Think solution. NITTO SEIKO

ADVANCED THREAD TIGHTENING ROBOT
NITOMAN RC5500-S
THREAD TIGHTENING ROBOT CONTROLLER

USER'S MANUAL
Ver 1.02

NITTO SEIKO CO.,LTD.

【Notes】

（2） By provision of operating manual recorded on CD-ROM, you shall be deemed to have agreed to the Terms and Conditions written in “readme.txt” on it.

（3） Contents of this manual are subject to update without notice according to specification change of the products.

（4） Unique nouns like the product name indicated in this brochure are registered or not registered trademark of each company.

Safety precautions

Before using this machine, fully read the safety precautions shown below for correct use.

- ◆ To secure safety of the robot, refer to JIS B 8433-1993 (Safety of industrial manipulating robot).
- ◆ This machine is designed and manufactured for the purpose of use for general industrial machinery.
- ◆ Installation of the robot and setup of the system must be carried out by technicians only.
- ◆ When moving or selling this machine, have the owner to be fully read this manual for correct use.

To prevent hazards to operators or other persons and damages to properties, be sure to observe the instructions in this operation manual shown below.

Marks indicating possible hazards and damages

	**WARNING**	Noncompliance with the instructions adjacent to this mark may lead to a loss of life or serious injury.
	**CAUTION**	Noncompliance with the instructions adjacent to this mark may lead to injury or physical damages.

Marks showing points to be observed

	This mark is accompanied with acts to be prohibited.
	This mark is accompanied with acts to be performed.

⚠ WARNING

[Installation]

Be sure to provide grounding cables.

Otherwise, you may suffer electric shocks.

DO NOT use this machine near combustibles, inflammables, and explosive substances, or in the corrosive or flammable atmosphere.

Otherwise, combustion, inflammation, or explosion may occur.

DO NOT use this machine where the robot and the controller may be splashed with water or oil.

Otherwise, malfunctions, fires, or electric shocks may occur.

DO NOT modify the robot and the controller. NEVER connect the controller to the robot other than of the specified type.

Otherwise, the controller may be damaged, or the robot may be malfunctioned, causing fires or serious accidents.

DO NOT install the robot and the controller to the locations where are unstable or subjected to vibrations.

Otherwise, the robot may be moved or tipped, leading to accidents or breakage.

Install the safety guard to the outside of motion areas.

Otherwise, you may suffer serious injury. For safety, be sure to provide the interlock switch for the door of the safety guard. Secure working space to carry out works related to teaching, maintenance, and check safely.

⚠ WARNING

[Installation]

DO NOT damage cables.

NEVER damage, forcibly bend or pull, wind, pinch them, nor put heavy objects on them. Otherwise, fires, electric shocks, or malfunctions due to earth leakage or disconnection may be caused.

Correctly carry out wiring, referring to “Operation Manual”.

Be sure to connect cables and connectors securely to prevent any looseness or disconnection. Otherwise, malfunctions or fires may occur.

Always provide the emergency stop switch for a location convenient for operation.

Otherwise, you cannot deal with unexpected troubles quickly, causing serious injury.

⚠ WARNING

[Operation]

When you find any heating, fume, or odor, immediately turn off the power switch, and disconnect the power plug.

Otherwise, the machine may be damaged, or fires may occur.

Make sure that the machine is in the “SERVO OFF” mode (operated by the teaching pendant) before operating the moving parts of the robot by the direct teaching.

Otherwise, you may suffer injury.

NEVER use the robot or the controller if they have been dropped or immersed in water.

Otherwise, malfunctions or electric shocks due to faults or damages may occur.

[Maintenance and check]

Turn off the power switch, disconnect the power plug to shut off the power completely, and wait for ten minutes or longer before moving, wiring, or checks. Wiring must be provided by electrical technicians only.

Provision of these measures helps prevention of electric shocks.

Be sure to read operation manual before maintenance and check.

Otherwise, accidents may occur in case of misoperation.

⚠ CAUTION

[Installation]

Completely provide electric shielding measures before using this machine in the locations shown below. Otherwise, malfunctions may occur.

1. Where there are high tension current or great magnetic field
2. Where welding is being performed and arc discharge may occur
3. Where noises due to static electricity are generated
4. Where exposure to radio activity may occur

DO NOT hold moving parts or cables when installing the machine.

Otherwise, you may suffer injuries.

NEVER block the vent of the controller.

Otherwise, heat is trapped in the machine, leading to fires or malfunctions.

DO NOT use this machine outdoors exposed to direct sunlight.

Otherwise, malfunctions or faults may occur.

[Operation]

Be sure to use this machine in locations where ambient temperature is within the range between 0°C and 40°C, humidity is within the range between 30% and 80%, free from dew condensation.

Otherwise, malfunctions, fires, or electric shocks may occur.

DO NOT use this machine with the power supply and under the voltage other than specified.

Otherwise, malfunctions, fires, or electric shocks may occur.

Table of contents

1. Preface

Thank you for your purchase of our product.
Fully read this manual for correct use.
After reading it, keep it for later reference by users. Be sure to hand it to the end user.

1.1 Outline of system

Advanced Thread Tightening Robot SR565Yθ aims to improve the functions of our conventional model SR560Yθ, based on the basic system configuration equivalent to that of the conventional model. The teaching pendant is equipped with a handy type 5.7-inch color LCD touch panel. It provides high operability, and incorporates a teaching ON/OFF key switch and a 3-position (OFF-ON-OFF) deadman switch in consideration of safety. The teaching pendant, also used as the control panel for the thread tightening robot, features superior cost performance.

This system allows storage of information on the position of the robot into the three tables, “Thread tightening point”, “Fixed point”, and “Palletizing point”.
At the thread tightening point, teaching and record of the thread tightening position are performed. Up to forty points for each of a hundred types of models from 0 to 99 can be recorded. Furthermore, at this point, two sets of work information per point can be stored, and selection of screw parameter (SR565Yθ-Z only), setup of thread tightening, and setup of tightening torque channel are possible.
At the “Fixed point”, up to forty fixed points that do not depend on the types of works, such as standby positions, can be recorded.
At the “Palletizing point”, three groups of up to two hundred of points can be recorded.
(Note: The “Yθ” type robot.)

Machine controller is used as the main control unit of the robot controller, and the thread tightening robot control software enables various types of control functions required for thread tightening.

The difference between this model and the conventional controller RC5500-S is shown below. The robot controller operating procedure is the same as that for the conventional model, enabling you to use this model without confusion.

1. Specifications of controller

Model of controller	RC5500-S	RC5000-S
Number of control axes	6 axes max.	4 axes max.
Serial port	RS232C (for teaching pendant.) Ethernet (100BASE-TX) (for PC connection)	RS232C: 2 ports (Including one port for teaching pendant)
External input	Standard user port: 16 ports [External 64 ports can be added.]	Standard user port: 4 ports (For Z-type: 7 ports) [Internal 16 ports and external 64 ports can be added.]
External output	Standard user port: 16 ports [External 64 ports can be added.]	Standard user port: 4 ports (For Z-type: 7 ports) [Internal 16 ports and external 64 ports can be added.]
Field network	CC-Link slave interface	None
Point control	Work area: 40 (50 *1) points × 100 types Fixed area: 40 (50 *1) points Palletizing area: 200 points × 3 groups (Palletizing function is not applicable to the Yθ-type robot.)	Work area: 40 points × 100 types Fixed area: 40 points Palletizing area: 200 points × 3 groups (Palletizing function is not applicable to the Yθ-type robot.)
Point work information	2 sets per point (4 sets *1) (Operation pattern, torque)	2 sets per point (Operation pattern, torque)
Sequence program	Ladder diagram (equivalence to 40K steps)	Ladder diagram (equivalence to 8K steps)
Outside dimensions (W × H × D)	200 (250 *1) × 450 × 420 mm (Excluding rubber feet)	200 × 450 × 470 mm (Excluding rubber feet)

*1: Depending on specifications.
[ ] is optionally available.

2. Applicable equipment

	RC5500	RC5000	
CPU	MP2310	MP930	(Yaskawa Electric Corp.)
Servo motor	ΣV series	ΣII series	(Yaskawa Electric Corp.)
Servo amplifier	ΣV series	ΣII series	(Yaskawa Electric Corp.)
Teaching pendant	GT1455HS	F940GOT	(Mitsubishi Electric Corp.)

1.2 Product structure

Our model number of the thread tightening robot controller should be indicated as shown below.

Model RC5500-S Ver.*.**

Accessories

Power supply cable, 3 m (CN51CBO) ····· 1 pce.
Servo power cable, 3 m (CN52-CBO3A) ····· 1 pce.
Encoder cable, 3 m (CN53-CBO3A) ····· 1 pce.
Feeder power supply/control cable 3 m (CN54-CBO) ····· 1 pce.
Driver power supply cable 3 m (CN56-CBO) ····· 1 pce
Driver control cable 3 m (CN57-CBO) ····· 1 pce.
Standard I/O (1 A) cable 3 m (CN58-CBOA) [for biaxial type only] ····· 1 pce.
Teaching pendant RC5500TS (GT1455HS-QTBDE, Mitsubishi Electric Corp.) ····· 1 unit
Teaching pendant connector cable, 3 m (GT11H-C30-37P, Mitsubishi Electric Corp.) ····· 1 pce.

- One complete set of the items shown above is provided for our standard type machine **(for SR565Yθ single unit)**.

Optional items

Standard I/O (1 A) cable, 3 m (CN58-CBOA) [for types other than biaxial type]
Standard I/O (1B) cable, 3 m (CN58-CBOB)
Standard I/O (2) cable, 3 m (CN59-CBO)
CC-Link slave interface
External add-on I/O unit
Teaching pendant connection cable 6 m (GT11H-C60-37P, Mitsubishi Electric Corp.)
Protective sheet (GT14H-50PSC, Mitsubishi Electric Corp.) ····· 5 sheets

- Specify the models of optional items when purchasing them.

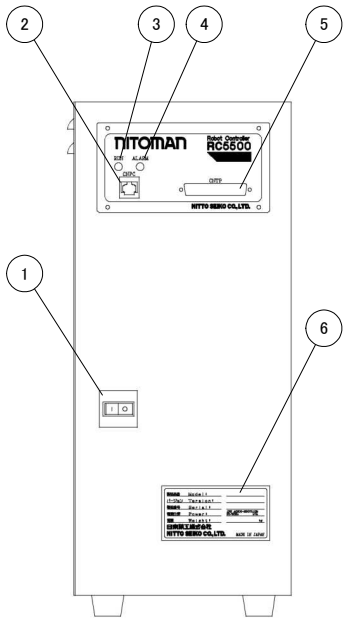
Related manual

Advanced thread tightening robot, nitoman RC5500TS Teaching Pendant, Operation Manual

2. Installation

2.1 Names and functions of components

1) Front of robot controller



[1] Power switch
When the “I” side of the robot controller power switch is pressed, power is supplied. When the “O” side is pressed, power is shut off.

[2] CNPC (PC connector)
This Ethernet connector connects the robot controller and the PC.
[Controller side model: NWMJ-C5E-DCTR-WH (MISUMI)]

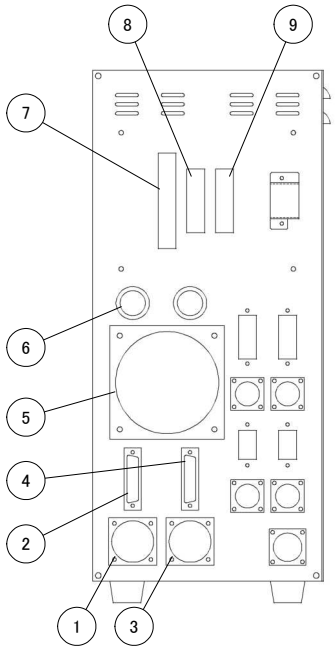
[3] RUN lamp (Green)
This lamp lights up when power is supplied to the robot controller, power switch [1] is turned on, and the CPU is correctly operated.

[4] ALARM lamp (Red)
This lamp lights up when the robot system is faulty.

[5] CNTP (Teaching pendant connector)
This connector connects the robot controller and the teaching pendant.
When the teaching pendant is not connected, the robot must be connected to the optional short-circuit receptacle. (The robot enters the emergency stop status unless it is connected to the short-circuit receptacle.)
[Controller side model: XM2D-3701 (OMRON)]

[6] Product nameplate
This product nameplate is attached to the robot controller.

2) Back of robot controller



[1] CN52A (Servo power supply connector “A” side)
This connector is used for servo motor output. For control of a single thread tightening robot, only “A” side should be connected. Three or four motor axes can be controlled.
[Controller side model: D/MS3102A22-14S (DDK)]

[2] CN53A (Encoder connector “A” side)
This connector is used for encoder input. For control of a single thread tightening robot, only “A” side should be connected. Three or four motor axes can be controlled.
[Controller side model: XM2D-2501 (OMRON)]

[3] CN52B (Servo power supply connector “B” side)
This connector is used for servo motor output. For control of two thread tightening robots, the “B” side should be also connected. Up to three motor axes can be controlled. For use of the “A” side only, a panel plug is attached.
[Controller side model: D/MS3102A22-14S (DDK)]

[4] CN53B (Encoder connector “B” side)
This connector is used for encoder input. For control of two thread tightening robots, the “B” side should be also connected. Up to three motor axes can be controlled. For use of the “A” side only, a panel plug is attached.
[Controller side model: XM2D-2501 (OMRON)]

[5] FAN0 (Cooling fan)
This suction type fan is used for cooling in the controller. Clogs in the fan filter may lead to insufficient cooling. Periodically clean the filter.
[Fan model: MD925A-24 (Oriental Motor)], [Filter model: FL9 (Oriental Motor)]

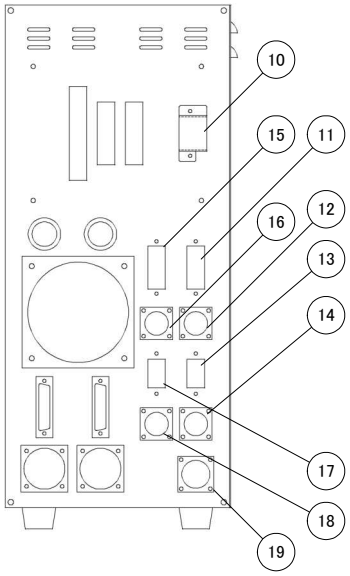
[6] Grommet with coating (for wiring)
The grommet is used to pass the I/O signal cable from the robot controller to outside. Two pieces are supplied with the controller. However, they may have been already used before shipment, depending on the type of the thread tightening robot.
[Type of grommet: C-30-SG-22A (TAKIGEN)]

[7] CN59 (Standard I/O-2 connector)
A connector for the standard I/O-2 (IB110-11F and OB110-11F) input and output signals. In addition to the I/O signals, external emergency stop input, and external emergency stop output are also assigned to the connector. With the CN59 connector, you can select “enable or disable” status of 24 VDC output to external equipment by using the short-circuit pins (SP1 and SP2) on the CN-50-01 PCB. With the standard setting, the 24 VDC external output is disabled. However, if “output” is to be enabled depending on specifications, the 24 VDC power supply for I/O is output via this connector. Be careful not to short-circuit the connector during wiring.
[Controller side model: XM8F-5022-12 (OMRON)]

[8] CN58B (Standard I/O-1B connector)
A connector for the standard I/O-1B (IB10D-114 and OB10D-114) input and output signals. The 24 VDC power supply for I/O is output via this connector. Be careful not to short-circuit the connector during wiring.
[Controller side model: XM8F-2422-12 (OMRON)]

[9] CN58A (Standard I/O-1B connector)

A connector for the standard I/O-1B (IB105-10C and OB105-10C) input and output signals. The 24 VDC power supply for I/O is output via this connector. Be careful not to short-circuit the connector during wiring.
[Controller side model: XM8F-2422-12 (OMRON)]



[10] TB0 (External emergency stop, external start signal input terminal block)

This terminal block is intended for input of external emergency stop and external start signals.
To input the external emergency stop signal, input from the b-contact between the two terminals in the upper side of the terminal block.
When no external emergency stop signal is used, short-circuit the terminals. Otherwise, the robot enters the emergency stop status.
To input the external start signal, connect between the two terminals in the lower side of the terminal block. (For details of connection, refer to "2.2.2 Specifications of external I/O".)

[11] CN57A (Driver control connector "A" side)

A connector for the control signal dedicated to the first thread tightening driver controller SD5**(T). The 24 VDC power supply for I/O
is output via this connector. Be careful not to short-circuit the connector during wiring.
[Controller side model: XM8L-2423 (OMRON)]

[12] CN56A (Driver power supply connector "A" side)

A connector for the power supply dedicated to the first thread tightening driver controller SD5**(T). Be careful to handle this connector, because power supply voltage is output from this connector after the ready switch is turned ON.
[Controller side model: NJC-20-3-RF (UL) (Nanaboshi)]

[13] CN55A (Feeder control connector "A" side)

A connector for the control signal dedicated to the first screw feeder FF***H.
[Controller side model: XM8L-1423 (OMRON)]

[14] CN54A (Feeder power supply connector "A" side)

A connector for the power supply dedicated to the first screw feeder FF***H. Be careful to handle this connector, because power supply voltage is output from this connector after the ready switch is turned ON.
[Controller side model: NJC-20-3-RF (UL) (Nanaboshi)]

[15] CN57B (Driver control connector "B" side)

A connector for the control signal dedicated to the second thread tightening driver controller SD5**(T). The 24 VDC power supply for I/O is output via this connector. Be careful not to short-circuit the connector during wiring. For use of the "A" side only, a panel plug is attached.
[Controller side model: XM8L-2423 (OMRON)]

[16] CN56B (Driver power supply connector "B" side)

A connector for the power supply dedicated to the second thread tightening driver controller SD5**(T). Be careful to handle this connector, because power supply voltage is output from this connector after the ready switch is turned ON. For use of the "A" side only, a panel plug is attached.
[Controller side model: NJC-20-3-RF (UL) (Nanaboshi)]

[17] CN55B (Feeder control connector “B” side)

A connector for the control signal dedicated to the second screw feeder FF***H. For use of the “A” side only, a panel plug is attached.
[Controller side model: XM8L-1423 (OMRON)]

[18] CN54B (Feeder power supply connector “B” side)

A connector for the power supply dedicated to the second screw feeder FF***H. Be careful to handle this connector, because power supply voltage is output from this connector after the ready switch is turned ON. For use of the “A” side only, a panel plug is attached.
[Controller side model: NJC-20-3-RF (UL) (Nanaboshi)]

[19] CN51 (Power supply connector)

A connector for the controller main power supply. Applicable power supply voltage is 200 V to 230 VAC. Do not use this connector for other than the specified power supply voltage. Be sure to ground the green/yellow earth cable for protection against electric shock.
[Controller side model: NJC-24-3-RM (UL) (Nanaboshi)]
[Type of power supply connector: WF4315 (Matsushita Electric Works, Ltd.)]

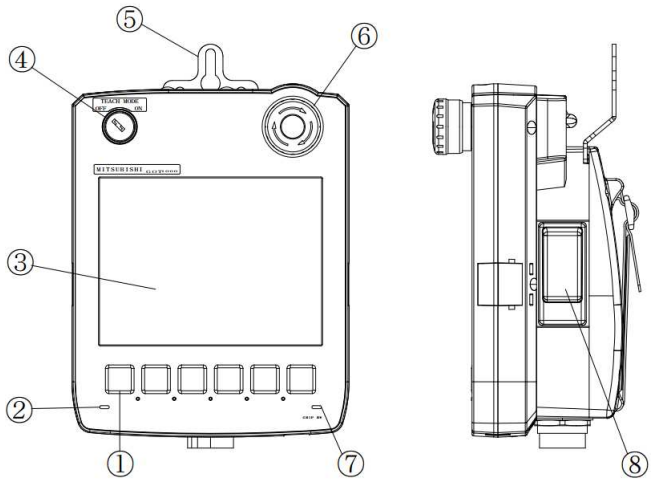
3) Teaching pendant

[1] Ready button
When this button is pressed while power is supplied to the robot controller, the CPU works correctly, and emergency status is completely reset (short-circuited), the ready lamp [3] lights up, power is supplied to the servo motor, power of 24 VDC is supplied to between the P and N of the I/O signal power supply, and the machine is ready for operation.

[2] POWER lamp
This lamp lights up while power is supplied to the robot controller.

[3] Liquid crystal display with touch switches
This 65536 color displayer comprises liquid crystal elements with the touch switches.

[4] TEACH OFF/ON key switch
Teaching valid/invalid status can be switched with this switch. Set this switch to the left side, “TEACH OFF” position, during the normal



operation. In this status, the key can be removed. When carrying out teaching or any setup, insert the key, and set it to the right side, “TEACH ON” position. In this status, neither automatic running nor removal of the key is possible.

[5] Main unit hanging bracket
A bracket to hang the robot body.

[6] Emergency stop switch
This is the push-lock and turn-reset type emergency stop switch. When it is pressed, it is locked with pushed-in, and the robot enters the emergency stop status. To cancel the emergency stop status, turn the button into the arrow direction (clockwise).

[7] Deadman switch lamp
This lamp lights up when the deadman switch on the side is turned on.

[8] Deadman switch
This is the three-position type deadman switch. When you release your finger from this switch, it is turned off. When you press it in once, it is turned on. When you press it in again, it is turned off. When performing teaching or the JOG operation of axes, or moving to your intended points that teaching has already been completed, this switch must be pressed in once to turn it on.

(For operating procedures of the teaching pendant, refer to the separate “Operation Manual for Advanced Thread Tightening Robot nitoman RC5500TS Teaching Pendant”.)

2.2 Specifications

2.2.1 Specifications of robot controller

Thread tightening robot controller RC5500-S

Items	Model: RC5500-S
Power supply voltage	Single phase, from 200 VAC to 230 VAC, 50/60 Hz
Number of axes to be controlled	Maximally six
Positioning system	PTP, linear, circular, and helical interpolation (interpolation is inapplicable to Yθ-type robots)
Position detecting system	Absolute value encoder system (battery backup “ER6VC4”: approximately 5 years)
Serial port	RS232C: Used for the teaching pendant. Ethernet (100Base-TX/10Base-T): For PC connection
Memory	RAM (battery backup “JZSP-BA01”: approximately 5 years)
External input	Standard user port, 16-pos. (For a single thread tightening robot) Up to 64 external ports can be added.
External output	Standard user port, 16-pos. (For a single thread tightening robot) Up to 64 external ports can be added.
Field network	CC-Link slave interface
Teaching system	MDI, remote teaching, direct teaching
Point control	Work area: 40 (50 *1) points x 100 models Fixed area: 40 points (50 *1) Palletize area: 200 points × 3 patterns (inapplicable to Yθ-robots)
Point work information	2-sets per point (4-sets *1): Torque/operation pattern selection
Sequence program	Ladder diagram (40K step or equivalence)
Robot program	Special motion language
Outside dimensions (W×H×D)	200 (250 *1) × 450 × 470
Weight	Approximately 20 kg
Teaching pendant	Handy type touch panel (with key switch and deadman switch) Teaching pendant can be used as control panel
PC software	Provided (optional)

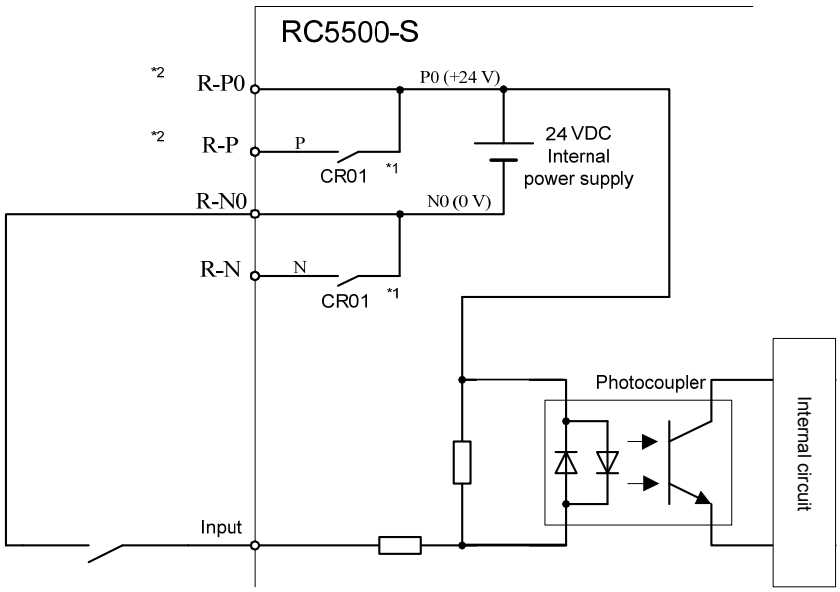
*1: Depending on specifications

2.2.2 Specifications of external I/O

1) General purpose signal input unit

Items	Specifications	
Number of input points	Standard user port: Internal 16 ports (For a single thread tightening robot)	Expansion user port: External 64 ports (Optional)
Input voltage	24 VDC ±20% (+19.2 to +28.8 V)	24 VDC (+20.4 to +28.8 V)
Input current	4.1 mA/input	5.0 mA/input
Response time	From OFF to ON: 0.5 ms max. From ON to OFF: 0.5 ms max.	From OFF to ON: 2 ms max. From ON to OFF: 3 ms max.
Input type	Sink input	
Insulation system	Photocoupler	

Internal circuit configuration



*1: CR01 is the operation ready relay (When the machine is ready for operation, the CR01 is tripped.)

*2: With the CN59 connector, you can select “enable” or “disable” status of internal 24 VDC (R-P, R-P0) output to external equipment, depending on the setting of the short-circuit pins (SP1 and SP2) on the CN-50-01 PCB.

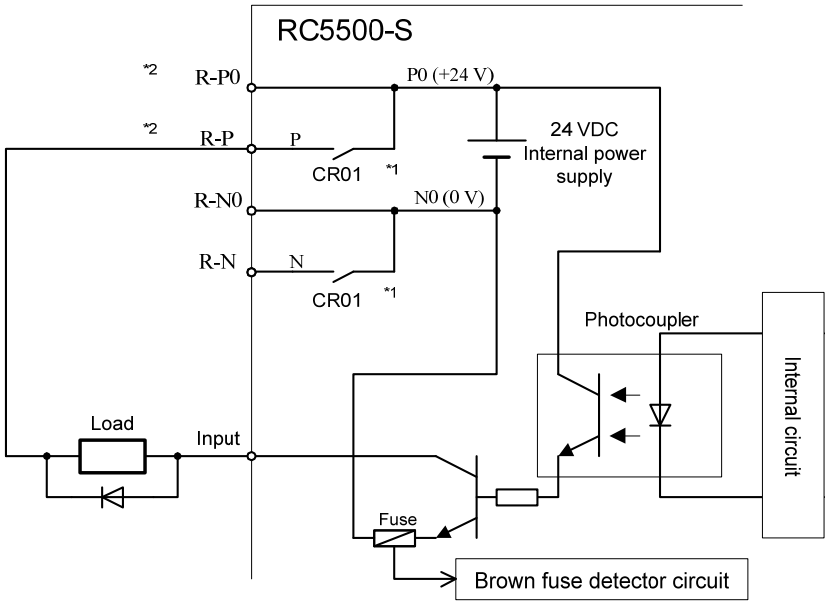
⚠ CAUTION

From the R-P0 and R-P terminals of the external I/O connector, +24 V power in the robot controller is output.
DO NOT provide external power supply to the R-P0 and R-P terminals.

2) General purpose signal output unit

Items	Specifications	
Number of output points	Standard user port: Internal 16 ports (For a single thread tightening robot)	Expansion user port: External 64 ports (Optional)
Rated load voltage	24 VDC ±20% (+19.2 to +28.8 V)	24 VDC (+20.4 to +28.8 V)
Max. load current	100 mA/input	50 mA/input
Leak current at OFF	0.1 mA max.	
Response time	From OFF to ON: 0.5 ms max. From ON to OFF: 0.5 ms max.	From OFF to ON: 2 ms max. From ON to OFF: 3 ms max.
Output type	Transistor/sink output	
Insulation system	Photocoupler	

Internal circuit configuration



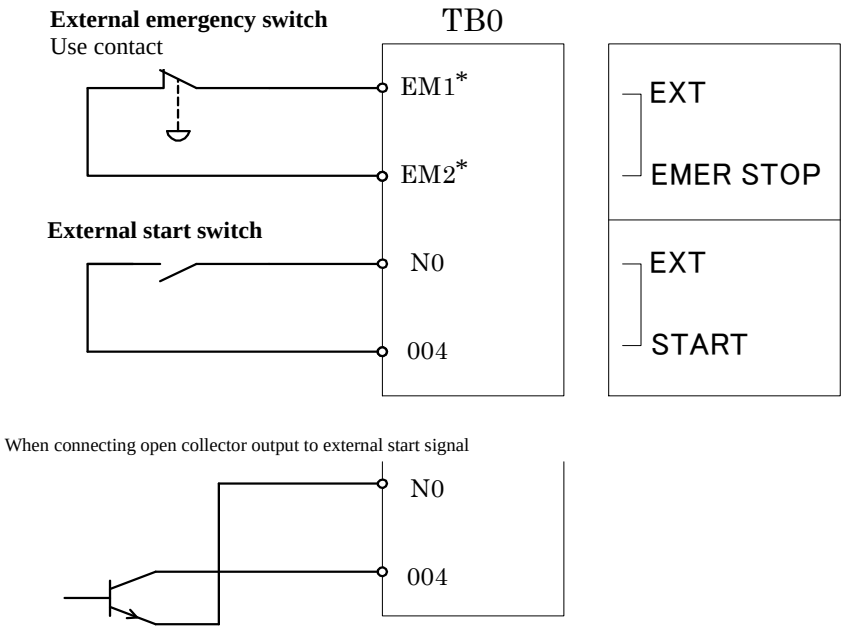
*1: CR01 is the operation ready relay (When the machine is ready for operation, the CR01 is tripped.)

*2: With the CN59 connector, you can select “enable” or “disable” status of internal 24 VDC (R-P, R-P0) output to external equipment, depending on the setting of the short-circuit pins (SP1 and SP2) on the CN-50-01 PCB.

CAUTION

From the R-P0 and R-P terminals of the external I/O connector, +24 V power in the robot controller is output.
DO NOT provide external power supply to the R-P0 and R-P terminals.

3) External signal connection terminal block TB0

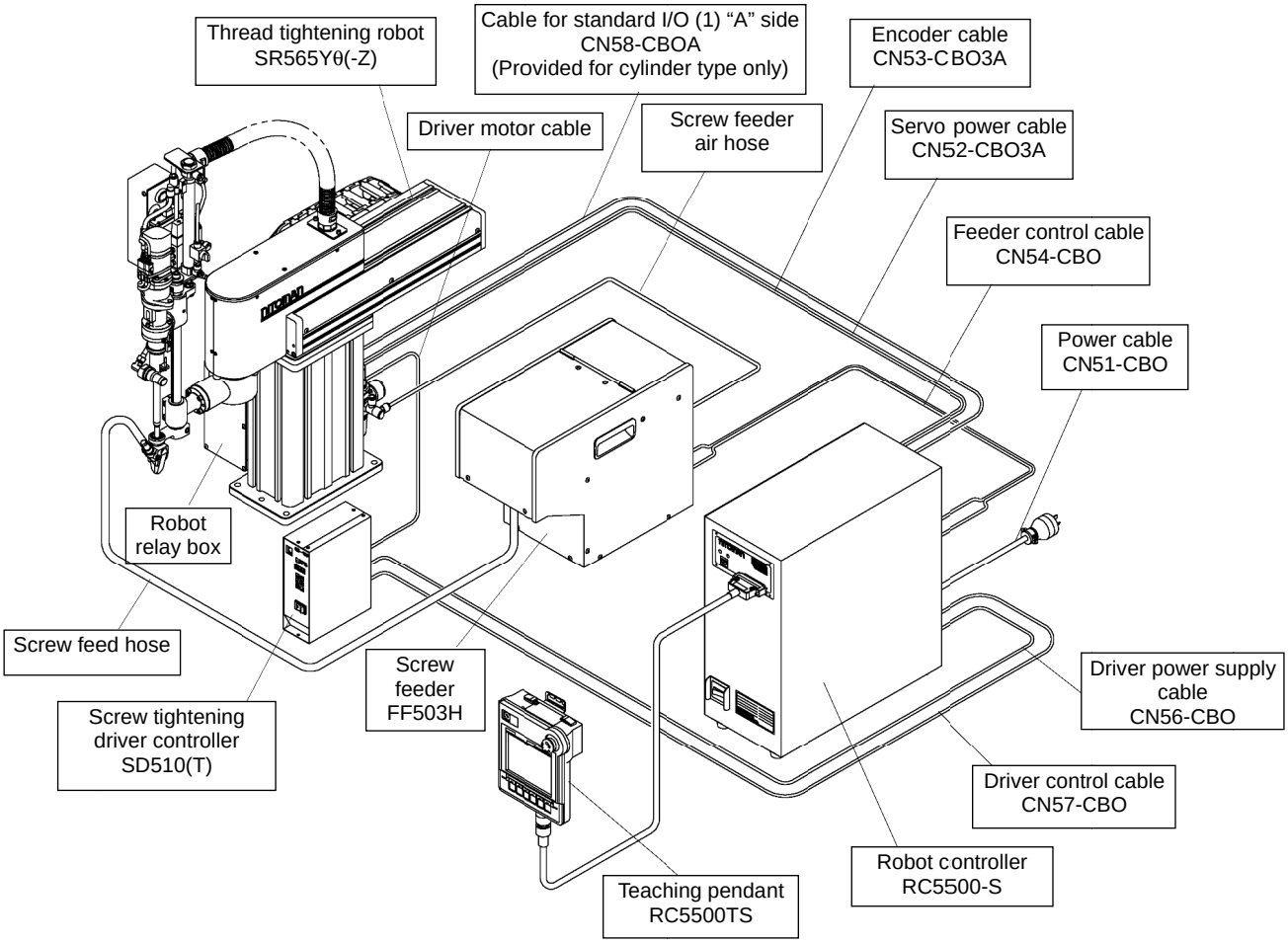


* EM1 and EM2 are also connected in parallel with CN59.

2.3 System setup

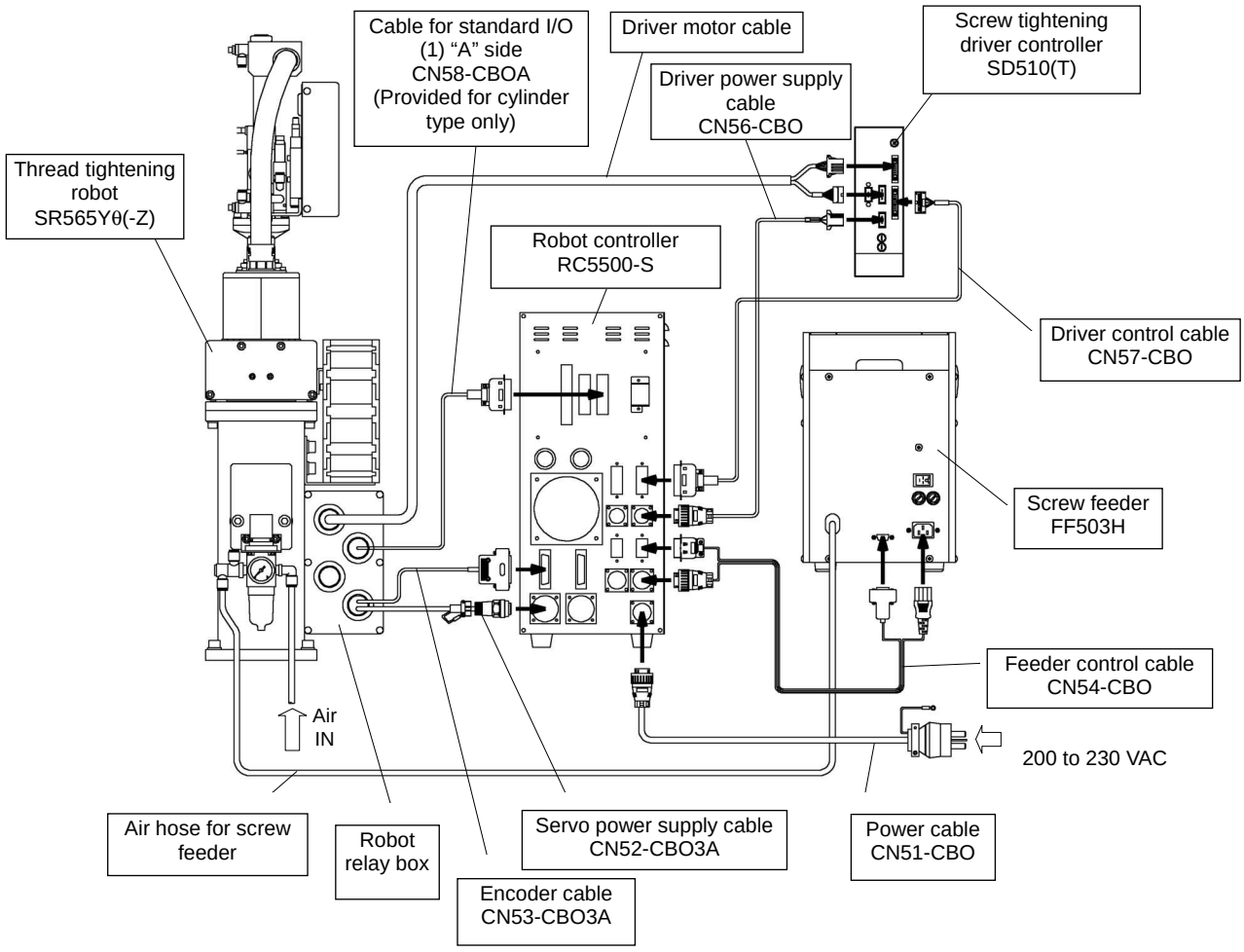
2.3.1 Connecting robot controller RC5500-S with robot

1) General connection drawing of thread tightening robot



* The above figure shows connections of SR565Yθ (-Z). When two thread tightening robots are used, one set of the thread tightening robot main unit, screw feeder, thread tightening driver controller should be added each.

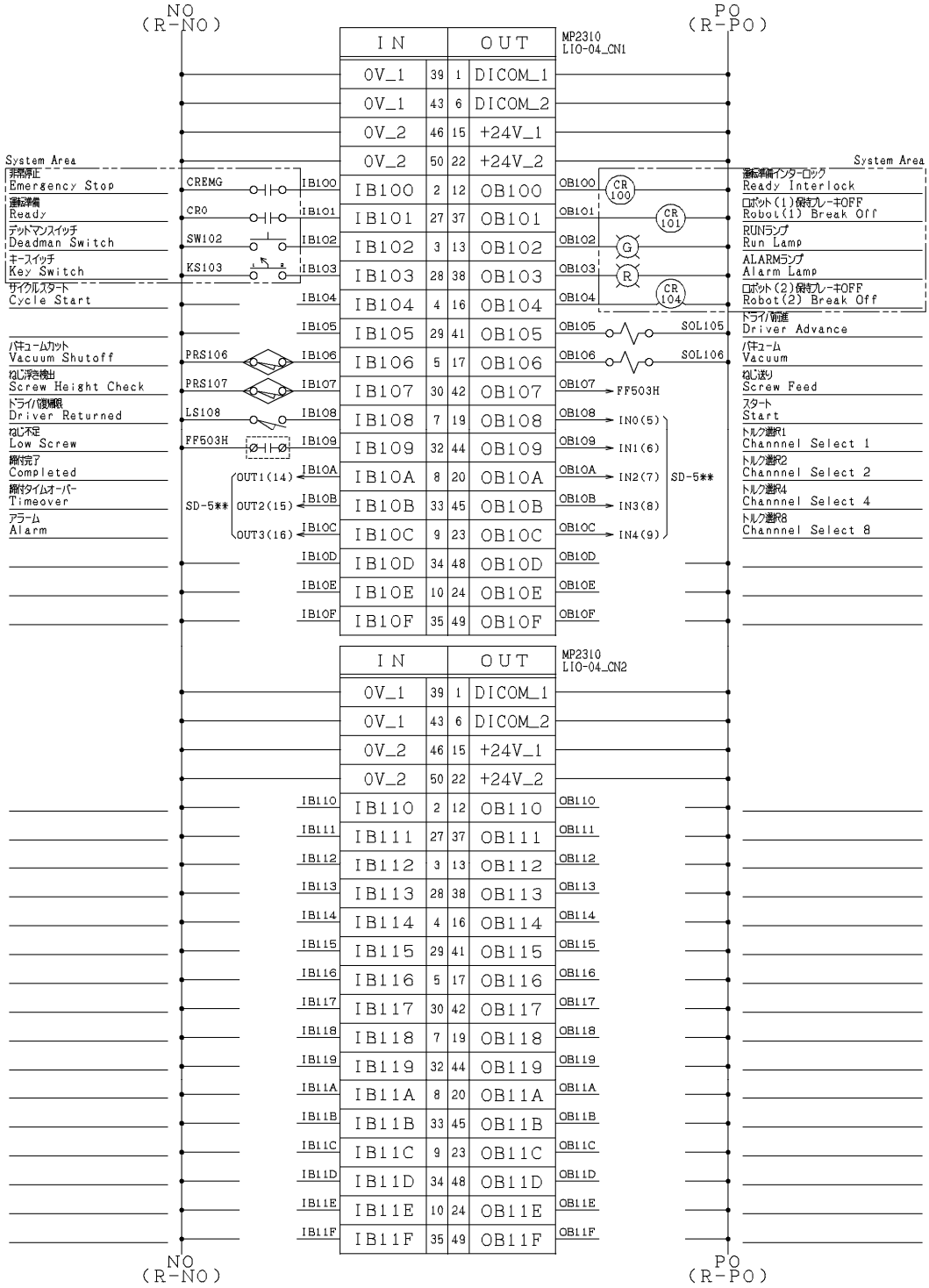
2) Drawing of connection on the back of controller



* The above figure shows connections of SR565Yθ (-Z). When two thread tightening robots are used, one set of the thread tightening robot main unit, screw feeder, thread tightening driver controller should be added each.

2.3.2 I/O connection diagram

1) Standard I/O (For a single SR565Yθ thread tightening robot)

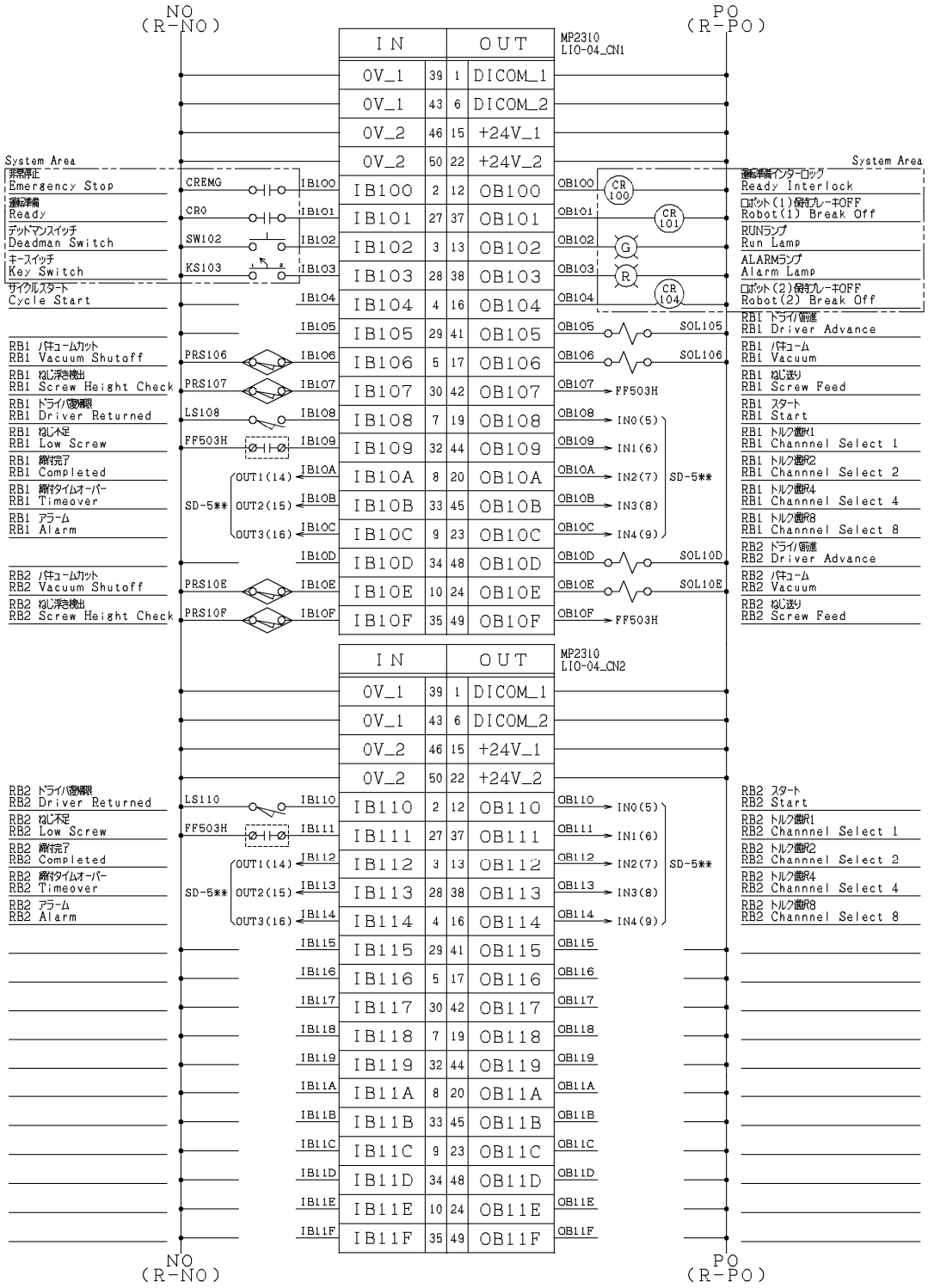


*1: Input from IB105 to 10C and output from OB105 to 10C can be taken out from the connector CN58A on the back of the RC5500-S or the terminal block on the PCB PI-50-01 in the RC5500-S.

*2: Input from IB10D to 114 and output from OB10D to 114 can be taken out from the connector CN58B on the back of the RC5500-S or the terminal block on the PCB PI-50-01 in the RC5500-S.

*3: Input from IB110 to 11F and output from OB110 to 11F can be taken out from the connector CN59 on the back of the RC5500-S or the terminal block on the PCB PI-50-01 in the RC5500-S.

2) Standard I/O (For double SR565Yθ thread tightening robots)

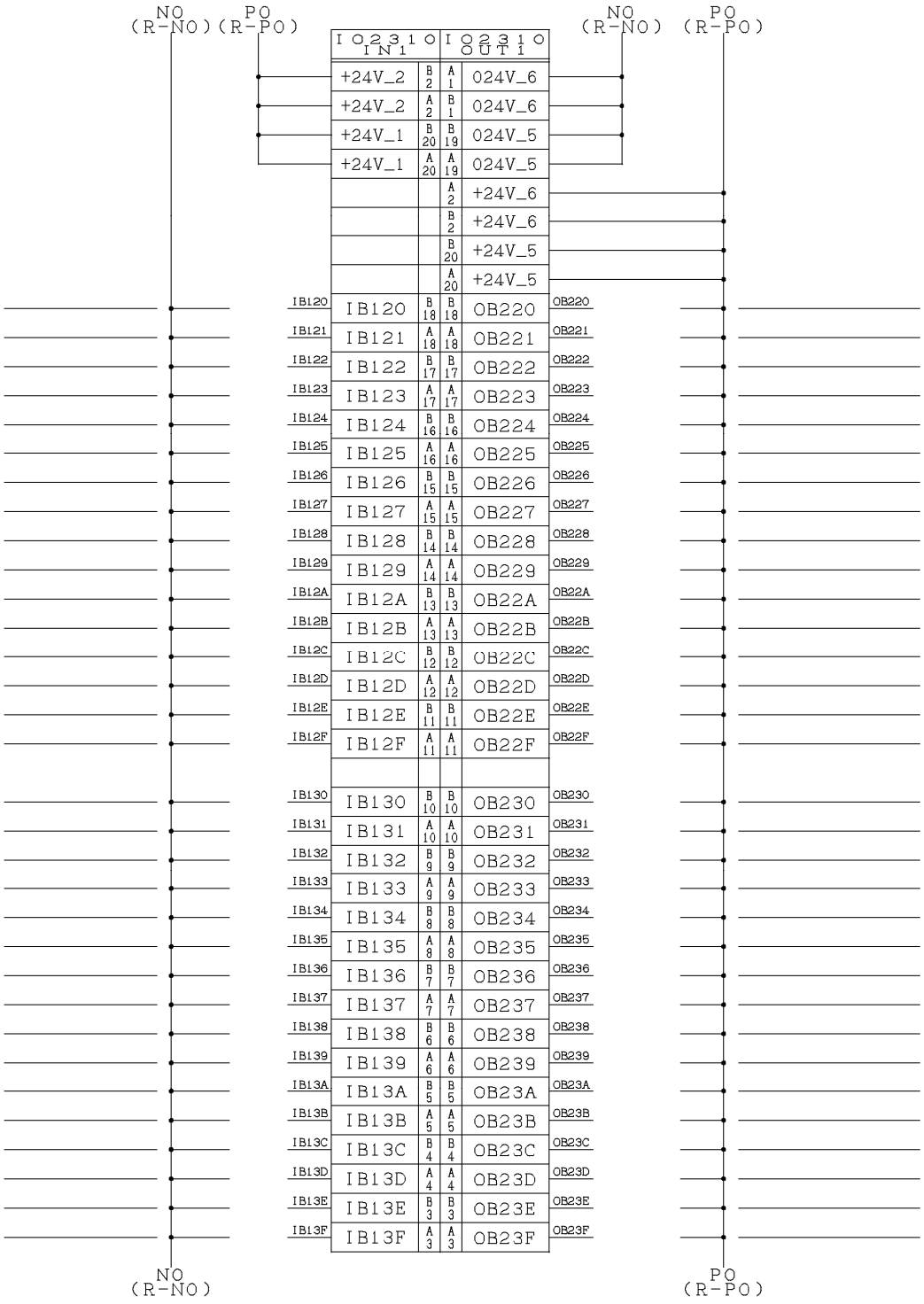


*1: Input from IB105 to 10C and output from OB105 to 10C can be taken out from the connector CN58A on the back of the RC5500-S or the terminal block on the PCB PI-50-01 in the RC5500-S.

*2: Input from IB10D to 114 and output from OB10D to 114 can be taken out from the connector CN58B on the back of the RC5500-S or the terminal block on the PCB PI-50-01 in the RC5500-S.

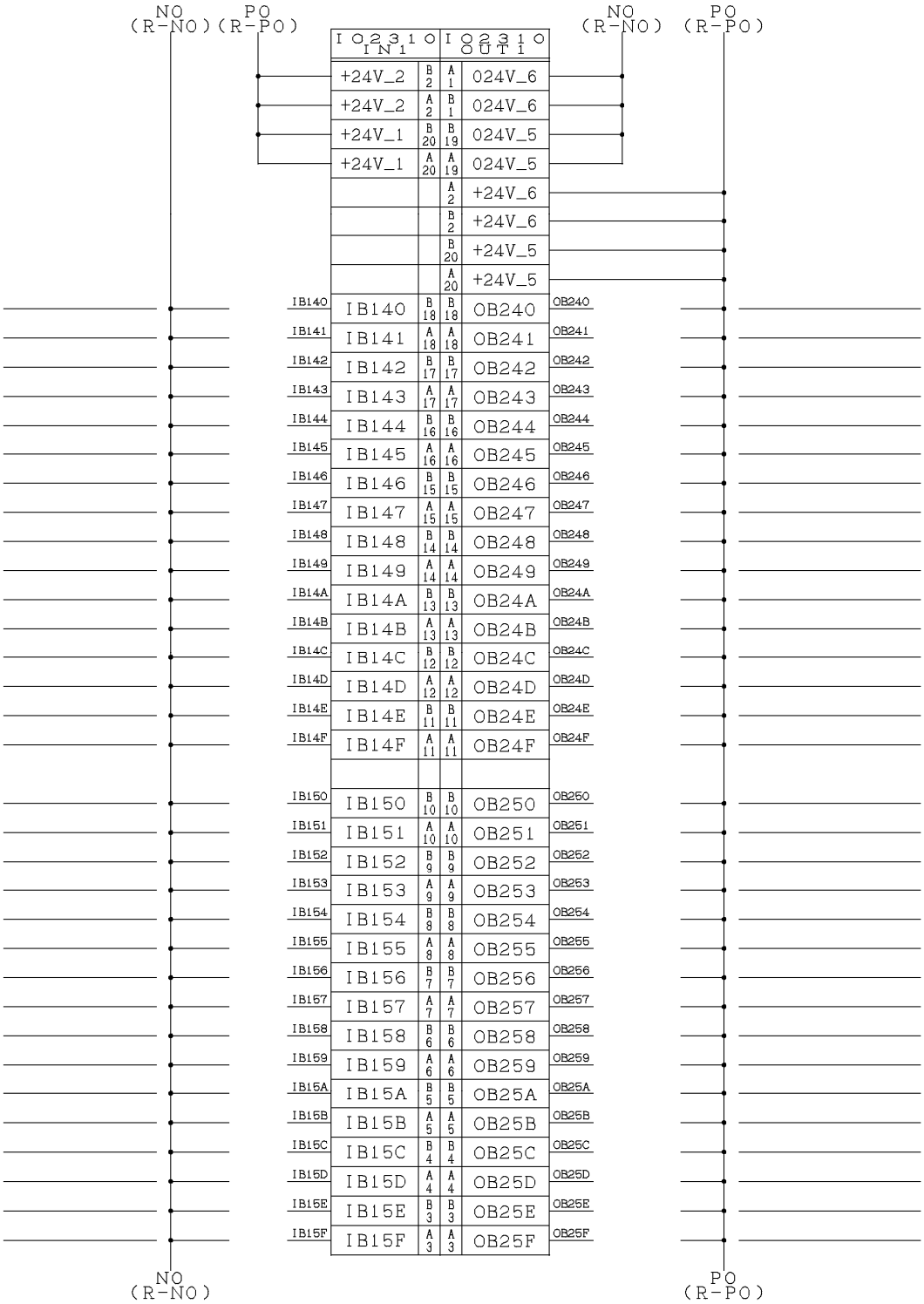
*3: Input from IB110 to 11F and output from OB110 to 11F can be taken out from the connector CN59 on the back of the RC5500-S or the terminal block on the PCB PI-50-01 in the RC5500-S.

3) Controller external expansion I/O-1 (Optional: Remote I/O unit can be externally added to the controller)



* Located in the controller external expansion box.

4) Controller external expansion I/O-2 (Optional: Remote I/O unit can be externally added to the controller)



* Located in the controller external expansion box.

2.3.3 Interface list

1) Standard I/O connectors CN58A, CN58B connection list (Cable is optional for types other than cylinder type)

[CN58A]

CN58A Pin No.	CN58A Connection cable No.	Cable	Signal
1	P0	Orange (1 point, red)	24 VDC+
2	N0	Gray (1 point, red)	24 VDC GND
3	IB105	White (1 point, red)	Input
4	IB107	Yellow (1 point, red)	Input
5	IB109	Pink (1 point, red)	Input
6	IB10B	Orange (2 point, red)	Input
7	OB105	Gray (2 point, red)	Output
8	OB107	White (2 point, red)	Output
9	OB109	Yellow (2 point, red)	Output
10	OB10B	Pink (2 point, red)	Output
11	-	Orange (3 point, red)	-
12	P	Gray (3 point, black)	24 VDC+
13	P0	Orange (1 point, black)	24 VDC+
14	N0	Gray (1 point, black)	24 VDC GND
15	IB106	White (1 point, black)	Input
16	IB108	Yellow (1 point, black)	Input
17	IB10A	Pink (1 point, black)	Input
18	IB10C	Orange (2 point, black)	Input
19	OB106	Gray (2 point, black)	Output
20	OB108	White (2 point, black)	Output
21	OB10A	Yellow (2 point, black)	Output
22	OB10C	Pink (2 point, black)	Output
23	-	Orange (3 point, black)	-
24	N	Gray (3 point, black)	24 VDC GND
Hood	SG	Shield	Shield

[CN58B]

CN58B Pin No.	CN58B Connection cable No.	Cable	Signal
1	P0	Orange (1 point, red)	24 VDC+
2	N0	Gray (1 point, red)	24 VDC GND
3	IB10D	White (1 point, red)	Input
4	IB10F	Yellow (1 point, red)	Input
5	IB111	Pink (1 point, red)	Input
6	IB113	Orange (2 point, red)	Input
7	OB10D	Gray (2 point, red)	Output
8	OB10F	White (2 point, red)	Output
9	OB111	Yellow (2 point, red)	Output
10	OB113	Pink (2 point, red)	Output
11	-	Orange (3 point, red)	-
12	P	Gray (3 point, black)	24 VDC+
13	P0	Orange (1 point, black)	24 VDC+
14	N0	Gray (1 point, black)	24 VDC GND
15	IB10E	White (1 point, black)	Input
16	IB110	Yellow (1 point, black)	Input
17	IB112	Pink (1 point, black)	Input
18	IB114	Orange (2 point, black)	Input
19	OB10E	Gray (2 point, black)	Output
20	OB110	White (2 point, black)	Output
21	OB112	Yellow (2 point, black)	Output
22	OB114	Pink (2 point, black)	Output
23	-	Orange (3 point, black)	-
24	N	Gray (3 point, black)	24 VDC GND
Hood	SG	Shield	Shield

CN58A, CN58B Connector model XM8A-2421 (OMRON)

2) Standard I/O-2 connector CN59 connection list (Both of connector and cable are optional)

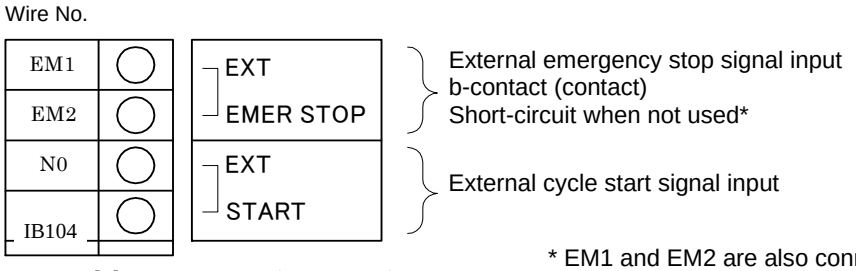
CN59 Pin No.	Wire No.	Cable	Signal
1	R-P	Orange (1 point, red)	24 VDC+
2	R-N	Gray (1 point, red)	24 VDC GND
3	IB100	White (1 point, red)	Input
4	IB112	Yellow (1 point, red)	Input
5	IB114	Pink (1 point, red)	Input
6	IB116	Orange (2 point, red)	Input
7	IB118	Gray (2 point, red)	Input
8	IB11A	White (2 point, red)	Input
9	IB11C	Yellow (2 point, red)	Input
10	IB11E	Pink (2 point, red)	Input
11	OB110	Orange (3 point, red)	Output
12	OB112	Gray (3 point, red)	Output
13	OB114	White (3 point, red)	Output
14	OB116	Yellow (3 point, red)	Output
15	OB118	Pink (3 point, red)	Output
16	OB11A	Orange (4 point, red)	Output
17	OB11C	Gray (4 point, red)	Output
18	OB11E	White (4 point, red)	Output
19	-	Yellow (4 point, red)	Unused, cannot be connected
20	ES11	Pink (4 point, red)	Emergency stop output 1
21	ES21	Orange (5 point, red)	Emergency stop output 2
22	EM1	Gray (5 point, red)	Emergency stop input (*1)
23	-	White (5 point, red)	Unused, cannot be connected
24	R-P0	Yellow (5 point, red)	24 VDC+
25	R-N0	Pink (5 point, red)	24 VDC GND

CN59 Connector model XM8A-5021 (OMRON)

CN8 Pin No.	Wire No.	Cable	Signal
26	R-P	Orange (1 point, black)	24 VDC+
27	R-N	Gray (1 point, black)	24 VDC GND
28	IB111	White (1 point, black)	Input
29	IB113	Yellow (1 point, black)	Input
30	IB115	Pink (1 point, black)	Input
31	IB117	Orange (2 point, black)	Input
32	IB119	Gray (2 point, black)	Input
33	IB11B	White (2 point, black)	Input
34	IB11D	Yellow (2 point, black)	Input
35	IB11F	Pink (2 point, black)	Input
36	OB111	Orange (3 point, black)	Output
37	OB113	Gray (3 point, black)	Output
38	OB115	White (3 point, black)	Output
39	OB117	Yellow (3 point, black)	Output
40	OB119	Pink (3 point, black)	Output
41	OB11B	Orange (4 point, black)	Output
42	OB11D	Gray (4 point, black)	Output
43	OB11F	White (4 point, black)	Output
44	-	Yellow (4 point, black)	Unused, cannot be connected
45	ES12	Pink (4 point, black)	Emergency stop output 1
46	ES22	Orange (5 point, black)	Emergency stop output 2
47	EM2	Gray (5 point, black)	Emergency stop input (*1)
48	R-N1	White (5 point, black)	Ready input (*1)
49	R-P0	Yellow (5 point, black)	24 VDC+
50	R-N0	Pink (5 point, black)	24 VDC GND
Hood	SG	Shield	Shield

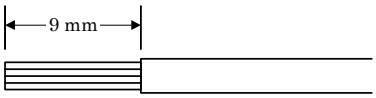
*1 Between NO and EM1: TP emergency stop parallel contact
Between EM1 and EM2: External emergency stop TB0 parallel contact
Between N0 and N1: TP ready parallel contact

3) Terminal block TB0



* EM1 and EM2 are also connected in parallel with CN59.

TB0 Model ML-1600-4P (Sato Parts)



TB0

Recommended length of exposed wire for wiring: 9 mm

Available wire: Stranded wire, from 0.3 mm^2 (AWG22) to 0.75 mm^2 (AWG20)

4) PC connector port CNPC connection list

[1] Specifications of Ethernet connector

Controller side: Ethernet connector, 8-pin, RJ-45 CAT5 socket

The other side: RJ-45 CAT5 plug

Ethernet connector pin assignment

Pin No.	Signals	Description
1	TXD+	Transmission data + side
2	TXD–	Transmission data – side
3	RXD+	Receiving data + side
4	-	
5	-	
6	RXD–	Receiving data – side
7	-	
8	-	

[2] Specifications of Ethernet cable

For the Ethernet cable, use a twisted pair cable with RJ-45 connector by referring to the table below. The Ethernet cable should be prepared by the user.

Type of Ethernet	Category	Remarks
10Base-T	Category 3 or higher	• To connect a target device via a hub: Straight cable
100Base-TX	Category 5 or higher	• To connect a target device without using a hub: Cross cable

2.3.4 Connector pins assignment

1) CN51 (Power supply connector)

CN51 Pin No.	Wire No.	Signals
1	L1	200 VAC
2	L2	200 VAC
3	PE	Grounding

Controller side connector model: NJC-24-3-RM (UL) (Nanaboshi)

2) CN52A (Servo power supply connector "A" side)

[When 3-axis control type is selected]

CN52A Pin No.	Wire No.	Signals
E	E	Grounding
L	U1	Motor (1) Power supply, phase U
M	V1	Motor (1) Power supply, phase V
A	W1	Motor (1) Power supply, phase W
K	E1	Motor (1) Power supply grounding
U	U2	Motor (2) Power supply, phase U
N	V2	Motor (2) Power supply, phase V
B	W2	Motor (2) Power supply, phase W
J	E2	Motor (2) Power supply grounding
T	U3	Motor (3) Power supply, phase U
V	V3	Motor (3) Power supply, phase V
P	W3	Motor (3) Power supply, phase W
C	E3	Motor (3) Power supply grounding
H	NC	
S	NC	
R	NC	
D	NC	
G	BR1	Brake power supply (+)
F	NO	Brake power supply (–)

[When 4-axis control type is selected]

CN52A Pin No.	Wire No.	Signals
E	E	Grounding
L	U1	Motor (1) Power supply, phase U
M	V1	Motor (1) Power supply, phase V
A	W1	Motor (1) Power supply, phase W
K	E1	Motor (1) Power supply grounding
U	U2	Motor (2) Power supply, phase U
N	V2	Motor (2) Power supply, phase V
B	W2	Motor (2) Power supply, phase W
J	E2	Motor (2) Power supply grounding
T	U3	Motor (3) Power supply, phase U
V	V3	Motor (3) Power supply, phase V
P	W3	Motor (3) Power supply, phase W
C	E3	Motor (3) Power supply grounding
H	U4	Motor (4) Power supply, phase U
S	V4	Motor (4) Power supply, phase V
R	W4	Motor (4) Power supply, phase W
D	E4	Motor (4) Power supply grounding
G	BR1	Brake power supply (+)
F	NO	Brake power supply (–)

Controller side connector model: D/MS3102A22-14S (DDK)

3) CN53A (Encoder connector “A” side)

[When 3-axis control type is selected]

CN53A Pin No.	Wire No.	Signal
1	PG11	Motor (1) Encoder +5 V
2	PG12	Motor (1) Encoder 0 V
3	SG1	Motor (1) shield
4	NC	
5	PG13	Motor (1) Encoder serial PS
6	PG14	Motor (1) Encoder serial/PS
7	PG21	Motor (2) Encoder +5 V
8	PG22	Motor (2) Encoder 0 V
9	SG2	Motor (2) shield
10	NC	
11	PG23	Motor (2) Encoder serial PS
12	PG24	Motor (2) Encoder serial/PS
13	NC	
14	PG31	Motor (3) Encoder +5 V
15	PG32	Motor (3) Encoder 0 V
16	SG3	Motor (3) shield
17	NC	
18	PG33	Motor (3) Encoder serial PS
19	PG34	Motor (3) Encoder serial/PS
20	NC	
21	NC	
22	NC	
23	NC	
24	NC	
25	NC	

[When 4-axis control type is selected]

CN53A Pin No.	Wire No.	Signal
1	PG11	Motor (1) Encoder +5 V
2	PG12	Motor (1) Encoder 0 V
3	SG1	Motor (1) shield
4	NC	
5	PG13	Motor (1) Encoder serial PS
6	PG14	Motor (1) Encoder serial/PS
7	PG21	Motor (2) Encoder +5 V
8	PG22	Motor (2) Encoder 0 V
9	SG2	Motor (2) shield
10	NC	
11	PG23	Motor (2) Encoder serial PS
12	PG24	Motor (2) Encoder serial/PS
13	NC	
14	PG31	Motor (3) Encoder +5 V
15	PG32	Motor (3) Encoder 0 V
16	SG3	Motor (3) shield
17	NC	
18	PG33	Motor (3) Encoder serial PS
19	PG34	Motor (3) Encoder serial/PS
20	PG41	Motor (4) Encoder +5 V
21	PG42	Motor (4) Encoder 0 V
22	SG4	Motor (4) shield
23	NC	
24	PG43	Motor (4) Encoder serial PS
25	PG44	Motor (4) Encoder serial/PS

Controller side connector model: XM2D-2501 (OMRON)

4) CN52B (Servo power supply connector “B” side)

CN52B Pin No.	Wire No.	Signals
E	E	Grounding
L	U4	Motor (4) Power supply, phase U
M	V4	Motor (4) Power supply, phase V
A	W4	Motor (4) Power supply, phase W
K	E4	Motor (4) Power supply grounding
U	U5	Motor (5) Power supply, phase U
N	V5	Motor (5) Power supply, phase V
B	W5	Motor (5) Power supply, phase W
J	E5	Motor (5) Power supply grounding
T	U6	Motor (6) Power supply, phase U
V	V6	Motor (6) Power supply, phase V
P	W6	Motor (6) Power supply, phase W
C	E6	Motor (6) Power supply grounding
H	NC	
S	NC	
R	NC	
D	NC	
G	BR2	Brake power supply (+)
F	NO	Brake power supply (–)

Controller side connector model: D/MS3102A22-14S (DDK)

5) CN53B (Encoder connector “B” side)

CN53B Pin No.	Wire No.	Signal
1	PG41	Motor (4) Encoder +5 V
2	PG42	Motor (4) Encoder 0 V
3	SG4	Motor (4) shield
4	NC	
5	PG43	Motor (4) Encoder serial PS
6	PG44	Motor (4) Encoder serial/PS
7	PG51	Motor (5) Encoder +5 V
8	PG52	Motor (5) Encoder 0 V
9	SG5	Motor (5) shield
10	NC	
11	PG53	Motor (5) Encoder serial PS
12	PG54	Motor (5) Encoder serial/PS
13	NC	
14	PG61	Motor (6) Encoder +5 V
15	PG62	Motor (6) Encoder 0 V
16	SG6	Motor (6) shield
17	NC	
18	PG63	Motor (6) Encoder serial PS
19	PG64	Motor (6) Encoder serial/PS
20	NC	
21	NC	
22	NC	
23	NC	
24	NC	
25	NC	

Controller side connector model: XM2D-2501 (OMRON)

6) CN54A, B (Feeder power supply connector “A” side, “B” side)

CN54A, B Pin No.	Wire No.	Signals
1	E	Grounding
2	L10	200 VAC
3	L20	200 VAC

Controller side connector model: NJC-20-3-RF (UL) (Nanaboshi)

7) CN55A, B (Feeder control connector “A” side, “B” side)

CN55 “A” side Pin No.	Wire No.	Signal
1	P0	24 VDC+
8	N0	24 VDC GND
2	OB107	RB1 Screw feed
9	SB-IN1	Spare
3	SB-OT0	Spare
10	SB-OT1	Spare
4	IB109	RB1 Screw shortage
11	SB-OT3	Spare
5	NC	
12	NC	
6	NC	
13	NC	
7	NC	
14	NC	

CN55 “B” side Pin No.	Wire No.	Signal
1	P0	24 VDC+
8	N0	24 VDC GND
2	OB10F	RB2 Screw feed
9	SD-IN1	Spare
3	SD-OT0	Spare
10	SD-OT1	Spare
4	IB111	RB2 Screw shortage
11	SB-OT3	Spare
5	NC	
12	NC	
6	NC	
13	NC	
7	NC	
14	NC	

Controller side connector model: XM8L-1423 (OMRON)

8) CN56A, B (Driver power supply connector)

CN56A, B Pin No.	Wire No.	Signals
1	E	Grounding
2	L10	200 VAC
3	L20	200 VAC

Controller side connector model: NJC-20-3-RF (UL) (Nanaboshi)

9) CN57A, B (Driver control connector)

CN57 “A” side Pin No.	Wire No.	Signal
1	P0	24 VDC+
13	P0	24 VDC+
2	N0	24 VDC GND
14	N0	24 VDC GND
3	OB108	RB1 Start
15	OB109	RB1 Torque selection 1
4	OB10A	RB1 Torque selection 2
16	OB10B	RB1 Torque selection 4
5	OB10C	RB1 Torque selection 8
17	SA-IN5	Spare
6	SA-IN6	Spare
18	SA-IN7	Spare
7	SA-OT0	Spare
19	IB10A	RB1 Tightening completed
8	IB10B	RB1 Tightening time over
20	IB10C	RB1 Alarm
9	SA-OT4	Spare
21	SA-OT5	Spare
10	SA-OT6	Spare
22	SA-OT7	Spare
11	NC	
23	NC	
12	NC	
24	NC	

CN57 “B” side Pin No.	Wire No.	Signal
1	P0	24 VDC+
13	P0	24 VDC+
2	N0	24 VDC GND
14	N0	24 VDC GND
3	OB110	RB2 Start
15	OB111	RB2 Torque selection 1
4	OB112	RB2 Torque selection 2
16	OB113	RB2 Torque selection 4
5	OB114	RB2 Torque selection 8
17	SC-IN5	Spare
6	SC-IN6	Spare
18	SC-IN7	Spare
7	SC-OT0	Spare
19	IB112	RB2 Tightening completed
8	IB113	RB2 Tightening time over
20	IB114	RB2 Alarm
9	SC-OT4	Spare
21	SC-OT5	Spare
10	SC-OT6	Spare
22	SC-OT7	Spare
11	NC	
23	NC	
12	NC	
24	NC	

Controller side connector model: XM8L-2423 (OMRON)

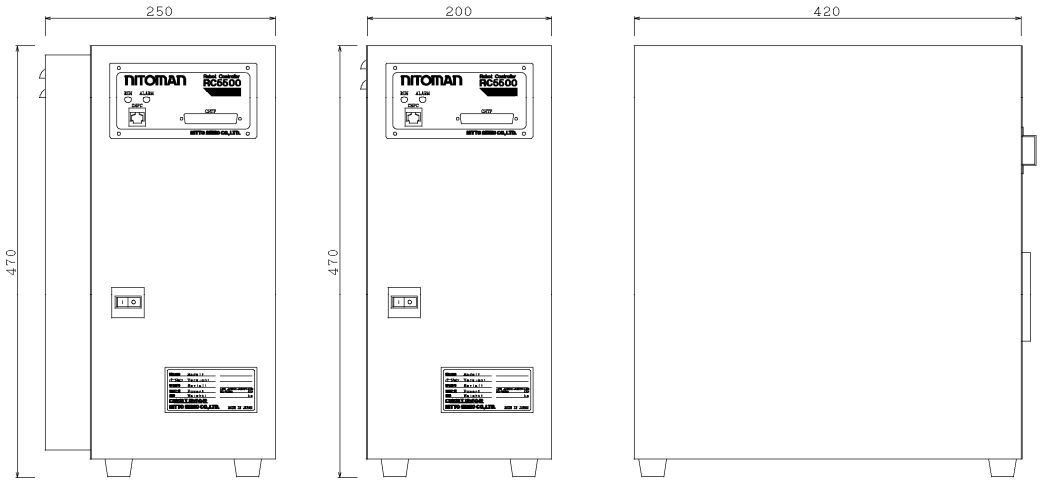
10) CNTP (Teaching Pendant connector)

CNTP Pin No.	Wire No.	Signal
1	FG	Frame ground
2	TXD	TXD
3	DTR	DTR
4	RXD	RXD
5	DSR	DSR
6	RTS	RTS
7	CTS	CTS
8	NC	
9	NC	
10	SG	Signal ground
11	NC	
12	N0	SWCOM (SW-COM)
13	N1	CW1 (Ready switch)
14	NC	SW2
15	NC	SW3
16	NC	SW4
17	NC	
18	N0	24 VDC GND (Pendant power supply)
19	N0	24 VDC GND (Pendant power supply)
20	EM1	ESW-1 (Emergency stop switch)
21	JUMP	ESW-1
22	JUMP	ESW-2
23	N0	ESW-2 (Emergency stop switch COM)
24	N0	DSW-1 (Deadman SW-COM)
25	JUMP	DSW-1
26	JUMP	DSW-2
27	IB102	DSW-2 (Deadman switch)
28	N0	KSW-C (Key SW-COM)
29	NC	KSW-1
30	IB103	KSW-2 (Key switch)
31	NC	Spare switch
32	NC	Spare switch
33	NC	
34	NC	
35	NC	
36	P0	24 VDC+ (Pendant power supply)
37	P0	24 VDC+ (Pendant power supply)

Controller side connector model: XM2D-3701 (OMRON)

2.3.5 Outside dimensions

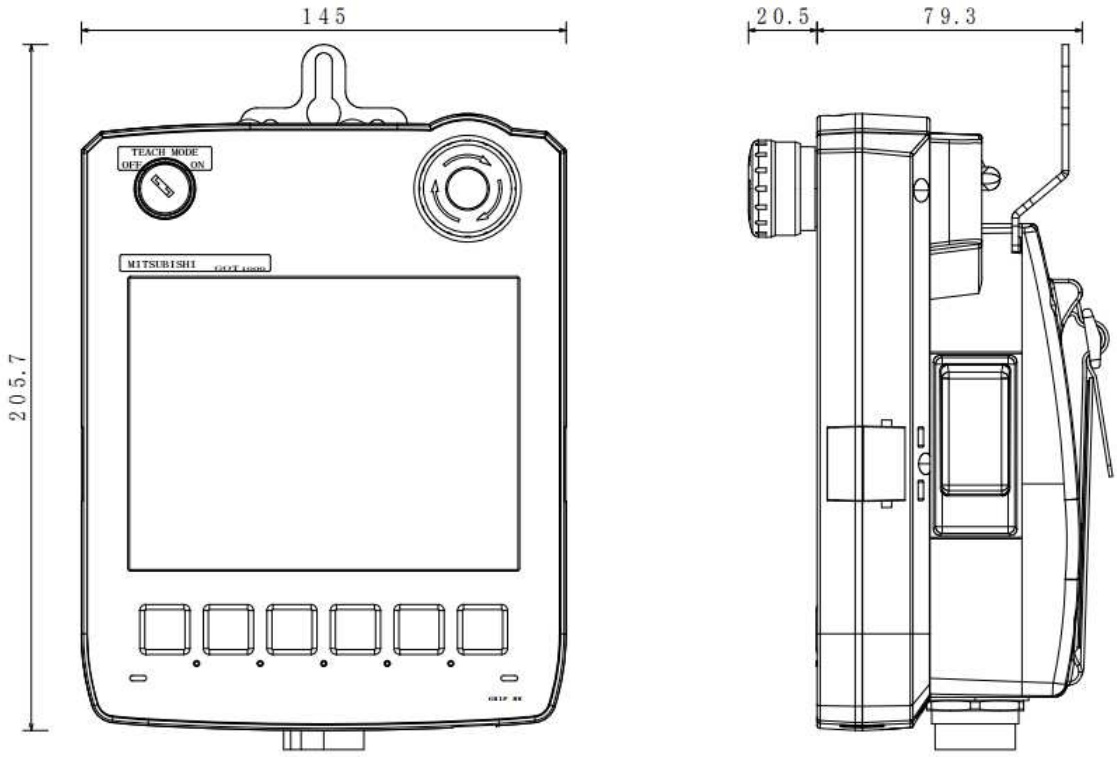
1) Robot controller RC5500-S



[Motor output: 400 W or more] (Special)

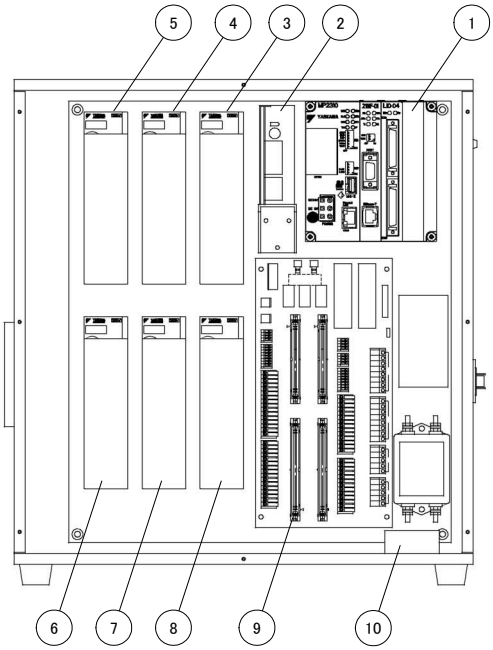
[Motor output: Less than 400 W] (Standard)

2) Teaching pendant RC5500TS



2.3.6 Robot controller inside parts location

1) Internal layout



[1] MC unit (Machine controller)
Model: JEPMC-MC2310 (Yaskawa Electric Corp.)
The MC unit incorporates the following units:
Communication module
Model: JAPMC-CM2310 217IF-01 (Yaskawa Electric Corp.)
I/O module
Model: JEPMC-IO2303 LIO-04 (Yaskawa Electric Corp.)

[2] Power supply
Model: PBA100F-24-J (Cosel)

[3] Sixth axis (Axis 6) Servo pack (For two Z-type robots only)
Model: See the table below.

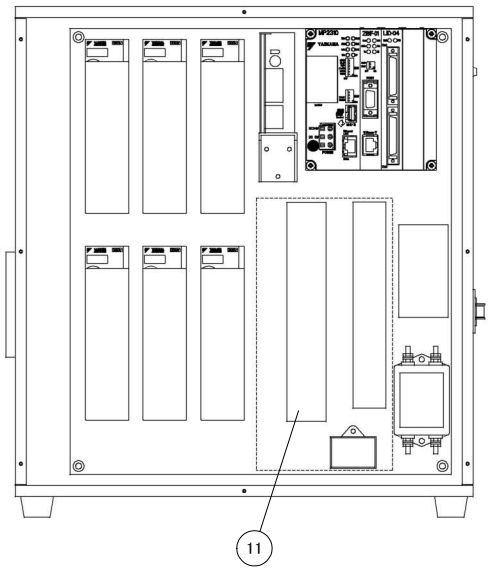
[4] Fifth axis (Axis 5) Servo pack (For two-type robots only)
Model: See the table below.

[5] Fourth axis (Axis 4) Servo pack (For two-type robots only)
Model: See the table below.

[6] Third axis (Axis 3) Servo pack (For Z-type robot only)
Model: See the table below.

[7] Second axis (Axis 2) Servo pack
Model: See the table below.

[8] First axis (Axis 1) Servo pack
Model: See the table below.



Motor output (W)	Model of servo pack
100W	SGDV-R90A11A
200W	SGDV-1R6A11A
400W	SGDV-2R8A11A
750W	SGDV-5R5A11A

* Yaskawa Electric Corp.

Example: for SR560Yθ-Z, the first axis = 200 W, the second axis = 100 W, and the third axis = 100 W.

[9] PI-50-01 PCB
For terminal block layout on the PCB, refer to “2.3.7 CN-50-01 Layout of terminal block on PCB”.

[10] Terminal block TB4

Terminal block layout

L1A	L2A	ET

[11] Terminal block TB2

Terminal block layout

L1C	L2C	L1C	L2C	L1C	L2C	L10	L20	L10	L20	L10	L20	L10	L20	L10	L20	L10A	L20A

2.3.7 PI-50-01 Layout of terminal block on PCB

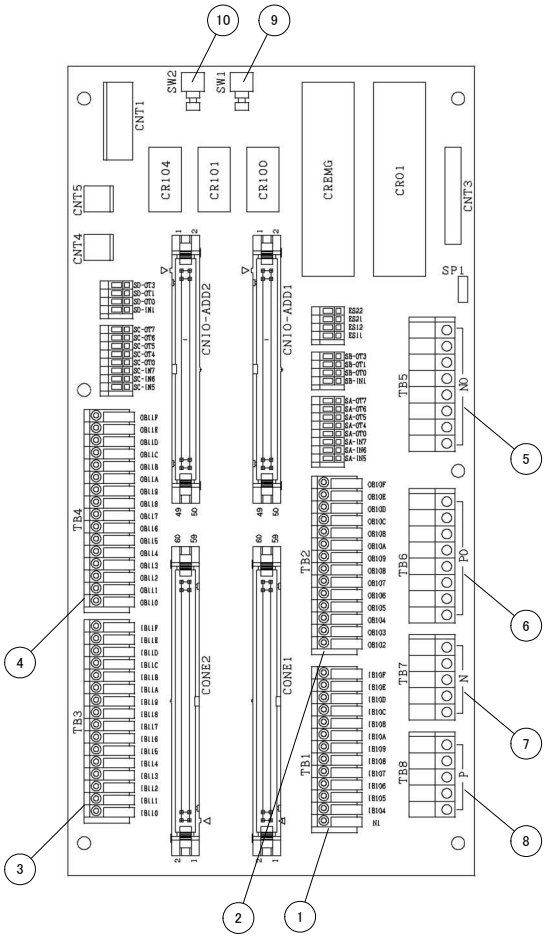
1) PI-50-01 PCB

[1] TB1 (Standard I/O-1 input terminal block)

Terminal block layout
IB10F
IB10E
IB10D
IB10C
IB10B
IB10A
IB109
IB108
IB107
IB106
IB105
IB104
N1

[2] TB2 (Standard I/O-1 output terminal block)

Terminal block layout
OB10F
OB10E
OB10D
OB10C
OB10B
OB10A
OB109
OB108
OB107
OB106
OB105
OB104
OB103
OB102



[3] TB3 (Standard I/O-2 input terminal block)

Terminal block layout
IB11F
IB11E
IB11D
IB11C
IB11B
IB11A
IB119
IB118
IB117
IB116
IB115
IB114
IB113
IB112
IB111
IB110

[4] TB4 (Standard I/O-2 output terminal block)

Terminal block layout
OB11F
OB11E
OB11D
OB11C
OB11B
OB11A
OB119
OB118
OB117
OB116
OB115
OB114
OB113
OB112
OB111
OB110

[5] TB5 (N0 terminal block: 24 VDC GND)

Terminal block layout
N0
N0
N0
N0
N0
N0
N0
N0

[6] TB6 (P0 terminal block: 24 VDC+)

Terminal block layout
P0
P0
P0
P0
P0
P0
P0
P0

[7] TB7 (N terminal block: 24 VDC GND)

Terminal block layout
N
N
N
N
N

[8] TB8 (P terminal block: 24 VDC+)

Terminal block layout
P
P
P
P
P

* Specifications of each terminal block

TB1, TB2, TB3, TB4: Model ML1900-V-**P (Sato Parts)
Standard unsheathed wire length: 10 mm
Applicable wire: Stranded wire, 0.2 mm^2 (AWG24) to 0.75 mm^2 (AWG20)

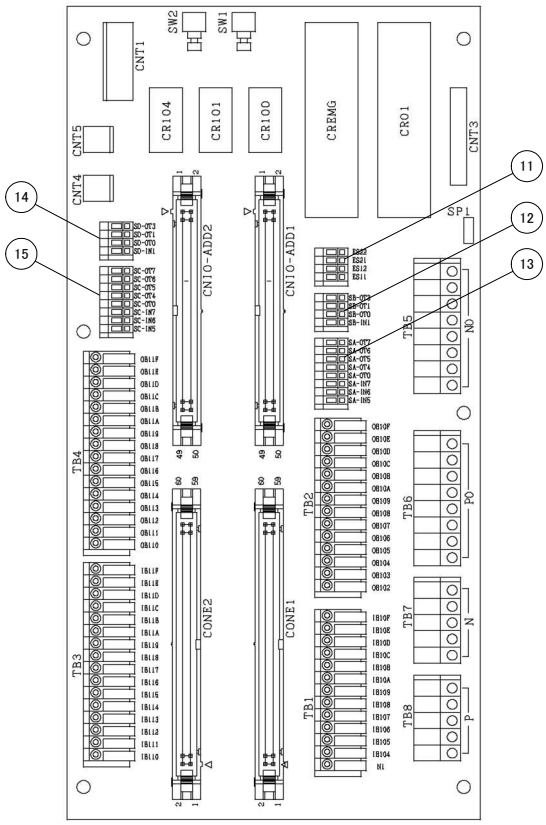
TB5, TB6, TB7, TB8: Model ML800S1V-**P (Sato Parts)
Standard unsheathed wire length: 11 mm
Applicable wire: Stranded wire, 0.3 mm^2 (AWG22) to 1.25 mm^2 (AWG16)

[9] SW1 (RB1 Motor holding brake compulsory release switch)
This switch is used to forcedly reset the robot (1) motor holding brake.
Even if the CPU is stopped and the teaching pendant cannot be used, the motor holding brake can be released while this switch is being pressed.

[10] SW2 (RB2 Motor holding brake compulsory release switch)
This switch is used to forcedly reset the robot (2) motor holding brake.
Even if the CPU is stopped and the teaching pendant cannot be used, the motor holding brake can be released while this switch is being pressed.

[11] TB9
(Terminal block for emergency stop output)

Terminal block layout
ES22
ES21
ES12
ES11



[12] TB12
(Terminal block for feeder "A" side control signal spare)

Terminal block layout
SB-OT3
SB-OT1
SB-OT0
SB-IN1

[14] TB13
(Terminal block for feeder "B" side control signal spare)

Terminal block layout
SD-OT3
SD-OT1
SD-OT0
SD-IN1

[13] TB10
(Terminal block for driver "A" side control signal spare)

Terminal block layout
SA-OT7
SA-OT6
SA-OT5
SA-OT4
SA-OT0
SA-IN7
SA-IN6
SA-IN5

[15] TB11
(Terminal block for driver "B" side control signal spare)

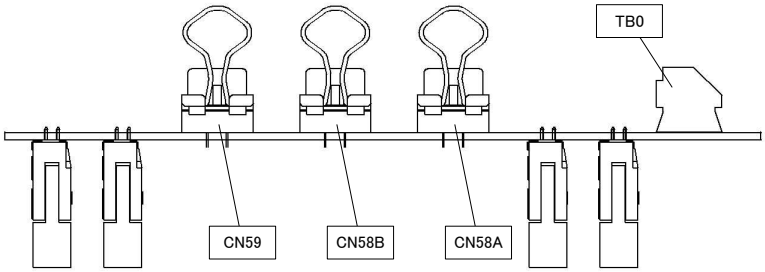
Terminal block layout
SC-OT7
SC-OT6
SC-OT5
SC-OT4
SC-OT0
SC-IN7
SC-IN6
SC-IN5

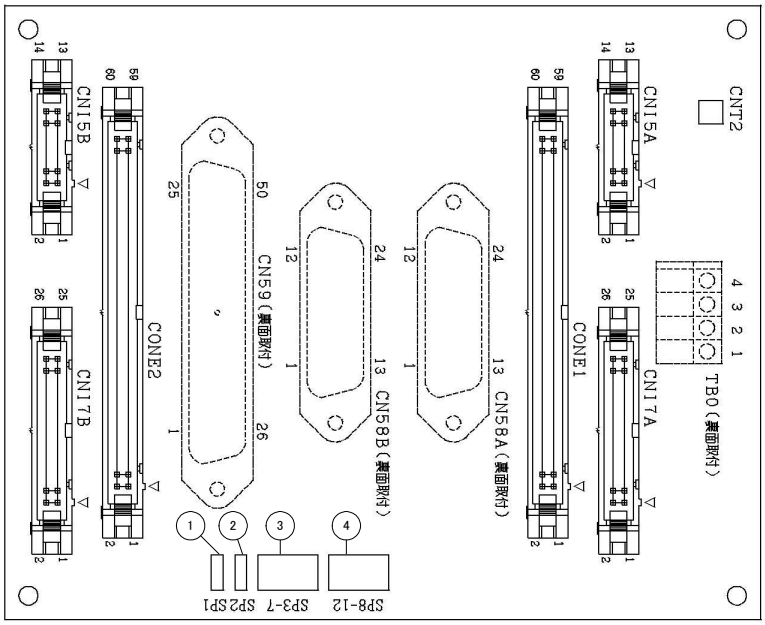
* Specifications of each terminal block

TB10, TB11, TB12, TB13: Model ML700NV-**P (Sato Parts)
Standard unsheathed wire length: 9 to 10 mm
Applicable wire: Stranded wire, 0.08 mm^2 (AWG28) to 0.32 mm^2 (AWG22)

2.3.8 CN-50-01 PCB short-circuit pin

1) CN-50-01 PCB





[1] SP1 (24 VDC external output setting)
1–2: “P” (internal 24 VDC) external output is enabled.
2–3: “P” (internal 24 VDC) external output is disabled. (Standard)

[2] SP2 (24 VDC external output setting)
1–2: “P” (internal 24 VDC) external output is enabled.
2–3: “P” (internal 24 VDC) external output is disabled. (Standard)

[3] SP3 to SP7 (Input signal assignment setting)

Short-circuit pin No.	I/O No.	Setting		Remarks
		1–2	2–3	
SP3	IB110	CN58B (Used for standard I/O-1B connector)	CN59 (Used for standard I/O-2 side connector)	Between 2 and 3, as standard setting
SP4	IB111			
SP5	IB112			
SP6	IB113			
SP7	IB114			

[4] SP8 to SP12 (Output signal assignment setting)

Short-circuit pin No.	I/O No.	Setting		Remarks
		1–2	2–3	
SP8	OB110	CN58B (Used for standard I/O-1B connector)	CN59 (Used for standard I/O-2 side connector)	Between 2 and 3, as standard setting
SP9	OB111			
SP10	OB112			
SP11	OB113			
SP12	OB114			

2.4 Maintenance and inspection

Be sure to disconnect the power cable of the robot controller before maintenance and inspection.

1) Check points
   - Check the voltage supplied to the controller. → Should be within the specified range, or within the range between 200 VAC to 230 VAC.
   - Check the cooling fan (FAN0) filter. → Check for clog in the filter.
   - Check the connectors. → Check for looseness or gap.
   - Check the cables. → Check for disconnection or damages.

2) Inspection intervals
   - Every six months

3) Consumables
   It recommended to keep spare consumables at your hand.
   - Cables
   - MC unit battery (1 pce.) → Replacement interval: Approximately five years
     Model: JZSP-BA01 (Yaskawa Electric Corp.)
   - Absolute value encoder battery → Replacement interval: Approximately five years
     Model: ER6VC4 (Toshiba Denchi)
   - Battery for teaching pendant (1 pce.) → Replacement interval: Approximately five years
     Model: GT11-50BAT (Matsushita Electric Works, Ltd.)

   Note) When replacing the battery, be sure to refer to “3.1 Replacing battery”. Otherwise, data stored in the controller may be lost and irretrievable.

3. Appendix

3.1 Replacing battery

1. MC unit battery

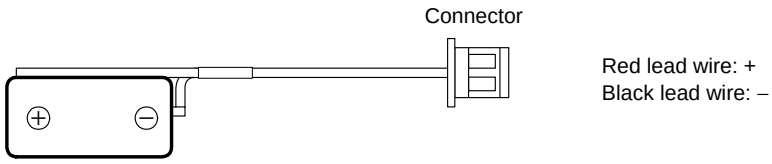
The MC unit incorporates a replaceable battery. This battery is intended for backup of the programs and data stored into the MC unit to prevent them from being lost when power supplied to the MC unit is shut off (due to power failure).
Service life of the battery is approximately five years.
Backup of data in the memory against power failure is possible until the total power failure period reaches a year. It may differ depending on the operating conditions, including ambient temperature.

When the “BATTERY ALARM” indicator on the “ROBOT (*) FAULT” screen of the teaching pendant is highlighted (when the “BAT” LED of the MC unit is lit up), be sure to replace the battery with new one within two weeks. Otherwise, programs and data stored in the MC unit memory will be lost.

• Preparation

1) Save of programs and data in memory
Prior to replacement of a battery, save the programs and data stored in the MC unit into the hard disc of the PC. The saved programs and data can be used in the case that those in the memory are deleted by mistake during the replacement of a battery.

2) Preparation of spare battery
Prepare a spare battery (model: JZSP-BA01).



JZSP-BA01 (Yaskawa Electric Corp.)

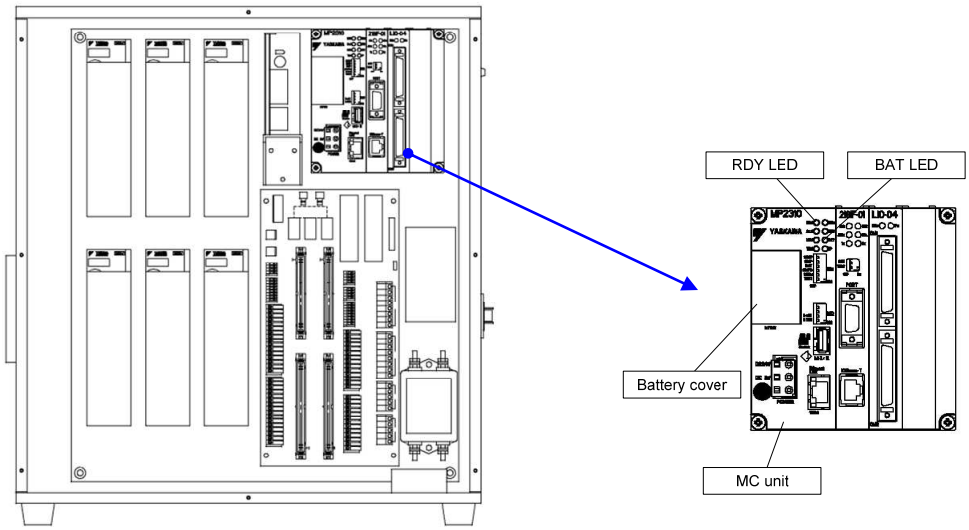
• Replacing battery

1) Remove the screws on the left side of the robot controller, and open the door.
2) Supply power to the robot controller, and turn on the power switch.
At this time, press the emergency stop switch of the teaching pendant or the same connected externally by way of precaution to enter the emergency stop status.

⚠ WARNING

When power is supplied with the side door of the robot controller opened, power voltage is supplied to the robot controller. DO NOT touch the power terminals. Otherwise, you may suffer electric shock.

3) Ensure that the “RDY” LED on the MC unit to the upper right on the robot controller right side is lit up.



4) Open the battery cover on the lower side of the MC unit.
5) Disconnect the connector at the end of the lead wire of the battery from the connector of the MC unit, and remove the battery from the battery holder.
6) Securely plug the connector at the end of the replacement battery to the connector of the MC unit. Then, load the replacement battery into the battery holder. (After the battery is loaded into the battery holder, you cannot put your finger in the connector, since the space around the connector is narrow.)
7) Make sure that the “BAT” LED of the MC unit is lit up (the “battery alarm” lamp of the teaching pendant is unlit).
8) Close the battery cover.
9) Turn off the power switch of the controller, and fix the door with the screws.

When the steps shown above are finished, replacement of the battery is completed.

⚠ WARNING

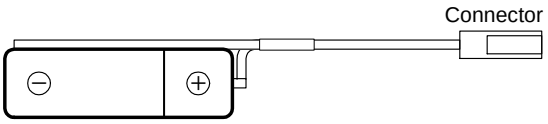
Be sure to replace the MC unit battery with power supplied to the MC unit. Otherwise, programs and data stored in the unit memory may be lost.

2. Absolute value encoder battery

In the robot controlled by the robot controller RC5500 Series, the absolute value encoder is used for detection of position. In the relay box of the robot, absolute encoder batteries are provided for each of the equipped axes of the robot. These batteries are intended for backup of current position data stored in the encoder to prevent them from being deleted when power supplied to the encoder is shut off (due to power failure).
Service life of the battery is approximately five years. It may differ depending on the operating conditions, including ambient temperature.

• Preparation

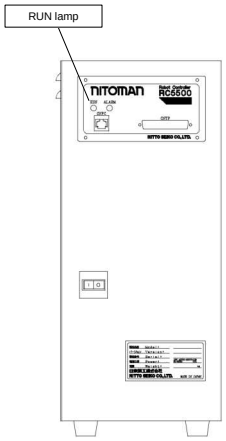
1) Preparation of spare battery
   Prepare spare batteries (model: ER6VC4) for each of the axes of the robot.



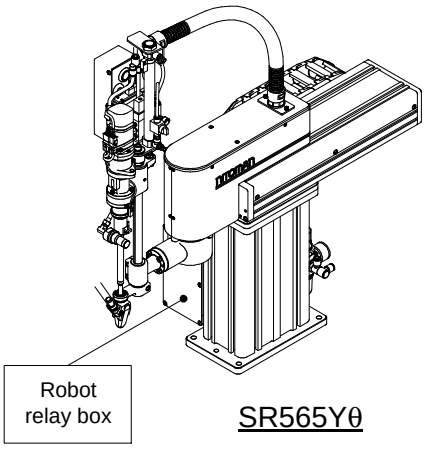
ER6VC4 (Toshiba Denchi)

• Replacing battery

1) Supply power to the robot controller, and turn on the power switch.
2) Press the emergency stop switch of the teaching pendant or the same connected to the outside to enter the emergency stop status. Make sure that the “RUN” lamp in front of the robot controller is lit up.
3) Remove the screws of the robot relay box (see the figure shown below), disconnect the battery connector connected to the encoder battery connecting PCB “EC-01-02” (see the figure on the next page), and remove all the old batteries from the battery holder.

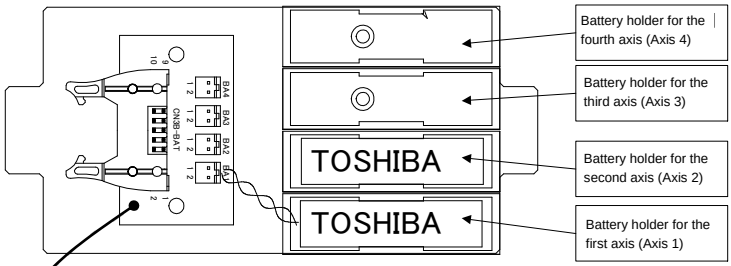


Front view of robot controller

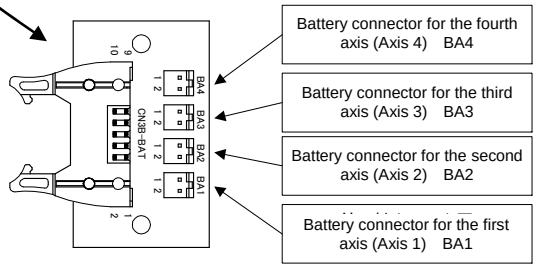


SR565Yθ

4) First, prepare a new battery, and securely plug the connector at the end of the lead wire of the battery to the battery connector (BA1 to BA4) on the PCB EC-01-02. Then, load the battery to the battery holder. Load all the batteries for the axes in a similar manner.
Connect the battery for the first axis to the BA1, the same for the second axis to the BA2, the same for the third axis to the BA3, and the same for the fourth axis to the BA4.



Battery connection PCB unit



Battery connection PCB EC-01-02

5) Make sure that all the batteries are securely loaded. Then, turn off the power switch of the robot controller to reset the “Absolute value encoder battery alarm (Servo pack alarm code A.830)” and “Absolute value encoder battery warning (Servo pack alarm code A930)”.
6) Wait for approximately ten seconds with power shut off. Then, turn on the power switch of the robot controller again. Battery replacement is complete if no alarm is issued.

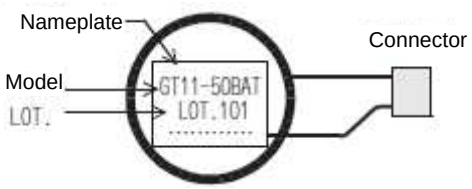
If the absolute value encoder battery is disconnected with power to the robot controller shut off (when the encoder cable is disconnected, or the connector CN3B-BAT on the PCB EC-01-02 is disconnected), data in the absolute value encoder is lost. In such a case, setup of the absolute value encoder is required. For setup of the encoder, refer to “3.2 Encoder setup (initialization) procedure”.

3. Battery for teaching pendant

The teaching pendant is equipped with the battery to store clock data, alarm history and recipe data.
The battery service life is approx. 5 years. However, it may vary depending on operating conditions (ambient temperature, etc.).

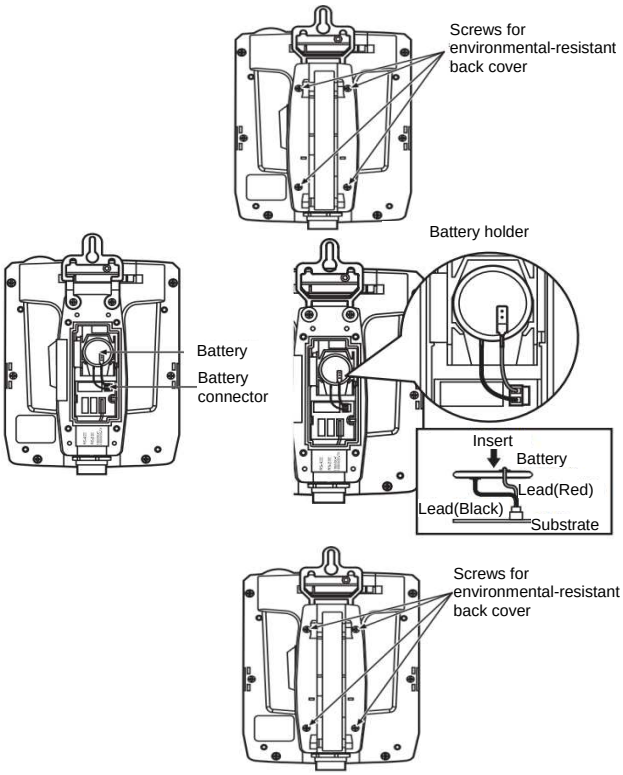
• Preparation

1) Saving memory data
   Before battery replacement, save the data in the teaching pendant into the PC hard disk, etc. The saved program and data should be used, in case where memory data are accidentally erased by a battery replacement failure, etc.
2) Preparing a battery for replacement
   Prepare a battery for replacement (Model: GT11-50BAT).



• Replacing battery

1) Turn OFF the power supply for the robot controller, and turn OFF the power supply for the teaching pendant.
2) Loosen the environmental-resistant back cover screws at four places on the back of the teaching pendant, and remove the cover.
3) Remove the used battery from the holder.
4) Disconnect the connector of the battery, and insert the connector of a new battery within 30 seconds.
5) Insert the new battery into the holder.
6) Re-mount the environmental-resistant back cover, and tighten the screws.
7) Turn ON the power switch of the robot controller. Unless an alarm is activated, the replacement procedure is completed.



If data in the teaching pendant are accidentally erased, download backup data, and conduct required setting procedure (clock setting).

3.2 Encoder reset (initialization) procedure

In the robot controlled by the robot controller RC5500 Series, the absolute value encoder is used for detection of position. Thus, even when power is turned on, calibration of origin is unnecessary, leading to drastic reduction in the time required for startup of the machine. However, in the cases shown below, encoder reset (initialization) is required. It can be performed against your intended axes only, since it is carried out for each axis individually. After the encoder reset is completed, be sure to perform the setup of origin described in the section 3.3 to decide the origin (zero point) of the encoder.

When encoder reset is required

- When encoder backup alarms (servo pack error codes A.810 or A.820) are issued
- When encoder extension cables for each axis are disconnected
- When the absolute value encoder battery is removed or CN3B-BAT connector on the PCB EC-50-01 is disconnected with power to the robot controller shut off.
- When the motor is replaced.

Reset of the absolute value encoder is valid only while the servo motor is in the OFF status. After the reset is completed, supply power again.

Carry out the origin setup only when it is necessary. Coordinate system of a point of which teaching has already been finished is altered, and the arm may move unexpectedly, if it is operated with the coordinate system altered.

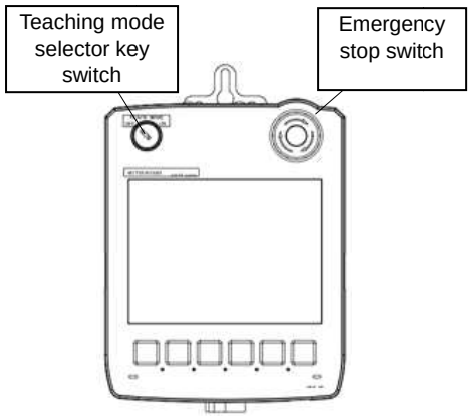
⚠ WARNING

After the encoder setup is finished, be sure to carry out the “origin setup”. Coordinate system of a point of which teaching has already been finished is altered, and the arm may move unexpectedly, if it is operated with the coordinate system altered.

• Encoder reset procedure

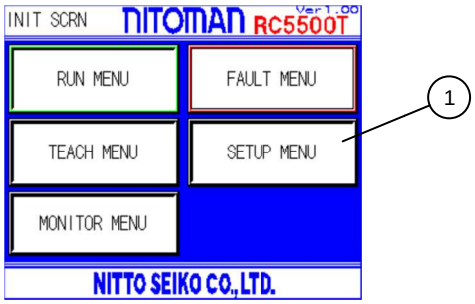
(For details of the teaching pendant operating procedure, refer to “Advanced Thread Tightening Robot nitoman RC5500TS Teaching Pendant Operation Manual”.)

1) Check if the teaching pendant is connected to the robot controller. If the teaching pendant is not connected, connect it to the robot controller.
2) Turn ON the power supply to the robot controller, and turn ON the power switch.
3) Press the teaching pendant emergency stop switch to bring the robot into emergency stop status.
4) Insert the teaching mode selector key switch into the teaching pendant, and turn the key to the “TEACH ON” side.

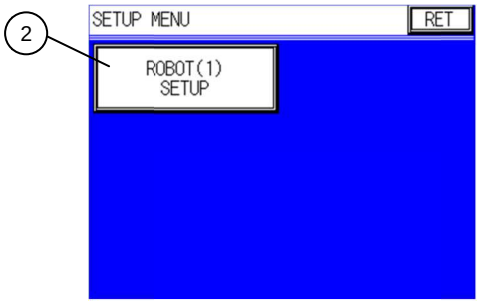


Teaching pendant

5) Open the initial screen of the teaching pendant, and press the [SETUP MENU] switch ([1] in the figure below).
6) A window opens, allowing you to select the robot to be set up. To set up ROBOT (1), press the [ROBOT (1) SETUP] switch ([2] in the figure below). However, when a single standard thread tightening robot is used, this screen will be skipped, and the ROBOT (1) SETUP MENU screen automatically opens.

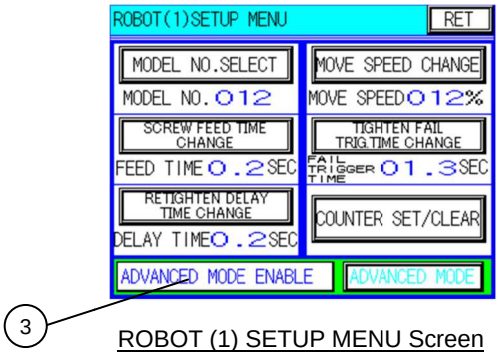


Initial screen

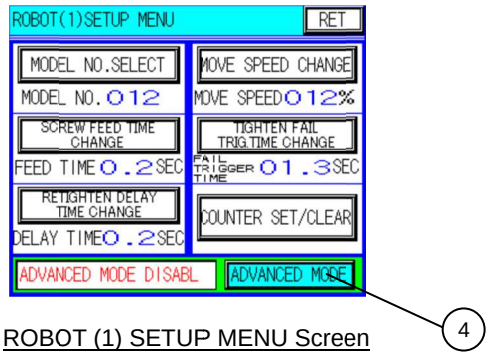


SETUP MENU selection screen

7) The SETUP MENU screen opens. Touch the [ADVANCED MODE DISABL] display field at the bottom of the screen ([3] in the figure below) three times. Then, [ADVANCED MODE ENABLE] is displayed. At the same time, the [ADVANCED MODE] selector switch on the right side ([4] in the figure below) lights up in light blue. If you press the [ADVANCED MODE] selector switch in this status, the display changes to the SETUP (ADVANCED) MENU screen.

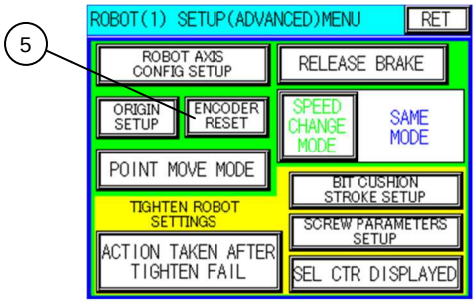


ROBOT (1) SETUP MENU Screen



ROBOT (1) SETUP MENU Screen

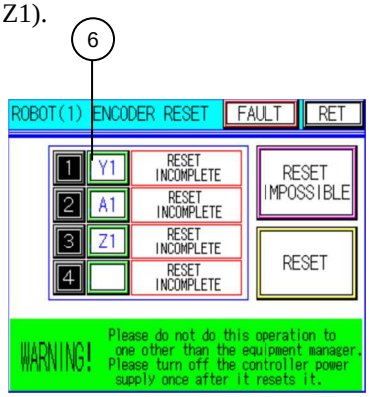
8) If you press the [ENCODER RESET] switch on the SETUP (ADVANCED) MENU screen, the display will switch to the ENCODER RESET screen.



ROBOT (1) SETUP (ADVANCED) MENU screen

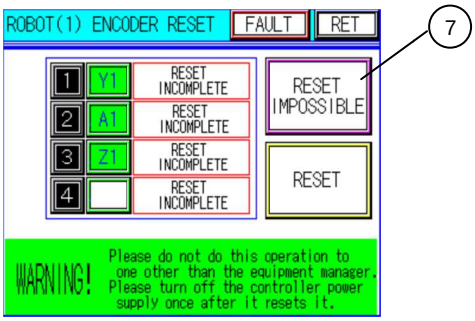
9) Select an axis subject to encoder reset processing among the axis name indication switches (Y1, A1 and Z1) ([6] in the figure below). The switch for the selected axis lights up in green.

* For the axis that has not been selected in this step, encoder reset processing will not be executed. For example, the following screen is displayed in the case of encoder reset processing for all three axes (Y1, A1 and Z1).



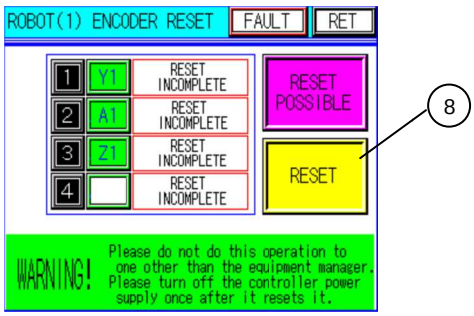
ROBOT (1) ENCODER RESET screen

10) Touch the [RESET IMPOSSIBLE] switch ([7] in the figure below) three times, to change the indication to [RESET POSSIBLE].



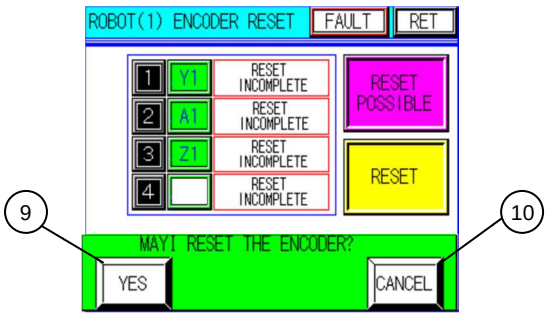
ROBOT (1) ENCODER RESET screen

11) Press the [RESET] switch ([8] in the figure below).



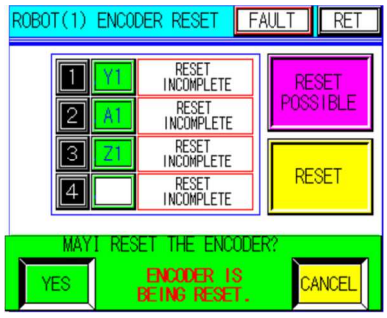
ROBOT (1) ENCODER RESET screen

12) A confirmation window opens again, asking if you intend to reset the encoder. If you intend to reset the encoder, press [YES] ([9] in the figure below). If you do not intend to reset the encoder, press [CANCEL] ([10] in the figure below).

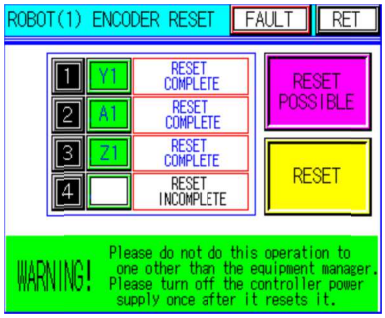


ROBOT (1) ENCODER RESET screen

13) If you press [YES] ([9] in the above figure), the “ENCODER IS BEING RESET” message appears at the center of the confirmation window. Then, the window automatically closes, and RC5500-TS completes the encoder reset processing. In this status, the indication on the axis name switch changes from [RESET INCOMPLETE] to [RESET COMPLETE].



ROBOT (1) ENCODER RESET screen



ROBOT (1) ENCODER RESET screen

14) Turn OFF the power supply for the robot controller. Wait for at least 10 seconds in this status, and then turn ON the power supply again.

Then, the encoder reset is finished.

To decide the origin (zero point) of the encoder for all the axes that the encoder reset has been completed, be sure to carry out the origin setup described in section 3.3.

3.3 Origin setup

In the robot controlled by the robot controller RC5500 Series, the absolute value encoder is used for detection of position. Thus, even when power is supplied to the machine, calibration of origin is unnecessary, leading to drastic reduction in the time required for startup of the machine. Although the origin (zero point) setup has been completed before shipment, it is mechanically required in the cases show below.

Carry out the origin setup only when it is necessary. Coordinate system of a point of which teaching has already been finished is altered, and the arm may move unexpectedly, if it is operated with the coordinate system altered.

When origin setup is required

- When encoder reset (refer to the previous section “3.2 Encoder reset”) is performed.
- When the origin is required to be changed.

⚠ WARNING

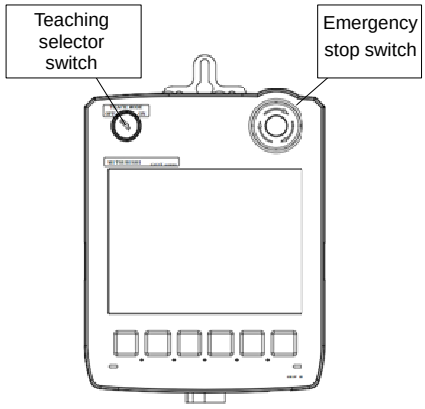
After the origin setup, be sure to check the position that teaching has already been completed with using the teaching pendant. Especially, if the setup origin has been altered intentionally, coordinate system of the point that teaching has already been finished differs from that after the origin setup. When the arm is operated with the coordinate system altered, it may move unexpectedly. After the origin setup is intentionally performed, be sure to carry out teaching for all the points. Delete all the points used by way of precaution.

• Origin setup procedures

(For details of operating procedures of the teaching pendant, refer to the “Operation Manual for Advanced Thread Tightening Robot Nitoman RC5500TS Teaching Pendant”.)

Before pushing the robot arm with hands to move to the origin for origin setup, select the “SERVO OFF” on the “JOG” screen via the “TEACH MENU” screen of the teaching pendant, or cancel the operation ready status by pressing the emergency stop switch. Procedures of moving after entering the emergency stop status are shown below.

1) Ensure that the teaching pendant is connected to the robot controller. If it is not connected, connect the teaching pendant to the robot controller.
2) Supply power to the robot controller, and turn on the power switch.
3) Press the emergency switch of the teaching pendant to enter the emergency stop status.
4) Insert the teaching selector key switch into the specified position of the teaching pendant, and set it to the “TEACH ON” position.

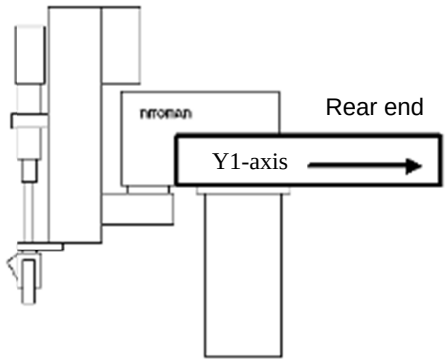


Teaching Pendant

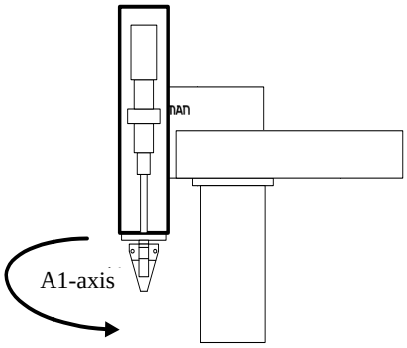
5) Push each axis to the origins shown on the next page with hands. For the robot with the Z-axis, including SR565Yθ-Z, follow the following steps: open the “BRAKE RELEASE” screen of the teaching pendant, release the Z-axis holding brake, push up the Z-axis to the uppermost end with hands, and actuate the holding brake. (For details of operating procedures of the teaching pendant, refer to the “Operation Manual for Advanced Thread Tightening Robot Nitoman RC5500TS Teaching Pendant”. For details of operating procedures of the holding brake, refer to “3.4 Releasing holding brake”.)

Origin of SR565Y θ type robot

i) First axis (Axis 1) [Axis name: Y1]

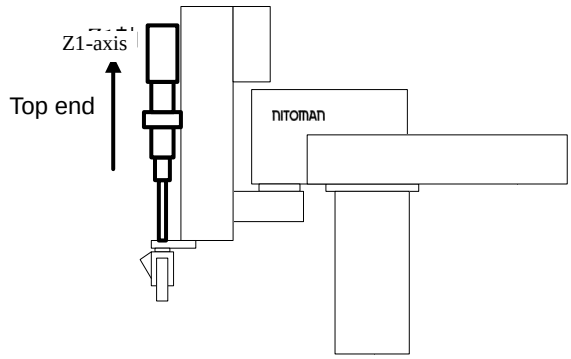


ii) Second axis (Axis 2) [Axis name: A1]



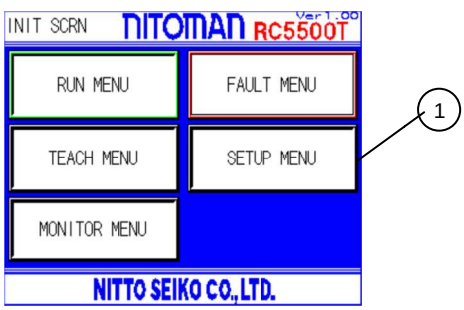
(Right end viewed from front of robot)

iii) Third axis (Axis 3) [Axis name: Z1] (SR565Y θ-Z only)
Release of holding brake is required

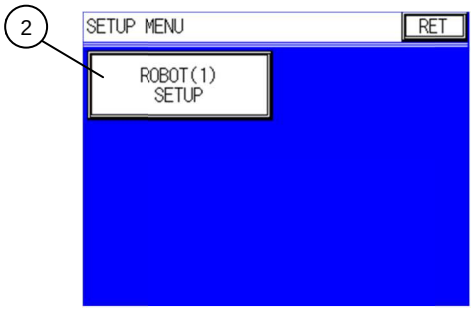


6) Open the “INIT” screen of the teaching pendant, and touch the “SETUP MENU” switch ([1] shown in the figure below).

7) A window opens, allowing you to select the robot to be set up. To set up ROBOT (1), press the [ROBOT (1) SETUP] switch ([2] in the figure below). However, when a single standard thread tightening robot is used, this screen will be skipped, and the ROBOT (1) SETUP MENU screen automatically opens.

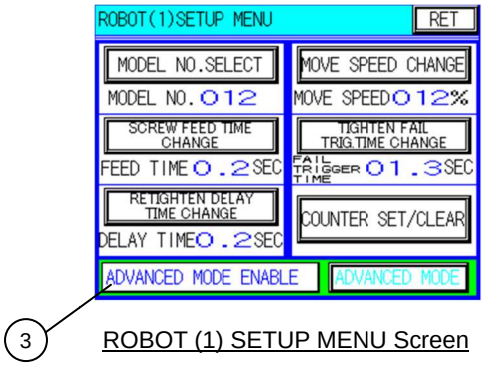


INIT screen

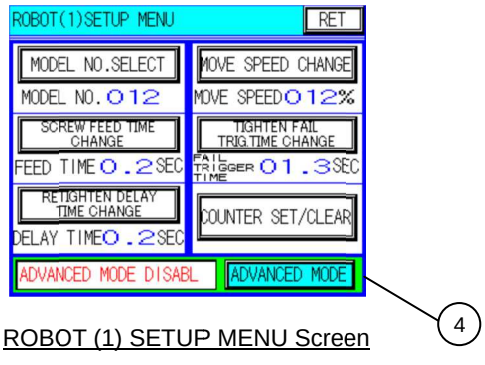


SETUP MENU selection screen

8) The SETUP MENU screen opens. Touch the [ADVANCED MODE DISABL] display field at the bottom of the screen ([3] in the figure below) three times. Then, [ADVANCED MODE ENABLE] is displayed. At the same time, the [ADVANCED MODE] selector switch on the right side ([4] in the figure below) lights up in light blue. If you press the [ADVANCED MODE] selector switch ([4] in the figure below) in this status, the display changes to the SETUP (ADVANCED) MENU screen.

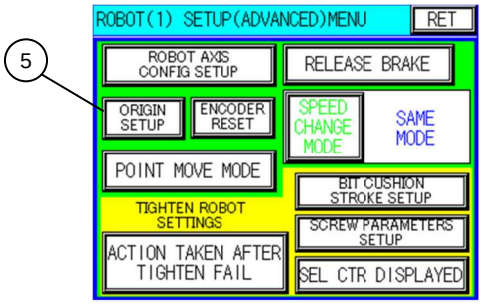


ROBOT (1) SETUP MENU Screen



ROBOT (1) SETUP MENU Screen

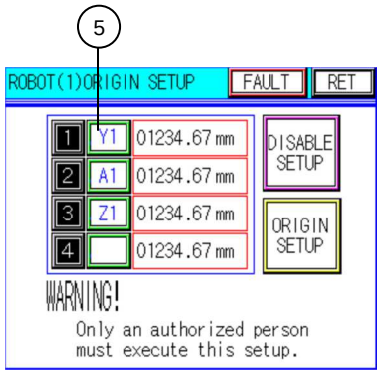
9) Touch the “ORIGIN SETUP” switch ([5] shown in the figure below) on the “SETUP (ADVANCED) MENU” screen to access to the “ORIGIN SETUP” screen.



ROBOT (1) SETUP (ADVANCED) MENU screen

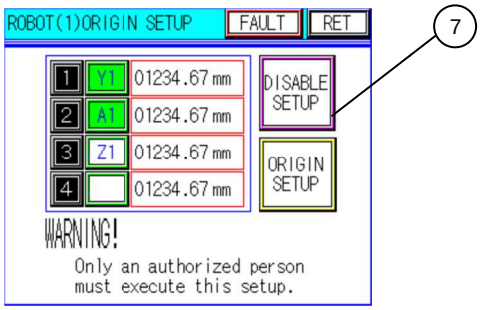
10) Select an axis subject to origin setup processing among the axis name indication switches (Y1, A1 and Z1) ([6] in the figure below). The switch for the selected axis lights up in green.

* Origin setup processing will not be executed for the axis that has not been selected in this step. For example, the following screen is displayed in the case of origin setup processing for two axes (Y1 and A1).



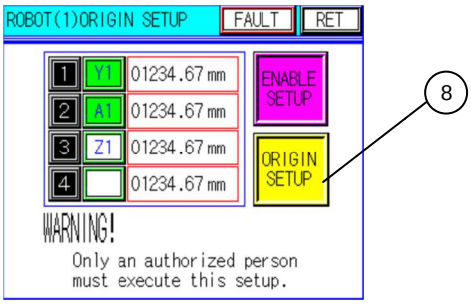
ROBOT (1) ORIGIN SETUP screen

11) Touch the “DISABLE SETUP” switch ([7] shown in the figure below) three times. Then, message “ENABLE SETUP” is indicated.



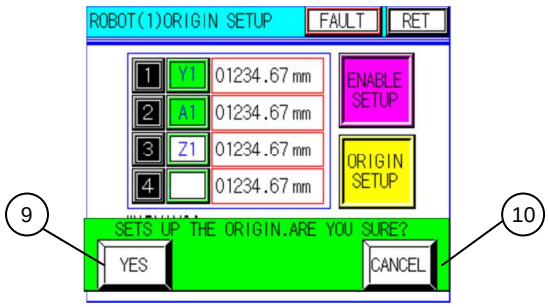
ROBOT (1) ORIGIN SETUP screen

12) Touch the “ORIGIN SETUP” switch ([8] shown in the figure below).



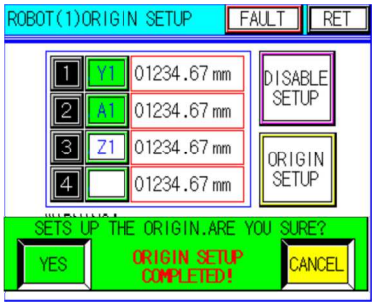
ROBOT (1) ORIGIN SETUP screen

13) Field indicating message “SETS UP THE ORIGIN. ARE YOU SURE?” appears in the lower part of the screen to confirm the setup. If you want to setup the origin, touch the “YES” switch ([9] shown in the figure below). If you do not want, touch the “CANCEL” switch ([10] shown in the figure below).



ROBOT (1) ORIGIN SETUP screen

14) When the “YES” switch ([9] shown in the figure below) is touched, message “ORIGIN SETUP COMPLETED!” appears in the center of the confirmation window. Then, the window closes automatically.



ROBOT (1) ORIGIN SETUP screen

ROBOT (1) ORIGIN SETUP screen

Then, the origin setup is completed.

Be sure to check the position that teaching has already been performed with using the teaching pendant.

3.4 Releasing holding brake

For the robot equipped with the vertical motion axis, including SR565Yθ-Z, the holding brake is provided to prevent dropping when power is shut off. In normal operation, release/actuation of the holding brake is automatically controlled interlocking with the ON/OFF status of the servo motor. However, the holding brake should be released compulsorily in the cases shown below.

When the holding brake should be released compulsorily

- When the direct teaching is performed.
- When the origin is setup.
- When the Z-axis is required to be moved compulsorily for installation of the robot.

While the servo motor is in the ON status, the holding brake cannot be released. Select “SERVO OFF” on the “JOG” screen via the “TEACH MENU” screen of the teaching pendant, or cancel the operation ready status by pressing the emergency stop button. Procedures to release the holding brake after setting the machine to the emergency stop status are shown below.

To release the holding brake compulsorily, perform either of the two steps shown below.

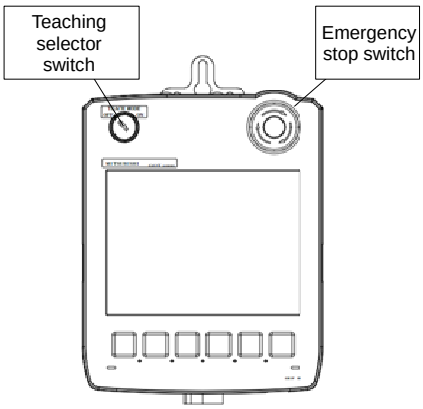
1. Release by teaching pendant
2. Use of compulsory release switch on PCB PI-50-01 in robot controller

Detailed procedures are shown below.

1. Release by teaching pendant

(For details of the operating procedures of the teaching pendant, refer to the “Operation Manual for Advanced Thread Tightening Robot Nitoman RC5500TS Teaching Pendant”.)

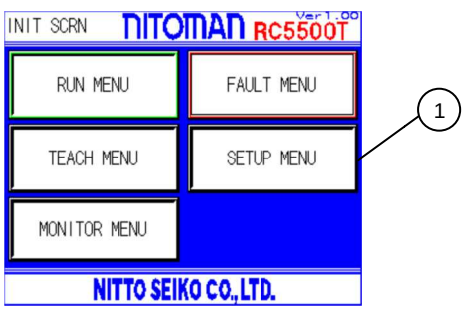
1) Ensure that the teaching pendant is connected to the robot controller. If it is not connected, connect the teaching pendant to the robot controller.
2) Supply power to the robot controller, and turn on the power switch.
3) Press the emergency switch of the teaching pendant to enter the emergency stop status.
4) Insert the teaching selector key switch into the specified position of the teaching pendant, and set it to the “TEACH ON” position.



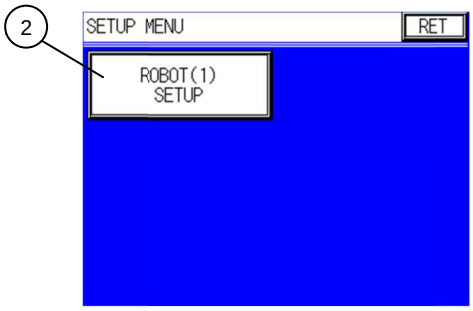
Teaching Pendant

5) Open the “INIT” screen of the teaching pendant, and touch the “SETUP MENU” switch ([1] shown in the figure below).

6) A window opens, allowing you to select the robot to be set up. To set up ROBOT (1), press the [ROBOT (1) SETUP] switch ([2] in the figure below). However, when a single standard thread tightening robot is used, this screen will be skipped, and the ROBOT (1) SETUP MENU screen automatically opens.

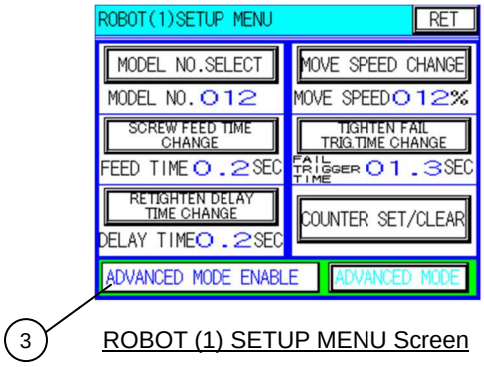


INIT screen

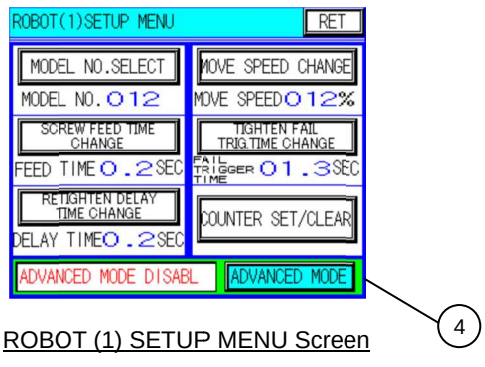


SETUP MENU selection screen

7) The SETUP MENU screen opens. Touch the [ADVANCED MODE DISABL] display field at the bottom of the screen ([3] in the figure below) three times. Then, message “ADVANCED MODE ENABLED” is indicated, and the “ADVANCED MODE” switch ([4] shown in the figure below) is highlighted in light blue. In this status, touch the “ADVANCED MODE” switch ([4] shown in the figure below). Then, the “SETUP (ADVANCED) MENU” screen appears.

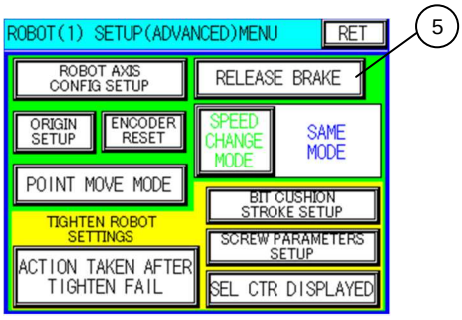


ROBOT (1) SETUP MENU Screen



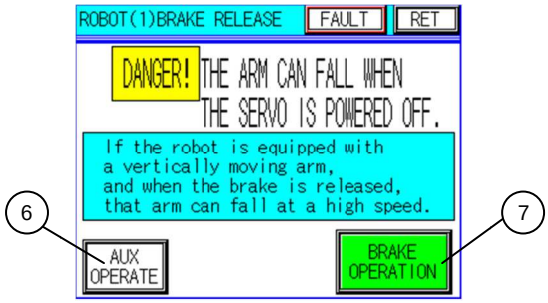
ROBOT (1) SETUP MENU Screen

8) Touch the “RELEASE BRAKE” switch ([5] shown in the figure below) on the “SETUP (ADVANCED) MENU” screen.

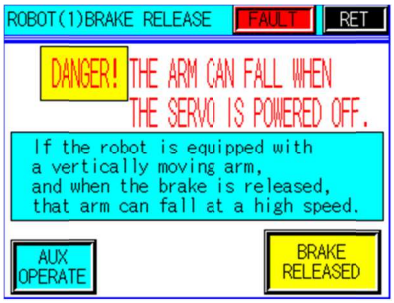


ROBOT (1) SETUP (ADVANCED) MENU screen

9) While touching the “AUX OPERATE” switch ([6] shown in the figure below) in the lower left part of the screen, touch the “BRAKE OPERATION” switch ([7] shown in the figure below) in the lower right part of the screen. Then, the brake is released, and the message “BRAKE OPERATION” (highlighted in green) indicated on the switch ([7] shown in the figure below) is changed to the message “BRAKE RELEASED” (highlighted in yellow).



ROBOT (1) BRAKE RELEASE screen

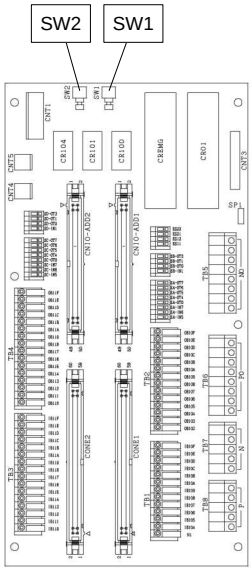


ROBOT (1) BRAKE RELEASE screen

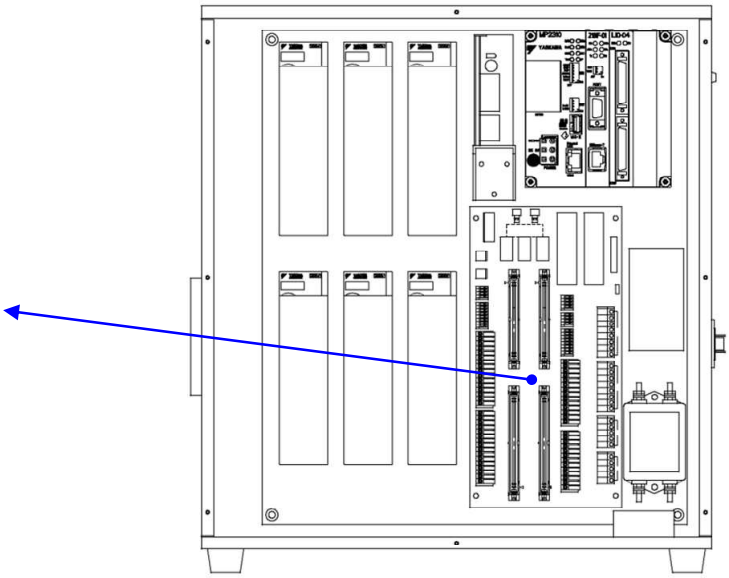
After the procedures shown above are completed, the brake is released. Touch the “BRAKE OPERATION” switch ([7] shown in the figure above) in the lower right part of the screen again, while touching the “AUX OPERATE” switch ([6] shown in the figure below). Then, the brake is actuated (locked), and the message “BRAKE RELEASED” (highlighted in yellow) indicated on the switch in the lower right part of the screen is changed to the message “BRAKE APPLIED” (highlighted in green).

2. Using compulsory release switch on PCB PI-50-01 in robot controller

This method enables compulsory release of the holding brake regardless of the display on the teaching menu screen. Use it to release the holding brake in case of emergency, such as failure in operation of the CPU.
Supply power to the robot controller, and turn on the power switch. When the ready switch is OFF, or when the machine is in “SERVO OFF” status, the holding brakes for Z1 and Z2 can be individually released, while the SW1 or SW2 is being pressed on the PI-50-01 PCB.



PCB PI-50-01



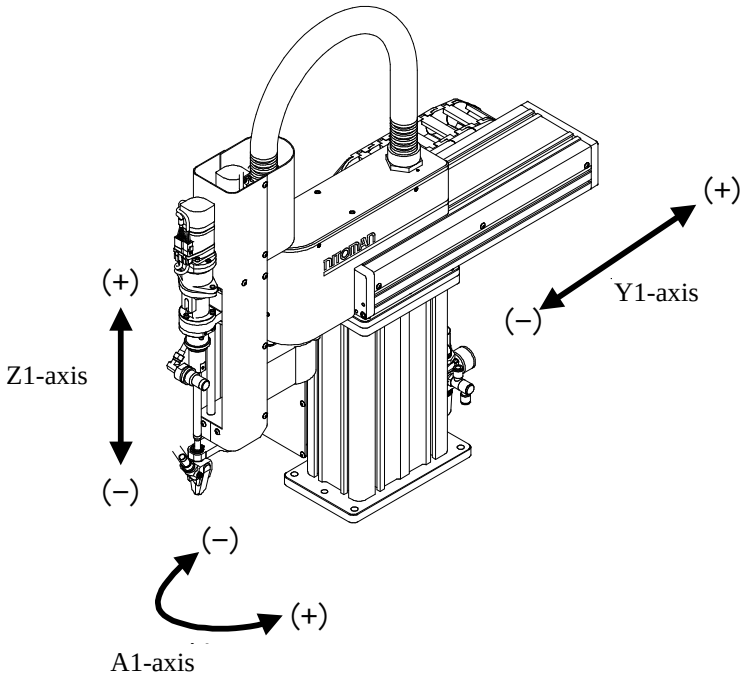
Interval view of controller left side

⚠ WARNING

When power is supplied with the side door of the robot controller opened, power voltage is supplied to the robot controller. DO NOT touch the power terminals. Otherwise, you may suffer electric shock.

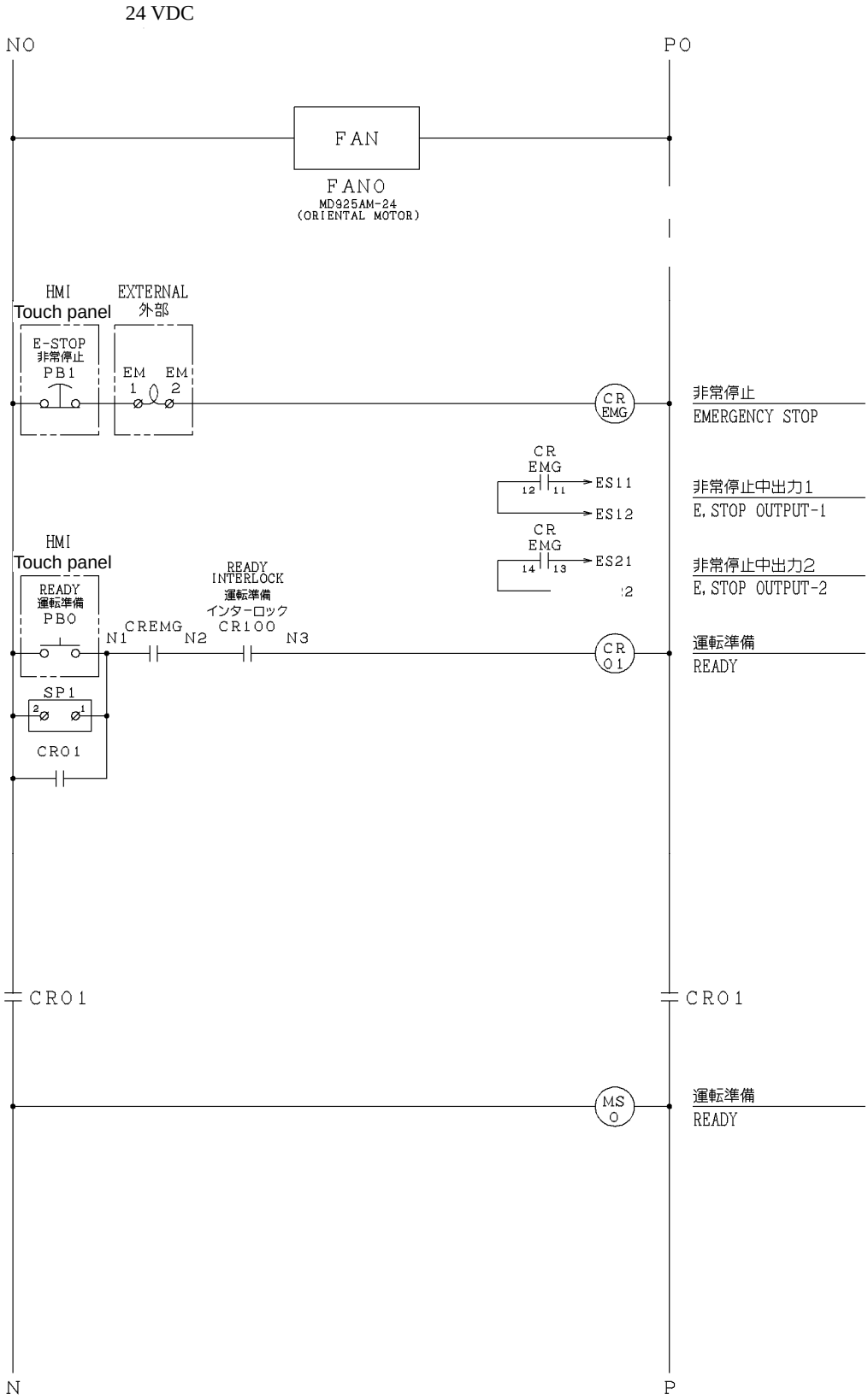
3.5 Robot coordinate system

Coordinate system of SR565Y θ-Z



3.6 Ready circuit

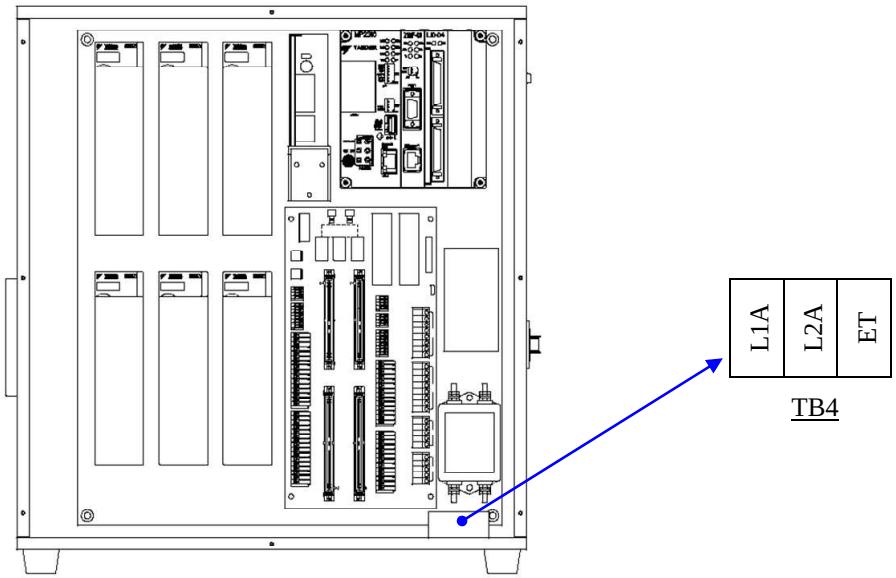
Ready circuit in robot controller RC5500-S



3.7 Precautions

Precautions for withstand voltage test

Because the robot controller RC5500 Series incorporates the indirect lightning stroke surge protector, the surge protector is tripped during withstand voltage (700 VAC or more) test against the controller, leading to impossibility of precise measurement. Before conducting withstand voltage test for the RC5500 series, be sure to disconnect the wire from the ET terminal on the TB4 terminal block inside the robot controller. Always close the side door before withstand voltage test. Do not forget to connect the wire to the ET terminal after elapse of at least 10 minutes from completion of the test.



Interval view of controller left side

3.8 Guarantee period and coverage

1) Guaranteed coverage
If any malfunction occurs to our products during the guaranteed period due to faults in materials or workmanship responsible for us, we will repair them free of charge.

2) Guarantee period
The shortest period among the periods shown below will be applied as the guaranteed period.
   i. Within one year from date of shipment
   ii. Within 2500 operation hours from date of shipment

3) Limitations
Note that faults shown below are out of our guarantee.
   i. Faults caused by inappropriate storage or handling by customers
   ii. Faults caused by unauthorized modifications to products by customers
   iii. Faults caused by external factors such as fires and abnormal voltage, or acts of God such as earthquakes, thunderbolts, typhoons, and floods

4) Items out of guarantee
Products of which guarantee periods were ended and faults described in the 3) above are out of our guarantee. All the required repairs to them will be charged. Investigation of causes of faults made upon customers' request will be also charged.

5) Expiration of charged repair period after discontinuance of production
Charged repair period will be ended seven years after the discontinuance of production.

[Revision record]

May 2010, first edition, RC5500-S Ver 1.00 RC5500-S0001

Dec 2016, Revision edition, RC5500-S Ver 1.01 RC5500-S0002

Feb 2018, Revision edition, RC5500-S Ver 1.02 RC5500-S0003

ADVANCED THREAD TIGHTENING ROBOT

NITOMAN RC5500-S

THREAD TIGHTENING ROBOT CONTROLLER

USER'S MANUAL

Ver1.02

NITTO SEIKO CO., LTD.

http://www.nittoseiko.co.jp/

● For improvement in performance, specifications may be modified without notice.

RC5500-S0003 Prepared in Feb 2018

Think solution. NITTO SEIKO

ADVANCED THREAD TIGHTENING ROBOT

NITOMAN® SR565Y θ

USER'S MANUAL Ver1.01

NITTO SEIKO CO.,LTD.

【Notes】

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(2) By provision of operating manual recorded on CD-ROM, you shall be deemed to have agreed to the Terms and Conditions written in “readme.txt” on it.

(3) Contents of this manual are subject to update without notice according to specification change of the products.

(4) Unique nouns like the product name indicated in this brochure are registered or not registered trademark of each company.

For safe use

1. Safety precautions

Fully read and understand the safety precautions shown below before using this machine, and appropriately handle it with care.

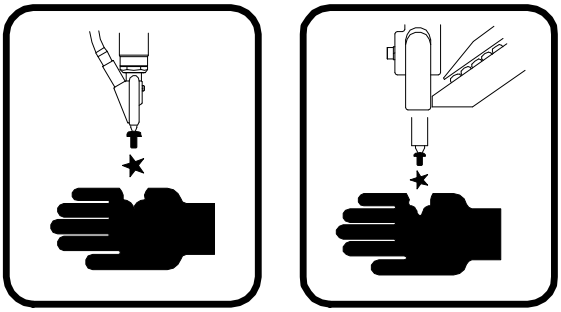
Stickers warning hazards shown below are attached to the robot, tip unit, robot controller, and other peripheral equipment.

Note that it is very difficult to cover all the detailed precautions for safety by this manual only, and proper judgment on safety by operators is very important for the prevention of possible hazards.

⚠ **WARNING**	Inappropriate handling may lead to serious accidents (deaths or serious injuries).

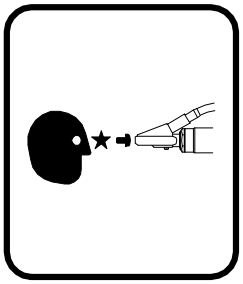
⚠ **CAUTION**	Inappropriate handling may lead to injuries, physical damages, or troubles to the operation of the machine.

⚠ WARNING Thread tightening



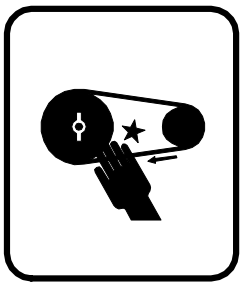
DO NOT put your hands in the thread tightening unit during operation. Otherwise, you may hurt your hands.

⚠ WARNING Screw feeding



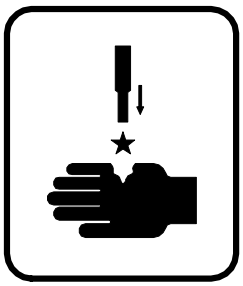
DO NOT look at the screw holding unit directly, nor turn it to anyone. Otherwise, loss of sight or injuries may be caused.

WARNING Entanglement



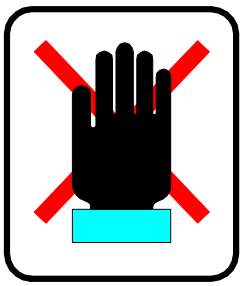
DO NOT put your hands in rotating sections such as belts and chains.
Otherwise, you may hurt your hands.

WARNING Caulking



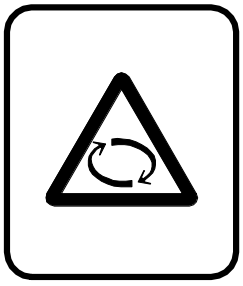
Be sure to keep your hands away from the alive caulking unit.
Otherwise, your may hurt your hands.

WARNING Prohibition of entrance



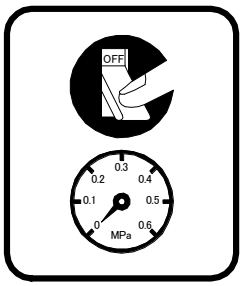
DO NOT enter hazardous areas.
Otherwise, you may collide with the robot, or you may be entangled between the robot and the machine.

WARNING Rotating objects



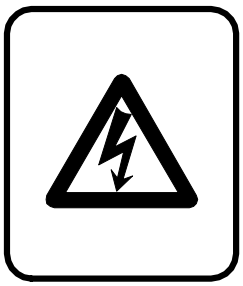
DO NOT enter the rotary areas.
Otherwise, you may collide with rotating objects, or you may be entangled between them and the machine.

⚠ WARNING Cutoff of power and air supply



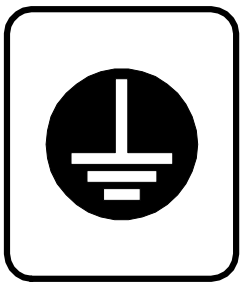
Be sure to cut the power and air supply off before adjusting or maintaining the machine.
Otherwise, you may suffer electric shocks or may be entangled in the machine.

⚠ WARNING Electric shock



Be sure to cut the power off before maintenance or inspection.
Otherwise, you may suffer electric shocks.

⚠ WARNING Grounding



Be sure to provide grounding of the third class or better for installation.
Otherwise, electric shocks or malfunctions may occur.

⚠ WARNING Wiring

Always completely cut off the power for all the phases from the outside before installation and wiring. Otherwise, you may suffer electric shocks, or the work may be damaged.

⚠ WARNING Startup and maintenance

DO NOT touch terminals while the machine is alive. Otherwise, electric shocks or malfunctions may occur.

⚠ WARNING After maintenance, inspection, and adjustment

Be sure to return all the tools used for maintenance, inspection, and adjustment to the toolbox. Working with them left on the machine or close to your feet may cause serious accidents.

⚠ WARNING Teaching

If you must enter the robot moving area during teaching, carefully watch out the motion of the machine. When working by two or more persons is required, be sure to discuss safety measures including oral signals during working, in advance. Otherwise, serious accidents may occur.

⚠ CAUTION After operation

Be sure to shut the power and air supply off after operation.

⚠ CAUTION Data backup battery

The robot controller and the robot incorporate the data backup batteries. Regularly replace them with fresh ones within their service lives. Otherwise, your important data may be lost. (For replacing procedures and intervals, refer to the operation Manual for the controller.)

⚠ CAUTION Long-term stopping

If the machine does not need to be operated for a long period, back up the data of the controller.

⚠ CAUTION Restarting after long-term stopping

Before restarting the machine that it has been stopped for a long period, completely clean and inspect it, and carry out a trial run to check for faults.

2. Special education

Operators of industrial robots must have special knowledge and skills to prevent hazards, since there are possible hazards different from those of conventional machines in industrial robots. Be sure to provide **"Special education for safety and hygiene" obliged** in the regulation of special education for safety and hygiene by the Ministry of Labor (Notice No.49, the Ministry of Labor).

3. Precautions for operation

[1] Operations including teaching (Article 150 of rules for labor safety and hygiene)

When operations such as teaching, cleaning, and lubrication, to be carried out in the robot moving area are required, provision of measures shown below is obliged to prevent hazards due to accidental moving or malfunction of the robot.

(1) Provision of rules for the items shown below is required, and operation must be performed in conformity with them.

a) Operating method and procedures of robot
b) Robot speed during teaching
c) Making signals during working by two or more persons
d) Troubleshooting
e) Measures required for restarting after the robot is stopped in case of malfunctions
f) Measures required for prevention of hazards due to accidental moving or malfunction of the robot

(2) Measures to stop the robot immediately by the superintendent of workers in case of malfunction must be provided.

(3) Measures to prevent anyone other than workers from operating the start switches of the robot, such as the notice of working on the start switched of the robot during operation, must be provided.

Rules described in (1) above must be established according to the operating statuses of customers' machines, considering opinions by related workers, technicians of manufacturer, and labor safety consultants.

[2] Check before operations including teaching (Article 151 of rules for labor safety and hygiene)

When operations such as teaching, cleaning, and lubrication, to be carried out in the robot moving area are required, check on the points shown below before the operations, and provision of measures such as repair and others in case of malfunctions are obliged in the rules.

(1) Check of damages on coating and outer sheath of external cables

(2) Check of abnormality in motion of robot

(3) Check of functions of controllers and emergency stopping devices

Preparations for use

1. Environmental conditions for installation

To operate this machine correctly, install it in the environment satisfying the conditions shown below.

Ambient temperature	**-0℃ to +40℃**
Ambient humidity	**From 45 to 85% RH**
Vibration	**Location free from vibration**
Outside air	**Place with less dusts and soot**
Noise	**Pulse width should be 1s or less, wave height should be 1000 V or less**

If the machine is installed in the environment that does not satisfy the conditions shown above, the robot controller circuit will be faulty, leading to faulty operation of the robot, causing accidents or malfunctions.

When installation in inferior environment is absolutely necessary, fully provide protective measures for the machine.

2. Securing installation space

⚠ **WARNING** Secure the space enough to install the machine.

Secure the installation space enough to inspect and adjust the machine, as well as fully understand the operation of the robot, specify the hazardous areas, and provide the safety guardrail. When using the function to set the robot moving area on the program (X, Y limiter), refer to the operation manual for the robot controller.

3. Installation of safety guardrail

⚠ **WARNING** Install the safety guardrail to prevent anyone from easily entering hazardous areas.

Install the **safety guardrail** near hazardous areas in which the robot moves, in order to prevent anyone from easily **entering** hazardous areas while the robot is automatically operated or is in the standby status. Be sure to observe the rules for safety and hygiene (4 of Article 150) by the Ministry of Labor that **obliges the installation of safety guardrail**.

Prepare **doors, ropes, and chains** for the entrance and exits, and provide the electrical **interlock mechanism** so that the machine automatically enters the emergency stop status when any of them is opened or removed. The safety guardrail shown in this manual shall not be able to be moved easily, broken, nor deformed with ease by external force.

4. Installation of robot

> ⚠ **WARNING** Install the robot onto the frame with enough strength.

Securely fix the robot onto the frame (steel plate with thickness of 16 mm or more and flatness of 0.2 or better) with a strength enough against the speed change reaction of the robot with using hexagon socket head bolts and hexagon bolts. Fixing of the robot onto the frame that does not satisfy these conditions causes not only the impossibility of accomplishment of jobs required, but also malfunctions of the robot and unexpected troubles. (For the sizes of mounting bolts, refer to the sketch drawings.)

5. Utilities

(1) Voltage of the power supply required for the machine should be within the range between 200 VAC and 230 VAC, 50/60 Hz. Prepare the appropriate receptacle.

(2) Supply clean air under air pressure of 0.4 MPa or higher by the air tube with outer diameter of 8 mm.

6. Installation of operation system

Install the operation box (teaching pendant) to the location, where the operator can see the operation, and is out of the robot working area. To deal with unexpected motions of the robot, the emergency stop switch must be installed to the location where the operator can handle it quickly.

7. Installation of controller

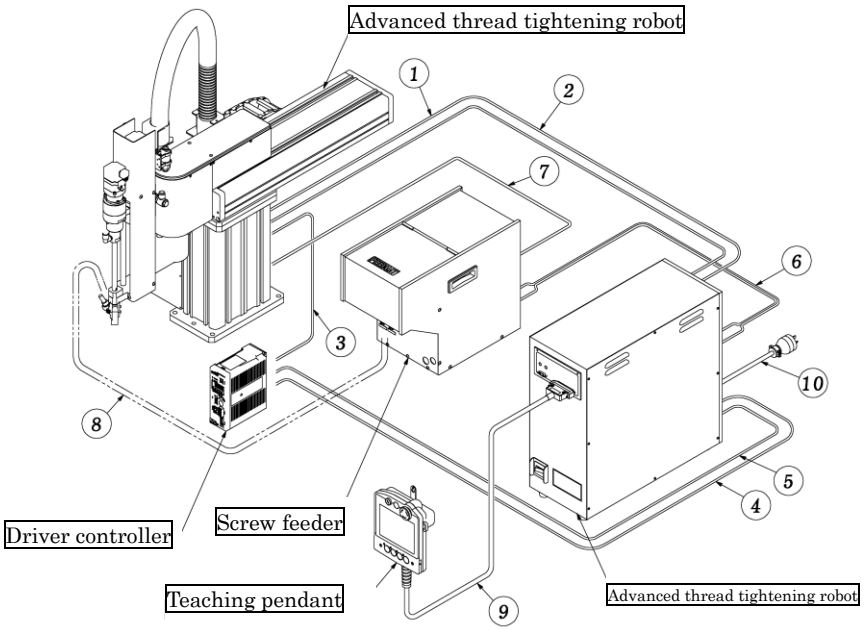
> ⚠ **CAUTION** Be sure to connect the grounding cable to the grounding terminal in the factory.

After connecting the machine connector cable and the power cable, place the controller out of the robot working area, but within area of the specified cable length. To prevent any malfunction, use a receptacle with the specified capacity located apart from the source of humidity, oil, and dusts. (For the capacity of the power supply, refer to the operation manual of the controller.)

If the controller has been stored in the lower part of the robot such as the feet of it on account of the installation space, and it is required to be operated in case of troubles, be sure to take it out of the robot moving area before operation.

Configuration of system

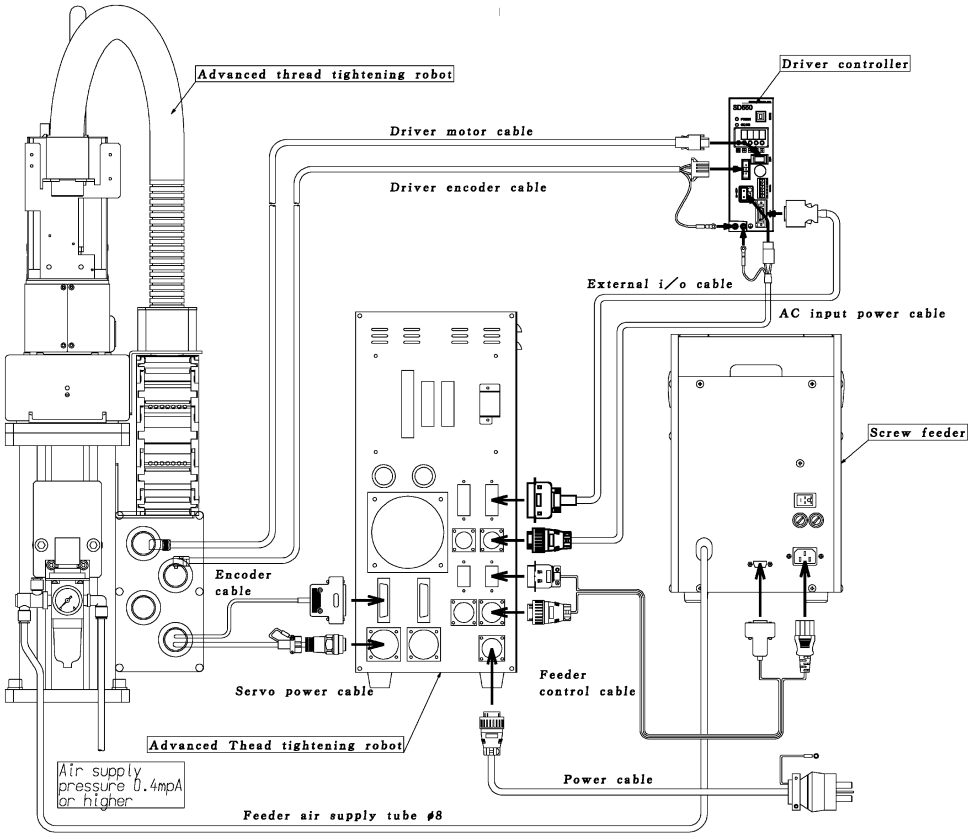
Thread tightening robot NITOMAN SR565Y θ comprises the units shown below.



No.	Designations	Standard lengths
①	Servo power cable	3000 mm
②	Encoder cable	3000 mm
③	Driver motor cable	3000 mm
④	AC input power cable	3000 mm
⑤	External I/O cable	3000 mm
⑥	Feeder control cable	3000 mm
⑦	Feeder air supply hose	3000 mm
⑧	Screw feeding tube	3000 mm
⑨	Pendant connecting cable	3000 mm
⑩	Power cable	3000 mm

1. Connection

Connection must be performed as shown in the figure below.
(Incomplete connection of connectors may cause failure in operation. Securely connect them.)

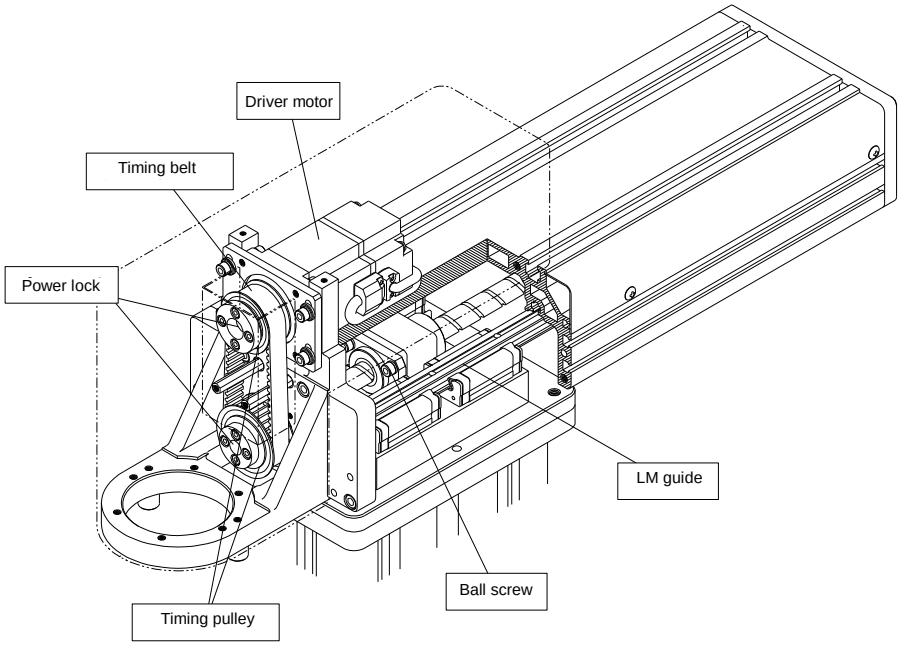


2. Construction of robot

Y-robot (Lateral linear axis)

In this machine, **the axis linearly moving in lateral directions**, called Y-robot (axis Y), has the construction shown in the figure below.

Power of the motor is transmitted to the **"ball screw"** via the **"timing belt"**.

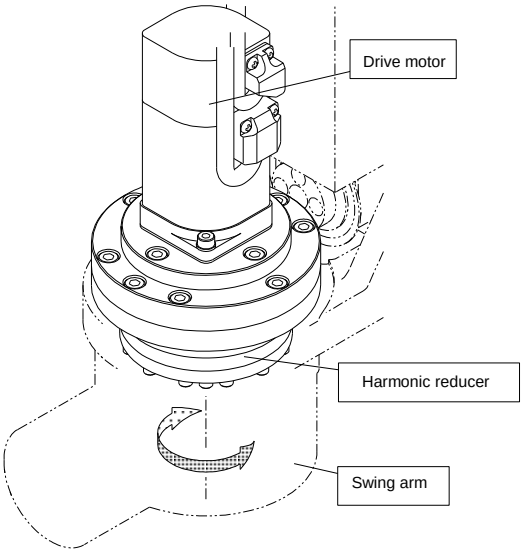


θ -robot (Swing axis)

The "Swing axis" at the tip of the Y-table, called θ -robot (axis W), has the construction shown in the figure below.

Equipment used for and specifications of the Y-robot and the θ -robot are shown in the table below.

	Y-robot	θ -robot
Drive motor	SGMAV-02A3A21	SGMAV-01A3A-NS11
Rated torque	0.637 N･m	0.318 N･m
Actual rotating speed	3500 rpm	3500 rpm
Model of reducer	Timing pulley	CSF20-50-2UH-SP
Reduction ratio	1/1.167	1/50
Model of ball screw	VFA1520C7S-***	-
Lead of ball screw	20 mm	-
Moving distance and angle per rotation of motor	17.143 mm	7.2 deg
Maximum moving speed	1000 mm/sec.	420 deg/sec.



3. Construction of thread tightening unit

For thread tightening robot SR565Y θ series, two types of thread tightening units of **"pneumatic cylinder lifting type unit"** and **"servo motor lifting type unit"** are available.

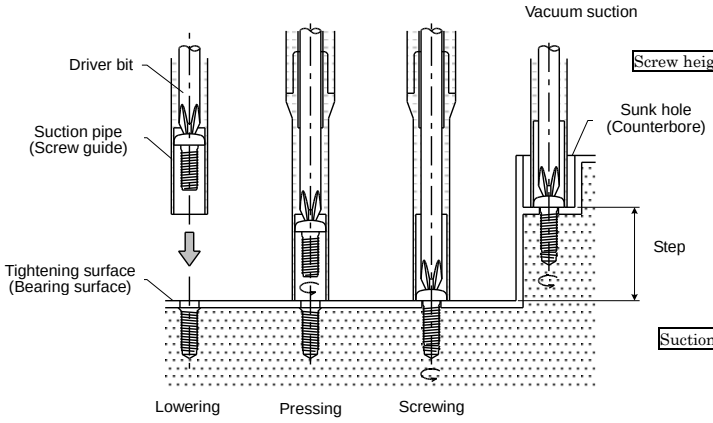
Details of them are described as shown below.

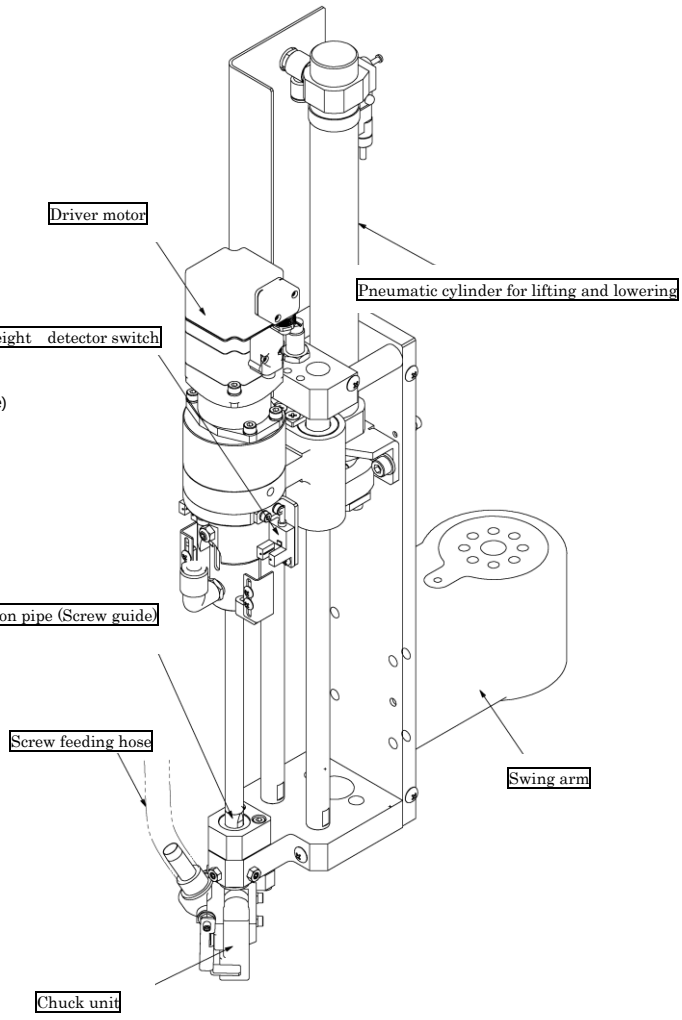
Thread tightening unit FM513V

The suction pipe (screw guide and holder) contains the driver bit with the bit shaft connected to the driver motor. When a screw is fed and the driver bit is lowered by the pneumatic cylinder type unit with the vacuum unit actuated, the screw is sucked and raised by the chuck unit. Then, the pipe is lowered to the bearing surface while the claws are being opened.

The suction pipe is stopped when it comes into contact with a work, and the rotated internal bit keeps to be further lowered for thread tightening.

When the screw is tightened and the reaction load applied to the driver bit reaches the specified setting (torque), the driver motor detects it, and raising is restarted to return the driver bit.





The suction pipe (screw guide) is designed to be stopped after it comes into contact with the top face of a work (screw tightening face). **The pipe presses the work with a force of approximately 30 N (approximately 3 kgf)** when a screw is tightened. Thus, if the top face (screw tightening bearing face) of a work does not have enough strength and it is liable to be damaged easily, it is possible to prevent the pipe from coming into contact with the work by installing the optional screw guide stopper. This unit, however, is inapplicable to the thread tightening on a "stepped" work as shown in the figure above.

For details of the thread tightening unit **"FM513V"**, refer to the **"Operation Manual for FM513V"**.

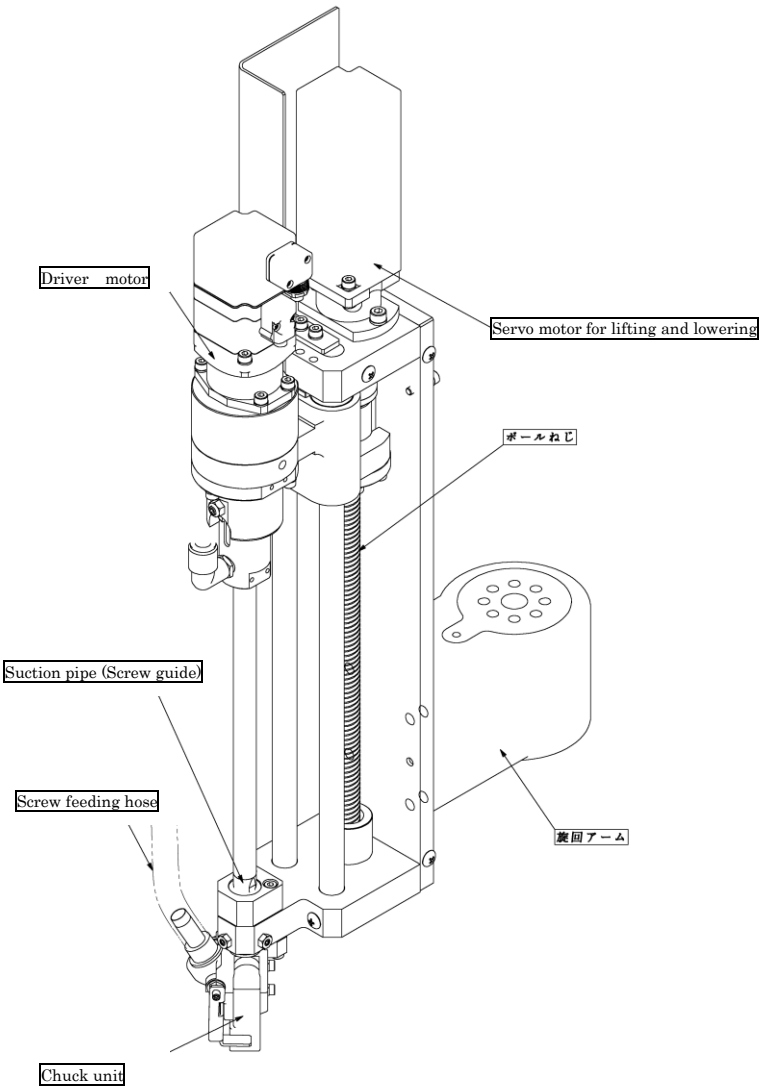
Thread tightening unit FM513VZ

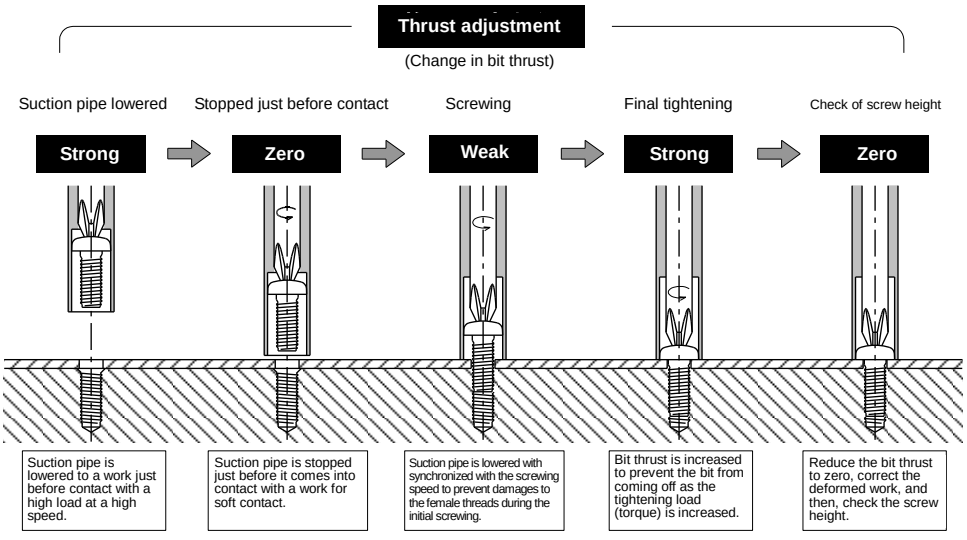
Thread tightening unit FM513VZ is applicable to SR565Y θ -Z only. This unit incorporates the servo motor for lifting and lowering the driver unit to **linearly control** the **"thread tightening thrust"** (force applied in the screw axis direction when tightening thread), unlike the normal units (including FM513V).

Thread tightening thrust is required to prevent the cross type driver bit from coming off from the cross-recessed section (called "come-out phenomenon") when the thread tightening torque is increased during thread tightening. Therefore, the thrust required for screwing (screwing thrust) considerably smaller than the thread tightening force should be acceptable.

When a pneumatic cylinder is used as the driving force for lifting and lowering, these forces cannot be switched, and the thrust must be adjusted until the "come-out phenomenon" will not occur to the driver bit.

In such a case, if female threads (of a threaded object) do not have enough strength (because soft material is used) and screwing thrust is excessive, the threads
may be damaged, leading to tightening faults.





Maintenance and check

Always shut the power off before maintenance and inspection unless otherwise specified.

1. Daily check

Daily check the points shown in the table below before starting operation.

No.	Checkpoints	Checking methods	Criteria	Measures
1	Connectors	Visually	Free from looseness, failure in connection, and dusts	Securely connect and clean
2	Cables	Visually	Free from damages and tear	Repair or replace

2. Cleaning and lubrication

Lubrication allows the machine operate smoothly, as well as influences the service life of the machine. Periodically lubricate it according to the instructions shown below.

[1] · Ball screw ····· Y-robot, thread tightening unit

Dusts and foreign matters in the ball screw may cause shorter service life due to excessive wear or damages. Clean and lubricate it with the intervals shown below.

Initial operation ····· **From 2 to 3 months**
Refill interval ····· **Every 6 months**
Grease used ····· **Lithium base grease (JIS No.2)**
[Viscosity of base oil: From 30 to 140 cSt (40℃)]
[Recommended brand] LR3 grease (NSK)
Albania No.2 (Showa Shell Sekiyu)
Or equivalences

Wipe old grease attached to the threaded shaft away with a factory cloth before refilling grease.

[2] · Guide rail ····· Y-robot

Dusts and foreign matters attached to the guide rail may cause excessive wear, leading to malfunctions. Clean and lubricate it with the intervals shown below.

Refill interval ····· **Every 100 km of travel distance or 6 months**

Travel distance can be found by the formulae below. (symbols shown in [ ] are units)

Travel distance [km] = (S÷T)×Operating time per day×Operating days

S = Robot stroke [mm]×2÷1000÷1000

T = Cycle time [s]÷3600

Grease used ····· **Lithium base grease (JIS No.2)**
[Recommended brand] AFB grease (THK)
Albania No.2 (Showa Shell Sekiyu)
Daphne Eponex Grease No.2 (Idemitsu Kosan)
Or equivalences

Normally, lubricate the rail surface only, and inject grease into the grease nipple with a grease gun, when refilling the block unit with grease. Note that excessive injection may lead to fluctuation in sliding resistance, causing lower moving speed.

[3] · Swing axis reducer····· θ-robot

Grease is applied to the inside of the reducer of the θ -robot. Degraded grease affects the speed of wear in the sliding parts in the reducer.

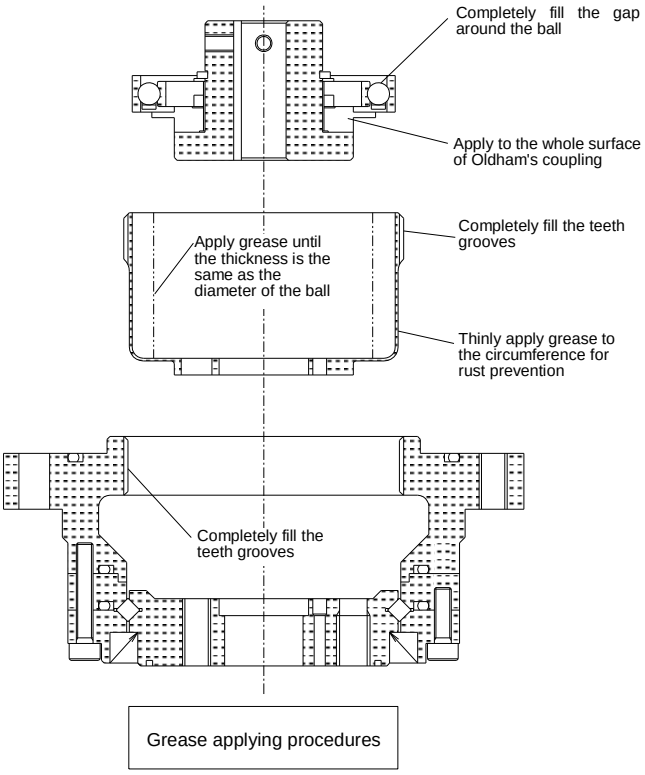
Therefore, it is recommended to change grease with the intervals shown below in order to maintain good performance of the robot for a long period.

Replacement interval ····· **Every 24 months**
Grease used ····· **Grease for harmonic drive system only**
[Brand] Harmonic grease SK-1A (Harmonic drive systems)

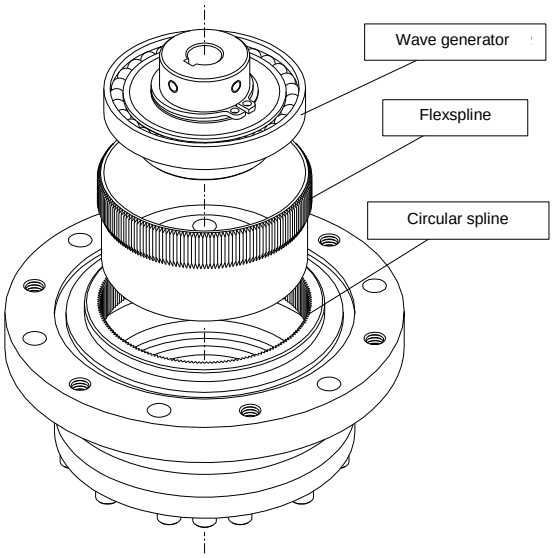
(Note)

Be sure to use the grease of the brand shown above only.

Disassembly and assembly of the harmonic drive reducer need some technical skills. When these works are required, contact us.



Grease applying procedures



Exploded view of harmonic drive reducer

3. Replacement

[1] Parts replacement

Replacement of suction pipe (screw guide) and driver bit

A suction pipe (screw guide) and a driver bit are consumables. **When faulty suction or tightening (come-out) occurs, check the parts, and replace them immediately, if necessary.**

For details of replacement procedures, refer to **"Operation Manual for Automatic Screw driving unit"**.

Replacement of vacuum filter

While screws are tightened, a very small amount of chips are unavoidably generated. **Chips excessively accumulated in the vacuum filter** may cause "faulty screw suction (dropping)", **leading to faulty thread tightening (as well as damages to works)**.

Removal of the filter element from the ejector, cleaning with high-pressure compressed air, and washing in the machine are sufficient for ordinary maintenance.

For details of replacement procedures, refer to **"Operation Manual for Automatic Screw driving unit"**.

Replacement of other parts

Parts		Replacement procedures	Replacement intervals
①	Driver motor (*Note) (KX driver)	After disconnecting the connector, detach the two fixing bolts, and pull the motor upward to remove it.	Whenever malfunctions occur due to the faulty driver motor.
②	Chuck claw	Detach the fixing bolts, and remove it. (DO NOT miss the incorporated spring.)	Whenever faulty screw holding, including dropping of screws, occurs frequently due to breakage or uneven wear.
③	Screw feeding hose (Standard hose)	Pull the hose out while holding the chuck unit with hands.	Whenever faulty screw feeding occurs frequently due to wear in the hose.
④	Screw feeding hose (Polyethylene hose)	Loosen the hose cap (screw), and pull the hose out.	-Ditto-
⑤	Wrong screw height sensor	After disconnecting the connection in the relay box, loosen the fixing bolt (at 1 pos.), and remove it.	Whenever malfunctions (check with the indicator lamp) occur due to faults in the sensor (including disconnection).
⑥	Vacuum cutoff sensor	-Ditto-	-Ditto-
⑦	Coordinate data backup battery	Disconnect the connector from the PCB in the relay box on the side of the robot column, and remove the battery. **(Refer to the operation manual for Thread tightening robot controller.)**	Every 5 years

* Driver motors are not consumables, and hard to be malfunctioned because of wear and tear. However, since they are installed to the moving sections, malfunctions in the encoder or disconnection of the cable due to repeated operation may occur. It is recommended to prepare spare driver motors, since they are hearts in the thread tightening machines.

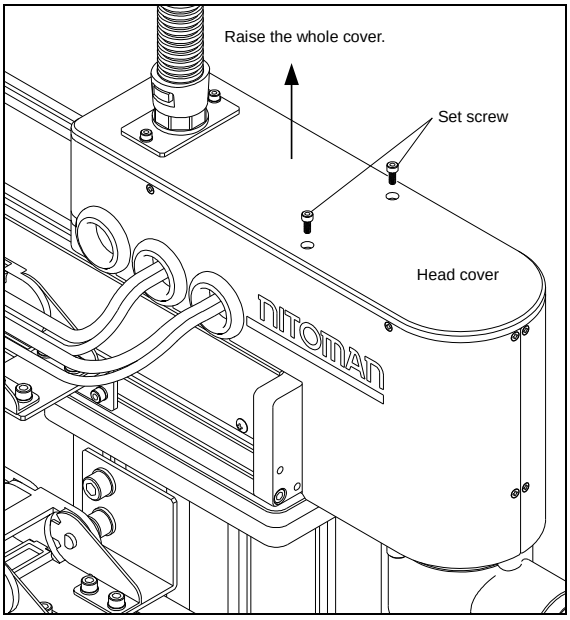
[2] Replacement of robot drive motor

When the robot drive motor is malfunctioned due to some reasons, replace it by following the procedures shown below. **(After the motor is replaced, resetting of the robot coordinate origin is required. For setting procedures, refer to the "Operation Manual for thread tightening robot controller".)**

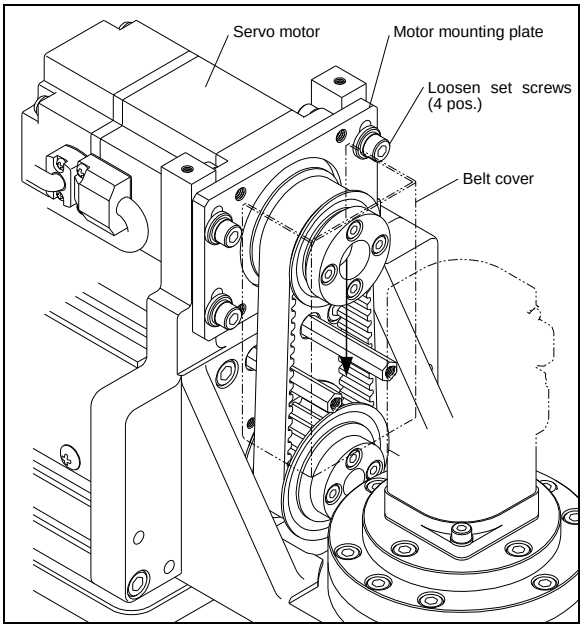
Replacement procedures of Y-robot motor

(1) Remove the **head cover**, and detach the grommet of the **motor cover** (RH).
(2) Disconnect the two connectors in the motor wiring.
(3) Loosen the four bolts (M5) on the **motor mounting plate**, and release the tension of the belt.
(4) Loosen the four motor mounting bolts (M5), and slantingly pull out the whole pulley from the **motor mounting plate**.
(5) After removing the **belt cover**, loosen the four bolts (M4) on the pulley **pressure flange**.

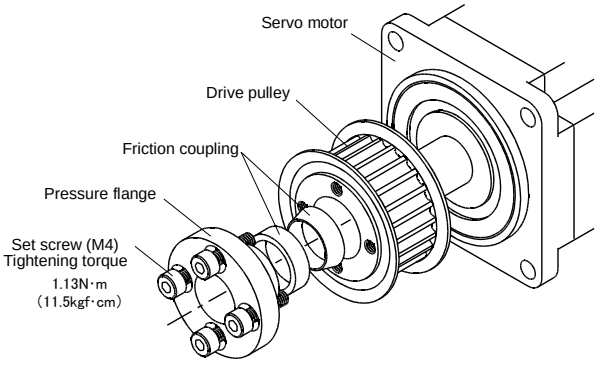
* When mounting the motor, reverse the steps shown above.

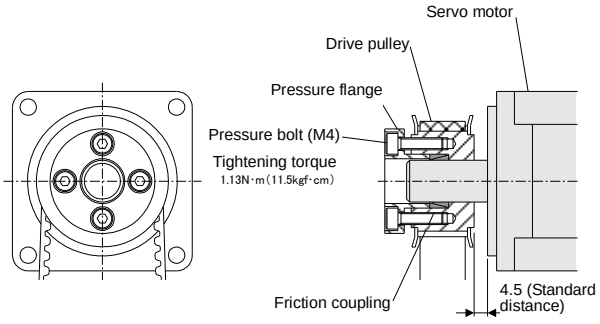


Step ①
Detach the set screws on the head cover, and raise the whole motor cover. (Take out the grommet with cables so that it is under the cover.)



Step ③
Loosen the fixing screws (at 4 pos.) on the motor mounting plate, and release the tension of the belt.





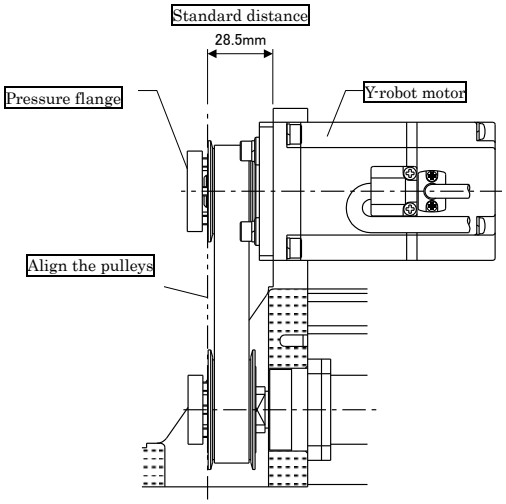
⚠ CAUTION

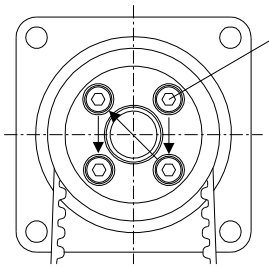
When assembling the Y-robot motor, "Belt setting" must be correctly carried out.

① The motor pulley (on the driving side) should be aligned with the ball screw pulley (on the driven side).

② The pressure bolts for the Power Lock (friction coupling) must be tightened with appropriate tightening torque.

③ The belt must be tensioned appropriately.





Pressure bolt (M4)

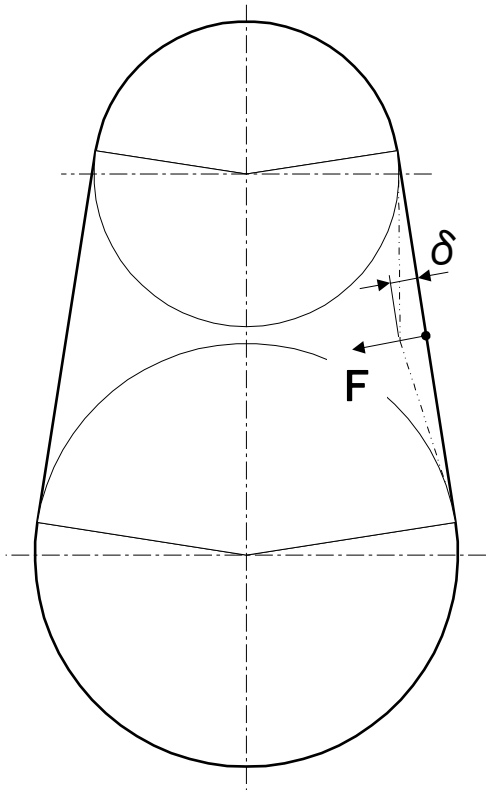
① Gradually tighten the bolts in the order indicated by the arrows shown in the figure on the left side.

② The final tightening torque should be 1.13 N·m (11.5 kgf·cm).

③ The drive pulley must be set on the motor output shaft so that it is apart from the servo motor by 4.5 mm, as shown in the figure on the previous page.

[Notes on assembly]
When setting the pulley on the motor shaft and tightening the friction coupling, temporarily tighten it at first (until the belt is tensioned slightly), and adjust the pulley position exactly after tightening the mounting bolts on the motor mounting plate.

Adjust the tension of the belt by applying the pressing force required, F, onto the center of the drive belt span (between the drive pulley and the driven pulley) until the deflection of the drive belt (δ) is 1.6 mm per 100 mm of span. Distance between the pulleys in the machine should be 95 mm. Thus, when the pressing force F is applied to the belt, deflection δ should be 1.5 mm, provided that the belt is appropriately tensioned.

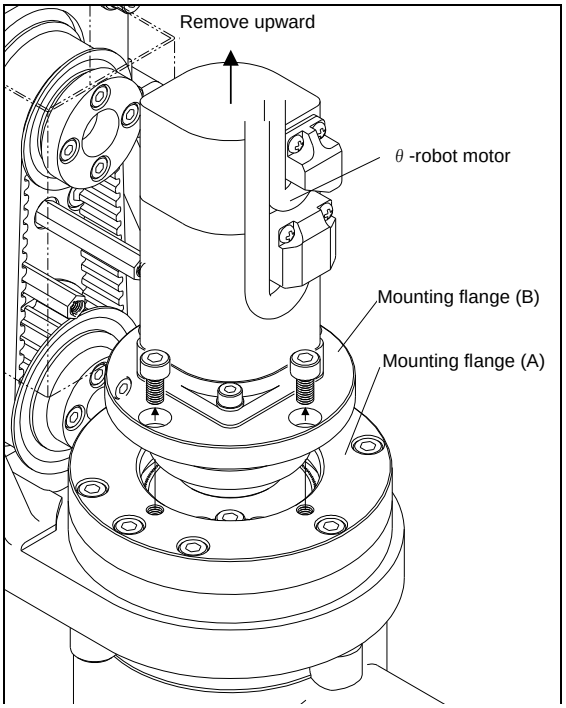


Pressing force F = 12 N
(Approximately 1.22 kgf)
Deflection δ = 1.5 mm

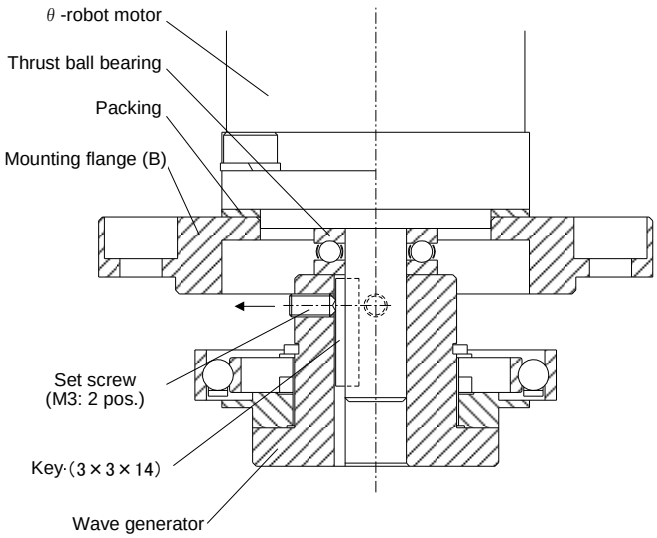
Replacement procedures of θ -robot motor

(1) Remove the **head cover**, and detach the grommet of the **motor cover** (RH).
(2) Disconnect the two connectors in the motor wiring.
(3) Loosen the four mounting bolts on the **mounting flange** (B), and take the whole motor out upward.
(4) Loosen the **set screws** (hexagon socket head set screw: 2 pos.) fixing the motor output shaft to the wave generator of the harmonic drive, and remove the wave generator.
(5) Detach the motor mounting bolts (at 2 pos.), and remove the motor.
(6) Remove the **key** of the motor output shaft with radio pliers, and remove the **thrust bearing** at last.

* When mounting the motor, reverse the steps shown above.
(Steps ① and ② above are the same as those of the removal of the Y-robot motor.)



Step ③④
After the mounting bolts of the mounting flange (B) are detached, the motor, packing, mounting flange (B), and the wave generator can be removed at a time.



Step ④
Loosen the set screws (M3: 2 pos.) on the boss of the wave generator, and remove the wave generator from the motor output shaft.

CAUTION

earing does not have its specified setting direction, it is
ng with a hole of the same circumference as the motor output
faces the motor)

Adjustment

Functions of the thread tightening robot can be classified as shown in the table below. For adjustment procedures, refer to the operation manual of respective devices.

Functions		Items to be adjusted	Parts to be adjusted		Adjustment procedures
Thread tightening	Tightening	・Tightening torque ・Tightening (rotating) speed	Driver controller		Refer to "Operation Manual for Driver controller"
	Lifting and lowering	・Lifting and lowering speed	Pneumatic type	Speed controller	Refer to "Operation Manual for Automatic Screw driving unit"
			Servo type	Teaching pendant	Refer to "Operation Manual for thread tightening robot controller"
		・Bit thrust	Pneumatic type	Regulator	Refer to "Operation Manual for Automatic Screw driving unit"
			Servo type	Teaching pendant	Refer to "Operation Manual for thread tightening robot controller"
Screw feeding	Alignment	・Configuration	Kick plate		Refer to "Operation Manual for Vibratory Track Screw Feeder"
		・Speed	Vibrator		↑
	Escape	・Speed	Speed controller		↑
	Feeding	・Speed	Restrictor (set screw)		↑
Moving	Moving	・Moving speed	Teaching pendant		Refer to "Operation Manual for thread tightening robot controller"
	Positioning	・Position data	↑		↑

⚠ CAUTION

Items shown above have been adjusted before the machine is delivered to customers. If you need to alter any of them after delivery, fully read the operation manuals for the device, and modify it carefully.

Especially, whenever any of the torque or rotating speed of the driver motor, and the robot parameter is required to be altered, be sure to record the initial data (factory set values) by way of precaution.

Troubleshooting

Causes of and remedies for typical troubles are shown in the table below.

For electrical troubles including faults in the connection of power supply or the controller, refer to the operation manual for the controller.

Symptoms	Possible causes	Checkpoints	Remedies
1. Driver (bit) is not rotated	Faulty cable connection	Connectors between driver and controller	Disconnect connectors, and reconnect them.
	Cable disconnection	Cables (near connectors)	Replace cables.
	Breakage of drive motor	Appearance of driver motor	Replace (repair).
	Breakage of controller PCB	Indicator of Driver controller	Replace (repair).
	Failure in input of start signal	Sequence circuit	Change sequence.
2. Driver cannot be raised and lowered			
①Pneumatic cylinder type	Insufficient air pressure	Supply pressure (regulator pressure gauge)	Adjust
②Servo type	Faulty motor (disconnection)	Operation of motor only	Replace if the motor cannot be operated.
	Foreign matters caught in the power transmitting route	Around ball screw and slide shaft	Remove foreign matters (clean).
3. Screws cannot be fed ①	Clogs in hose	Screw feeding hose	Replace
	Insufficient compressed air volume	Feeder (Air volume adjuster nozzle)	Adjust
	Clogs in alignment unit	Alignment section (should be free from foreign matters)	Remove foreign matters and dusts
		Presser plate (Dimensions of presser plate for screw head)	Adjust
	Faulty escape	Escape operation	Adjust operating speed
4. Screws cannot be fed②	Excessive force feeding force (Screws are popped out from chuck claws)	Feeder (Air volume adjuster nozzle)	Adjust
5. Screw drops during operation	Insufficient suction force	Vacuum filter (accumulated dusts)	Remove dusts (clean)
6. Faulty tightening occurs frequently			
①Wrong screw height	Faulty adjustment of detecting dog	Detecting dog	Adjust
	Lower setting torque	Appropriate work tightening torque	Reset the torque.
②Wrong (insufficient) torque	Higher setting torque	Appropriate work tightening torque	Reset the torque.
7. Robot cannot be operated.			
①Motor can be rotated.	Looseness or breakage in power transmission route	Y-robot.....Friction coupling pressure flange θ -robot...Harmonic reducer inside	Retighten the bolts. (Replace if they are broken.)
②Motor cannot be rotated.	Malfunctioned motor (disconnection)	Operation of motor only	Replace if it cannot be operated.
	Foreign matters caught in the power transmission route	Y-robot.....Around ball screw, guide rail, and belts θ -robot...Harmonic reducer inside	Remove foreign matters (clean).
8. Noises from the operated robot			
①Noises occur to the specific position	Breakage of ball screw and nut Breakage of guide rail and block	Check for thread shaft and rail surface for scratches.	Replace the ball screw and guide rail.
②Noises occur regardless of location	Looseness of mounting bolts	Mounting bolts	Retighten them.
9. Dislocation	Looseness or breakage in power transmission route	Y-robot.....Friction coupling pressure flange θ -robot... Harmonic reducer inside	Retighten the bolts. (Replace if they are broken.)

Guarantee

In case of any malfunction of NITOMAN SR565Y θ, our guarantee is applicable as shown below. Note that repairs must be carried out by yourselves if any malfunction occurs to your machine out of Japan.

1. Guaranteed coverage

If any malfunction occurs to the parts of this machine due to faults in materials or workmanship responsible for us, we will repair free of charge.

However, malfunctions due to causes shown below will not be covered by the guarantee.

(1) Natural disasters such as earthquakes, thunderbolts, typhoons, and floods, fires, or other accidents
(2) Modifications not authorized by us
(3) Use of lubricating oils and greases not specified by us
(4) Inappropriate maintenance and check
(5) Inappropriate or wrong adjustment
(6) Wrong operation
(7) Maintenance by someone other than authorized factories or us

2. Guarantee period

We guarantee NITOMAN SR565Y θ from the date of acceptance for the periods shown in the table below.

Object parts	Guarantee period
Machinery parts except for consumables	1 year or 2500 hours of operation
Trade items	6 months or 1300 hours of operation
Consumables	Out of guarantee
Special parts (such as fasters and wiring and piping parts)	Out of guarantee

(Operating period in a day should be 8 hours.)

3. Limitations

Note that faults shown below are out of our guarantee.

(1) Damages caused by aging and use, and malfunctions due to wear (such as natural discoloring of paint and plating, and degradation of consumables)
(2) Slight sensory phenomena that do not affect the quality and function of the robot (such as working noise from the robot and working speed)

[Revision records]

・Aug 2015, first edition , SR565Y θ Ver1.00

・Apr 2017, second edition , SR565Y θ Ver1.01