FANUC Robot series

R-30*i*A/R-30*i*A Mate/R-30*i*B CONTROLLER

CC-Link Interface （Slave）

OPERATOR'S MANUAL

```
┌─────────────────────────────────────────────────────────────────┐
│                    ●   Original Instructions                      │
└─────────────────────────────────────────────────────────────────┘
```

Before using the Robot, be sure to read the "FANUC Robot Safety Manual (B-80687EN)" and understand the content.

The products in this manual are controlled based on Japan's "Foreign Exchange and Foreign Trade Law". The export from Japan may be subject to an export license by the government of Japan.

Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government.

Should you wish to export or re-export these products, please contact FANUC for advice.

In this manual we have tried as much as possible to describe all the various matters.

However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.

Therefore, matters which are not especially described as possible in this manual should be regarded as "impossible".

SAFETY PRECAUTIONS

Thank you for purchasing FANUC Robot.
This chapter describes the precautions which must be observed to ensure the safe use of the robot.
Before attempting to use the robot, be sure to read this chapter thoroughly.

Before using the functions related to robot operation, read the relevant operator's manual to become familiar with those functions.

If any description in this chapter differs from that in the other part of this manual, the description given in this chapter shall take precedence.

For the safety of the operator and the system, follow all safety precautions when operating a robot and its peripheral devices installed in a work cell.
In addition, refer to the "FANUC Robot SAFETY HANDBOOK (B-80687EN)".

1 WORKING PERSON

The personnel can be classified as follows.

Operator:
- Turns robot controller power ON/OFF
- Starts robot program from operator's panel

Programmer or teaching operator:
- Operates the robot
- Teaches robot inside the safety fence

Maintenance engineer:
- Operates the robot
- Teaches robot inside the safety fence
- Maintenance (adjustment, replacement)

- An operator cannot work inside the safety fence.
- A programmer, teaching operator, and maintenance engineer can work inside the safety fence. The working activities inside the safety fence include lifting, setting, teaching, adjusting, maintenance, etc.
- To work inside the fence, the person must be trained on proper robot operation.

During the operation, programming, and maintenance of your robotic system, the programmer, teaching operator, and maintenance engineer should take additional care of their safety by using the following safety precautions.

- Use adequate clothing or uniforms during system operation
- Wear safety shoes
- Use helmet

2   DEFINITION OF WARNING, CAUTION AND NOTE

To ensure the safety of user and prevent damage to the machine, this manual indicates each precaution on safety with "Warning" or "Caution" according to its severity. Supplementary information is indicated by "Note". Read the contents of each "Warning", "Caution" and "Note" before attempting to use the oscillator.

⚠**WARNING**
Applied when there is a danger of the user being injured or when there is a danger of both the user being injured and the equipment being damaged if the approved procedure is not observed.

⚠**CAUTION**
Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

NOTE
Notes are used to indicate supplementary information other than Warnings and Cautions.

- Read this manual carefully, and store it in a sales place.

3   WORKING PERSON SAFETY

Working person safety is the primary safety consideration.   Because it is very dangerous to enter the operating space of the robot during automatic operation, adequate safety precautions must be observed.
The following lists the general safety precautions.   Careful consideration must be made to ensure working person safety.

(1)   Have the robot system working persons attend the training courses held by FANUC.

FANUC provides various training courses.   Contact our sales office for details.

(2)   Even when the robot is stationary, it is possible that the robot is still in a ready to move state, and is waiting for a signal.   In this state, the robot is regarded as still in motion.   To ensure working person safety, provide the system with an alarm to indicate visually or aurally that the robot is in motion.
(3)   Install a safety fence with a gate so that no working person can enter the work area without passing through the gate.   Install an interlocking device, a safety plug, and so forth in the safety gate so that the robot is stopped as the safety gate is opened.

The controller is designed to receive this interlocking signal of the door switch. When the gate is opened and this signal received, the controller stops the robot (Please refer to "STOP TYPE OF ROBOT" in SAFETY PRECAUTIONS for detail of stop type).   For connection, see Fig.3 (a) and Fig.3 (b).

(4)   Provide the peripheral devices with appropriate grounding (Class A, Class B, Class C, and Class D).

(5)   Try to install the peripheral devices outside the work area.

(6)   Draw an outline on the floor, clearly indicating the range of the robot motion, including the tools such as a hand.

(7)   Install a mat switch or photoelectric switch on the floor with an interlock to a visual or aural alarm that stops the robot when a working person enters the work area.

(8)   If necessary, install a safety lock so that no one except the working person in charge can turn on the power of the robot.

> The circuit breaker installed in the controller is designed to disable anyone from turning it on when it is locked with a padlock.

(9)   When adjusting each peripheral device independently, be sure to turn off the power of the robot

(10) Operators should be ungloved while manipulating the operator's panel or teach pendant. Operation with gloved fingers could cause an operation error.

(11) Programs, system variables, and other information can be saved on memory card or USB memories. Be sure to save the data periodically in case the data is lost in an accident.

(12) The robot should be transported and installed by accurately following the procedures recommended by FANUC. Wrong transportation or installation may cause the robot to fall, resulting in severe injury to workers.

(13) In the first operation of the robot after installation, the operation should be restricted to low speeds. Then, the speed should be gradually increased to check the operation of the robot.

(14) Before the robot is started, it should be checked that no one is in the area of the safety fence. At the same time, a check must be made to ensure that there is no risk of hazardous situations. If detected, such a situation should be eliminated before the operation.

(15) When the robot is used, the following precautions should be taken. Otherwise, the robot and peripheral equipment can be adversely affected, or workers can be severely injured.
    - Avoid using the robot in a flammable environment.
    - Avoid using the robot in an explosive environment.
    - Avoid using the robot in an environment full of radiation.
    - Avoid using the robot under water or at high humidity.
    - Avoid using the robot to carry a person or animal.
    - Avoid using the robot as a stepladder. (Never climb up on or hang from the robot.)

(16) When connecting the peripheral devices related to stop(safety fence etc.) and each signal (external emergency , fence etc.) of robot. be sure to confirm the stop movement and do not take the wrong connection.

(17) When preparing trestle, please consider security for installation and maintenance work in high place according to Fig.3 (c). Please consider footstep and safety bolt mounting position.
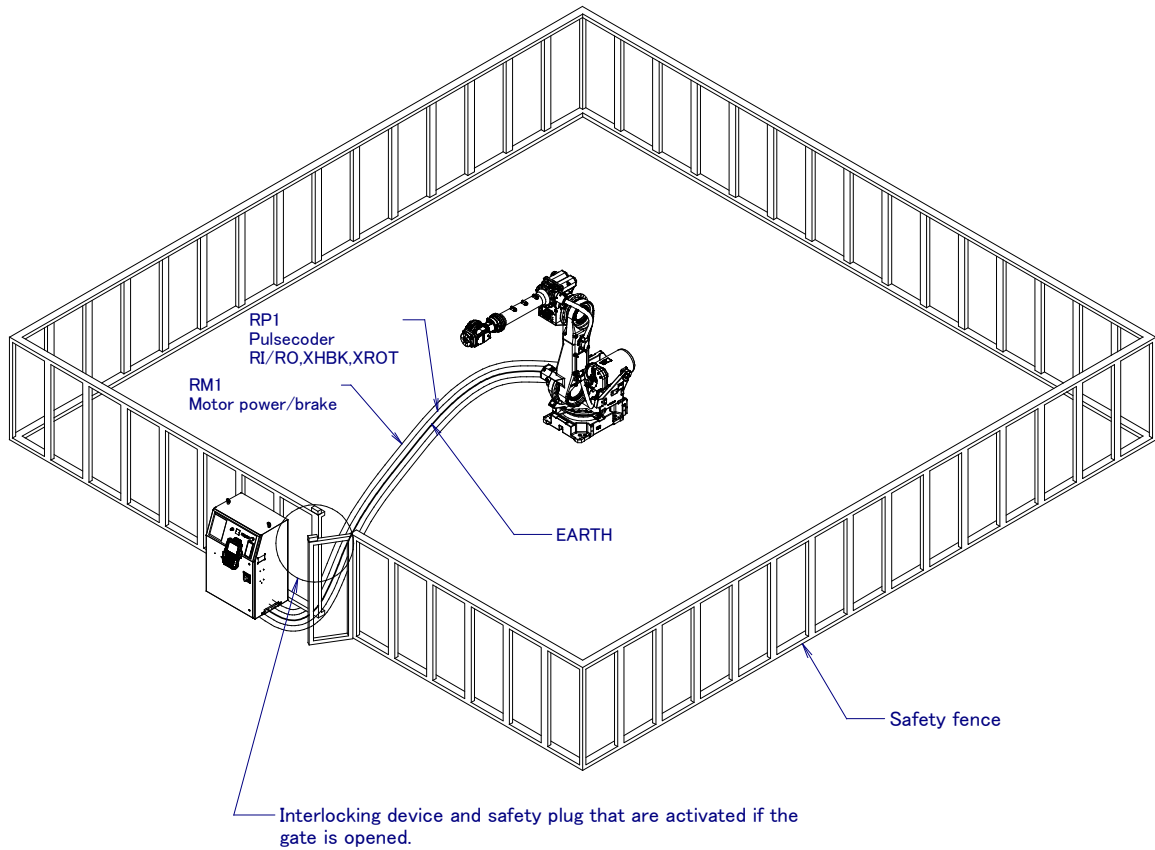
RP1
Pulsecoder
RI/RO,XHBK,XROT

RM1
Motor power/brake

EARTH

Safety fence

Interlocking device and safety plug that are activated if the
gate is opened.

Fig. 3 (a)   Safety fence and safety gate

Dual chain

Emergency stop board
or Panel board

EAS1

EAS11

EAS2

EAS21

Single chain

Panel board

FENCE1

FENCE2

(Note)

In case of R−30iB
Terminals EAS1,EAS11,EAS2,EAS21 are provided on the
emergency stop board.

In case R−30iA
Terminals EAS1,EAS11,EAS2,EAS21 are provided on the
emergency stop board or connector panel

In case R−30iA Mate
Terminals EAS1,EAS11,EAS2,EAS21 or FENCE1,FENCE2
are provided on the emergency stop board or in the connector
panel of CRM65（Open air type）.

Refer to the ELECTRICAL CONNCETIONS Chapter
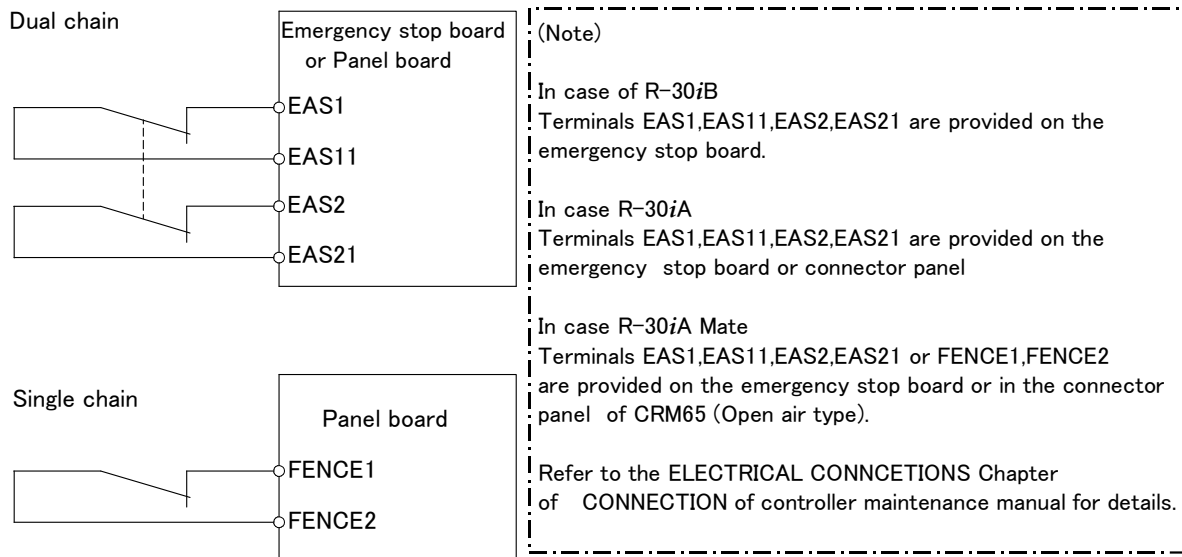of   CONNECTION of controller maintenance manual for details.

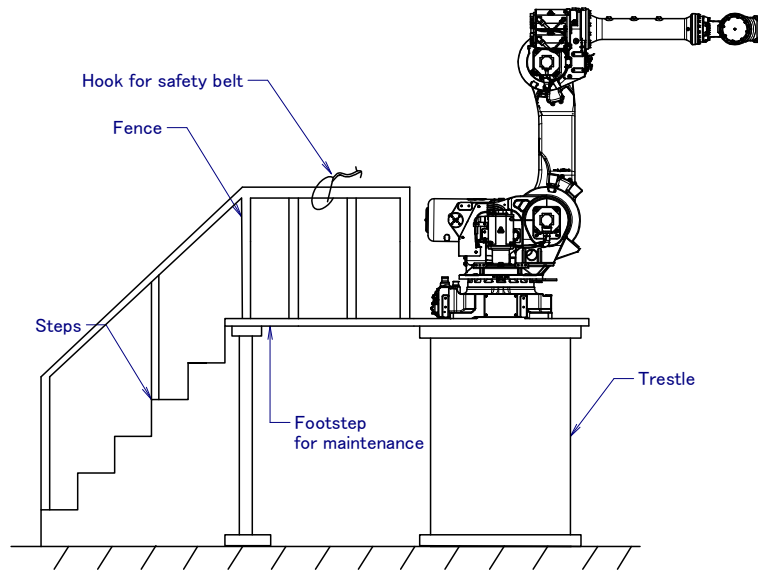**Fig. 3 (b)   Limit switch circuit diagram of the safety fence**

Fig.3 (c) Footstep for maintenance

3.1 OPERATOR SAFETY

The operator is a person who operates the robot system.   In this sense, a worker who operates the teach pendant is also an operator.   However, this section does not apply to teach pendant operators.

(1) If you do not have to operate the robot, turn off the power of the robot controller or press the EMERGENCY STOP button, and then proceed with necessary work.
(2) Operate the robot system at a location outside of the safety fence
(3) Install a safety fence with a safety gate to prevent any worker other than the operator from entering the work area unexpectedly and to prevent the worker from entering a dangerous area.
(4) Install an EMERGENCY STOP button within the operator's reach.

> The robot controller is designed to be connected to an external EMERGENCY STOP button. With this connection, the controller stops the robot operation (Please refer to "STOP TYPE OF ROBOT" in SAFETY PRECAUTIONS for detail of stop type), when the external EMERGENCY STOP button is pressed.   See the diagram below for connection.
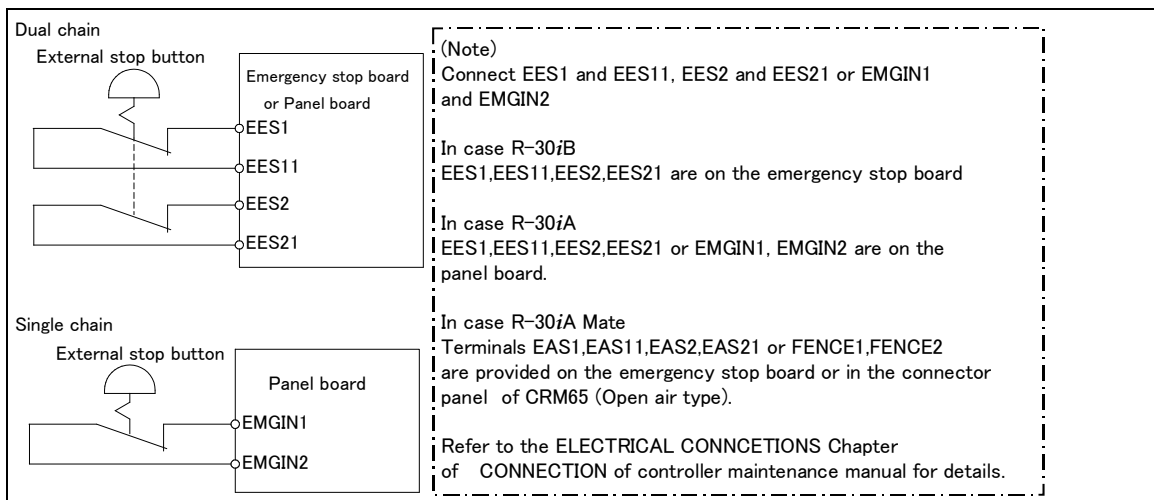

Fig.3.1 Connection diagram for external emergency stop button

3.2   SAFETY OF THE PROGRAMMER

While teaching the robot, the operator must enter the work area of the robot.   The operator must ensure the safety of the teach pendant operator especially.

(1)   Unless it is specifically necessary to enter the robot work area, carry out all tasks outside the area.
(2)   Before teaching the robot, check that the robot and its peripheral devices are all in the normal operating condition.
(3)   If it is inevitable to enter the robot work area to teach the robot, check the locations, settings, and other conditions of the safety devices (such as the EMERGENCY STOP button, the DEADMAN switch on the teach pendant) before entering the area.
(4)   The programmer must be extremely careful not to let anyone else enter the robot work area.
(5)   Programming should be done outside the area of the safety fence as far as possible. If programming needs to be done in the area of the safety fence, the programmer should take the following precautions:
   −   Before entering the area of the safety fence, ensure that there is no risk of dangerous situations in the area.
   −   Be prepared to press the emergency stop button whenever necessary.
   −   Robot motions should be made at low speeds.
   −   Before starting programming, check the entire system status to ensure that no remote instruction to the peripheral equipment or motion would be dangerous to the user.

Our operator panel is provided with an emergency stop button and a key switch (mode switch) for selecting the automatic operation mode (AUTO) and the teach modes (T1 and T2).   Before entering the inside of the safety fence for the purpose of teaching, set the switch to a teach mode, remove the key from the mode switch to prevent other people from changing the operation mode carelessly, then open the safety gate.   If the safety gate is opened with the automatic operation mode set, the robot stops (Please refer to "STOP TYPE OF ROBOT" in SAFETY PRECAUTIONS for detail of stop type).   After the switch is set to a teach mode, the safety gate is disabled.   The programmer should understand that the safety gate is disabled and is responsible for keeping other people from entering the inside of the safety fence. (In case of R-30*i*A Mate Controller standard specification, there is no mode switch.   The automatic operation mode and the teach mode is selected by teach pendant enable switch.)

Our teach pendant is provided with a DEADMAN switch as well as an emergency stop button.   These button and switch function as follows:
(1) Emergency stop button: Causes an emergency stop (Please refer to "STOP TYPE OF ROBOT" in SAFETY PRECAUTIONS for detail of stop type) when pressed.
(2) DEADMAN switch: Functions differently depending on the teach pendant enable/disable switch setting status.
   (a)   Disable: The DEADMAN switch is disabled.
   (b)   Enable: Servo power is turned off when the operator releases the DEADMAN switch or when the operator presses the switch strongly.
   Note) The DEADMAN switch is provided to stop the robot when the operator releases the teach pendant or presses the pendant strongly in case of emergency.   The R-30*i*B/R-30*i*A/ R-30*i*A Mate employs a 3-position DEADMAN switch, which allows the robot to operate when the 3-position DEADMAN switch is pressed to its intermediate point.   When the operator releases the DEADMAN switch or presses the switch strongly, the robot stops immediately.

The operator's intention of starting teaching is determined by the controller through the dual operation of setting the teach pendant enable/disable switch to the enable position and pressing the DEADMAN switch.   The operator should make sure that the robot could operate in such conditions and be responsible in carrying out tasks safely.

Based on the risk assessment by FANUC, number of operation of DEADMAN SW should not exceed about 10000 times per year.

The teach pendant, operator panel, and peripheral device interface send each robot start signal. However the validity of each signal changes as follows depending on the mode switch and the DEADMAN switch of the operator panel, the teach pendant enable switch and the remote condition on the software.

In case of R-30*i*B/R-30*i*A controller or CE or RIA specification of R-30*i*A Mate controller

Mode	Teach pendant enable switch	Software remote condition	Teach pendant	Operator panel	Peripheral device
AUTO mode	On	Local	Not allowed	Not allowed	Not allowed
		Remote	Not allowed	Not allowed	Not allowed
	Off	Local	Not allowed	Allowed to start	Not allowed
		Remote	Not allowed	Not allowed	Allowed to start
T1, T2 mode	On	Local	Allowed to start	Not allowed	Not allowed
		Remote	Allowed to start	Not allowed	Not allowed
	Off	Local	Not allowed	Not allowed	Not allowed
		Remote	Not allowed	Not allowed	Not allowed

T1,T2 mode:DEADMAN switch is effective.

In case of standard specification of R-30*i*A Mate controller

Teach pendant enable switch	Software remote condition	Teach pendant	Peripheral device
On	Ignored	Allowed to start	Not allowed
Off	Local	Not allowed	Not allowed
	Remote	Not allowed	Allowed to start

(6)   (Only when R-30*i*B/R-30*i*A Controller or CE or RIA specification of R-30*i*A Mate controller is selected.) To start the system using the operator's panel, make certain that nobody is the robot work area and that there are no abnormal conditions in the robot work area.

(7)   When a program is completed, be sure to carry out a test operation according to the procedure below.
   (a)   Run the program for at least one operation cycle in the single step mode at low speed.
   (b)   Run the program for at least one operation cycle in the continuous operation mode at low speed.
   (c)   Run the program for one operation cycle in the continuous operation mode at the intermediate speed and check that no abnormalities occur due to a delay in timing.
   (d)   Run the program for one operation cycle in the continuous operation mode at the normal operating speed and check that the system operates automatically without trouble.
   (e)   After checking the completeness of the program through the test operation above, execute it in the automatic operation mode.

(8)   While operating the system in the automatic operation mode, the teach pendant operator should leave the robot work area.

3.3   SAFETY OF THE MAINTENANCE ENGINEER

For the safety of maintenance engineer personnel, pay utmost attention to the following.

(1)   During operation, never enter the robot work area.
(2)   A hazardous situation may arise when the robot or the system, are kept with their power-on during maintenance operations. Therefore, for any maintenance operation, the robot and the system should be put into the power-off state. If necessary, a lock should be in place in order to prevent any other person from turning on the robot and/or the system. In case maintenance needs to be executed in the power-on state, the emergency stop button must be pressed.
(3)   If it becomes necessary to enter the robot operation range while the power is on, press the emergency stop button on the operator panel, or the teach pendant before entering the range. The

maintenance personnel must indicate that maintenance work is in progress and be careful not to allow other people to operate the robot carelessly.

(4)   When entering the area enclosed by the safety fence, the maintenance worker must check the entire system in order to make sure no dangerous situations exist. In case the worker needs to enter the safety area whilst a dangerous situation exists, extreme care must be taken, and entire system status must be carefully monitored.

(5)   Before the maintenance of the pneumatic system is started, the supply pressure should be shut off and the pressure in the piping should be reduced to zero.

(6)   Before the start of teaching, check that the robot and its peripheral devices are all in the normal operating condition.

(7)   Do not operate the robot in the automatic mode while anybody is in the robot work area.

(8)   When you maintain the robot alongside a wall or instrument, or when multiple workers are working nearby, make certain that their escape path is not obstructed.

(9)   When a tool is mounted on the robot, or when any moving device other than the robot is installed, such as belt conveyor, pay careful attention to its motion.

(10) If necessary, have a worker who is familiar with the robot system stand beside the operator panel and observe the work being performed. If any danger arises, the worker should be ready to press the EMERGENCY STOP button at any time.

(11) When replacing a part, please contact FANUC service center. If a wrong procedure is followed, an accident may occur, causing damage to the robot and injury to the worker.

(12) When replacing or reinstalling components, take care to prevent foreign material from entering the system.

(13) When handling each unit or printed circuit board in the controller during inspection, turn off the circuit breaker to protect against electric shock.
      If there are two cabinets, turn off the both circuit breaker.

(14) A part should be replaced with a part recommended by FANUC. If other parts are used, malfunction or damage would occur. Especially, a fuse that is not recommended by FANUC should not be used. Such a fuse may cause a fire.

(15) When restarting the robot system after completing maintenance work, make sure in advance that there is no person in the work area and that the robot and the peripheral devices are not abnormal.

(16) When a motor or brake is removed, the robot arm should be supported with a crane or other equipment beforehand so that the arm would not fall during the removal.

(17) Whenever grease is spilled on the floor, it should be removed as quickly as possible to prevent dangerous falls.

(18) The following parts are heated. If a maintenance worker needs to touch such a part in the heated state, the worker should wear heat-resistant gloves or use other protective tools.
      − Servo motor
      − Inside the controller
      − Reducer
      − Gearbox
      − Wrist unit

(19) Maintenance should be done under suitable light. Care must be taken that the light would not cause any danger.

(20) When a motor, reducer, or other heavy load is handled, a crane or other equipment should be used to protect maintenance workers from excessive load. Otherwise, the maintenance workers would be severely injured.

(21) The robot should not be stepped on or climbed up during maintenance. If it is attempted, the robot would be adversely affected. In addition, a misstep can cause injury to the worker.

(22) When performing maintenance work in high place, secure a footstep and wear safety belt.

(23) After the maintenance is completed, spilled oil or water and metal chips should be removed from the floor around the robot and within the safety fence.

(24) When a part is replaced, all bolts and other related components should put back into their original places. A careful check must be given to ensure that no components are missing or left not mounted.

(25) In case robot motion is required during maintenance, the following precautions should be taken :

    - Foresee an escape route. And during the maintenance motion itself, monitor continuously the whole system so that your escape route will not become blocked by the robot, or by peripheral equipment.

    - Always pay attention to potentially dangerous situations, and be prepared to press the emergency stop button whenever necessary.

(26) The robot should be periodically inspected. (Refer to the robot mechanical manual and controller maintenance manual.) A failure to do the periodical inspection can adversely affect the performance or service life of the robot and may cause an accident

(27) After a part is replaced, a test operation should be given for the robot according to a predetermined method. (See TESTING section of "Controller operator's manual".) During the test operation, the maintenance staff should work outside the safety fence.

4 SAFETY OF THE TOOLS AND PERIPHERAL DEVICES

4.1 PRECAUTIONS IN PROGRAMMING

(1) Use a limit switch or other sensor to detect a dangerous condition and, if necessary, design the program to stop the robot when the sensor signal is received.

(2) Design the program to stop the robot when an abnormal condition occurs in any other robots or peripheral devices, even though the robot itself is normal.

(3) For a system in which the robot and its peripheral devices are in synchronous motion, particular care must be taken in programming so that they do not interfere with each other.

(4) Provide a suitable interface between the robot and its peripheral devices so that the robot can detect the states of all devices in the system and can be stopped according to the states.

4.2 PRECAUTIONS FOR MECHANISM

(1) Keep the component cells of the robot system clean, and operate the robot in an environment free of grease, water, and dust.

(2) Don't use unconfirmed liquid for cutting fluid and cleaning fluid.

(3) Employ a limit switch or mechanical stopper to limit the robot motion so that the robot or cable does not strike against its peripheral devices or tools.

(4) Observe the following precautions about the mechanical unit cables. When theses attentions are not kept, unexpected troubles might occur.
   - Use mechanical unit cable that have required user interface.
   - Don't add user cable or hose to inside of mechanical unit.
   - Please do not obstruct the movement of the mechanical unit cable when cables are added to outside of mechanical unit.
   - In the case of the model that a cable is exposed, Please do not perform remodeling (Adding a protective cover and fix an outside cable more) obstructing the behavior of the outcrop of the cable.
   - Please do not interfere with the other parts of mechanical unit when install equipments in the robot.

(5) The frequent power-off stop for the robot during operation causes the trouble of the robot. Please avoid the system construction that power-off stop would be operated routinely. (Refer to bad case example.) Please execute power-off stop after reducing the speed of the robot and stopping it by hold stop or cycle stop when it is not urgent. (Please refer to "STOP TYPE OF ROBOT" in SAFETY PRECAUTIONS for detail of stop type.)
   (Bad case example)

- Whenever poor product is generated, a line stops by emergency stop.
- When alteration was necessary, safety switch is operated by opening safety fence and power-off stop is executed for the robot during operation.
- An operator pushes the emergency stop button frequently, and a line stops.
- An area sensor or a mat switch connected to safety signal operate routinely and power-off stop is executed for the robot.

(6) Robot stops urgently when collision detection alarm (SRVO-050) etc. occurs. The frequent urgent stop by alarm causes the trouble of the robot, too. So remove the causes of the alarm.

5 SAFETY OF THE ROBOT MECHANISM

5.1 PRECAUTIONS IN OPERATION

(1) When operating the robot in the jog mode, set it at an appropriate speed so that the operator can manage the robot in any eventuality.
(2) Before pressing the jog key, be sure you know in advance what motion the robot will perform in the jog mode.

5.2 PRECAUTIONS IN PROGRAMMING

(1) When the work areas of robots overlap, make certain that the motions of the robots do not interfere with each other.
(2) Be sure to specify the predetermined work origin in a motion program for the robot and program the motion so that it starts from the origin and terminates at the origin.
    Make it possible for the operator to easily distinguish at a glance that the robot motion has terminated.

5.3 PRECAUTIONS FOR MECHANISMS

(1) Keep the work areas of the robot clean, and operate the robot in an environment free of grease, water, and dust.

5.4 PROCEDURE TO MOVE ARM WITHOUT DRIVE POWER IN EMERGENCY OR ABNORMAL SITUATIONS

For emergency or abnormal situations (e.g. persons trapped in or by the robot), brake release unit can be used to move the robot axes without drive power.
Please refer to controller maintenance manual and mechanical unit operator's manual for using method of brake release unit and method of supporting robot.

6   SAFETY OF THE END EFFECTOR

6.1   PRECAUTIONS IN PROGRAMMING

(1) To control the pneumatic, hydraulic and electric actuators, carefully consider the necessary time delay after issuing each control command up to actual motion and ensure safe control.
(2) Provide the end effector with a limit switch, and control the robot system by monitoring the state of the end effector.

7   STOP TYPE OF ROBOT

The following three robot stop types exist:

Power-Off Stop (Category 0 following IEC 60204-1)
Servo power is turned off and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.
The following processing is performed at Power-Off stop.
-     An alarm is generated and servo power is turned off.
-     The robot operation is stopped immediately. Execution of the program is paused.

Controlled stop (Category 1 following IEC 60204-1)
The robot is decelerated until it stops, and servo power is turned off.
The following processing is performed at Controlled stop.
-     The alarm "SRVO-199 Controlled stop" occurs along with a decelerated stop. Execution of the program is paused.
-     An alarm is generated and servo power is turned off.

Hold (Category 2 following IEC 60204-1)
The robot is decelerated until it stops, and servo power remains on.
The following processing is performed at Hold.
-     The robot operation is decelerated until it stops. Execution of the program is paused.

> ⚠ **WARNING**
> The stopping distance and stopping time of Controlled stop are longer than the stopping distance and stopping time of Power-Off stop. A risk assessment for the whole robot system, which takes into consideration the increased stopping distance and stopping time, is necessary when Controlled stop is used.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Power-Off stop or Controlled stop. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the controller type or option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Servo disconnect
A	AUTO	P-Stop	P-Stop	C-Stop	C-Stop	P-Stop
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
B	AUTO	P-Stop	P-Stop	P-Stop	P-Stop	P-Stop
	T1	P-Stop	P-Stop	-	P-Stop	P-Stop
	T2	P-Stop	P-Stop	-	P-Stop	P-Stop
C	AUTO	C-Stop	C-Stop	C-Stop	C-Stop	C-Stop
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop

P-Stop: Power-Off stop
C-Stop: Controlled stop
-:   Disable

The following table indicates the Stop pattern according to the controller type or option configuration.

Option	R-30iB
Standard	A (*)
Controlled stop by E-Stop (A05B-2600-J570)	C (*)

(*)   R-30iB does not have servo disconnect.

Option	R-30iA				R-30iA Mate		
	Standard (Single)	Standard (Dual)	RIA type	CE type	Standard	RIA type	CE type
Standard	B (*)	A	A	A	A (**)	A	A
Stop type set (Stop pattern C) (A05B-2500-J570)	N/A	N/A	C	C	N/A	C	C

 (*)   R-30iA standard (single) does not have servo disconnect.
(**) R-30iA Mate Standard does not have servo disconnect, and the stop type of SVOFF input is Power-Off stop.

The stop pattern of the controller is displayed in "Stop pattern" line in software version screen. Please refer to "Software version" in operator's manual of controller for the detail of software version screen.

"Controlled stop by E-Stop" option

When "Controlled stop by E-Stop" (A05B-2600-J570) option (In case of R-30iA/R-30iA Mate, it is Stop type set (Stop pattern C) (A05B-2500-J570)) is specified, the stop type of the following alarms becomes Controlled stop but only in AUTO mode.   In T1 or T2 mode, the stop type is Power-Off stop which is the normal operation of the system.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open. (R-30iA/R-30iB controller)
SRVO-194 Servo disconnect	Servo disconnect input (SD4-SD41, SD5-SD51) is open. (R-30iA controller)
SRVO-218 Ext.E-stop/Servo Disconnect	External emergency stop input (EES1-EES11, EES2-EES21) is open. (R-30iA Mate/R-30iB controller)
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Controlled stop is different from Power-Off stop as follows:
- In Controlled stop, the robot is stopped on the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Controlled stop, physical impact is less than Power-Off stop. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End Of Arm Tool) should be minimized.
- The stopping distance and stopping time of Controlled stop is longer than the stopping distance and stopping time of Power-Off stop, depending on the robot model and axis. Please refer to the operator's manual of a particular robot model for the data of stopping distance and stopping time.

In case of R-30*i*A or R-30*i*A Mate, this function is available only in CE or RIA type hardware.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and stopping time of Controlled stop are longer than the stopping distance and stopping time of Power-Off stop. A risk assessment for the whole robot system, which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

120919

TABLE OF CONTENTS

ADDITIONAL INFORMATION

OPERATION

1   CC-LINK INTERFACE (SLAVE) OVERVIEW

The CC-Link Interface (Slave) function on robot is a communication function that conforms to the protocol, CC-Link Version 1.11 of CLPA (CC-Link PARTNER ASSOCIATION). Robot with this function acts as a Remote Device station.

One of the following hardware is necessary to use this function. Please see the following important notices for R-30*i*A and R-30*i*A Mate.

R-30*i*A
"CC-Link Remote Device Station PCB(A)" or "CC-Link Remote Device Station PCB(B)"
R-30*i*A Mate
"CC-Link Remote Device Station PCB(B)"
R-30*i*B
"CC-Link Remote Device Station PCB(B)"

> **NOTE**
> **Please verify the software version when the controller is R-30*i*A.**
> "CC-Link Remote Device Station PCB(B)" is supported by 7DA1/22 or later (including 7DA3/XX). If the version is older than 7DA1/22 or the version is 7DA0/XX, please use "CC-Link Remote Device Station PCB(A)". If the controller is R-30*i*A Mate, "CC-Link Remote Device Station PCB(B)" is supported.

> **NOTE**
> **Please see the following notices if the controller is R-30*i*A.**
> "4-slot back plane" is necessary to use "CC-Link Remote Device Station PCB(A)".
> Please do not use "CC-Link Remote Device Station PCB(A)" and "CC-Link Remote Device Station PCB(B)" at the same time. Please install 2 CC-Link boards of the same type when 2 CC-Link boards are to be used.

> **NOTE**
> **Please see the following notice if the controller is R-30*i*A Mate.**
> "CC-Link Remote Device Station PCB(A)" cannot be installed to R-30*i*A Mate controller.
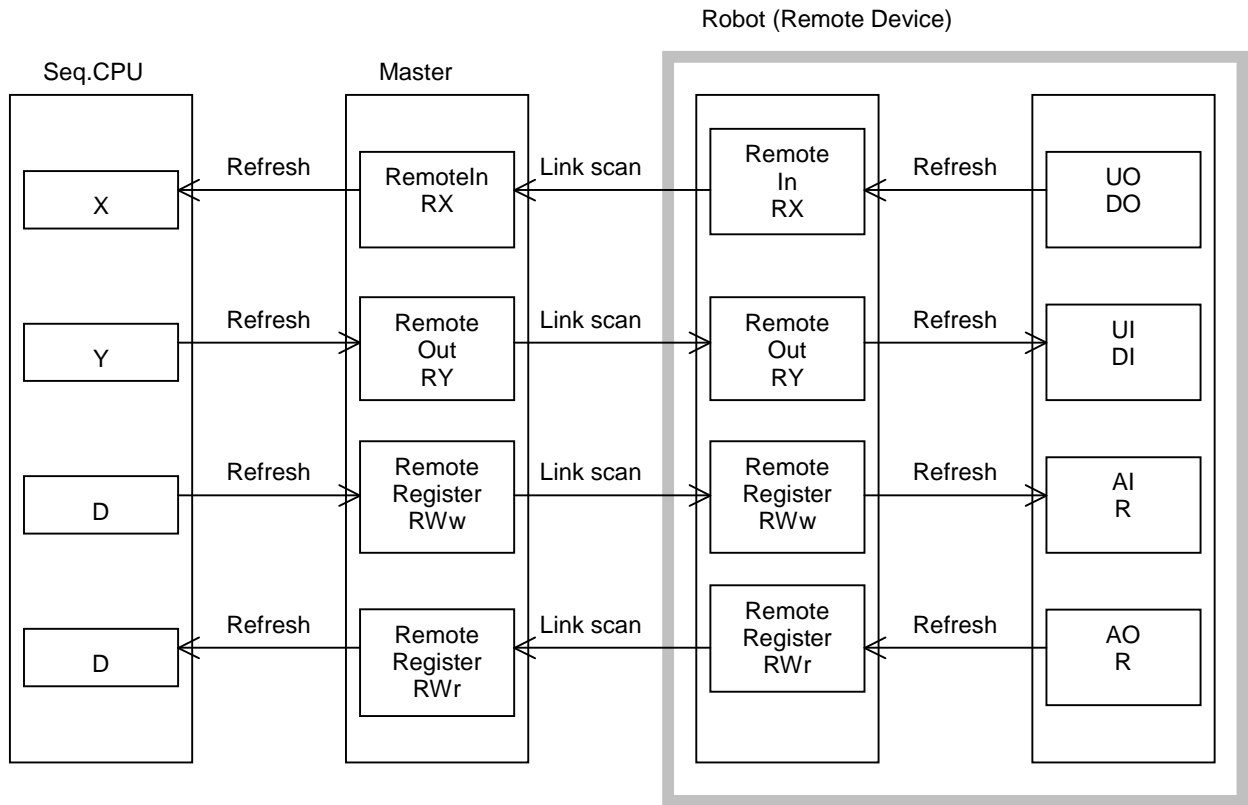
> **NOTE**
> **Please see the following notice if the controller is R-30*i*B.**
> "CC-Link Remote Device Station PCB(A)" cannot be installed to R-30*i*B controller.

1.1   FEATURE

The CC-Link Interface (Slave) function exchanges Digital I/O data (DI/DO) and UOP data (UI/UO) via Remote Input/Output (RX/RY), and exchanges Analog I/O data (AI/AO) and Register data (R) via Remote Registers (RWr/RWw).

1.2   TERMS

TERMS	DESCRIPTION
Remote Device station	A station that can exchange both bit data and 16 bit words.
Remote Input :RX /Remote Output:RY	Bit data transmitted within a CC-Link network or an area stored with this bit data. Input data on the Master station is named RX and output data is named RY.
Remote Register RWr /Remote Register RWw	16 bit words transmitted within a CC-Link network or an area stored with this word data. Input data on the Master station is named RWr and output data is named RWw.

1.3   SPECIFICATION OVERVIEW

Table 1.3 CC-Link interface (slave) specification overview

ITEM	SPECIFICATION
Communication protocol	CC-Link Version 1.11
Station type	Remote Device station
Baud rate	165K, 625K, 2.5M, 5M or 10M bps can be selected.
Number of CC-Link communication boards that can be installed on a robot.	2 Please see 1.4 ORDER NUMBER for the detail of CC-Link communication board.
Number of CC-Link Remote Device Stations by a CC-Link communication board.	1, 2, 3 or 4 stations can be occupied.

ITEM	SPECIFICATION
Number of data that can be exchanged by a CC-Link communication board. (In case of 4 stations occupancy)	Remote In RX : User area 112 + System area 16* Remote Out RY: User area 112 + System area 16* Remote Register RWr: 16** Remote Register RWw: 16**

How to add the second CC-Link communication board when "CC-Link Remote Device Station PCB(A)" is used.	Add another CC-Link daughter board to CC-Link mother board. (NOTICE:
	  Only one CC-Link mother board can be installed.
	  Up to two CC-Link daughter boards can be installed.)

How to add the second CC-Link communication board when "CC-Link Remote Device Station PCB(B)" is used.	Add another CC-Link Remote Device Station PCB(B) to an empty slot of the controller. (NOTICE: Up to two CC-Link Remote Device Station PCB(B) can be installed.)
Restriction of CC-Link hardware	Do not install CC-Link Remote Device Station PCB(A) and CC-Link Remote Device Station PCB(B) at the same time.

(*) The usage of "System area" is defined in "CC-Link Specifications (Profile) BTP-05028" of CLPA. The "System area" can not be used for any purposes other than the defined usage.
(**) The data is restricted to the patterns.   Refer to the section 2.3 Remote Resister.

1.4   ORDER NUMBER

Table 1.4 CC-Link interface (slave)

Name	Order number
CC-Link Interface (Slave)	A05B-2500-J786 NOTE) 7DA0/17 or later of R-30*i*A/R-30*i*A Mate
CC-Link Interface (Slave)	A05B-2600-J786 NOTE) R-30*i*B

One of the following hardware is necessary to use this function.

R-30*i*A
  "CC-Link Remote Device Station PCB(A)" or "CC-Link Remote Device Station PCB(B)"
R-30*i*A Mate
  "CC-Link Remote Device Station PCB(B)"
R-30*i*B
  "CC-Link Remote Device Station PCB(B)"

  "CC-Link Remote Device Station PCB(A)" cannot be installed to R-30*i*A Mate/R-30*i*B.
Please use CC-Link Remote Device Station PCB(B) for R-30*i*A Mate/R-30*i*B.

1.4.1   CC-Link Remote Device Station PCB(A)

CC-Link Remote Device Station PCB(A) consists of a CC-Link mother board and at least one CC-Link daughter board. You can install up to two CC-Link daughter boards on a CC-Link mother board. Please order A05B-2500-J061 "CC-Link Remote Device Station PCB" to use only one daughter board.   You can get one mother board and one daughter board by A05B-2500-J061. If you want to get only a daughter board, please order A05B-2500-J062 "CC-Link Remote Device Station daughter board".   You need to install two daughter boards then please order A05B-2500-J061 AND A05B-2500-J062, and install second daughter board to your mother board.   The following section "B.1 installation" describes how to install a daughter board.

To install CC-Link mother board, you should use A05B-2500-H081 4slot back plane.

1.4.2   CC-Link Remote Device Station PCB(B)

CC-Link Remote Device Station PCB(B) is installed to an option slot of R-30*i*A/R-30*i*A/R-30*i*B controller directly (Therefore, no mother board is necessary for CC-Link Remote Device Station PCB(B)). Up to 2 CC-Link Remote Device Station PCB(B) can be installed to R-30*i*A/R-30*i*A Mate/ R-30*i*B controller. Please order A05B-2500-J110 or A05B-2600-J110 "CC-Link Remote Device Station PCB(B)" to purchase a CC-Link Remote Device Station PCB(B).

If the controller is R-30*i*A, please check the software version. "CC-Link Remote Device Station PCB(B)" is supported by 7DA1/22 or later (including 7DA3/XX). If the version is older than 7DA1/22 or the version is 7DA0/XX, please use "CC-Link Remote Device Station PCB(A)". If the controller is R-30*i*A Mate/R-30*i*B, "CC-Link Remote Device Station PCB(B)" is supported.

Table 1.4.2 CC-Link remote device station PCB

Name	Order number
CC-Link Remote Device Station PCB(A) (CC-Link mother board and CC-Link daughter board)	A05B-2500-J061 NOTE: R-30*i*A only
CC-Link Remote Device Station daughter board (CC-Link daughter board)	A05B-2500-J062 NOTE: R-30*i*A only
CC-Link Remote Device Station PCB(B) (No CC-Link mother board is necessary)	A05B-2500-J110 NOTE: R-30*i*A/ R-30*i*A Mate
CC-Link Remote Device Station PCB(B) (No CC-Link mother board is necessary)	A05B-2600-J110 NOTE: R-30*i*B only

2 SETUP

This chapter describes the setting of CC-Link Interface (Slave) function.

2.1 CC-LINK INTERFACE SETUP

The following table shows the setup items of CC-Link Interface (Slave) funciton. You must set up these items referring to their descriptions, before you can use this function.

Table 2.1 (a) Setup items of CC-Link interface

ITEM	DESCRIPTION
Error one shot default: DISABLE	ENABLE: The errors of CC-Link Interface (Slave) function can be reset, even while this function is in the error state. e.g. You should enable this item if you need to move the robot even while a data link error is occurring. DISABLE: The errors of CC-Link Interface (Slave) function can NOT be reset before their causes are resolved. **NOTE) If this item is enabled, the robot can move even while this function is in the error state. Disable this item before starting a production.**
Station No. range: 1 to 64 default: 1	This item indicates the station number. In case that two or more stations are occupied, enter the head number of these. For example, if StationNo.=10 and Number of Stations=4, then Station No.10, 11, 12 and 13 will be occupied. If Station No.65 or later is occupied, then "PRIO-322 St.No out of range" will be posted. Enter values that meet the following condition: StationNo. + Number of Stations - 1 <= 64
Number of Stations range: 1 to 4 default: 4	This item indicates the number of stations that will be occupied. The number of bit data and word data exchanged will be decided according to this item. **NOTE) The last 16 points of bit data are assigned to DI/DO, but their usage is limited to the usage as system area. For example, user program can't turn on the DO in the system area.** **NOTE) The UOP(UI/UO) will NOT be assigned when the number of stations is 1.**
Baudrate default: 10Mbps	This item indicates the baud rate. The following baud rates are available. - 156Kbps - 625Kbps - 2.5Mbps - 5Mbps - 10Mbps
RWr (x)	By the following setting, Analog output(AO) and Registers(R) will be assigned to Remote Registers(RWr). The number of RWr data will be decided according to the number of stations. (The number of RWr data 'x' will be shown in brackets).
Number of AOs range: 0 to 32766 default: 0	This item indicates the number of Analog outputs(AO) that will be assigned to RWr. Enter a value that meets the following condition: Number of AOs + Number of Registers <= x

ITEM	DESCRIPTION
Number of Registers range: 0 to 32766 default: 0	This item indicates the number of Registers(R) that will be assigned to RWr. Enter a value that meets the following condition: Number of AOs + Number of Registers <= x
Reg start index range: 1 to 32766 default: 1	This item indicates the head number of Registers(R) that will be assigned to RWr. For example, if Number of Registers=2 and Reg start index=1, then R[1] and R[2] will be assigned to RWr. **NOTE) Assign existent Registers.**
RWw (y)	By the following setting, Analog input(AI) and Registers(R) will be assigned to Remote Registers(RWw). The number of RWw data will be decided according to the number of stations. (The number of RWw data 'y' will be shown in brackets).
Number of AIs range: 0 to 32766 default: 0	This item indicates the number of Analog inputs(AI) that will be assigned to RWw. Enter a value that meets the following condition: Number of AIs + Number of Registers <= y
Number of Registers range: 0 to 32766 default: 0	This item indicates the number of Registers(R) that will be assigned to RWw. Enter a value that meets the following condition: Number of AIs + Number of Registers <= x
Reg start index range: 1 to 32766 default: 10	This item indicates the head number of Registers(R) that will be assigned to RWw. For example, if Number of Registers=5 and Reg start index=5, then R[5], R[6], R[7], R[8] and R[9] will be assigned to RWw. **NOTE) Assign existent Registers.**
Reg Data range: Unsigned Int or Int default: Unsigned Int	This item specifies the data type of robot side receiving remote registers RWw that are assigned to Registers (R). You can select whether unsigned Integer (Range: 0 to 65535) or Integer (Range: -32768 to 32767). **NOTE)** **1. This setting doesn't affect to robot side sending register RWr. Accommodate the possible range of sending register (R[*]) and receiving side setting (Unsigned Int or Signed Int). If these aren't matched, invalid data exchange may happen.** **2. Remote registers RWr or RWw assigned to analog input output AI/O are always handled as unsigned Integer.**

CC-Link SETUP screen will be displayed by the following steps:

```
┌─────────────┐
│   MENUS     │ →  6 SETUP  →  F1 TYPE  →  CC-Link
└─────────────┘
```

```
┌──────────────────────────────────────────────────┐
│ SETUP CC-Link                    JOINT 10%         │
│ Remote device board:1                   1/10       │
│                                                    │
│  1 Error one shot:               DISABLE           │
│  2 Station No.:                  1                 │
│  3 Number of Stations:           4                 │
│  4 Baudrate:                     [ 10Mbps ]        │
│  RWr ( 16 )                                        │
│  5 Number of AOs:                0                 │
│  6 Number of Registers:          0                 │
│  7 Reg start index:              1                 │
│  RWw ( 16 )                                        │
│  8 Number of AIs:                0                 │
│  9 Number of Registers:          0                 │
│  10  Reg start index:            10                │
│  11  Reg Data:                   [Unsigned Int]    │
│    [ TYPE ]          BOARD                 >        │
│   CLA_ASG                                  >        │
└──────────────────────────────────────────────────┘
```

NOTE
1 When you change "Number of Stations", "Number of AIs" or "Number of AOs",
   clear the current I/O assignment by pushing NEXT and F1(CLR_ASG). The
   changes will be activated at the next power-on.
2 When you change "Station No." or its following items, cycle power to activtate
   the changes.
3 In case that two CC-Link communication boards are installed to a robot, the
   board which has a smaller physical slot number will be "Board1" and another will
   be "Board2". For information of the physical slot number, refer to "B.1
   Installation".
4 The values set on this screen will be saved in the system file "CCLINK.SV." This
   SV file can be saved by All backup operation in the FILE screen.
5 If an out of range value is entered into a remote register, "PRIO-331 CC-LK Reg
   data invalid (Board No.)" will be posted and zero value will be sent to master
   device instead of the invalid register data.

2.2   REMOTE INPUT/OUTPUT(RX/RY)

The number of Remote input data(RX) and Remote output data(RY) exchanged by the CC-Link Interface
function is decided according to the number of stations. The following table shows the relation between
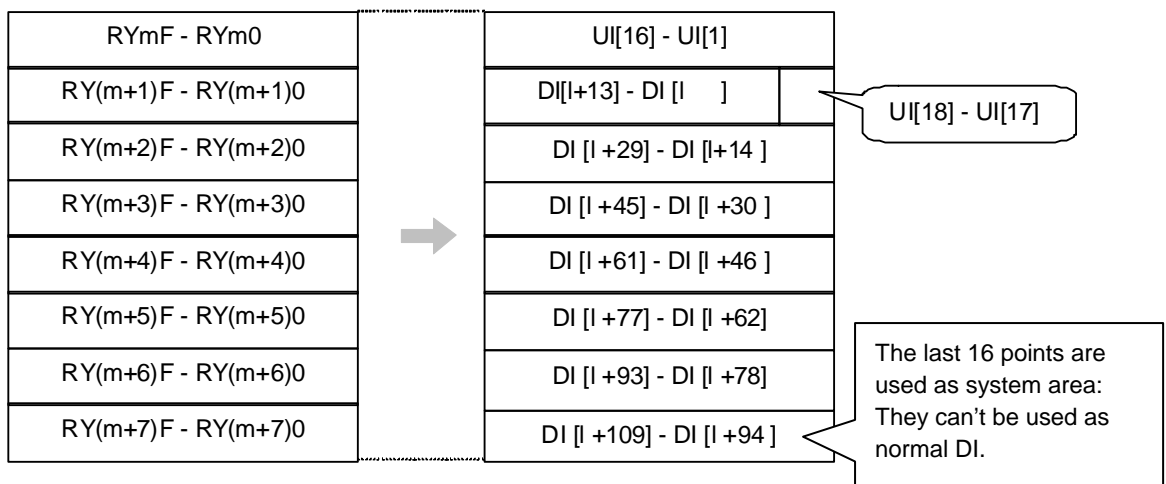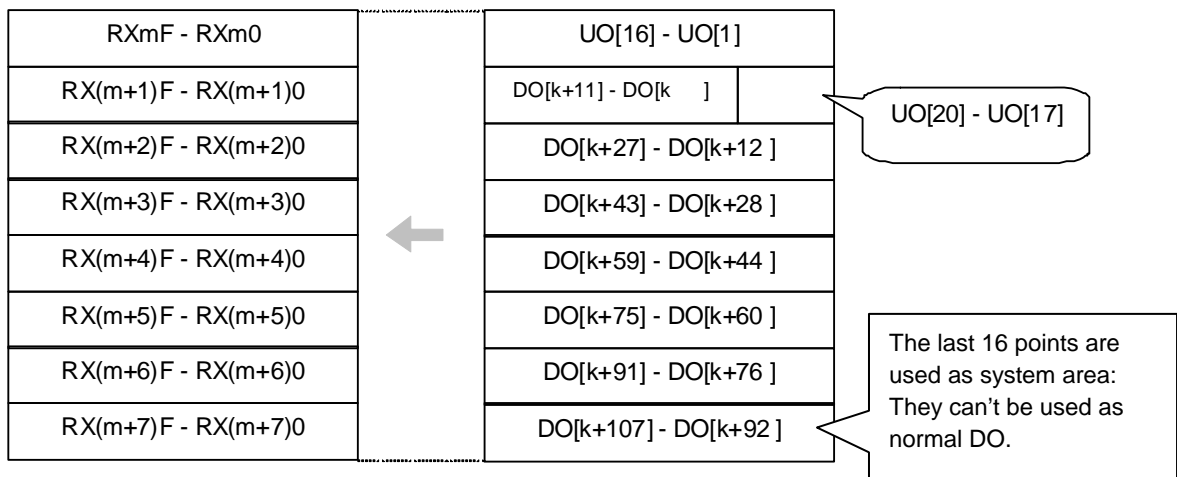the number of RX/RY and the number of stations.

	1 station	2 stations	3 stations	4 stations
Remote input RX	User area 16 pnts + System area 16 pnts	User area 48 pnts + System area 16 pnts	User area 80 pnts + System area 16 pnts	User area 112 pnts + System area 16 pnts
Remote output RY	User area 16 pnts + System area 16 pnts	User area 48 pnts + System area 16 pnts	User area 80 pnts + System area 16 pnts	User area 112 pnts + System area 16 pnts

UOP output (UO) and Digital output (DO) will be assigned to Remote input (RX) in turn. UOP input (UI) and Digital input (DI) will be assigned to Remote output (RY) in turn.

NOTE
1 The last 16 points of DI/DO of CC-Link are used as system area, but their usage is limited to the usage as system area. For example, user program can't turn on the DO in the system area.
2 The following change of the system variable prevents the UOP from being assigned to RX/RY. When you change the system variable, clear the I/O assignment and cycle power.
    $CCLINKRD[board no.].$ASGUOP = TRUE -> FALSE
3 In case of 1 station, the UOP(UI/UO) will NOT be assigned.

---

e.g. Number of Stations=4, UO:20 points, UI:18 points.

RX / Remote input		Data mapping
RXmF - RXm0		UO[16] - UO[1]
RX(m+1)F - RX(m+1)0		DO[k+11] - DO[k] / UO[20] - UO[17]
RX(m+2)F - RX(m+2)0		DO[k+27] - DO[k+12]
RX(m+3)F - RX(m+3)0		DO[k+43] - DO[k+28]
RX(m+4)F - RX(m+4)0	←	DO[k+59] - DO[k+44]
RX(m+5)F - RX(m+5)0		DO[k+75] - DO[k+60]
RX(m+6)F - RX(m+6)0		DO[k+91] - DO[k+76]
RX(m+7)F - RX(m+7)0		DO[k+107] - DO[k+92]

The last 16 points are used as system area: They can't be used as normal DO.

RY / Remote output		Data mapping
RYmF - RYm0		UI[16] - UI[1]
RY(m+1)F - RY(m+1)0		DI[l+13] - DI [l] / UI[18] - UI[17]
RY(m+2)F - RY(m+2)0		DI [l +29] - DI [l+14]
RY(m+3)F - RY(m+3)0		DI [l +45] - DI [l +30]
RY(m+4)F - RY(m+4)0	→	DI [l +61] - DI [l +46]
RY(m+5)F - RY(m+5)0		DI [l +77] - DI [l +62]
RY(m+6)F - RY(m+6)0		DI [l +93] - DI [l +78]
RY(m+7)F - RY(m+7)0		DI [l +109] - DI [l +94]

The last 16 points are used as system area: They can't be used as normal DI.

NOTE
1   The value of 'm' will be decided according to the Station No. Refer to the
    CC-Link Master station manual for details.
2   The value of 'k' and 'l' will be decided by the system automatically but you can
    change them. To check and change the value, refer to the Digital I/O CONFIG
    screen. The following shows Rack No. and Slot No. of the CC-Link
    communication board.

Rack No.	92
Slot No.	Board 1: 1
	Board 2: 2

3   The last 16 points of DI/DO of CC-Link are used as system area, and their usage
    is limited to the usage as system area. For example, user program can'␣t turn on
    the DO in the system area.

NOTE
4   The following change of the system variable prevents the UOP from being
    assigned to RX/RY. When you change the system variable, clear the I/O
    assignment and cycle power.
    $CCLINKRD[board no.].$ASGUOP = TRUE -> FALSE
5   In case of 1 station, the UOP(UI/UO) will NOT be assigned.

2.3   REMOTE REGISTER(RWr/RWw)

The number of Remote register data(RWr/RWw) exchanged by the CC-Link Interface function is decided according to the number of stations. The following table shows the relation between the number of RWr/RWw and the number of stations.

	1 station	2 stations	3 stations	4 stations
Remote register RWr	4 points	8 points	12 points	16 points
Remote register RWw	4 points	8 points	12 points	16 points

Analog output (AO) and Registers (R) will be assigned to Remote registers (RWr) in turn. Analog input (AI) and Registers (R) will be assigned to Remote registers (RWw) in turn.

The value exchanged via R is unsigned word data (16bits) of which the range is 0 to 65535, or signed word data (16bits) of which the range is –32768 to 32767. In R-30iB, you can send float value, which is larger than -32769 and smaller than 65536, if $CCLINKRD[board No.].$AUTO_REGCHG is set to not 0. The value is sent with integer by cutting off the floating part.
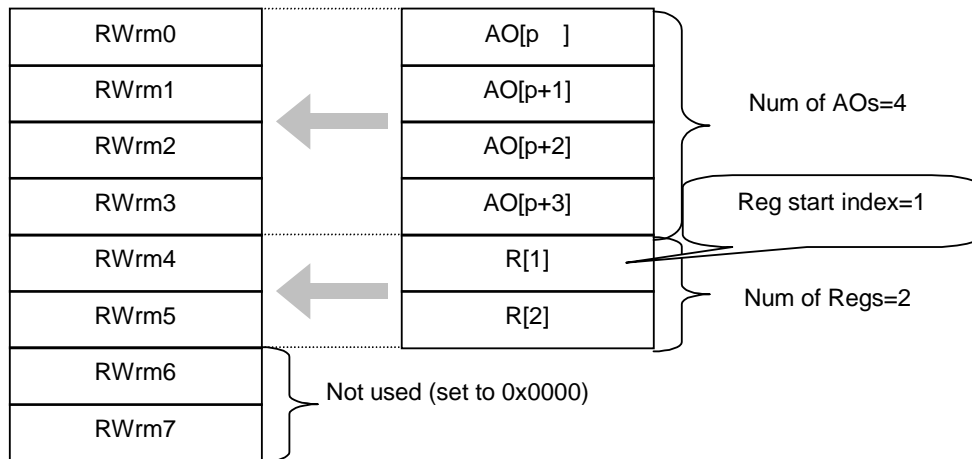The value exchanged via AI/AO is always unsigned word data (16bits) of which the range is 0 to 65535 (0x0000 to 0xFFFF).

e.g. Assignment to RWr (2 stations)
Number of Stations   = 2
Number of AOs   = 4
Number of Registers   = 2
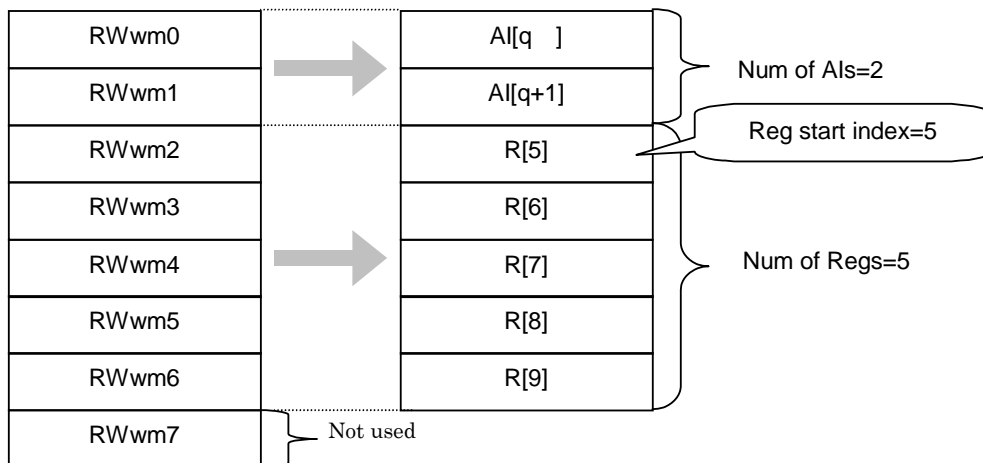Reg start index   = 1

RWrm0		AO[p]	
RWrm1	←	AO[p+1]	Num of AOs=4
RWrm2		AO[p+2]	
RWrm3		AO[p+3]	Reg start index=1
RWrm4	←	R[1]	
RWrm5		R[2]	Num of Regs=2
RWrm6		Not used (set to 0x0000)	
RWrm7			

NOTE

1 The value of 'm' will be decided according to the Station No. Refer to the CC-Link Master station manual for details

2 The value of 'p' will be decided by the system automatically but you can change them. To check and change the value, refer to the Analog I/O CONFIG screen. The following shows Rack No. and Slot No. of the CC-Link communication board

Rack No.	92
Slot No.	Board 1: 1
	Board 2: 2

---

e.g. Assignment to RWw (2 stations)

Number of Stations   = 2
Number of AIs   = 2
Number of Registers   = 5
Reg start index   = 5

RWwm0	→	AI[q]	Num of AIs=2
RWwm1		AI[q+1]	
RWwm2		R[5]	Reg start index=5
RWwm3		R[6]	
RWwm4	→	R[7]	Num of Regs=5
RWwm5		R[8]	
RWwm6		R[9]	
RWwm7		Not used	

NOTE
1 The value of 'm' will be decided according to the Station No. Refer to the CC-Link Master station manual for details
2 The value of 'q' will be decided by the system automatically but you can change them. To check and change the value, refer to the Analog I/O CONFIG screen. The following shows Rack No. and Slot No. of the CC-Link communication board.

Rack No.	92
Slot No.	Board 1: 1 Board 2: 2

3   STATUS

The current status of the Remote Device station is indicated by the LEDs placed on the CC-Link communication board and displayed on the CC-Link STATUS screen.

3.1   LED

The CC-Link Remote Device Station communication board has 4 LEDs. The following table shows their functions.

NAME	COLOR	ON	OFF
ERR	Red	- CRC error occurred - Station No. setup abnormal	- Normal data exchange - Hardware being reset
RD	Green	Data being received	- Failure in receiving data - Hardware being reset
SD	Green	Data being sent	- No data sent - Hardware being reset
RUN	Green	In the data link	- Before entering the data link - Failure in receiving data - Time out occurred in receiving data. - Hardware being reset

---
NOTE
   In case that ERR is OFF but the robot can't communicate with PLC even if the setting of the robot is correct, the station type of the robot in the setting of **PLC** might be "Remote I/O Station". Set the station type of the robot to "Remote Device Station" because robot only supports "Remote Device Station".
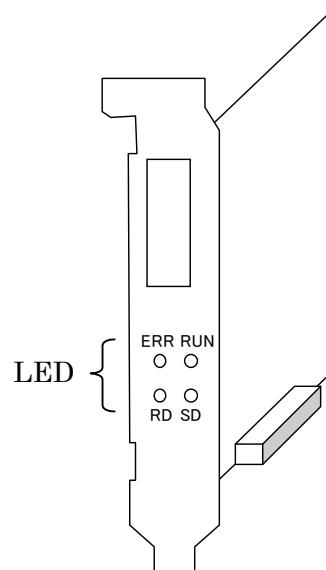
Fig. 3.1 (a) Remote device station PCB (A) CC-Link daughter board
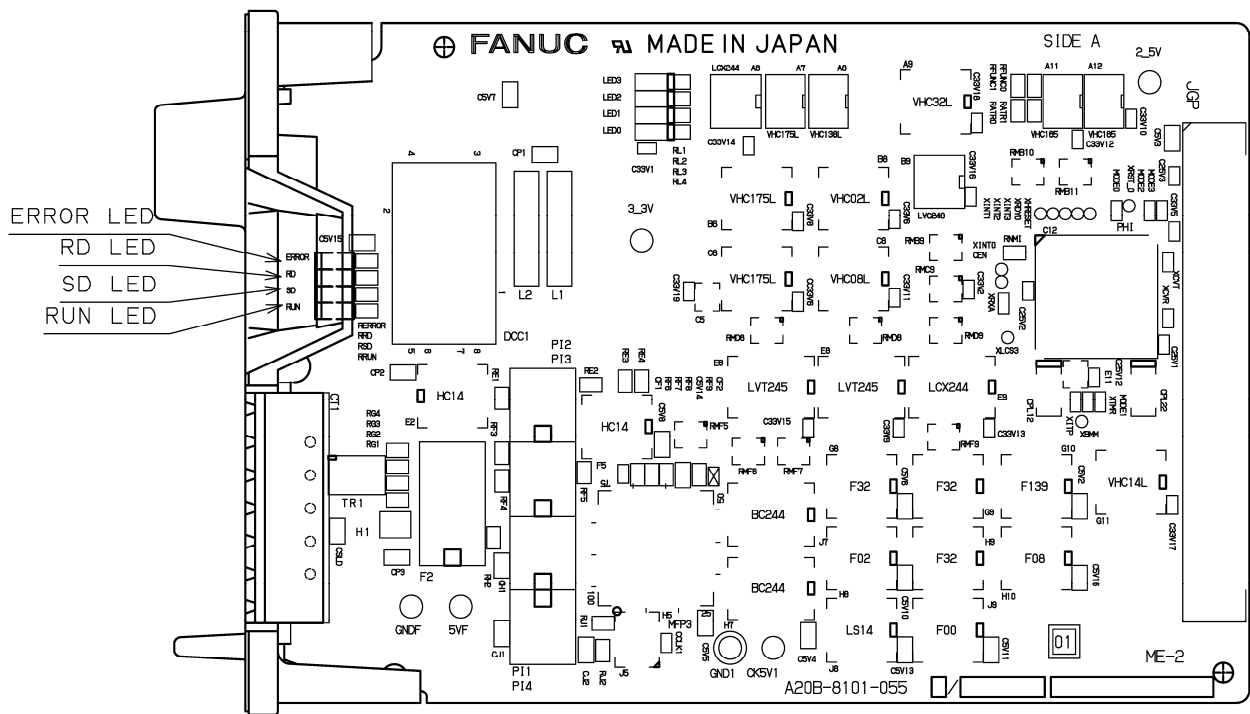
Fig. 3.1(b) Remote device station PCB (B)

3.2 CC-LINK INTERFACE STATUS

The following table shows the items of the CC-Link STATUS screen.

Table 3.2 Status items of CC-Link interface

ITEM	DESCRIPTION
Sequencer CPU STOP / RUN	This item indicates the status of the sequencer CPU* on the Master station. **This item indicates the correct status only while the Remote Device station is exchanging data with the Master station.**
Error flags OFF / ON	The following error flags indicate whether an error occurred or not for their factor. (OFF: No error occurd. / ON: Error occured)
Station No	If ON, this Remote Device station occupied a station number that is out of the range (1 to 64).
CRC	If ON, CRC error occurred.
Data link	If ON, this Remote Device Station is out of the data link. **If you turn on the Remote Device station while the CC-Link cable is disconnected or the Master station is off, this item will NOT be ON.**
Sequencer CPU	If ON, the sequencer CPU* on the Master station is abnormal. **This item indicates the correct status only while the Remote Device station is exchanging data with the Master station.**
Maker code	This item indicates the maker code.** The maker code is "174H" for Remote Device Station PCB (A). The maker code is "316H" for Remote Device Station PCB (B).
Device code	This item indicates the device code. ** The device code is "1H" for Remote Device Station PCB (A). The device code is "23H" for Remote Device Station PCB (B).
Software version	This item indicates the software version.

(*) The sequencer CPU controls the units within the CC-Link network by executing a sequence program.

(**) Maker code and Device code are defined by CLPA.

CC-Link STATUS screen will be displayed by the following steps:

MENU →0 NEXT →4 STATUS →F1 TYPE → CC-Link

STATUS CC-Link	JOINT 10%
Remote Device Board:1	
1 Sequencer CPU:	STOP
2 Error flags:	
3 Station No:	OFF
4 CRC:	OFF
5 Data link:	OFF
6 Sequencer CPU:	OFF
7 Maker code:	174H
8 Device code:	1H
9 Software version:	1014H
[TYPE]	BOARD
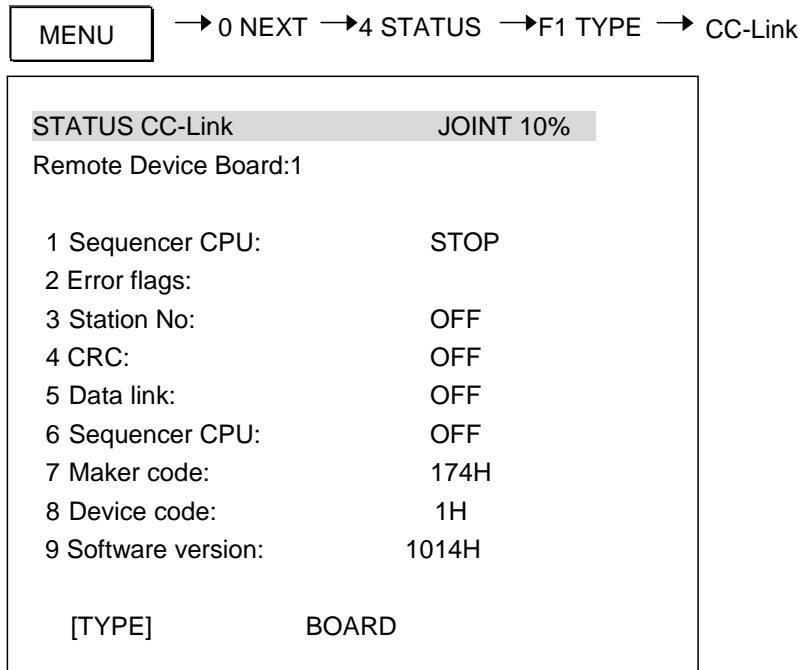
4   ERROR CODES

PRIO-320 STOP CC-LK System error (ID=x)(y)
Cause : Internal system error occurred.
Remedy : Contact FANUC's service site. The ID number in the brackets is necessary to track the problems.

PRIO-321 WARN CC-LK Board not installed
Cause : No CC-Link Remote Device Station PCB is installed.
Remedy : Install CC-Link Remote Device Station PCB.

PRIO-322 STOP CC-LK St.No out of range (Board No.)
Cause :A station number out of the range (1 to 64) was occupied.
Remedy : Change Station No. or Number of Stations on CC-Link SETUP screen.

PRIO-323 WARN CC-LK CRC error (Board No.)
Cause :CRC error was detected.
Remedy : Confirm the connection of CC-Link cable and terminal registers, and countermeasures to noise.
Set Baud rate to match the Master station's baud rate.

PRIO-324 STOP CC-LK Data link error (Board No.)
Cause : This Remote Device station left the data link. The CC-Link cable were disconnected or the Master station was turned off.
Remedy : Confirm the connection of CC-Link cable and the status of the Master station.

> **NOTE**
> If you turn on the Remote Device station while the CC-Link cable is disconnected or the Master station is off, this alarm will NOT be posted.

PRIO-325 STOP CC-LK Seq. CPU stopped (Board No.)
Cause : The sequencer CPU stopped.
Remedy : Confirm the status of the sequencer.

> **NOTE**
> This alarm is detected correctly only while the Remote Device station is exchanging data with the Master station.

PRIO-326 STOP CC-LK Seq. CPU abnormal (Board No.)
Cause : The sequencer CPU is abnormal.
Remedy : Confirm the status of the sequencer.

> **NOTE**
> This alarm is detected correctly only while the Remote Device station is exchanging data with the Master station.

PRIO-327 STOP CC-LK Reg index error (Board No.)
Cause :A non-existent register was used.
Remedy : Change Number of Registers or Reg start index on CC-Link SETUP screen.

PRIO-328 STOP CC-LK AO/R too many (Board No.)

Cause: Too many AOs or Registers were assigned to RWr.

Remedy: Change Number of AOs and Number of Registers on CC-Link SETUP screen.

PRIO-329 STOP CC-LK AI/R too many (Board No.)

Cause: Too many AIs and Registers were assigned to RWw.

Remedy: Change Number of AIs and Number of Registers on CC-Link SETUP screen.

PRIO-330 STOP CC-LK PNTtoUOP not enough (Board No.)

Cause: The number of points of RX/RY to be assigned to UOP is not enough.

Remedy: Change Number of Stations on CC-Link SETUP screen.

PRIO-331 STOP(R-30*i*B) WARN(R-30*i*A/R-30*i*A Mate)
CC-LK Reg data invalid (Board No.)

Cause: A numerical value set to a remote register was not 16bits integer.

Remedy: CC-Link function of robot supports only unsigned or signed 16bits word data. Do not enter another type of value to remote register.

In R-30*i*B, you can send float value, which is larger than -32769 and smaller than 65536, if $CCLINKRD[board No.].$AUTO_REGCHG is set to not 0. The value is sent with integer by cutting off the floating part.

In R-30*i*B, severity of this alarm can be changed to warning if $CCLINKRD[board No.].$REG_ER_WARN is set to not 0.

PRIO-332 STOP CC-LK no comm. to master (Board No.)

Cause: Channel carrier detection error.

Remedy: Confirm the connection of CC-Link cable and terminal registers, and countermeasures to noise. Set Baud rate to match the Master station's baud rate.

PRIO-333 SYST CC-LK comm. task failed.

Cause: Internal system error occurred.

Remedy: Contact FANUC's service site.

PRIO-334 STOP CC-LK too many boards found

Cause: A. Three or more CC-Link daughter boards are installed.
B. Three or more CC-Link Remote Device Station PCB(B) are installed.

Remedy: Robot controller supports only two CC-Link communication boards.
Please turn off the controller and remove excess board.

PRIO-335 STOP CC-LK different board types

Cause: Two types of CC-Link Remote Device Station PCB are installed.

Remedy: The type of CC-Link Remote Device Station PCB must be the same. Please turn off the controller and remove all CC-Link board of another type.

APPENDIX

A   MEMORY MAPPED PROFILE

The usage of Remote Input/Output(RX/RY) and Remote registers(RWr/RWw) is defined in "CC-Link Specifications (Profile) BTP-05028" of CLPA.

A.1   REMOTE INPUT RX/REMOTE OUTPUT RY

The following shows the memory mapped profile of Remote Input(RX) and Remote Output(RY). The set of 16 bits located at the bottom is "System area." The "System area" can not be used for any purposes other than the usage defined by CLPA.

Remote Device -> Master		Master -> Remote Device		
Device No.	Name	Device No.	Name	
RXm0	User area	RYm0	User area	
RXm1		RYm1		
RXm2		RYm2		
RXm3		RYm3		
RXm4		RYm4		
RXm5		RYm5		
RXm6		RYm6		
RXm7		RYm7		
RXm8		RYm8		
RXm9		RYm9		
RXmA		RYmA		
RXmB		RYmB		
RXmC		RYmC		
RXmD		RYmD		
RXmE		RYmE		
RXmF		RYmF		
- - -		- - -		
RX(m+n)0	Reserved	RY (m+n)0	Reserved	⎫
RX(m+n)1		RY (m+n)1		
RX(m+n)2		RY (m+n)2		
RX(m+n)3		RY (m+n)3		
RX(m+n)4		RY (m+n)4		
RX(m+n)5		RY (m+n)5		
RX(m+n)6		RY (m+n)6		
RX(m+n)7		RY (m+n)7		
RX(m+n)8	Initial data processing request flag	RY (m+n)8	Initial data processing complete flag	System area
RX(m+n)9	Initial data setting complete flag	RY (m+n)9	Initial data setting request flag	
RX(m+n)A	Error status flag	RY (m+n)A	Error reset request flag	
RX(m+n)B	Remote READY	RY (m+n)B	Reserved	
RX(m+n)C	Reserved	RY (m+n)C		
RX(m+n)D		RY (m+n)D		
RX(m+n)E		RY (m+n)E		
RX(m+n)F		RY (m+n)F		⎭

m: This value is decided according to the station number.
n: This value is decided according to the number of stations.

Device No.	Name	Function
RX(m+n)8	Initial data processing request flag	This signal will be ON after power-on to request the Master station to perform the initial data processing. When the initial data processing is completed (RY(m+n)8=ON), this signal will be OFF.
RX(m+n)9	Initial data setting complete flag	In the Remote READY status, when the Master station requests the initial data setting (RY(m+n)9=ON), this signal will be ON. When RY(m+n)9 is OFF, this signal will be OFF.
RX(m+n)A	Error status flag	In the Remote READY status, when an error of this CC-Link Interface function occurs, this signal will be ON. NOTE) This signal reflects the errors of the CC-Link Interface function only.
RX(m+n)B	Remote READY	After power-on, when the initial data processing on the Master station is completed (RY(m+n)8=ON), this signal will be ON.
RY(m+n)8	Initial data processing complete flag	After power-on, when the initial data processing on the Master station is completed, this signal will be ON.
RY(m+n)9	Initial data setting request flag	When the Master station requests the initial data setting, this signal will be ON.
RY(m+n)A	Error reset request flag	When this signal is turned ON, Error status flag(RX(m+n)A) will be OFF. NOTE) Even when this signal is turned ON, the robot will NOT be reset.

A.2   REMOTE REGISTER RWr / RWw

The following shows the memory mapped profile of Remote Registers(RWr/RWw).

Remote Device -> Master		Master -> Remote Device	
Device No.	Name	Device No.	Name
RWrm0	User area	RWwm0	User area
RWrm1		RWwm1	
RWrm2		RWwm2	
RWrm3	1 station	RWwm3	1 station
RWrm4		RWwm4	
RWrm5		RWwm5	
RWrm6		RWwm6	
RWrm7	2 stations	RWwm7	2 stations
RWrm8		RWwm8	
RWrm9		RWwm9	
RWrmA		RWwmA	
RWrmB	3 stations	RWwmB	3 stations
RWrmC		RWwmC	
RWrmD		RWwmD	
RWrmE		RWwmE	
RWrmF	4 stations	RWwmF	4 stations

m: This value is decided according to the station number.

B   CC-LINK HARDWARE CONNECTION AND MAINTENANCE

B.1   INSTALLATION

B.1.1   Installation of CC-LINK Remote Device Station PCB (A)

In the R-30*i*A controller a CC-Link daughter board is installed to a PCI slot mounted on a CC-Link mother board.
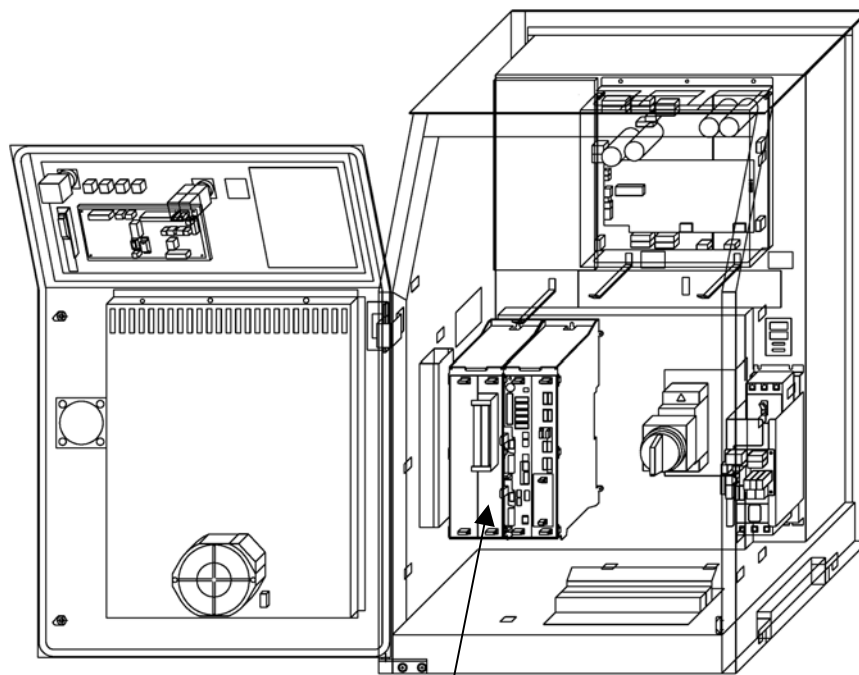
CC-Link mother board

How to install a CC-Link daughter board to a PCI slot.
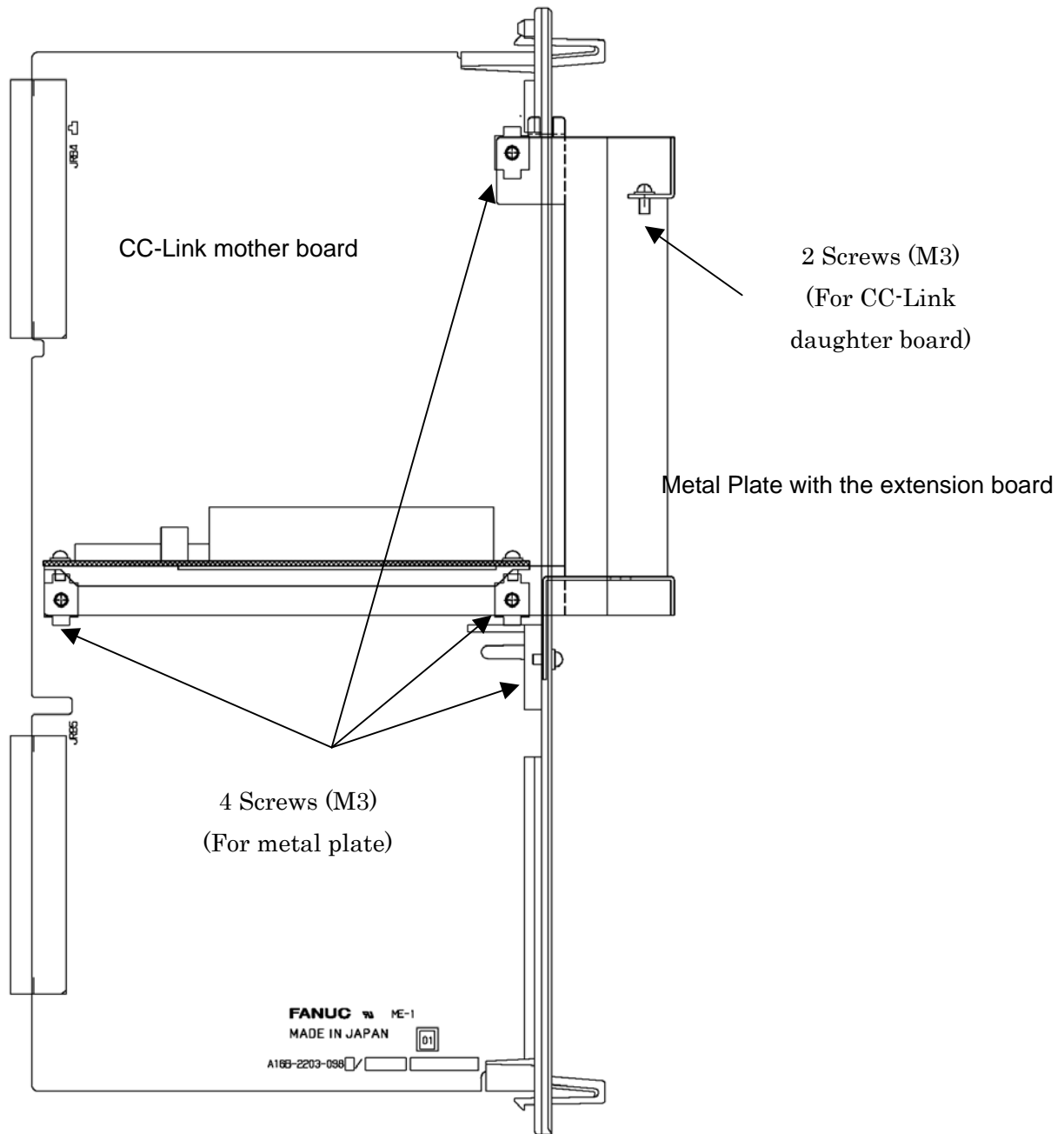
1   Remove 4 screws that fix the metal plate with the extension board. And detach the metal plate with the extension board from the mother board.
2   Remove 2 screws that fix PCI boards.
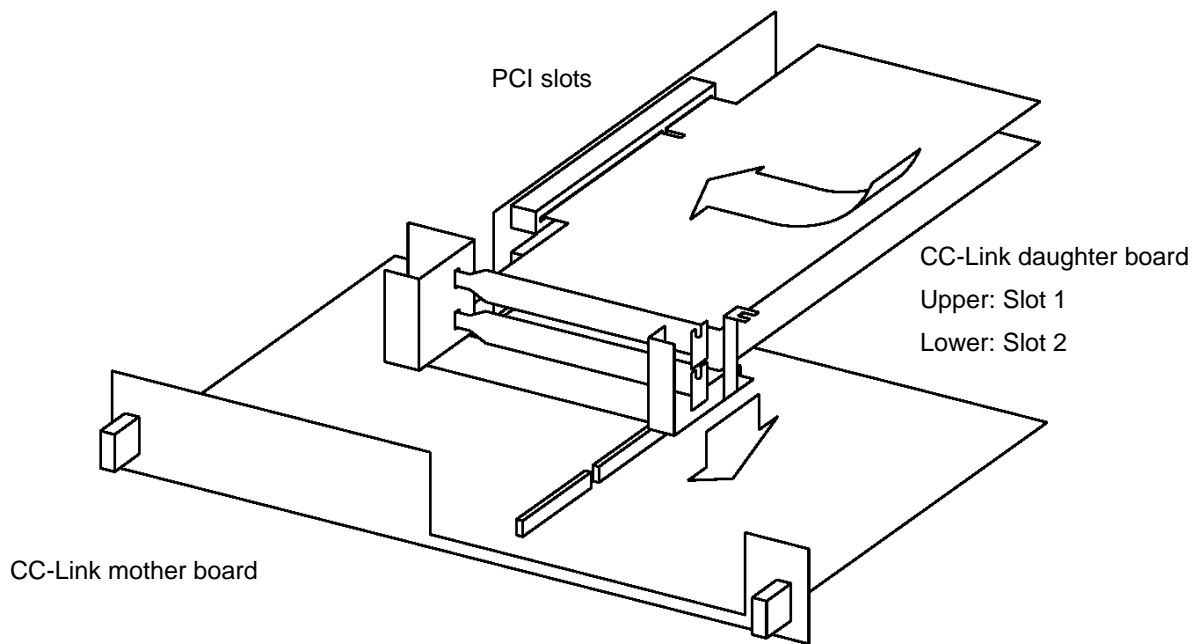
3   Insert the CC-Link daughter boards to the PCI slot and fix the boards with 2 screws.
4   Attach the extension boards to the mother board. Do ot bend the pin of the connector on the extension board.
5   Remove 4 screws that fix the metal plate with the extension board. And detach the metal plate with the extension board from the mother board.

B.1.2   Installation of CC-Link Remote Device Station PCB (B)

In the R-30*i*A controller, a CC-Link Remote Device Station PCB (B) is installed to an option slot like the figure below.

LATCH

MINI SLOT1

MINI SLOT2

MINI SLOT3
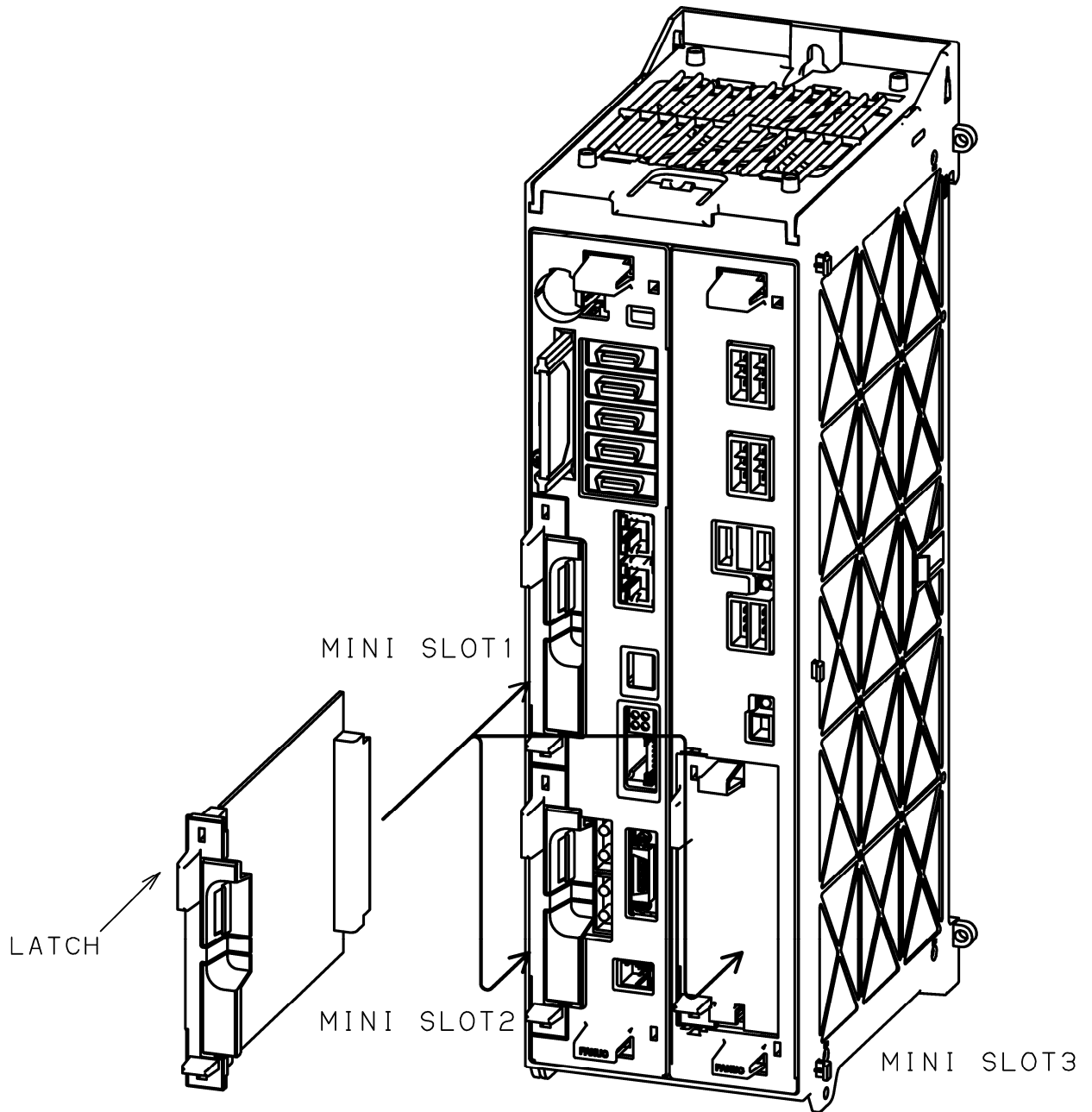
In the R-30*i*A Mate controller, a CC-Link Remote Device Station PCB (B) is installed to an option slot like the figure below.
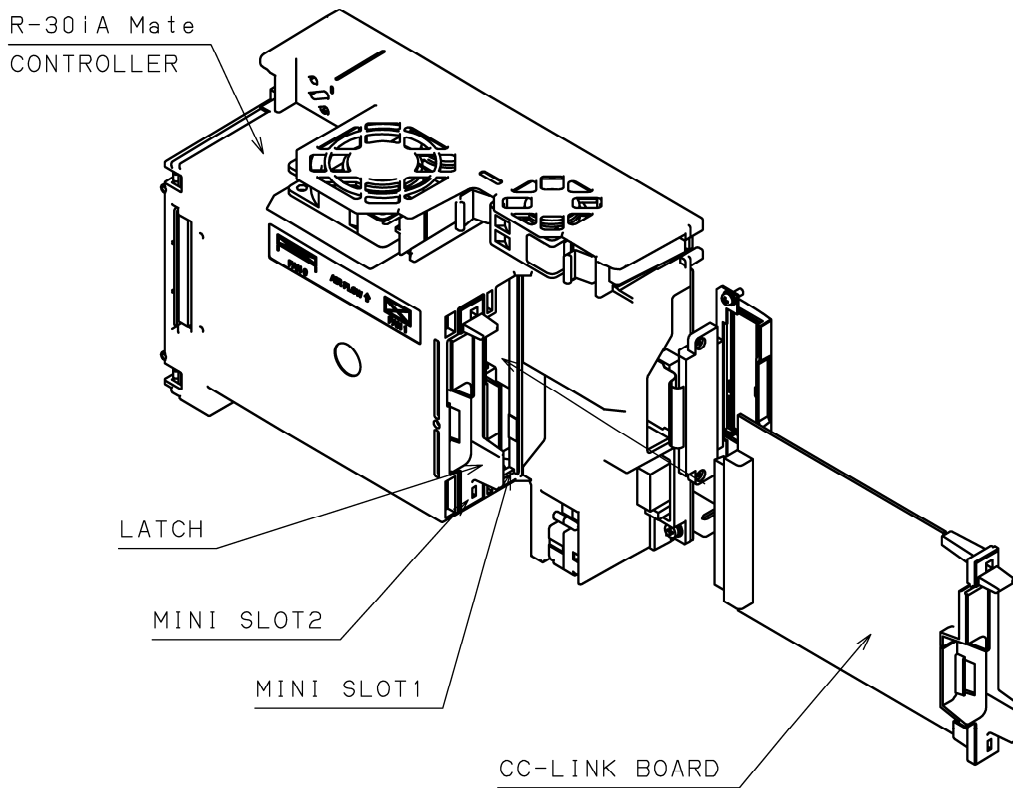
In the R-30*i*B controller, a CC-Link Remote Device Station PCB (B) is installed to an option slot like the figure below.
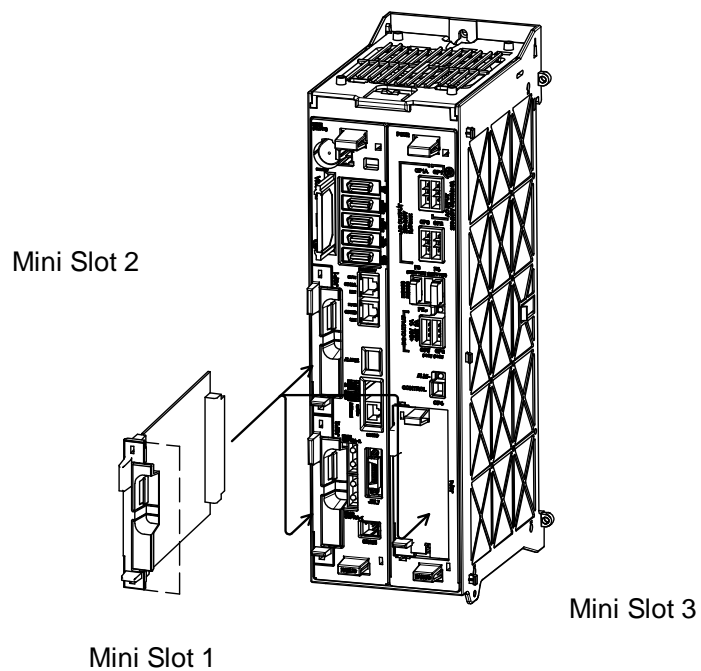
B.2   CONNECTOR

The following connector is used as a CC-Link interface.

CT1

Connector pin's array

1 2 3 4 5

Screws to attatch/detatch
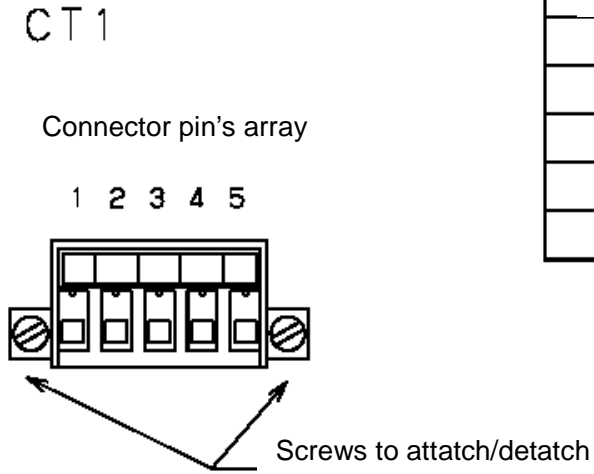
No.	Signal
1	DA
2	DB
3	DG
4	SLD
5	FG

Connector on the cable side:

Phoenix Contact
MSTB2.5/5-STF-5.08
(Attatched with the product)
Applicable wires: AWG24-12

B.3   HOW TO CONNECT A CC-LINK CABLE

Loosen the screws to detatch the connector from the PCB. Connect the communication cable to the connector by the following steps:
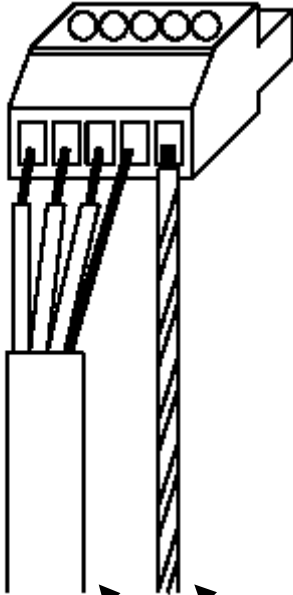
(1)   Pare the sheath of the cable and remove an unnecessary portion of the shield.

(2)   Pare the sheath of the wires to match the length of the terminals.*

(3)   Loosen the screws to facilitate inserting wires.

(4)   Insert each wires into the holes of the connector.

(5)   Tighten the screws to fix the wires.

(6)   Attatch the connector to PCB.

(7)   Tighten the screws to fix the connector.

(*)Terminals are available. Tie up the stripped wires and fix a terminal to it. The following terminal is recommended.

Phoenix Contact, series AI (Applicable tool:ZA3)

FG cable are connected to both a connector and a cabinet before the delivery (Except the case of ordering PCB only).

CC-Link cable needs to be prepared and connected by the user.

B.4   HOW TO LEAD CC-LINK CABLE

The following is how to lead the cable into the R-30*i*A controller.

A CABINET

CABLE CLAMP
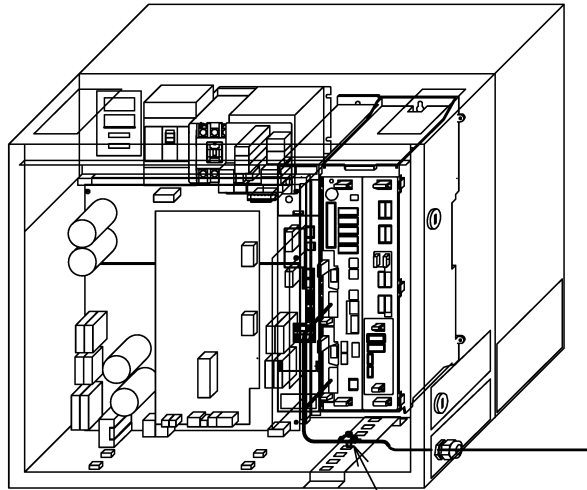
For A cabinet, use a hole of the lower row in order to lead
CC-Link cable to the inside of A cabinet. If all holes of the lower
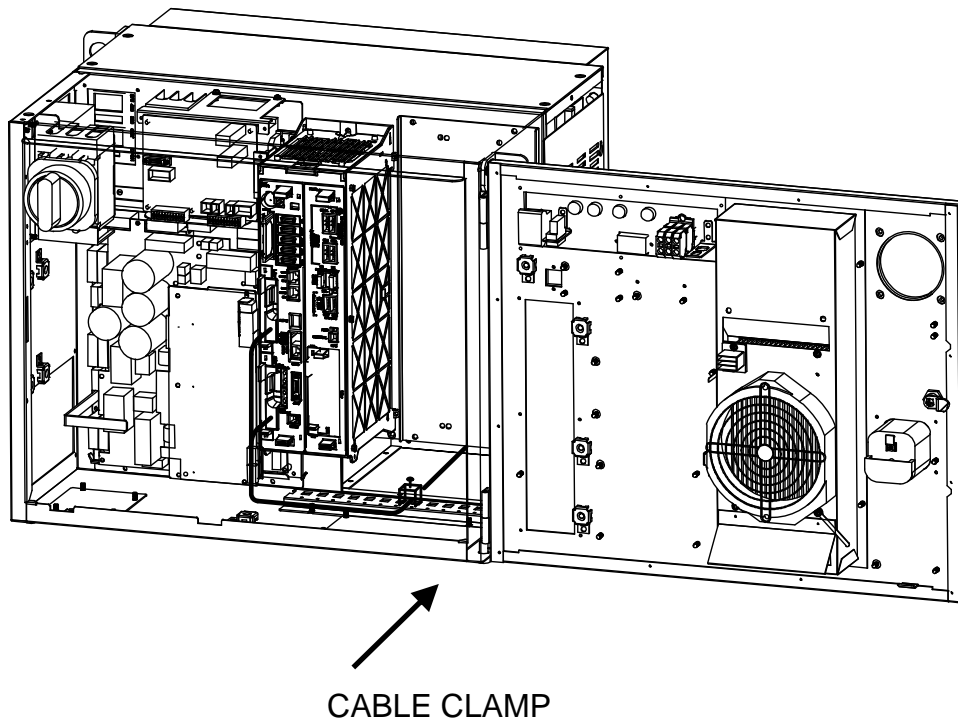row have already been used, use a hole of the upper row

B CABINET
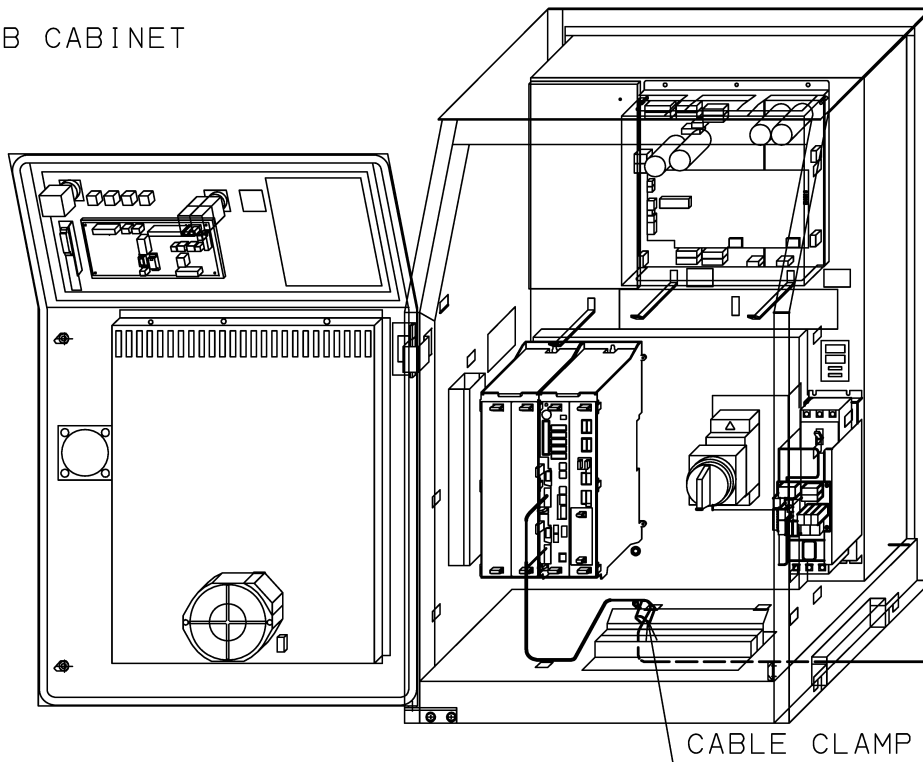
CABLE CLAMP

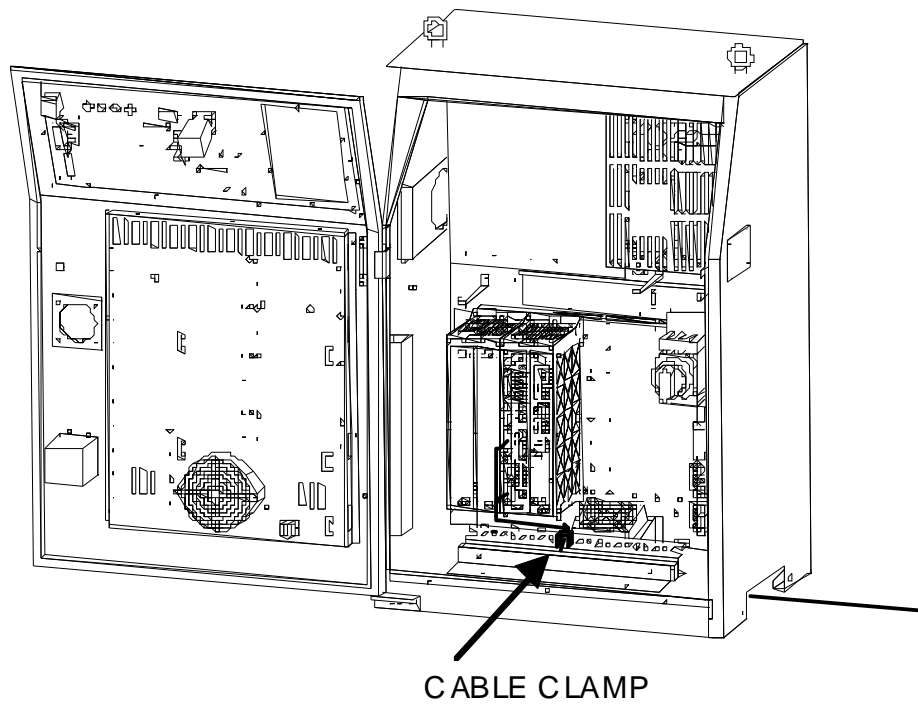The following is how to lead the cable into the R-30*i*A Mate controller.
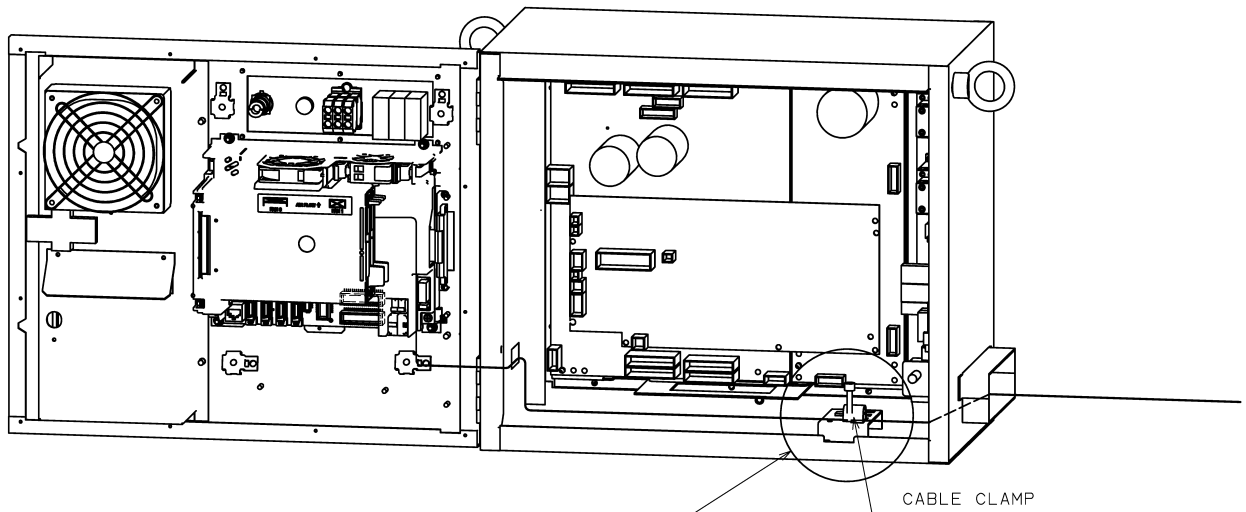
NOTE : Clamp the two cables together with Pulsecoder cable at the position in the figure below.
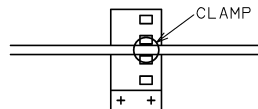
The following is how to lead the cable into the R-30*i*B controller.

CABLE CLAMP

CABLE CLAMP

B.5   HOW TO WIRE CC-LINK CABLE

For information on how to wire the CC-Link cable, refer to the "CC-Link cable wiring manual (CC0208-06)" of CLPA. You must prepare the CC-Link cable and the terminal resisters. When you wire the CC-Link cable in the robot controller, you must pare the sheath of the CC-Link cable to expose the outer shield and fix the cable on the earthed plate by a clamp as follows. (For this purpose, a clamp is provided with a controller). Since this cable clamp is not only to fix the cable on the controller but also to stabilize the system, these steps must be done.

Earthed plate

Cable clamp
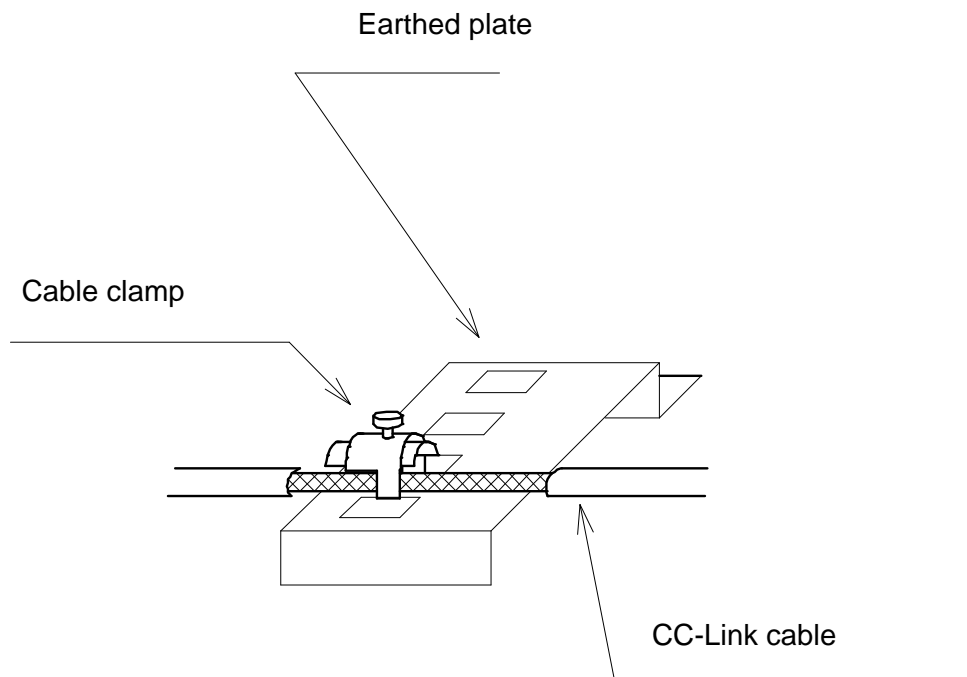
CC-Link cable

B.6 HOW TO CONNECT THE EARTH CABLE IN CASE ONLY THE PCB IS PROVIDED

The following figure is for R-30*i*A controller (Fig. B.6 (a)).
Refer to "B.3 How to connect a CC-Link cable" connect the bar terminal of the earth cable to the connector and then connect the circle terminal to the robot cabinet to earth as follows.
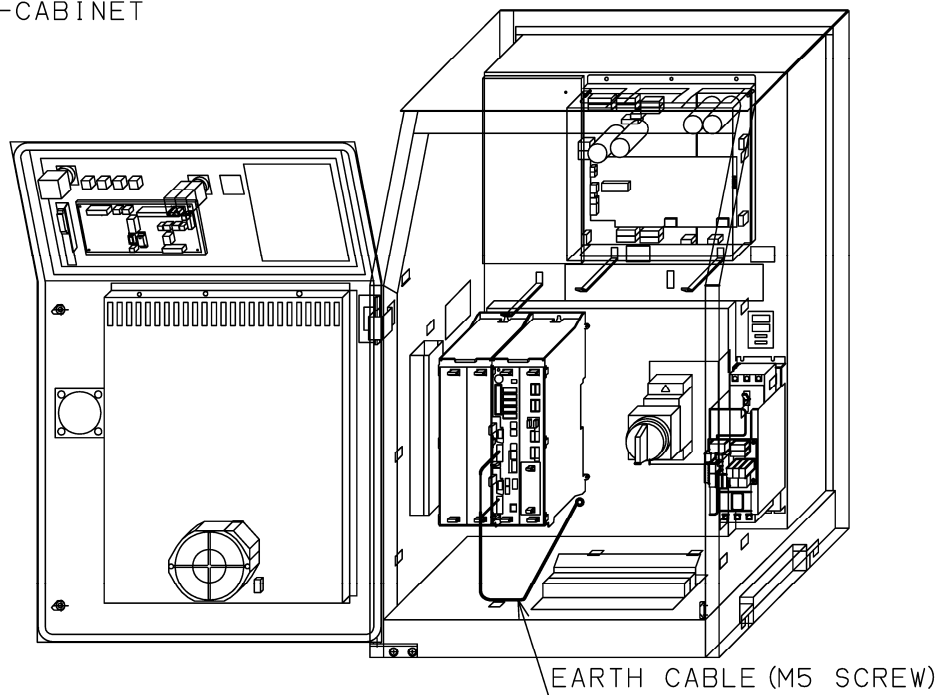
A-CABINET

EARTH CABLE (M5 SCREW)

B-CABINET

EARTH CABLE (M5 SCREW)
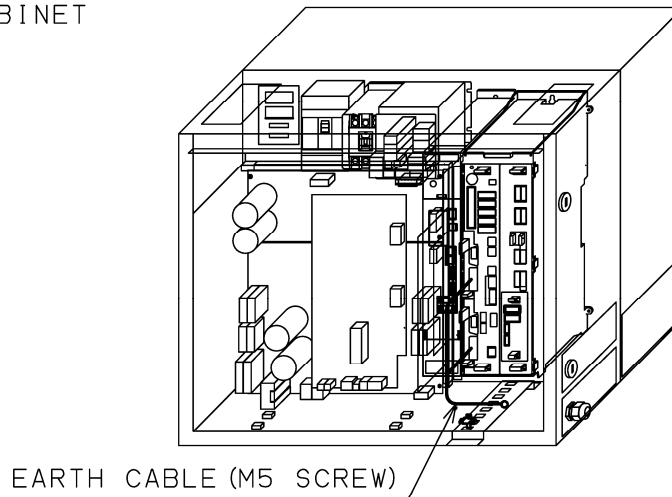
Fig. B.6(a) R-30*i*A earth cable

For R-30*i*A Mate controller, connect the circle terminal to the robot cabinet to earth as follows.
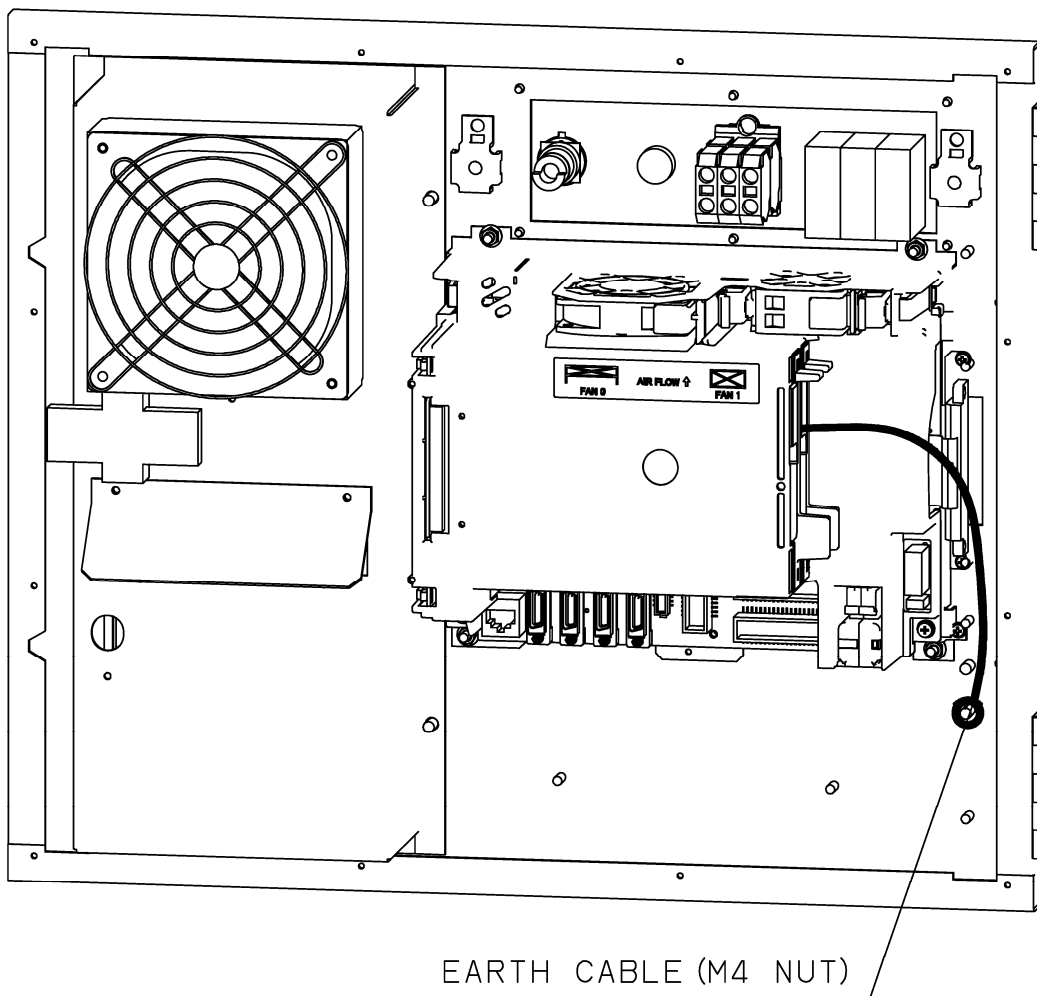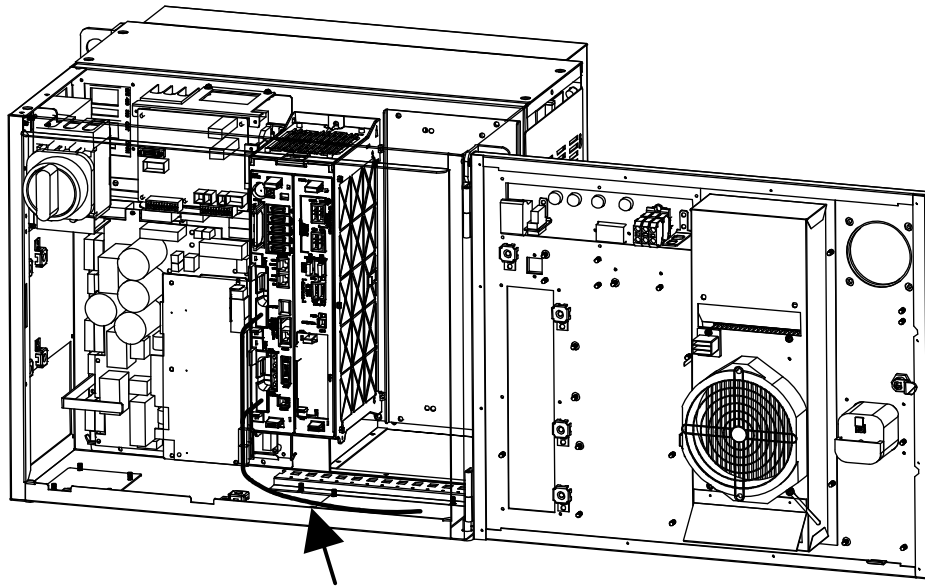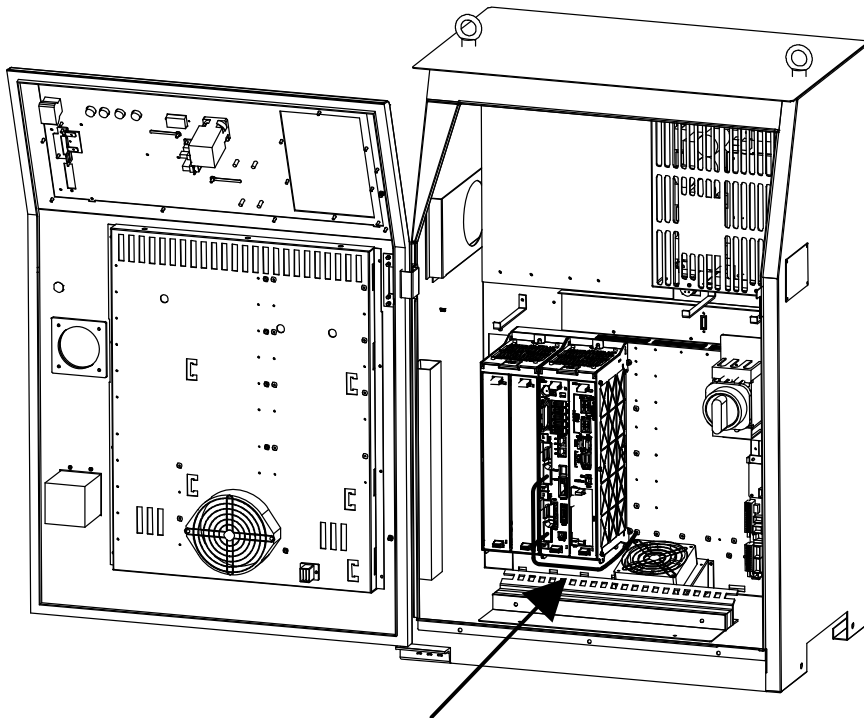
EARTH CABLE (M4 NUT)

Fig. B.6 (b) R-30*i*A Mate earth cable

For R-30*i*B controller, connect the circle terminal to the robot cabinet to earth as follows.

EARTH CABLE (M5 NUT)

EARTH CABLE (M5 SCREW)

Fig. B.6 (c) R-30*i*B earth cable

ADDITIONAL INFORMATION

FANUC Robot Series R-30*i*A/R-30*i*A Mate/R-30*i*B CONTROLLER
CC-Link Interface (Slave) Operator's Manual
Description is added

1.Type of applied technical documents

Name	FANUC Robot Series R-30*i*A/R-30*i*A Mate/R-30*i*B CONTROLLER CC-Link Interface (Slave) Operator's Manual
Spec.No./Ed.	B-82654EN/04

2.Summary of Change

Group	Name/Outline	New, Add, Correct, Delete	Applicable Date
Basic			
Optional Function	Description is added	Add	Immediately
Unit			
Maintenance Parts			
Notice			
Correction			
Another			

1. We add sentences to NOTE of Section 3.1 last.

NOTE

1   When you change "Number of Stations", "Number of AIs" or "Number of AOs", clear the current I/O assignment by pushing NEXT and F1(CLR_ASG). The changes will be activated at the next power-on. Clear assignment may be necessary before changing assignment.

Add → If clear assignment isn't done, I/O communication may not be done. If it doesn't work fine, try clear assignment or do whenever possible.

2   When you change "Station No." or its following items, cycle power to activate the changes.

3   In case that two CC-Link communication boards are installed to a robot, the board which has a smaller physical slot number will be "Board1" and another will be "Board2". For information of the physical slot number, refer to "B.1 Installation".

4   The values set on this screen will be saved in the system file "CCLINK.SV." To save settings of the CC-Link, press [FCTN] key and select "SAVE" when displaying any CC-Link screen. You can also save it from FILE screen -> F4 key BACKUP -> "1 System files" or "8 All of above". To select a device for saving, press [F5] "UTIL" on the file screen and select "Set Device".

Add → Please check whether CCLINK.SV is wrote because writing is missed when device is write protected even when prompt shows them as saved.

5   If an out of range value is entered into a remote register, "PRIO-331 CC-LK Reg data invalid (Board No.)" will be posted and zero value will be sent to master device instead of the invalid register data.

2. We add Subsection 2.3.1 to end of Section 2.3.

2.3.1 How to send the integer other than 16 bit (signed / unsigned) integer or real number

You should use 2 register to send them. Concretely, for example, set integral part of the value, which is divided by 65536 from sent value, to R[2], set the odd to R[1], and send both register by CC-Link.

Example of TP program (When you want to send R[100])
    R[1] = R[100] MOD 65536
    // Pay attention R[100] isn't changed at here.
    R[2] = R[100] DIV 65536

When you want to receive the value larger than 65535, convert the value received by 2 register.

Example of TP program (When you convert received data by R[1] and R[2] to R[100])
    R[100] = R[2] *65536 + R[1] (Pay attention R[1] and R[2] are changed during running this line.)

You can send the value less than signed 16 bit value or real number by similar way.

				Title	FANUC Robot Series R-30iA/R-30iA Mate/R-30iB CONTROLLER CC-Link Interface (Slave) Operator's Manual
				Draw No.	B-82654EN/04 - 01
01	2017.05.08	S. Ozaki	Initial release		
Ed.	Date	Design	Description		**FANUC CORPORATION**	Page 2/3
	Date	2017.05.08	Design. S. Ozaki	Apprv.		

3. We add a sentence to Section A.1.

A. 1 REMOTE INPUT RX/REMOTE OUTPUT RY

The following shows the memory mapped profile of Remote Input(RX) and Remote Output(RY). The set of 16 bits located at the bottom is "System area." The "System area" can not be used for any purposes other than the usage defined by CLPA.
Initial data setting isn't necessary for CC-Link of robot controller.

Add

INDEX

REVISION RECORD

Edition	Date	Contents
04	Oct.,2012	•Added the description of R-30*i*B controller.
03	Feb.,2009	•Notice about system reserved area was added.
02	Jun., 2007	•Added the description of new CC-Link remote device PCB (B). •Added the description of R-30*i*A Mate controller.
01	Mar.,2007	

B-82654EN/04