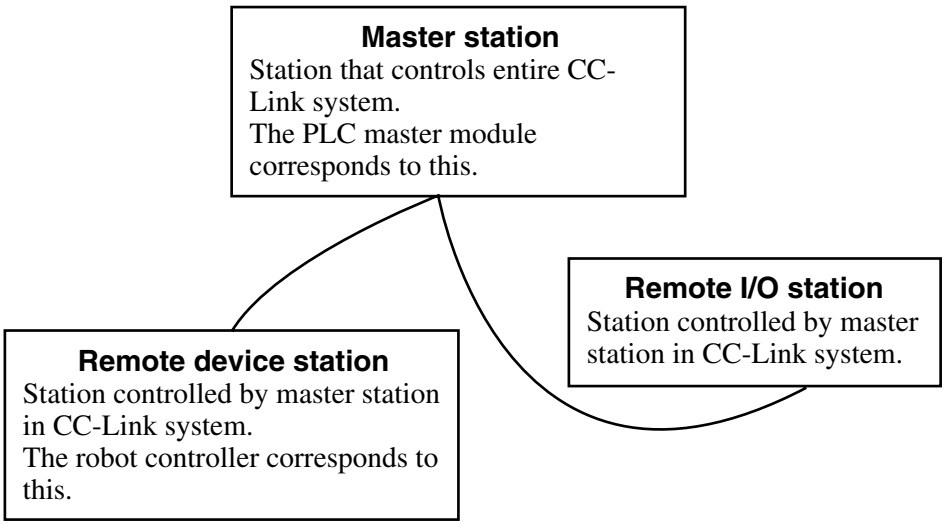
MEMO

1. Features

CC-Link is the abbreviation of Control & Communication Link.
The CC-Link system connects the robot controller and dispersed input/output modules with dedicated cables, and controls these modules from the master station PLC.
The CC-Link system allows wiring to be reduced.



NOTE
The dedicated input of the STD.DIO connector provided on the controller will be disabled except for an interlock signal (DI 11). When the external 24V monitor control of system parameters is disabled, the interlock signal (DI 11) will also be disabled.

CC-Link is a registered trademark of CC-Link partner association.
The CC-Link compatible module provided with a CC-Link label is compatible with CC-Link Ver 1.10.

[Wiring saving]

One dedicated cable (4-wire) is used to connect the robot controller and PLC. This allows the entire system wiring to be reduced.

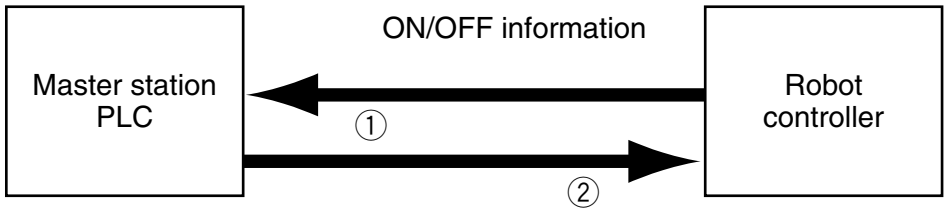
[Emulated serialization on parallel DIO]

By making the robot controller's internal settings without using a robot program, the various I/O devices, such as the sensors and relays mounted on the robot controller's parallel I/O can be controlled from the PLC as if they were CC-Link system I/O devices.

CAUTION
An emergency stop terminal for hardwire is provided in the SAFETY connector on the robot controller. When the CC-Link system is used while STD. DIO is not used (external DC 24V power supply is not used), invalidate the external DC 24V monitor control setting in SYSTEM > PARAM mode. If it is left valid, the STD. DIO interlock signal is made valid causing an error in the robot operation commands.

2. Mechanism

The mechanism of communication is explained in this section to provide an understanding of how the robot controller and PLC operate via the CC-Link system.



① The robot controller's ON/OFF information is sent to the master station PLC via the network (CC-Link system cable).

② The master station PLC's ON/OFF information is set to the robot controller via the network (CC-Link system cable).

* The robot controller monitors the ON/OFF information at a 10ms cycle.

* The ON/OFF information consists of 16 points each of dedicated I/O points, 96 points each of general-purpose I/O points as bit information, and two words each of dedicated I/O words, 14 words each of general-purpose I/O words as word information.

If the following is executed with the robot program in the robot controller, the bit information will be sent to the master station PLC via the CC-Link system by ①.

SO (20) = 1

Conversely, if the following is executed with the robot program, the bit information received from the master station PLC via the CC-Link system will be monitored by ②, and will wait for the ON information.

WAIT SI (20) = 1

If the following is executed with the robot program in the robot controller, the word information will be sent to the master station PLC via the CC-Link system by ①.

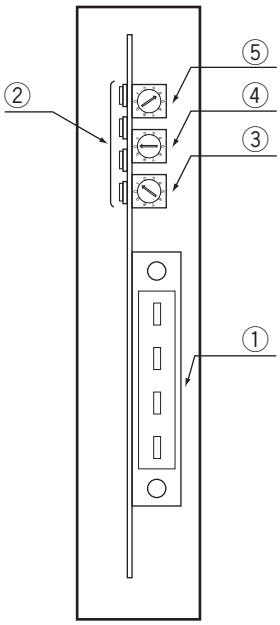
SOW (2) = 256

Conversely, if the following is executed with the robot program, the word information received from the master station PLC via the CC-Link system will be substituted in integer variable A% by ②.

A% = SIW (3)

3. Names of each part on the CC-Link compatible module

The part names of the CC-Link compatible module installed in the robot controller are described in this section. The CC-Link compatible module is installed into an optional slot in the robot controller.



Front of the unit

① CC-Link system cable terminals

These terminals are used to connect the CC-Link system cable. Each of the four terminals has a meaning, so do not make miswiring. These terminals are “DA”, “DB”, “DG” and “SLD” from the top.

② Transmission monitor LED

The status in the CC-Link system is indicated with ON, OFF and flickering status of four LEDs. These terminals are “RUN”, “ERRL”, “SD” and “RD” from the top.

③ Station No. setting switch (LSB: 1st digit)

This is the rotary switch for setting the robot controller station No. in the CC-Link system. The 1st digit of the station No. is set with this switch.

④ Station No. setting switch (MSB: 2nd digit)

This is the rotary switch for setting the robot controller station No. in the CC-Link system. The 2nd digit of the station No. is set with this switch.

⑤ Communication speed switch (BPS)

This is the rotary switch for setting the CC-Link system’s communication speed.

4. Assignment of CC-Link compatible I/O

NOTE
SIW(n) and SOW(n) are handled as numerical data of word with no sign. SID(n) and SOD(n) are handled as numerical data of double words with a sign.

NOTE
The dedicated input of the STD.DIO connector provided on the controller will be disabled except for an interlock signal (DI 11). When the external 24V monitor control of system parameters is disabled, the interlock signal (DI 11) will also be disabled.

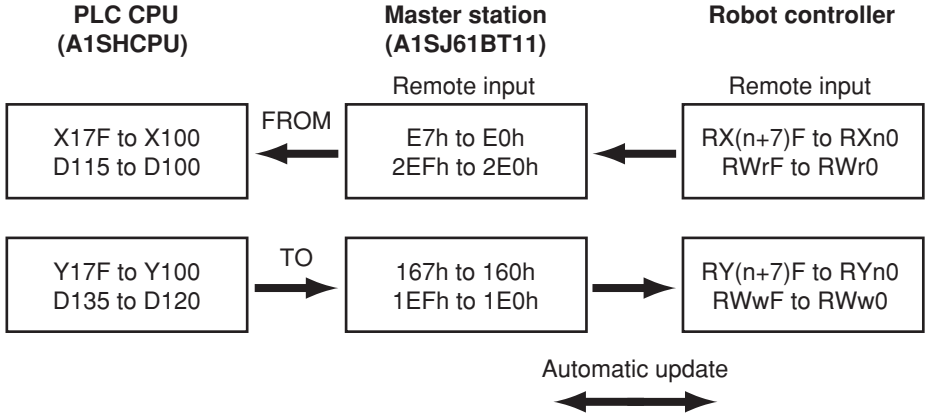
The I/O expressions used in the robot controller's program language and the I/O expressions for the remote device stations differ. The correspondence is shown below.

Output from robot controller			Input to robot controller		
Program language		Remote device station	Program language		Remote device station
	SOW(0)*3	RWr0		SIW(0)*3	RWw0
	SOW(1)*3	RWr1		SIW(1)*3	RWw1
SOD(2)	SOW(2)	RWr2	SID(2)	SIW(2)	RWw2
	SOW(3)	RWr3		SIW(3)	RWw3
SOD(4)	SOW(4)	RWr4	SID(4)	SIW(4)	RWw4
	SOW(5)	RWr5		SIW(5)	RWw5
SOD(6)	SOW(6)	RWr6	SID(6)	SIW(6)	RWw6
	SOW(7)	RWr7		SIW(7)	RWw7
SOD(8)	SOW(8)	RWr8	SID(8)	SIW(8)	RWw8
	SOW(9)	RWr9		SIW(9)	RWw9
SOD(10)	SOW(10)	RWrA	SID(10)	SIW(10)	RWwA
	SOW(11)	RWrB		SIW(11)	RWwB
SOD(12)	SOW(12)	RWrC	SID(12)	SIW(12)	RWwC
	SOW(13)	RWrD		SIW(13)	RWwD
SOD(14)	SOW(14)	RWrE	SID(14)	SIW(14)	RWwE
	SOW(15)	RWrF		SIW(15)	RWwF
SO0(7~0)*1		RXn7~RXn0	SI0(7~0)*1		RYn7~RYn0
SO1(7~0)*1		RXnF~RXn8	SI1(7~0)*1		RYnF~RYn8
SO2(7~0)		RX(n+1)7~RX(n+1)0	SI2(7~0)		RY(n+1)7~RY(n+1)0
SO3(7~0)		RX(n+1)F~RX(n+1)8	SI3(7~0)		RY(n+1)F~RY(n+1)8
SO4(7~0)		RX(n+2)7~RX(n+2)0	SI4(7~0)		RY(n+2)7~RY(n+2)0
SO5(7~0)		RX(n+2)F~RX(n+2)8	SI5(7~0)		RY(n+2)F~RY(n+2)8
SO6(7~0)		RX(n+3)7~RX(n+3)0	SI6(7~0)		RY(n+3)7~RY(n+3)0
SO7(7~0)		RX(n+3)F~RX(n+3)8	SI7(7~0)		RY(n+3)F~RY(n+3)8
SO10(7~0)		RX(n+4)7~RX(n+4)0	SI10(7~0)		RY(n+4)7~RY(n+4)0
SO11(7~0)		RX(n+4)F~RX(n+4)8	SI11(7~0)		RY(n+4)F~RY(n+4)8
SO12(7~0)		RX(n+5)7~RX(n+5)0	SI12(7~0)		RY(n+5)7~RY(n+5)0
SO13(7~0)		RX(n+5)F~RX(n+5)8	SI13(7~0)		RY(n+5)F~RY(n+5)8
SO14(7~0)		RX(n+6)7~RX(n+6)0	SI14(7~0)		RY(n+6)7~RY(n+6)0
SO15(7~0)		RX(n+6)F~RX(n+6)8	SI15(7~0)		RY(n+6)F~RY(n+6)8
----------		RX(n+7)F~RX(n+7)0*2	----------		RY(n+7)F~RY(n+7)0*2

n: Address assigned to master module with station No. setting
n= (station No. - 1) × 2

Caution)
****1: Has a meaning in the robot controller's internal process as a dedicated input/output. This cannot be used as a general-purpose input/output in the robot program.***
****2: This area is reserved for the CC-Link system.***
****3: Has a meaning in the robot controller's internal process as a dedicated command region. This cannot be used as a general-purpose input/output in the robot program.***

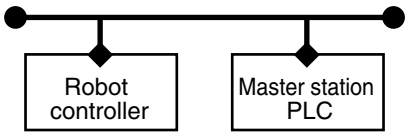
An example of the flow of the I/O information in the robot controller (remote device station) is shown below. The buffer memory in the master station used to store the information, etc., differs according to the PLC type and station No., etc. Refer to the PLC Manual for details.



5. Shift of CC-Link system connection status and robot controller status

Always start the CC-Link system specification robot controller in the servo OFF state after the power is turned ON.

① Normal state of CC-Link system connection when robot controller power is turned ON

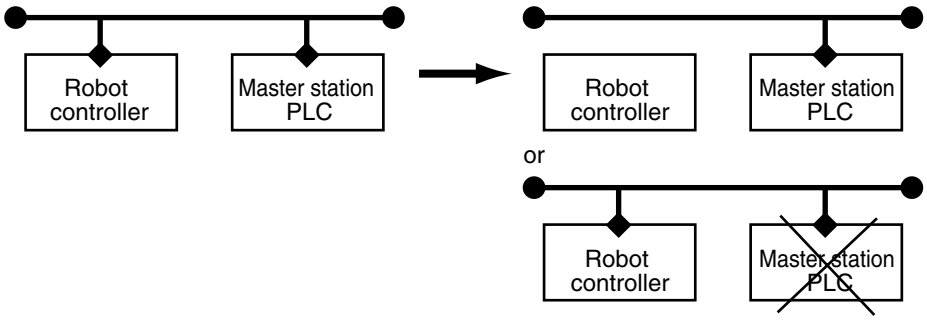


- Emergency stop/interlock signal in CC-Link system are valid
- When SAFE mode is enabled, service mode input signal is made valid with SI (02) in the CC-Link system.
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid when the external 24V monitor control setting in SYSTEM > PARAM mode is left valid.
- When the external 24V monitor control setting in SYSTEM > PARAM mode is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector.

* The signals in the CC-Link system are sent and received.

* Always initialize with the master station PLC when connecting to the CC-Link system.

② Shift from CC-Link system normal connection state to CC-Link system erroneous connection state



- Emergency stop input turns off with SI (00) in the robot controller.
- Service mode input turns off with SI (02) in the robot controller.
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid when the external 24V monitor control setting in SYSTEM > PARAM mode is left valid.
- When the external 24V monitor control setting in SYSTEM > PARAM mode is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector.

* The signals in the CC-Link system are not sent or received.

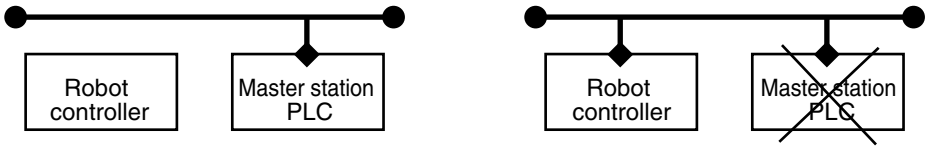
* The “CC-Link Communication Error” is added to the error history in the robot controller.

* If the connection to the CC-Link system shifts from the normal state to the erroneous state, the CC-Link system connection must be returned to the normal state.

* The CC-Link system will return when the CC-Link system connection is recovered to the normal state.

③ CC-Link system erroneous connection state due to following factors when robot controller power is turned ON

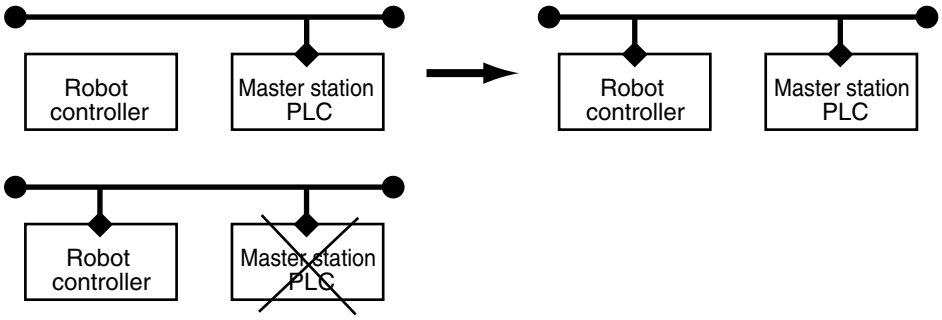
- Connection to CC-Link system not possible
- Error in master station PLC



- Emergency stop/interlock signals in CC-Link system are invalid
- When SAFE mode is enabled, service mode input signal is made valid with SI (02) in the CC-Link system.
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid when the external 24V monitor control setting in SYSTEM > PARAM mode is left valid.
- When the external 24V monitor control setting in SYSTEM > PARAM mode is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector.

* The signals on the CC-Link system cannot be exchanged.
* As opposed to the state given in ②, in this state, the emergency stop state by SI (00) is not attained in the controller, so the robot can be operated from the programming unit.
  (The robot controller can be started independently when setting up the system, etc.)
* Service mode input signal cannot be invalidated with SI (02) when SAFE mode is enabled, so change the service mode parameter setting in SYSTEM > PARAM mode. In this case, take full precautions to prevent improper settings that might lead to a hazardous situation.
* When the connection to the CC-Link system is correctly recovered, the system will automatically return to the CC-Link system.
* The “CC-Link Communication Error” has been added to the error history in the robot controller.
  (A standby state for up to 2.5 seconds will occur to check the communication.)

④ Transmission from CC-Link system erroneous connection state to CC-Link correct connection state when robot controller power is turned ON



- CC-Link system emergency stop/interlock signals change to valid state
- Emergency stop terminal in SAFETY connector is valid.
- Interlock signal in STD. DIO connector is valid when the external 24V monitor control setting in SYSTEM > PARAM mode is left valid.
- When the external 24V monitor control setting in SYSTEM > PARAM mode is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector.

* The signals in the CC-Link system can be sent and received.

* When the connection to the CC-Link system shifts to the normal state, the initialization process must be carried out with the master station PLC when connecting to the CC-Link system.

* When service mode parameter setting in SYSTEM > PARAM mode has been changed while SAFE mode is enabled, make the service mode parameter setting again. In this case, take full precautions to prevent improper settings that might lead to a hazardous situation.

* The CC-Link system will return when the CC-Link system connection is recovered to the normal state.

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Chapter 2 Connection

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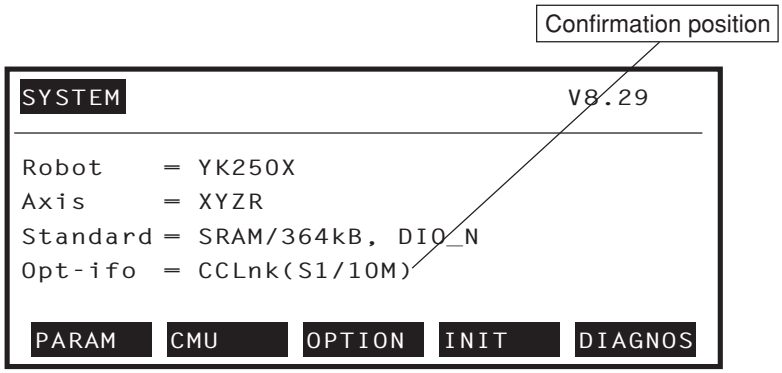
1. Confirming the CC-Link compatible module settings

With the CC-Link system specification robot controller, the CC-Link compatible module station No. and communication speed settings can be confirmed with the programming unit (hereinafter, MPB).

- When connecting CC-Link compatible module to existing robot controller
  → Follow the procedures given in section 2., and change the settings for the CC-Link system specifications.
- For CC-Link system specification robot controller
  (When robot controller is purchased with CC-Link compatible module mounted)
  → Follow the procedures given in section 3., and set the station No. and communication speed.



[Operation]

1. Press the MODE key.

2. Press the F 4 (SYSTEM) key.

3. The display above will appear. The station No. and communication speed set for the CC-Link system will appear in the parentheses following "CCLnk" on the screen. The meaning of the above example is shown below.

   S1 :Station No. 1

   (Setting range: 1 to 61)

   * Four stations are occupied. Thus, this means that (station No. +3) is occupied.

   10M :10Mbps

   (Setting communication speed [unit: bps]: 156K, 625K, 2.5M, 5M, 10M)

   * The communication speed must match the master station setting.

⚠ ***CAUTION***
If the robot controller is not connected to the CC-Link system or if there is an error in the CC-Link system, the error "CC-Link Communication Error" will appear on the MPB when the robot controller power is turned ON. The above settings can be confirmed even in this state.

2. Setting to the CC-Link system specification controller

When connecting the CC-Link compatible module to an existing robot controller, the CC-Link compatible module must be installed in the robot controller. Check the CC-Link system specifications with the procedure given in section 1.

2.1 Saving the robot controller data

Before installing the CC-Link compatible module into the robot controller, be sure to save the data stored in the robot controller into an external memory by using VIP software, etc.

2.2 Installing the CC-Link compatible module

Install the CC-Link compatible module into the robot controller while referring to the procedure for installing an option board. Also set the station No. and communication baud rate for the CC-Link compatible module with the procedures given in "3. Setting the CC-Link compatible module" in chapter 2.

CAUTION
If you need an instruction manual for installing the option board, please contact our sales office.

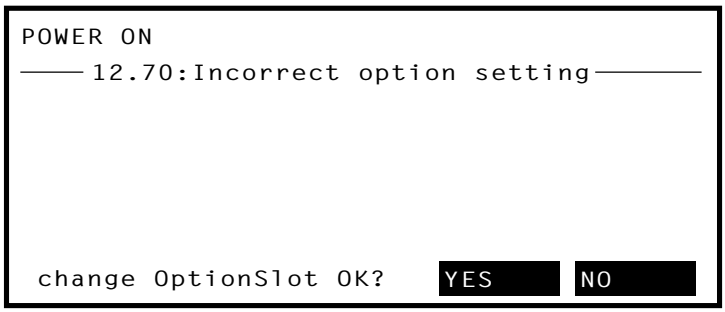
2.3 Response when starting the robot controller

The robot controller will always start up with an "option board setting error" after the CC-Link compatible module has been installed. Make the following settings as explained below.

[Procedure]

1. Make connections to all input connectors on the front panel of the robot controller.

2. The following type of question will appear on the MPB screen, so answer as "YES".



3. If the controller does not operate properly because of a memory error, etc., load the data saved in step 2.1 into the controller. Refer to the controller instruction manual for details on loading the data.

   If the robot controller is not correctly connected with the CC-Link system, the message "CC-Link Communication Error" will appear on the MPB.

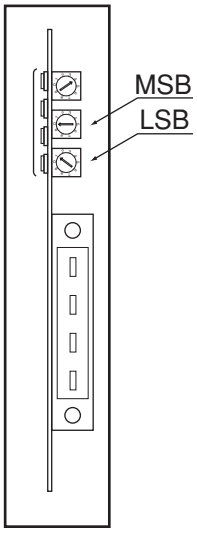
NOTE
For instructions on how to load data using the support software VIP, refer to the VIP user's manual.

3. Setting the CC-Link compatible module

To connect the CC-Link system specification controller to the CC-Link system, the station No. and communication speed must be set with the rotary switch on the CC-Link compatible module. Confirm the current station No. and communication speed with the procedures given in section 1.

3.1 Setting the station No.

Using the rotary switches MSB and LSB in front of the CC-Link compatible module, set the station No. of the robot controller in the CC-Link system.



Front of the unit

NOTE

Up to 64 stations can be set in the CC-Link system, but the CC-Link system itself occupies 4 stations (specified No. +3), so set the station No. between 1 and 61.

CAUTION

- ***Never directly touch the conductive sections or electronic parts other than the rotary switch on the CC-Link compatible module.***
- ***Do not apply impact on the CC-Link compatible module.***
- ***Do not place water or conductive matters, etc., which could cause damage near the CC-Link compatible module.***
- ***Accurately set the station No.***
- ***Make sure not to set the rotary switch BPS by mistake.***

[Procedures]

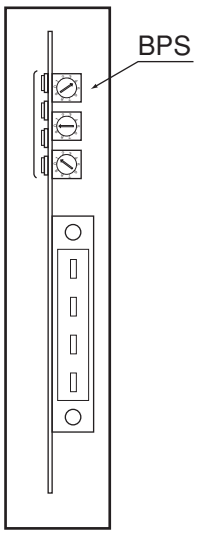
1. Check the station No. of the robot controller in the CC-Link system.
   The station No. must be set between 1 and 61.
2. Using a flat-blade precision screwdriver, set the 10th digit on rotary switch MSB.
3. In the same manner, set the 1st digit on rotary switch LSB.

WARNING

When setting the station No., completely shut off the power supplied to the robot controller.

3.2 Setting the communication speed

Using the rotary switch BPS in front of the CC-Link compatible module, set the communication speed for the robot controller in the CC-Link system.



Front of the unit

NOTE
The communication speed must match the CC-Link system's master station setting.

CAUTION
- ***Never directly touch the conductive sections or electronic parts other than the rotary switch on the CC-Link compatible module.***
- ***Do not apply impact on the CC-Link compatible module.***
- ***Do not place water or conductive matters, etc., which could cause damage near the CC-Link compatible module.***
- ***Accurately set the communication speed.***
- ***Make sure not to set the rotary switches MSB and LSB by mistake.***

WARNING
When setting the station No., completely shut off the power supplied to the robot controller.

[Procedures]

1. Confirm the communication speed for the robot controller in the CC-Link system.
   The communication speed must be set between 156K and 10Mbps. The correspondence of the communication speed and switch is shown below.

Switch No.	0	1	2	3	4	Other than left setting
Communication speed [bps]	156K	625K	2.5M	5M	10M	Error

2. Using a flat-blade precision screwdriver, set the switch No. corresponding to the communication speed with rotary switch BPS.

4. Noise measures

Two ferrite cores must be mounted on the input power cable when connecting to the CC-Link system.

4.1 Mounting the ferrite core

Mount two ferrite cores onto the input power cable connected to the input power connector on the front panel of the robot controller.

[Procedures]

1. Mount the two ferrite cores (supplied) onto the input power cable. The ferrite core should be placed as close to the robot controller body as possible.

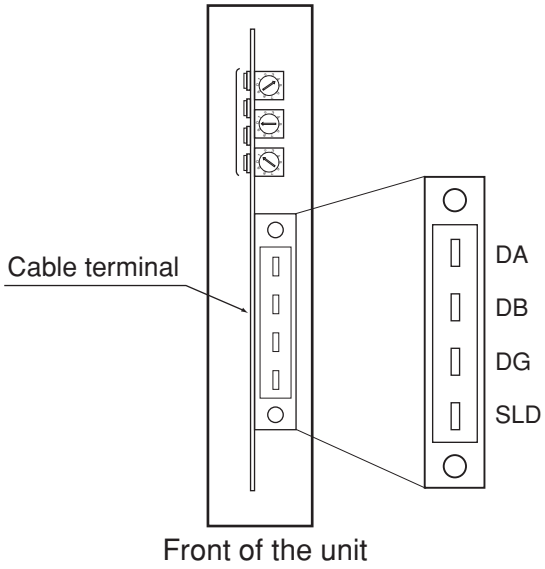
⚠ ***WARNING***
Completely shut off the power supply to the input power cable before starting this work.

2. Fix the mounted ferrite core with an Insulock tie, etc.

⚠ ***CAUTION***
Securely fix the ferrite core. If the ferrite core is not mounted, trouble could occur with the CC-Link system operations.

5. Connecting to the CC-Link system

The CC-Link system cable must be connected to the CC-Link compatible module in order to connect to the CC-Link system.



⚠ *WARNING*
When setting the station No., completely shut off the power supplied to the robot controller.

5.1 Connecting to the cable terminal to the controller

Connect the CC-Link system cable to the CC-Link system cable terminal on the CC-Link compatible module.

⚠ *CAUTION*
- ***Always remove the terminal block section when installing the CC-Link system cable.***
- ***Securely fix the CC-Link system cable.***
- ***Carefully carry out the work to valid applying excessive force on the CC-Link cable.***
- ***Treat each end of the C-Link system cable wire with a round terminal or Y terminal so that it will not dislocate.***
- ***Carefully carry out the work so that the CC-Link system cable is not incorrectly wired.***
- ***Refer to the master station PLC instruction manual for details on the CC-Link system cable connection.***

[Procedure]

1. Using a Phillips head screwdriver, completely loosen the two screws on both sides of the CC-Link system cable terminal, and remove the terminal block section from the CC-Link compatible module.

2. Using a Phillips head screwdriver, securely fix the CC-Link system cable to the terminal block removed in step 1.

   The name of each terminal on the cable terminal block is shown above.

   * When connecting a terminator, connect it across DA-DB.

   * A slit to prevent incorrect inverted insertion is provided on the cable terminal block.

3. Connect the cable terminal, into which the CC-Link system cable has been installed, to the CC-Link compatible module terminal block section on the robot controller, and completely fix with the two screws on both sides using a Phillips head screwdriver.

5.2 Testing the line from the master station PLC

⚠ *CAUTION*
If the line test results indicate a correct connection, place the CC-Link system cable into a conduit, or fix it with a clamp.

The master station PLC in the CC-Link system has a function to test the line to the remote station. Using this function, confirm that the robot controller is accurately recognized as a remote station in the CC-Link system.
Refer to the master station PLC instruction manual for details.

6. Parameter setting for CC-Link serial I/O board

NOTE

- *Set the Board status parameter to "INVALID" when not using serial I/O boards.*
- *When the Board status parameter is set to "INVALID", the dedicated input/output of the STD.DIO connector becomes enabled. When the Board status parameter is set to "VALID", the dedicated input (except DI1) of the STD.DIO connector becomes disabled.*
- *For remote commands and I/O commands, refer to the command reference manual.*
- *For a description of codes issued from the message output function for SOW(1), refer to "1. Error message" in chapter 9.*
- *When the Remote command & I/O command parameter is set to "VALID", the Output MSG to SOW(1) parameter cannot be set to "VALID". Likewise, when the Output MSG to SOW(1) parameter is set to "VALID", the Remote command & I/O command parameter cannot be set to "VALID".*

The following functions are enabled or disabled by setting the parameters for the CC-Link serial I/O board.

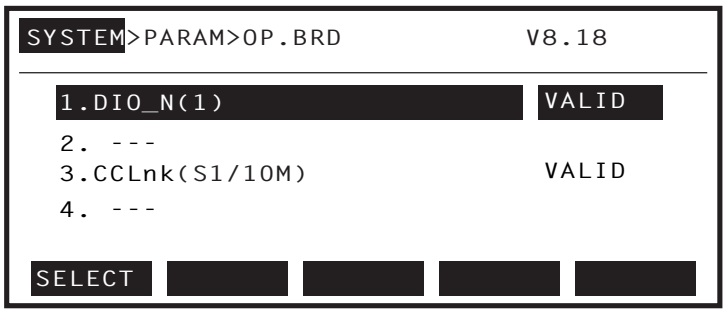
	Parameter	Meaning
1.	Board condition	Enables or disables the serial I/O board. When set to "VALID" the serial I/O can be used. When set to "INVALID" the serial I/O cannot be used.
2.	Remote cmd / IO cmd (SI05)	Enables or disables the functions of remote commands and I/O commands using word information and bit information. When set to "VALID" the remote commands and I/O commands can be used. When set to "INVALID" the remote commands and I/O commands cannot be used. This parameter cannot be set to "VALID" simultaneously with parameter 3.
3.	Output MSG to SOW(1)	Enables or disables the function to send an message number, which is displayed on the MPB, to word information SOW(1). When set to "VALID" the message number to be displayed on the MPB will be output. When set to "INVALID" the message number to be displayed on the MPB will not be output. This parameter cannot be set to "VALID" simultaneously with parameter 2.

6.1 Parameter setting for CC-Link serial I/O board

1) Press the [F 1] (PARAM) key in "SYSTEM" mode to enter "SYSTEM>PARAM" mode.

2) Press the [F 5] (OP. BRD) key in "SYSTEM>PARAM" mode to enter the option board parameter setting mode.
The option boards installed in the controller are displayed in order on the MPB screen.

Fig. 2-6-1

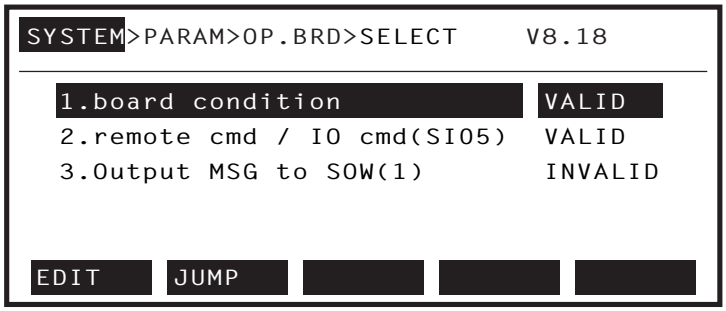


Option boards installed into the option slots are displayed on the MPB screen.

Type	Display	Meaning
Option DIO	DIO_N(n)	An option DIO board of NPN specifications is installed. The number in parentheses is an ID number.
	DIO_P(n)	An option DIO board of PNP specifications is installed. The number in parentheses is an ID number.
Serial I/O	CCLnk(n/m)	A CC-Link unit is installed. Letters in parentheses indicate a station number "n" and a communication speed "m".
	D_Net(n/m)	A DeviceNet unit is installed. Letters in parentheses indicate a MAC ID number "n" and communication speed "m".
	Profi(n/m)	A ProfiBUS unit is installed. Letters in parentheses indicate a Station address "n" and communication speed "m".
Network	E_Net	An Ethernet unit is installed.

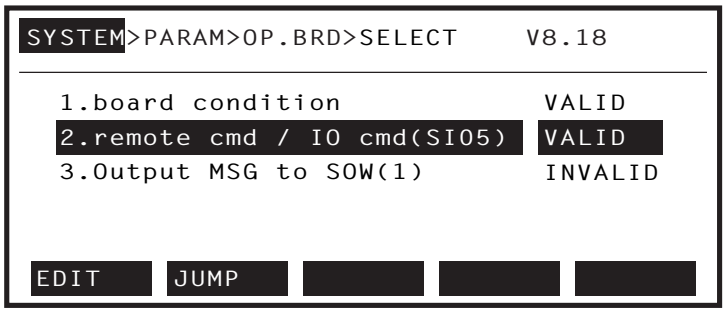
3) In "SYSTEM>PARAM>OP. BRD" mode, select the "CCLnk" with the cursor (↑/↓) keys and press the [F 1] (SELECT) key.

Fig. 2-6-2



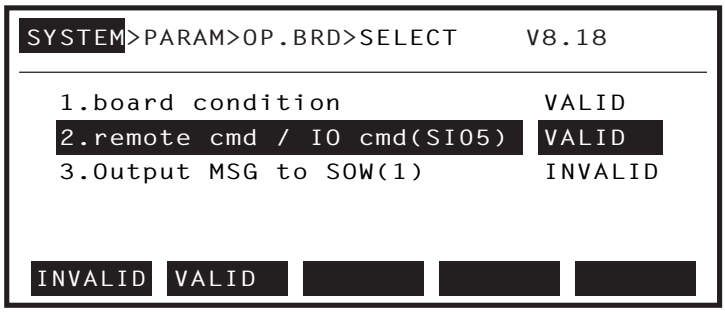
4) Select the parameter with the cursor (↑/↓) keys.

Fig. 2-6-3



5) Press the F 1 (EDIT) key.

Fig. 2-6-4



6) Press the F 1 (INVALID) or F 2 (VALID) key.

7) Press the ESC key to quit the edit mode. To continue setting another parameter, use the cursor (↑/↓) keys to select the parameter.

MEMO

Chapter 3 Communication

Contents

MEMO

1. State when robot controller power is turned ON

The CC-Link system specification robot controller always starts operation in servo OFF state when the power turned ON.

① When connection to CC-Link system is correctly established.

The following conditions must be satisfied to correctly connect to the CC-Link system:

- The CC-Link system cable must be physically connected
- The station No. and communication speed must be correctly set
- The master station PLC must be operating correctly

When the robot controller is correctly connected to the CC-Link system, the normal state will be indicated with the LEDs on the CC-Link compatible module.

At this time, the emergency stop signal and interlock signal in the CC-Link system will be valid, so these signals must be turned ON with the initial data process.

The emergency stop terminal in SAFETY connector is always kept valid. The interlock signal in STD. DIO connector is also valid unless the external 24V monitor control setting in SYSTEM > PARAM mode is set invalid.

When SAFE mode is enabled, service mode input signal is made valid with SI (02) in the CC-Link system. When the external 24V monitor control setting in SYSYEM >PARAM mode is left valid while SAFE mode is enabled, service mode input signal is also made valid with DI (02) in SAFETY connector.

② When connection to CC-Link system is incorrectly established

The following causes can be considered a correct connection with the CC-Link system cannot be established:

- The CC-Link system cable is not physically connected
- The station No. or communication speed is set incorrectly
- The master station PLC is not operating correctly

When the robot controller is incorrectly connected to the CC-Link system, the error state will be indicated with the LEDs on the CC-Link compatible module. Note that if the master station PLC is not operating correctly, nothing will appear on the LEDs.

The emergency stop signal and interlock signal in the CC-Link system are invalid in this case, so the robot controller can be operated independently. However, if the correct state has been established even once after the robot controller power was turned ON, the robot controller's emergency stop state cannot be canceled without correctly connecting to the CC-Link system.

The emergency stop terminal in SAFETY connector is always kept valid. The interlock signal in STD. DIO connector is also valid unless the external 24V monitor control setting in SYSTEM > PARAM mode is set invalid.

When the external 24V monitor control in SYSYEM >PARAM mode is left valid while SAFE mode is enabled, service mode input signal is made valid with DI (02) in SAFETY connector.

Service mode input signal in the CC-Link system cannot be invalidated when SAFE mode is enabled, so change the service mode setting in SYSTEM > PARAM mode. In this case, take full precautions to prevent improper settings that might lead to a hazardous situation.

* For meanings of LED display, see Chapter 4 in this manual.

2. Initial process for connecting to CC-Link system

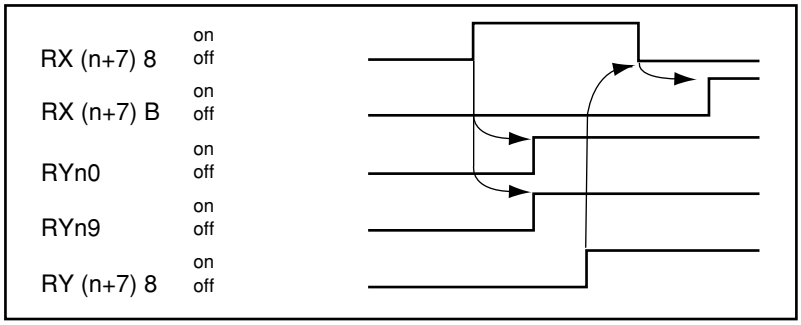
The initial data process must be carried out to correctly connect to the CC-Link system.

2.1 Initial data process

The initial data process is carried out to confirm that the robot controller is correctly connected to the CC-Link system. Prepare the process on the master station PLC side so that the following type of process is always carried out before data is exchanged.

Initial data process (master station PLC side)

① Confirm that RX(n+7)8 (initial data process request flag) is ON.
② Turn RYn0 (emergency stop input) and RYn9 (interlock input) ON.
③ Turn RY(n+7)8 (initial data process completion flag) ON.
④ Confirm that RX(n+7)8 (initial data process request flag) is OFF.
⑤ Confirm that RX(n+7)B (remote station Ready) is ON.



The robot controller internal process will automatically start when the power is turned ON and the system is returned from an error state.

⚠ ***CAUTION***

- ***RX(n+7) B (remote station Ready) must always be used on the master station PLC side as the flag to indicate whether the robot controller is operating correctly.***
- ***When starting up the system in the emergency stop state using RYn0 (emergency stop input), carry out the initial data process first, and then turn RYn0 (emergency stop input) OFF. The robot controller will start up in the servo OFF state when the power is turned ON.***

3. Communication with master station PLC

The method for communicating with the master station PLC by using the robot program when the CC-Link system is correctly connected is explained in this section.

3.1 Receiving data

Data is received by reading the master station PLC output device data with the robot controller's input port.
The correspondence of the master station PLC's output device numbers and robot controller's input port numbers is shown below.

Master station output device No.	Robot controller input port No.	Master station output device No.	Robot controller input port No.	
RYn7~RYn0	SI(07)~SI(00)	RWwn		SIW(0)
RYnF~RYn8	SI(17)~SI(10)	RWw(n+1)		SIW(1)
RY(n+1)7~RY(n+1)0	SI(27)~SI(20)	RWw(n+2)	SID(2)	SIW(2)
RY(n+1)F~RY(n+1)8	SI(37)~SI(30)	RWw(n+3)		SIW(3)
RY(n+2)7~RY(n+2)0	SI(47)~SI(40)	RWw(n+4)	SID(4)	SIW(4)
RY(n+2)F~RY(n+2)8	SI(57)~SI(50)	RWw(n+5)		SIW(5)
RY(n+3)7~RY(n+3)0	SI(67)~SI(60)	RWw(n+6)	SID(6)	SIW(6)
RY(n+3)F~RY(n+3)8	SI(77)~SI(70)	RWw(n+7)		SIW(7)
RY(n+4)7~RY(n+4)0	SI(107)~SI(100)	RWw(n+8)	SID(8)	SIW(8)
RY(n+4)F~RY(n+4)8	SI(117)~SI(110)	RWw(n+9)		SIW(9)
RY(n+5)7~RY(n+5)0	SI(127)~SI(120)	RWw(n+10)	SID(10)	SIW(10)
RY(n+5)F~RY(n+5)8	SI(137)~SI(130)	RWw(n+11)		SIW(11)
RY(n+6)7~RY(n+6)0	SI(147)~SI(140)	RWw(n+12)	SID(12)	SIW(12)
RY(n+6)F~RY(n+6)8	SI(157)~SI(150)	RWw(n+13)		SIW(13)
		RWw(n+14)	SID(14)	SIW(14)
		RWw(n+15)		SIW(15)

n: Address assigned to master module with station No. setting

CAUTION
SIW(0) and SIW(1) are viewed as dedicated input ports. The robot controller handles these ports as input ports of meaningful data, so do not use them as general-purpose input ports.
Set these ports to "0" in most cases.

When reading the bit information from the master station PLC's output device No. with the robot controller, write the following commands in the robot program in the same manner as the DI input port:

WAIT command
Assignment statement

Example :To wait for RY(n+1)0 to turn ON
WAIT SI(20) = 1 ..... * The robot program will wait for SI(20) to turn ON.

NOTE
The SI statement in the robot language can be defined from SI0 ( ) to SI27 ( ), but the CC-Link compatible module accepts from SI0 ( ) to SI15 ( ).

Example :To read the RY(n+1) 0 to RY(n+1)7 data in variable A
A = SI2() ..... * The SI2() data will be converted into a decimal and substituted into variable A. If SI2() is 7Fh, variable A will be 127.

When reading the word information from the master station PLC's output device No. with the robot controller, write the following command in the robot program.

Assignment statement

NOTE
Word data read out with SIW(n) is a little endian format with no sign. Double word data read out with SID(n) is a little endian format with a sign.

Example :To read the RWw (n+2) word data in variable B
B = SIW (2) ..... * The SIW (2) data will be substituted into variable B as a decimal. If SIW (2) is 01FFh, variable B will be 511.

Example :To read the RWw (n+2) and RWw (n+3) double word data into variable C
C = SID (2) ..... * The SIW (2) and SIW (3) data will be substituted into variable C as a decimal. If SIW (2) is 0010h and SIW (3) is 0001h, variable C will be 65552.

3.2 Transmitting data

Data is transmitted by writing the robot controller output port data into the master station PLC's input device.
The correspondence of the master station PLC's input device numbers and robot controller's output port numbers is shown below.

Master station input device No.	Robot controller output port No.	Master station input device No.	Robot controller output port No.	
RXn7~RXn0	SO(07)~SO(00)	RWrn		SOW(0)
RXnF~RXn8	SO(17)~SO(10)	RWr(n+1)		SOW(1)
RX(n+1)7~RX(n+1)0	SO(27)~SO(20)	RWr(n+2)	SOD(2)	SOW(2)
RX(n+1)F~RX(n+1)8	SO(37)~SO(30)	RWr(n+3)		SOW(3)
RX(n+2)7~RX(n+2)0	SO(47)~SO(40)	RWr(n+4)	SOD(4)	SOW(4)
RX(n+2)F~RX(n+2)8	SO(57)~SO(50)	RWr(n+5)		SOW(5)
RX(n+3)7~RX(n+3)0	SO(67)~SO(60)	RWr(n+6)	SOD(6)	SOW(6)
RX(n+3)F~RX(n+3)8	SO(77)~SO(70)	RWr(n+7)		SOW(7)
RX(n+4)7~RX(n+4)0	SO(107)~SO(100)	RWr(n+8)	SOD(8)	SOW(8)
RX(n+4)F~RX(n+4)8	SO(117)~SO(110)	RWr(n+9)		SOW(9)
RX(n+5)7~RX(n+5)0	SO(127)~SO(120)	RWr(n+10)	SOD(10)	SOW(10)
RX(n+5)F~RX(n+5)8	SO(137)~SO(130)	RWr(n+11)		SOW(11)
RX(n+6)7~RX(n+6)0	SO(147)~SO(140)	RWr(n+12)	SOD(12)	SOW(12)
RX(n+6)F~RX(n+6)8	SO(157)~SO(150)	RWr(n+13)		SOW(13)
		RWr(n+14)	SOD(14)	SOW(14)
		RWr(n+15)		SOW(15)

n: Address assigned to master module with station No. setting

CAUTION
SIW(0) and SIW(1) are viewed as dedicated input ports.

To write the robot controller's bit information into the master station PLC's input device No., write the following commands in the robot program in the same manner as the DO output port:

SET/RESET command
Assignment statement
OUT command

Example : To turn RX(n+1)0 ON
SET SO(20) or SO(20) =1 .... * SO(20) will turn ON.

NOTE
The SO statement in the robot language can be defined from SO2 ( ) to SO27 ( ), but the CC-Link compatible module accepts from SO2 ( ) to SO15 ( ).

Example : To write variable A data into RX(n+1)0 to RX(n+1)7
SO2() = A ..... * The variable A data will be converted into a binary and substituted into SO2(). If variable A is 127, 7Fh will be set in SO2().

When writing the robot controller's word information into the master station PLC's input device No., write the following command in the robot program.

Assignment statement

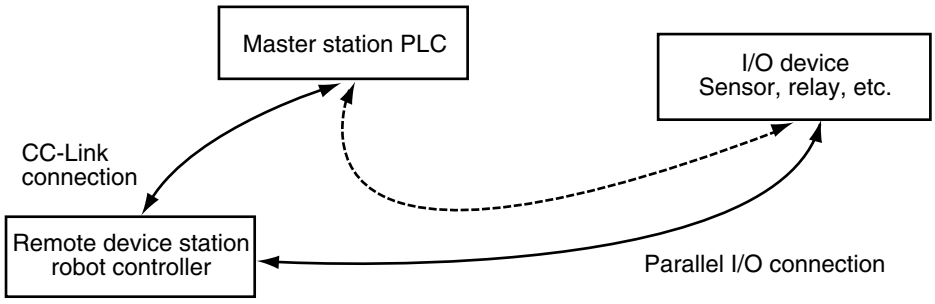
NOTE
Word data written with SOW(n) is a little endian format with no sign.
Double word data written with SOD(n) is a little endian format with a sign.

Example : To write 512 into RWr (n+2) as word data
SOW (2) = 512 ..... * 512 is substituted in SOW (2), and SOW (2) becomes 0200h.

Example : To write 69905 as the double word data for RWr (n+2) and RWr (n+3)
SOD (2) = 69905 ..... * 69905 is substituted in SOD (2), SOW (2) becomes 1111h and SOW (3) becomes 0001h.

4. Direct connection by emulated serialization on parallel DIO

The master station PLC can exchange bit information data with the parallel port on the robot controller's parallel I/O unit regardless of the robot program. By using this function, I/O devices such as a sensor or relay can be used like a device connected to CC-Link.



NOTE
When the directly connected and set output port is used with the program, the bit information may not become the intended value. Do not use the directly connected and set output port with the program.

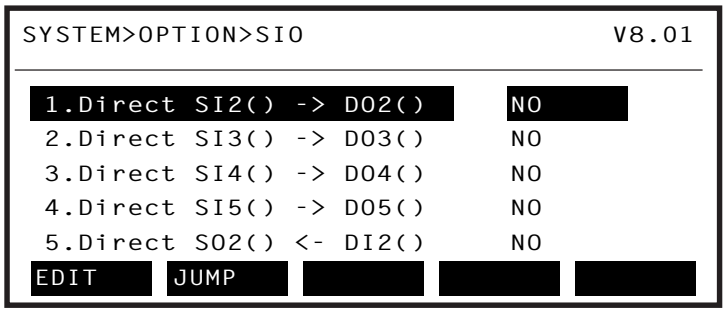
4.1 Emulated serialization setting on parallel DIO

The relation of the parallel port and serial port that can be connected is shown below.

Input device such as sensor		Output device such as valve	
DI port →	SO port	DO port ←	SI port
DI2()	SO2()	DO2()	SI2()
DI3()	SO3()	DO3()	SI3()
DI4()	SO4()	DO4()	SI4()
DI5()	SO5()	DO5()	SI5()

[Operation]

1. Press the F 3 (SIO) key in "SYSTEM > OPTION" mode.



Valid keys and submenu functions in this mode are as follows.

Valid keys	Menu	Function
Cursor (↑/↓) keys		Selects SIO parameters.
F1	EDIT	Sets SIO parameters.
F2	JUMP	Jumps to specified SIO parameter.

NOTE
When the port specified by SIO is identical with the port used by the program, the output results might be inaccurate.

1. Direct connection from SI n ( ) to DO n ( )

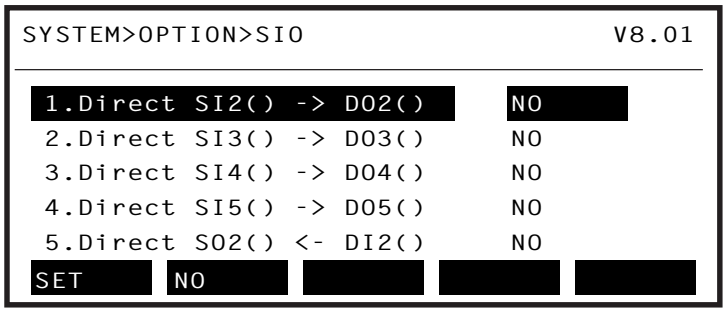
Serial port input can be directly connected to parallel port output. The relation of the parallel port and serial port that can be connected is as follows.

NOTE
When the port specified by SIO is identical with the port used by the program, the output results might be inaccurate.

Output device such as sensor		
DO port	←	SI port
DO2()		SI2()
DO3()		SI3()
DO4()		SI4()
DO5()		SI5()

[Operation]

1. Select an SI port (from items 1 to 4) in the "SYSTEM > OPTION > SIO" mode.
2. Press the F 1 (EDIT) key.



3. Press the F 1 (SET) key to enable the connection or the F 2 (NO) key to cancel the setting.
4. Press the ESC key to quit setting or select another SI port with the cursor keys to continue setting.

2. Direct connection from SO n ( ) to DI n ( )

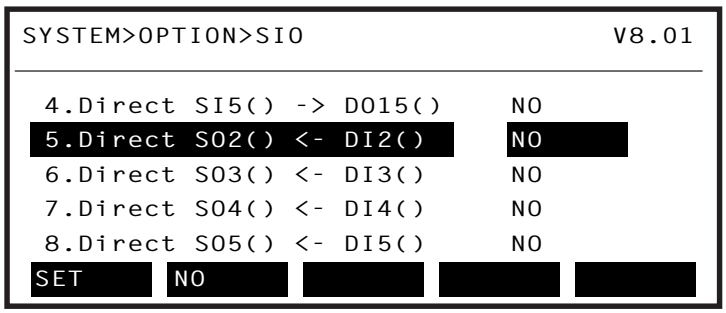
Parallel port input can be directly connected to serial port output. The relation of the parallel port and serial port that can be connected is as follows.

NOTE
When the port specified by SIO is identical with the port used by the program, the output results might be inaccurate.

Input device such as valve	
DI port →	SO port
DI2()	SO2()
DI3()	SO3()
DI4()	SO4()
DI5()	SO5()

[Operation]

1. Select a DI port (from items 5 to 8) in the "SYSTEM > OPTION > SIO" mode.
2. Press the F 1 (EDIT) key.



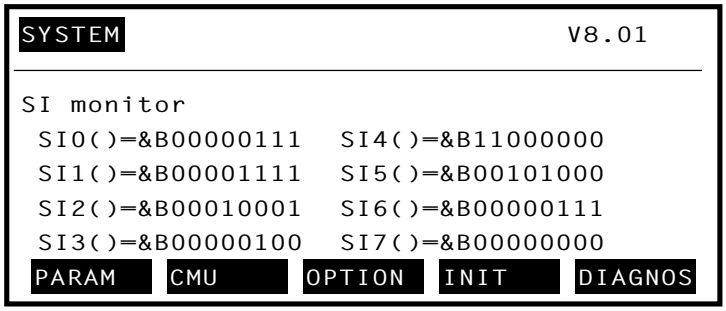
3. Press the F 1 (SET) key to enable the connection or the F 2 (NO) key to cancel the setting.
4. Press the ESC key to quit setting or select another DI port with the cursor keys to continue setting.

5. Referring to communication data

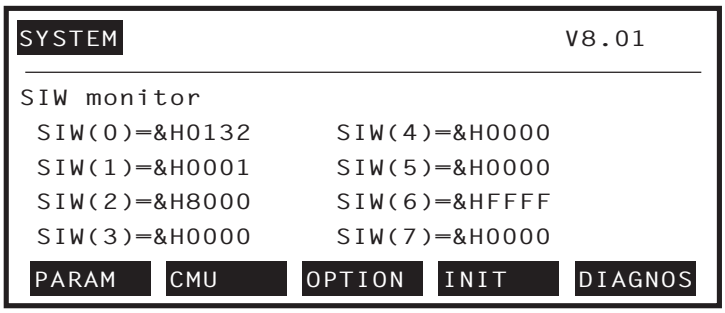
The ON/OFF information exchanged with the master station PLC can be referred to using the programming unit (hereinafter, MPB).
Note that the MPB display update interval is longer than the CC-Link data update interval, so if the ON/OFF interval is short, accurate information may not be displayed.

5.1 Referring to the data from the programming unit

The data exchanged with the master station PLC can be referred to with the MPB. The reference unit is the robot controller input/output port No.



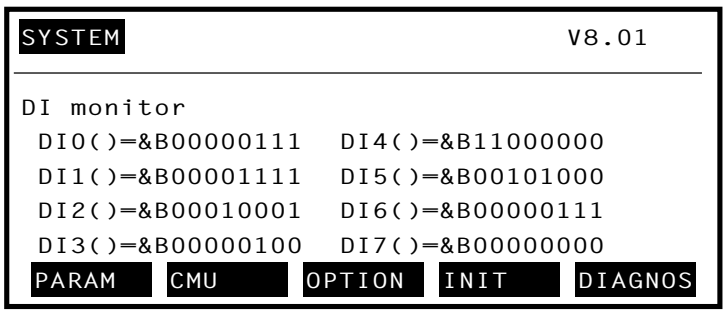
** &Bxxxxxxx corresponds to the 0th bit to 7th bit from right to left.*



** &Hxxxx expresses a hexadecimal.*

[Operation]

1. Press the DISPLAY key. A screen like that shown below will appear.



2. Press the DISPLAY key several times to check the status of SI input ports 0 to 7.
3. Press the DISPLAY key more to check the status of SI input ports 10 to 15.
4. Press the DISPLAY key twice more to check the status of SO input ports 0 to 7.
5. Press the DISPLAY key more to check the status of SO input ports 10 to 15.
6. Press the DISPLAY key twice more to check the status of SIW input ports 0 to 7.
7. Press the DISPLAY key more to check the status of SIW input ports 8 to 15.
8. Press the DISPLAY key more to check the status of SOW output ports 0 to 7.
9. Press the DISPLAY key more to check the status of SOW output ports 8 to 15.
10. To stop checking the input/output ports, press the ESC key.

Chapter 4 Troubleshooting

Contents

MEMO

1. Items to confirm before starting up CC-Link system

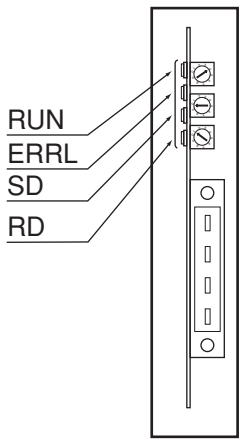
Confirm the following items before starting up the CC-Link system.

	Confirmation details	Check
1	Is the CC-Link compatible module accurately connected? (Refer to Chapter 2 section 2 or 3.)	
2	Is the robot controller set to the CC-Link system specifications? (Refer to Chapter 2 section 1.)	
3	Are the CC-Link compatible module station No. and communication speed correctly set? (Refer to Chapter 2 section 1.)	
4	Is the ferrite core connected to the power input cable to the robot controller? (Refer to Chapter 2 section 4.)	
5	Is the CC-Link system cable accurately connected to the CC-Link compatible module? (Refer to Chapter 2 section 5.)	
6	Was the line test from the master station PLC correct? (Refer to the master station PLC instruction manual.)	
7	Is the master station PLC set for the 4-station occupying remote device? (Refer to the master station PLC instruction manual.)	
8	Is the master station PLC exchanging the data for four stations? (The data for four stations must always be exchanged.)	
9	Has the initial data process been carried out between the master station and robot controller? (Refer the initialization process in Chapter 3 section 2.)	
10	Is the master station PLC judging that the robot controller is correctly functioning using RX(n+7)8 (remote station Ready)? (Refer the samples in Chapter 5 section 4.)	

NOTE

The dedicated input of the STD.DIO connector provided on the controller will be disabled except for an interlock signal (DI 11). When the external 24V monitor control of system parameters is disabled, the interlock signal (DI 11) will also be disabled.

2. Meanings of LEDs on CC-Link compatible module



Front of the unit

The LEDs on the CC-Link compatible module express the following statuses.
Use these for confirmation when an error occurs.

RUN	ERRL	SD	RD	Meaning
○	◎	○	○	Normal communication is taking place, but the CRC error occurs sometimes because of noise.
○	◎	○	○	The settings have varied from the baud rate and station No. setting made when connected to the CC-Link system.
○	◎	●	○	A CRC error occurred in the received data, and a response cannot be made.
○	●	○	○	Normal communication
○	●	●	○	There is no data addressed to the local station.
●	○	●	○	Station No. setting illegal. (Non-existing station No. was specified.)
●	○	●	●	Communication speed setting illegal. (Unusable communication speed was specified.)
●	◎	○	○	Polling response is being carried out, but a CRC error occurred in the refresh reception.
●	◎	●	○	A CRC error occurred in the data addressed to the local station.
●	●	○	○	Data has not been initialized.
●	●	◎	●	The local station is not set to a remote device station.
●	●	●	○	There is no data addressed to the local station or the data addressed to the local station cannot be received because of noise. An illegal communication speed was set. (It can be spefified but differs from the master station.)
●	●	●	○	Data cannot be received because of a line disconnection. The power for communication has been cut off.
●	●	●	●	Communication with the master station was not possible when the power was turned ON.
Others				An improbable state

(○ : ON, ● : OFF, ◎ : Flicker)

⚠ ***CAUTION***
Even if the LED displays indicate the normal communication state, there may be cases when communication with the master station PLC is not possible unless the initial data process is carried out. Always carry out the initial data process. (Refer to Chapter 3.)

3. Troubleshooting

If trouble occurs in the connection with the robot controller while starting up the CC-Link system or during operation, check the following items in listed order.

3.1 Robot controller front panel LED confirmation

[Confirmation item 1]

<Confirmation details>

- The “PWR” LED is OFF.

<Cause>

- Power is not being supplied to the robot controller.

<Countermeasures>

- Measure the voltage at the AC power input terminal of the power connector with a multimeter and check that the rated voltage is being supplied.

* Refer to the robot controller owner’s manual for the rated voltage for the robot controller.

[Confirmation item 2]

<Confirmation details>

- The “ERR” LED is ON.

<Cause>

- The robot controller is in emergency stop.
- A major error has occurred in the robot controller.

<Countermeasures>

- Confirm the error message displayed on the programming unit.
- Take measures by following the troubleshooting section in the robot controller instruction manual.

* Refer to the robot controller instruction manual for details on the errors.

3.2 Programming unit error display confirmation

[Confirmation item 1]

<Confirmation details>

- "CC-Link Communication Error" is displayed on the programming unit.

<Cause>

- An error has occurred in the CC-Link system connection.

<Countermeasures>

- Check whether the CC-Link system cable is disconnected or incorrectly connected.
- Check the station No. and communication speed settings for the CC-Link compatible module.
- Confirm that the master station PLC is operating.

[Confirmation item 2]

<Confirmation details>

- Check whether an error other than "CC-Link Communication Error" is displayed on the programming unit. In this case, this problem is not related to the CC-Link system connection. Note, however, the message "CC-Link Communication Error" may not appear on the programming unit if multiple errors have occurred simultaneously.

<Cause>

- An error has occurred in the robot controller.

<Countermeasures>

- Check the error message displayed on the programming unit.
- Check the error history using the programming unit. Check the error history in the "SYSTEM > DIAGNOS > HISTORY" mode using the programming unit.
- Take measures by following the troubleshooting section in the robot controller instruction manual.

* Refer to the robot controller instruction manual for details on the errors.

3.3 CC-Link compatible module LED confirmation

[Confirmation item 1]

<Confirmation details>

- The LED display on the CC-Link compatible module is not “RUN. ERR. SD. RD” = “○●○○”.(○:ON, ●:OFF)

<Cause>

- An error has occurred in the CC-Link system connection. Refer to table in Chapter 4 section 2 for the meanings of the LED displays.

<Countermeasures>

- Check whether the CC-Link system cable is disconnected or incorrectly connected, and whether the terminator is connected.
- Check whether the CC-Link system cable is laid near the main circuit or power cable, or whether it is bundled with these.
- Check that the ferrite core is connected to the robot controller’s power supply cable.
- Check the station No. and communication speed settings for the CC-Link compatible module.
- Check that the master station PLC is operating correctly.
- Check that the robot controller on the master station PLC is set to the remote device station.

[Confirmation item 2]

<Confirmation details>

- The LED display on the CC-Link compatible module is “RUN, ERR, SD, RD” = “●●○○”.(○:ON, ●:OFF)

<Cause>

- The initial data process has not been executed when the CC-Link system was connected. Refer to Chapter 3.
- The RX(n+7)B (remote station Ready) signal is not ON.

<Countermeasures>

- Carry out the initial data process when connecting to the CC-Link system.

3.4 Confirmation from master station PLC

[Confirmation item 1]

<Confirmation details>

- Using the master station PLC's line test function, confirm robot controller is correctly connected to the CC-Link system.

* Refer to the master station PLC instruction manual for details on the line test.

[Confirmation item 2]

<Confirmation details>

- Using the master station PLC's line test function, check whether an error has occurred in the robot controller's CC-Link connection.

<Cause>

- The ferrite core for noise measures is not connected.
- The CC-Link cable is laid near sources of noise such as the power cable.

<Countermeasures>

- Connect the ferrite core for noise measures onto the input power cable.
- Wire the CC-Link cable away from noise sources such as the power cable.

4. Error messages relating to CC-Link

This section describes error messages relating to CC-Link compatible units. For other messages, refer to robot controller owner's manuals.
When an error occurs, an error message appears on the message line (2nd line) of the MPB screen.

12.1 : Emg.stop on

Code : &H0C01
Meaning/Cause : a. MPB emergency stop button was pressed.
b. Emergency stop terminals on SAFETY connector are open (emergency stop status).
c. MPB or terminator is not connected to MPB connector.
d. SAFETY connector is not connected.
e. SI(00) is not ON.
f. Error in connection to CC-Link system.
Action : 1. Release the MPB emergency stop button.
2. Close the emergency stop terminals on SAFETY connector.
3. Connect MPB or terminator to MPB connector.
4. Attach the SAFETY connector.
5. Set SI(00) to ON.
6. Correct the connection to CC-Link system.

12.2 : Interlock on

Code : &H0C02
Meaning/Cause : a. Program was executed or moving of axis attempted with interlock signal still input.
b. Interlock signal turned ON during execution of program or axis movement..
c. DC 24V is supplied to STD.DIO connector and DI(11) is not turned ON.
d. SI(11) is not ON.
e. Error in connection to CC-Link system.
Action : 1. Cancel the interlock signal, and execute program or move axis.
2. Set DI(11) on STD.DIO connector to ON.
3. Set SI(11) to ON.
4. When not using STD.DIO, disable (invalid) the "Watch on STD.DO DC24V" parameter in SYSTEM mode.
5. Correct the connection to CC-Link system.

12.11: CC-Link communication error

Code : &H0C0B
Meaning/Cause : a. Error in cable for CC-Link system.
b. Master station sequencer power is turned off or the operation has stopped.
Action : 1. Check for the cable and take measures to suppress noise on the controller.
2. Check if the master station sequencer is operating correctly.

12.12: CC-Link overtime error

Code : &H0C0C
Meaning/Cause : a. Communication error in CC-Link system due noise, etc.
b. Master station sequencer power is turned off or the operation has stopped.
Action : 1. Take measures to suppress noise on the CC-Link system cable and controller.
2. Check if the master station sequencer is operating correctly.

12.70: Incorrect option setting

Code : &H0C46
Meaning/Cause : a. Error in DIP switch setting on option unit.
b. Mismatched option units have been installed.
c. Cannot identify the installed option unit.
Action : 1. Check the DIP switch settings on the option unit.
2. Install the correct option units.
3. Replace the option unit.

MEMO

Chapter 5 Specifications

Contents

MEMO

YAMAHA robot controller (4-station occupying)

Remote input/output

Remote → Master		Master → Remote	
Device No.	Signal name	Device No.	Signal name
RXn0	SO (00): Emergency stop input status output	RYn0	SI (00): Emergency stop input
RXn1	SO (01): CPU_OK status output	RYn1	SI (01): Servo ON input
RXn2	SO (02): Servo ON status output	RYn2	SI (02): Service mode input
RXn3	SO (03): Alarm status output	RYn3	System area [for future expansion]
RXn4	System area [for future expansion]	RYn4	
RXn5		RYn5	SI (05):IO command execution trigger input
RXn6		RYn6	System area [for future expansion]
RXn7		RYn7	
RXn8	SO (10): AUTO mode status output	RYn8	SI (10): Sequence control input
RXn9	SO (11): Origin return complete status output	RYn9	SI (11): Interlock input
RXnA	SO (12): Sequence program execution status output	RYnA	SI (12): Robot program start input
RXnB	SO (13): Robot program execution status output	RYnB	SI (13): AUTO mode input
RXnC	SO (14): Program reset status output	RYnC	System area [for future expansion]
RXnD	System area [for future expansion]	RYnD	SI (15): Program reset input
RXnE	SO (16): IO command execution judgment output	RYnE	SI (16): MANUAL mode input
RXnF	SO (17): Output during IO command execution	RYnF	SI (17): Absolute reset input
RX(n+1)0	SO(20) to SO(27): General-purpose output	RY(n+1)0	SI(20) to SI(27): General-purpose input
to		to	
RX(n+1)7		RY(n+1)7	
RX(n+1)8	SO(30) to SO(37): General-purpose output	RY(n+1)8	SI(30) to SI(37): General-purpose input
to		to	
RX(n+1)F		RY(n+1)F	
RX(n+2)0	SO(40) to SO(47): General-purpose output	RY(n+2)0	SI(40) to SI(47): General-purpose input
to		to	
RX(n+2)7		RY(n+2)7	
RX(n+2)8	SO(50) to SO(57): General-purpose output	RY(n+2)8	SI(50) to SI(57): General-purpose input
to		to	
RX(n+2)F		RY(n+2)F	
RX(n+3)0	SO(60) to SO(67): General-purpose output	RY(n+3)0	SI(60) to SI(67): General-purpose input
to		to	
RX(n+3)7		RY(n+3)7	
RX(n+3)8	SO(70) to SO(77): General-purpose output	RY(n+3)8	SI(70) to SI(77): General-purpose input
to		to	
RX(n+3)F		RY(n+3)F	
RX(n+4)0	SO(100) to SO(107): General-purpose output	RY(n+4)0	SI(100) to SI(107): General-purpose input
to		to	
RX(n+4)7		RY(n+4)7	
RX(n+4)8	SO(110) to SO(117): General-purpose output	RY(n+4)8	SI(110) to SI(117): General-purpose input
to		to	
RX(n+4)F		RY(n+4)F	
RX(n+5)0	SO(120) to SO(127): General-purpose output	RY(n+5)0	SI(120) to SI(127): General-purpose input
to		to	
RX(n+5)7		RY(n+5)7	
RX(n+5)8	SO(130) to SO(137): General-purpose output	RY(n+5)8	SI(130) to SI(137): General-purpose input
to		to	
RX(n+5)F		RY(n+5)F	

n: Address assigned to master module with station No. setting

Remote → Master		Master → Remote	
Device No.	Signal name	Device No.	Signal name
RX(n+6)0 to RX(n+6)7	SO(140) to SO(147): General-purpose output	RY(n+6)0 to RY(n+6)7	SI(140) to SI(147): General-purpose input
RX(n+6)8 to RX(n+6)F	SO(150) to SO(157): General-purpose output	RY(n+6)8 to RY(n+6)F	SI(150) to SI(157): General-purpose input
RX(n+7)0	Reserved	RY(n+7)0	Reserved
RX(n+7)1		RY(n+7)1	
RX(n+7)2		RY(n+7)2	
RX(n+7)3		RY(n+7)3	
RX(n+7)4		RY(n+7)4	
RX(n+7)5		RY(n+7)5	
RX(n+7)6		RY(n+7)6	
RX(n+7)7		RY(n+7)7	
RX(n+7)8	Initial data process request flag	RY(n+7)8	Initial data process complete flag
RX(n+7)9	Not used	RY(n+7)9	Not used
RX(n+7)A		RY(n+7)A	
RX(n+7)B	Remote station ready	RY(n+7)B	Reserved
RX(n+7)C	Reserved	RY(n+7)C	
RX(n+7)D		RY(n+7)D	
RX(n+7)E	(Reserved: QnA)	RY(n+7)E	(Reserved: QnA)
RX(n+7)F		RY(n+7)F	

n: Address assigned to master module with station No. setting

Remote registers

Remote → Master			Master → Remote		
Device No.	Name		Device No.	Name	
RWrn		Dedicated SOW(0)	RWwn		Dedicated SIW(0)
RWr(n+1)		Dedicated SOW(1)	RWw(n+1)		Dedicated SIW(1)
RWr(n+2)	General-purpose SOD(2)	General-purpose SOW(2)	RWw(n+2)	General-purpose SID(2)	General-purpose SIW(2)
RWr(n+3)		General-purpose SOW(3)	RWw(n+3)		General-purpose SIW(3)
RWr(n+4)	General-purpose SOD(4)	General-purpose SOW(4)	RWw(n+4)	General-purpose SID(4)	General-purpose SIW(4)
RWr(n+5)		General-purpose SOW(5)	RWw(n+5)		General-purpose SIW(5)
RWr(n+6)	General-purpose SOD(6)	General-purpose SOW(6)	RWw(n+6)	General-purpose SID(6)	General-purpose SIW(6)
RWr(n+7)		General-purpose SOW(7)	RWw(n+7)		General-purpose SIW(7)
RWr(n+8)	General-purpose SOD(8)	General-purpose SOW(8)	RWw(n+8)	General-purpose SID(8)	General-purpose SIW(8)
RWr(n+9)		General-purpose SOW(9)	RWw(n+9)		General-purpose SIW(9)
RWr(n+10)	General-purpose SOD(10)	General-purpose SOW(10)	RWw(n+10)	General-purpose SID(10)	General-purpose SIW(10)
RWr(n+11)		General-purpose SOW(11)	RWw(n+11)		General-purpose SIW(11)
RWr(n+12)	General-purpose SOD(12)	General-purpose SOW(12)	RWw(n+12)	General-purpose SID(12)	General-purpose SIW(12)
RWr(n+13)		General-purpose SOW(13)	RWw(n+13)		General-purpose SIW(13)
RWr(n+14)	General-purpose SOD(14)	General-purpose SOW(14)	RWw(n+14)	General-purpose SID(14)	General-purpose SIW(14)
RWr(n+15)		General-purpose SOW(15)	RWw(n+15)		General-purpose SIW(15)

n: Address assigned to master module with station No. setting

2. Details of remote input/output signals

Device No.	Signal name	Details
RXn0	SO (00): Emergency stop input status output	Turns ON when robot controller is in emergency stop state.
RXn1	SO (01): CPU_OK status output	Turns ON when robot controller is in normal state.
RXn2	SO (02): Servo ON status output	Turns ON when robot controller motor power is ON.
RXn3	SO (03): Alarm status output	Turns ON when robot controller is in following state: • Serious error occurred in robot controller. • Emergency stop input OFF
RXn8	SO (10): AUTO mode status output	Turns ON when selected mode is AUTO mode. Turns OFF when other mode is selected.
RXn9	SO (11): Origin return complete status output	Turns ON when robot has complete origin return.
RXnA	SO (12): Sequence program execution status output	Turns ON while sequence program is executed.
RXnB	SO (13): Robot program execution status output	Turns ON while robot program is executed.
RXnC	SO (14): Program reset status output	Turns ON when robot program has been reset. Turns OFF when robot program starts.
RXnD	SO (15): Battery alarm output	Turns ON when the system backup battery (all models of RCX series) or absolute battery (RCX142/222) is low.
RXnE	SO (16): IO command execution judgment output	Turns OFF while executing the IO command. After executing the IO command turns ON if normal, and stays OFF if abnormal.
RXnF	SO (17): Output during IO command execution	Turns ON while the IO command is being executed.
RX(n+1)0 to RX(n+1)7	SO(20) to SO(27): General-purpose output	General-purpose output turns ON/OFF when value is substituted to SO port, or SET/RESET command is executed or OUT command is executed.
to	to	
RX(n+6)8 to RX(n+6)F	SO(150) to SO(157): General-purpose output	
RX(n+7)8	Initial data process request flag	The initial data process request flag turns ON to request the initial data setting when the power is turned ON, or when returning from a communication error. Turns OFF when initial data process is completed (initial data process complete flag RY(n+7)8 turns ON).
RX(n+7)B	Remote station ready	Turns ON when initial data setting is completed and READY state is entered when power is turned ON or when returning from communication error.

n: Address assigned to master module with station No. setting

Device No.	Signal name	Details
RYn0	SI (00): Emergency stop input	Turn OFF to trigger emergency stop on controller. Keep turned ON during normal operation.
RYn1	SI (01): Servo ON input	Turn ON to cancel emergency stop and turn ON the robot servo motor. Servo-ON is executed when this input is switched from OFF to ON. Emergency stop input [SI(00)] (RYn0) must be ON and emergency stop conditions in the robot controller (emergency stop terminal of SAFETY connector, etc.) must be canceled.
RYn2	SI (02): Service mode input	Turn OFF to enter the controller in service mode. Keep turned ON during normal operation. (Effective only when SAFE mode is enabled.) (In SAFE mode enabled, dedicated input might be disabled depending on service mode parameter setting.)
RYn3	SI (03): Step run	Turn ON to execute a step in the program during AUTO mode. One line of the program is executed when this input is changed from OFF to ON.
RYn5	SI (05): IO command execution trigger input	Changes from OFF to ON while executing the IO command. Turns ON after the IO command is set to a general-purpose input.
RYn8	SI (10): Sequence control input	Turn ON to execute sequence program in the robot controller. Sequence program is executed when this input is ON.
RYn9	SI (11): Interlock input	Turn OFF to stop execution of robot program. Keep tuned ON to continue program execution.
RYnA	SI (12): Robot program start input	Turn ON to execute robot program. Robot program is executed when this input is switched from OFF to ON. Robot controller must be in AUTO mode.
RYnB	SI (13): AUTO mode input	Turn ON to select AUTO mode. Robot program enters AUTO mode when this input is switched from OFF to ON.
RYnC	**[RCX141/221]** SI (14): Absolute reset input	Turn ON to perform absolute reset on robot. Reset is performed when this input is changed from OFF to ON. Absolute reset is not performed on axes that use mark method for origin return. Robot controller must be in MANUAL mode to perform absolute reset.
	[RCX142/222] SI (14): Origin return	Turn ON to perform origin return on incremental axes. When this input is changed from OFF to ON, origin return is performed on axes that are set to "sensor" or "stroke end" origin return method. Origin return is not performed on axes that are set to "mark" origin return method.
RYnD	SI (15): Program reset input	Turn ON to reset robot program. Program reset is executed when this input is switched from OFF to ON. Robot controller must be in AUTO mode.
RYnE	SI (16): MANUAL mode input	Turn ON to select MANUAL mode. Robot program enters MANUAL mode when this input is switched from OFF to ON.
RYnF	**[RCX141/221]** SI (17): Origin return	Turn ON to perform origin return on incremental axes. When this input is changed from OFF to ON, origin return is performed on axes that are set to "sensor" or "stroke end" origin return method. Origin return is not performed on axes that are set to "mark" origin return method.
	[RCX142/222] SI (17): Absolute reset input	Turn ON to perform absolute reset on robot. Reset is performed when this input is changed from OFF to ON. Absolute reset is not performed on axes that use mark method for origin return. Robot controller must be in MANUAL mode to perform absolute reset.

n: Address assigned to master module with station No. setting

Device No.	Signal name	Details
RY(n+1)0 to RY(n+1)7	SI(20) to SI(27): General-purpose input	Set these inputs to ON or OFF to refer to SI port values or execute WAIT command.
to	to	
RY(n+6)8 to RY(n+6)F	SI(150) to SI(157): General-purpose input	
RY(n+7)8	Initial data process complete flag	Turns ON when power is turned ON, communication error is reset, or data initialization is requested or completed. Emergency stop input (RYn0) and interlock input (RYn9) are turned ON when data is initialized.

n: Address assigned to master module with station No. setting

Device No.	Name		Details
RWwn		Dedicated SIW(0)	Used as the remote command area.
RWw(n+1)		Dedicated SIW(1)	Used as the remote command's command data area.
RWw(n+2)	General-purpose SID(2)	General-purpose SIW(2)	Used to input word or double word data from SIW or SID port. Or, used as remote command's command data area.
RWw(n+3)		General-purpose SIW(3)	
RWw(n+4)	General-purpose SID(4)	General-purpose SIW(4)	
RWw(n+5)		General-purpose SIW(5)	
RWw(n+6)	General-purpose SID(6)	General-purpose SIW(6)	
RWw(n+7)		General-purpose SIW(7)	
RWw(n+8)	General-purpose SID(8)	General-purpose SIW(8)	
RWw(n+9)		General-purpose SIW(9)	
RWw(n+10)	General-purpose SID(10)	General-purpose SIW(10)	
RWw(n+11)		General-purpose SIW(11)	
RWw(n+12)	General-purpose SID(12)	General-purpose SIW(12)	
RWw(n+13)		General-purpose SIW(13)	
RWw(n+14)	General-purpose SID(14)	General-purpose SIW(14)	
RWw(n+15)		General-purpose SIW(15)	

n: Address assigned to master module with station No. setting

Device No.	Name		Details
RWrn		Dedicated SOW(0)	Used as remote command's status area.
RWr(n+1)		Dedicated SOW(1)	Used as remote command's error code area.
RWr(n+2)	General-purpose SOD(2)	General-purpose SOW(2)	Used to output word or double word data from SOW or SOD port. Or, used as remote command's response area.
RWr(n+3)		General-purpose SOW(3)	
RWr(n+4)	General-purpose SOD(4)	General-purpose SOW(4)	
RWr(n+5)		General-purpose SOW(5)	
RWr(n+6)	General-purpose SOD(6)	General-purpose SOW(6)	
RWr(n+7)		General-purpose SOW(7)	
RWr(n+8)	General-purpose SOD(8)	General-purpose SOW(8)	
RWr(n+9)		General-purpose SOW(9)	
RWr(n+10)	General-purpose SOD(10)	General-purpose SOW(10)	
RWr(n+11)		General-purpose SOW(11)	
RWr(n+12)	General-purpose SOD(12)	General-purpose SOW(12)	
RWr(n+13)		General-purpose SOW(13)	
RWr(n+14)	General-purpose SOD(14)	General-purpose SOW(14)	
RWr(n+15)		General-purpose SOW(15)	

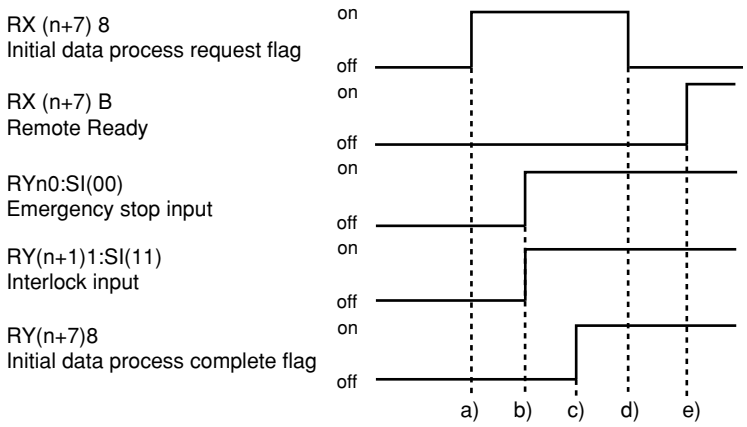
n: Address assigned to master module with station No. setting

3. Dedicated input/output signal timing chart

3.1 Initial data process for CC-Link connection

⚠ *CAUTION*

- ***The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)***
- ***If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.***



Confirmation of connection with master station PLC at power ON

a) Initial data process request flag ON is output
b) Emergency stop and interlock input ON is input
c) Initial data process complete flag ON is input
d) Initial data process request flag OFF is output
e) Remote Ready ON is output

Connection with the CC-Link system is completed with this process.

* This process is always required to correctly connect to the CC-Link system.

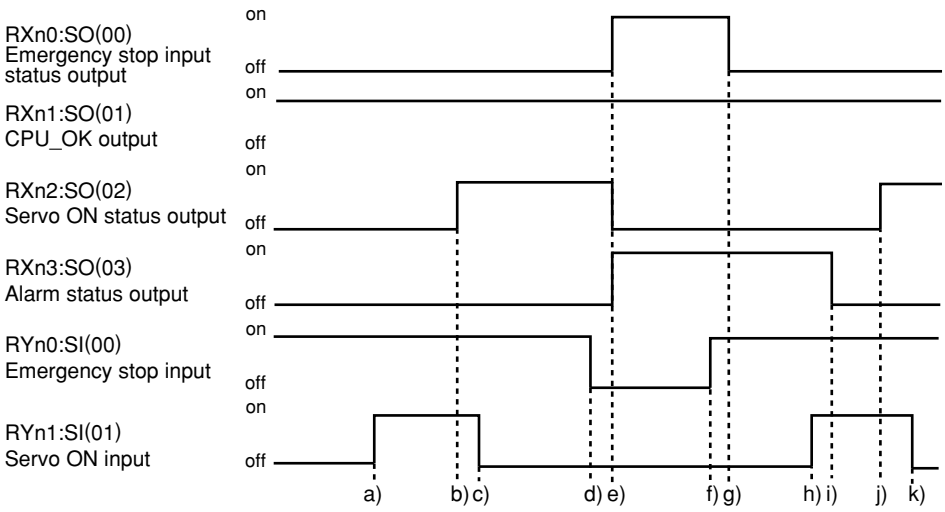
* To enter the emergency stop state, turn RYn0:SI(00) OFF after the above process is established.

* The servo is OFF when the controller power is turned ON.

3.2 Servo ON and emergency stop

⚠ *CAUTION*

- ***The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)***
- ***If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.***



Initial servo ON process after power ON

a) Servo ON input ON is input

b) If not in the emergency stop state, output servo ON status ON is output

c) After confirming that servo ON status output is ON, servo ON input OFF is input

Shift to emergency stop

d) Emergency stop input OFF is input

e) Emergency stop input status and alarm status output ON are output
Servo ON status output OFF is output

Servo ON process from emergency stop status

f) Emergency stop input ON is input

g) Emergency stop input status output OFF is output

h) Servo ON input ON is input

i) Alarm status output OFF is output

j) Servo ON status output ON is output

k) After confirming that servo ON status output is ON, servo ON input OFF is input

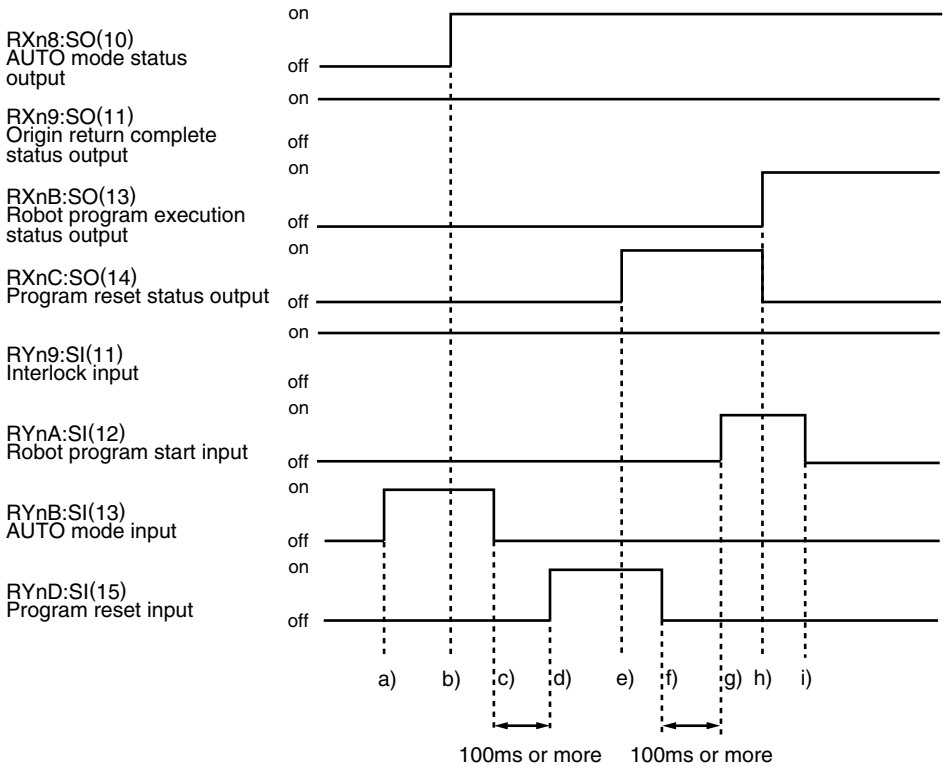
* The servo is OFF when the controller power is turned ON.

* When SAFE mode is enabled, dedicated inputs other than SI (00) and SI (11) might be disabled depending on service mode parameter setting unless service mode input signal is set to ON with SI (02) in the CC-Link system.

3.3 AUTO mode changeover, program reset and program execution

⚠ *CAUTION*

- *The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)*
- *If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.*



AUTO mode changeover process

a) AUTO mode input ON is input

b) AUTO mode status output ON is output

c) After confirming that the AUTO mode status output is ON, the AUTO mode input OFF is input

Program reset process

d) Program reset input ON is input

e) Program reset status output ON is output

f) After confirming that the program reset status output is ON, the program reset input OFF is input

Program execution process

g) Robot program start input ON is input

h) Program reset status output OFF is output

Robot program execution status output ON is output

i) After confirming that the robot program execution status output is ON, the robot program start input OFF is input

* The program cannot be executed if the emergency stop input and interlock input are OFF.

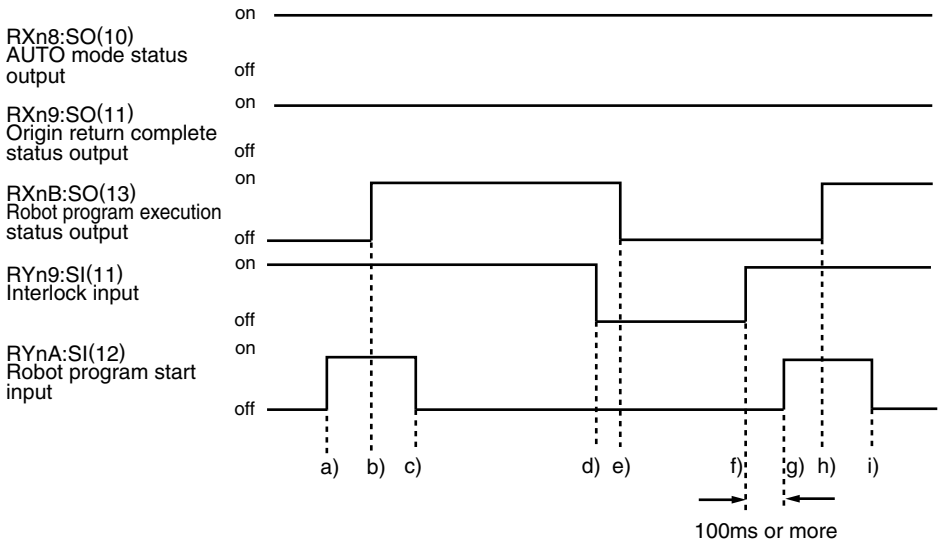
* If the origin return complete status output is not ON, execution of the program may not be possible depending on the execution level setting value.

* When SAFE mode is enabled, dedicated inputs other than SI (00) and SI (11) might be disabled depending on service mode parameter setting unless service mode input signal is set to ON with SI (02) in the CC-Link system.

3.4 Stopping with program interlock

⚠ *CAUTION*

- ***The dedicated input ON/OFF process from the master station PLC to the controller must be carried out at an interval of 100ms or more. If the interval is too short, the dedicated input may not be recognized. (This also applies to the same dedicated input and differing dedicated input intervals.)***
- ***If dedicated outputs are provided for the dedicated inputs from the master station PLC to controller, use them.***



Program execution process

a) Robot program start input ON is input

b) Robot program execution status output ON is output

c) After confirming that the robot program execution status output is ON, the start input OFF is input

Program stop process using interlock input

d) Interlock input OFF is input

e) Robot program execution status output OFF is output

Program execution after stopping program with interlock input

f) Interlock input ON is input

g) Robot program start input ON is input

h) Robot program execution status output ON is output

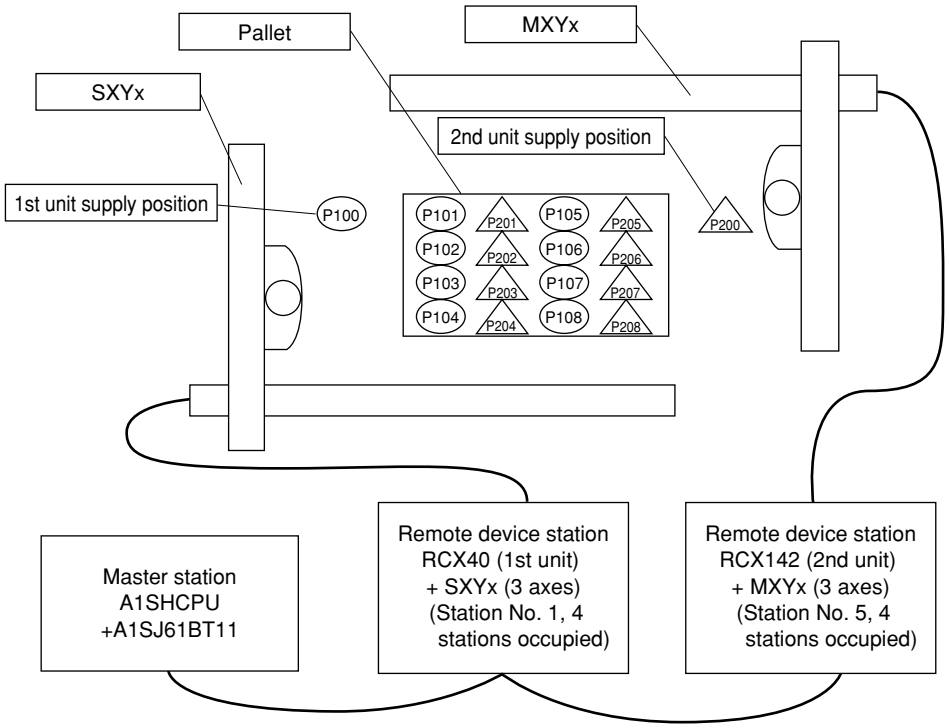
i) After confirming that the robot program execution status output is ON, the start input OFF is input

* The program will also stop when the emergency stop input OFF is input. In this case, the emergency stop input status and alarm status output ON will be output, and the servo ON status output OFF will be output. The servo ON process is required to start the program again.

* When SAFE mode is enabled, dedicated inputs other than SI (00) and SI (11) might be disabled depending on service mode parameter setting unless service mode input signal is set to ON with SI (02) in the CC-Link system.

4. Sample program

An example for the following type of hardware configuration has been prepared for this section.



[Details of sample]

- Pick & place work is carried out using the PLC and RCX40 + SXYx (3 axes), RCX142+MXYx (3 axes).
- The workpieces supplied to each robot are arranged on one pallet.
- The workpiece is supplied at a rate faster than the robot operation.
- The two robots will interfere above the pallet, so data is exchanged to prevent interference.
- When handling the workpiece, the robot moves at a low speed.
- The robot controller directly exchanges the pallet.

* Refer to the robot programming manual for details on the robot program language.

* The PLC circuit is a simple circuit that executes the selected robot program when emergency stop is canceled.

[Robot program data assignment]

*** Variables used**

1st unit :	A	: Point No. in pallet
2nd unit :	B	: Point No. in pallet

*** Points used**

1st unit :	P100	: Point above workpiece supply
	P101	: 1st point above pallet
	:	:
	P108	: 8th point above pallet
	P121	: Z axis position point for workpiece supply
	P122	: Z axis position point on pallet
2nd unit :	P200	: Point above workpiece supply
	P201	: 1st point above pallet
	:	:
	P208	: 8th point above pallet
	P221	: Z axis position point for workpiece supply
	P222	: Z axis position point on pallet

*** Bit information used**

1st unit :	SI (40)	: Point No. reception complete input
	SI (41)	: Movement complete response standby input
	SI (42)	: Movement complete standby input
	SO (23) to SO (20)	: Point No. setting output group
	SO (40)	: Point No. setting complete output
	SO (41)	: Movement complete output
	SO (42)	: Movement complete response output
	DI (47)	: Pallet change complete input
	DO (40)	: Chuck hand open close (0: Close, 1: Open)
	DO (47)	: Pallet exchange command output
2nd unit :	SI (23) to SI (20)	: Point No. setting input group
	SI (40)	: Point No. transmission complete input
	SI (41)	: Movement complete standby input
	SI (42)	: Movement complete response standby input
	SO (40)	: Point No. setting reception complete output
	SO (41)	: Movement complete response output
	SO (42)	: Movement complete output
	DO (40)	: Chuck hand open/close (0: Close, 1: Open)

[PLC data assignment]

X0 (*1)	: Unit error
X1 (*1)	: Local station data link status
X6 (*1)	: Data link start normal completion
X7 (*1)	: Data link start error completion
X0F (*1)	: Unit ready
X100	: 1st unit's SO(00): Emergency stop input status
X101	: 1st unit's SO(01): CPU_OK
:	:
X17F	: 1st unit reservation
X180	: 2nd unit's SO(00): Emergency stop input status
X181	: 2nd unit's SO(01): CPU_OK
:	:
X1FF	: 2nd unit reservation
Y0 (*1)	: Refresh instruction
Y6 (*1)	: Data link start request
Y100	: 1st unit's SI(00): Emergency stop input
Y101	: 1st unit's SI(01): Servo ON input
:	:
Y17F	: 1st unit reservation
Y180	: 2nd unit's SI(00): Emergency stop input
Y181	: 2nd unit's SI(01): Servo ON input
:	:
Y1FF	: 2nd unit reservation
M0	: Unit preparation complete flag
M1	: Parameter setting flag
M2	: Data link start flag
M4	: 1st station data link status
M8	: 5th station data link status
D0	: No. of connection units storage device
D1	: 1st unit local station information setting storage device
D2	: 2nd unit local station information setting storage device
D10	: Parameter setting status storage device

*1: This number is determined by the master module mounting position and the number of occupied input/output points mounted before the module.

[Robot program]

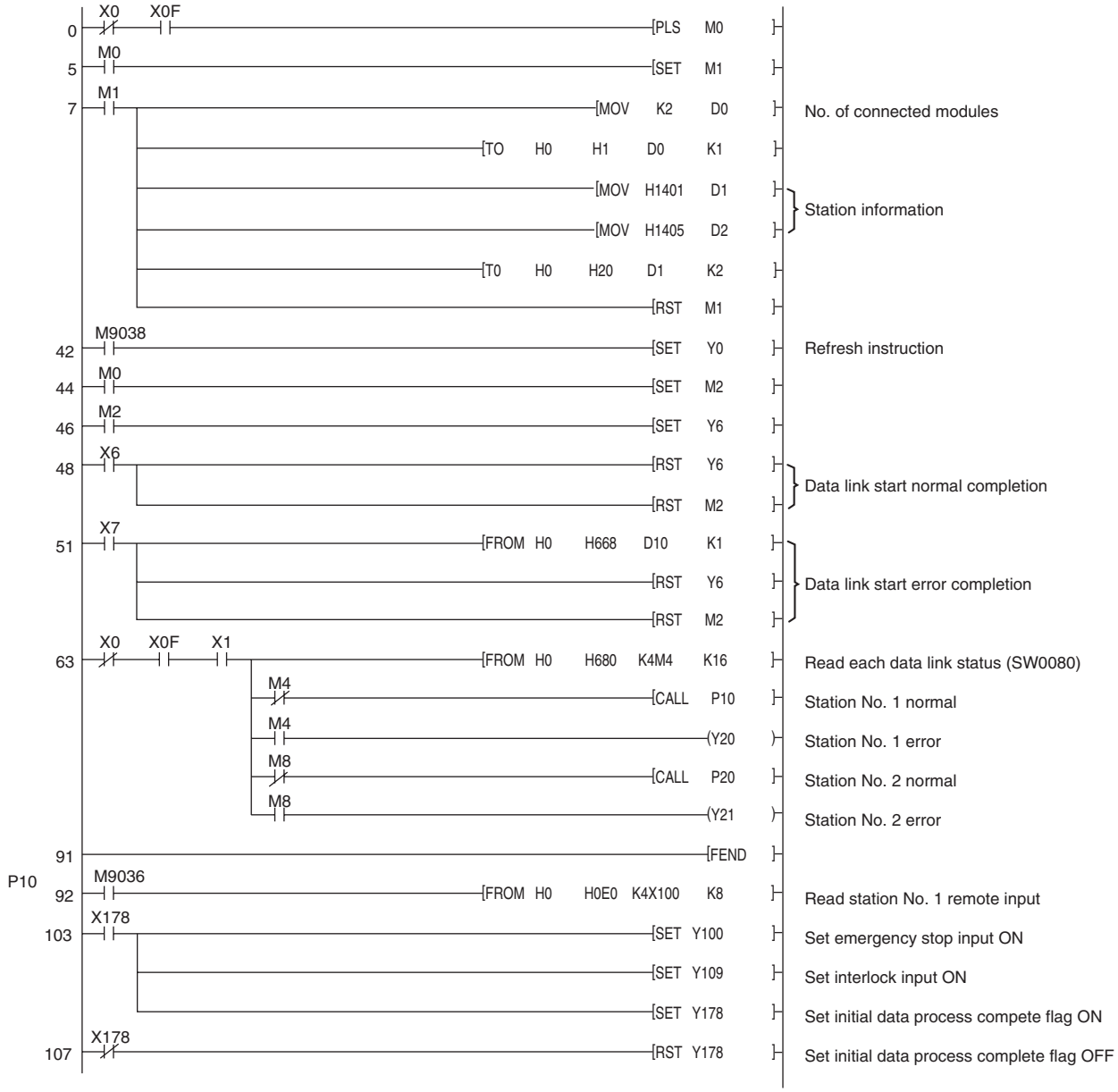
1st unit's RCX40

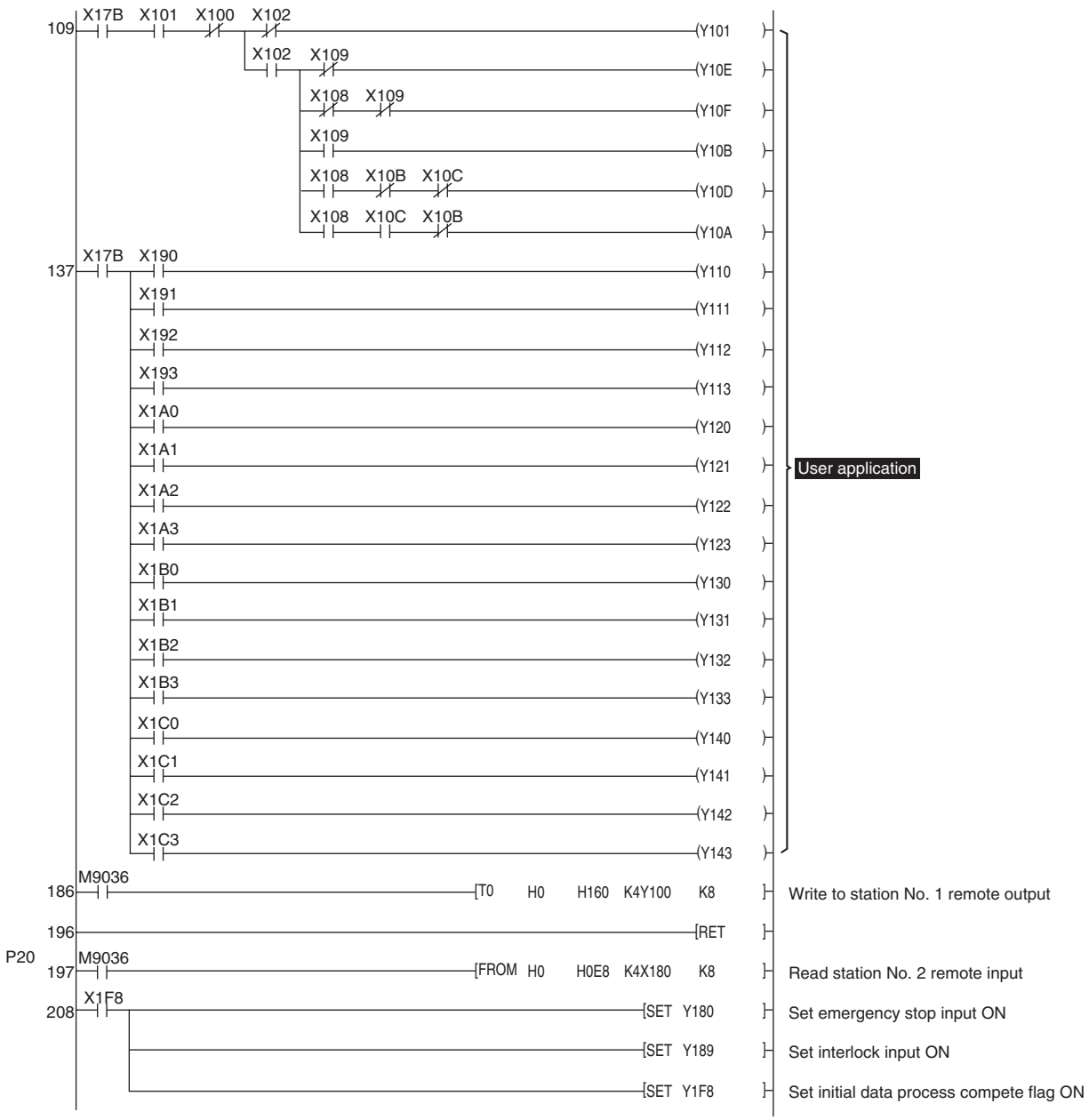
```
 'INIT ROUTINE
    RESET SO2()
    RESET SO4()
    RESET DO4()
    A=101
'MAIN ROUTINE
    MOVE P,P100,Z=0
    GOSUB *PICK
*ST1:
    MOVE P,P[A],Z=0
    GOSUB *PLACE
    MOVE P,P100,Z=0
    SO(41)=1
    WAIT SI(41)=1
    SO(41)=0
    WAIT SI(41)=0
    SO(23,22,21,20)=A-100
    SO(40)=1
    WAIT SI(40)=1
    SO(40)=0
    WAIT SI(40)=0
    SO(23,22,21,20)=0
    GOSUB *PICK
    WAIT SI(42)=1
    SO(42)=1
    WAIT SI(42)=0
    SO(42)=0
    A=A+1
    IF A>108 THEN
      A=101
      DO(47)=1
      WAIT DI(47)=1
      DO(47)=0
    ENDIF
    GOTO *ST1
    HALT
'SUB ROUTINE FOR PICK
*PICK:
    DO(40)=1
    DRIVE(3,P121),S=20
    WAIT ARM(3)
    DO(40)=0
    DELAY 500
    RETURN
''SUB ROUTINE FOR PLACE
*PLACE:
    DRIVE(3,P122),S=20
    WAIT ARM(3)
    DO(40)=1
    DELAY 500
    RETURN
```

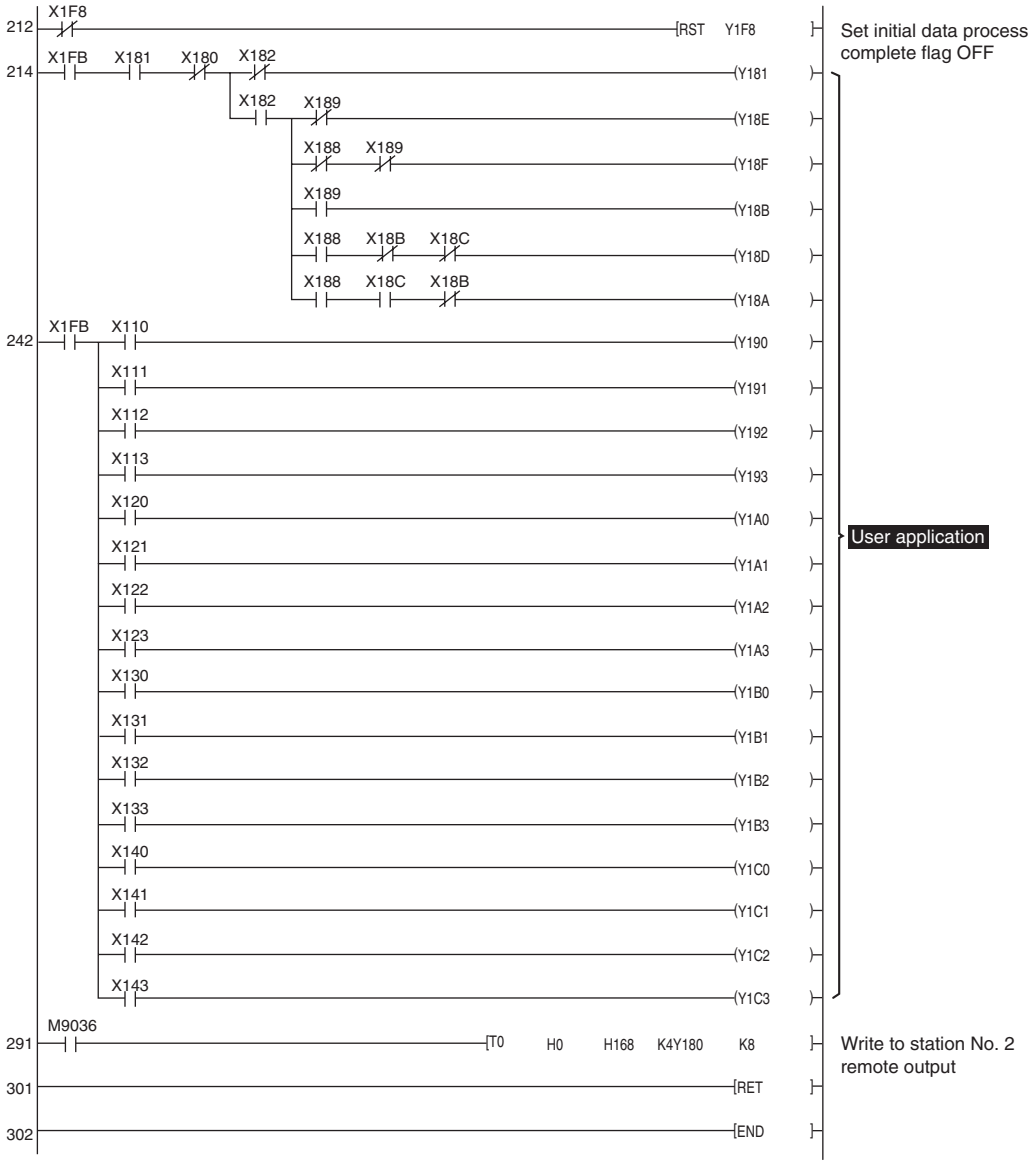
2nd unit's RCX142

```
'INIT ROUTINE
    RESET SO2()
    RESET SO4()
    RESET DO4()
    B=201
'MAIN ROUTINE
    MOVE P,P200,Z=0
    GOSUB *PICK
*ST2:
    WAIT SI(41)=1
    SO(41)=1
    WAIT SI(41)=0
    SO(41)=0
    WAIT SI(40)=1
    B=SI(23,22,21,20)
    SO(40)=1
    WAIT SI(40)=0
    SO(40)=0
    B=B+200
    MOVE P,P[B],Z=0
    GOSUB *PLACE
    MOVE P,P200,Z=0
    SO(42)=1
    WAIT SI(42)=1
    SO(42)=0
    WAIT SI(42)=0
    GOSUB *PICK
    GOTO *ST2
    HALT
'SUB ROUTINE FOR PICK
*PICK:
    DO(40)=1
    DRIVE(3,P221),S=20
    WAIT ARM(3)
    DO(40)=0
    DELAY 500
    RETURN
'SUB ROUTINE FOR PLACE
*PLACE:
    DRIVE(3,P222),S=20
    WAIT ARM(3)
    DO(40)=1
    DELAY 500
    RETURN
```

[PLC program]


X0 X0F [PLS M0]
M0 [SET M1]
M1 [MOV K2 D0] No. of connected modules
[TO H0 H1 D0 K1]
[MOV H1401 D1] Station information
[MOV H1405 D2]
[T0 H0 H20 D1 K2]
[RST M1]
M9038 [SET Y0] Refresh instruction
M0 [SET M2]
M2 [SET Y6]
X6 [RST Y6] Data link start normal completion
[RST M2]
X7 [FROM H0 H668 D10 K1]
[RST Y6] Data link start error completion
[RST M2]
X0 X0F X1 [FROM H0 H680 K4M4 K16] Read each data link status (SW0080)
M4 [CALL P10] Station No. 1 normal
M4 (Y20) Station No. 1 error
M8 [CALL P20] Station No. 2 normal
M8 (Y21) Station No. 2 error
[FEND]
P10
M9036 [FROM H0 H0E0 K4X100 K8] Read station No. 1 remote input
X178 [SET Y100] Set emergency stop input ON
[SET Y109] Set interlock input ON
[SET Y178] Set initial data process compete flag ON
X178 [RST Y178] Set initial data process complete flag OFF


109
X17B X101 X100 X102
(Y101
X102 X109
(Y10E
X108 X109
(Y10F
X109
(Y10B
X108 X10B X10C
(Y10D
X108 X10C X10B
(Y10A
137
X17B X190
(Y110
X191
(Y111
X192
(Y112
X193
(Y113
X1A0
(Y120
X1A1
(Y121
X1A2
(Y122
X1A3
(Y123
X1B0
(Y130
X1B1
(Y131
X1B2
(Y132
X1B3
(Y133
X1C0
(Y140
X1C1
(Y141
X1C2
(Y142
X1C3
(Y143
User application
186
M9036
[T0 H0 H160 K4Y100 K8
Write to station No. 1 remote output
196
[RET
P20
197
M9036
[FROM H0 H0E8 K4X180 K8
Read station No. 2 remote input
208
X1F8
[SET Y180
Set emergency stop input ON
[SET Y189
Set interlock input ON
[SET Y1F8
Set initial data process compete flag ON


212
X1F8
RST Y1F8
Set initial data process complete flag OFF
214
X1FB X181 X180 X182
Y181
X182 X189
Y18E
X188 X189
Y18F
X189
Y18B
X188 X18B X18C
Y18D
X188 X18C X18B
Y18A
242
X1FB X110
Y190
X111
Y191
X112
Y192
X113
Y193
X120
Y1A0
User application
X121
Y1A1
X122
Y1A2
X123
Y1A3
X130
Y1B0
X131
Y1B1
X132
Y1B2
X133
Y1B3
X140
Y1C0
X141
Y1C1
X142
Y1C2
X143
Y1C3
291
M9036
T0 H0 H168 K4Y180 K8
Write to station No. 2 remote output
301
RET
302
END

5. CC-Link compatible module specifications

The CC-Link compatible module with the label is compatible with CC-Link Ver. 1.10. Limits on the station-to-station cable length, etc., can be eased by using the Ver. 1.10 compatible CC-Link cable. Refer to the master station PLC instruction manual compatible with Ver. 1.10.

Specification item	CC-Link compatible module		
Target controller	RCX Series controller		
Remote station type	Remote device station		
Number of occupied stations	Fixed to four stations		
Station No. setting	1 to 61 (rotary switch)		
Communication speed setting	10M / 5M / 2.5M / 625K / 156Kbps (rotary switch)		
Number of CC-Link input/output points *1)	Remote input/output	Dedicated input : 16 points (11 points are currently used.)	
		General-purpose input : 96 points	
		Dedicated output : 16 points (11 points are currently used.)	
		General-purpose output : 96 points	
	Remote register	Dedicated input : 2 words	
		General-purpose input : 14 words	
		Dedicated output : 2 words	
		General-purpose output : 14 words	
Monitor LED	RUN, ERRL, SD, RD		

*1) Controller's I/O update intervals are 10ms at shortest, but actual I/O update intervals change depending on the update time for the master station.

⚠ ***CAUTION***
For the names and description of remote input/output signals and remote registers, refer to the tables shown in "1. Profile" and "2. Details of remote input/output signals" in this chapter.

⚠ ***CAUTION***
The specifications and appearance are subject to change without prior notice.

MEMO

Chapter 6 Appendix

Contents

MEMO

1. Term definition

1. CC-Link (Control & Communication Link)

CC-Link is a registered trademark of CC-Link partner association.

2. SAFE mode setting

When the SAFE mode setting is enabled, service mode input is made valid so that safety functions such as operating speed limits in MANUAL mode can be used. The SAFE mode setting is determined at the time of shipping.

The SAFE mode setting is always enabled for controllers compatible with CE marking.

3. SERVICE mode

This mode is valid only when the SAFE mode setting is enabled, and can be controlled by service mode input signals.

4. SAFETY connector

This connector is used to connect emergency stop input and service mode input. Located on the front panel of the robot controller.

5. STD. DIO connector

This connector is used to receive or output dedicated I/O signals and general-purpose I/O signals. Located on the front panel of the robot controller.

6. bit information

Bit data transmitted and received between master station PLC and controller.

7. Word information

Word data transmitted and received between master station PLC and controller.

8. Little endian

Method to substitute LSB in low-order address and refer to LSB when handling word information data as double word data.

For example, when the value 00012345h is substituted in SOD (2), 2345h is substituted in SOW (2) of the first word, and 0001h is substituted in SOW (3) of the second word.

Revision record

Manual version	Issue date	Description
1st Edition	Jan. 2002	–
2nd Edition	May 2002	–
3rd Edition	Nov. 2002	–
4th Edition	Jan. 2003	–
Ver. 1.05	Aug. 2006	English manual Ver. 1.05 is based on Japanese manual Ver. 1.06.
Ver. 1.06	Oct. 2006	English manual Ver. 1.06 is based on Japanese manual Ver. 1.06.

OWNER'S MANUAL

YAMAHA Robot Controller

RCX Series CC-Link UNIT

Oct. 2006
Ver. 1.06
This manual is based on Ver. 1.06 of Japanese manual.