YAMAHA
YAMAHA MOTOR CO., LTD.

FIELD NETWORK DEVICE
FOR YAMAHA CONTROLLER

RCX series

YC-Link

User's Manual

ENGLISH E

E103-Ver. 1.02

Contents

1. OVERVIEW 1

1.1 YC-Link Compatible Unit Nomenclature 3

1.2 Accessory 4

2. INSTALLATION 5

2.1 Connecting the YC-Link Cable 5

2.2 Specifying the RCX Series YC-Link Compatible Unit Settings 6

2.2.1 DIP Switch Settings 6

2.2.2 Rotary Switch Settings 6

2.3 Specifying the SR1 Series YC-Link Compatible Unit Settings 7

2.3.1 Rotary Switch Settings 7

2.3.2 SR1 Series HPB Connector 8

2.3.3 SR1 Series Unit's SAFETY Connector 9

3. OPERATION 12

4. TROUBLESHOOTING 15

4.1 Error Messages 15

4.2 SR1 Series Alarm Displays 17

MEMO

1. OVERVIEW

[About YC-Link]

The YC-Link system allows an RCX series multi-axis robot controller to control SR1 series single-axis robot controllers by serial communication. SR1 series controllers connected to YC-Link can be controlled as RCX series robot axes, allowing users to "add additional axes" to the RCX controller without concern for different controllers. A single RCX series unit can control a robot system with up to 4 axes, with an expansion capability that accommodates up to 6 axes per robot, and up to 8 axes for the overall controller system.

[YC-Link compatible units]

A standard RS485 serial communication format (multipoint communication) is used for communication between controllers. YC-Link compatible units are equipped with RS485 interfaces, and offer a network with controllers connected in a multi-drop (daisy chain) configuration. There are 2 types of YC-Link compatible units: those for the RCX series, and those for the SR1 series.

[Control format]

A YC-Link system comprises 1 primary station and 1 or more secondary stations, with the single primary station controlling the secondary stations. The RCX series unit is the primary station, and the SR1 series units are the secondary stations. A single YC-Link system has only 1 primary station. This primary station recognizes each of the secondary stations by their station Nos. specified at the rotary switch of the YC-Link compatible unit.

The primary station transmits various types of data and commands to the secondary stations, using the station Nos. as the transmission destinations. The secondary stations check the destination Nos. of the transmitted data, and when a station recognizes its own station No. as the destination, it processes that data and sends a reply. Command processing is completed when the primary station receives a reply from a secondary station to which data was transmitted. The primary station performs these transmission/reception operations versus the secondary stations in a periodic manner.

[Special Features]

In the YC-Link system, all secondary station (SR1 series) operations are controlled from the primary station (RCX series). An SR1 series HPB programming box is therefore not required. Robot axes connected to the SR1 series can be controlled in the same manner as robot axes connected to the RCX series. The SR1 series can perform most of the same operations as the RCX series, shares the same format as most including operations performed using by robot language, manual operations by RPB/MPB, parameter editing, operations by parallel/serial I/O, and operations by online commands, etc.

[Compatible robots]

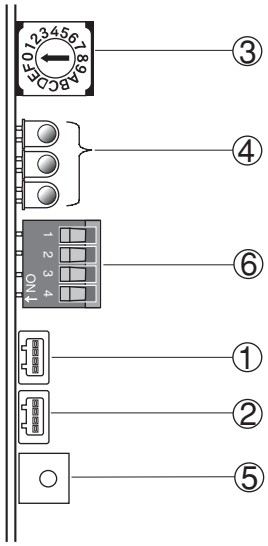
SR1 series compatible single-axis robots can be added to the YC-Link system. Even if a robot is not yet supported by the RCX series, it can be added to the system, and can be controlled from the RCX series, provided that it is compatible with the SR1 series.

CAUTION

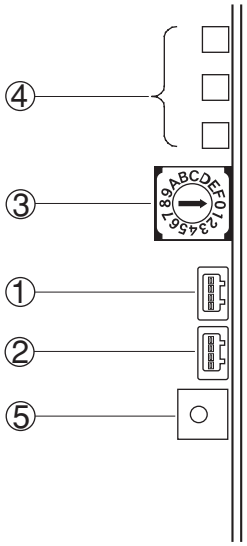
The YC-Link system does not support the MOVE statement's "CONT" option, or the DRIVE statement's "T" option.

1.1 YC-Link Compatible Unit Nomenclature

■ **For RCX series**



■ **For SR1 series**



①, ② **YC-Link cable connector**

The YC-Link unit's accessory YC-Link cable is connected to either of these connectors. Both connectors have the same specifications.

③ **Station No. setting switch**

This is the rotary switch used to specify the YC-Link unit's station No.

④ **LED (green, yellow, red)**

These are the YC-Link status indicator LEDs.

⑤ **FG terminal**

This is the frame ground terminal (M3 female thread)

⑥ **Dip Switch (for RCX series only)**

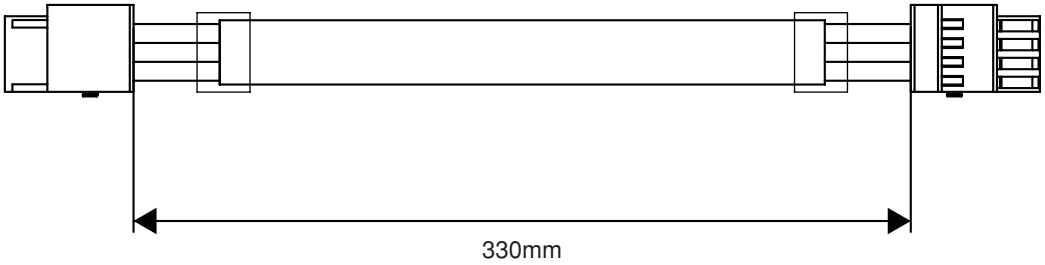
These are the YC-Link function selection switches.

1.2 Accessory

Check the following accessories are included in your YC-Link unit

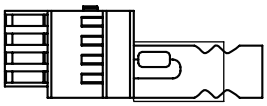
① **YC-Link cable**

Model KBG-M532L-000 One cable is provided for each SR1 series controller connected by YC-Link



② **Terminal resistance**

Model KBG-M5163-100 2pcs

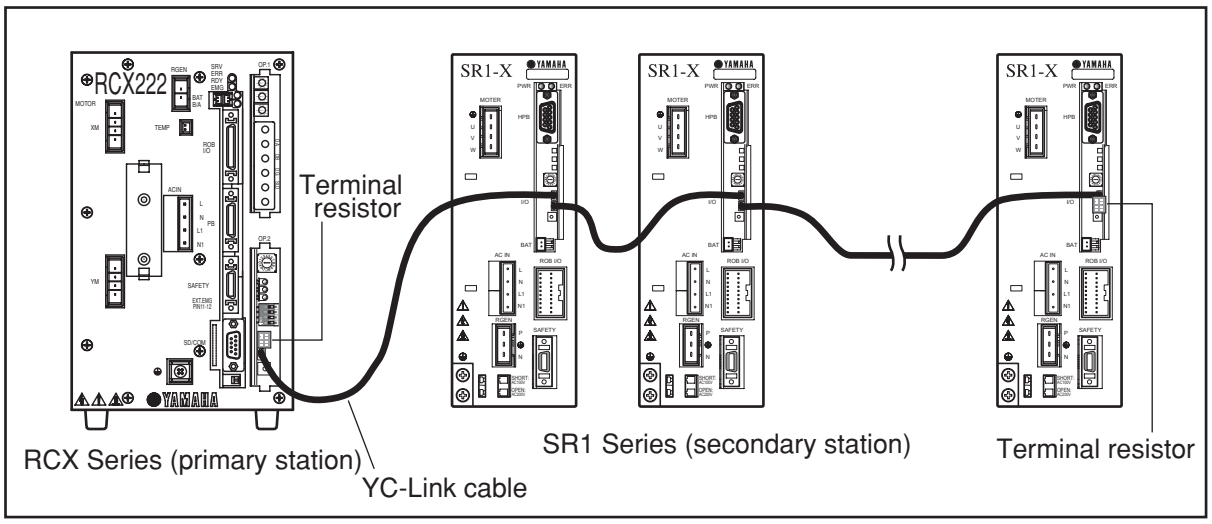


2. INSTALLATION

This section explains the YC-Link system installation procedure. For items not included here, please refer to the user's manuals of the controllers in question.

2.1 Connecting the YC-Link Cable

Connect the YC-Link compatible unit's accessory cable as shown in the figure below. Each YC-Link compatible unit is equipped with 2 same-type communication connectors, and the communication cable can be connected to either of them. Connect the accessory terminal resistors at both ends of the network (at vacant communication connectors).



■ **Communication connector signal table**

Pin No	Name	Signal
1	CMD+	Signal 1
2	CMD-	Signal 2
3	SG	Signal ground
4	FG	Frame ground

CAUTION

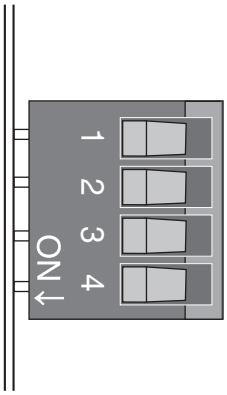
- **Use the YC-Link cable and terminal resistors that came with the YC-Link compatible module.**
- **Be sure to install the terminal resistors.**

2.2 Specifying the RCX Series YC-Link Compatible Unit Settings

Set the RCX series YC-Link compatible unit as the "primary station".

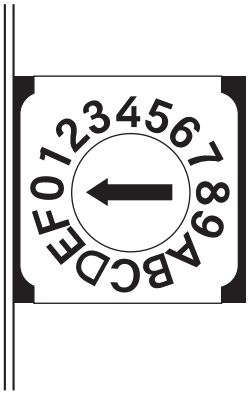
2.2.1 DIP Switch Settings

Set all the RCX series YC-Link compatible unit's DIP Switch settings (Nos. 1 to 4) to their ON positions.



2.2.2 Rotary Switch Settings

To specify this setting, use a minus driver to turn the arrow indicator at the center of the rotary switch. For the RCX series, specify a setting of "0".



2.3 Specifying the SR1 Series YC-Link Compatible Unit Settings

Set the SR1 series YC-Link compatible unit as a "secondary station".

2.3.1 Rotary Switch Settings

Refer to the table below to verify the axis to be used by YC-Link, then specify a "0 to 7" setting at the rotary switch of the SR1 which is to be connected to that axis. If an axis used by the RCX has a dual drive setting, specify a station No. which is 1 lower than those shown in the table.

■ **For "main only" axis assignment, or "6 + 2" assignments**

Indication	Rotary Switch Setting	Indication	Rotary Switch Setting
M1	0	M5	4
M2	1	M6	5
M3	2	S1	6
M4	3	S2	7

* S1 and S2 settings are not possible in "Main only" configurations.

■ **For "4 + 4+ axis assignments**

Indication	Rotary Switch Setting	Indication	Rotary Switch Setting
M1	0	S1	4
M2	1	S2	5
M3	2	S3	6
M4	3	S4	7

■ **For "2 + 2" axis assignments**

Indication	Rotary Switch Setting	Indication	Rotary Switch Setting
M1	0	---	---
M2	1	---	---
S1	2	---	---
S2	3	---	---

■ **For "3+ 3" axis assignments**

(Compatible software versions: RCX141/142 Ver. 8.69 onwards, RCX221/222 Ver. 9.16 onwards)

Indication	Rotary Switch Setting	Indication	Rotary Switch Setting
M1	0	S1	2
M2	1	S2	3
M3	4	S3	5

CAUTION

- **Use care to avoid duplicate station No. settings.**
- **An "F" station No. setting disables the SR1 series unit's YC-Link function, and the SR1 unit functions as a standard single-axis controller.**

NOTE

The "3 + 3" axis assignment setting is only valid for controllers of the following software versions.

- RCX141/142 Ver. 8.69 onwards
- RCX221/222 Ver. 9.16 onwards

2.3.2 SR1 Series HPB Connector

The YC-Link system does not use an HPB programming box for SR1 series units. Connect the SR1 unit's accessory dummy connector to the HPB connector.

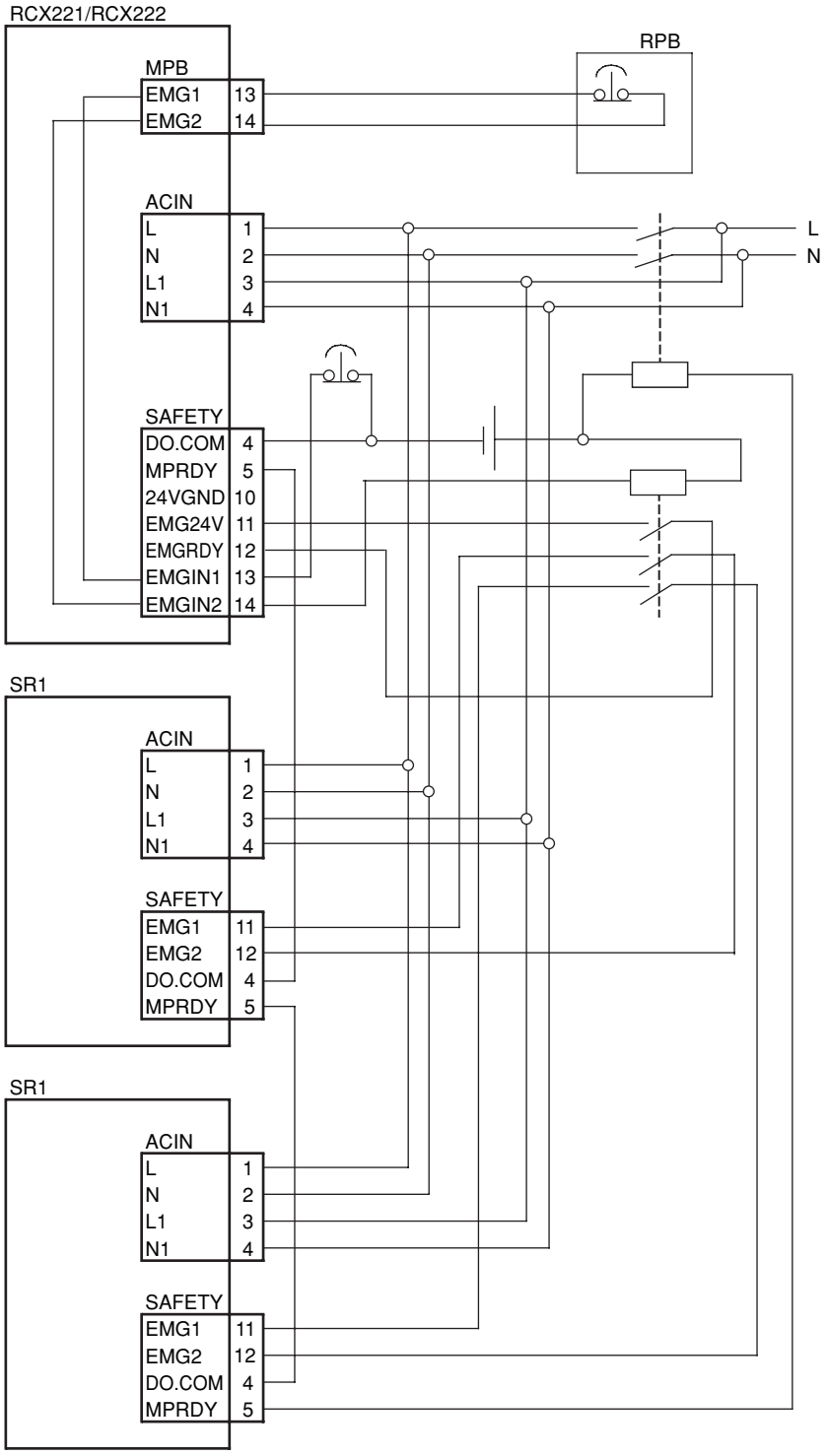
CAUTION

If nothing is connected to the HPB connector, it will be impossible to cancel the SR1 unit's EMERGENCY STOP status.

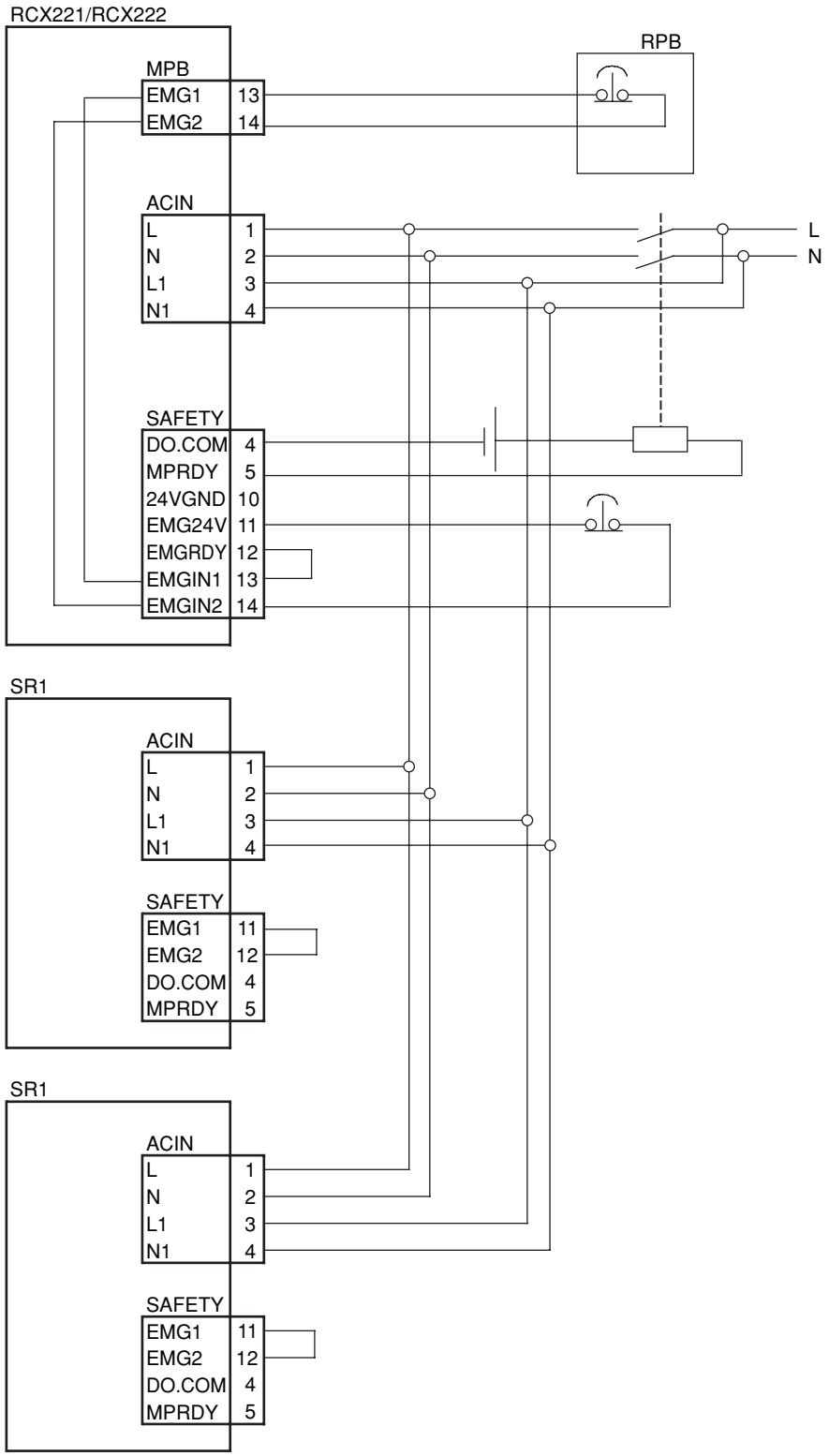
2.3.3 SR1 Series Unit's SAFETY Connector

The SR1 series interlock and service inputs are disabled in the YC-Link system. For the Emergency Stop input and MPRDY output, see the connection examples shown below.

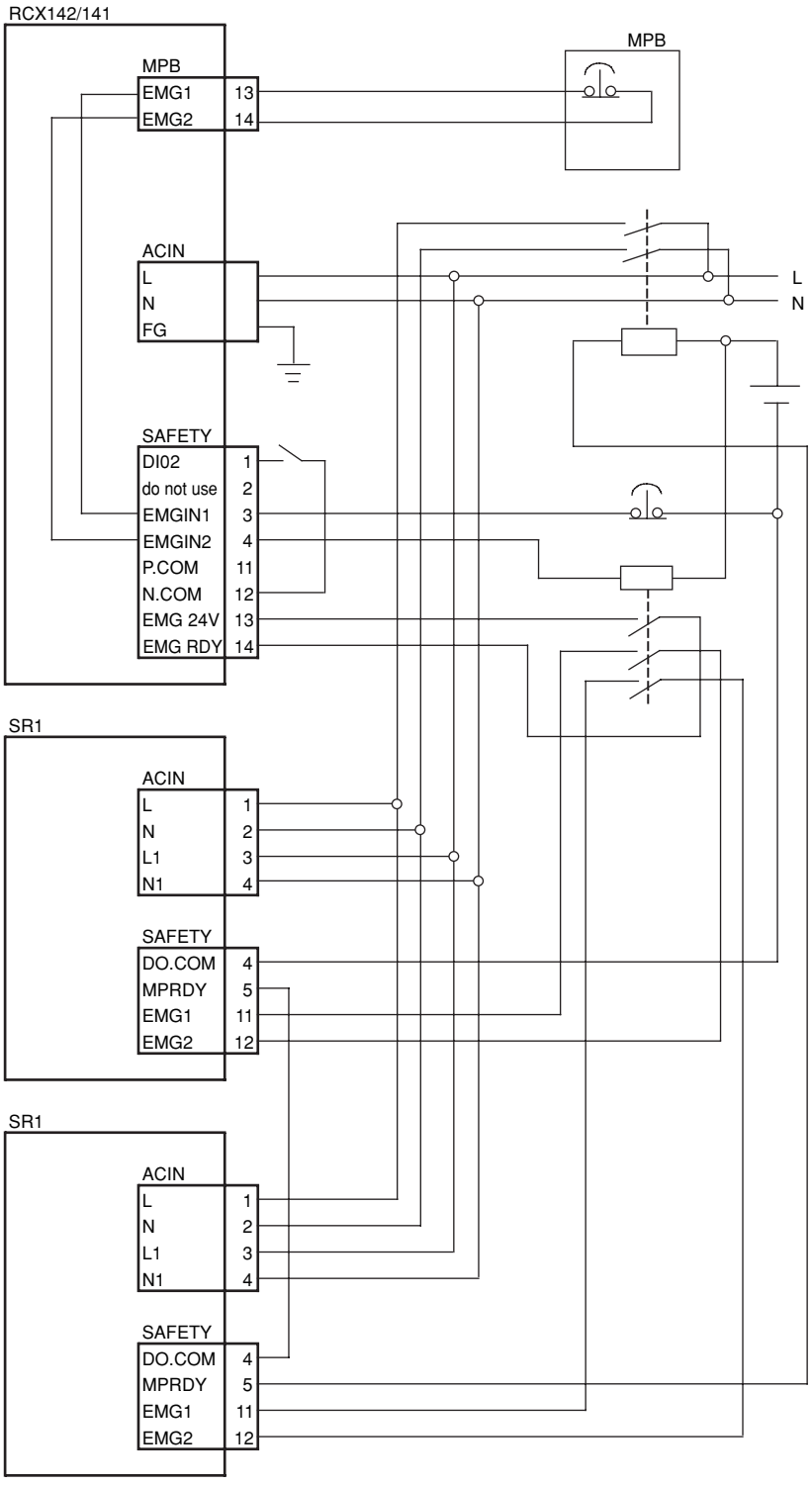
■ **[Ex.1] Connection to RCX221/RCX222**
(when using emergency stop input and MPRDY output of SR1 series)



■ [Ex.2] Connection to RCX221/RCX222
(when not using emergency stop input and MPRDY output of SR1 series)



■ [Ex.3] Connection to RCX142/RCX141 (NPN specifications)



CAUTION

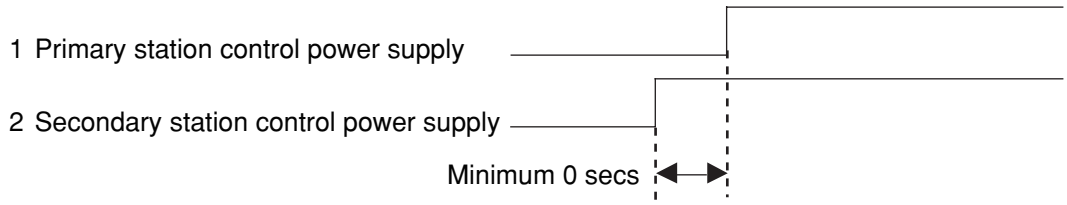
P.COM and N.COM on the SAFETY connector are internally connected to P.COMDI and N.COMDI on the STD.DIO connector.

3. OPERATION

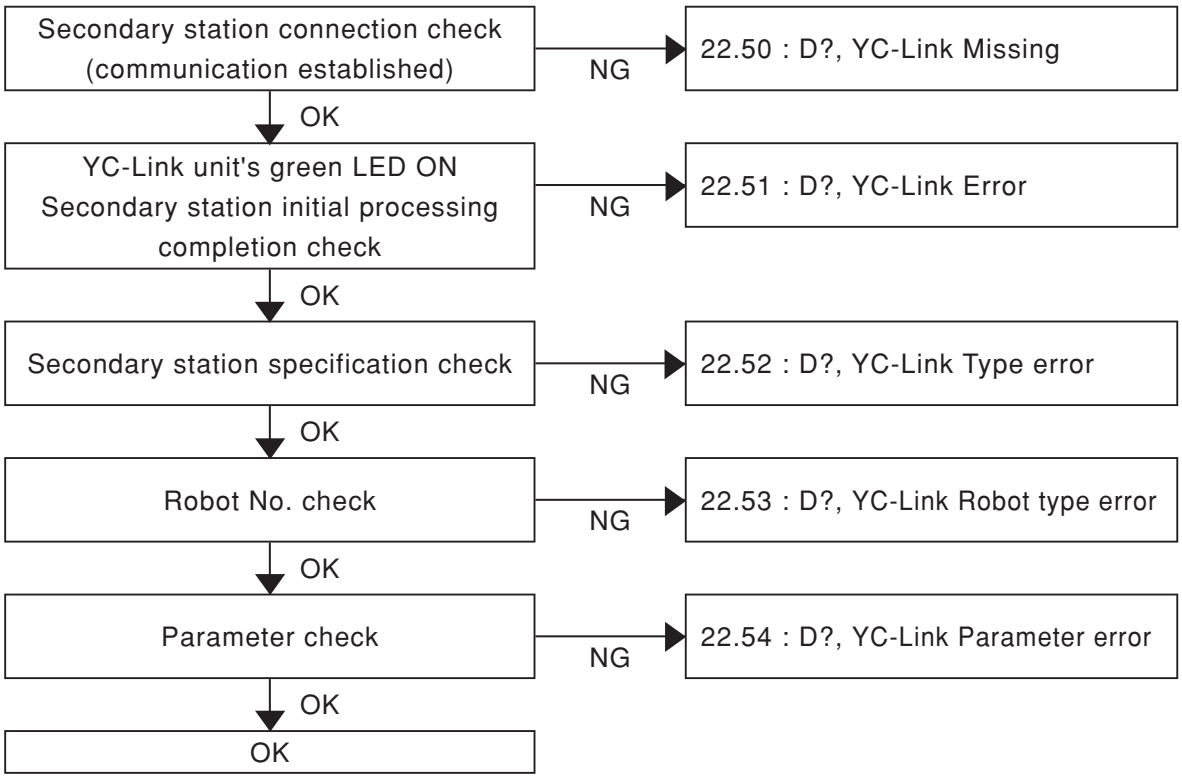
The YC-Link system is controlled by a primary station RCX series unit. For basic operation procedures, refer to the primary station RCX series unit's operation manual.
This section explains the operation procedures and cautions unique to the YC-Link system.

Power ON

When the primary station controller is started, a connection check occurs for secondary station controllers. Therefore, the control power supplies of secondary stations must be switched ON no later than the primary station power ON. A simultaneous primary station and secondary station power ON is acceptable.



After the power is turned ON, the primary station performs the following processing. If an error occurs, refer to the error message and the troubleshooting item.



Servo ON

Servos should not switch ON until after the main power for the RCX series and SR1 series has switched ON. An error occurs if a servo is switched ON when the main power supply is OFF.

Emergency Stop

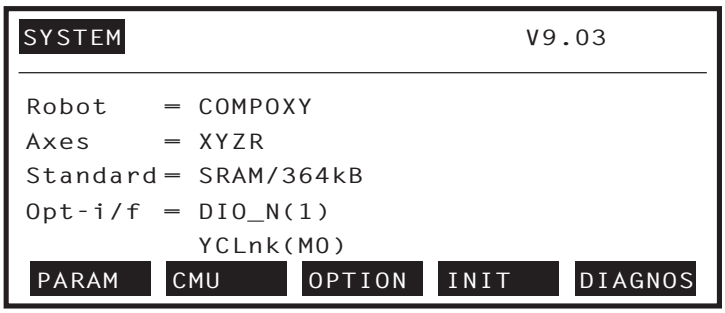
A "servo OFF" status is established at all axes when the RCX series Emergency Stop input (D100) switches OFF. If the SR1 series main power is also wired (by external circuit) to switch OFF at this time, the "19.33: D?, Main power OFF" error may occur at the SR1 series.

Emergency Stop Cancel

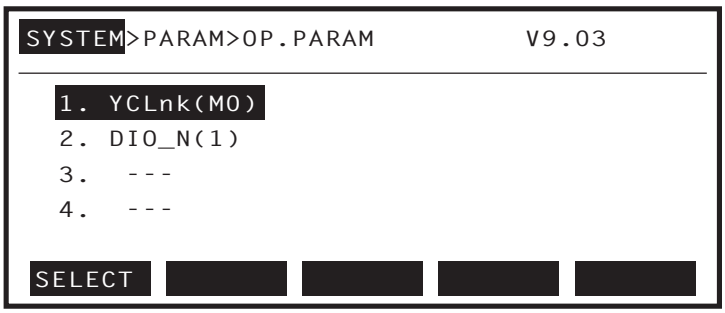
To cancel an Emergency Stop status, switch the Emergency Stop input (D100) ON, then perform an Emergency Stop cancel operation at the RPB/MPB, or simply switch the Servo ON input (D101) ON. An "alarm reset" (alarm status cancel) then occurs at the SR1 series. If an alarm is active at the SR1 series, clear the SR1 alarm if possible in order to enable subsequent operation. Some SR1 series alarms can be reset and others cannot. Refer to the SR1 series operation manual for details. If an alarm occurs which cannot be reset, the power for the entire YC-Link system must be restarted.

YC-Link compatible unit check

When the "SYSTEM" mode is selected at the RPB/MPB, "YCLnk (Mn)" appears on the 7th line if a YC-Link compatible unit is connected to the RCX series. n is the station nember set by the rotary swith.



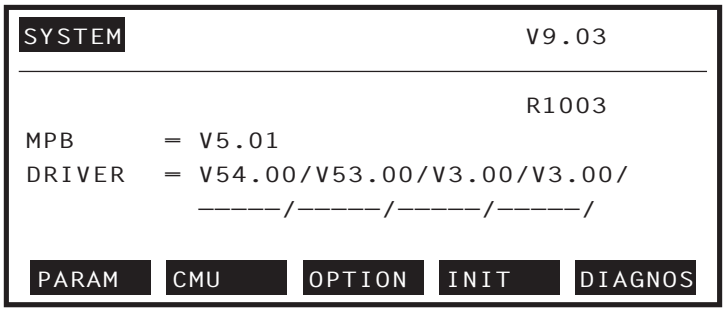
The YC-Link compatible units also display at the option board's parameter setting screen (system > parameter > OP board).



In this example, a YC-Link compatible unit is installed in Option Slot 1.

Software version display for secondary station SR1 Series

To display the version information, press the [>>] key while in the "SYSTEM" mode.



The driver version display shows the SR1 series versions for YC-Link system axes where SR1 units are used.

4. TROUBLESHOOTING

4.1 Error Messages

This section explains the YC-Link system error messages.

22.50 : YC-Link Missing (YC-Link disconnect)

Code : &H1632
Meaning : The secondary station connection test failed at primary station startup.
Cause : The secondary station power is OFF.
The YC-link communication cable and terminal resistor are disconnected.
The secondary station's "station No." setting is incorrect.
Remedy : Configure so that the secondary station power switches ON before or simultaneously with the primary station power ON.
Verify that the YC-link communication cable and the terminal resistor are connected.
Check the station No. settings.

22.51 : YC-Link Error

Code : &H1633
Meaning : The secondary station failed to start properly.
Cause : Secondary station communication failure.
Remedy : Verify that the YC-link communication cable and the terminal resistor are connected.

22.52 : YC-Link type error

Code : &H1634
Meaning : Mismatch between the secondary station specifications and the setting.
Cause : The secondary station controller (SR1) specification (SR1-X/SR1-P) or the current sensor specification has been changed (controller was replaced).
Remedy : Check the connected SR1 type, and the current sensor specification.
Verify that the station No. setting is correct.
Perform a system generation.

22.53 : YC-Link robot type error

Code : &H1635
Meaning : Mismatch between the secondary station robot No. and the setting.
Cause : The secondary station controller setting was changed, or the controller was replaced.
Remedy : Verify that the correct SR1 is connected.
Verify that the station No. setting is correct.
Perform a system generation.

22.54 : YC-Link parameter error

Code : &H1636
Meaning : Mismatch between the secondary station parameter and the setting.
Cause : The secondary station parameter setting was changed, or the controller was replaced.
Remedy : Verify that the correct SR1 is connected.
Verify that the station No. setting is correct.
Perform a system generation.

22.55 : YC-Link communication error (YC-Link network error)

Code : &H1637
Meaning : The secondary station failed to reply.
Cause : The communication cable is disconnected.
The communication is malfunctioning due to noise.
A serious failure has occurred at the secondary station controller.
Remedy : Verify that the communication cable is connected.
Implement noise countermeasures.
Check the secondary station controller's condition.

22.56 : YC-Link emergency stop ON (YC-Link Emg stop on)

Code : &H1638
Meaning : The secondary station is in emergency stop.
Cause : The secondary station is in emergency stop.
Remedy : Release the secondary station emergency stop.

4.2 SR1 Series Alarm Displays

SR1 series alarms display in a "19.xx : D?, message" format, with "xx" indicating the SR1 series alarm No.

For example, if an overload (alarm No. = 1) condition occurs at the SR1 connected to the 5th axis, the alarm display would appear as follows;

19.1 : D5, Overload

For details concerning SR1 series alarms, refer to the SR1 series operation manual.

Revision record

Manual version	Issue date	Description
Ver. 1.00	Oct. 2006	English manual Ver. 1.00 is based on Japanese manual Ver. 1.01.
Ver. 1.01	Jun. 2007	English manual Ver. 1.01 is based on Japanese manual Ver. 1.02.
Ver. 1.02	Jan. 2008	English manual Ver. 1.02 is based on Japanese manual Ver. 1.03.

User's Manual

YAMAHA YC-Link

Robot Controller

Jan. 2008
Ver. 1.02
This manual is based on Ver. 1.03 of Japanese manual.

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IM Operations

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