FANUC Robot series

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

CC-Link Interface（Slave）

OPERATOR'S MANUAL

B-83974EN/01

- **Original Instructions**

Thank you very much for purchasing FANUC Robot.
Before using the Robot, be sure to read the "FANUC Robot SAFETY HANDBOOK (B-80687EN)" and understand the content.

SAFETY PRECAUTIONS

This chapter describes the precautions which must be followed to ensure the safe use of the robot.
Before using the robot, be sure to read this chapter thoroughly.

For detailed functions of the robot operation, read the relevant operator's manual to understand fully its specification.
For the safety of the operator and the system, follow all safety precautions when operating a robot and its peripheral equipment installed in a work cell.
In addition, refer to the "FANUC Robot SAFETY HANDBOOK (**B-80687EN)**".

1 DEFINITION OF USER

The user can be defined as follows.

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

Programmer:
- Operates the robot
- Teaches the robot inside the safety fence

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

- Operator is not allowed to work in the safety fence.
- Programmers and maintenance engineers are allowed to work in the safety fence. The work inside the safety fence includes lifting, setting, teaching, adjustment, maintenance, etc.
- To work inside the safety fence, the person must receive a professional training for the robot.

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

- Adequate clothes for the operation
- Safety shoes
- A helmet

2 DEFINITION OF SAFETY NOTATIONS

To ensure the safety of users 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 using the robot.

Symbol	Definitions
⚠**WARNING**	Used if hazard resulting in the death or serious injury of the user will be expected to occur if he or she fails to follow the approved procedure.
⚠**CAUTION**	Used if a hazard resulting in the minor or moderate injury of the user, or equipment damage may be expected to occur if he or she fails to follow the approved procedure.
NOTE	Used if a supplementary explanation not related to any of WARNING and CAUTION is to be indicated.

- Check this manual thoroughly, and keep it handy for the future reference.

3 SAFETY OF THE USER

User 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 user safety.

(1) Have the robot system users 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 user 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 user 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 (b).

(4) Provide the peripheral equipment with appropriate earth (Class A, Class B, Class C, and Class D).
(5) Try to install the peripheral equipment outside the robot operating space.
(6) Draw an outline on the floor, clearly indicating the range of the robot operating space, 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 user enters the work area.
(8) If necessary, install a safety lock so that no one except the user 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 equipment independently, be sure to turn off the power of the robot.
(10) Operators should be ungloved while manipulating the operator 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. (refer to Controller OPERATOR'S MANUAL.)
(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 inside 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.)
- Outdoor

(16) When connecting the peripheral equipment 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 footstep, please consider security for installation and maintenance work in high place according to Fig. 3 (c). Please consider footstep and safety belt mounting position.

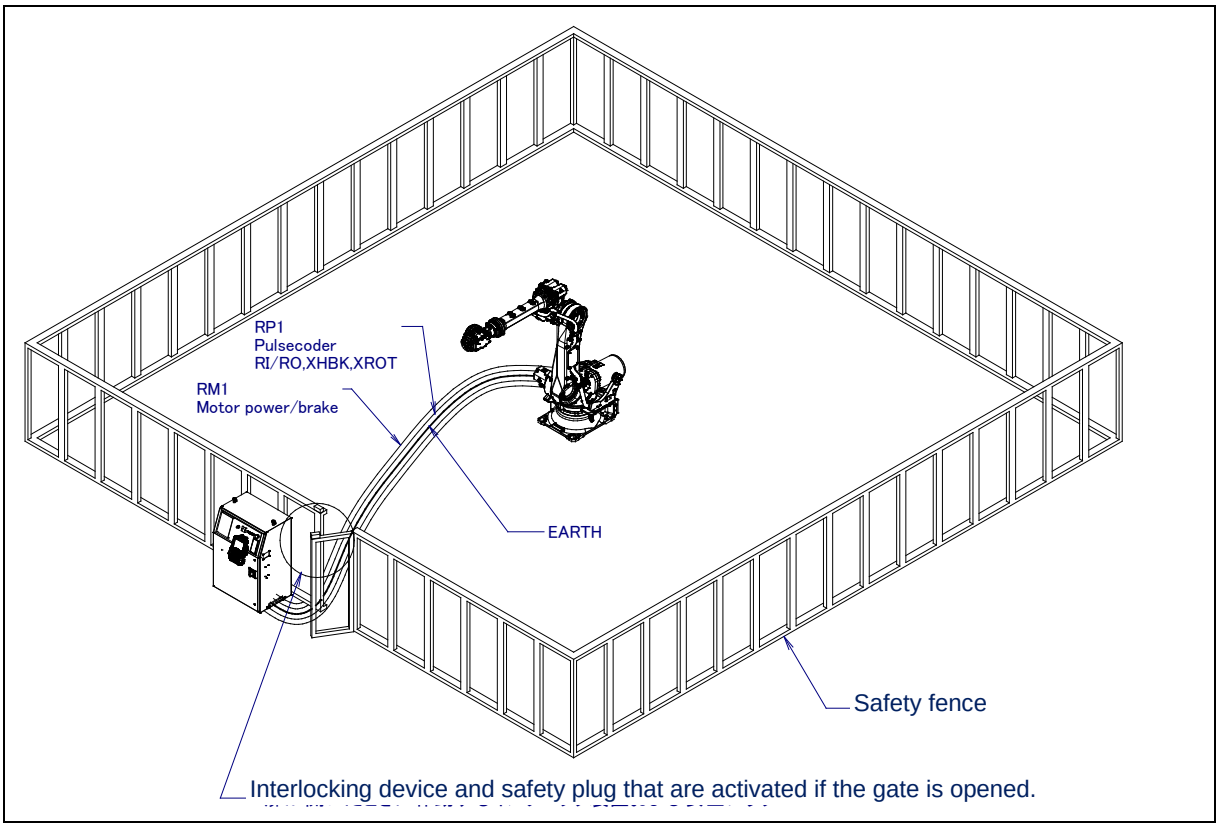

Fig. 3 (a) Safety fence and safety gate

⚠WARNING
When you close a fence, please confirm that there is not a person from all directions of the robot.

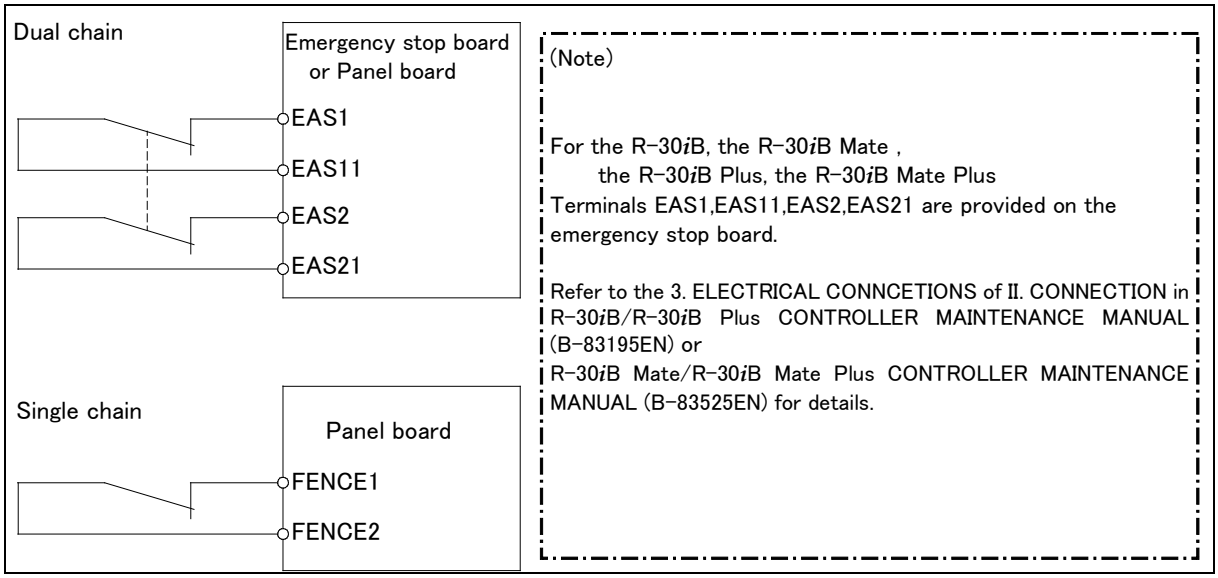

Fig. 3 (b) Connection diagram for the signal of safety fence

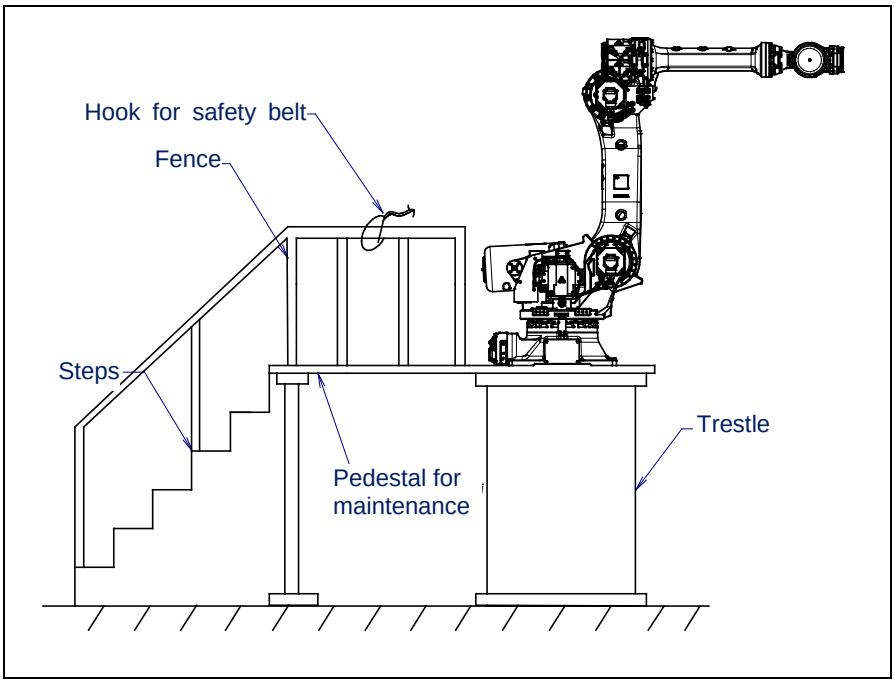

Fig. 3 (c) Pedestal for maintenance

3.1 SAFETY OF THE OPERATOR

An operator refers to a person who turns on and off the robot system and starts a robot program from, for example, the operator panel during daily operation.
Operators cannot work inside of the safety fence.

(1) If the robot does not need to be operated, turn off the robot controller power or press the EMERGENCY STOP button during working.
(2) Operate the robot system outside the operating space of the robot.

(3) Install a safety fence or safety door to avoid the accidental entry of a person other than an operator in charge or keep operator out from the hazardous place.
(4) Install one or more necessary quantity of EMERGENCY STOP button(s) within the operator's reach in appropriate location(s) based on the system layout.

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.

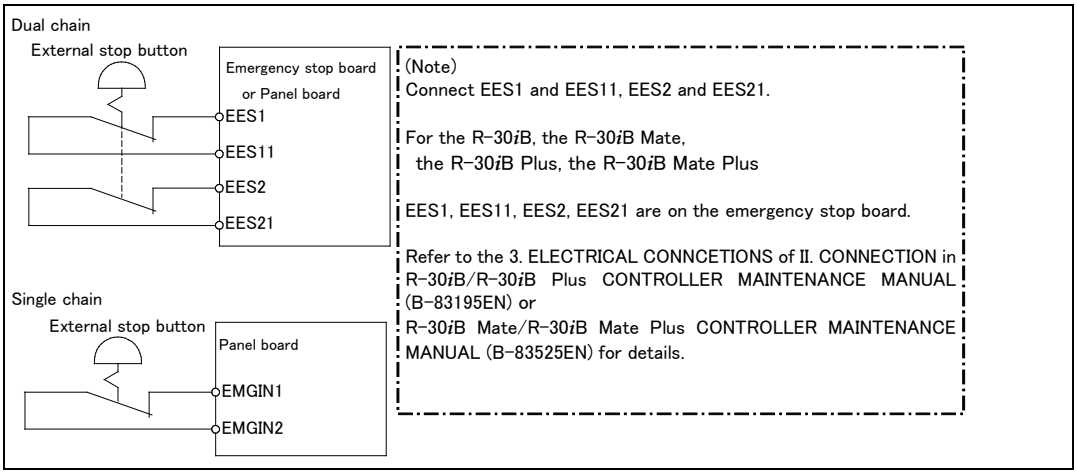

Fig. 3.1 Connection diagram for external emergency stop button

3.2 SAFETY OF THE PROGRAMMER

While teaching the robot, the operator may need to enter the robot operation area. The programmer must ensure the safety especially.

(1) Unless it is specifically necessary to enter the robot operating space, carry out all tasks outside the operating space.
(2) Before teaching the robot, check that the robot and its peripheral equipment are all in the normal operating condition.
(3) If it is inevitable to enter the robot operating space 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 operating space.
(5) Programming should be done outside the area of the safety fence as far as possible. If programming needs to be done inside 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 whole robot 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 (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 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.

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 the stop of the robot (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) Enable: Servo power is turned off when the operator releases the DEADMAN switch or when the operator presses the switch strongly.
   (b) Disable: The DEADMAN switch is disabled.
   (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 Plus/R-30*i*B Mate Plus 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 equipment 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.

Mode	Teach pendant enable switch	Software remote condition	Teach pendant	Operator panel	Peripheral equipment
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.

(6) To start the system using the operator box or operator panel, make certain that nobody is the robot operating space area and that there are no abnormalities in the robot operating space.
(7) When a program is completed, be sure to carry out a test operation according to the following procedure.
   (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 continuous operation at low speed.
   (c) Run the program for one operation cycle in continuous operation 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 continuous operation 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.

(8) While operating the system in the automatic operation, the programmer should leave the safety fence.

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 operating space.
(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 as far as possible.
(3) If it becomes necessary to enter the robot operating space while the power is on, press the emergency stop button on the operator box or operator panel, or the teach pendant before entering the range. The maintenance worker 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 worker must check the whole robot 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 whole robot 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 maintenance work, check that the robot and its peripheral equipment are all in the normal operating condition.
(7) Do not operate the robot in the automatic operation while anybody is in the robot operating space.
(8) When you maintain the robot alongside a wall or instrument, or when multiple users are working nearby, make certain that their escape path is not obstructed.
(9) When a tool is mounted on the robot, or when any movable device other than the robot is installed, such as belt conveyor, pay careful attention to its motion.
(10) If necessary, have a user who is familiar with the robot system stand beside the operator panel and observe the work being performed. If any danger arises, the user should be ready to press the EMERGENCY STOP button at any time.
(11) When replacing a part, please contact your local FANUC representative. If a wrong procedure is followed, an accident may occur, causing damage to the robot and injury to the user.
(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 operating space and that the robot and the peripheral equipment 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 user needs to touch such a part in the heated state, the user 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 robot 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 execution should be given for the robot according to a predetermined method. (See TESTING section of “Controller operator’s manual”.) During the test execution, the maintenance worker should work outside the safety fence.

4 SAFETY OF THE TOOLS AND PERIPHERAL EQUIPMENT

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 abnormality occurs in any other robots or peripheral equipment, even though the robot itself is normal.
(3) For a system in which the robot and its peripheral equipment 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 equipment 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, operate the robot where insulated from the influence of oil, water, and dust.

(2) Don't use unconfirmed liquid for cutting fluid and cleaning fluid.
(3) Adopt limit switches or mechanical stoppers to limit the robot motion, and avoid the robot from collisions against peripheral equipment or tools.
(4) Observe the following precautions about the mechanical unit cables. Failure to follow precautions may cause problems.
- Use mechanical unit cable that have required user interface.
- Do not add user cable or hose to inside of the mechanical unit.
- Please do not obstruct the movement of the mechanical unit 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.
- When installing user peripheral equipment on the robot mechanical unit, please pay attention that the device does not interfere with the robot itself.

(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 perform 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 and power-off of the robot is incurred.
- When alteration is necessary, safety switch is operated by opening safety fence and power-off stop is incurred 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 operates routinely and power-off stop is incurred for the robot.
- Power-off stop is regularly incurred due to an inappropriate setting for Dual Check Safety (DCS).

(6) Power-off stop of Robot is executed when collision detection alarm (SRVO-050) etc. occurs. Please try to avoid unnecessary power-off stops. It may cause the trouble of the robot, too. So remove the causes of the alarm.

5 SAFETY OF THE ROBOT MECHANICAL UNIT

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 operating spaces 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 robot operation area 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 pinched 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 (R-30*i*B Plus, R-30*i*B Mate Plus)

There are following three types of Stop Category.

Stop Category 0 following IEC 60204-1 (Power-off Stop)

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.
"**Stop Category 0**" performs following processing.

- An alarm is generated, and then the servo power turns off. Instantly the robot stops.
- Execution of the program is paused.

Frequent Category 0 Stop of the robot during operation can cause mechanical problems of the robot.
Avoid system designs that require routine or frequent Category 0 Stop conditions.

Stop Category 1 following IEC 60204-1 (Controlled Stop, Smooth Stop)

The robot is decelerated until it stops, and servo power is turned off.
"**Stop Category 1**" performs following processing.

- The alarm "**SRVO-199 Controlled stop**" or "**SRVO-289 Smooth Stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.

In Smooth stop, the robot decelerates until it stops with the deceleration time shorter than Controlled stop.
The stop type of Stop Category 1 is different according to the robot model or option configuration. Please refer to the operator's manual of a particular robot model.

Stop Category 2 following IEC 60204-1 (Hold)

The robot is decelerated until it stops, and servo power remains on.
"**Stop Category 2**" performs following processing.

- The robot operation is decelerated until it stops. Execution of the program is paused.

> ⚠ **WARNING**
> 1 The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time is necessary when Stop Category 1 is used. Please refer to the operator's manual of a particular robot model for the data of stopping distance and time.
> 2 In multi arm system, the longest stopping distance and time of Stop Category 1 among each robot are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the multi arm system.
> 3 In the system which has extended axis, the longer stopping distance and time of Stop Category 1 among robot and extended axis are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the system which has extended axis. Please refer to the extended axis setup procedure of the controller operator's manual for considering the stopping distance and time of the extended axis.
> 4 When Stop Category 1 occurs during deceleration by Stop Category 2, the stop type of robot is changed to Stop Category 0.
> 5 In case of Stop Category 1, motor power shutdown is delayed for a maximum of 2 seconds. In this case, a risk assessment for the whole robot system is necessary, including the 2 seconds delay.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Stop Category 0 or Stop Category 1. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Deadman switch (*)
A	AUTO	Category 0	Category 0	Category 1	Category 1	-
	T1	Category 0	Category 0	-	Category 1	Category 0
	T2	Category 0	Category 0	-	Category 1	Category 0
C	AUTO	Category 1	Category 1	Category 1	Category 1	-
	T1	Category 0	Category 0	-	Category 1	Category 0
	T2	Category 0	Category 0	-	Category 1	Category 0
D	AUTO	Category 1	Category 1	Category 1	Category 1	-
	T1	Category 1	Category 1	-	Category 1	Category 1
	T2	Category 1	Category 1	-	Category 1	Category 1

Category 0: Stop Category 0
Category 1: Stop Category 1
-: Disable
(*) The stop pattern of NTED input is same as Deadman switch.
The following table indicates the Stop pattern according to the controller type or option configuration. The case R651 is specified.

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	C(**)
Old Stop Function (A05B-2670-J680)	A(**)
All Smooth Stop Function (A05B-2670-J651)	D(**)

The case R650 is specified.

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	A(**)
Stop Category 1 by E-Stop (A05B-2670-J521)	C(**)
All Smooth Stop Function (A05B-2670-J651)	D(**)

(**)R-30*i*B Mate Plus does not have SVOFF input.

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.

"Old Stop Function" option

When "**Old Stop Function**" (A05B-2670-J680) option is specified, the stop type of the following alarms becomes Stop Category 0 in AUTO mode.

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.
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.

Stop Category 0 is different from **Stop Category 1** as follows:

- In Stop Category 0, 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 stopping distance and time of Stop Category 0 is shorter than those of Stop Category 1, depending on the robot model and axis.

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.

"All Smooth Stop Function" option

When "**All Smooth Stop Function**" (A05B-2670-J651) option is specified, the stop type of the following alarms becomes Stop Category 1 in all operation modes (AUTO, T1 and T2 mode).

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-003 Deadman switch released	Both deadman switches on Teach pendant are released.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-037 IMSTP input (Group: %d)	IMSTP input (*IMSTP signal for a peripheral device interface) is ON.
SRVO-232 NTED input	NTED input (NTED1-NTED11, NTED2-NTED21) is open.
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.
SRVO-410 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[5] is OFF.
SRVO-419 DCS PROFIsafe comm. error	PROFINET Safety communication error occurs.

Stop Category 1 is different from **Stop Category 0** as follows:

- In Stop Category 1, the robot is stopped along 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 Stop Category 1, physical impact is less than Stop Category 0. 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 time of Stop Category 1 is longer than those of Stop Category 0, depending on the robot model and axis.

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 time of Stop Category 1 are longer than those of Stop Category 0. 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.

"Stop Category 1 by E-Stop" option

When "**Stop Category 1 by E-Stop**" (A05B-2670-J521) option is specified, the stop type of the following alarms become Category 1 Stop but only in AUTO mode. In T1 or T2 mode, the stop type is Category 0 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.
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.

Stop Category 1 is different from **Stop Category 0** as follows:

- In Stop Category 1, the robot is stopped along 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 Stop Category 1, physical impact is less than Stop Category 0. 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 time of Stop Category 1 is longer than those of Stop Category 0, depending on the robot model and axis.

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 time of Stop Category 1 are longer than those of Stop Category 0. 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.

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TABLE OF CONTENTS

1 ABOUT THIS MANUAL

This manual is made from R-30*i*A/R-30*i*A Mate/R-30*i*B CONTROLLER CC-Link Interface (Slave) OPERATOR'S MANUAL B-82654EN/04 but changed for only R-30*i*B Plus/R-30*i*B Mate Plus.
In addition, following points are changed.

- When device is write protected, write is missed.
- Sometimes assignment clear procedure is necessary.
- Communication way over 16 bit integer or real number.
- Initial setting isn't necessary.

2 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 1.10 of CLPA (CC-Link PARTNER ASSOCIATION). Robot with this function acts as a Remote Device station.

"CC-Link Remote Device Station PCB" hardware is necessary to use this function.

Cable length between stations should be 2m or more in CC-Link Ver.1.00 in specific condition, but cable length between stations should be 20cm or more in CC-Link Ver. 1.10. Wiring become easy in Ver.1.10.
If Ver.1.10 device and Ver.1.00 device are mixed, total cable length and cable length between stations are Ver.1.00 specifications.
If system consists of only Ver.1.10 or later (Ver.1.10, Ver.2.00) devices and Ver.1.10 cables, cable length between stations is 20cm or more.

System consists of only Ver.1.10 or later（Ver.1.10，Ver.2.00）devices and Ver.1.10 cables
（Using End resistance110Ω）

Communication speed	Cable length between stations	Max total cable length
156kbps	20cm or more	1200m
625kbps		900m
2.5Mbps		400m
5Mbps		160m
10Mbps		100m

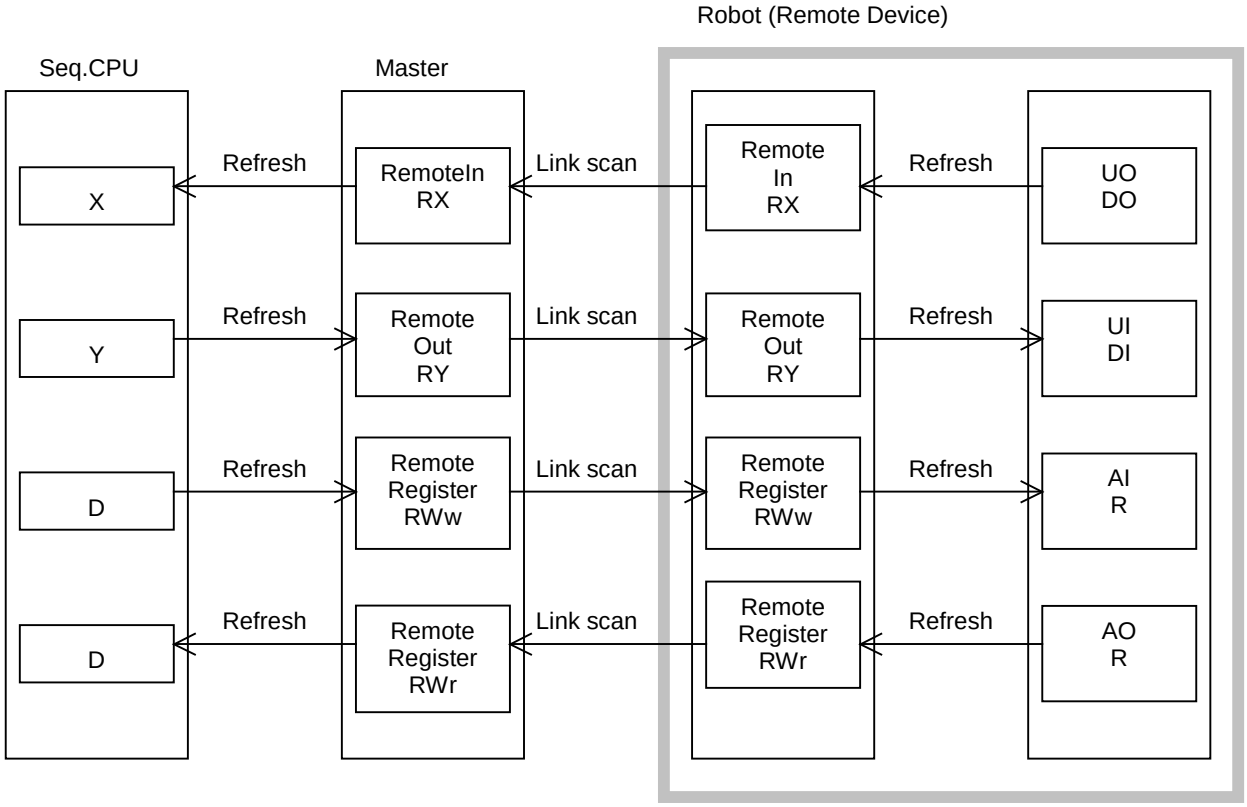
Reference Only CC-Link Ver.1.00 case（Using End resistance110Ω）

Communication speed	Cable length between stations		Max total cable length
	Between Remote I/O station or Remote device station (Minimal-length cable)	Anteroposterior stations of Master / Local intelligent device station	
156kbps	30cm or more	1m or more(A) 2m or more(B)	1200m
625kbps			600m
2.5Mbps			200m
5Mbps	30cm～59cm *		110m
	60cm or more*		150m
10Mbps	30cm～59cm *		50m
	60cm～99cm *		80m
	1m or more		100m

(A):1m or more is only when system consists of only master, remote I/O, remote device stations
(B):2m or more is when system also includes local stations or intelligent device stations
* : If only 1 part of cable length between remote I/O or remote device stations is this condition, rightmost "Max total cable length" is adopted.

2.1 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).



2.2 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.
CSP file	CC-Link specification tries to load CSP file to master and master setting is done. But software which can load CSP file seems to be not exist. CSP file itself is prepared for FANUC. If you need CSP file, request to FANUC.

2.3 SPECIFICATION OVERVIEW

Table 2.3 CC-Link interface (slave) specification overview

ITEM	SPECIFICATION
Communication protocol	CC-Link Version 1.10
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.
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.	Add another CC-Link Remote Device Station PCB to an empty slot of the controller. (NOTICE: Up to two CC-Link Remote Device Station PCB can be installed.)

(*) 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.

2.4 ORDER NUMBER

Table 2.4 (a) CC-Link interface (slave)

Name	Order number
CC-Link Interface (Slave)	A05B-*-J786

“CC-Link Remote Device Station PCB” hardware is necessary to use this function.
Up to 2 CC-Link Remote Device Station PCB can be installed to controller.

Table 2.4 (b) CC-Link remote device station PCB

Name	Order number
CC-Link Remote Device Station PCB	A05B-*-J110

3 SETUP

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

3.1 CC-Link INTERFACE SETUP

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

Table 3.1 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) (Not allowed to set)	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) (Not allowed to set)	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:

MENU → 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. Clear assignment may be necessary before changing assignment.
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”.
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.

3.2 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.

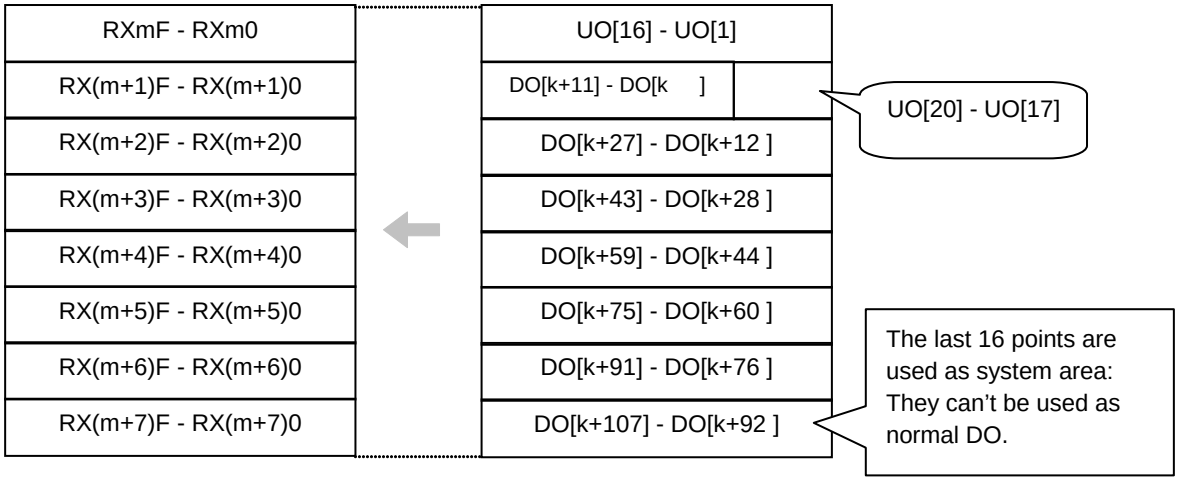
	1 station	2 stations	3 stations	4 stations
Remote input RX	User area 16 pnts + System area 16 pnts	User area 48 pnts + System area 16 pnts	User area 80 pnts + System area 16 pnts	User area 112 pnts + System area 16 pnts
Remote output RY	User area 16 pnts + System area 16 pnts	User area 48 pnts + System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

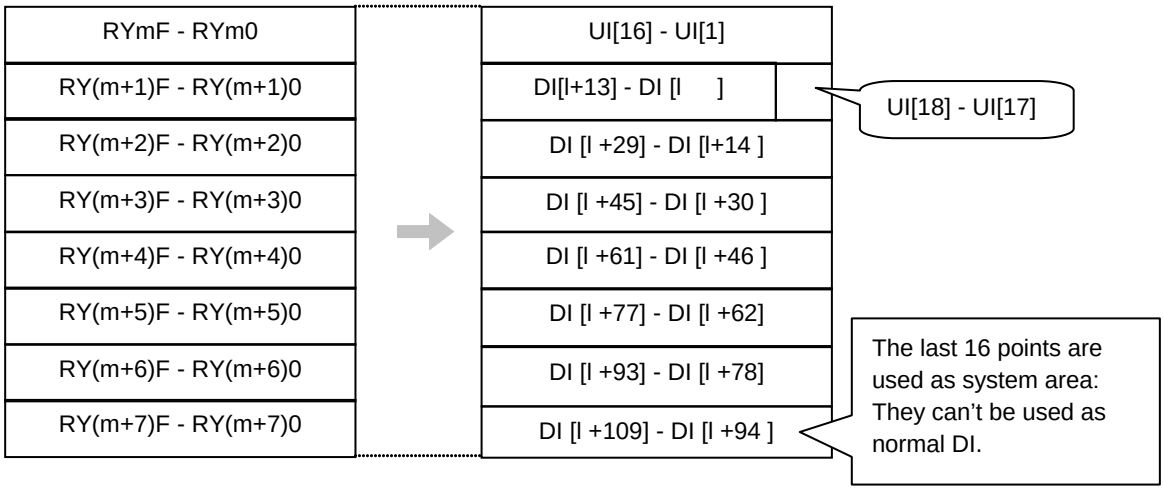
UOP output (UO) and Digital output (DO) will be assigned to Remote input (RX) in turn. UOP input (UI) and Digital input (DI) will be assigned to Remote output (RY) in turn.

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.





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 'I' 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.

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.

3.3 REMOTE REGISTER(RWr/RWw)

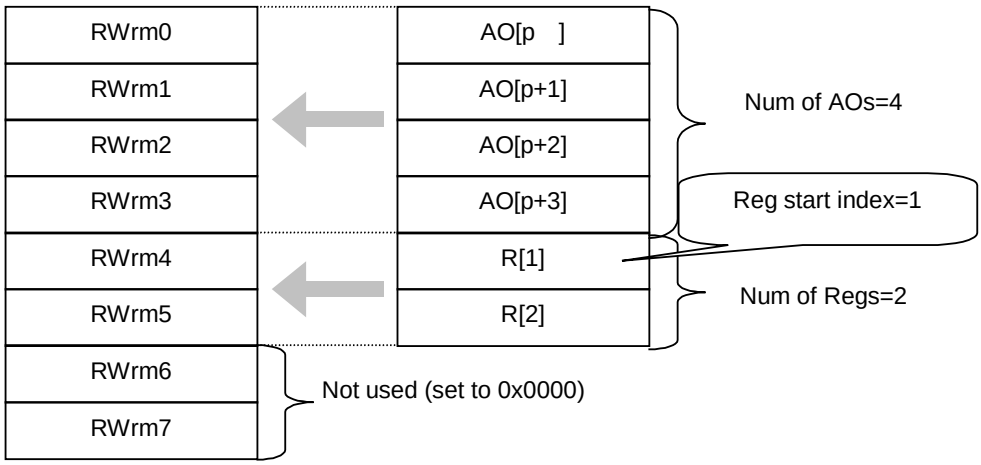
The number of Remote register data(RWr/RWw) exchanged by the CC-Link Interface function is decided according to the number of stations. The following table shows the relation between the number of RWr/RWw and the number of stations.

	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. 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

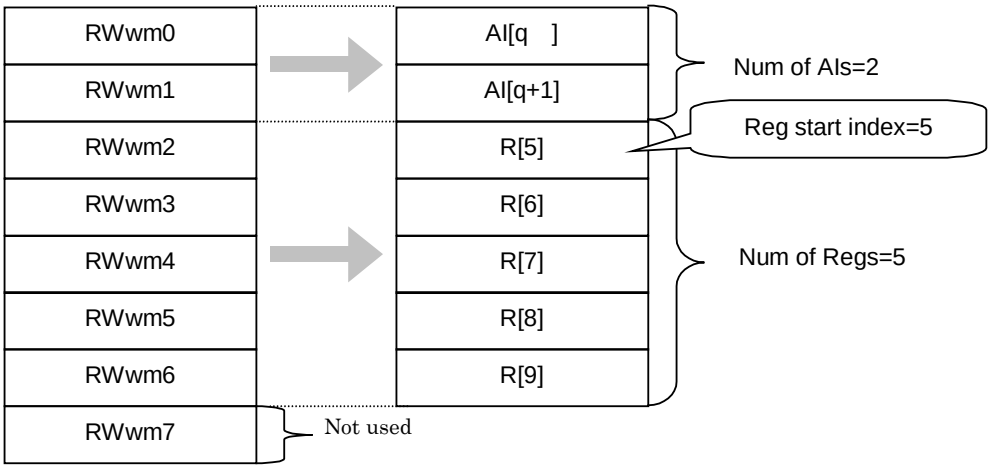


NOTE
1 The value of 'm' will be decided according to the Station No. Refer to the CC-Link Master station manual for details
2 The value of 'p' will be decided by the system automatically but you can change them. To check and change the value, refer to the Analog I/O CONFIG screen. The following shows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



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

3.3.1 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.

4 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.

4.1 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".

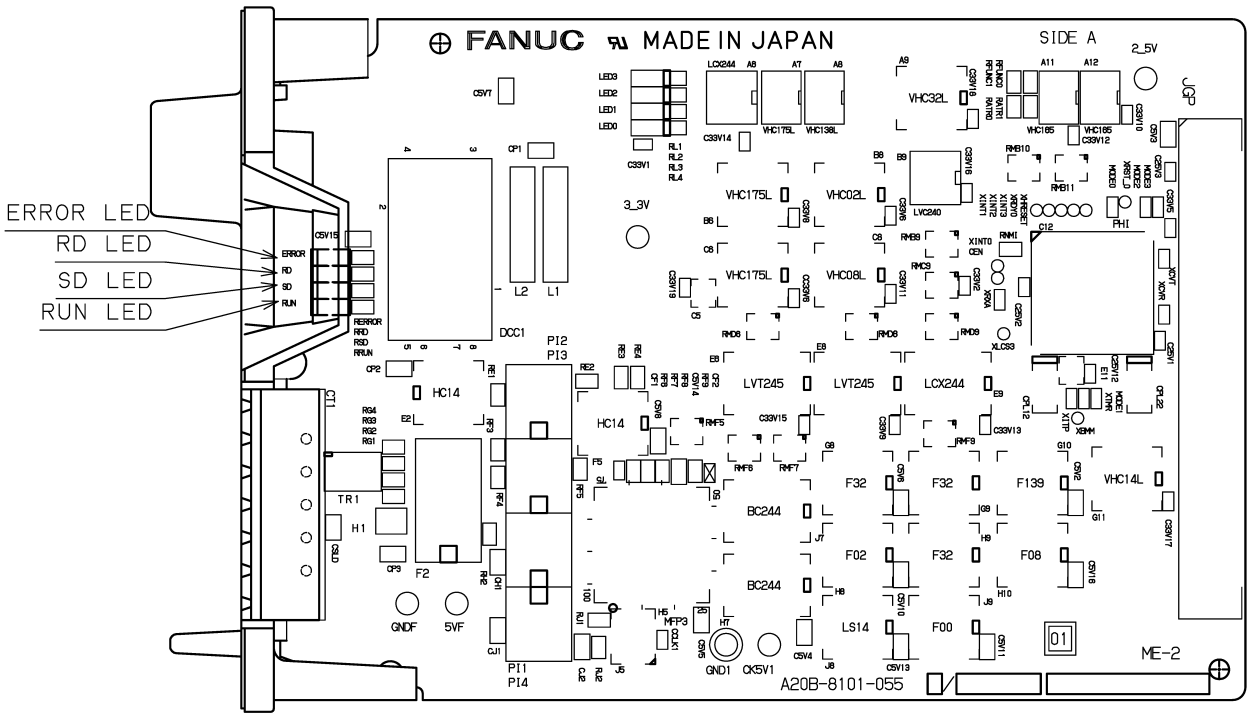


Fig. 4.1 Remote device station PCB

4.2 CC-LINK INTERFACE STATUS

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

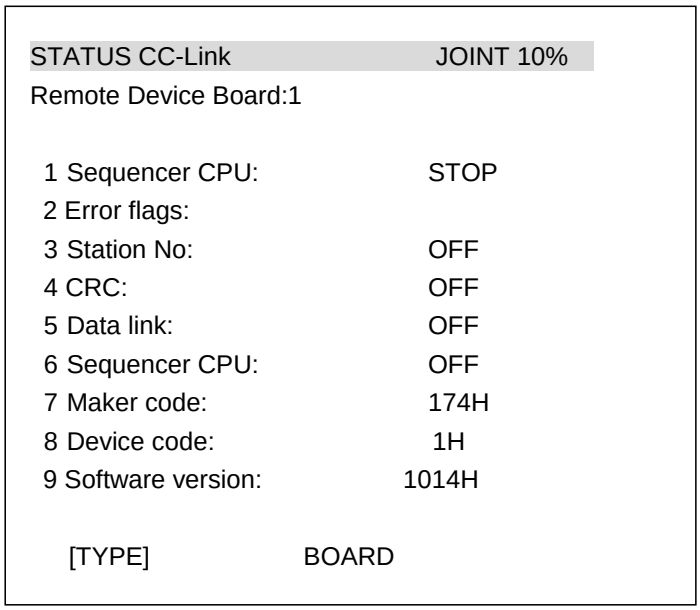
Table 4.2 Status items of CC-Link interface

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 “316H”.
Device code	This item indicates the device code. **The device code is “23H”.
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



5 ALARM 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.

> ⚠**CAUTION**
> 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.

> ⚠**CAUTION**
> 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.

> ⚠**CAUTION**
> 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 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.
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.
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: Three or more CC-Link Remote Device Station PCB are installed.
Remedy: Robot controller supports only two CC-Link communication boards.
Please turn off the controller and remove excess board.

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.
Initial data setting isn’t necessary for CC-Link of robot controller.

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	System area
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	
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).

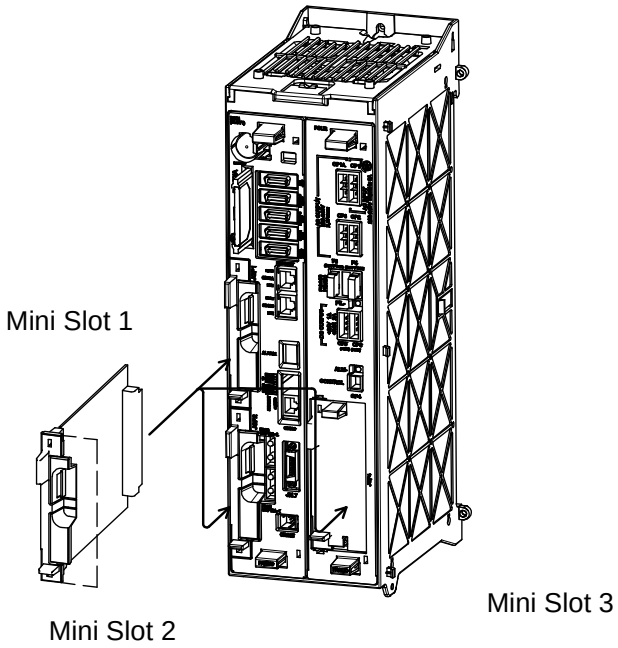
Remote Device -> Master		Master -> Remote Device	
Device No.	**Name**	**Device No.**	**Name**
RWrm0	User area	RWwm0	User area
RWrm1		RWwm1	
RWrm2		RWwm2	
RWrm3	1 station	RWwm3	1 station
RWrm4		RWwm4	
RWrm5		RWwm5	
RWrm6		RWwm6	
RWrm7	2 stations	RWwm7	2 stations
RWrm8		RWwm8	
RWrm9		RWwm9	
RWrmA		RWwmA	
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.

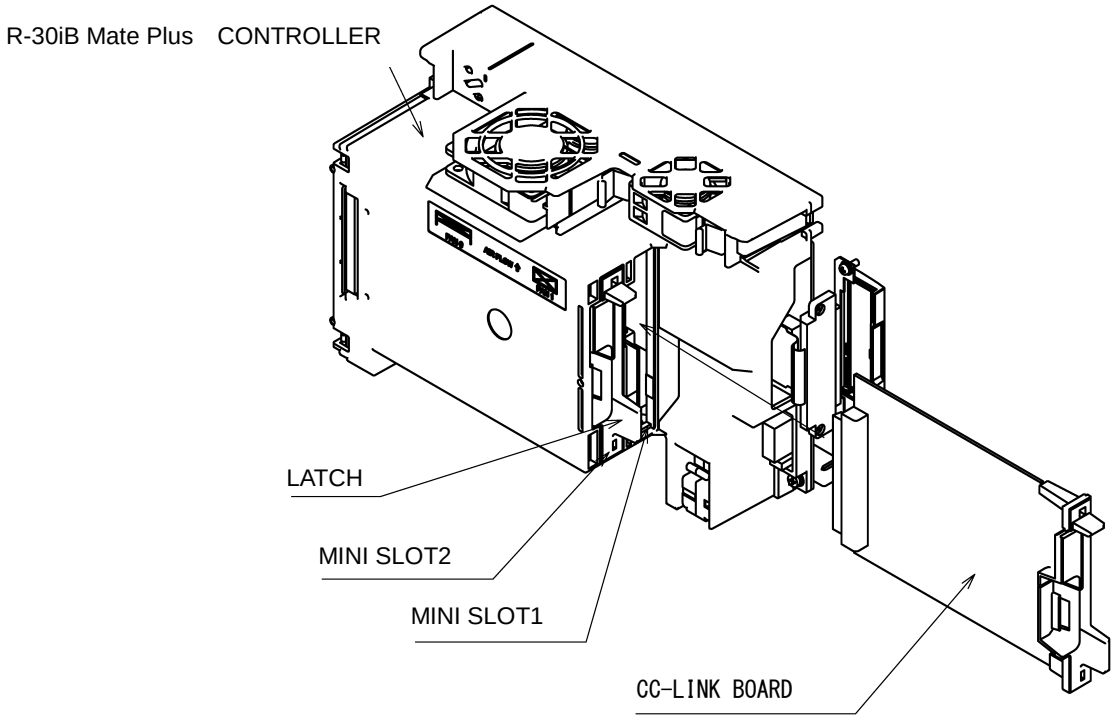
B CC-Link HARDWARE CONNECTION AND MAINTENANCE

B.1 INSTALLATION OF CC-Link REMOTE DEVICE STATION PCB

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



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

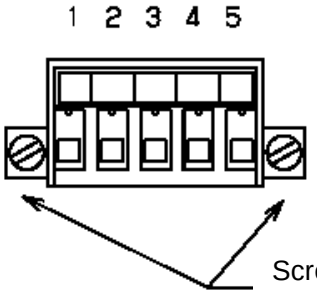


B.2 CONNECTOR

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

CT1

Connector pin's array

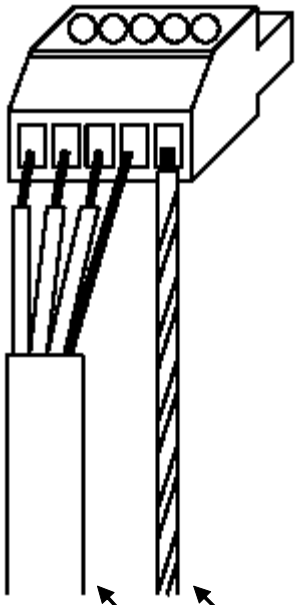


No.	Signal
1	DA
2	DB
3	DG
4	SLD
5	FG

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.(NOTE)
(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.

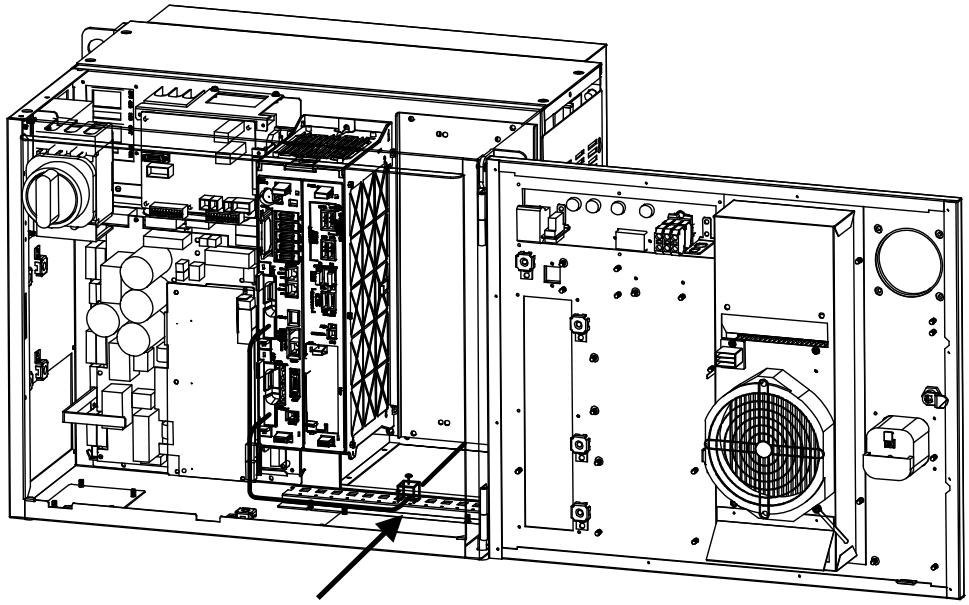
NOTE
Terminals are available. Tie up the stripped wires and fix a terminal to it. The following terminal is recommended.
Phoenix Contact, series AI (Applicable tool:ZA3)

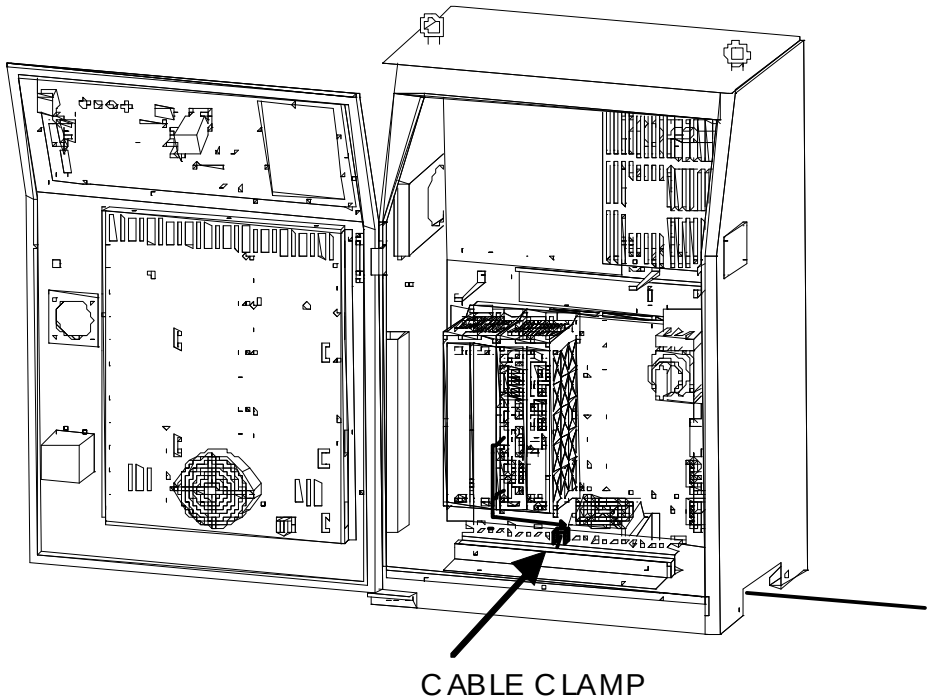
FG cable are connected to both a connector and a cabinet before the delivery (Except the case of ordering PCB only).

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

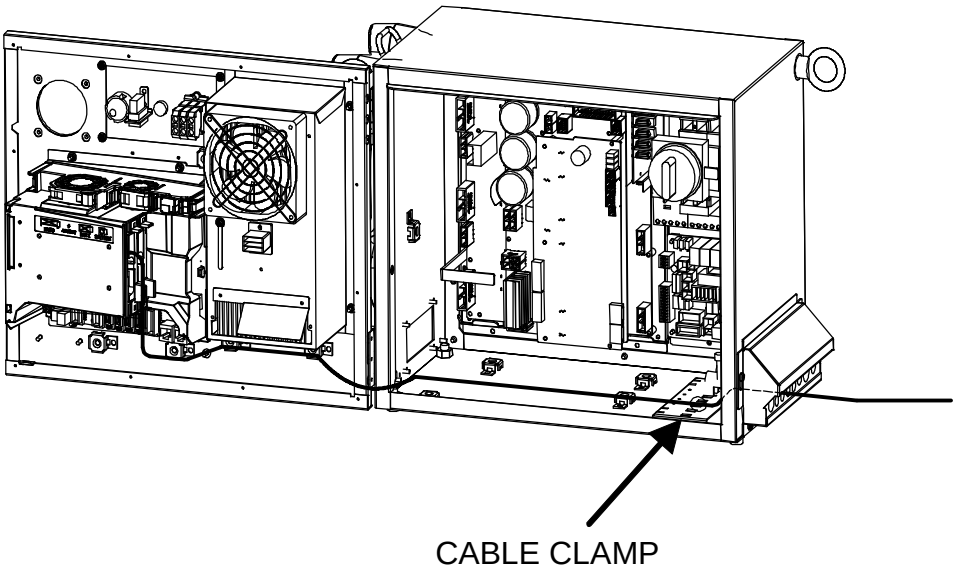
B.4 HOW TO LEAD CC-Link CABLE

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



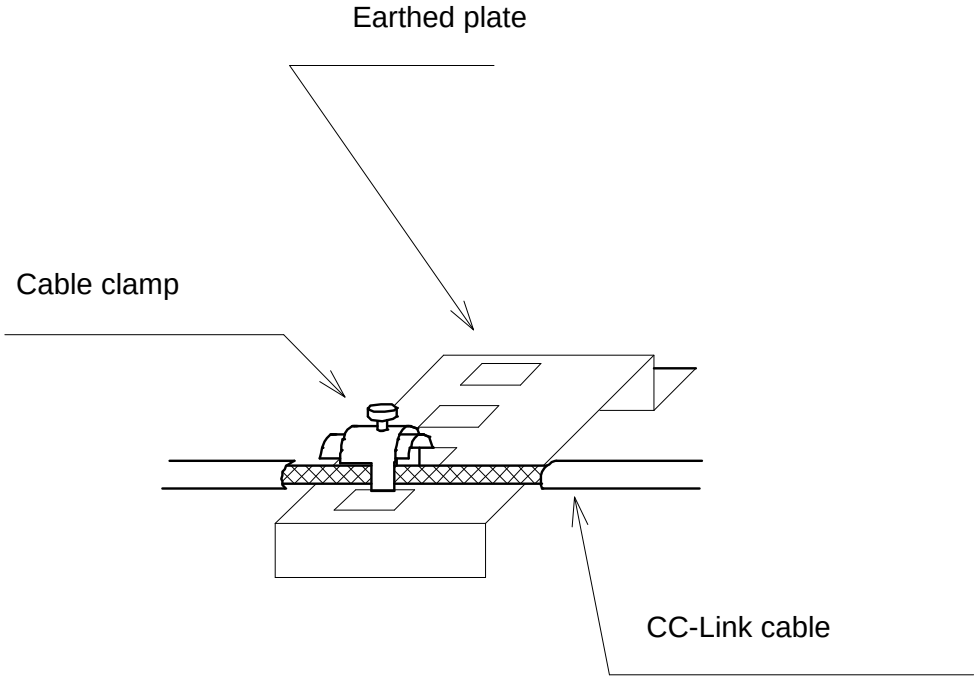


The following is how to lead the cable into the R-30*i*B Mate Plus controller.



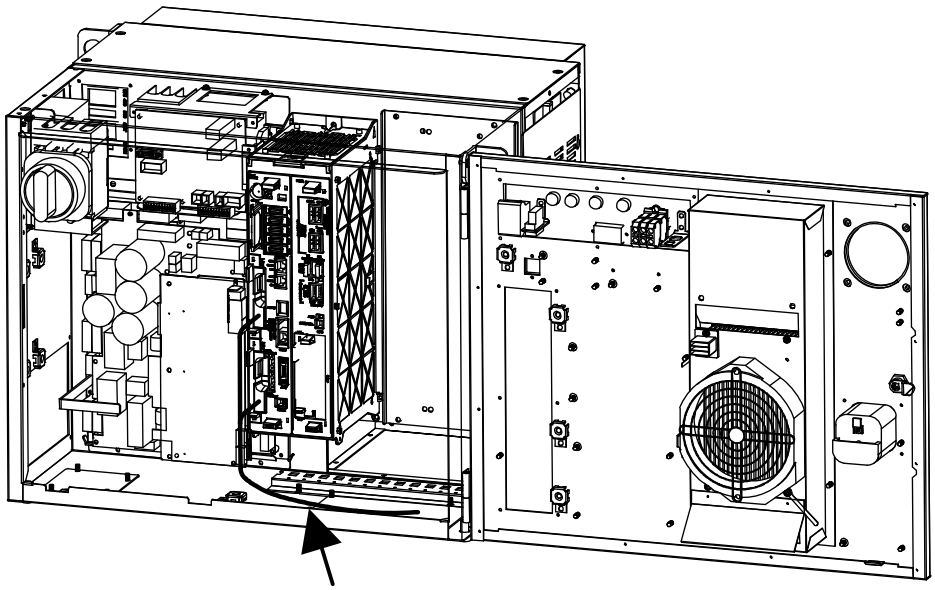
B.5 HOW TO WIRE CC-Link CABLE

For information on how to wire the CC-Link cable, refer to the “CC-Link cable wiring manual” 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.

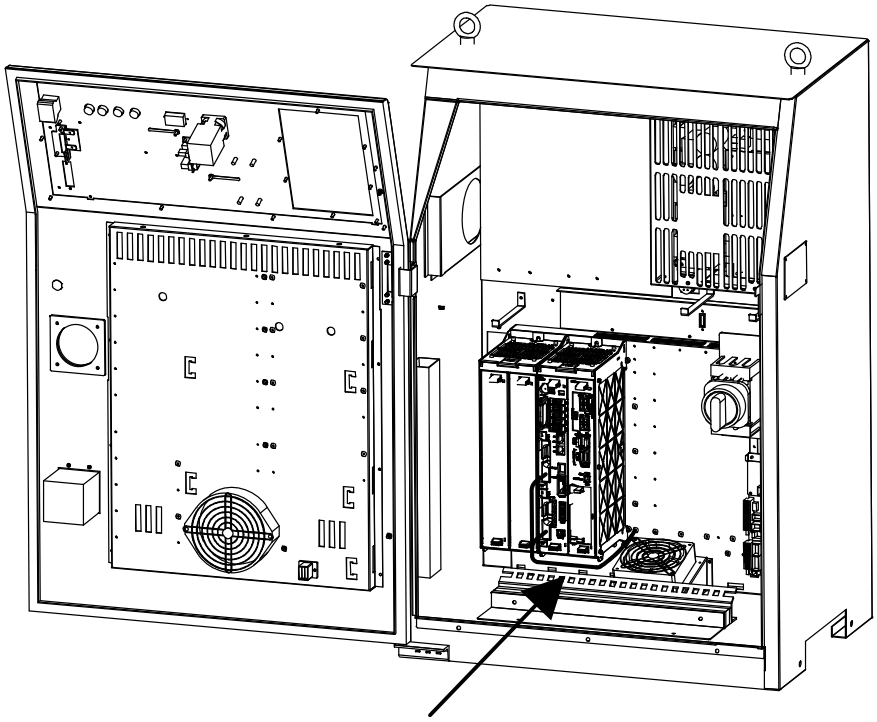


B.6 HOW TO CONNECT THE EARTH CABLE IN CASE ONLY THE PCB IS PROVIDED

For R-30*i*B Plus controller, connect the bar terminal of the earth cable to the connector like “B.3 How to connect a CC-Link cable” and then connect the circle terminal to the robot cabinet to earth as follows.

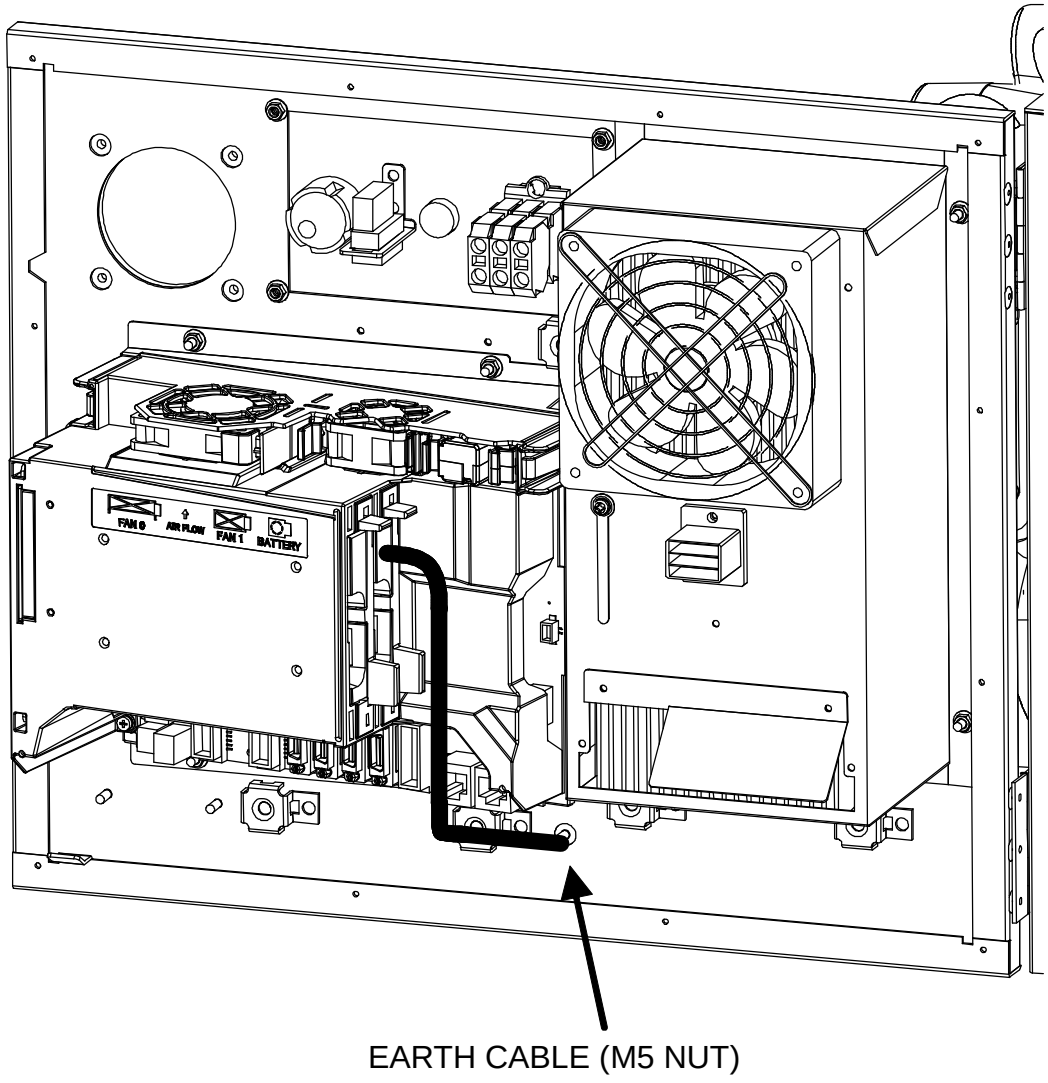


EARTH CABLE (M5 NUT)



EARTH CABLE (M5 SCREW)

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



INDEX

REVISION RECORD

Edition	Date	Contents
01	Jul.,2017	

B-83974EN/01