

HD-4259E-1

**FOUP OPENER
USER' S GUIDE**



KWF-12F3-M

Hirata
The Global Production Engineering Company

The instruction manual about this device is divided as follows.
Read all instruction manuals carefully before use.

- **USER'S GUIDE** (This manual)
Explanation about outline and start-up procedures (installation, maintenance, etc.) of this device
- Attached instruction manual
The manual which is added only when there are a special function and option.
- **INTERFACE SPECIFICATIONS**
Explanation about connection and the communication
- **KWF-12F2 Maintenance Tool USER'S GUIDE**
Explanation about the FOUP OPENER'S operation

In this manual, English is original.

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Contact your sales agent for individual warranty coverage.

KWF-12F3-M
FOUP OPENER USER'S GUIDE (HD-4259E-1)

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Kumamoto Head Quarters
111 Hitotsugi, Ueki, Kita, Kumamoto 861-0198 JAPAN
Phone 81-96-272-0555
Facsimile 81- 96-272-7901

Semiconductor Business Unit
1016-6 Kusuno, Kita, Kumamoto 861-5511 JAPAN
Phone 81-96-245-1333
Facsimile 81-96-245-0816

[Contact method]

When you contact us, please tell the model name and the serial No. described on the device nameplate.

PREFACE

Safety

Hirata robot systems include computer-controlled mechanism that is capable of moving at the high speed and entering considerable force. Like all robot systems and industrial equipment, system user must treat them with respect.

- (1) Read and understand this manual and other related publication prior to operation. All personnel who maintain Hirata robot systems should read this manual.
- (2) Safeguards should be an integral part of robot work-cell design, installation, operator training and operating procedure. Hirata robot systems have various communication features to aid you in constructing system safeguards. These include remote emergency stop circuitry, and digital input and output lines.
- (3) Hirata Corporation recommends the use of status lamp or any device to express the robot and operation status.
- (4) Daily and periodical maintenance is highly recommended to ensure the robot performance and lifetime.
- (5) Hirata Corporation requests to system integrator to provide necessary training and instruction to an operator.
- (6) The teaching pendant equips dead-man switch. It is prohibited to disable the feature by banding.
- (7) Pay particular attention and clearly notify before operation when the other operator is in the working envelope.
- (8) When mode change from Maintenance to Host Port is performed by the key switch, inadvertent start of user's machine and FOUP Opener shall be prevented by user's design. FOUP Opener sends signal to user's machine when such mode change is performed, and then make sure to design user's circuits and other constructions to prevent inadvertent start even at sudden mode change during operation of FOUP Opener in Maintenance mode

Notations

There are two levels of special notations are used in this manual.

Notation	Description
 WARNING	If the actions indicated in a WARNING are not complied with, injury or major equipment damage could result.
 CAUTION	If the action specified in the CAUTION is not complied with, damage to your equipment could result.
 NOTE	A NOTE provides supplementary information, emphasizes a point or procedure, or gives a tip for easier operation.

Lock out/Tag out Procedure

As standard custom in industrial field, it is necessary to implement the lock out/tag out procedure to prevent injury accident and breakage of devices during install, maintenance and service for the system. Follow the procedure in accordance with prevailing or company regulations, or refer to the guideline described below in case of no regulations.

Turn off the power of host device or the switch providing the power and lock, and keep a start up key off. Then place a sign reading “UNDER INSPECTION” in an easily seen location.

Designate following information in the sign.

- (1) Date and time of maintenance/service
- (2) Name of the person in charge of maintenance/service
- (3) Description of maintenance/service work
- (4) Signature of the service supervisor and production manager

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Chapter 1. OUTLINE

This operation manual describes the mechanical structure, maintenance, and interface of FOUP Opener, KWF-12F3-M.

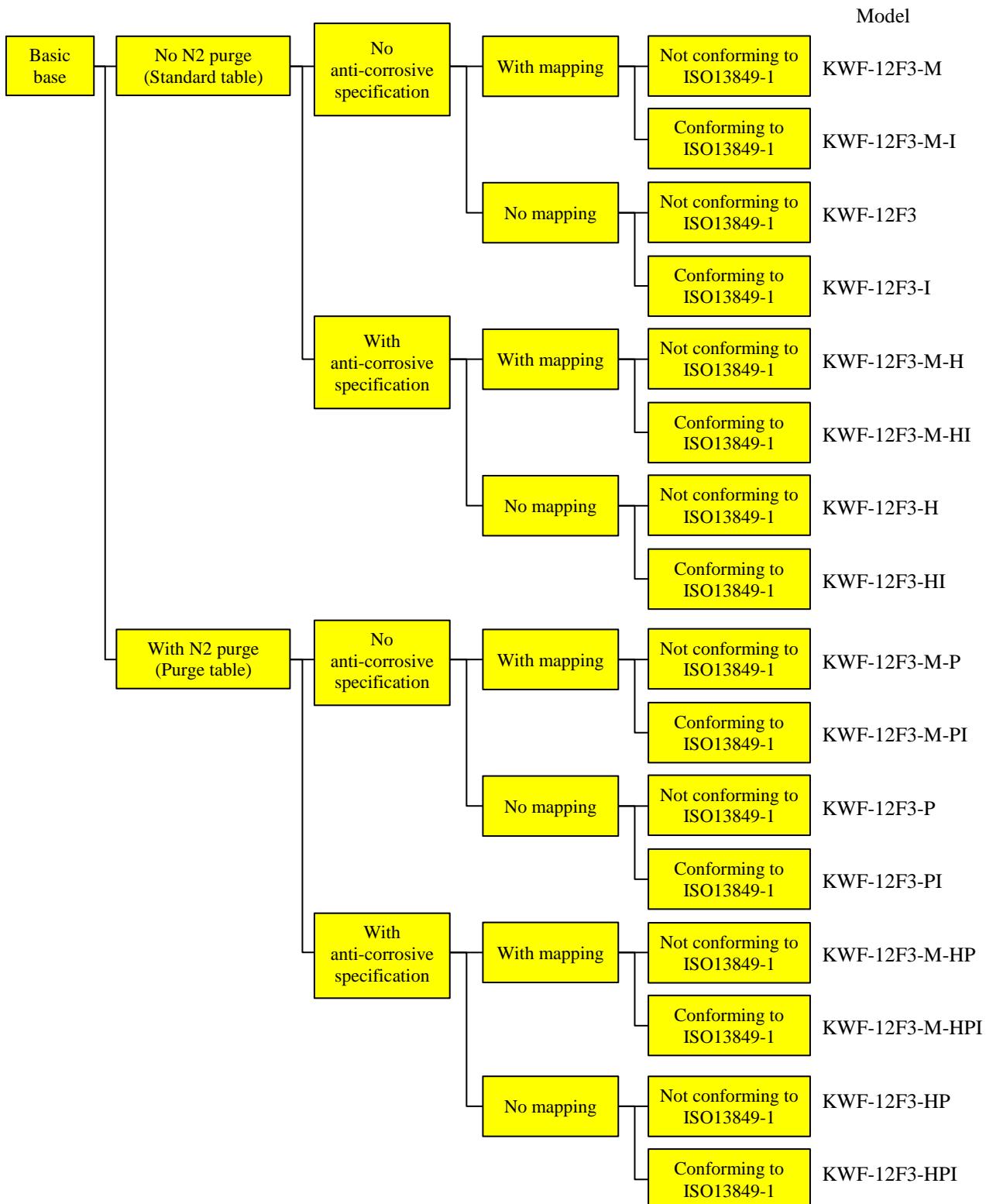
1.1 Outline

This machine is an opener specifically for FOUP that contains 300 mm (12 inch) wafers.

Prior to operating this machine, make sure to read this manual thoroughly to acquire a complete understanding. Concerning the interface specifications, refer to the separate interface specifications.

1.2 Structure

1.2.1 Product Lineup



※When the wafer size is 200mm and 300mm dual use, the model will be changed from "M" to "8M".

1.2.2 Structure

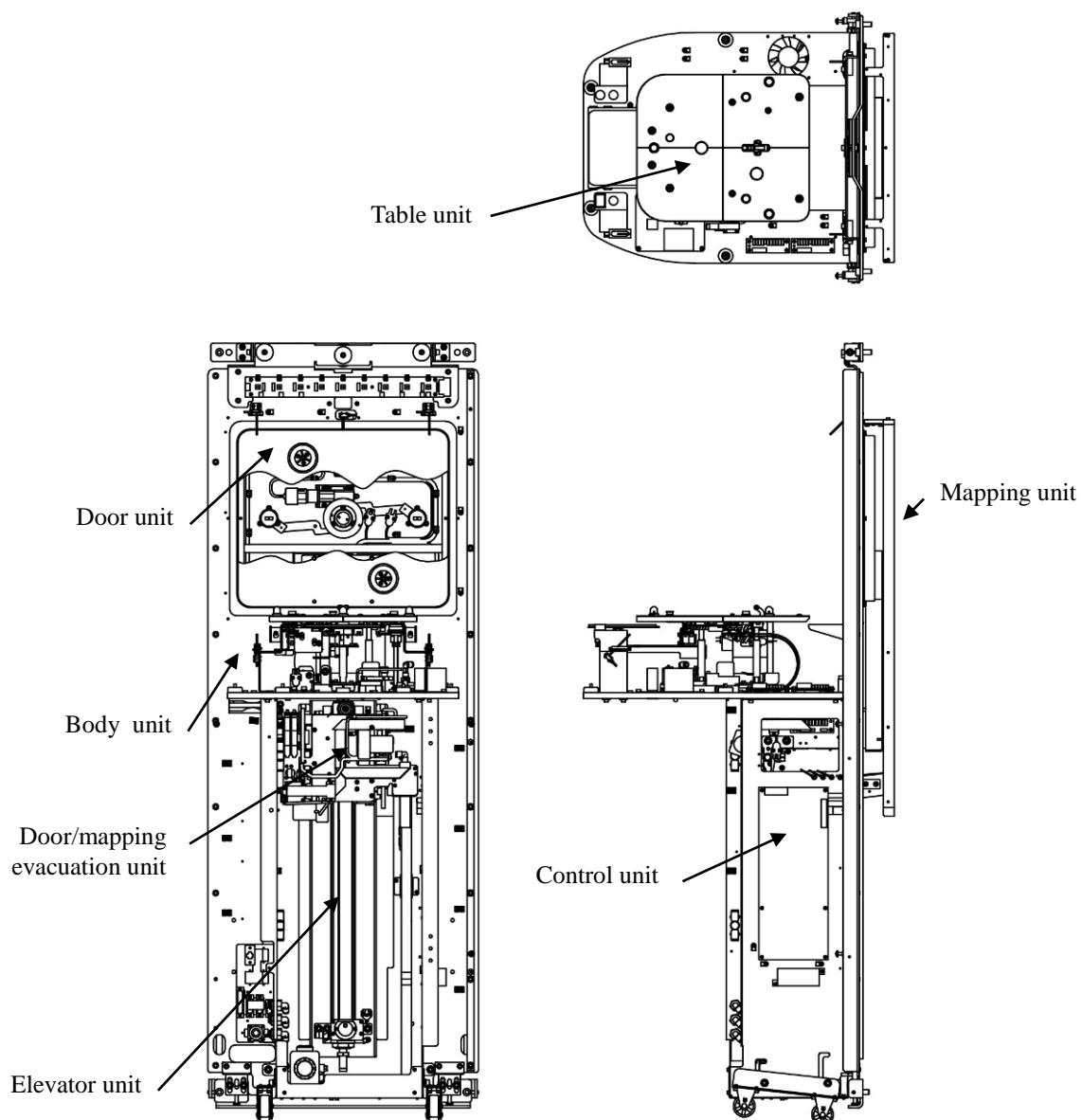


Fig 1.1 Internal Component Diagram of KWF-12F3-M

- ※ For the nitrogen (N₂) purge specification (KWF-12F3-*P), the internal components are described in the operation manual of the machine with the nitrogen (N₂) purge specification.

1.3 Precautions before Use

- (1) Until installation, make sure to keep this device in the dedicated storage box used upon shipping from the factory.
- (2) Prior to turning ON the power switch, make sure to confirm all cables have properly been connected.
- (3) Do not use this machine in high-temperature (40°C or above) or high-humidity locations. Avoid using the device where dust, oil smoke, flammable or corrosive gas exists. The standard specifications of this machine have been designed for the protection grade IP22.
- (4) Make sure to confirm that use-conditions such as the power supply frequency, dielectric strength and so on are satisfactory for the specifications of the device.
- (5) In order to prevent malfunctions of this machine, be sure to follow the operation manual. In no case should this machine be used in a manner which is not described in the operation manual.
- (6) Before operating this machine, check that there are no persons or obstructions (tools, instruments, etc.) within the operating area.
- (7) For the works on this machine such as installation, operation, adjustment, maintenance inspection, cleaning, parts replacement, and repair, the worker shall have a sufficient level for the work content. To safely perform the operation and the work described in this document, the skill depending on the content is required. The skill is classified into Level 1 to Level 3.

Division table of worker level

Level 1	Device operator: Normal operation, trouble recovery operation
Level 2	Maintenance personnel, FSE: Maintenance, periodical inspection
Level 3	Qualified personnel for programming skill, FSE: Repair, programming

The work contents described in this operation manual shall be intended only for the worker of Level 1.

※ Maintenance personnel:

Indicate the experts of the equipment maintenance in the end user, and are required to receive the training by a trainer who possesses the P-BET certified qualification.

※ FSE:

Stands for Field Support Engineer. The FSE indicates a person who has concluded the maintenance contract with Hirata, and has undergone the necessary training of Hirata.

Each operator is required to possess the operation level trained in the relevant operation.

Failure to do so can result in personal injury/serious damage to the device.

In order to ensure the safe operation, observe the instructions described herein, and assign the personnel of the required level to perform the operation and work.

- (8) This machine does not have Emergency stop or Emergency switching off function. Make sure to provide emergency operation conforming to the requirements in section 9.2.5.4 of EN 60204-1: 1997 to the host equipment as required in accordance with the result of risk assessment.
- (9) This machine is a device which has an up/down mechanism (Door unit/Mapping unit). Pay close attention to its operation. Do not use the mechanism alone until it is assembled into the device.
- (10) This machine does not conform to ISO13849-1, and wafer containers are assumed to be transferred by AGV etc. Confirm that there are no people/obstacles within operation area.
(As an optional specification, there is a device conforming to ISO13849-1.)

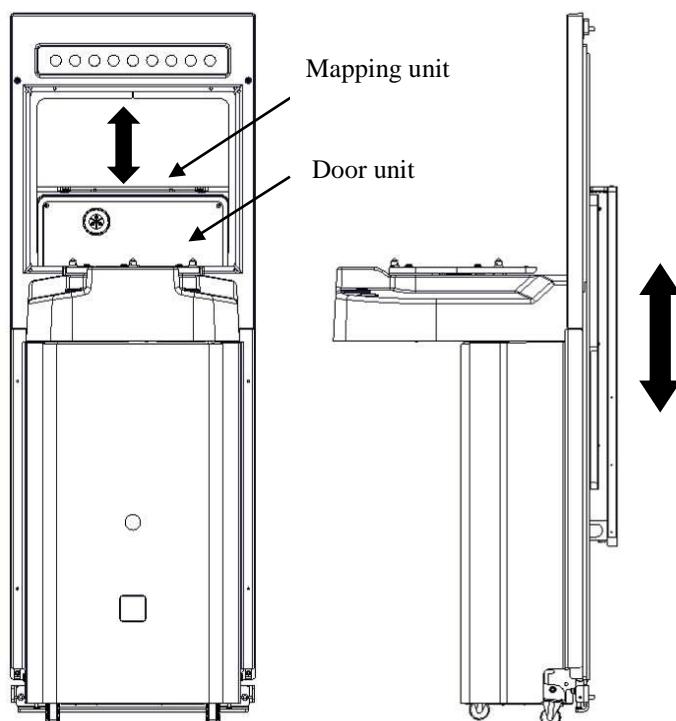


Fig 1.2 Precautions before Use

1.3.1 Nitrogen (N₂) Purge Specification

- ※ Precautions for the nitrogen (N₂) purge specification are described in the operation manual of the machine with the nitrogen (N₂) purge specification.

1.4 Remodeling



CAUTION

In order to secure the safety, never remodel this machine.
As any operation exceeding the maximum ability of the system may cause a malfunction and the life time may be shortened. Never perform such an operation.

1.5 Basic Functions

This machine has following functions.

- ① **Raising/lowering mechanism**
Raises and lowers the door carrier and mapping unit.
- ② **Dock sliding mechanism**
Swivels the FOUP horizontally and moves it forward and backward.
- ③ **Clamp mechanism**
Clamps to fix the FOUP in position.
- ④ **Latch open/close mechanism**
Locks and releases the FOUP.
- ⑤ **Suction mechanism**
Applies suction to the FOUP door to hold it.
- ⑥ **Door evacuation mechanism**
Moves the door carrier forward and backward so that the FOUP door can open and close.
- ⑦ **Mapping evacuation mechanism**
Moves the mapping head forward and backward.
- ⑧ **Wafer protrusion detector**
Detects wafers which protrude from the carrier.
- ⑨ **Hand-pinch detector**
Detects interference during FOUP docking.
- ⑩ **FOUP presence detector**
Detects the presence of the FOUP.
- ⑪ **FOUP placement detector**
Detects the placement of the FOUP.
- ⑫ **Mapping detector**
Performs mapping of the wafers in the FOUP.
- ⑬ **Main switch**
Turns the main power ON/OFF. ※ Upon “ON”, the power lamp is lit.
- ⑭ **Operator access switch**
Additional function can be equipped depending on the user’s request. (It is not functional normally.)
- ⑮ **Mode select switch**
Switches the operation mode between the maintenance mode and host port mode.

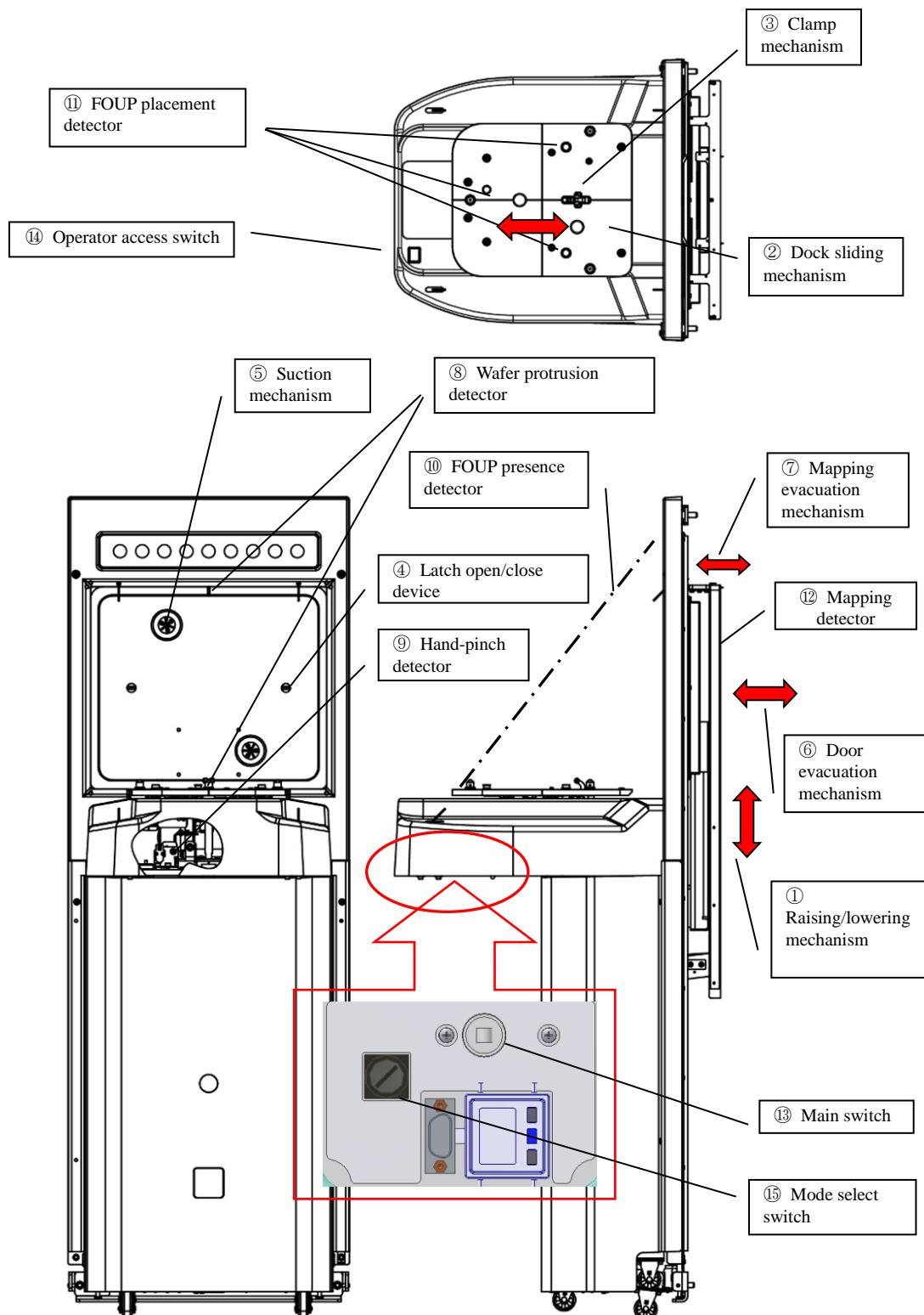


Fig 1.3 Basic Functions KWF-12F3-M

1.6 Main Body Specifications

Table 1.1 Main Body Specifications

Name	FOUP Opener					
Model	KWF-12F3-M					
Application	300 mm FOUP (SEMI Standard compliant)					
External dimensions	1386H×470W×566D (Total height × Total width × Depth)					
Main body weight	63 kgf					
Sound level	70 dB(A) or less					
Mechanism	Clamp	Dock sliding	Latch open/close	Door open/close	Raising/lowering	Mapping open/close
Drive type	DC motor	DC motor	DC motor	DC motor	Rodless cylinder	DC motor
Motor output Cylinder size	4.5 W	4.1 W	13.1 W	4.1 W	φ32 mm	3.6 W
Speed reduction mechanism	Gear	Gear	Gear	Gear	-	Gear
Movement stroke	35°	70 mm	90°	38 mm	387 mm	33 mm
Fan (with revolution detective)	DC 24 V, 2.4 W, Air volume 1.2 m ³ /min					
Detection function	FOUP detection		Detection of FOUP presence	Transmission optical sensor		
			Detection of FOUP placement status	Transmission optical sensor		
	Wafer protrusion (Crystal wafer can be detected optionally.)		Carrier wafer protrusion detection	Transmission optical sensor		
	Hand-pinch		Detection of obstructions during docking	Transmission optical sensor		
	Mapping ⁱ		Detection of wafers in FOUP	Transmission optical sensor		

ⁱ Option

1.7 Utility Specifications

1.7.1 DC 24 V Specifications

Table 1.2 Utility Specifications (DC 24 V)

Power supply	DC 24 V \pm 5%
Required electric capacitance	Current consumption during operation: Max 4.0 A, Current consumption during standby: 1.2 A DC 25.2 V \times 4.0 A = 100.8 VA (When one LP is used)
Vacuum air	Working pressure: -40 to -80 kPa, Less than 1.0 L/min (ANR), Connection diameter ϕ 6 air tube (One-touch Fittings)
Compressed air	Working pressure: 0.5 to 0.6 MPa, Connection diameter ϕ 6 air tube (One-touch Fittings) Compressed air consumption (※1): Less than 4.3 L Compressed air required amount: 43 L/min (ANR) or more
Compressed air exhaust	Connection diameter ϕ 6 (Can be connected into the system, with the silencer normally attached.)

※1 Compressed air consumption:

Amount of air consumed in the machine which uses a cylinder
The value indicated above is the amount of air consumed to operate the FOUP opener for one cycle.

※2 Compressed air required amount:

Amount of air required to operate the specified load at the specified speed
The value indicated above is the amount of air required to operate the FOUP opener in a specified cycle time.

1.7.2 Power Supply Selection

For the power supply to this machine, use the Class 2 power source or equivalent power source.

- (1) In case the power is to be supplied to several units of this machine from one power supply, make sure to take the influence of the voltage drop through the length of the wiring into consideration and supply the sufficient power voltage that can compensate the voltage drop due to the conductor resistance. The allowable setting width for the voltage of DC 24 V on the main board for this machine is to be \pm 5%.
(If the voltage drops during operation, it shall not become lower than DC 22.8 V.)
- (2) In case the power specifications have not satisfied the descriptions stated above, an abnormal sound or a slight vibration is observed. In such a case, it may be avoided by setting the power voltage so that the voltage of DC 24 V on the main board for this machine may become approximately 25 V (within 24 V + 5%).
- (3) For the input wire of the power supply, select the electric wire which fully satisfies the performance of power supply.

- (4) Wiring length (from power supply to FOUP opener)
For each FOUP opener, the wiring length shall be 6.5 m or less, and the wire diameter shall be 0.75 sq or more.

※ If it is difficult to satisfy this condition, consult HIRATA.

- (5) Under the environment with severe noise, it is recommended to attach a power line filter.

Recommended filter: Seiwa Electric Mfg Co. Ltd. E04SR401938

1.8 Diagram of External Dimensions

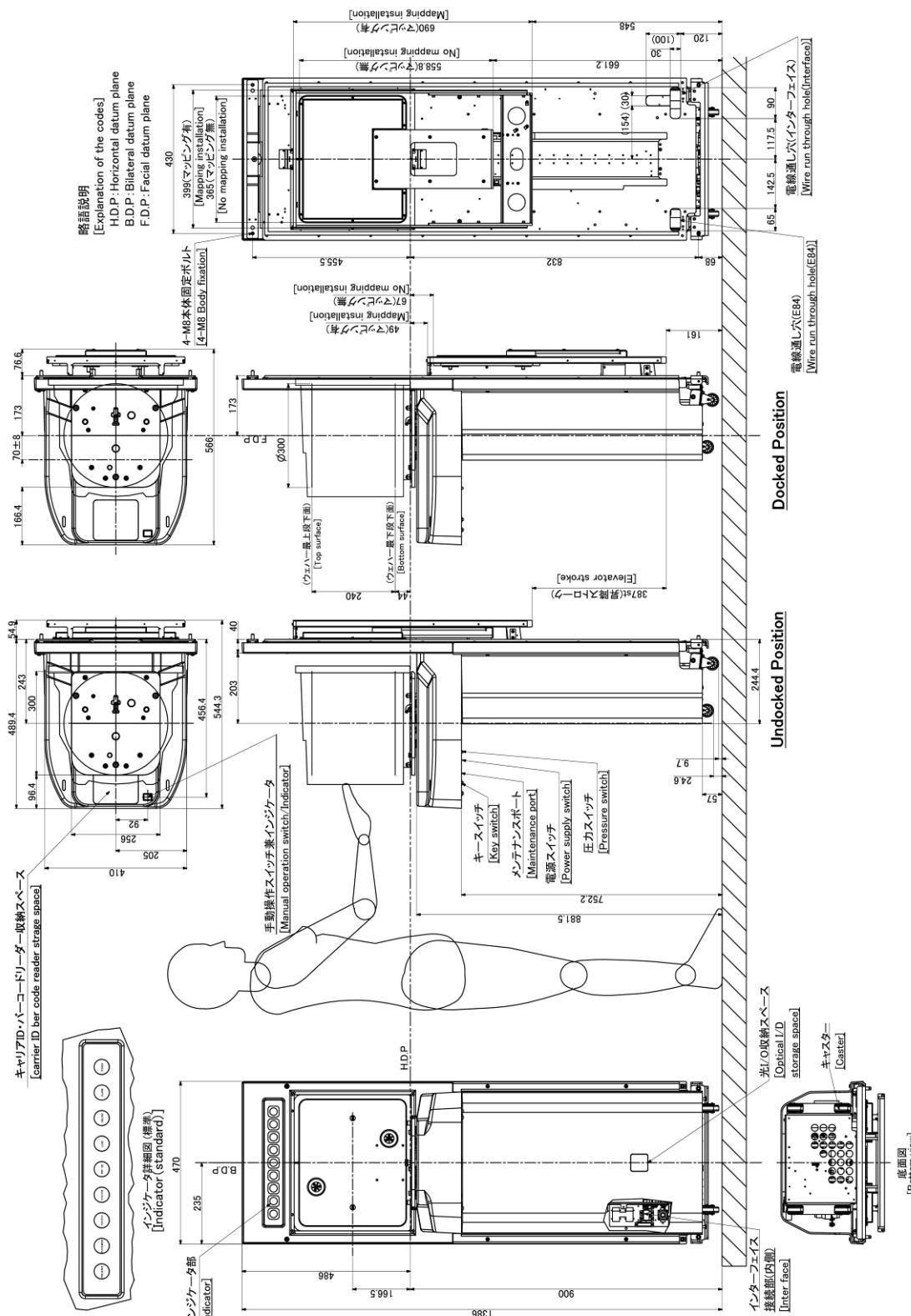


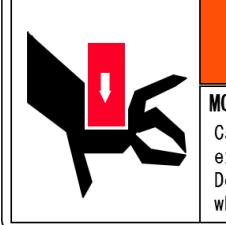
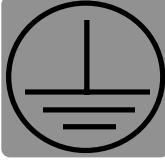
Fig 1.4 Diagram of KWF-12F3-M External Dimensions

- ※ The external view for the nitrogen (N₂) purge specification is shown in the operation manual of the machine with the nitrogen (N₂) purge specification.

1. 9 Label Layout

1. 9. 1 Labels and Direction Sentences

Understand fully the meanings of the warning labels in the following table, and make sure to observe the direction sentences of the warning indications.

	Label	
1	 Do not open with machine running.	<p><Do not open with machine running></p> <p>In the location where this mark is affixed, the machine is operating somewhere. If the cover, etc. is opened during operation, personal injury may occur.</p>
2	 MOVING PARTS INSIDE Can cause injury to extremities. Do not touch this part while equipment is running.	<p><MOVING PARTS INSIDE></p> <p>In the location where this mark is affixed, the machine is operating somewhere. If the cover is opened during operation, a hand or finger may be pinched, resulting in personal injury.</p>
3		<p><Protective earth></p> <p>Protective earth terminal for installation</p>

1.9.2 Drawing of Label Layout

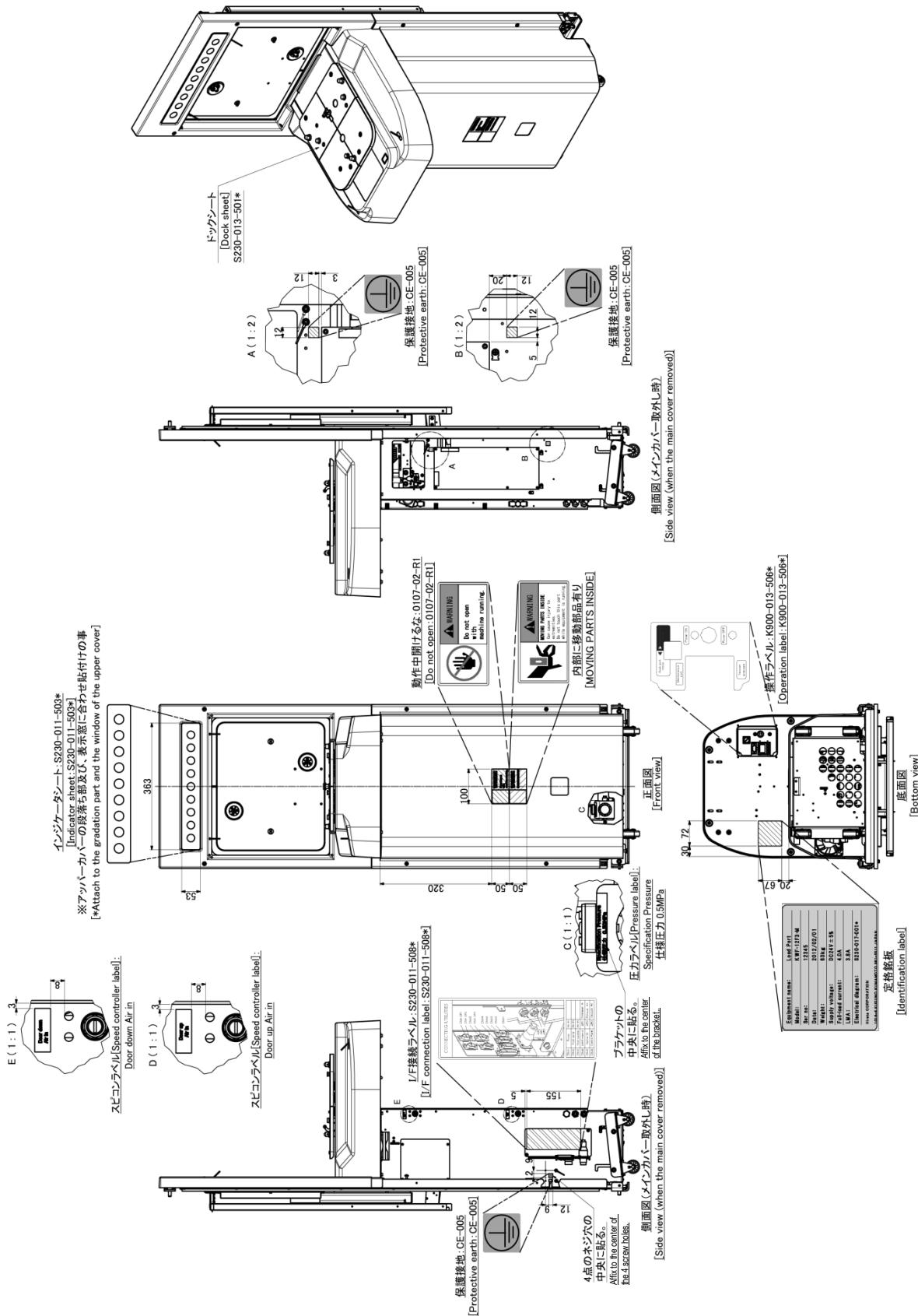
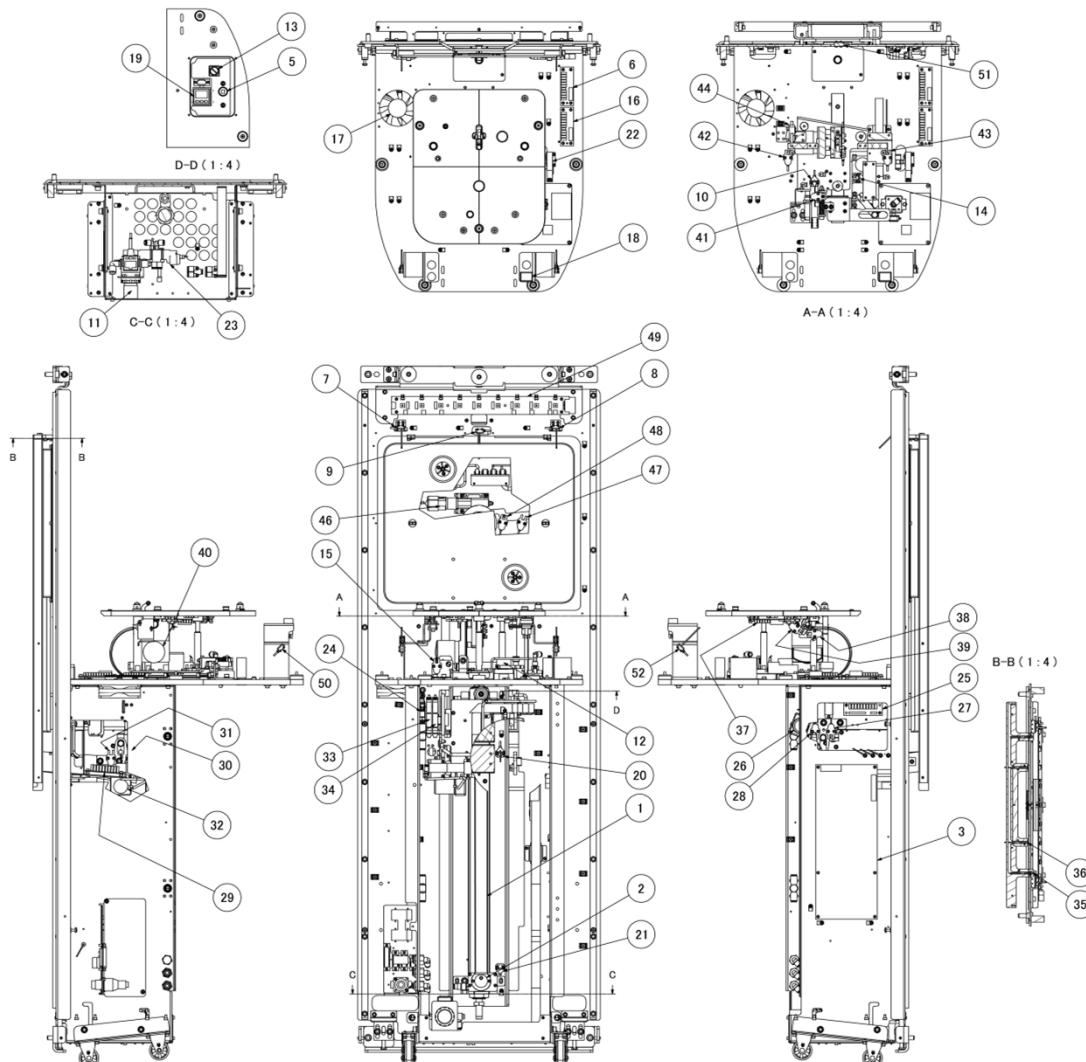


Fig 1.5 Drawing of KWF-12F3-M Label Layout

1.10 Drawing of Device Layout



No	Mark tube	Part name	No	Mark tube	Part name
1	—	Elevator cylinder	27	X22	Door open sensor
2	SRV	Elevator encoder	28	X23	Door close sensor
3	HPC-979	CPU board	29	—	Relay board 4 (mapping evacuation)
4	Not reserve		30	X16	Mapping out limit sensor
5	—	Locker switch	31	X17	Mapping return limit sensor
6	—	Relay board 1 (middle base 2)	32	E12, 13	Mapping out/return motor
7	X00A-R	Presence sensor (photoreceptor)	33	X20	Mapping amplifier (300 mm)
8	X00B-R	Presence sensor (photoreceptor)	34	X21	Mapping amplifier (200 mm)
9	X01-R	Wafer protrusion sensor (photoreceptor)	35	—	Mapping amplifier (300 mm)
10	X02	Hand-pinch sensor	36	—	Mapping amplifier (200 mm)
11	X06	Pressure SW (positive pressure) with regulator	37	—	Relay board 5 (table)
12	E18, 19	Dock/undock motor	38	X24	Clamp sensor
13	X09	Mode select key switch	39	X25	Unclamp sensor
14	X26	Table dock sensor	40	E16, 17	Clamp/unclamp motor
15	X27	Table undock sensor	41	X34	Placement sensor (1)
16	—	Relay board 2 (middle base 1)	42	X33	Placement sensor (2)
17	X08	Fan	43	X32	Placement sensor (3)
18	OP ACC SW	Operation switch	44	PL-LS	Placement sensor (LS)
19	X03	Pressure SW (vacuum)	45	Not reserve	
20	X04	Elevator upper limit sensor	46	M00	Latch motor
21	X05	Elevator lower limit sensor	47	X13	Door latch sensor
22	E00, 01	Solenoid valve (suction)	48	X14	Door unlatch sensor
23	E02, E03	Solenoid valve (elevator)	49	—	Indicator board
24	E02, E03	Solenoid valve (elevator)	50	X00A-T	Presence sensor (projector)
25	—	Relay board 3 (door evacuation)	51	X01A-T	Wafer protrusion sensor (projection)
26	E08, 09	Door open/close motor	52	X00B-T	Presence sensor (projection)

※1 Optional (200 mm for common use)

Fig 1.6 KWF-12F3-M (8M) Drawing of Device Layout

1.11 Air Line Wiring Diagram

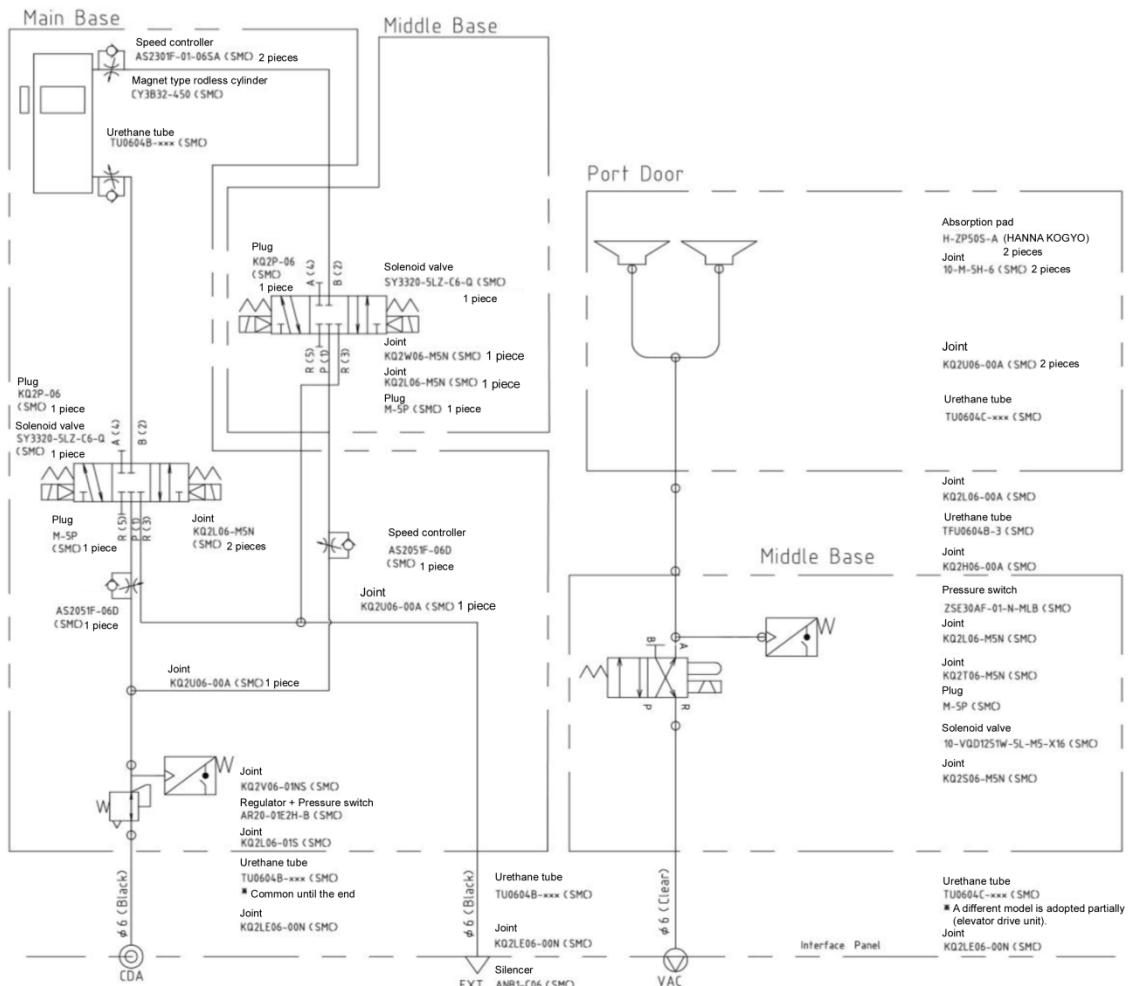


Fig 1.7 KWF-12F3-M Air Line Wiring Diagram

Chapter 2. INSTALATION

2.1 Installation Environment

Install this machine in the environment described below.
This product has been designed and manufactured to meet the protection grade IP22.

Table 2.1 Installation Environment

Item	Contents
Service environment	Clean room
Storage (Transportation) temperature	5 to 55°C
Operation temperature	5 to 40°C (average 23°C)
Storage humidity	35 to 85% (no condensation)
Operation humidity	45 to 85% (no condensation)
Altitude	1000 m or below
Vibration (in operation)	0.3 G or less

※ For the utility specifications, refer to “1.7 Utility Specifications”.

(Other important points regarding the installation location)

- It must not be subject to contact with water, dust, oil mist or cutting oil.
- It must not be subject to direct sunlight.
- There must be no flammable or corrosive gasses.
- There must be no strong impacts or vibration.
- There must be no effects from electrical noise.
- Sufficient space for maintenance inspections must be secured

2.1.1 Transport Method

Follow the procedure below to transport and unpack this machine.



CAUTION

This machine is heavy and must be carried by more than two people.

- (1) With the double-wrapped unit, remove the packaging material only around casters at the bottom.
- (2) When the bottom of the unit appears, hold the sleeve 2 and lift the main unit upright.
 - * When lifting up the main unit, do not hold the BOLTS plate.
- (3) After removing the sleeve 2 and all of the packaging materials, hold both sides of the cowl firmly and transport.



CAUTION

While transferring, make sure to pay close attention so that your foot may not be caught between the main cover and the floor.



(1) Remove the packaging material around casters



(2) Lift up with sleeve 2 being held.

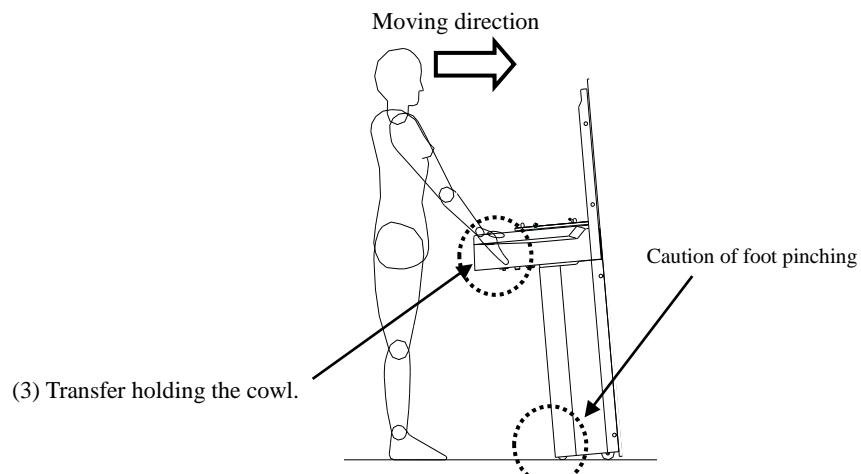


Fig 2.1 Transfer Method

2. 2 Mounting Surface

When installing this machine, install to the machine according to the dimensions of mounting surface on the back of the main unit shown below.
(Conformed to SEMI Standard E63)



NOTE

In case the mounting surface has bad precision, it may impair the precision of this machine. Give consideration to the mounting surface precision in SEMI Standard in designing.

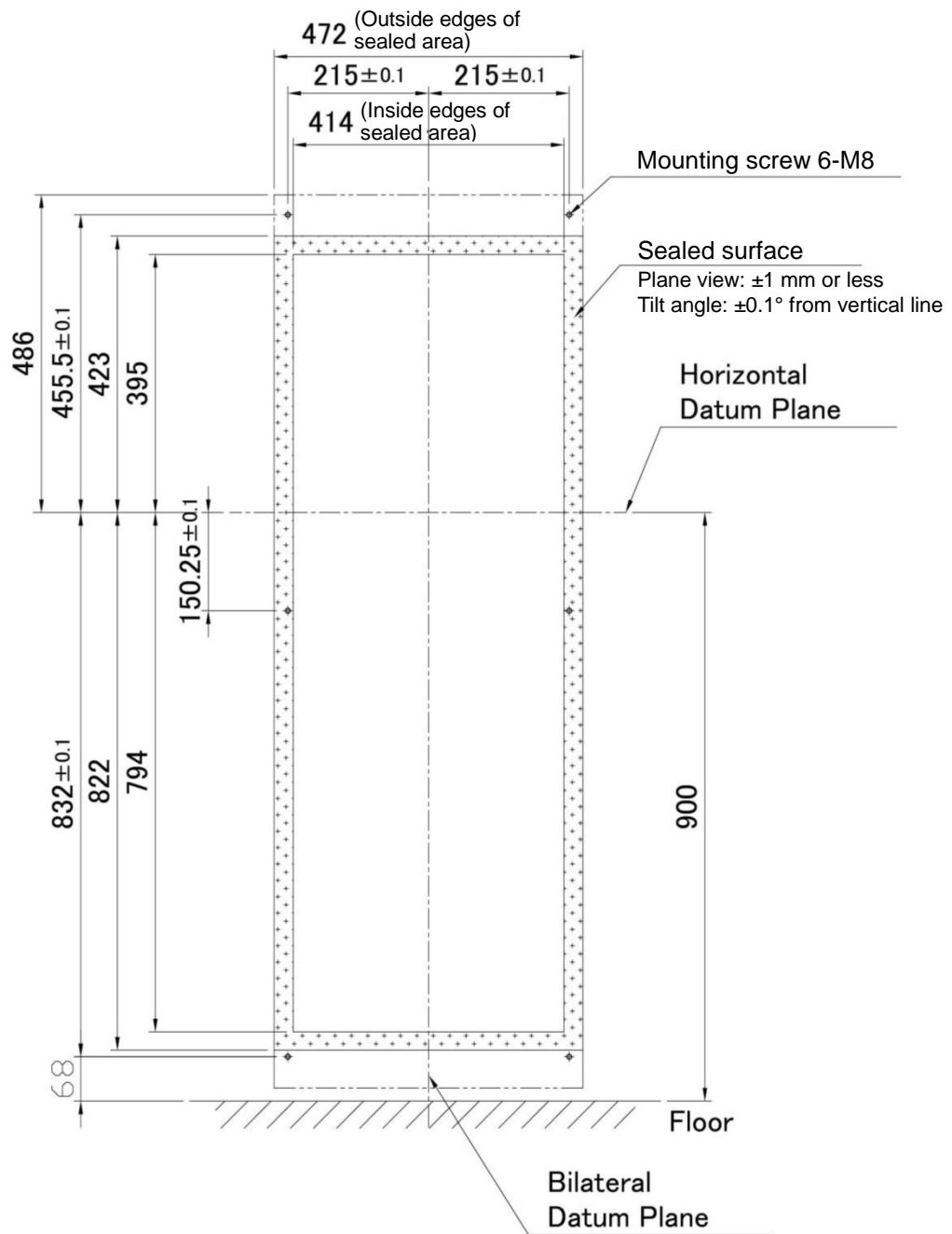


Fig 2.2 Dimensions of Mounting Surface to Machine

2.3 Installation Space

Make following spaces around this machine during installation.

- ① Side space: 98 mm or larger from the side wall
Assumption: Which allows to hold the side of the front cover by hand, and to keep sufficient clearance (the shoulder width) for maintenance.
- ② Space between two units: 91 mm or larger (minimum pitch is 505 mm)
Assumption: Which allows holding the side of the front cover.
- ③ Front space: 1500 mm or larger
Assumption: Which allows to remove the front cover while an operator squats down and set the cover aside.
- ④ Above and below space: 1980 mm or larger
Assumption: Space where an operator can execute work standing.

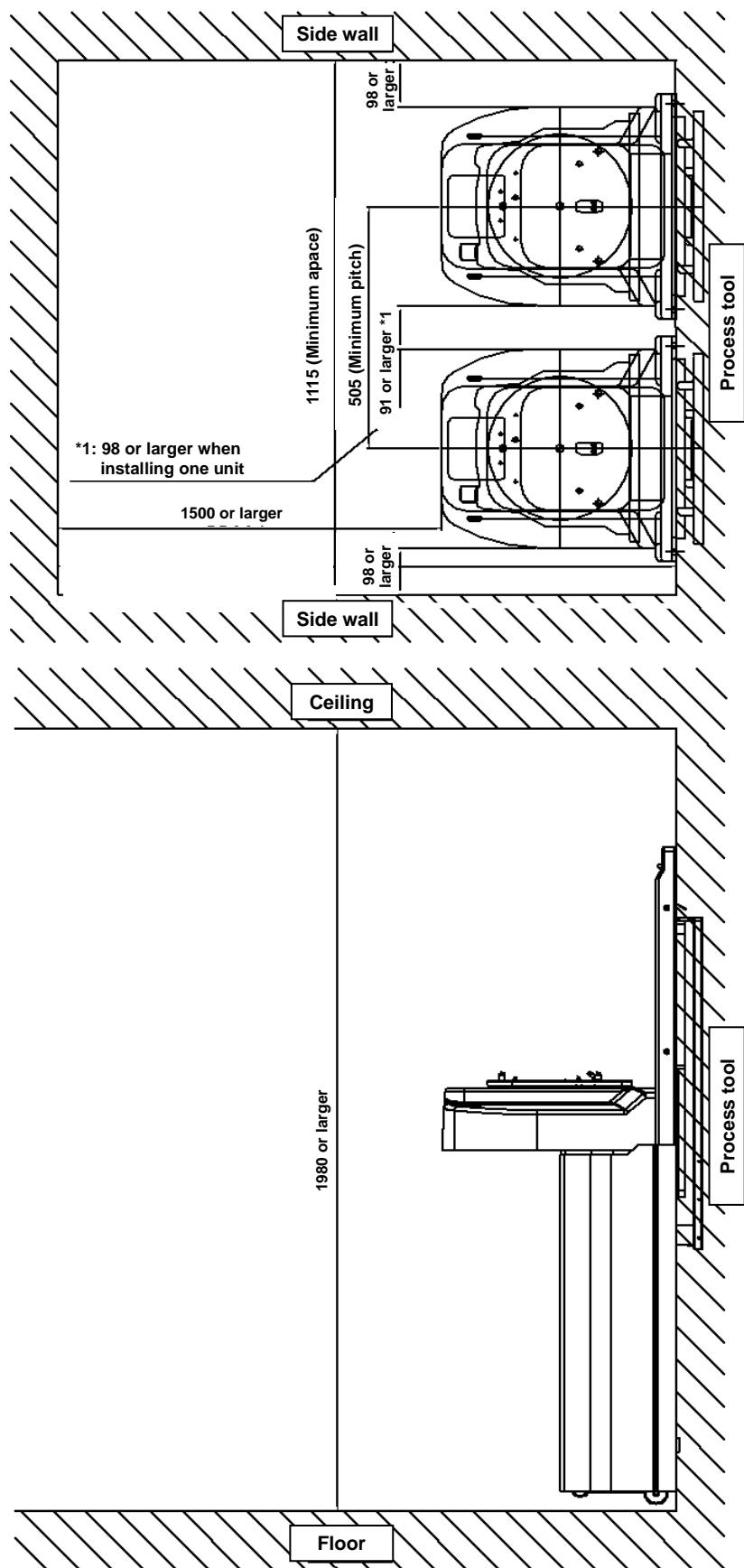


Fig 2.3 Installation Environment

2.4 Installation and Adjustment Flow-chart

Refer to the following flow-chart when installing and adjusting this machine.
Details of each item are described later.

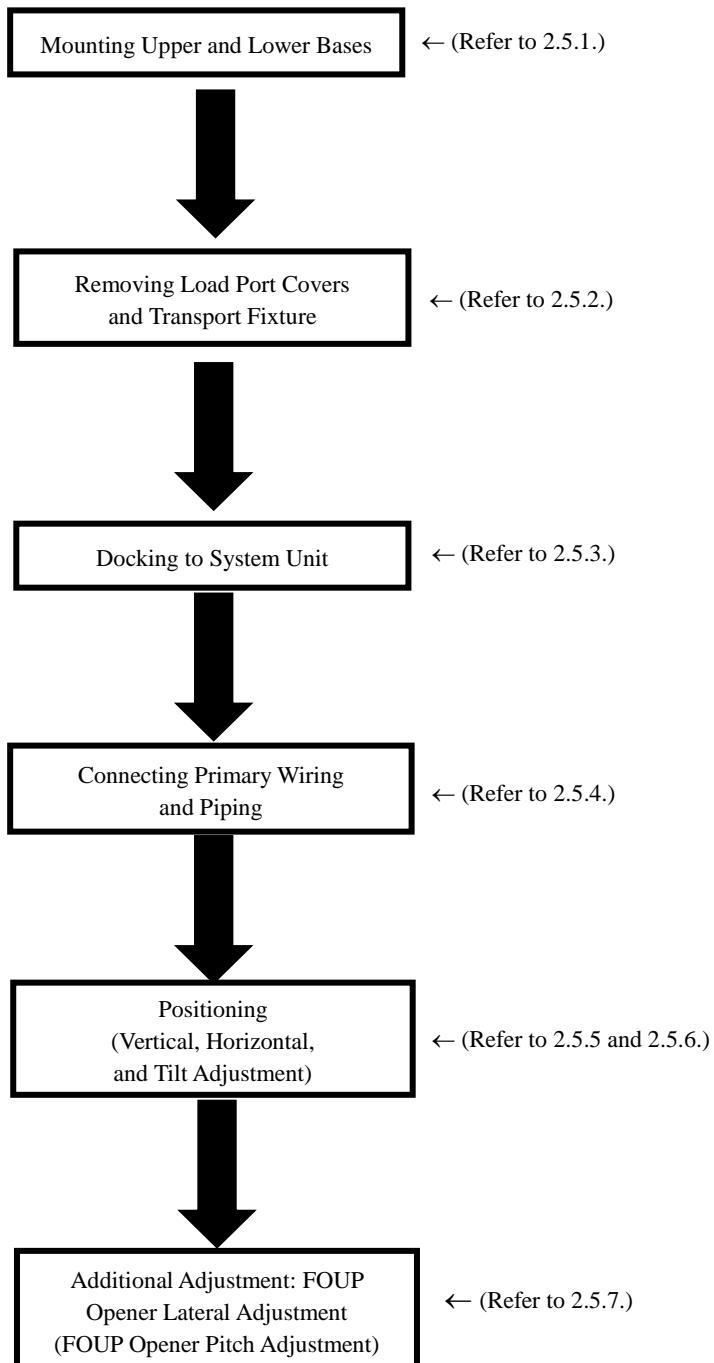


Fig 2.4 Installation and Adjustment Flow-chart



In case where the level adjustment for a wafer transfer robot and this machine is necessary, execute the level alignment in both right-left and front-rear directions.

To remove this machine before shipment, refer to “Appendix C Packing Procedures”.

2.5 Mounting to System Unit

2.5.1 Mounting Upper and Lower Bases

- Prepared part: Unpacked machine
- Parts: Upper base (attached part), lower base (attached part)
- Tool: Hexagon wrench (M8)
- Work procedure:
 - (1) Remove the upper and lower bases packed together with the sleeve 1 in the packing box, and unpack them.
 - (2) Mount the lower base to the lower portion of the unit FIMS face.
(M8 hexagon socket head cap screw x 2)
Tightening torque: Unit mounting tap made of aluminum: 12.2 (N·m)
Unit mounting tap made of iron: 25.5 (N·m)
* The hole to which the base is mounted is slot in shape. Fix in the center of the hole.
 - (3) Mount the upper base to the upper portion of the unit FIMS face.
(M8 hexagon socket head cap screw x 2)
Tightening torque: Unit mounting tap made of aluminum: 12.2 (N·m)
Unit mounting tap made of iron: 25.5 (N·m)
- Estimated work time: 5 minutes

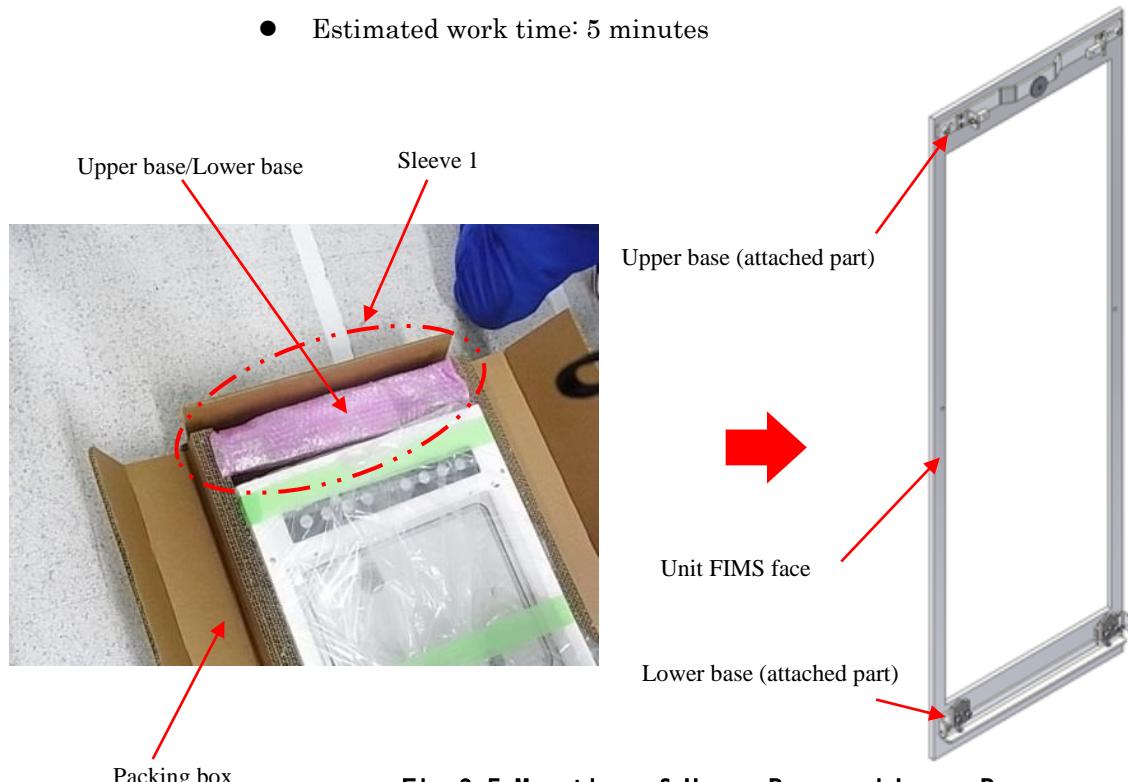


Fig 2.5 Mounting of Upper Base and Lower Base

2. 5. 2 Removing Transport Fixture and Covers

- Tools: Hexagon wrench (M3), Phillips screwdriver
 - Work procedure:
- (1) Remove the screws on the door back face cover of the door and mapping holding bracket. (M3 hexagon socket head cap screw x 2)
 - * Be careful not to lose them because the cover will be secured after removal of the door and mapping holding bracket.

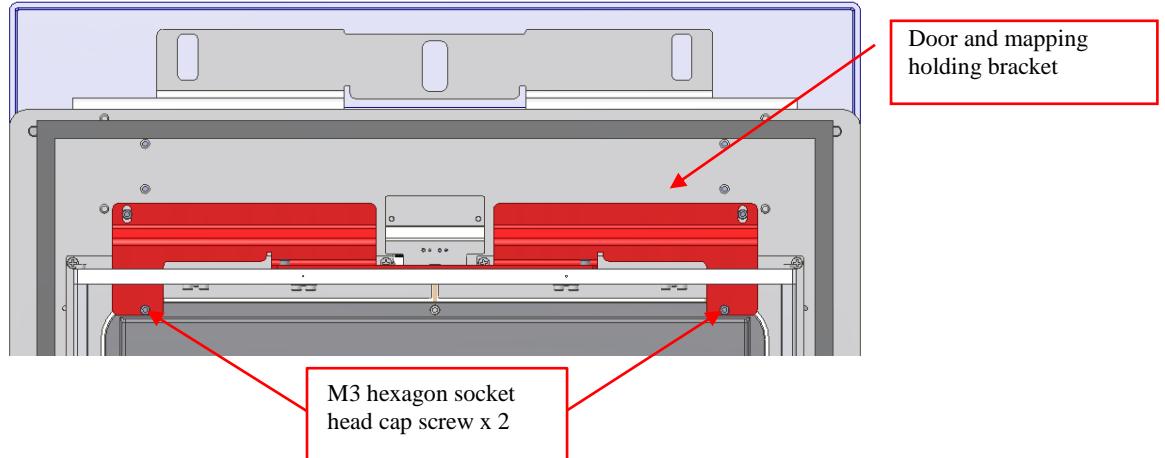


Fig 2. 6 Removal of Door and Mapping Holding Bracket 1

- (2) Remove the fixing screws on the mapping frame surface. (M3 hexagon socket head cap screw x 2)
 - * Be careful not to lose them because they will be tightened again after removal of the door and mapping holding bracket, for loss prevention.

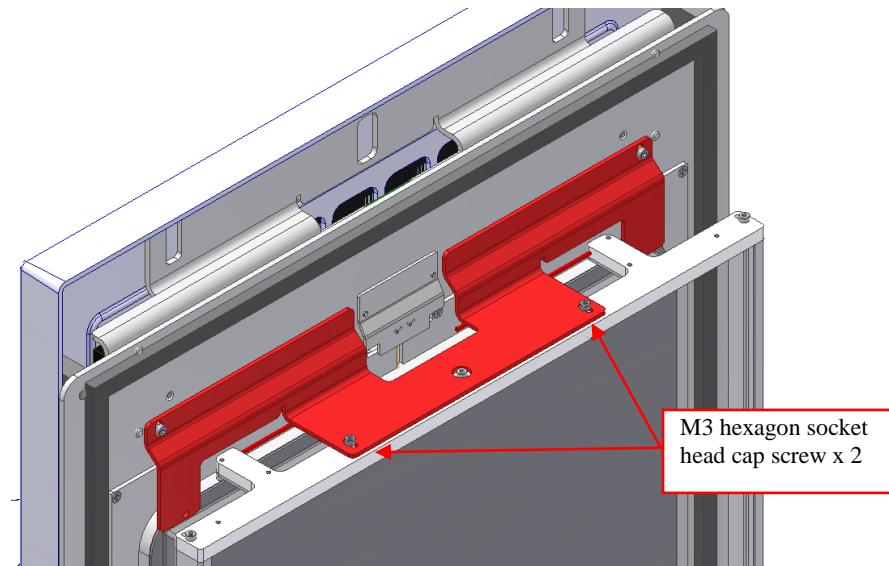


Fig 2. 7 Removal of Door and Mapping Holding Bracket 2

- (3) Remove the fixing screw on the bolts plate back face.
(M3 hexagon socket head cap screw x 2)

* Be careful not to lose them because they will be tightened again after removal of the door and mapping holding bracket, for loss prevention.

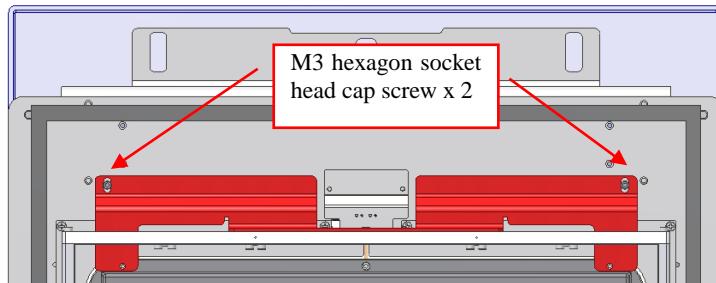


Fig 2.8 Removal of Door and Mapping Holding Bracket 3

- (4) Tighten the bolts removed in (1), (2) and (3) again.



Because bolts removed in (1) are for the door back face cover, be sure to use them for tightening.

Operation is not prevented even if the bolts removed in (2) and (3) are not tightened after removal of the door and mapping holding bracket. However, be careful not to lose them because use of the door and mapping holding bracket for transport is indispensable.

- (5) Remove the table holding bracket. (M4 screw x 2).



The table position is changed by removing the table holding bracket. Therefore, if the undocked position is used as the reference, it is recommended to leave the bracket. Remove it after the air and power are supplied.

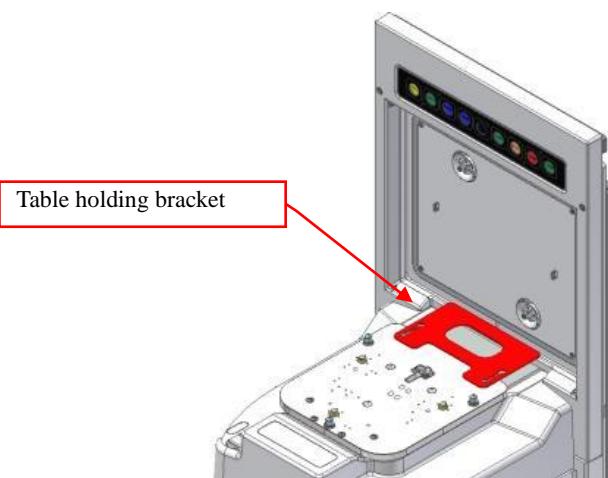


Fig 2.9 Removal of Table Holding Bracket and Covers

- (6) Tighten the M4 screws removed in (5) again.



Operation is not prevented even if the removed bolts are not tightened. However, be careful not to lose them because they are used for transportation.

- (7) Remove the upper cover. * Screws shall have safety catcher function.
(M3 cross-recessed binding head screw x 2)
- (8) Remove the main cover. * Screws shall have safety catcher function.
(M4 cross-recessed binding head screw x 4)

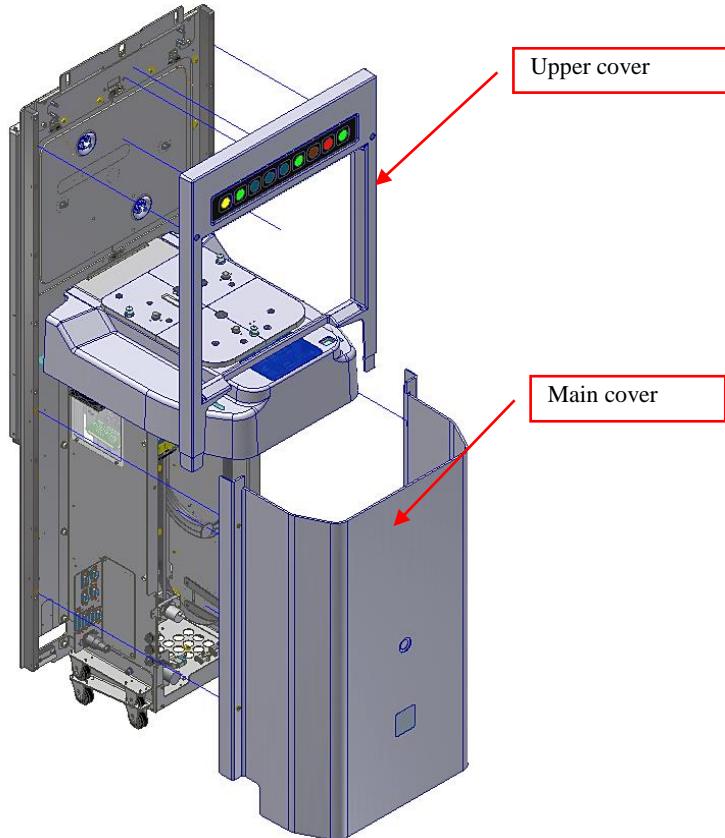


Fig 2.10 Removal of Covers

Estimated work time: 5 minutes



NOTE

Install the transport jig for transportation in the reverse order of the procedure described above.

2.5.3 Docking to System Unit

- Part: Mounting washer (attached part)
- Tool: Hexagon wrench (M5)
- Work procedure:



CAUTION

When moving this machine, hold the middle base portion and the upper cover portion.

- (1) Move this machine to the front of the unit where the lower base slightly touches the back face of bolts plate of this machine. (Using the attached casters helps to move easily.) At that time, align the lower base end with the bolts plate end so that docking is aligned with the center of the system unit as much as possible.
- (2) Slightly contact this machine to the unit face with the machine tilted toward you (at a tilt angle of approximately 5°), hook the bolts plate on the V grave on both sides of the lower base, and then raise the machine.

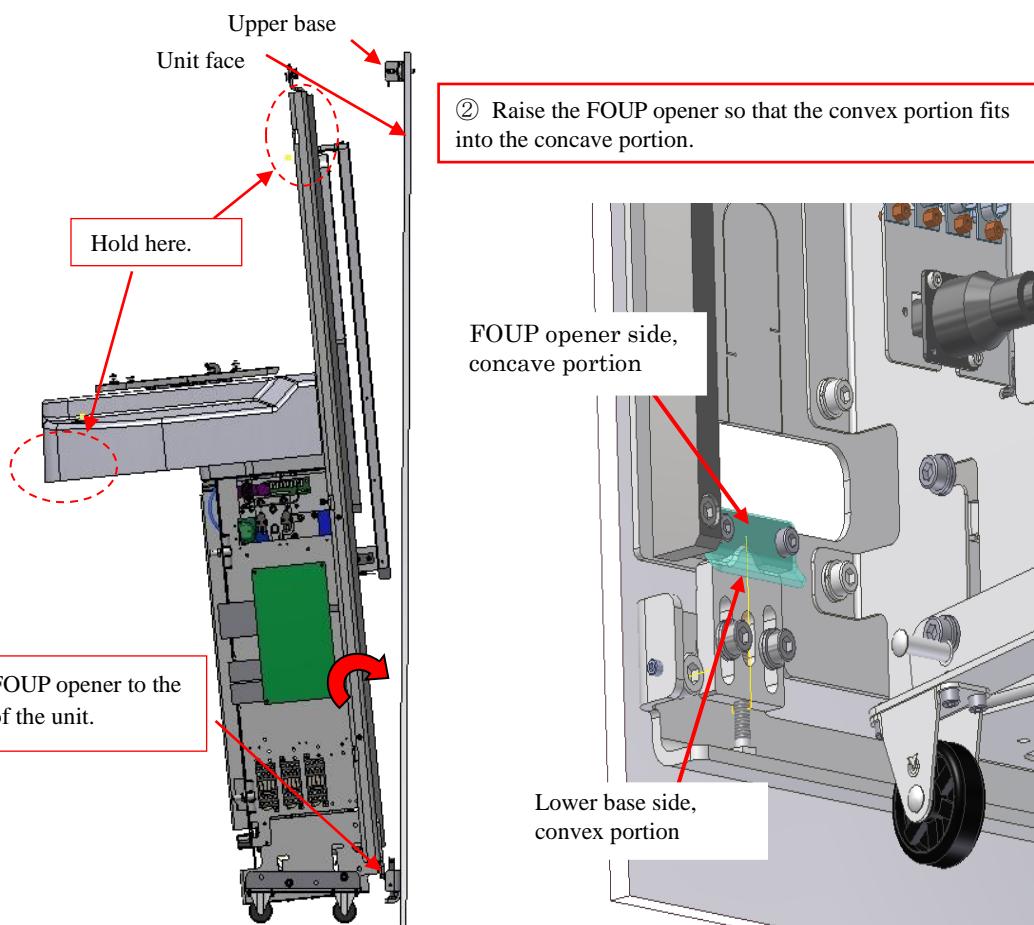


Fig 2.11 Docking to System Unit 1

- (3) Fix this machine to the upper base with the mounting washer (attached part). (M5 hexagon socket head cap screw x 3)
Tightening torque: 6.2 (N·m)

- Estimated work time: 3 minutes

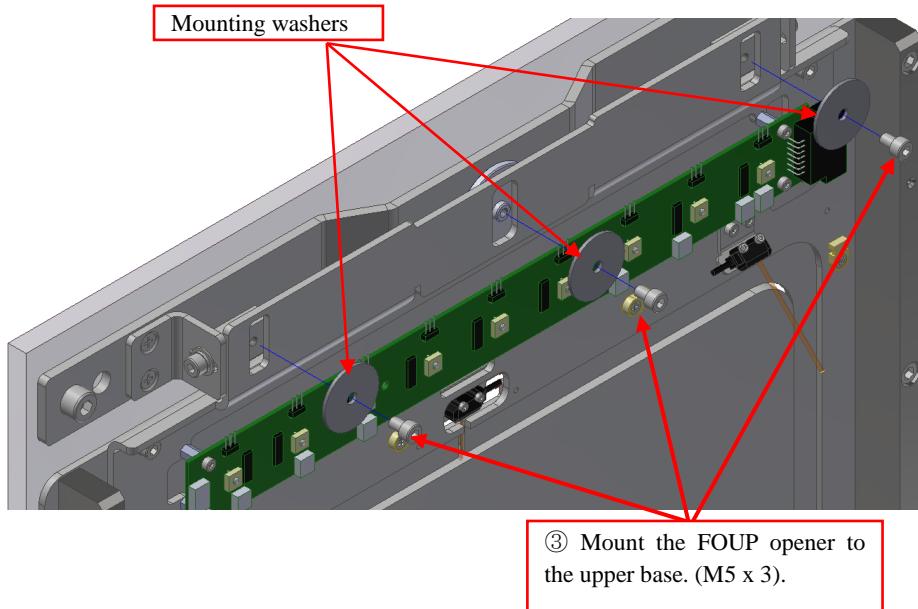


Fig 2.12 Docking to System Unit 2

2.5.4 Connecting Primary Wiring and Piping

- Work procedure:

- (1) From lower part of this machine, take the primary wiring and piping into this machine through the opening.
- (2) Make connections according to the CNA, No assignment.
(Refer to ➔ “Table 2.3 CAN and No Assignment”)

* Connecting the primary wiring and piping can also be performed after adjusting the position of this machine.

- Estimated work time: 5 minutes

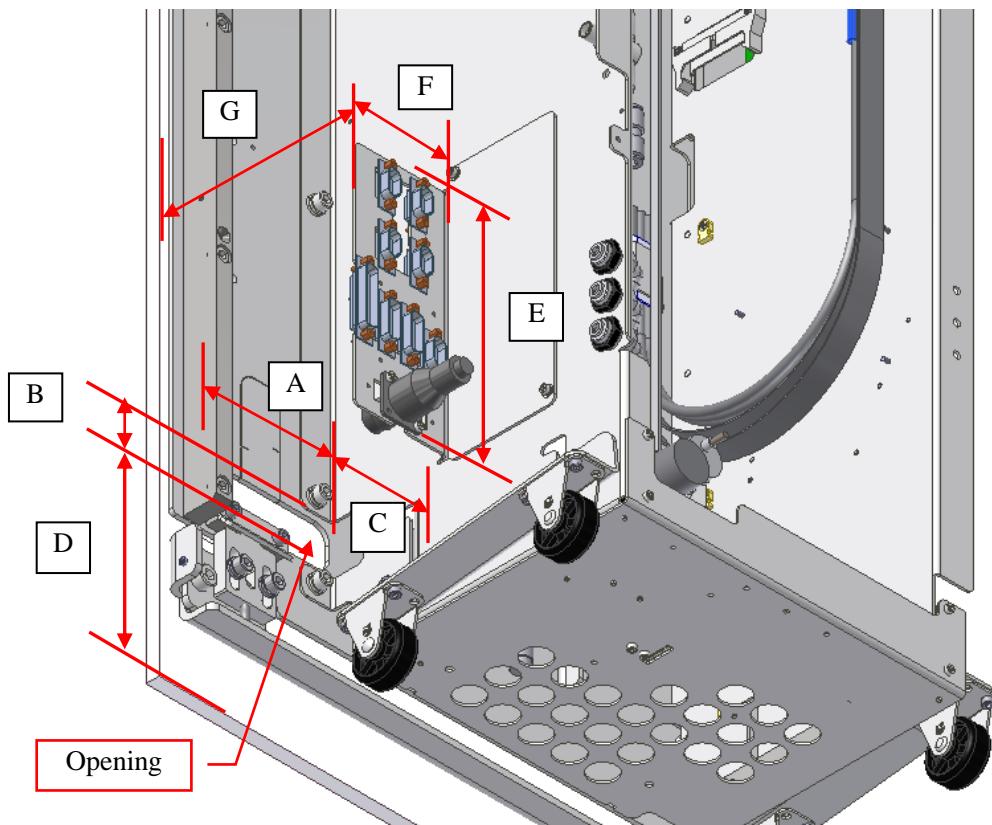


Fig 2.13 Dimensions and Location of Opening

Table 2.2 Dimensions and Location of Opening

Location	Description	Dimension
A	Width of opening	90 mm
B	Length of opening	30 mm
C	Distance between BDP and opening	117.5 mm
D	Distance between floor face and opening	120 mm
E	Length of panel	170 mm
F	Width of panel	68.4 mm
G	Distance between bolts face and panel face	96.4 mm

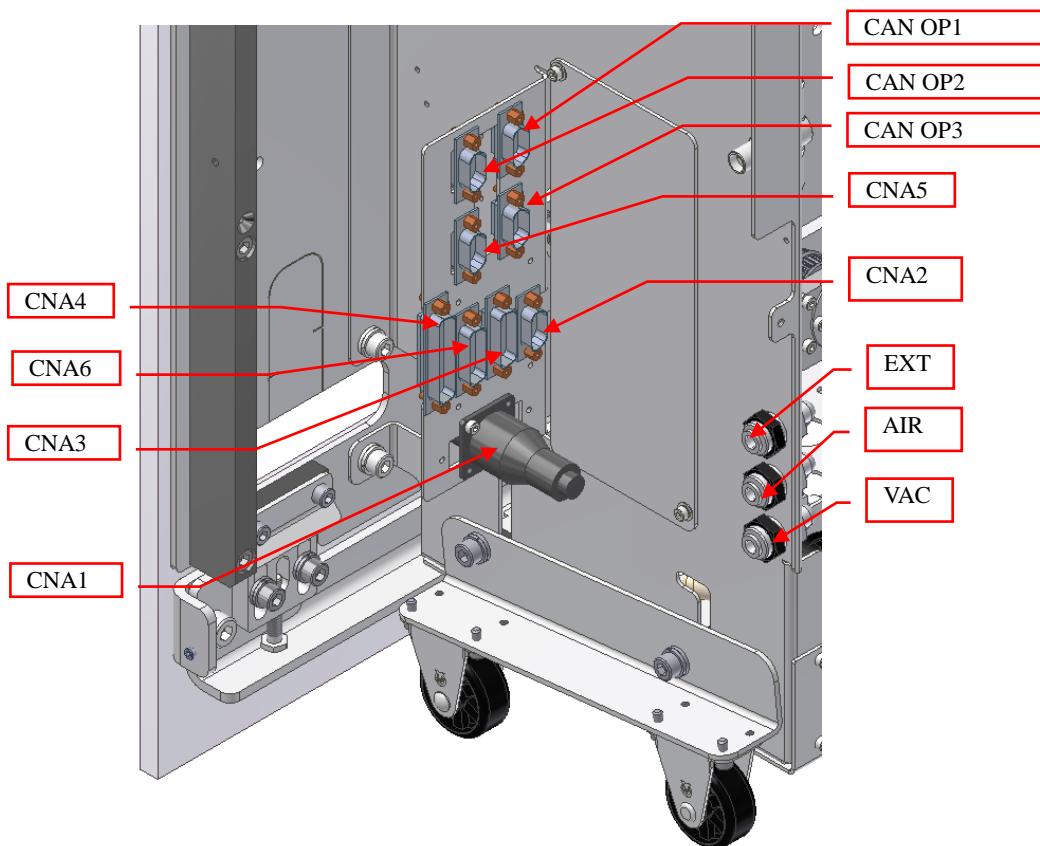


Fig 2.14 Detailed Connector Assignment

Table 2.3 CAN and No Assignment

No	Name	Connecting connector	Remark
CNA1	Power (24 V)	206060-1	Attached part
CNA2	Host Serial	D-Sub 9 pin (#4-40 UNC)	-
CNA3	Host Parallel	D-Sub 15 pin (#4-40 UNC)	-
CNA4	AMHS Interlock	D-Sub 25 pin (#4-40 UNC)	-
CNA5	Carrier ID	D-Sub 9 pin (#4-40 UNC)	Option
CNA6	Control Panel	D-Sub 15 pin (#4-40 UNC)	-
CNA OP1	Option1	D-Sub 9 pin (#4-40 UNC)	Special option
CNA OP2	Option2	D-Sub 9 pin (#4-40 UNC)	
CNA OP3	Option3	D-Sub 9 pin (#4-40 UNC)	
AIR	Compressed Air	φ6	-
EXT	Exhaust Air	φ6	-
VAC	Vacuum Air	φ6	-

- Recommend connector maker
OMRON
Japan Aviation Electronics Industry, Ltd. (JAE)
HIROSE ELECTRIC CO, LTD. (HRS)
DDK Ltd.
- ※ Connection of piping and wiring for the nitrogen (N2) purge specification (KWF-12F3-*P) is described in the operation manual of the machine with the nitrogen (N2) purge specification.

2.5.5 Positioning (Vertical and Horizontal Adjustment)

- Tools: Level, Hexagon wrench (M5, M6), Hexagon spanner (10 mm)
- Work procedure:
 - (1) Slightly loosen the M5 hexagon socket head cap screw that is fixed to the upper base (x 3).
 - (2) Slightly loosen the M6 hexagon socket head cap screw of the adjustment block that is fixed to the lower base (x 4).
 - (3) Put the level on the table.
 - * Set the table to the dock position. When moving the table to the dock position, remove the transport bracket.
 - (4) Adjust the lower base adjustment bolt (x 2) alternately to set the (vertical) height of dock table to HDP 900 mm.
 - * When the height of the table top face is 896.5 mm, that of the dock table is HDP 900 mm and that of the shoulder portion of the KC pin is HDP 900 mm.
 - * Height adjustable range: ± 10 mm
 - (5) Adjust the horizontal position of the dock table with the adjustment bolt of the lower base while checking the level.
 - * Lateral adjustable range: ± 3.0 mm ($\pm 0.13^\circ$)
 - (6) Tighten the M6 hexagon socket head cap screw of the adjustment block (x 4) which was loosened in step (2).

Tightening torque: 7.5 (N·m)
 - (7) Tighten the M5 hexagon socket head cap screw (x 3) which was loosened in step (1).

Tightening torque: 6.2 (N·m)
 - (8) Check the level again. If there is no problem, adjustment is completed.
- Estimated work time: 5 minutes

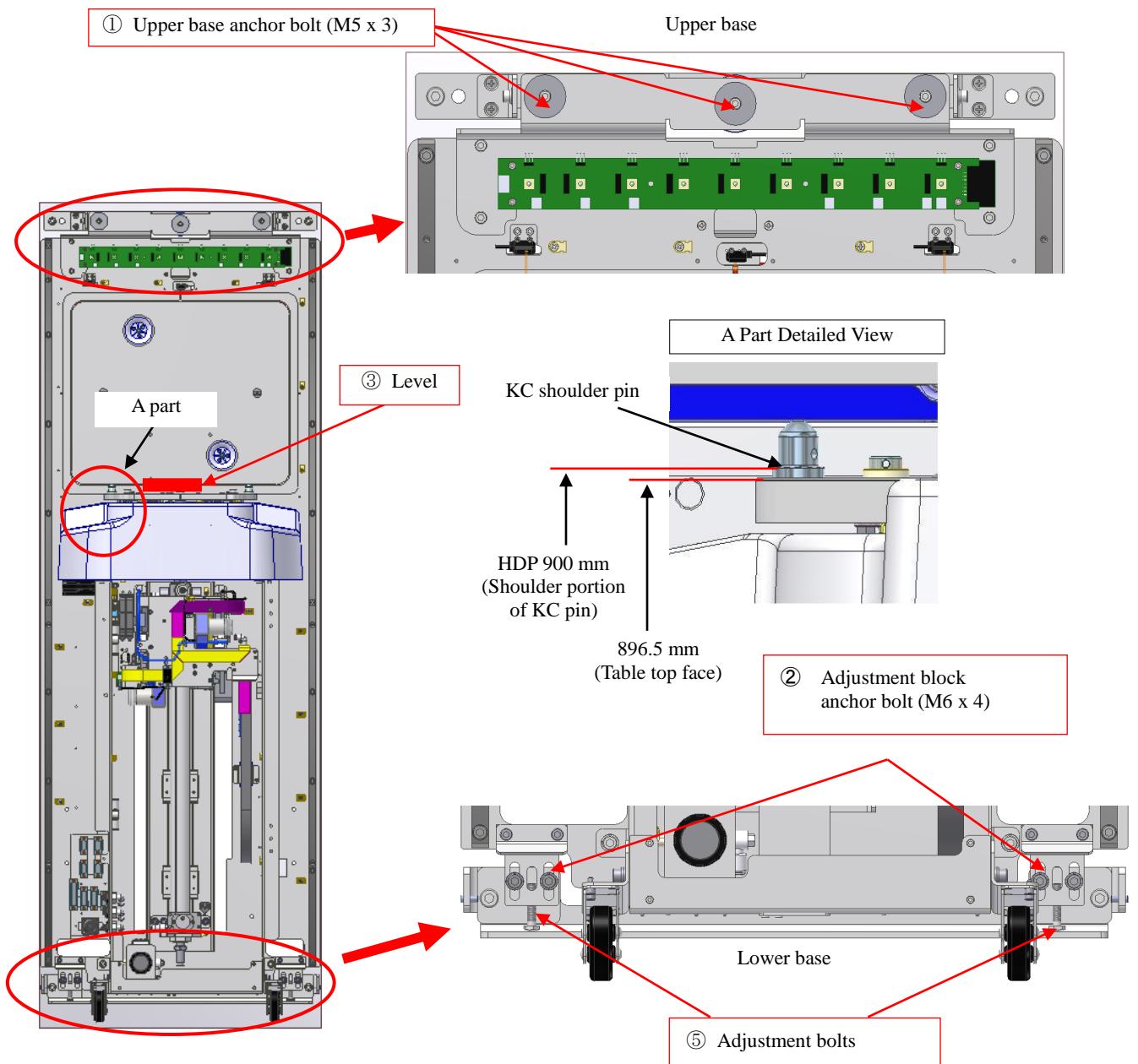


Fig 2.15 Vertical and Horizontal Adjustment

2. 5. 6 Positioning (Tilt Adjustment)

- Tools: Hexagon wrench (M5)

- Work procedure:

- (1) Loosen the M5 hexagon socket head cap screw that fixes the right and left sides of the upper base (x 2).
- (2) Loosen the M5 hexagon socket head cap screw that fixes the center of the upper base (x 1).
 - * To prevent the associative rotation, loosen it with the adjustment screw fixed.
- (3) Put the level on the table.
 - * Set the table to the dock position. When moving the table to the dock position, remove the transport bracket.
- (4) Rotate the tilt adjustment screw to adjust the table tilt while checking the level. * Back-and-forth adjustable range: ± 4.5 mm ($\pm 0.2^\circ$)
- (5) Tighten the M5 hexagon socket head cap screw (x 1) for the center of the upper base axis which was loosened in step (2). * Tightening torque: 6.2 (N·m)
- (6) Tighten the M5 hexagon socket head cap screw on the right and left sides of the upper base (x 2) which was loosened in step (1). * Tightening torque: 6.2 (N·m)
- (7) Check the level again. If there is no problem, adjustment is completed.

- Estimated work time: 5 minutes

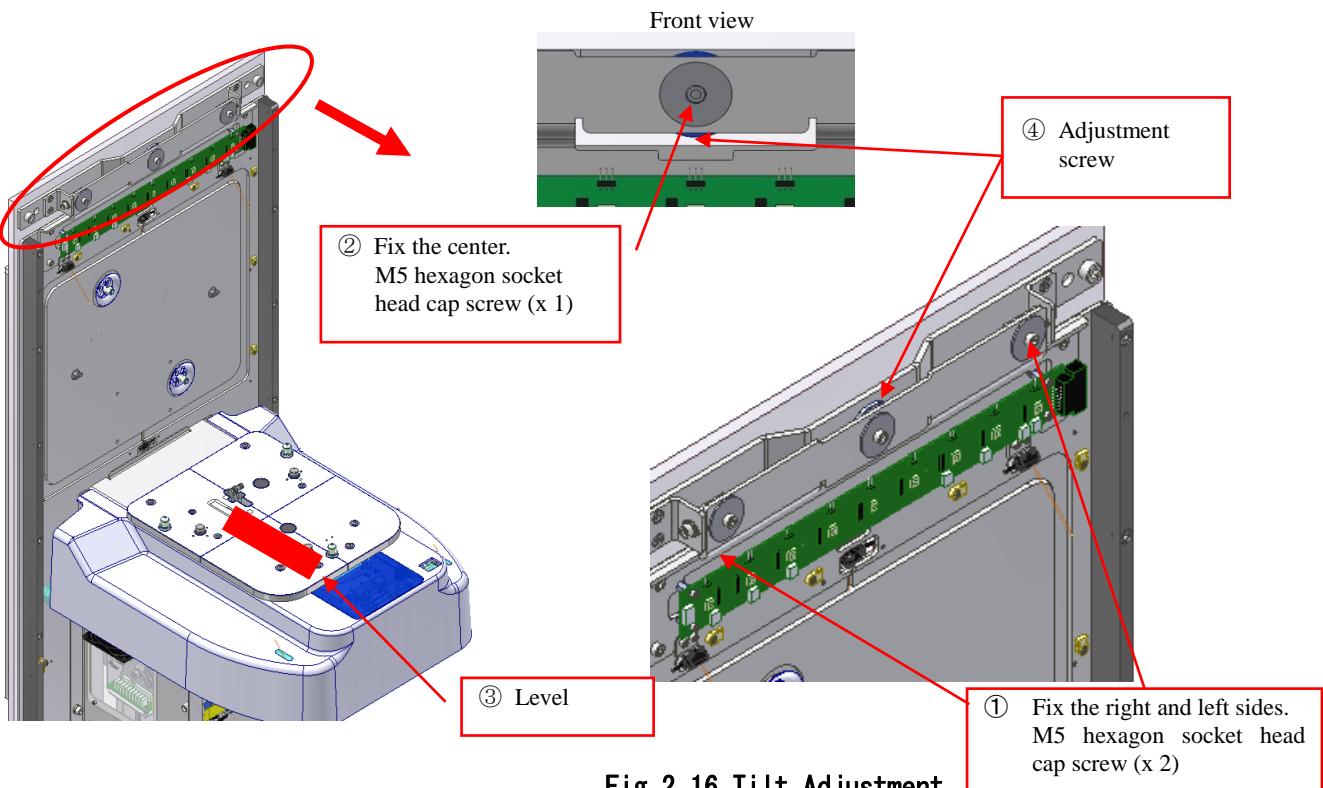


Fig 2.16 Tilt Adjustment

2.5.7 Additional Adjustment: F0UP Opener Lateral Adjustment (F0UP Opener Pitch Adjustment)

The pitch between these machines is typically 505 mm or more in SEMI standard. However, when the pitch design dimension between the machines is 505 mm, the installed dimension may be 505 mm or less. Since this machine has lateral adjustment (pitch adjustment) function, the entire machine can be adjusted by ± 2 mm in lateral direction.

- Tools: Hexagon wrench (M5, M8)
- Work procedure:
 - (1) Slightly loosen the M5 hexagon socket head cap screw of the upper base (x 3).
* Do not loosen too much. (Approximately half-turn is desired.)
 - (2) Slightly loosen the M8 hexagon socket head cap screw of the lower base (x 2).
* Do not loosen too much. (Approximately half-turn is desired.)
 - (3) Adjust the M5 set screw at the side of the machine lower base while checking the pitch dimension with a scale, etc., and move the entire machine laterally.
* To move this machine in the right direction from the viewpoint of the machine front, tighten the right set screw. (Ensure that the set screw on the other side is loosened.)
 - (4) Tighten the M8 hexagon socket head cap screw of the lower base (x 2) which was loosened in step (2).
Tightening torque: Unit mounting tap made of aluminum: 12.2 (N·m)
Unit mounting tap made of iron: 25.5 (N·m)
 - (5) Tighten the M5 hexagon socket head cap screw for the upper base (x 3) which was loosened in step (1).
Tightening torque: 6.2 (N·m)
 - (6) Check the pitch dimension again. If there is no problem about the level, adjustment is completed.
- Estimated work time: 5 minutes

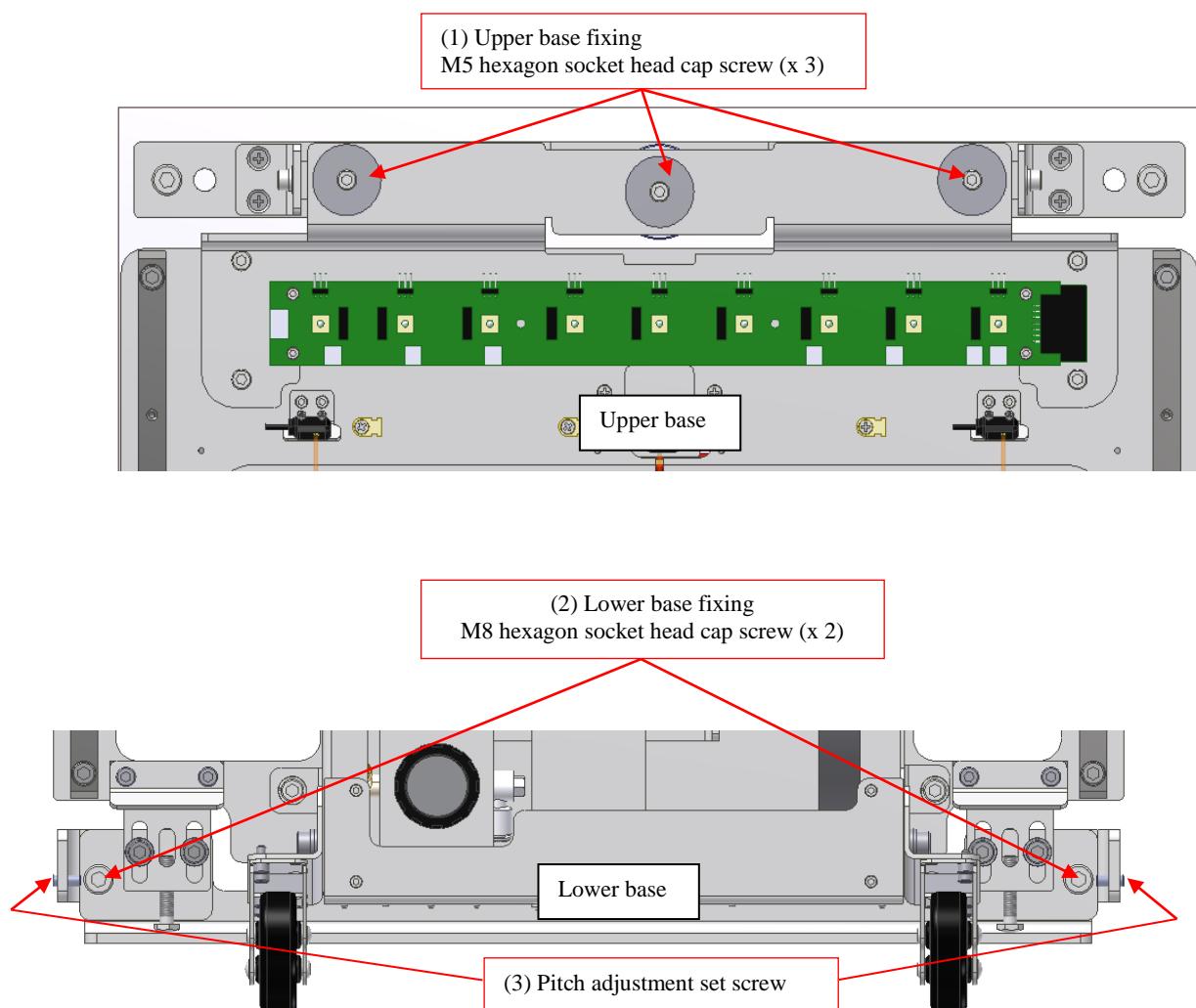


Fig 2.17 F0UP Opener Pitch Adjustment

Chapter 3. STARTING AND STOPPING THE MACHINE

This chapter describes how to turn ON and OFF the power of this machine.

3.1 Turning ON the Power

- (1) Connect (CNA1)ⁱ power supply to the power socket.
- (2) Press the ON side of the main power switch.
- (3) The power lamp (POWER) illuminates.
- (4) The power is now ON.

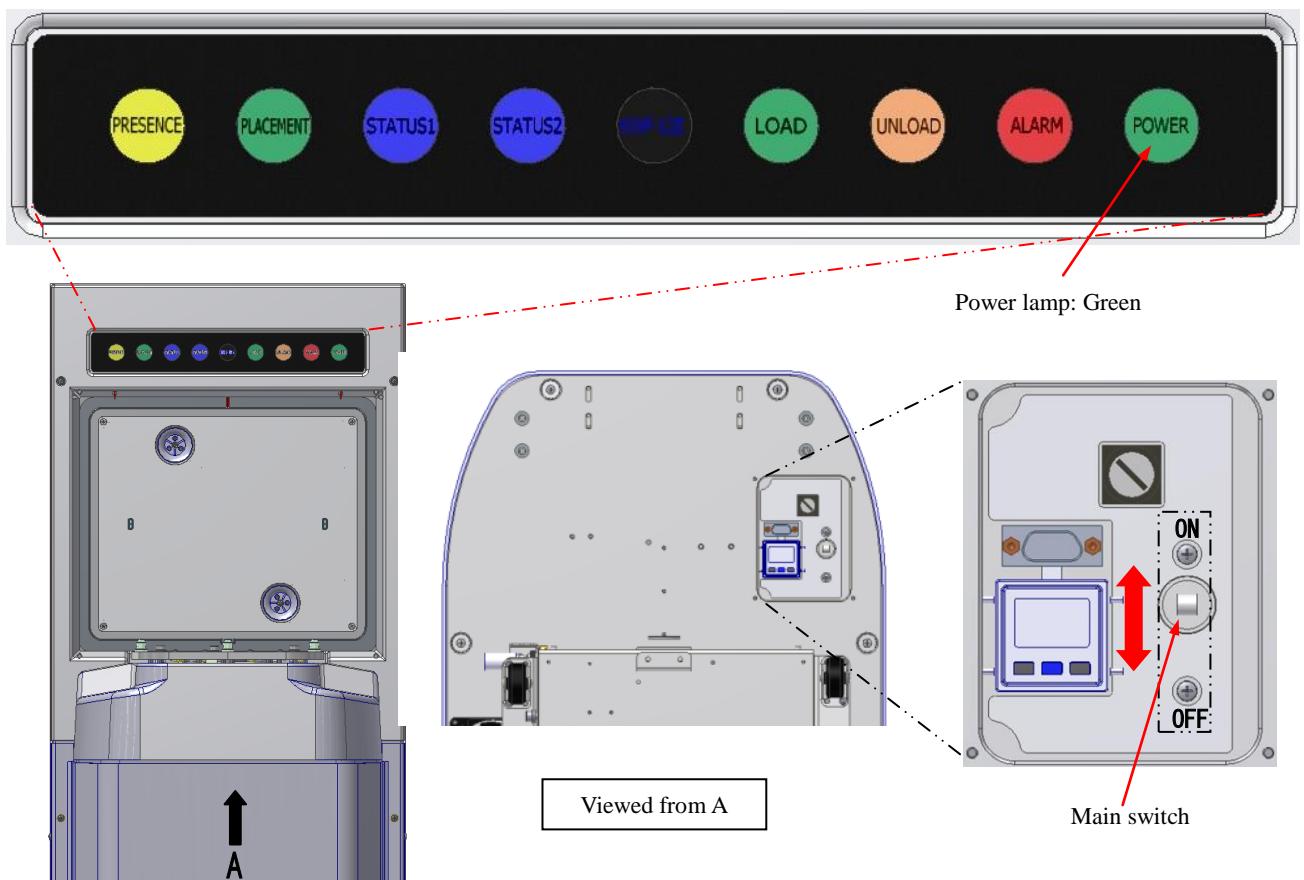


Fig 3.1 Turning ON the Power

3.2 Turning OFF the Power

- (1) Switch the main power switch shown in Fig 3.1 to the OFF side.
- (2) The power lamp (POWER) shown in Fig 3.1 goes out.
- (3) The power is now OFF.

ⁱ Primary AC power must be connected to “PE” and “-Ve” (negative side). Also make sure that the supplying power is SELV (Safety Extra Low Voltage).

3. 3 Mode Select Switch


CAUTION

Read carefully and understand this chapter well. Also, take safety measure properly before using mode select function.

3. 3. 1 Functions

Mode select switch is used for changing the operating mode of this machine between “Maintenance mode” and “Host port mode”. Selecting either one of the two communication ports enables applicable operations.

In “Maintenance mode”, an exclusive maintenance tool can control the operations of this machine, and is mainly for the maintenance of this machine. In “Host port mode”, the host equipment can control the operations of this machine.

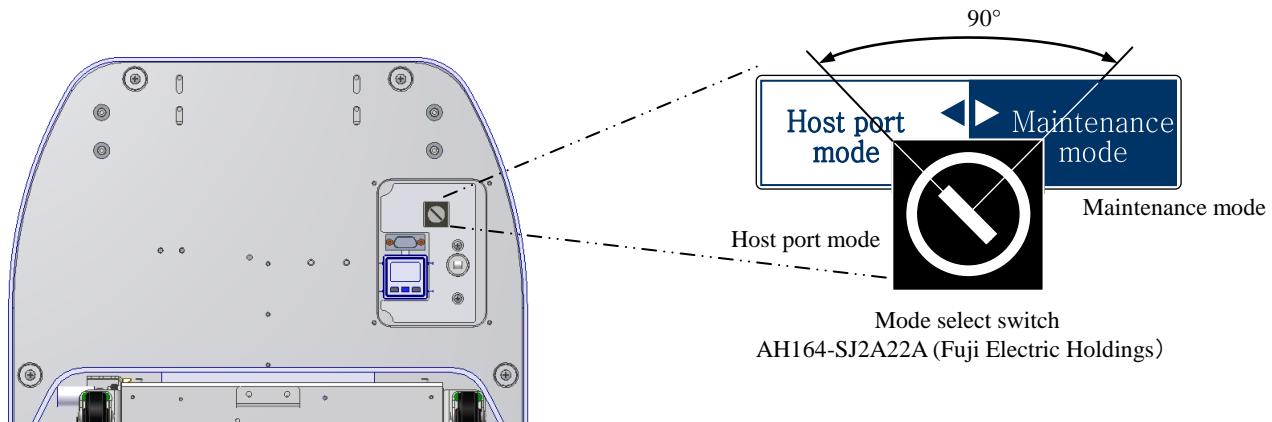


Fig 3. 2 Mode Select Switch

The key attached to the machine is used to change the mode. The key can be inserted and pulled out in Host port mode, where in Maintenance mode it cannot be. Remove the key during automatic operation. When maintenance is required, only the persons who have received the maintenance training should be allowed to use the key.


CAUTION

When doing any inspection work in Maintenance mode, perform the lockout/tag out procedure described in 4.1 Precautions for Maintenance Inspections of Chapter 4 in this manual to prevent an unexpected external operation. When changing from Maintenance mode to Host port mode, undo lockout/tag out process and start operation by following the start-up procedure of the host equipment. In order to prevent starting the system suddenly by the host equipment, take proper measure following the company safety rule. In Host port mode, this machine will not start operation unless receiving commands by the host equipment

3. 4 Description of Modes

3. 4. 1 Maintenance Mode

In Maintenance mode, the operation by using special maintenance tool, KWF-12F2 Maintenance Tool, is available in case of the trouble such as machine breakdown or no work even after resetting by reboot. Signals from the host equipment are ignored, the operation for this machine from the host port cannot be done and the operation from the maintenance port can be done.

Operations in Maintenance mode are following:

- (1) When the power switch is turned ON with the key switch being in Maintenance mode, this machine starts up in Maintenance mode. Operation can be done on the Windows personal computer in which the software for maintenance KWF-12F2-M has been installed.
(* The commercially available RS-232C cross cable is needed.)
- (2) Changing to Maintenance mode during the operation in Host port mode brings the machine to a stop with abnormal signal to host equipment and Maintenance mode is available.
- (3) Changing to Maintenance mode while there is no operation in Host port mode brings the machine to Maintenance mode without abnormal signal.
- (4) Following operations by commands through the maintenance port are available:
 - ◆ Control each mechanismⁱ
 - ◆ LOAD and UNLOAD operationⁱ
 - ◆ Automatic repeat of LOAD and UNLOAD operationⁱ
 - ◆ Parameter setting of this machine

3. 4. 2 Host Port Mode

In Host port mode, the operation by host equipment (Automatic operation mode) is available. The operation of this machine via the Maintenance Tool is not available.

Operations in Host port mode are following:

- (1) This machine starts up in Host port mode when the power turning ON with Host port mode selected.
- (2) Changing to Host port mode during the operation in Maintenance mode brings the machine to a stop with abnormal signal and Host port mode is available.
- (3) Changing to Host port mode while there is no operation in Maintenance mode brings the machine to Host port mode without abnormal signal.
- (4) Following operations by commands through the host port are available.
 - ◆ Control each mechanism
 - ◆ LOAD and UNLOAD operation
 - ◆ Parameter setting of this machine

ⁱ All interlocks are functional but FOUP presence setting is available.

Chapter 4. MAINTENANCE INSPECTION



WARNING

Make sure that maintenance and inspection for this machine is done by well-trained personnel.

4.1 Precautions for Maintenance Inspections

- (1) This machine has no circuit breaker. Prepare a main circuit breaker compliant to EN/IEC 60204-1 at the host equipment.
- (2) When inspecting, turn off the main power, lock the breaker, keep a start-up key off and place a sign reading "UNDER INSPECTION" in an easily seen location by following lockout/tag out procedure.
- (3) When reassembling or when replacing parts, take care that no foreign objects enter the main body of the machine.
- (4) Be sure to use the replacement parts specified by the Hirata Corporation. In particular, do not use fuses other than those with the specified rating. Using a fuse with a different rating may not only damage the machine, but may also cause a fire.
- (5) After maintenance inspection, there is a possibility that miswiring, assembly error, or other cause may result in the machine operating out of control. Before turning the power ON, check thoroughly that there are no people in the machine's operating area.

4.2 Daily Inspection

- (1) Before starting the machine

Before starting the machine, clean and take basic care of all parts. At the same time, check each part for damage and cracks. The following points should be checked and maintained regularly.

- ① Check the suction air.
- ② Check that there is no external damage to the suction air duct.
- ③ Check the air (if air devices are used).
- ④ Check that there is no leakage from the air hoses (if air devices are used).

- (2) After starting

- ① Check that there is no abnormal noise or vibration when the machine is operating.
- ② Check that positioning is correct and that there is no variation in stop position.

- (3) After stopping the machine

- ① Check that the motor is not abnormally hot.
- ② Clean and take basic care of all parts.
- ③ Check each part for damage and cracks.

4.3 Periodic Inspection

In order to maintain the performance of the machine, perform the following regular inspection and maintenance items.

Table 4.1 Items of Periodic Inspection

Name of part to inspect	Inspection item	Inspection interval	Remarks	Refer to item
Main unit anchor bolts	Tightening torque	6 months (The first inspection is performed one week after the start of operation.)	Specified torque = 6.2 N·m	4.3.1
LM guide	Supply and application of grease	12 months (When operation is 100 times/day or less)	Amount of grease = Proper quantity Recommended grease: AFF (THK)	4.3.2.1
Cam follower				4.3.2.2
Worm gear Worm wheel				4.3.2.3

4.3.1 Main Unit Anchor Bolts

For anchoring this machine to the processing tool, use M5 hexagon socket head cap screws or M5 hexagon bolts (tightening torque 6.2 N·m). If these bolts become loose, the machine may become out-of-position or may fall off. One week after the start of operation, check the tightening torque. After that, check the tightening torque every 6 months.

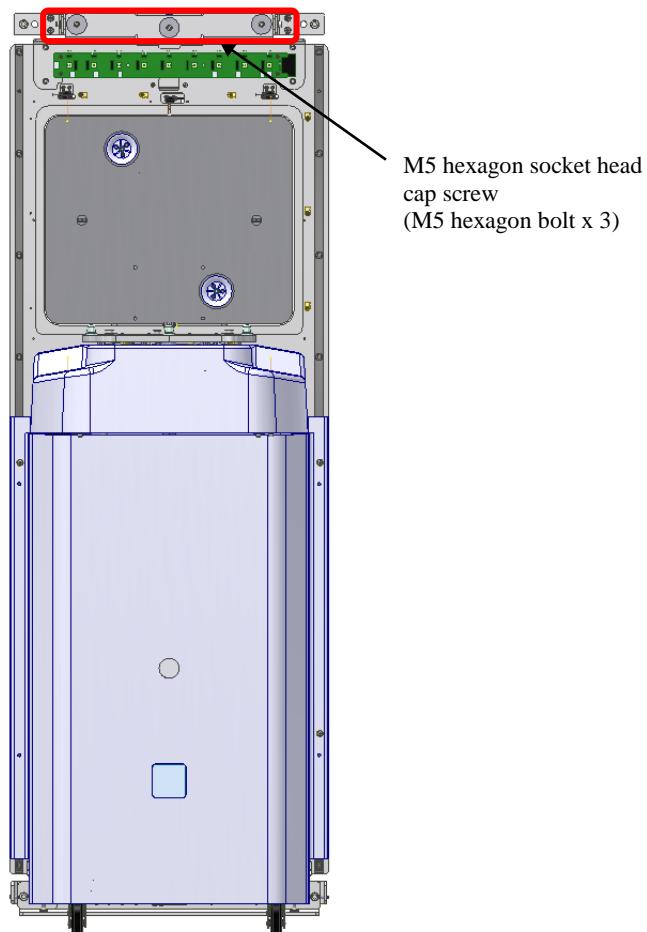


Fig 4.1 Main Unit Anchor Bolts

4.3.2 Supply and Application of Grease

The LM guide and a cam follower use lithium-based low-dust grease. These parts slide and roll; if the grease runs out, there is the danger of abnormal wear and abnormal noise occurring. Supply grease as described below. However, if an extremely large amount of grease is applied, or if the supply of grease is unbalanced, the load on the motor will increase, and grease may splatter. Use the appropriate amount of grease.

For lithium-based low-dust grease, use the lithium-based low-dust grease in the table below.

Table 4.2 Lithium-based Low-dust Grease List

Manufacturer	Grease type
THK	AFF grease ^{*1}
NSK	LG2 grease

*1 Recommended grease

4.3.2.1 Supply of Grease to LM Guide

Inspect every 12 months and if the grease is running out, apply grease following the procedure below. The location to apply grease is the elevator mechanism. For other locations, the oilless type LM guide is used. Therefore, supply of grease is not required.

- Grease: AFF+70 (Grease gun mounting type) (THK)
- Tools: Grease gun MG70 (Nozzle N type) (THK), cross head screwdriver
- Parts: IPA, cotton cloth, vinyl gloves, mirror, lights
- Work procedure:
 - (1) Move the lifting shaft to the upper end.
 - (2) Turn the machine power OFF.
 - (3) Remove the main cover.
(M4 cross-recessed binding head screw x 4)

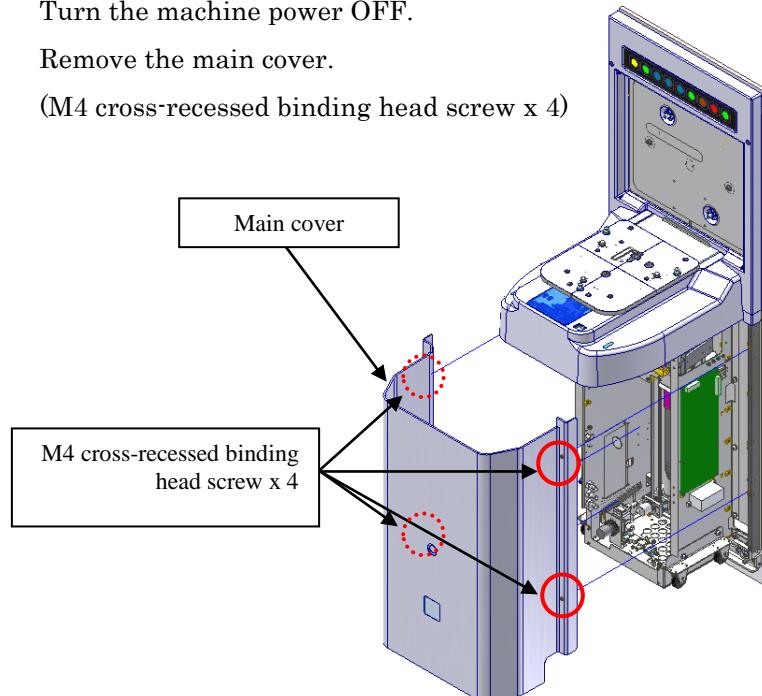


Fig 4.2 Removal of Main Cover

- (4) Use a cotton cloth moistened with IPA to wipe off all of the old grease.
- (5) Use the grease gun to supply grease from the grease nipple of LM block on the lower side.

At that time, the grease nipple is obstructed by the evacuation unit and cannot be seen. Therefore, use a light and mirror to check the position of the grease nipple.

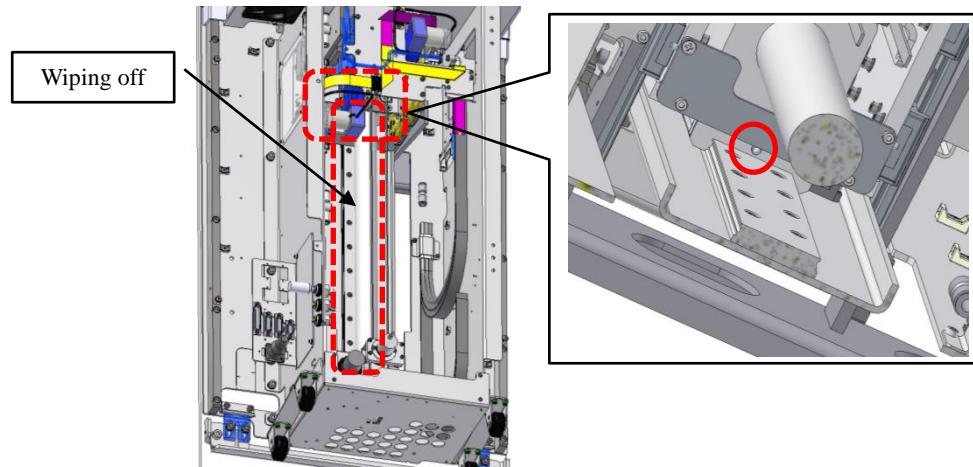


Fig 4.3 Wiping off LM Rail on Lower Side and Checking Position of Grease Nipple on Lower Side

- (6) Turn the machine power ON, and move the lifting shaft to the lower end.
- (7) Turn the machine power OFF.
- (8) Wipe off the grease from the spots that could not be cleaned in (4).
- (9) Use the grease gun to supply grease from the grease nipple of LM block on the upper side.

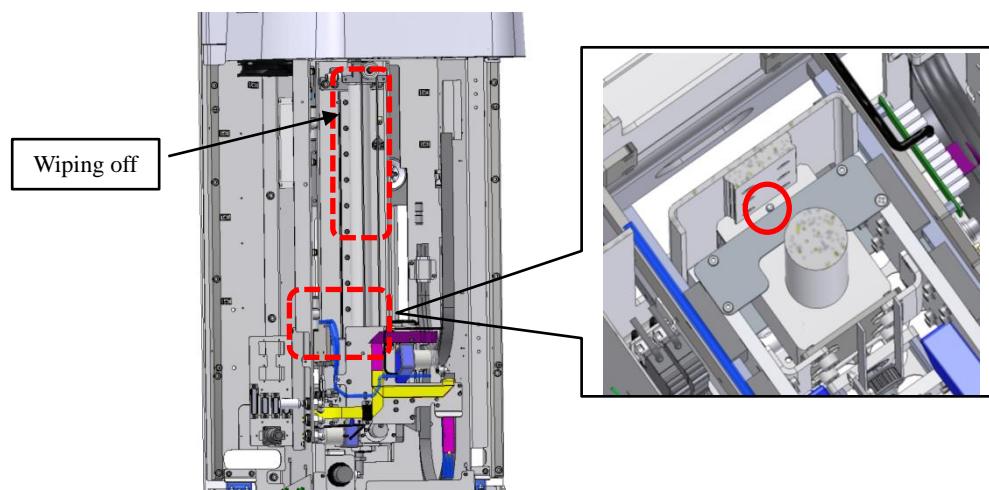


Fig 4.4 Wiping off LM Rail on Upper Side and Checking Position of Grease Nipple on Upper Side

- (10) Turn the machine power ON. Repeat all raising/lowering movements several times to let the grease work its way in.
 - (11) Reattach the main cover.
- Estimated work time: 20 minutes

4.3.2.2 Lubrication to Cam Follower

Inspect every 12 months and if the grease is running out, apply grease following the procedure below. The 3 locations to apply grease to are the following: ① The dock sliding mechanism, ② The door evacuation mechanism, and ③ The mapping evacuation mechanism.

- Grease: AFF (THK)
- Tools: Cross head screwdriver, hexagon wrench (M3)
- Parts: IPA, cotton cloth, vinyl gloves
- Work procedure:
 - (1) Move the applicable axis to the unload position.
 - (2) Turn the machine power OFF.
 - (3) Remove the main cover (M4 cross-recessed binding head screw x 4).
 - (4) Remove the cowl (M4 cross-recessed binding head screw x 4).
 - (5) Remove the window cover (M3 hexagon socket head cap screw x 4).

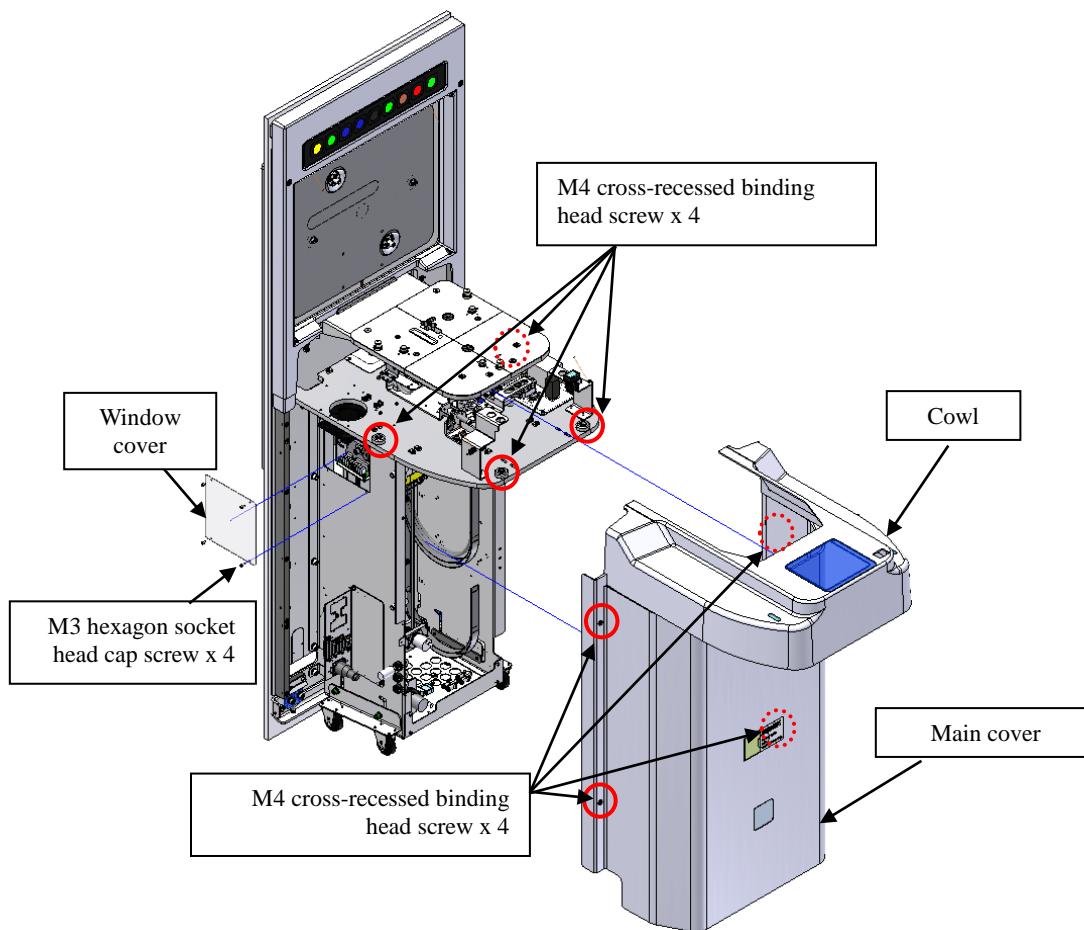


Fig 4.5 Removal of Covers

- (6) Use a cotton cloth moistened with IPA to wipe off all of the old grease.
- (7) Directly apply new grease to the inside of the slot that contacts the cam follower of each cam guide.

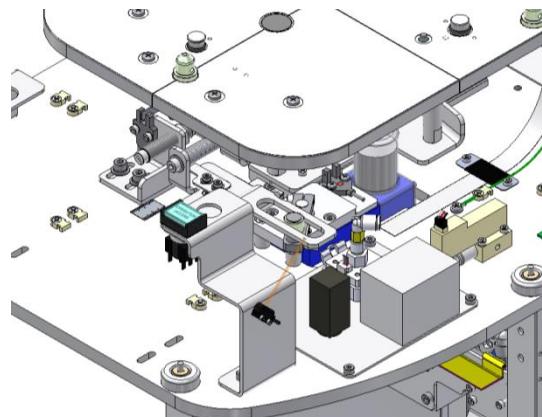


Fig 4.6 Cam Follower Sliding Portion of Dock Slide Mechanism

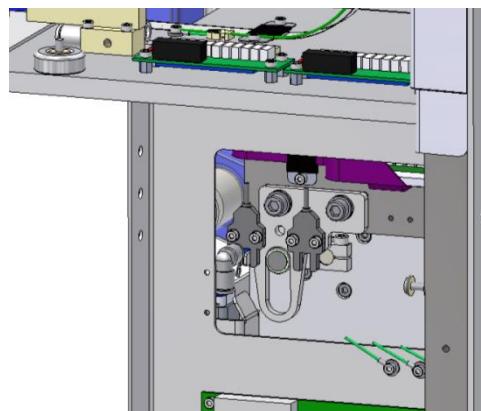


Fig 4.7 Cam Follower Sliding Portion of Door Evacuation Mechanism

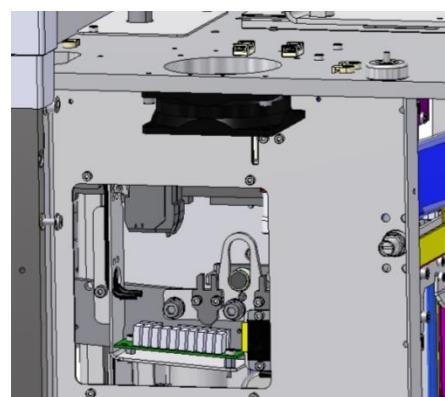


Fig 4.8 Cam Follower Sliding Portion of Mapping Evacuation Mechanism

- (8) Turn the machine power ON, and move the table to the dock position.

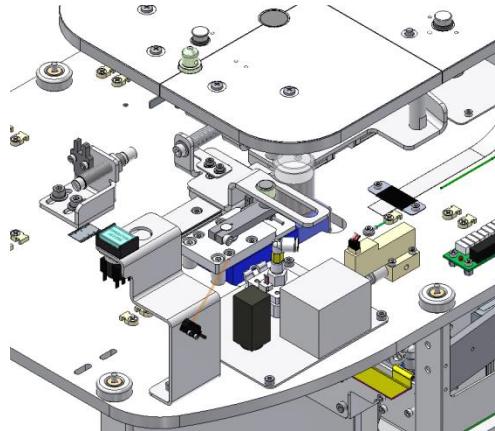


Fig 4.9 Dock Position

- (9) Open the door to the position of the cam arm turned by 90 degrees (door half-open position).

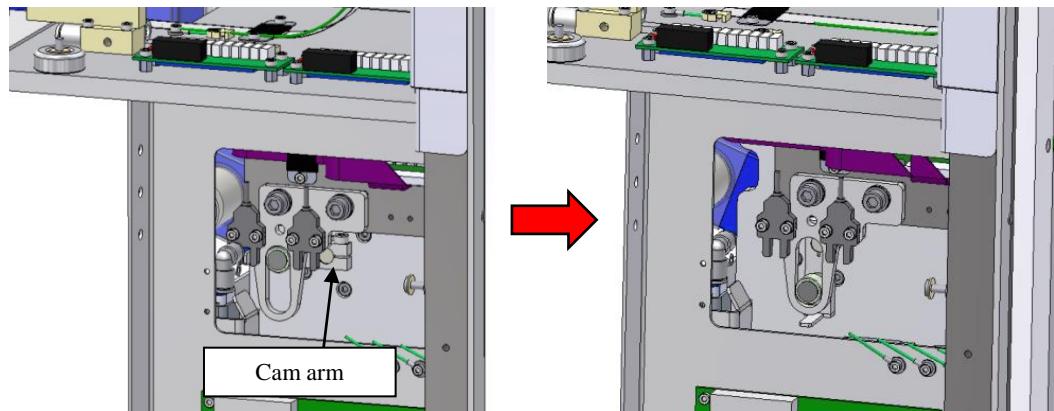


Fig 4.10 Door Half-Open Position

- (10) Lower the mapping head to the mapping start position.

- (11) Move the mapping head forward to the position of the cam arm turned by 90 degrees (mapping head half-protruded position).

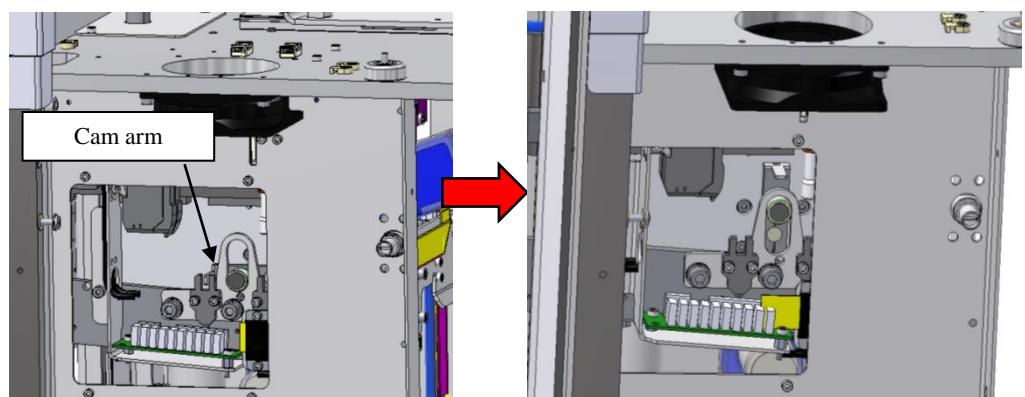


Fig 4.11 Mapping Head Half-Protruded Position

- (12) Turn the machine power OFF.

- (13) Wipe off the grease from the spots that could not be cleaned in (6).

- (14) Apply grease to the spots to which it could not be applied in (7).

- (15) Turn the machine power ON. Repeat all movements several times to let the grease work its way in.
- (16) Reattach covers
 - Estimated work time: 20 minutes

4.3.2.3 Lubrication to the Worm Gear and Worm Wheel

Inspect once every 12 months. If the grease is running out, follow the procedure below to apply new grease. The location to apply grease is the latch open/close mechanism.


CAUTION

This work is performed in EFEM and the machine. Be sure to check that the machine power is turned OFF before entering EFEM and the machine.

- Grease: AFF (THK)
- Tools: Hexagon wrench (M3)
- Parts: IPA, cotton cloth, vinyl gloves
- Work procedure:
 - (1) Turn the machine power OFF.
 - (2) Remove the door back cover. (M3 hexagon socket head cap screw x 9)

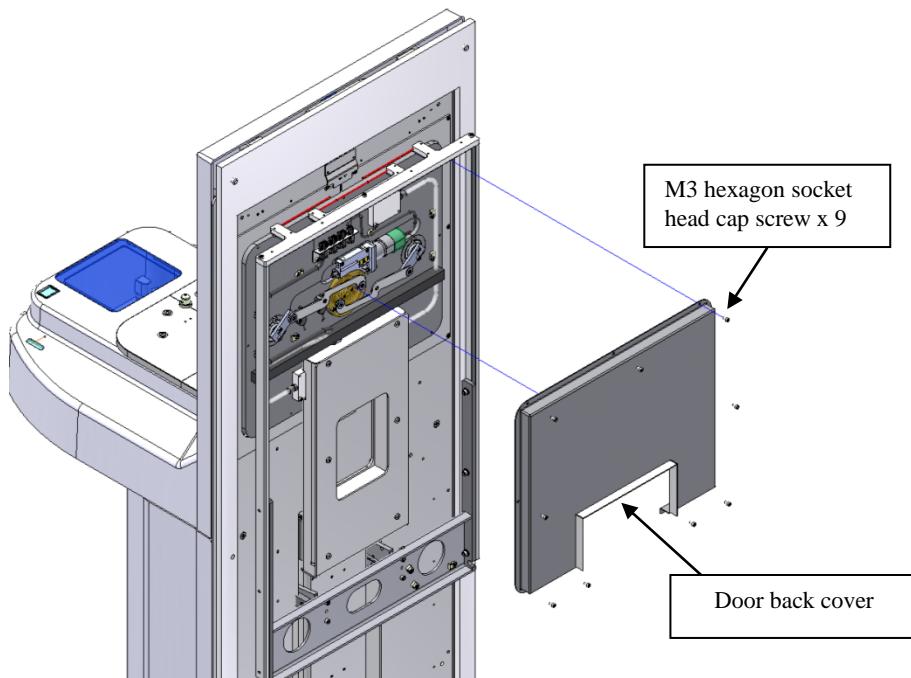


Fig 4.12 Removal of Door Back Cover

- (3) Use a cotton cloth moistened with IPA to wipe off all of the old grease.
- (4) Directly apply new grease to the side surfaces of the worm gear and worm wheel.

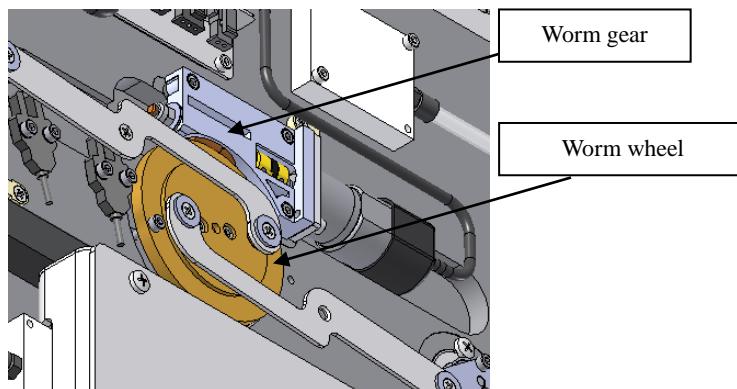


Fig 4.13 Worm Gear & Worm Wheel Portions

- (5) Turn the machine power ON. Open and close the latch several times to let the grease work its way in.
 - (6) Turn the machine power OFF again.
 - (7) Reattach the door back cover.
 - (8) Turn the machine power ON.
- Estimated work time: 15 minutes

4.4 Disposal Instruction



NOTE

Some components and materials used for this machine should be wasted by following the disposal method.

4.4.1 Clock Battery Disposal

The coin shaped manganese dioxide lithium secondary battery (type: ML2032WK2) is used for the clock battery of the CPU board. Although this type of battery can be disposed as general nonflammable garbage, the handling depends on each local government. Follow the instruction specified by the local government. If an electric capacity remains in the disposed battery, the contact with other metal may cause burst or fire. To avoid this, be sure to dispose the battery with its (+) and (-) terminals covered with an adhesive insulating tape.

4.4.2 Grease Disposal

The grease for applying to the driving unit is lithium-based low-dust grease. Unnecessary grease and the waste containing the grease should be disposed by following advice below.

- ① The employer must dispose industrial wastes or entrust an industrial waste processor who took permission from the prefecture's governor or a local public entity in case it is executing disposal jobs with the waste disposal.
- ② Dumping prohibited.
- ③ In case of a landfill disposal, wastes must previously be thrown into the fire facility and the disposing reference must be under that determined in the waste disposal and cleaning enforcement ordinance.
- ④ In case of incineration, be sure to have somebody watch it. Select a proper place and method to avoid explosion or any damage.

4.4.3 Plastic Materials Disposal

Plastic materials should be recycled or disposed of in accordance with prevailing regulations. (Please refer to "4.4.4 Parts List" about used material.)

If you have any question concerning the disposal method for other parts and materials, please contact us.

4.4.4 Parts List

As the reference data upon a deletion, the part list is shown below.

Table 4.3 Parts List (Electrical Equipment)

Location	Part name	Type	Manufacturer	Qty.
Body unit	CPU board	HPC-979	Hirata	1
	Indicator board	HPC-909A	Hirata	1
	Solenoid valve (Elevator)	SY3320-5LZ-C6-Q	SMC	2
	Load presence sensor (Presence)	E3T-ST11-ALN2M	OMRON	2
	Load presence sensor (Wafer protrusion)	E3T-ST11-ALN2M	OMRON	1
	Regulator + Pressure SW	AR20-01E2H-B	SMC	1
	Jacques socket	JFS-4S-B1WM	NICHIA TSU	8
	Connector	20606-1	AMP	1
Elevator unit	Photo micro sensor (Door elevator)	EE-SX771 2M	OMRON	2
	Encoder	E6A2-CW5C 360P/R 0.5M	OMRON	1
Table unit	Geared motor (Dock/Undock)	TG-47G-VG-500-KA, 24V	TSUKASA ELECTRIC	1
	Geared motor (Clamp/Unclamp)	TG-06E-B-500KA, 24V	TSUKASA ELECTRIC	1
	Relay board	HPC-786-C	Hirata	1
	Relay board	HPC-786-D	Hirata	1
	Relay board	HPC-786-E	Hirata	1
	Pressure switch	ZSE30AF-01-N-MLB	SMC	1
	Solenoid valve	10-VQD1251W-5L-M5-X16	SMC	1
	DC sensor fan	9A0824S4011	SANYO DENKI	1
	Key switch	AH164-SJ2A22A	Fuji Electric Holdings	1
	Locker switch	CP32V/7.5DDC	Fuji Electric Holdings	1
	Photo micro sensor (Undock)	EE-SX770 2M	OMRON	1
	Photo micro sensor (Presence)	EE-SX770 2M	OMRON	3
	Photo micro sensor (Clamp/Unclamp)	EE-SX770 2M	OMRON	2
	Photo micro sensor (Dock)	EE-SX771 2M	OMRON	1
	Photo micro sensor (Hand-pinch)	EE-SX871 2M	OMRON	1
	Small micro switch (Presence)	D2MV-01L2-1C3	OMRON	1
	Push button	A165L-JWM-24D-1	OMRON	1

Location	Part name	Type	Manufacturer	Qty.
Evacuation unit	Geared motor (Door open/close)	TG-47G-VG-500-KA, 24V	TSUKASA ELECTRIC	1
	Relay board	HPC-786-A	Hirata	1
	Photo micro sensor (Door open/close)	EE-SX770 2M	OMRON	2
	Photo micro sensor (Mapping out/return)	EE-SX770 2M	OMRON	2
	Fiber amplifier	FS-V31SO	KEYENCE	1
	Geared motor (Mapping out/return)	TG-47F-VG-100-KA, 24V	TSUKASA ELECTRIC	1
	Relay board	HPC-786-B	Hirata	1
Mapping unit	Fiber sensor	FU-16Z	KEYENCE	1
Door unit	Geared motor (Latch open/close)	TG-205A-FU-4.7-Q2287, 24V	TSUKASA ELECTRIC	1
	Photo micro sensor	EE-SX770 2M	OMRON	2
Combination mapping unit	Fiber sensor	FU-16Z	KEYENCE	1
	Fiber amplifier	FS-V31SO	KEYENCE	1
Control Unit	Power supply ⁱ	HWS150-24/A	TDK-Lambda	1

ⁱ The unit will be added for AC 200 V version.

Table 4.4 Parts List (Resin・Rubber Part)

Location	Part name	Type	Manufacturer	Qty.	Obtained standard/material	Size
Body unit	Window cover	K900-011-139	Hirata	1	PVC	130x140x1
	Sealing packing	EH2210-10tx10x200mm	Nitto	2	EPDM	10x10x2000
	Upper cover	K900-011-501	Sansenkasei	1	UL94HB・ABS	640x470x30.5
	Cowl	K900-011-502	Nippo Shimane	1	UL94HB・ABS	473x410x129.3
	Main cover	K900-011-510	Nippo Shimane	1	UL94HB・ABS	720x470x235
	Screw fall prevention washer	TM-147-1	TOCHIGIYA	2	PA	φ8x0.8
	Screw fall prevention washer	TM-147-2	TOCHIGIYA	4	PA	φ10x0.8
	Indicator sheet	S230-011-503*-00-*	Kyobishi	1	UL94-HB・PET	363x53x0.5
	I/F label	S230-011-508-00-00	Kyobishi	1	PP	155x60x0.5
	Caster	GR-38BN	Yuei	4	6 nylon	φ38x16
	Regulator + Pressure SW	AR20-01E2H-B	SMC	1	POM	70x40x95
	Protection bush	NAE-024	Misumi	1	6 nylon	4.4x5.3x140
	Speed controller	AS2051F-06D	SMC	2	PBT, NBR, HNBR	φ15.5x53x35
Elevator unit	Timing belt	GBN11833GT-60	Misumi	1	Chloroprene rubber, Nylon	1263x6x1.26
Table unit	Geared motor (Dock)	TG-47G-VG-500-KA,24V	TSUKASA ELECTRIC	1	UL94-HB	40x100x57
	Screw fall prevention washer	TM-147-2	TOCHIGIYA	4	PA	φ10x0.8
	Cap	L45800012-003	NSK	2	POM	φ20x5
	SW sheet	K900-013-505*	Kyobishi	1	Polyallylate	18.9x12.9x0.6
	Operation label	K900-013-506	Kyobishi	1	UL94V-0・PVC	75x110x0.5
	Roller	K150-013-022B	Hirata	2	Dirline	φ8x4.5
	Dock sheet	S230-013-501-00-00	Kyobishi	1	Mat clear	255x299x0.5
	DC sensor fan	9A0824S4D011	SANYO DENKI	1	UL94V-0	□80x25
	Scale tape	TMEPN-20000	Misumi	1	PET	12.5x25x0.32
	Flange bush	80F-1005	OILES	1	Oil-impregnated POM	φ10x5
	Flange bush	80F-1206	OLIES	2	Oil-impregnated POM	φ12x6
Door unit	Adsorption pad	K150-014-104	HANNAKOGYO	2	UL94-HB・Si	φ46X14.6
	Gear case	K410-014-111C	Hirata	1	MCN	39x60x20
Evacuation unit	Geared motor (Mapping out/return)	TG-47F-VG-100-KA, 24V	TSUKASA ELECTRIC	1	UL94-HB, Rubber	40x100x57
	Geared motor (Door open/close)	TG-47G-VG-500-KA, 24V	TSUKASA ELECTRIC	1	UL94-HB, Rubber	40x100x57
All	Sensor set	-	OMRON	-	-	-
	Joint set	-	SMC	-	PBT, PP, PUM, NBR	-
	Air hose set	TU/TFU/TUS	SMC	-	U	-
	Amplifier	-	OMRON	-	-	-
	External wiring	-	-	-	-	-
	Substrate	-	-	-	-	-
	Tiemount	MB-1, KR-5G5	Tyton	-	UL94V-2, 66Nylon	-
	INSULOK	AB-80, 10, 150, 200	Tyton	-	UL94V-2, 66Nylon	-

※ Abbreviation description

PVC: Polyvinyl chloride resin

PBT: PBT resin

POM: Acetal resin

PE: Polyethylene resin

PET: PET resin

MMA: Acrylic resin

U: Polyurethane

Si: Silicone rubber

PP: Polypropylene

ABS: ABS resin

PC: Polycarbonate resin

NBR: Nitrile rubber

Chapter 5. PARTS REPLACEMENT

5.1 Encoder Replacement

- Parts: Encoder type for replacement: E6A2-CW5C 360P/R 0.5M (OMRON)
Screw lock type: TB1344H (ThreeBond)
- Tools: Cross head screwdriver, nipper, hexagon wrench (M3),
tension meter, spanner (width across flats 8)
- Preparation: PC with a maintenance software “KWF-12F2 Maintenance Tool” installed, RS-232C serial cable (cross cable), USB - serial conversion connector (If there is no RS-232C port in the PC), FOUP
- Work procedure:

- (1) With FOUP placed, move the door to the loading position, and turn the machine power OFF.
- (2) Remove the main cover
(M4 cross-recessed binding head screw x 4)

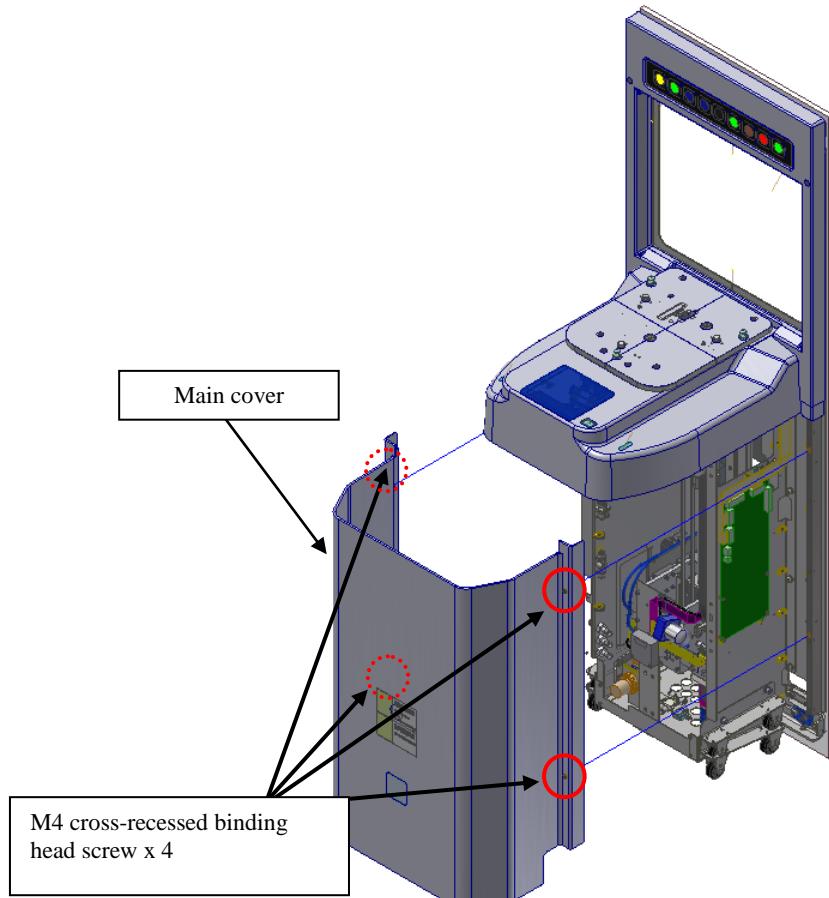


Fig 5.1 Door Loading Position and Removal of Main Cover

- (3) Loosen the hexagon nut (M5) on the back side of the idler fixing portion, and slightly lower the idler to loosen the belt tension.

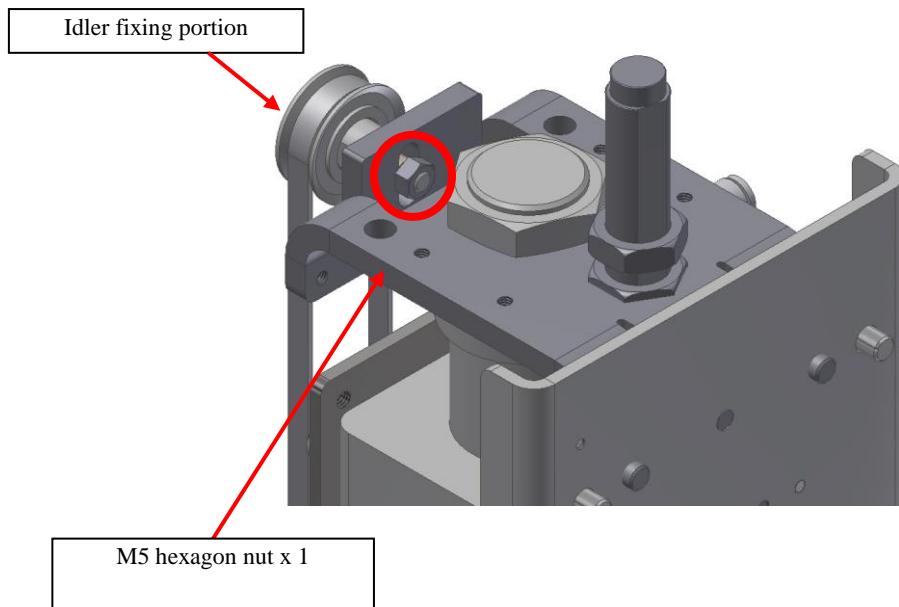


Fig 5-2 Nut on Back Side of Idler Fixing Portion

- (4) Turn on the power and raise the door to the close position.
(5) Turn off the power.
(6) Remove the encoder relay connector.

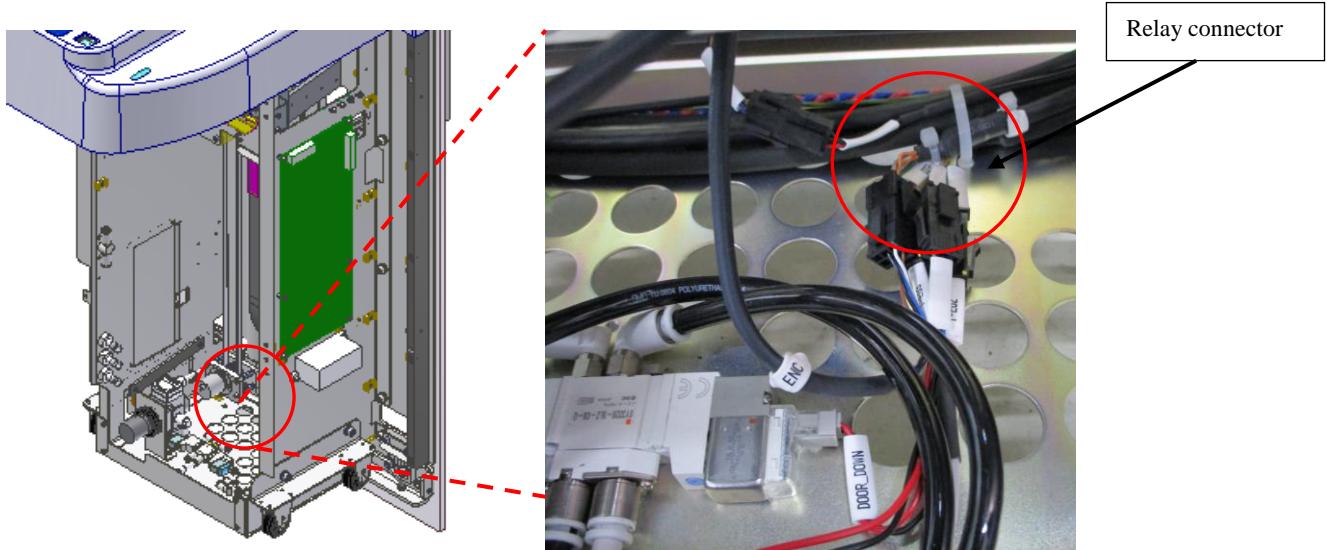


Fig 5.3 Encoder Relay Connector

- (7) Remove the hexagon socket head cap screw on the inner side of the elevator base BKT.
(M5 hexagon socket head cap screw P=3 x 1)

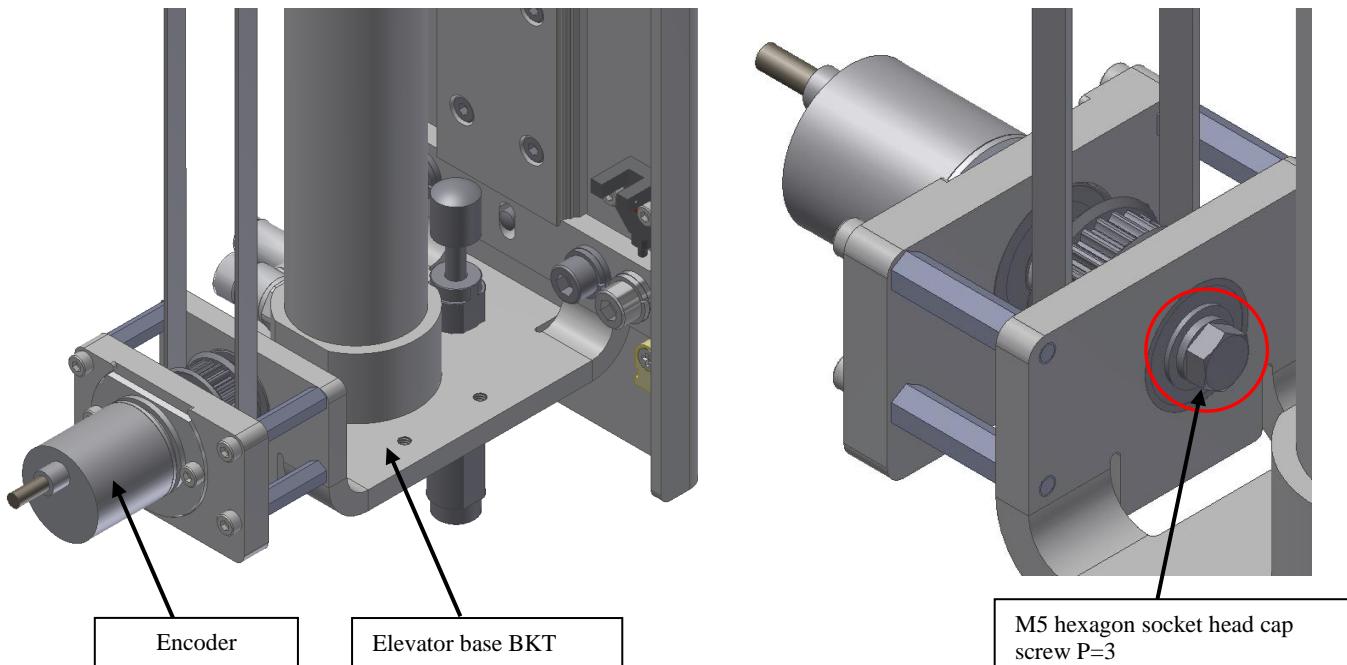


Fig 5.4 Removal of Bolt

- (8) Remove the screw, and then remove the bearing mounting plate.
(M3 hexagon socket head cap screw x 4)

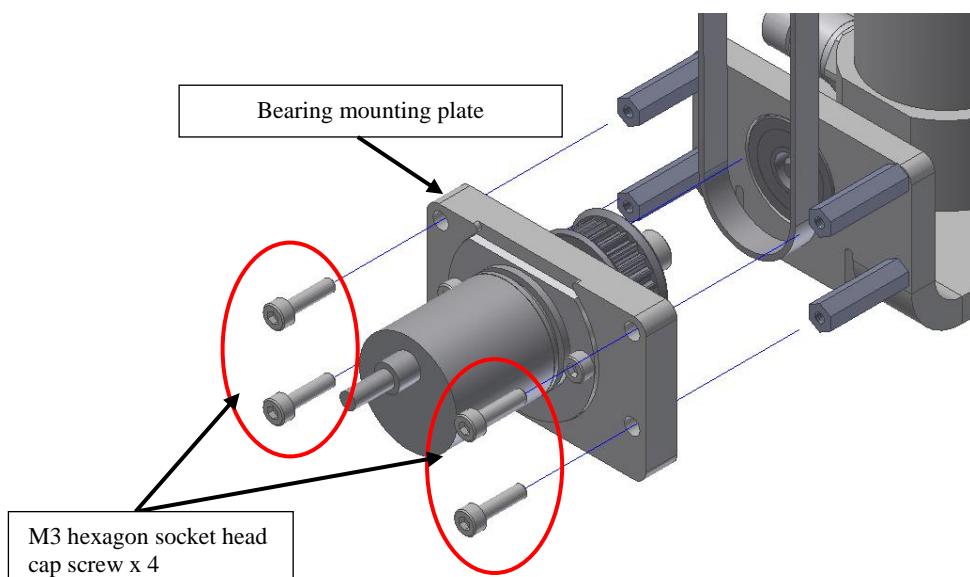


Fig 5.5 Removal of Bearing Mounting Plate

- (9) Loosen the set screws that fix the encoder shaft.
(M3 hexagon socket head cap screw x 2)

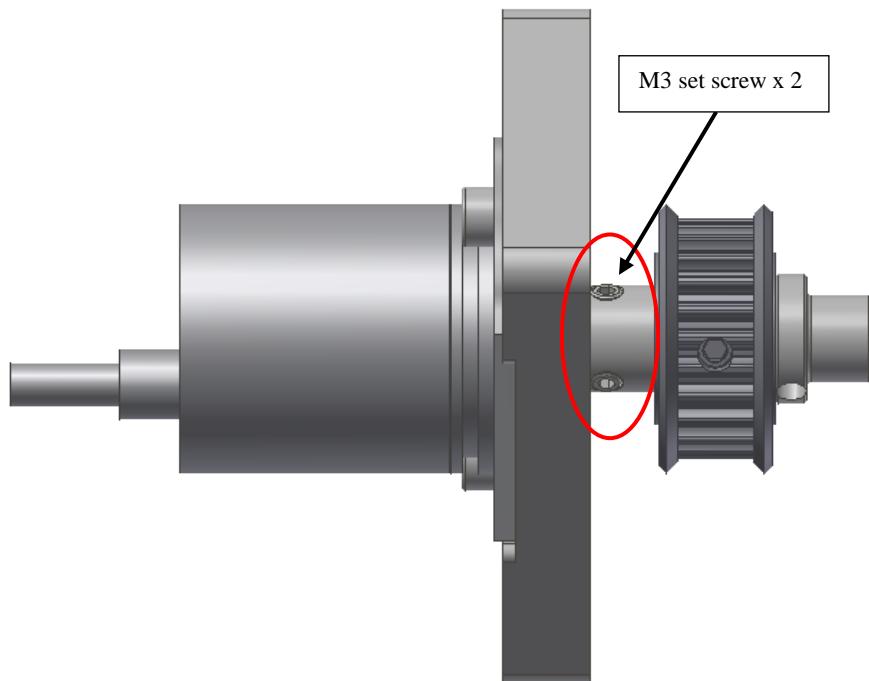


Fig 5.6 Loosening of Set Screws

- (10) Remove the encoder portion from the bearing mounting plate.
(M3 hexagon socket head cap screw x 2)

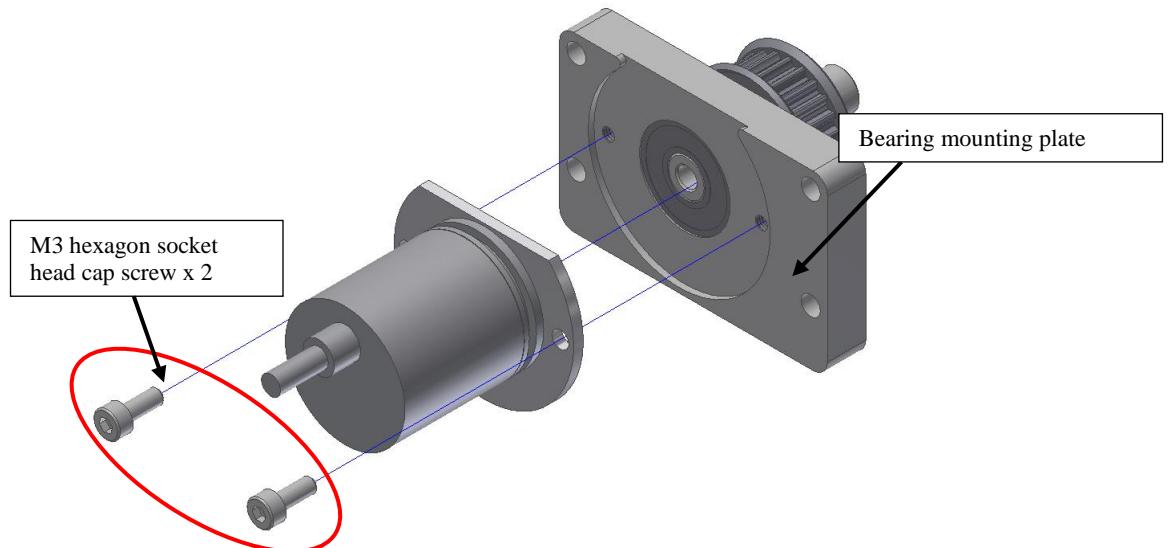


Fig 5.7 Removal of Encoder Portion

- (11) Remove the encoder plate from the encoder.
(M3 cross countersunk screw x 2)

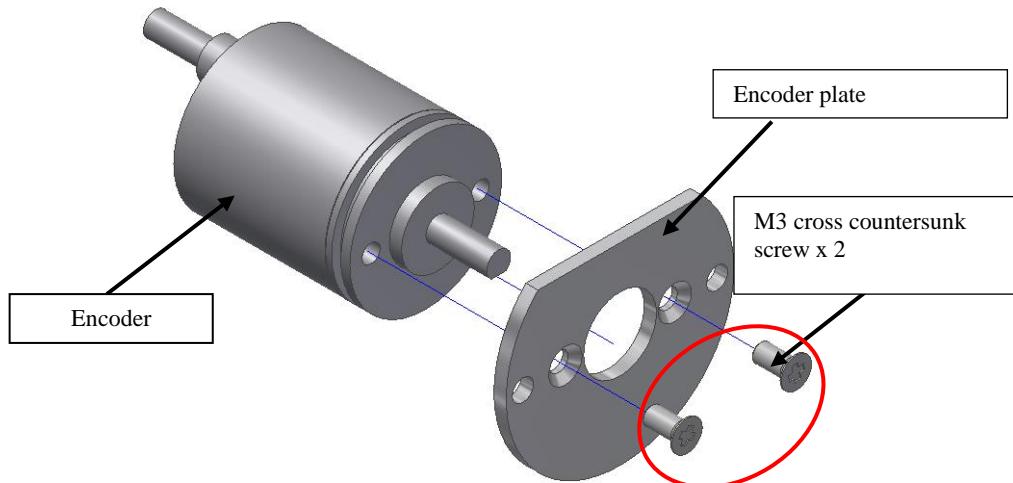


Fig 5.8 Removal of Encoder Plate

- (12) Install a new encoder to the encoder plate.
(M3 cross countersunk screw x 2) ※ Tightening torque: 0.6 N.m
※ Apply screw lock (TB134 4H ThreeBond) to the countersunk screws to be used.

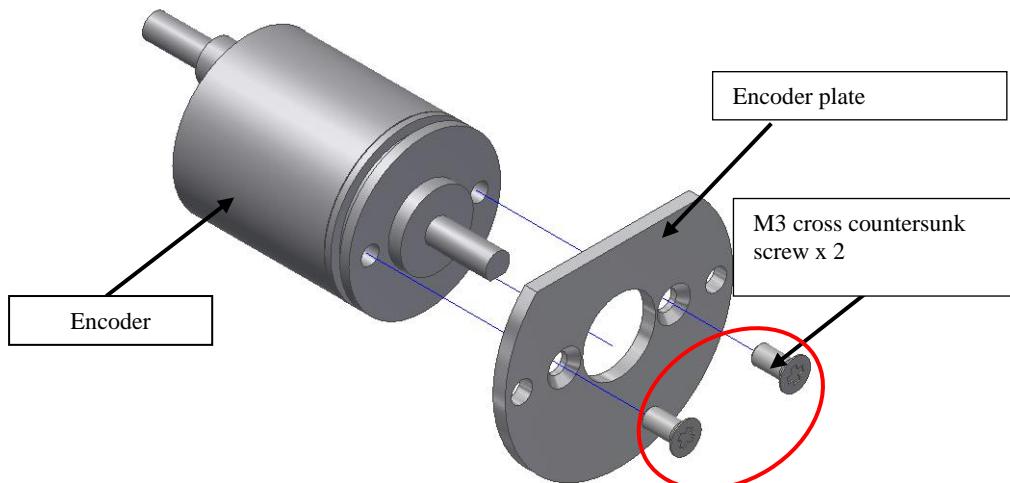


Fig 5.9 Installation of Encoder Plate

- (13) Install the encoder portion to the bearing mounting plate.
(M3 hexagon socket head cap screw x 2) ※ Tightening torque: 0.6 N.m

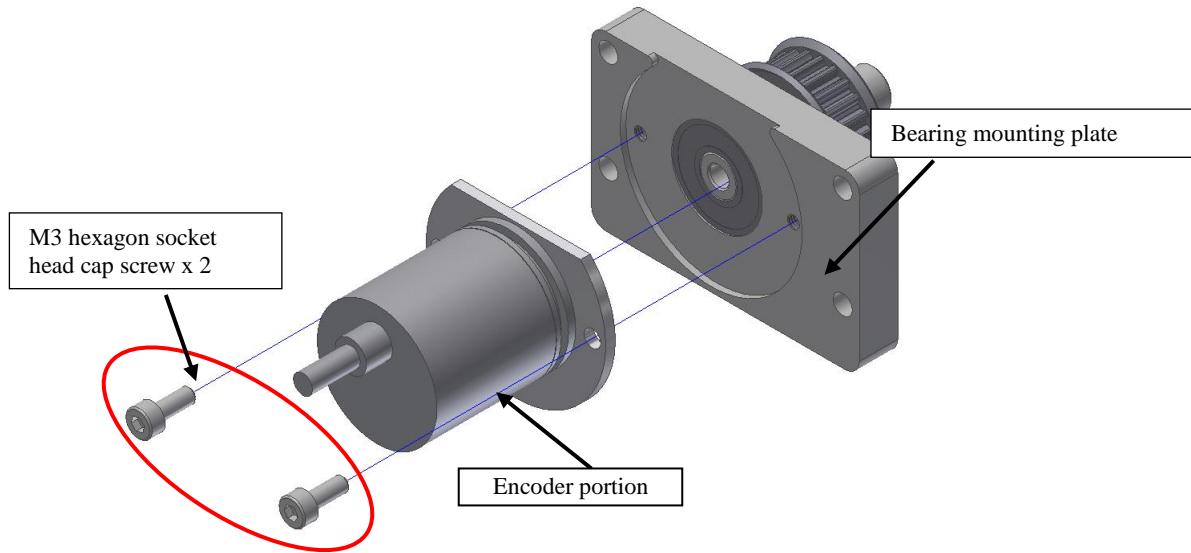


Fig 5.10 Installation of Encoder Portion

- (14) Fix the set screws that fixes the encoder shaft.
(M3 hexagon socket head cap screw x 2) ※ Tightening torque: 0.6 N.m
※ Apply screw lock (TB134 4H ThreeBond) to screws to be used.

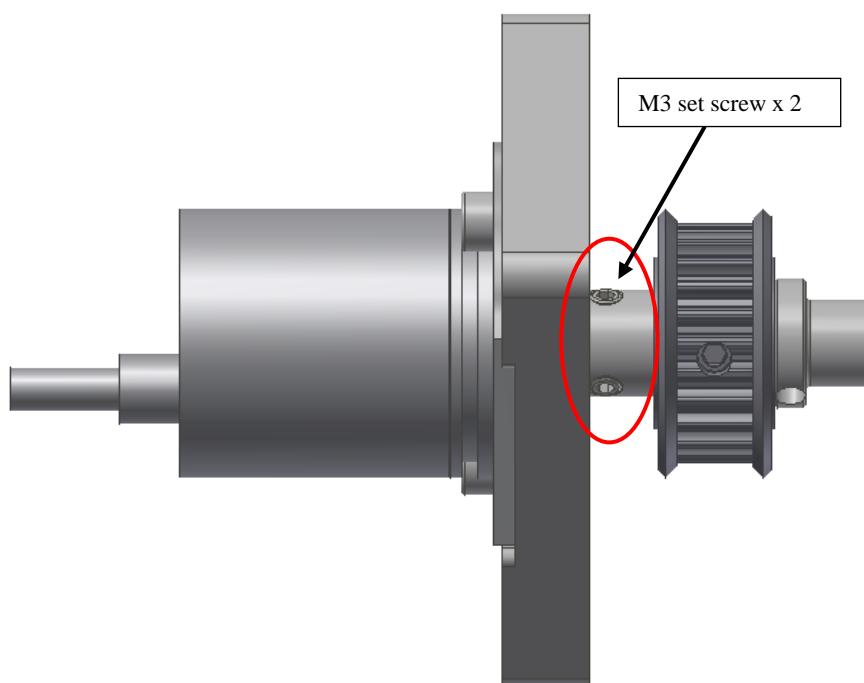


Fig 5.11 Fixing of Set Screws

- (15) Fix the screws to install the bearing mounting plate.

(M3 hexagon socket head cap screw x 4) ※ Tightening torque: 1.3 N.m

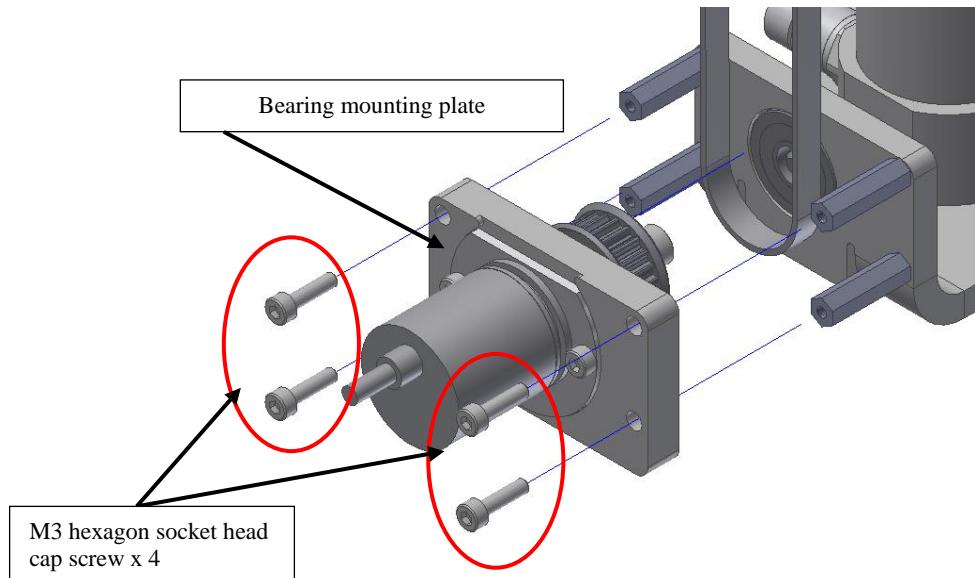


Fig 5.12 Installation of Bearing Mounting Plate

- (16) Fix the hexagon socket head cap screw on the inner side of the elevator base BKT.

(M5 hexagon socket head cap screws P = 3 x 1) ※ Tightening torque: 6.2 N.m

※ Apply screw lock (TB134 4H ThreeBond) to screws to be used.

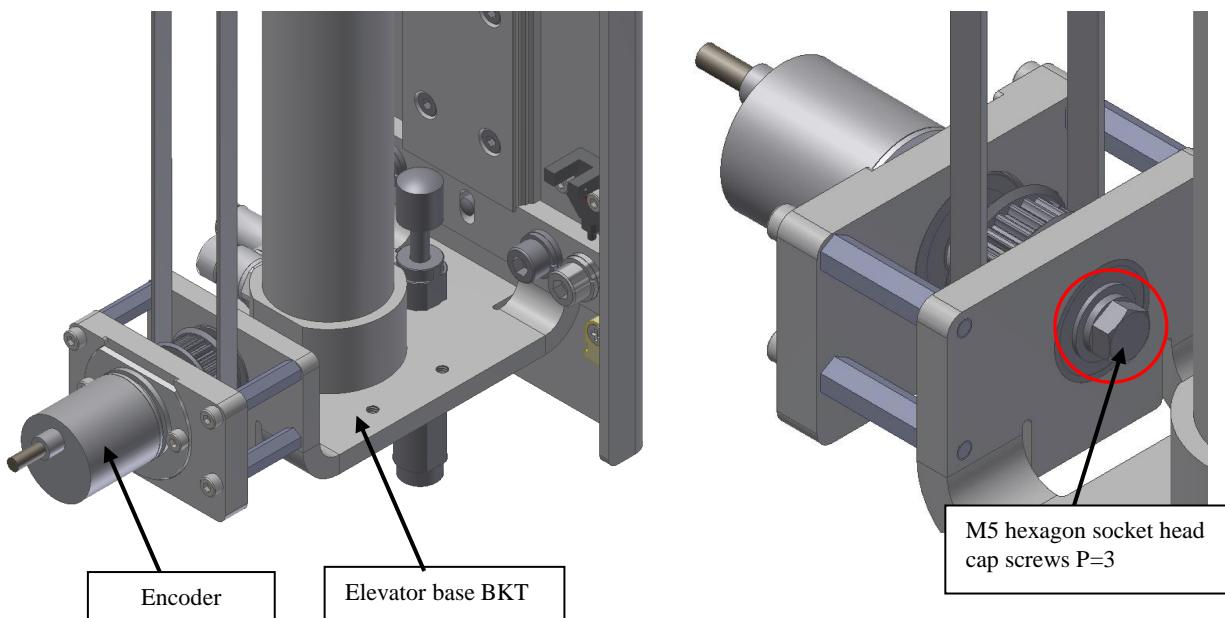


Fig 5.13 Fixing of Screws

- (17) Install the encoder relay connector. (※Refer to Fig 5.3 in the step (6).)
- (18) Turn the machine power ON, move the door to the loading position, and then turn the machine power OFF.
- (19) Fix the nuts loosened in the step (3) again.
At that time, move the idler fixing portion up/down to adjust the timing belt tension value to be 30 to 40 N. ※ Tightening torque: 6.2 N.m
※ Apply screw lock (TB134 4H ThreeBond) to fixing nuts.

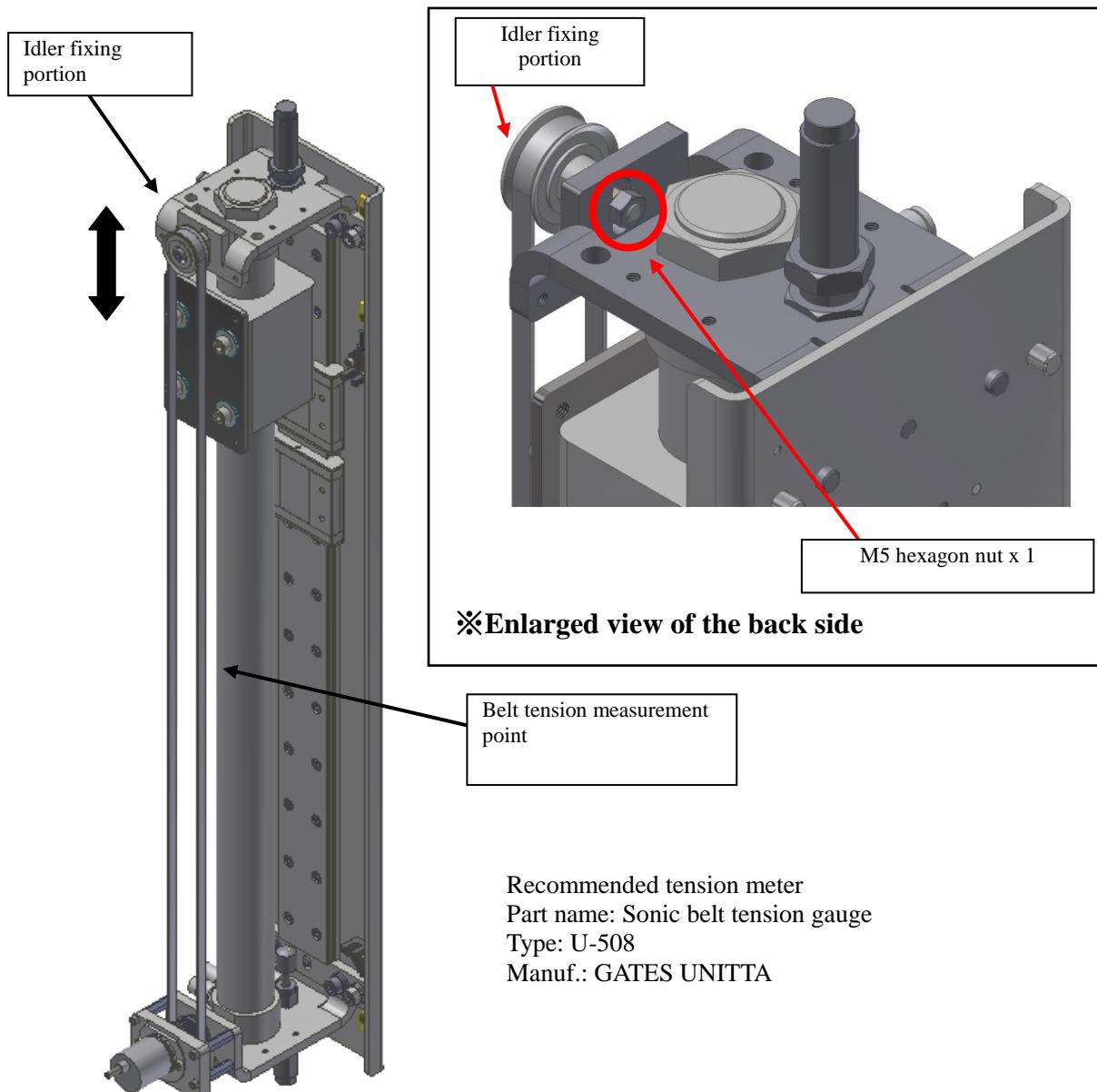
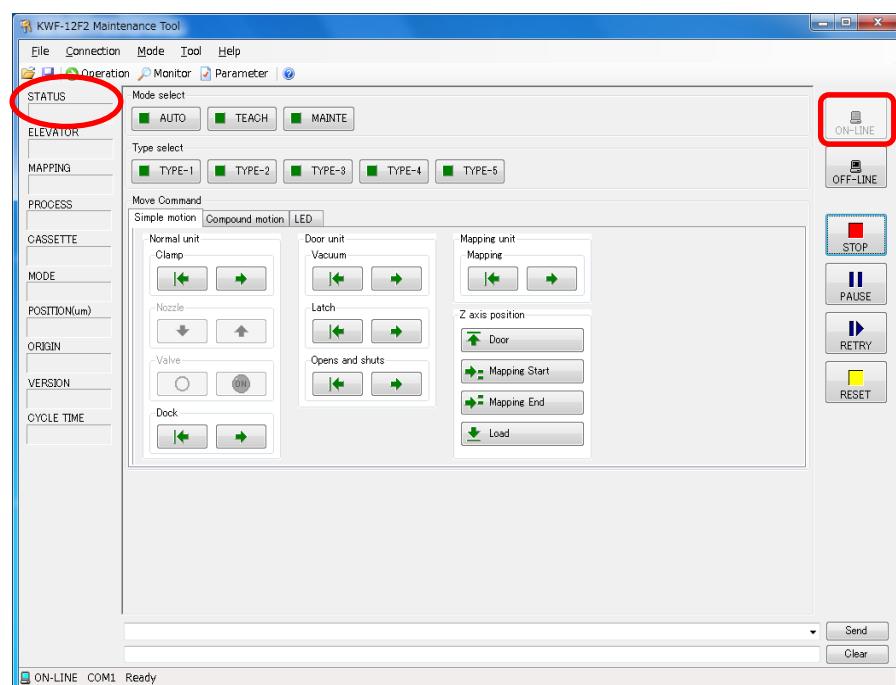


Fig 5.14 Nut Fixing and Belt Tension Measurement Point

Table 5.1 Tension Meter Setting Value

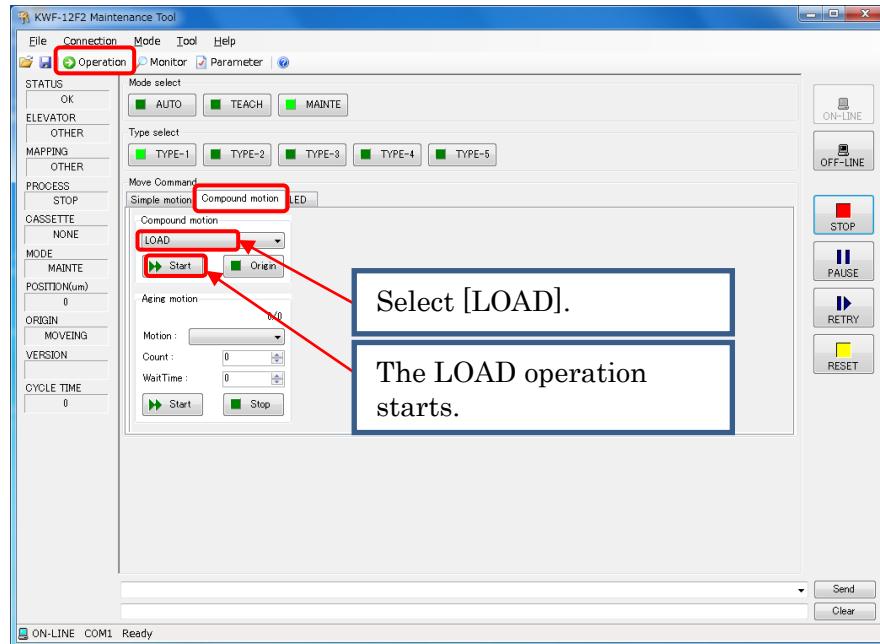
Setting Description	Set Value	Description
MASS	2.5	Belt unit mass (g/Width mm x Length m)
WIDTH	6	Belt width (mm)
SPAN	557	Distance between the Pulley's shafts (mm)
-	30 to 40 N	Tension value (N)

- (20) Turn on the power.
- (21) Conduct the Z-axis (lifting shaft) calibration by the following procedure.
- ① Connect the PC with KWF-12F2 Maintenance Tool installed, and the maintenance port of this machine, with the RS-232C cable.
 - ② Start the KWF-12F2 Maintenance Tool.
 - ③ Click a button of “ON-LINE”. Communication is started between PC and this machine.
- ※ When the PC becomes the communication state, STATUS becomes OK.

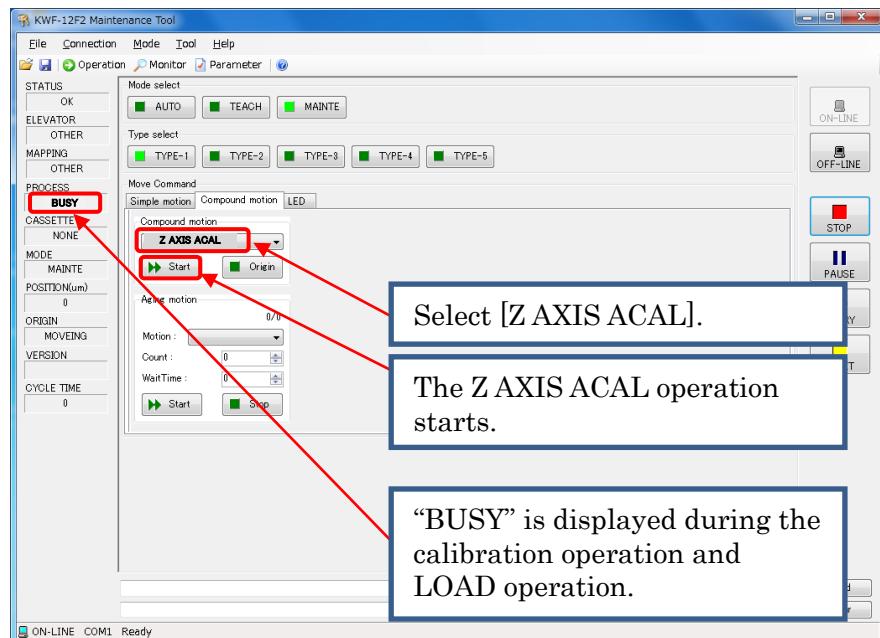


- ④ Upload the current parameter.
Refer to “Chapter 6, 6.1.1 Parameter Upload”.
- ⑤ Put a FOUP on this machine.

- ⑥ Perform the LOAD operation in KWF-12F2 Maintenance Tool.

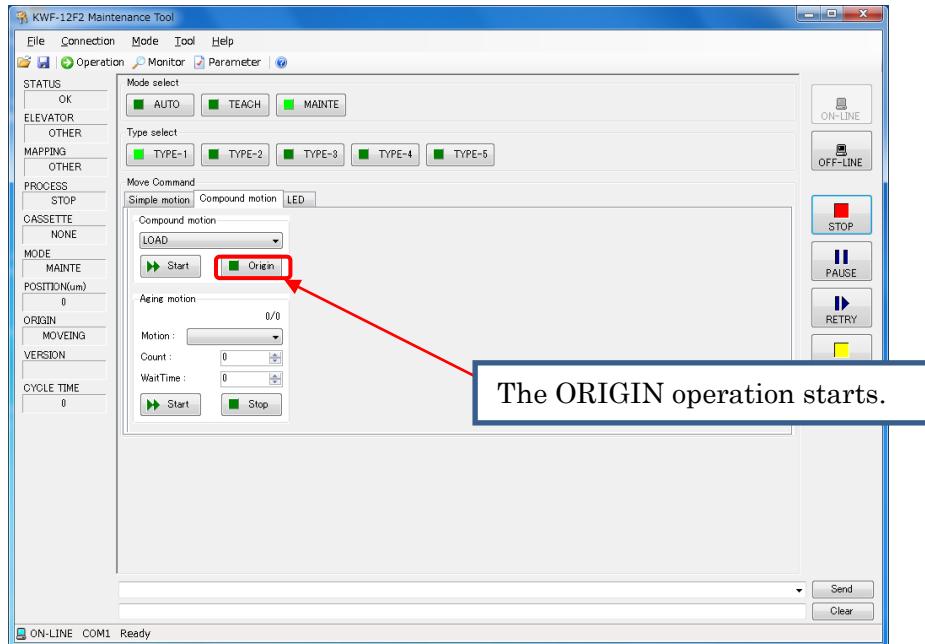


- ⑦ Perform Z-Axis ACAL in KWF-12F2 Maintenance Tool.



When Z AXIS ACAL cannot be completed, download the parameter stored before the operation, in this machine.

- ⑧ Perform the unload “ORIGIN” operation in KWF-12F2 Maintenance Tool.



- ⑨ Remove a FOUP from this machine, and finish Z-axis (Lifting shaft) calibration.
 (22) Next, conduct the mapping calibration.
 Refer to “Chapter 8, 8.5.2. Operating Procedure”.
 (23) If there is no problem on the operation, install the main cover.
 ● Estimated work time: 45 minutes

5. 2 CPU Board Replacement

- Parts: CPU board for replacement Type: HPC-979 (Hirata)
- Tools: Cross head screwdriver, hexagon wrench (M3)
- Preparation: PC with a maintenance software “KWF-12F2 Maintenance Tool” installed, RS-232C serial cable (cross cable), USB – serial conversion connector (If there is no RS-232C port in the PC)
- Work procedure:
 - (1) Upload the present parameter.
 “Refer to Chapter 6, 6.1.1 Upload Parameter.”
 - (2) Turn the machine power OFF.
 - (3) Remove the main cover. (M4 cross-recessed binding head screw x 4)
 - (4) Disconnect all connectors in the CPU board.
 (Some connectors require a cross head screwdriver.)
 - (5) Remove the CPU board. (M3 hexagon socket head cap screw x 6)
 - (6) Replace it with a new CPU board.
 - (7) Attach the connectors following the connector’s numbering.

- (8) Turn the machine power ON.
- (9) Set up.

When the CPU board is replaced or the parameter is wrong, conduct the set up of the CPU board again.

Refer to ➔ “Chapter 6, 6.3 Resetting CPU Board”

- (10) If there is no problem in the operation, install the main cover.

- Estimated work time: 30 minutes

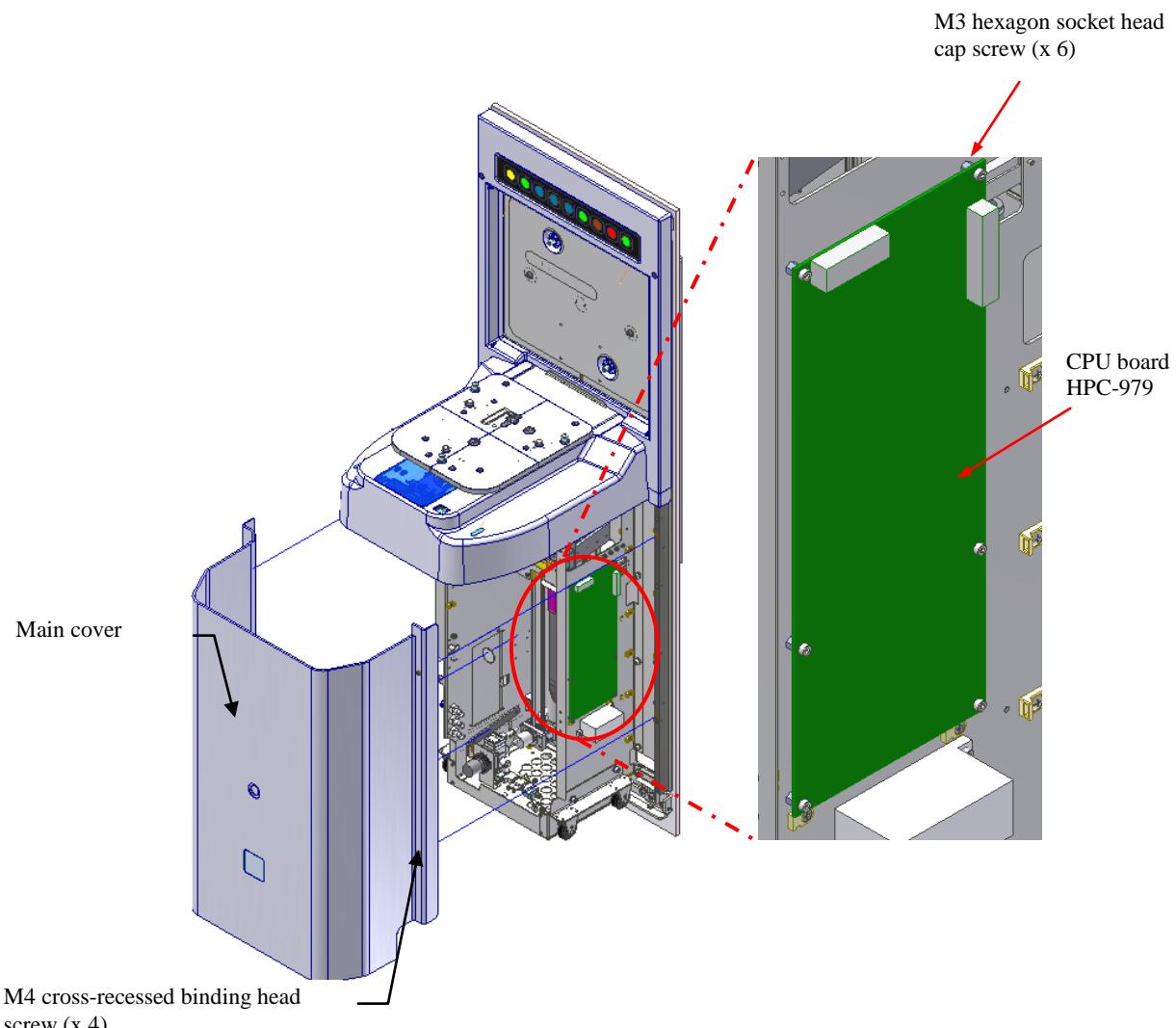


Fig 5.15 CPU Board Replacement

5.3 Replacement of the Clock Battery

**NOTE**

When the clock battery is running down, follow the procedure below to replace the battery.

For instruction on disposal of the clock battery after replacement, refer to “4.4.1 Clock Battery Disposal”.

- Parts: Clock battery Type: ML2032WK2 (Hirata)
Insulator lock type: AB100 (HellermannTyton)
- Tools: Cross head screwdriver, nipper
- Work procedure:
 - (1) Turn the machine power OFF.
 - (2) Remove the main cover. (M4 cross-recessed binding head screw x 4)

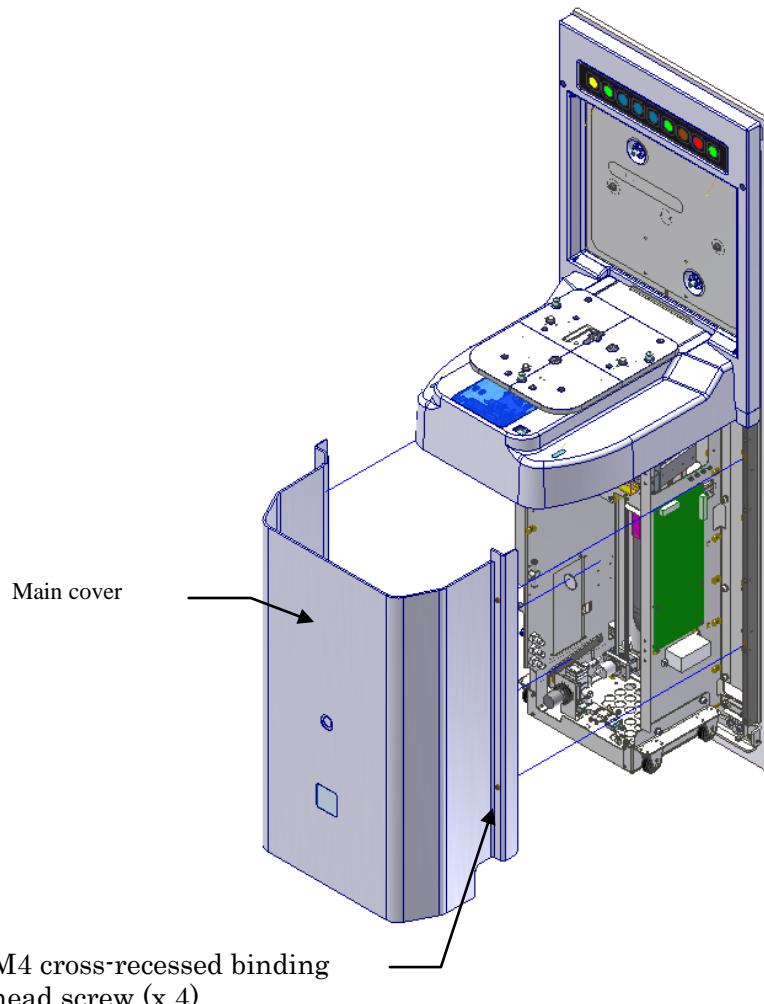


Fig 5.16 Removal of Main Cover

- (3) Replace the clock battery connected to J4 on the CPU board (HPC-979).



The clock battery is fixed with a fastening strap. At the time of replacement, cut the fastening strap. Fix a new clock battery with a fastening strap.

- Estimated work time: 10 minutes

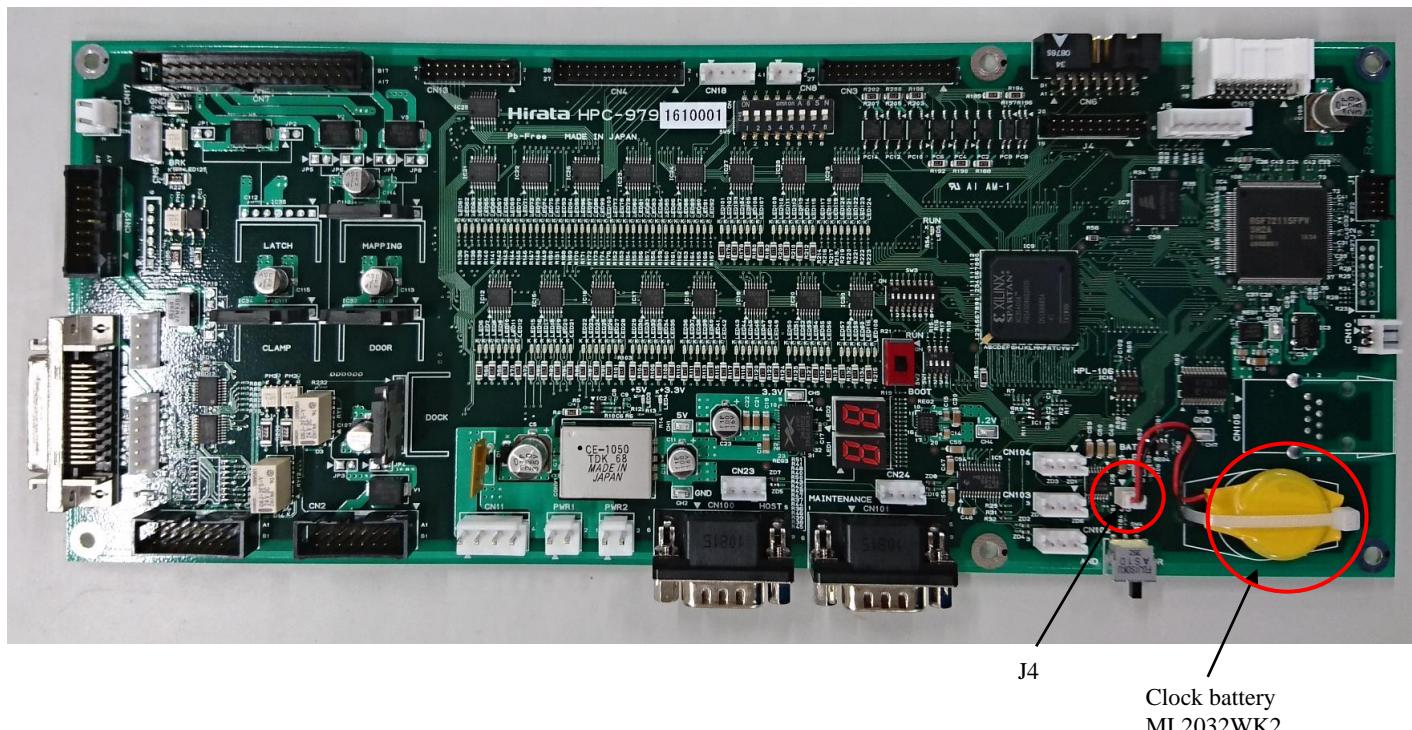


Fig 5.17 CPU Board (Replacing Clock Battery)

Chapter 6. SET UP

This machine is setup before factory shipment. Setup will be needed again in following cases.

- Updating the program
Refer to ⇨ “6.1 Program Version Update”
- Modifying the control method of the indicator lamp (switching between external control and internal control)
Refer to ⇨ “6.2 Changing the Indicator Lamp Settings”
- Replacing the CPU board or resetting.
Refer to ⇨ “6.3 Resetting CPU Board”

Following items are needed to setup:

- PC with the maintenance software “KWF-12F2 Maintenance Tool” installed
- RS-232C cross cable to connect PC and this machine

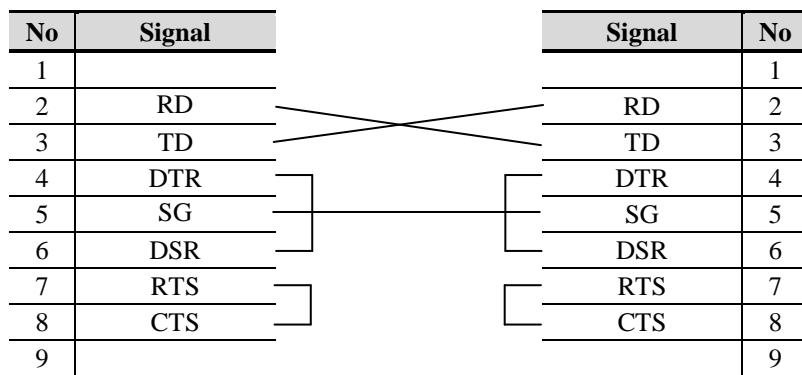


Fig 6.1 RS-232 Cross Cable

- USB - serial conversion connector (If there is no RS-232C port in the PC)

6.1 Program Version Update

The version up of the program is executed upon adding the specifications.
Follow the procedure below to perform program version update.

- (1) Uploadⁱ the current parameters and save them to a file.

Refer to → “6.1.1 Parameter Upload”

- (2) Downloadⁱⁱ the most recent program (update).

Refer to → “6.1.2 Program Download”

- (3) Download the parameters.

Refer to → “6.1.3 Parameter Download”

6.1.1 Upload Parameter

There is rarely such a case that data is initialized upon a version-up.
Therefore the parameter upload is executed and the current data is saved.
The upload procedures are as follows:

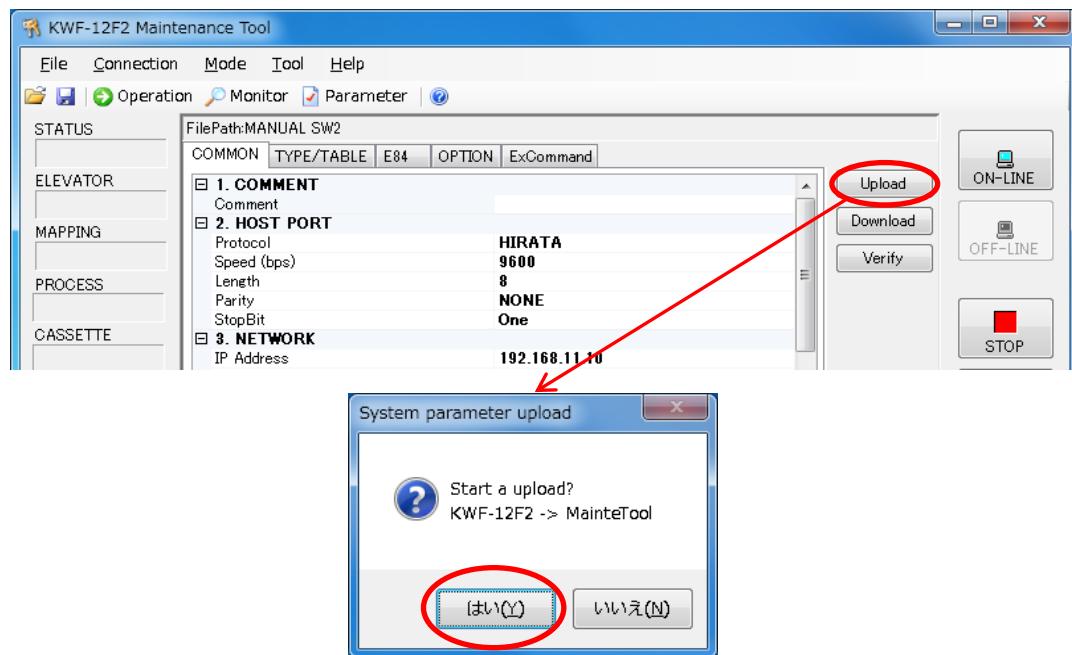
- (1) Use an RS-232C cable to connect the PC with the KWF-12F2 Maintenance Tool installed to the maintenance port of this machine.
- (2) Start the KWF-12F2 Maintenance Tool.
- (3) Click the “Parameter” tab, and then click the “ON-LINE” button.
Communication begins between the PC and this machine.



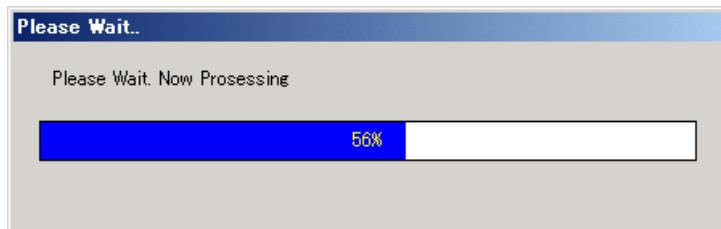
ⁱ Upload: Loading data from the FOUP Opener to the PC

ⁱⁱ Download: Writing data from the PC to the FOUP Opener

- (4) Click the “Upload” button in the “COMMON” tab.
The “Upload” dialog box appears.



- (5) Click the “Yes” button to start upload. During upload, the progress bar is displayed.



- (6) When the upload has properly been completed, the “Please Wait... ” dialog box is automatically closed.
(7) Press the “Save” button and save the uploaded data in the desired location.



NOTE

If an error occurs during upload, attempt the upload again. Save the uploaded parameters to a file and store them carefully.

6.1.2 Program Download

Follow the procedure below to download the program.

- (1) Move this machine to its home position and turn OFF the power switch.
- (2) Remove the main cover, and slide the lever of the slide switch “SW1” on the CPU board (HPC-979) to the BOOT side.

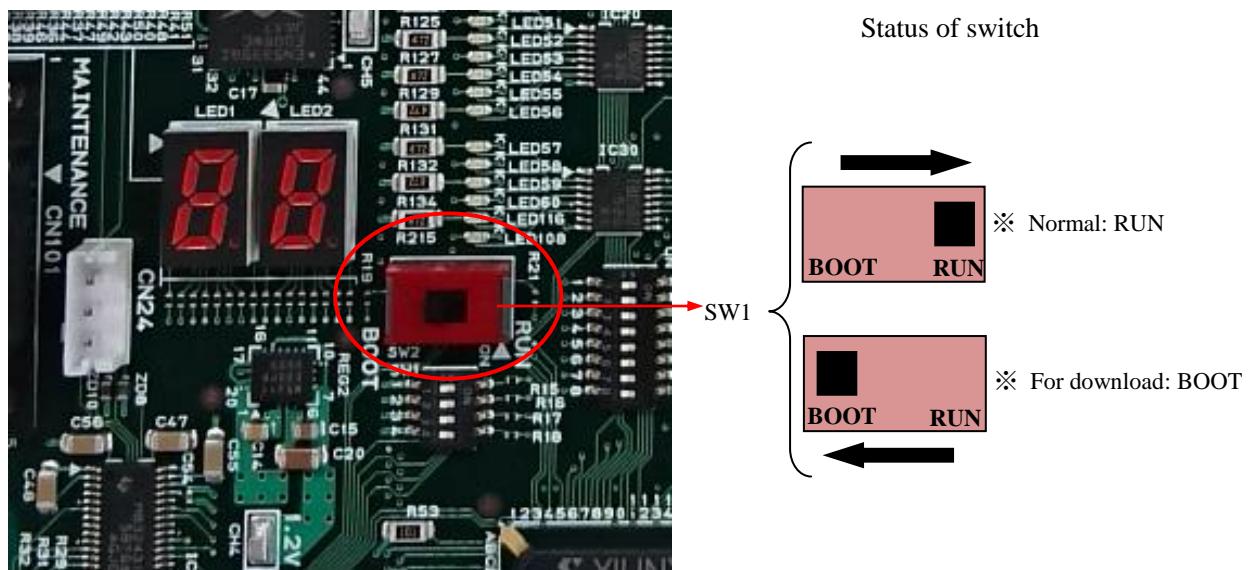
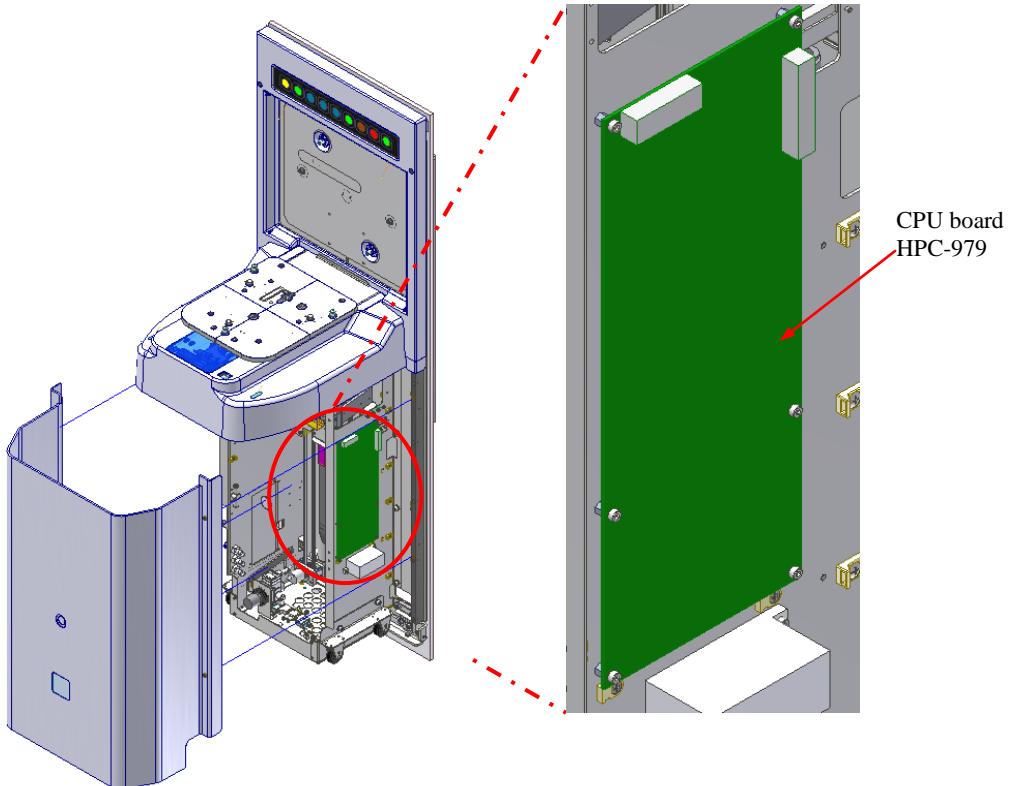


Fig 6.2 CPU Board (HPC-979) and Slide Switch “SW1”

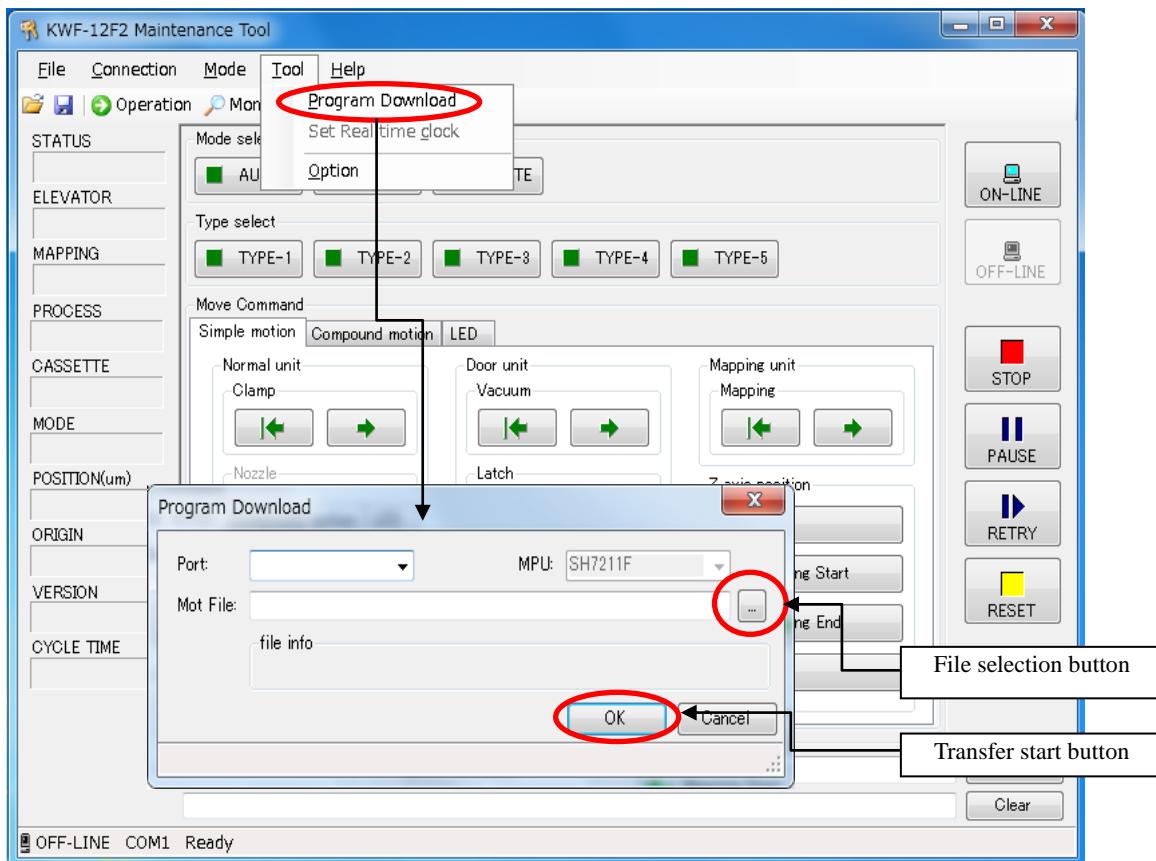
- (3) Turn the machine power ON again.
- (4) Use an RS-232C cable to connect the PC with the KWF-12F2 Maintenance Tool installed to the maintenance tool of this machine.
- (5) Start KWF-12F2 Maintenance Tool.



NOTE

Do not press the “ON-LINE” button before transferring the program.

- (6) Click the “Program Download” button from “Tool” of the menu bar. The “Program Download” dialog box appears.

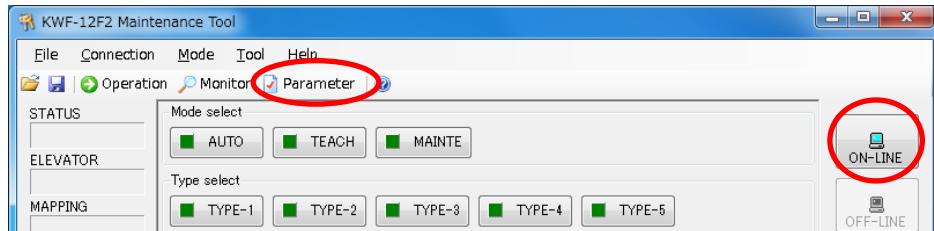


- (7) Click the file selection button and specify the program file (not the extension of .12F2 but .mot) provided by Hirata.
- (8) Click the transfer start button to start to transfer.
- (9) After completing the transfer, turn OFF the power switch of this machine, and slide the slide switch “SW1” on the CPU board to the RUN side.

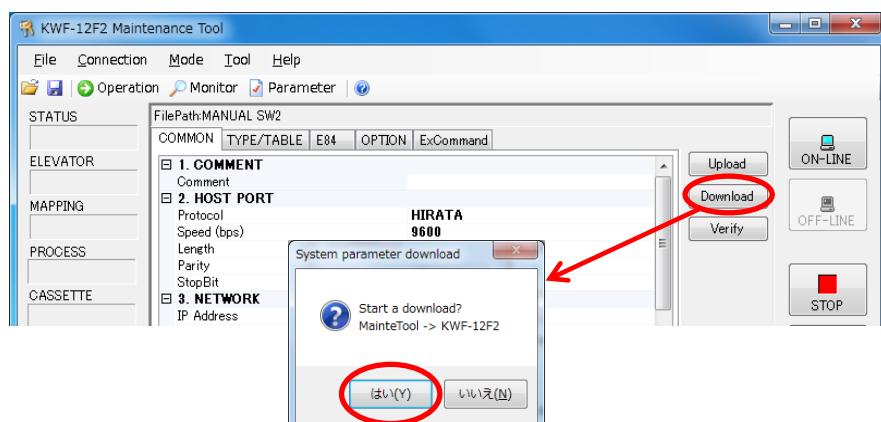
6.1.3 Parameter Download

Follow the procedure below to download the parameters.

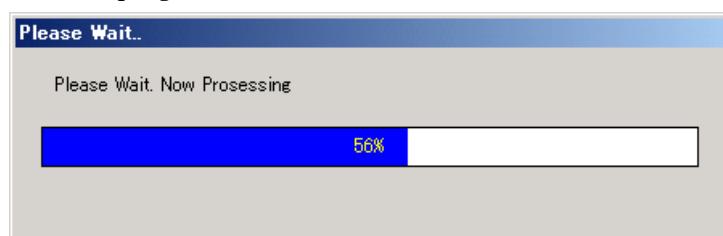
- (1) Use an RS-232C cable to connect the PC with the KWF-12F2 Maintenance Tool installed to the maintenance port of this machine.
- (2) Start the KWF-12F2 Maintenance Tool.
- (3) Click the “Parameter” tab, and then click the “ON-LINE” button. Communication begins between the PC and this machine.



- (4) Click the “Open” button, and open the saved parameters. (File of extension .12F2)
- (5) Click the “Download” button in the “COMMON” tab. The “Download” dialog box appears.



- (6) Click the “Yes” button to start download. A progress bar is displayed while the download is in progress.



- (7) When the download is completed successfully, the “Please Wait...” dialog box closes automatically.



If an error occurs during download, attempt the download again.

6.2 Changing the Indicator Lamp Settings

For the indicator lamp, there are two methods of the control with command and the control from the upper level signal. The change of the indicator lamp setting is executed upon changing the control method. The indicator lamp control setting is just like the specification upon shipping.

The indicator lamp control settings can be changed by using a DIP switch (SW5) on the CPU board HPC-979.

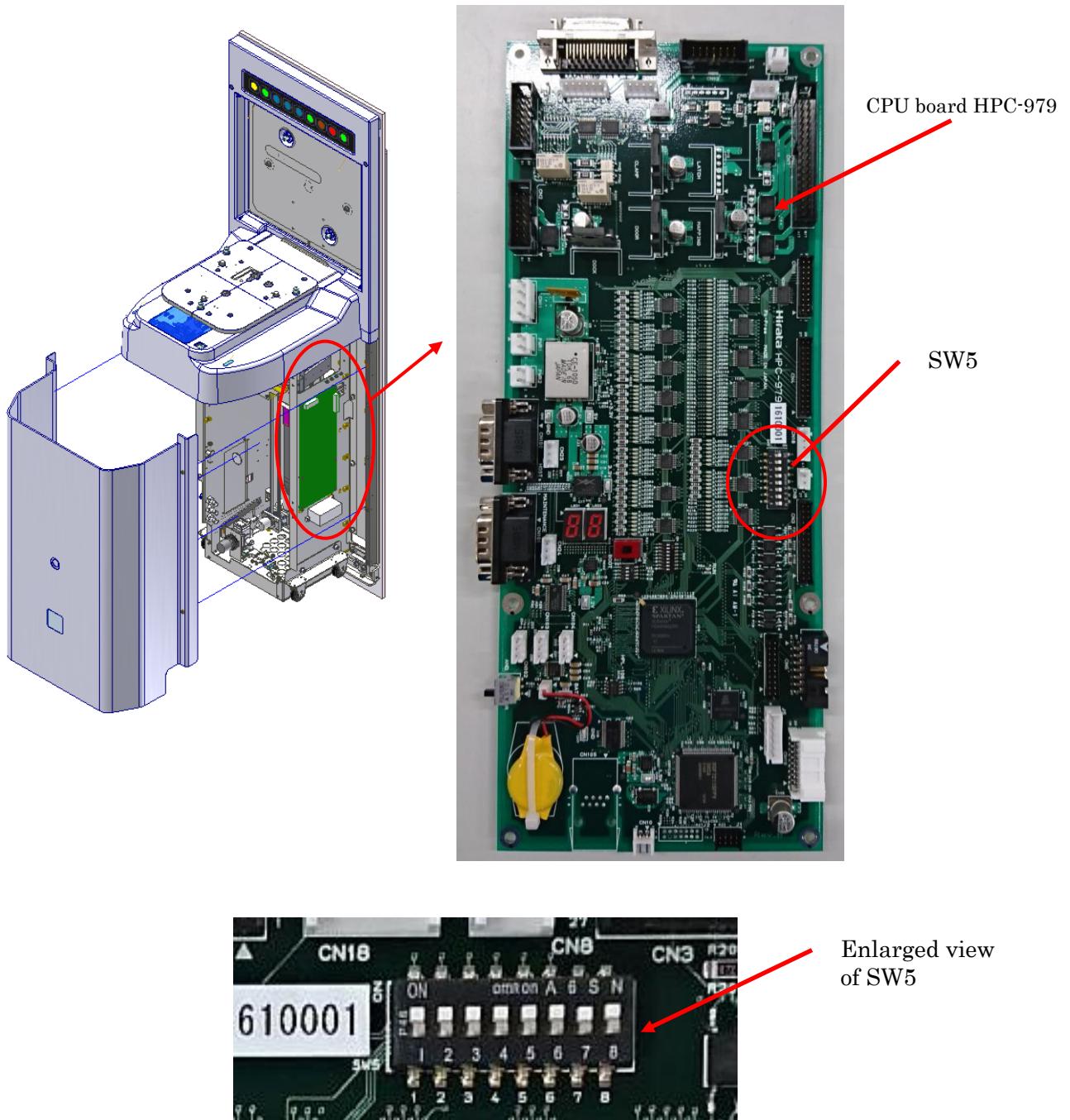


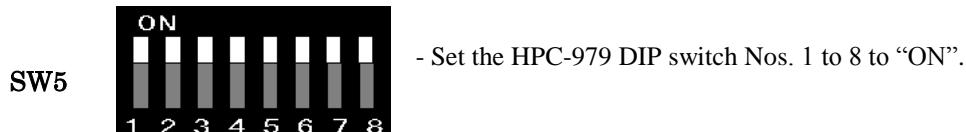
Fig 6.3 Position of the DIP Switch (SW5)



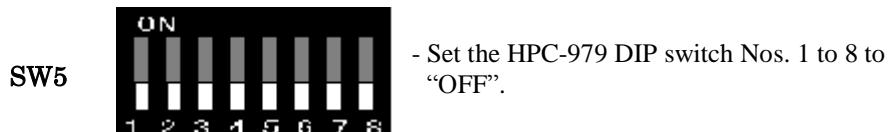
NOTE

The power of this machine must be turned OFF before the indicator lamp settings are changed. When the switch settings are completed, reinstall the removed connectors in their original positions to complete the procedure.

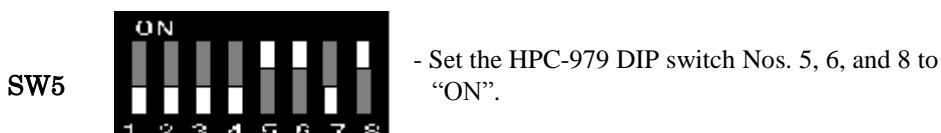
- (1) If the indicators are to be controlled by a higher level command, set SW5 Nos. 1 to 8 to “ON”.



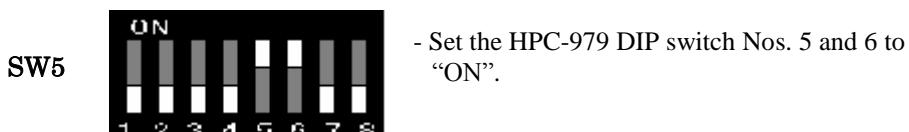
- (2) If the indicators are to be controlled by a higher level PIO, set SW5 Nos. 1 to 8 to “OFF”.



- (3) If PRESENCE and PLACEMENT are to be controlled by the load port, and LOAD and UNLOAD are to be controlled by a higher level PIO, then change SW5 Nos. 5, 6, and 8 to “ON”.



- (4) In case where both PRESENCE and PLACEMENT are controlled with the load port and both LOAD and UNLOAD are controlled by a higher level PIO, when the power used for the lamp control varies depending on CNA1 and CNA6, set SW5 Nos. 5 and 6 to “ON”.



6.3 Resetting CPU Board

If the CPU board has been replaced, or if the parameters have been damaged, repeat CPU board setup. The following items are required in order to repeat setup.

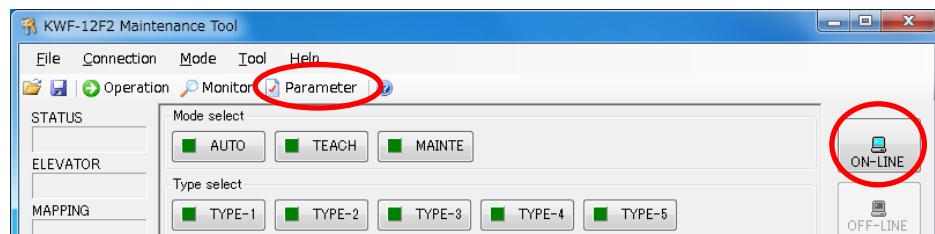
- ① Program file (only when the CPU board was replaced) → extension .mot file
- ② Parameter file → extension .12F2 file

Follow the procedure below to repeat CPU board setup.

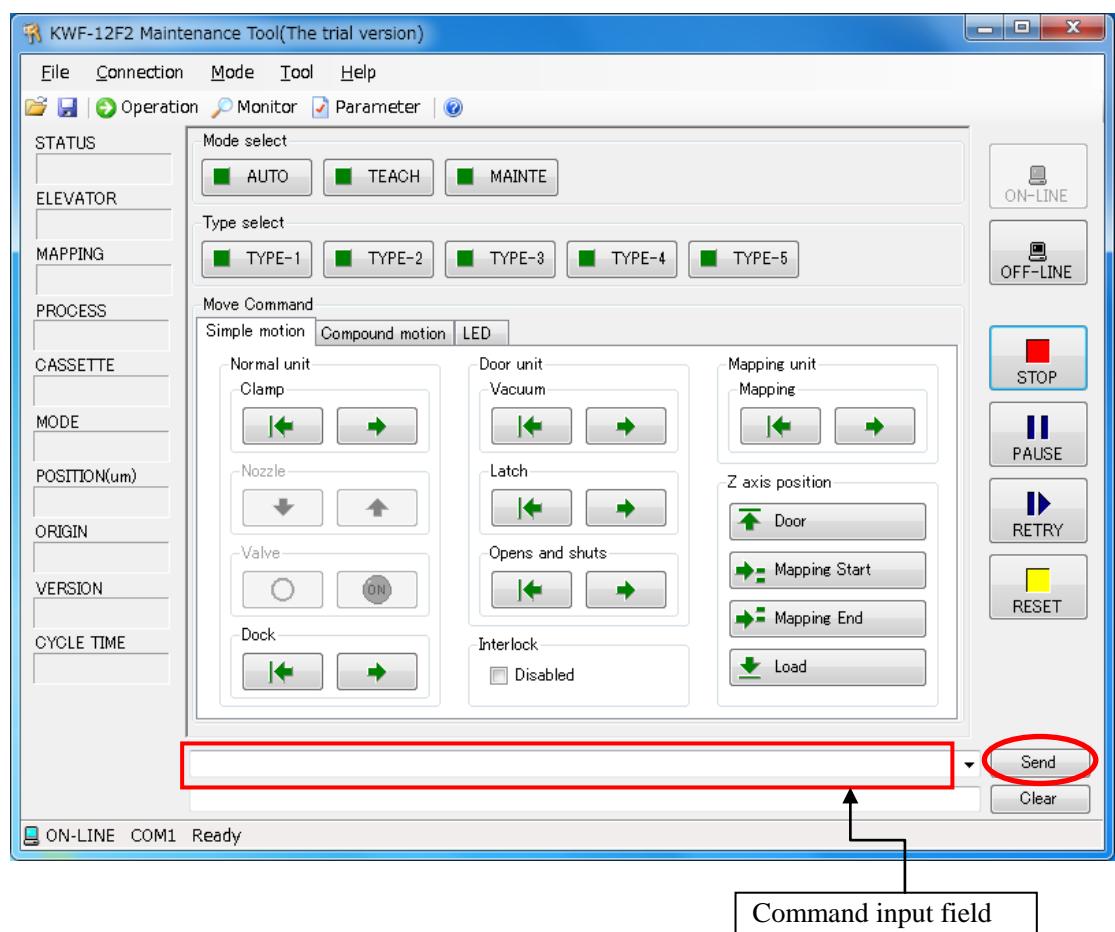
- (1) Download the program (only if the CPU board was replaced).
Refer to ⇒ “6.1.2 Program Download”
- (2) Initialize the parameters.
Refer to ⇒ “6.3.1 Parameter Initialization”
- (3) Download the parameters.
Refer to ⇒ “6.1.3 Parameter Download”
- (4) Upload the parameters.
Refer to ⇒ “6.1.1 Parameter Upload”

6.3.1 Parameter Initialization

- (1) Use an RS-232C cable to connect the PC with the KWF-12F2 Maintenance Tool installed to the maintenance port of this machine.
- (2) Start the KWF-12F2 Maintenance Tool.
- (3) Click the “Parameter” tab, and then click the “ON-LINE” button. Communication between PC and this machine starts.



- (4) Type “SET:DFAL” in the command input field, and click the “Send” button.



- (5) Turn the machine power ON again.

Chapter 7. LED Indicators

LED indicators on the CPU board HPC-979 show the status of this machine such as signal input. The layout and description of the LED indicators are as follows.

7.1 Layout of LED

The position of LED indicators for input/output signal monitor is on the CPU board HPC-979 in the middle of the side surface of this machine.

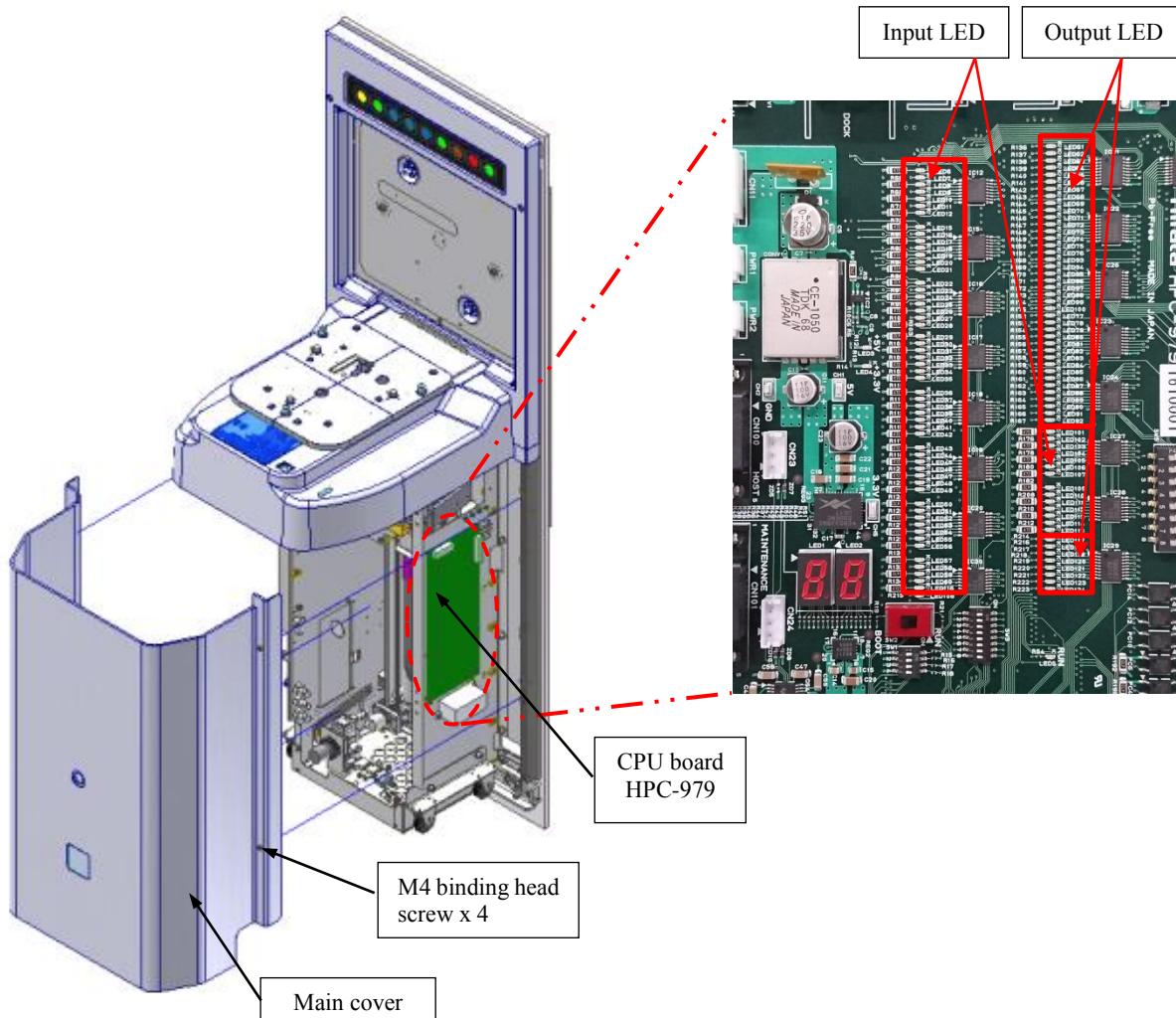


Fig 7.1 Layout of LED

7.2 Status LED

The 7 segments LED on the CPU board HPC-979 in Fig 7.1 shows the status of this machine. Fig 7.2 shows the details.

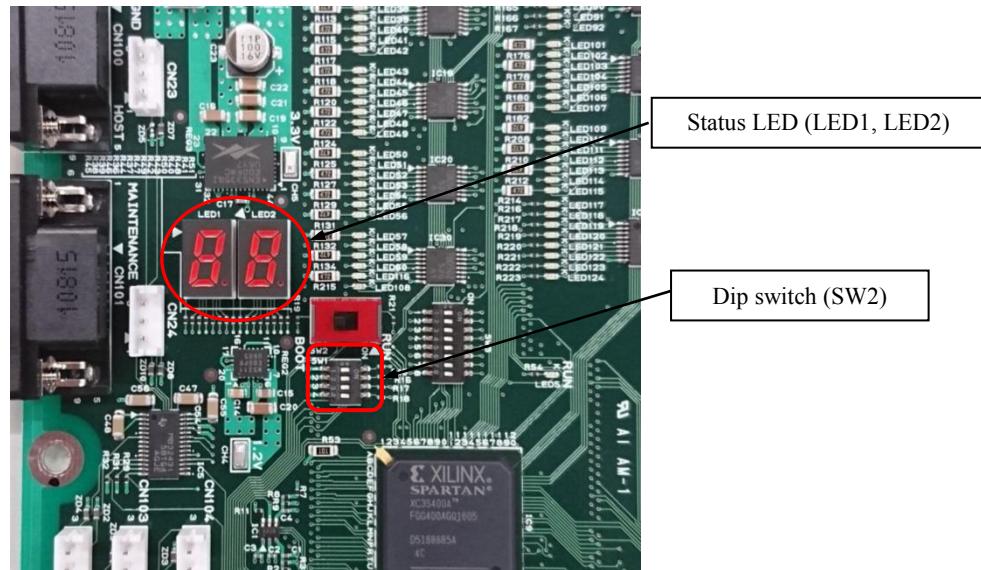


Fig 7.2 Details of Status LED

Both indicators in the status LED show the figure of “8” repeatedly during normal operation.

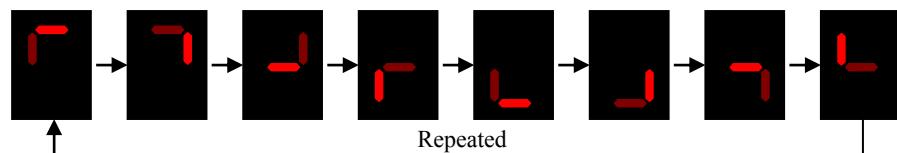


Fig 7.3 LED Sign during Normal Operation

To show the status on the LED indicator, set the dip switch (SW2) as in Fig 7.4. Setting No. 2 switch OFF enables the status LED.

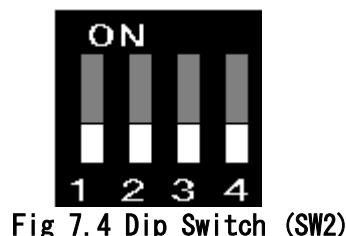


Fig 7.4 Dip Switch (SW2)

7.3 LED Number and Signal Name on the CPU Board

Following table is the list of the LED numbers and signals on the CPU board HPC-979 of this machine.

7.3.1 Input LED Number and Signal Name

Table 7.1 LED Number and Signal List

LED number	Input signal name	LED number	Input signal name
LED6	DI56 (NOT USED)	LED43	TRAY UNDOCK ⁱ
LED7	DI57 (NOT USED)	LED44	DI28A (NOT USED)
LED8	DI62 (NOT USED)	LED45	DI28B (NOT USED)
LED9	DI58 (NOT USED)	LED46	DI28C (NOT USED)
LED10	DI59 (NOT USED)	LED47	OK TO OPERATE (PIO)
LED11	DI60 (NOT USED)	LED48	AVAILABLE (PIO)
LED12	DI61 (NOT USED)	LED49	DI31 (NOT USED)
LED15	PRESENCE A	LED50	PLACEMENT 1
LED16	PRESENCE B	LED51	PLACEMENT 2
LED17	WAFER PROTRUDE	LED52	PLACEMENT 3
LED18	PINCH HAND ⁱ	LED53	DI35 (NOT USED)
LED19	DOOR VAC ACTV	LED54	DI36 (NOT USED)
LED20	DOOR UP	LED55	DI37 (NOT USED)
LED21	DOOR DOWN	LED56	DI38 (NOT USED)
LED22	ELV VACUUM ACTV	LED57	DI39 (NOT USED)
LED23	MANUAL SW2	LED58	DI48 (NOT USED)
LED24	FAN ALARM ⁱ	LED59	PLACEMENT (ELEVATOR INTERLOCK INPUT)
LED25	MDE SEL	LED60	DI49 (NOT USED)
LED26	MANUAL SW	LED101	N2 FLOW SW1 (NOT USED)
LED27	DI11 (NOT USED)	LED102	N2 FLOW SW2 (NOT USED)
LED28	DI12 (NOT USED)	LED103	N2 FLOW SW3 (NOT USED)
LED29	LATCH OPEN ⁱ	LED104	N2 FLOW SW4 (NOT USED)
LED30	LATCH	LED105	N2 PRESSURE (NOT USED)
LED31	DI15 (NOT USED)	LED106	N2 HUMUDITY (NOT USED)
LED32	MAPPING FWD	LED107	N2 NOZZLE UP (NOT USED)
LED33	MAPPING BWD	LED108	N2 NOZZLE DOWN (NOT USED)
LED34	DI18 (NOT USED)	LED109	TURN POSITION (NOT USED)
LED35	DI19 (NOT USED)	LED110	TURN ORIGIN (NOT USED)
LED36	MAPPING SENS1	LED111	TURN DOCK (NOT USED)
LED37	MAPPING SENS2	LED112	RSVI3 (NOT USED)
LED38	DOOR OPEN	LED113	RSVI4 (NOT USED)
LED39	DOOR CLOSE ⁱ	LED114	RSVI5 (NOT USED)
LED40	CLAMP	LED115	RSVI6 (NOT USED)
LED41	UNCLAMP	LED116	RSVI7 (NOT USED)
LED42	TRAY DOCK		

ⁱ Detection status when this machine is at origin (unload) and FOUP is not loaded. (Light up)

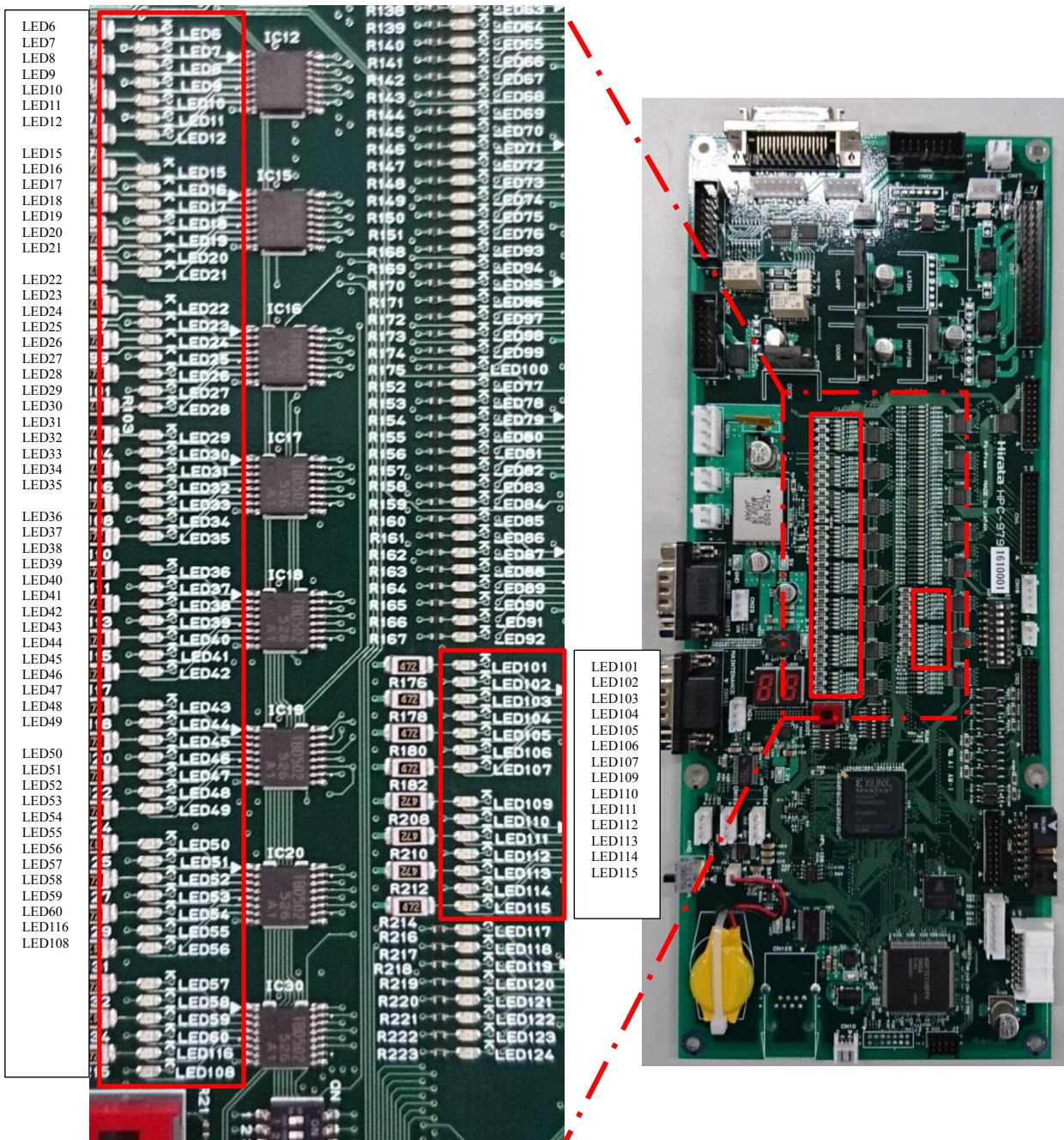


Fig 7.5 Input LED Layout

7.3.2 Output LED Number and Signal Name

Table 7.2 LED Number and Signal List

LED number	Output signal name	LED number	Output signal name
LED61	DOOR VAC ON	LED77	CLAMP
LED62	DOOR VAC OFF	LED78	UNCLAMP
LED63	ELV UP	LED79	TRAY DOCK
LED64	ELV DOWN	LED80	TRAY UNDOCK
LED65	MANUAL SW LED	LED81	DOOR OPEN (PIO)
LED66	DO5 (NOT USED)	LED82	LOAD PORT READY (PIO)
LED67	DO6 (NOT USED)	LED83	CARRIER PRESENCE (PIO)
LED68	MANUAL SW LED2	LED84	OPERATIONAL STATUS (PIO)
LED69	DOOR OPEN	LED85	CARRIER SET (PIO)
LED70	DOOR CLOSE	LED86	ALM LED
LED71	LATCH OPEN	LED87	LOAD LED
LED72	LATCH	LED88	UNLOAD LED
LED73	MAPPING FWD	LED89	PRESENCE LED
LED74	MAPPING BWD	LED90	PLACEMENT LED
LED75	DO14 (NOT USED)	LED91	STATUS1 LED
LED76	DO15 (NOT USED)	LED92	STATUS2 LED
LED93	N2 VALVE1 (NOT USED)	LED117	TURN CW (NOT USED)
LED94	N2 VALVE2 (NOT USED)	LED118	TURN CCW (NOT USED)
LED95	N2 VALVE3 (NOT USED)	LED119	RSVO2 (NOT USED)
LED96	N2 NOZZLE UP (NOT USED)	LED120	RSVO3 (NOT USED)
LED97	N2 NOZZLE DOWN (NOT USED)	LED121	RSVO4 (NOT USED)
LED98	DO45 (NOT USED)	LED122	RSVO5 (NOT USED)
LED99	DO46 (NOT USED)	LED123	RSVO6 (NOT USED)
LED100	DO47 (NOT USED)	LED124	RSVO7 (NOT USED)

ⁱ Detection status when this machine is at origin (unload) and FOUP is not loaded (Light up)

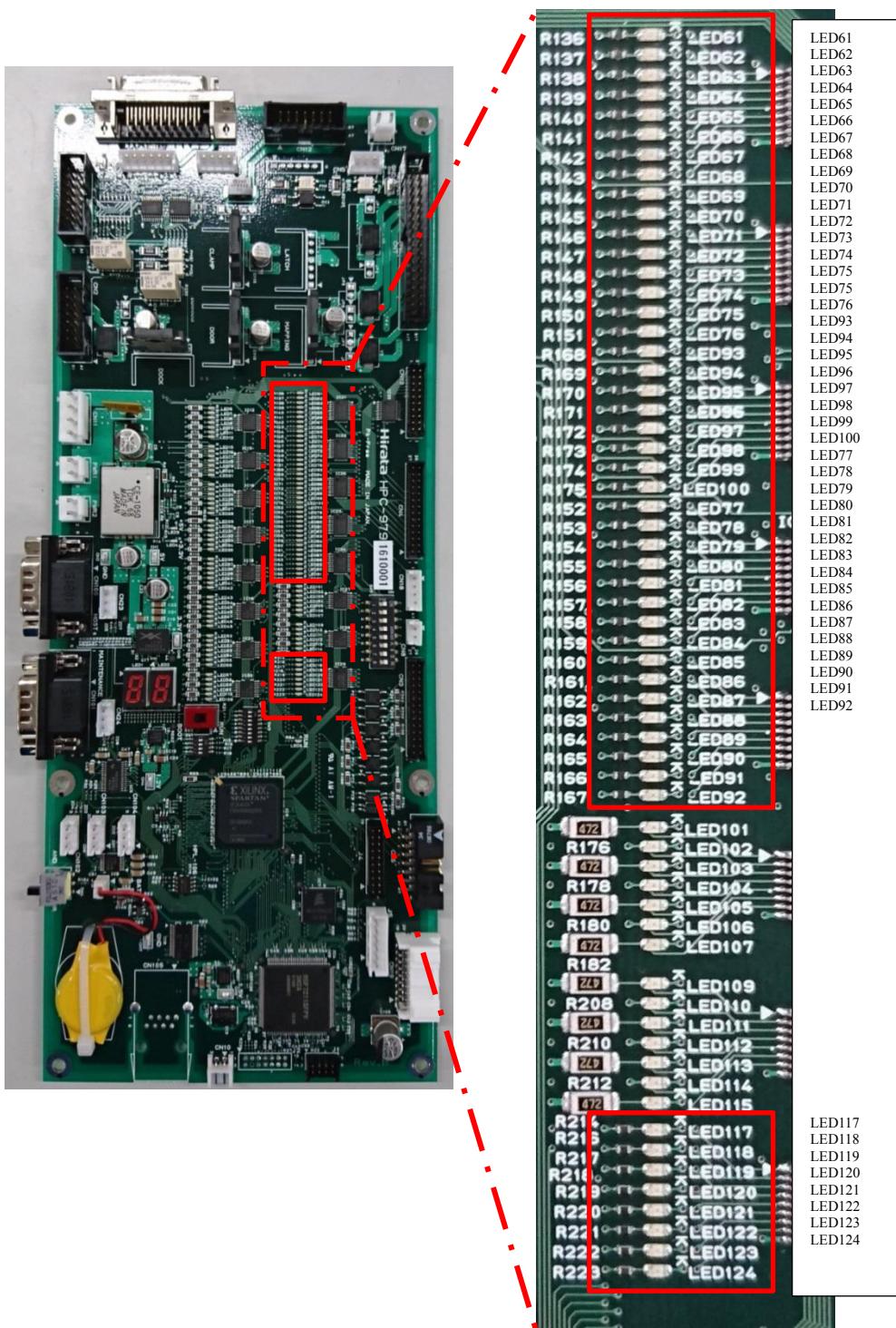


Fig 7.6 Output LED Layout

7.3.3 Option Output LED Number, Power LED Number, and Signal Name

Table 7.3 LED Number and Signal List

LED number	Output signal name	LED number	Power monitor signal name
LED13	DO48 (NOT USED)	LED3	+5 V
LED14	DO49 (NOT USED)	LED4	+3.3 V
LED125	BRAKE (NOT USED)		

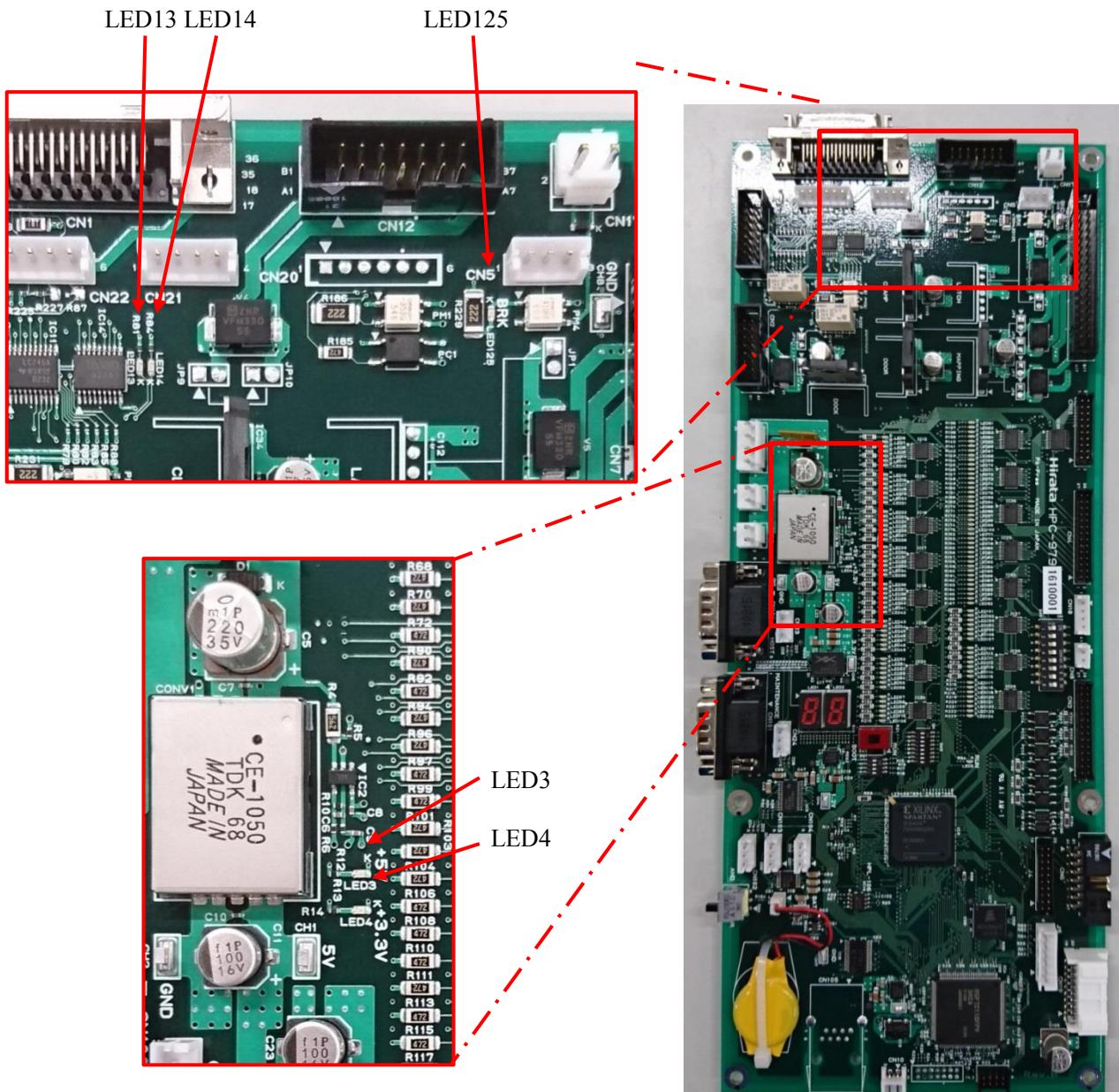


Fig 7.7 Option Output LED and Power LED Layout

Chapter 8. MAPPING

8.1 Mapping Parameter Setting

Mapping performs calculation and determination of the position and the thickness of the wafer based on mapping parameters.

In this machine, the following parameter is set to the rated value at the time of shipment. When it does not apply to a condition of the use, change the setting appropriately.

Mapping parameters can be modified by maintenance software KWF-12F2 Maintenance Tool or the commands. Refer to separate manuals for setting methods.

The following are the parameters used for mapping.

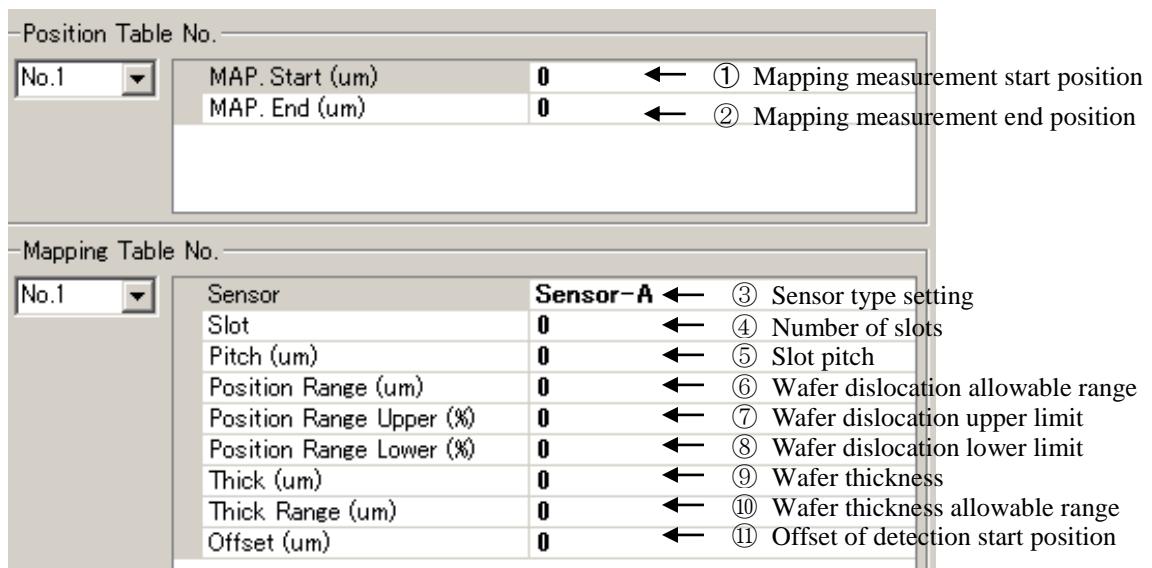


Fig 8.1 Mapping Setting Parameter

For the parameter setting contents, refer to “TYPE/TABLE screen”.



NOTE

The settings ① and ② are adjusted before factory shipment and are not required to be changed when a standard thickness wafer (775 µm) is used. In other cases, it is recommended to perform the mapping auto calibration (8.5.2) after the installation.

8.2 Mapping Operation

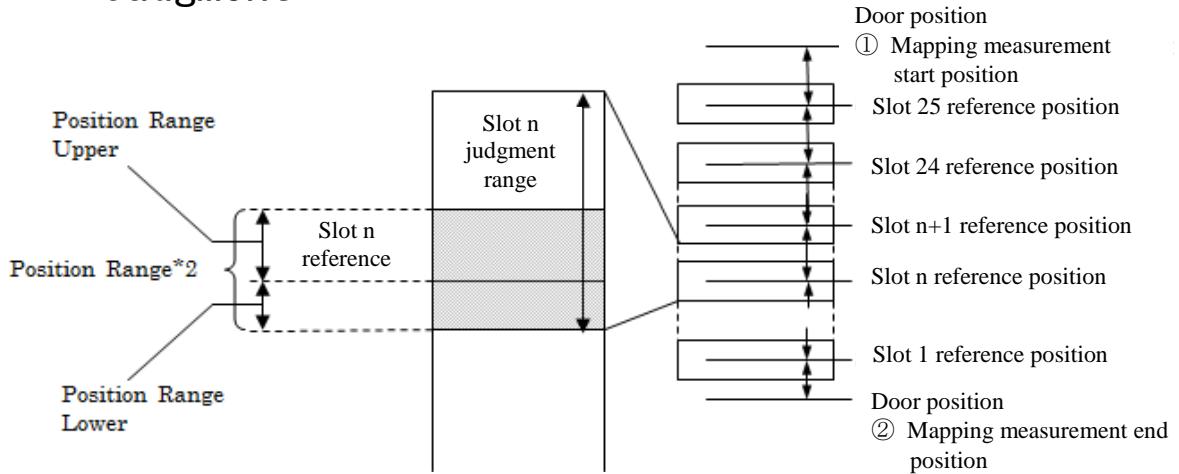
The mapping operation is performed according to the parameters of ① mapping measurement start position (hereinafter called “①”) and ② mapping measurement end position (hereinafter called “②”).

When the door locates to the position ①, the mapping unit moves to the overrun limit, and then wafer detecting process by mapping sensor starts. The door moves down to the position ②. The positions where the sensor turns to ON from OFF and also turns to OFF from ON are recorded during this motion.

The wafer detection can also be performed in the same manner when the door moves up from ② to ①.

The positions where the sensor turns to ON from OFF and also turns to OFF from ON can be recorded by the number of slots. If positions more than the number of slots are detected, an error occurs.

8.3 Width and Position Calculation and Pass/Fail Judgment



In position and thickness calculation and their pass/fail judgment, the position of the sensor ON-to-OFF change point detected by the mapping operation in the slot range is checked first. The reference position of slot (n) is obtained from the following equation.

*n = 1 indicates the top slot.

$$\text{Reference position of slot (n)} = (\textcircled{1} \text{ Mapping measurement start position} + \textcircled{11} \text{ Offset of detection start position} + \textcircled{5} \text{ Slot pitch} \times n)$$

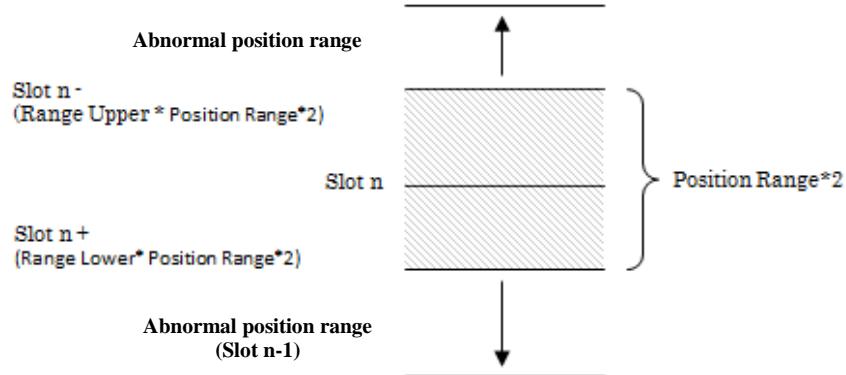
The range of (Position Range setting value $\times 2$)ⁱ including this reference position is the normal position range of the Slot n. The thickness judgment is performed when the detected wafer lower surface is within Position Range in the figure above.

The detected wafer thickness is judged as “thick”, “normal”, or “thin” depending on $\textcircled{9}$ Reference value of thickness detection and $\textcircled{10}$ Tolerance of thickness detection. The detailed judgment contents are described as follows.

- Normal position range: Range between the Slot n reference position - (Range Upper * Position Range*2) and the Slot n reference position + (Range Lower * Position Range*2)
 - Normal thickness range: Range between the thickness reference position - (Thick Range) and the thickness reference position + (Thick Range)
- ⁱ The above is true when the range includes the value of one-side range in the standard setting.

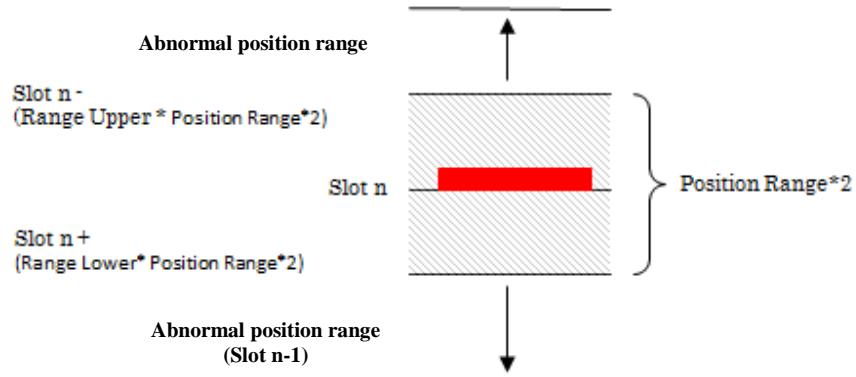
ⁱ In the standard setting, the parameter setting value includes the value of one-side range.

(1) None (result = 0)



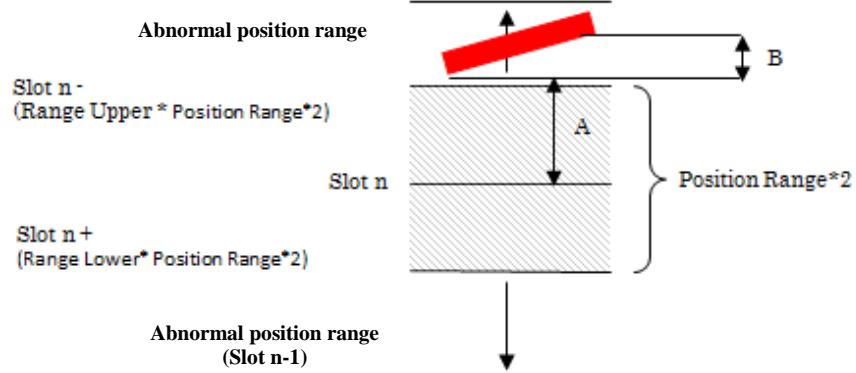
The sensor has never been turned ON.

(2) Exist (result = 1)

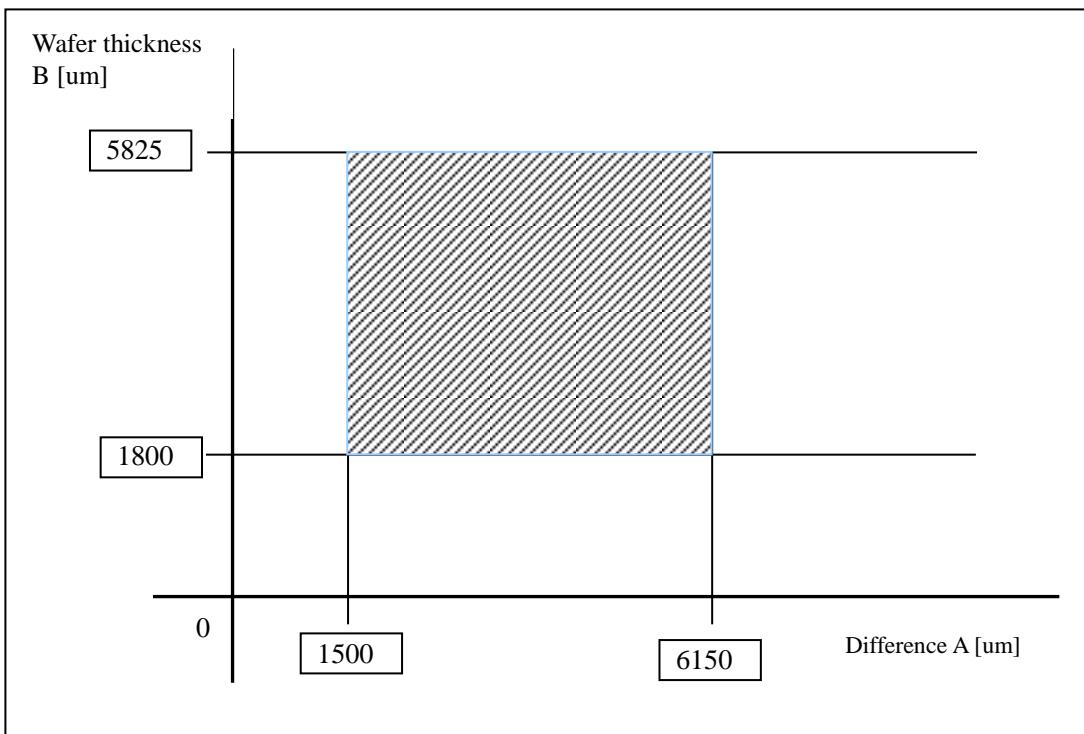


The sensor is turned ON once when the lower surface of the wafer is within the normal position range, and the thickness detection value is within the normal thickness range.

(3) Cross (result = 2)



When the difference A between the wafer lower surface position and the Slot n reference position, and the wafer thickness B are within the judgment range shown in the figure below, the result is judged as "cross".

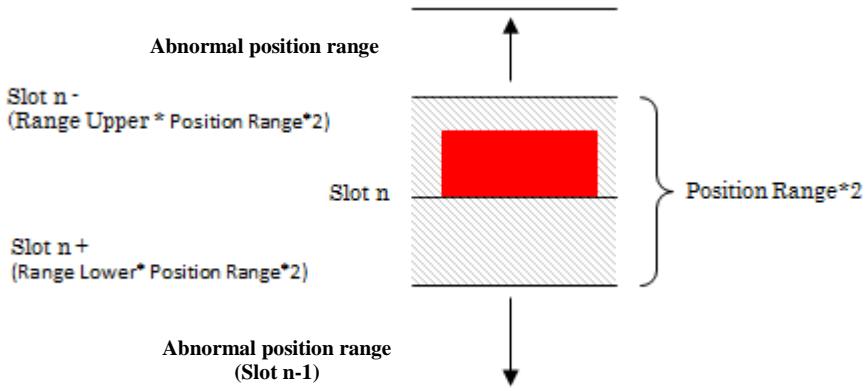


At this point, Slot n+1 (one step higher) is also judged as “cross”.

* Depending on the shape of the container, the result may be judged as “thickness abnormality” or “position abnormality”.

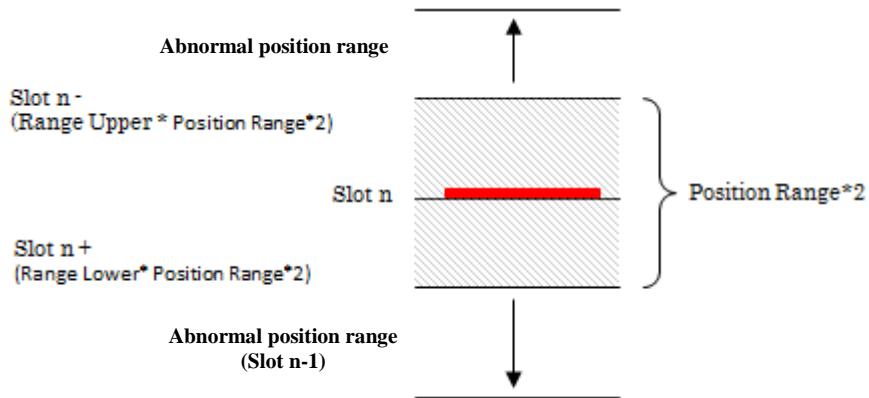
* In case of a thin wafer with a large degree of bending, the cross judgment may not be performed correctly.

(4) Thick (result = 3)



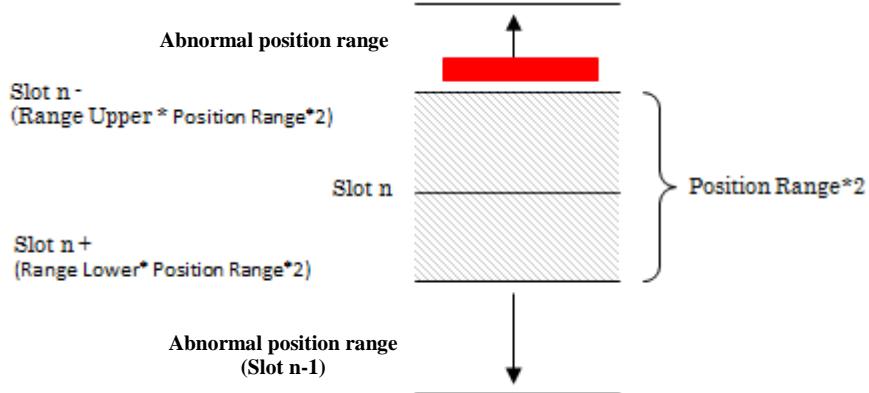
The wafer lower surface position is within the normal position range, and the thickness detection value exceeded the normal thickness range.

(5) Thin (result = 4)



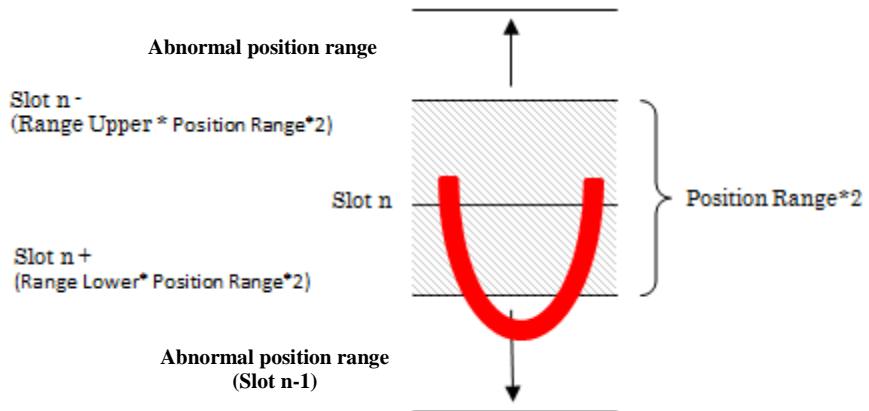
The wafer lower surface position is within the normal position range, and the thickness detection value did not reach the normal thickness range.

(6) Abnormal position (result = 5)



The result is out of the cross judgment range, and the wafer lower surface position is out of the normal position range.

(7) Bending abnormality (result = 2 or 5)



In the figure above, the wafer lower surface is in the range of Slot n-1, and the judgment result is output to Slot n-1. If the result is in the Slot n-1 cross judgment range, Slot n/n-1 is judged as “cross” abnormality. In other cases, Slot n-1 is judged as “position abnormality”. It is not judged as “bending”.

8.4 Mapping Sensor

This machine equips the mapping sensor unit as follows.

- Sensor (Fiber unit transmission): FU-16Z (KEYENCE)
- Amplifier: FS-31V-SO (KEYENCE)

Response time of the sensor for mapping motion and return motion is 250us each. It takes 250us to turn the signal output ON after shading (when detecting wafer) and 250us to turn the signal output OFF after light intercepting.

Concerning the signal output conditions, it turns ON when the quantity of light decreases less than the threshold value of the sensor, and it turns OFF when the quantity of light increases more than the threshold value of the sensor.

Location of mapping sensor amplifier is shown as follows.

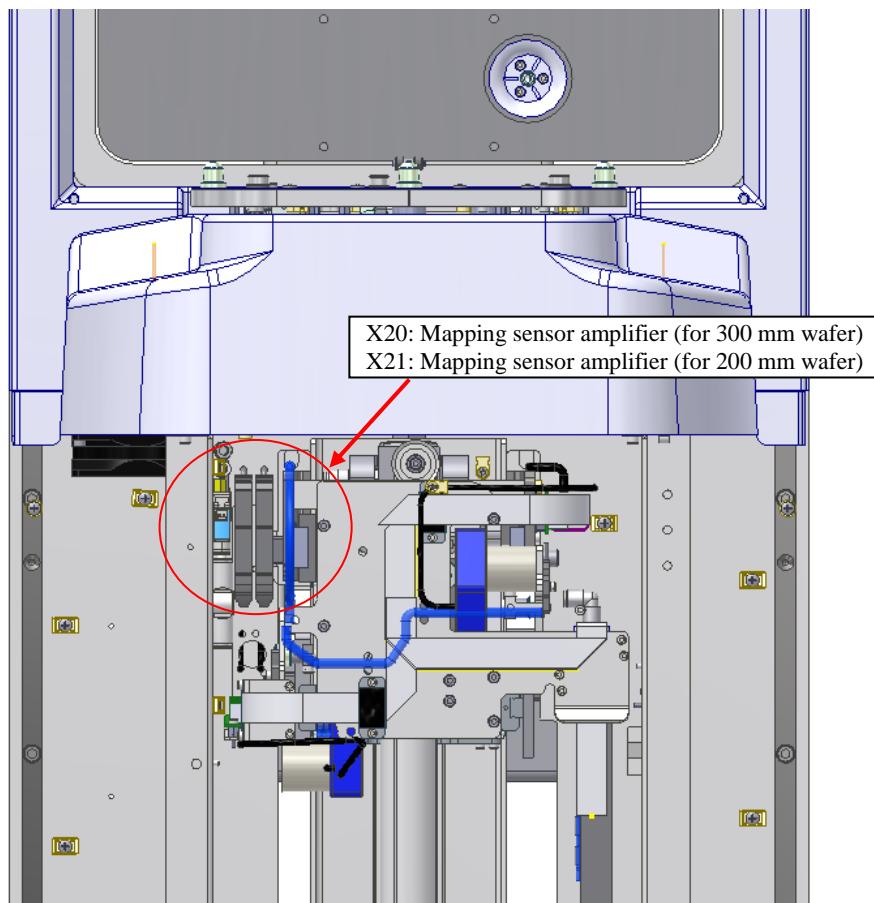


Fig 8.2 Mapping Sensor Amplifier Position

8.4.1 Outline of Sensor Amplifier

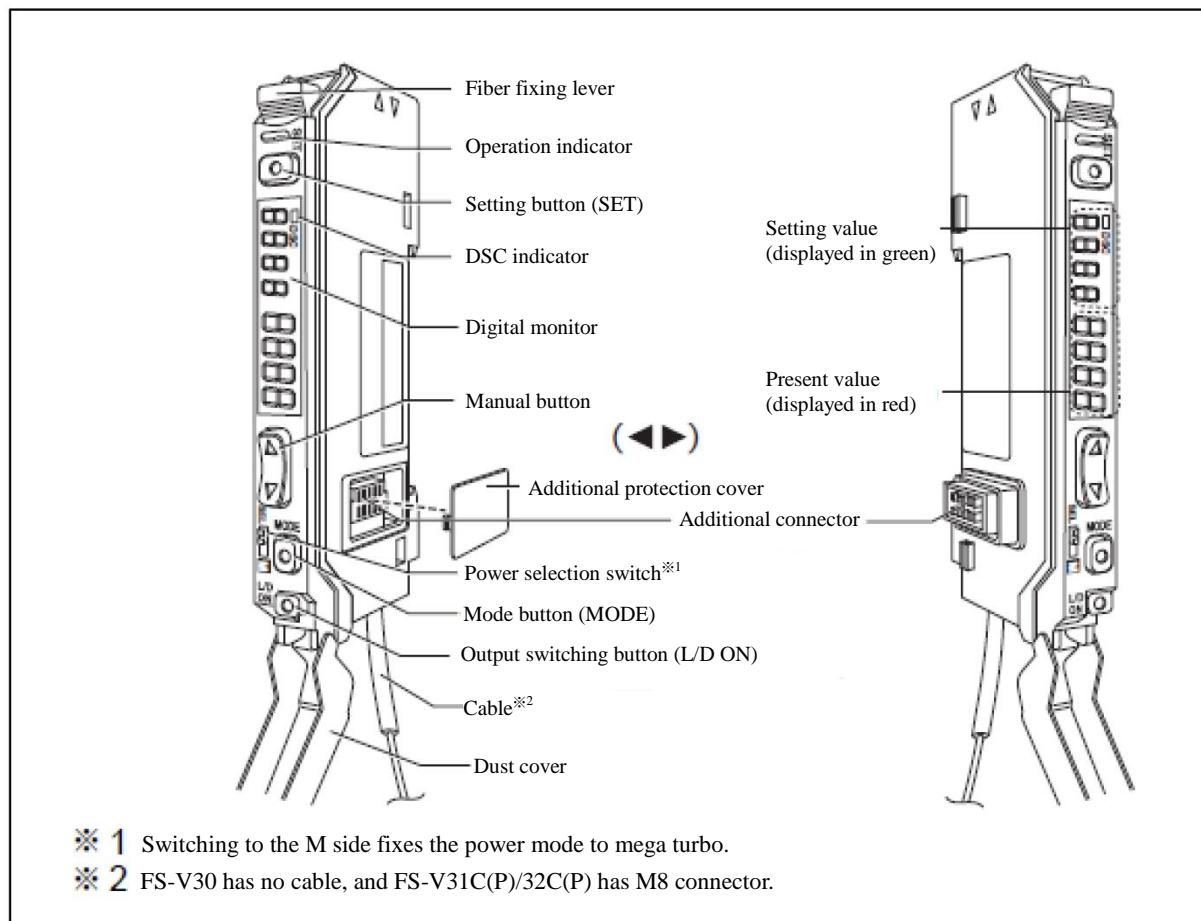


Fig 8.3 Name of Each Part of Mapping Sensor Amplifier

- Excerpt from KEYENCE Operation Manual -

8.4.2 Mapping Sensor Amplifier Setup

8.4.2.1 Mapping Sensor Amplifier Setting Values

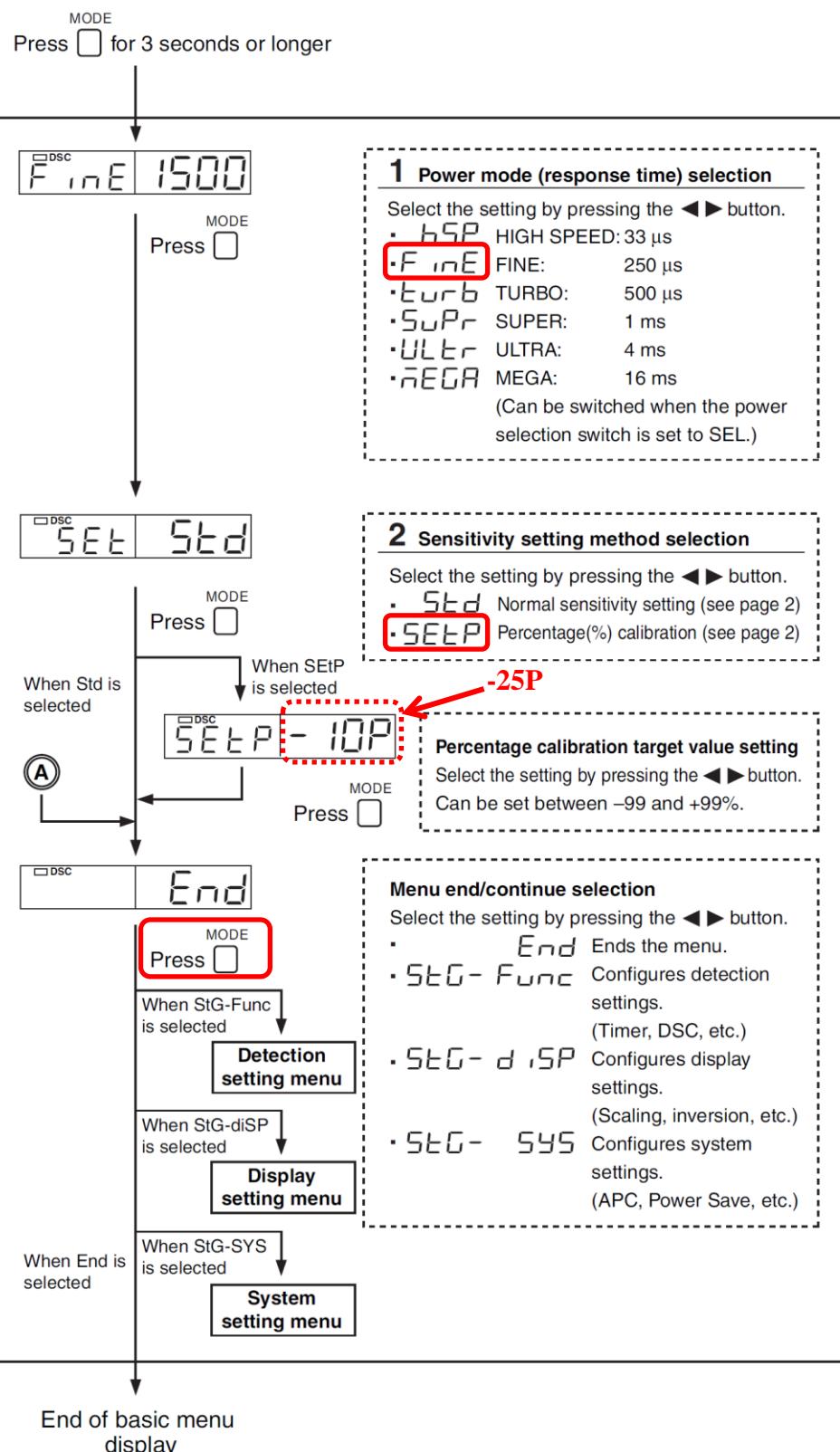
Table 8.1 List of Mapping Sensor Amplifier Setting Values

Setting item	Setting value	
	Amplifier indication	Description
Basic setting menu	-	Used to make basic settings.
Power mode (response time)		250 µs
Sensibility setting method		Percent (%) tuning (%)
Percent tuning target value	-25P	-25%
Detection setting menu		Used to make detection settings.
Timer mode		Timer off
Detection mode		Automatic sensibility follow-up mode
Detection operation		Mainly with the reflection type (Received light amount with workpiece > Received light amount without workpiece)
Calibration speed		Level 1 with Fine selected 52.43 s
External input function switching		Does not use an external input.
Light power switching		Normal
Display setting menu		Used to make display settings.
Display value calibration function		Uses a display scaling function.
Display scaling target value		2000
Display reverse selection		Normal display
Display customization selection		Does not perform display customization.
System setting menu		Used to make system settings.
S-APC setting		APC is invalid.
Power saving mode setting		Normal display
Key lock level setting		Level 1
Selection for number of interference prevention units		Normal

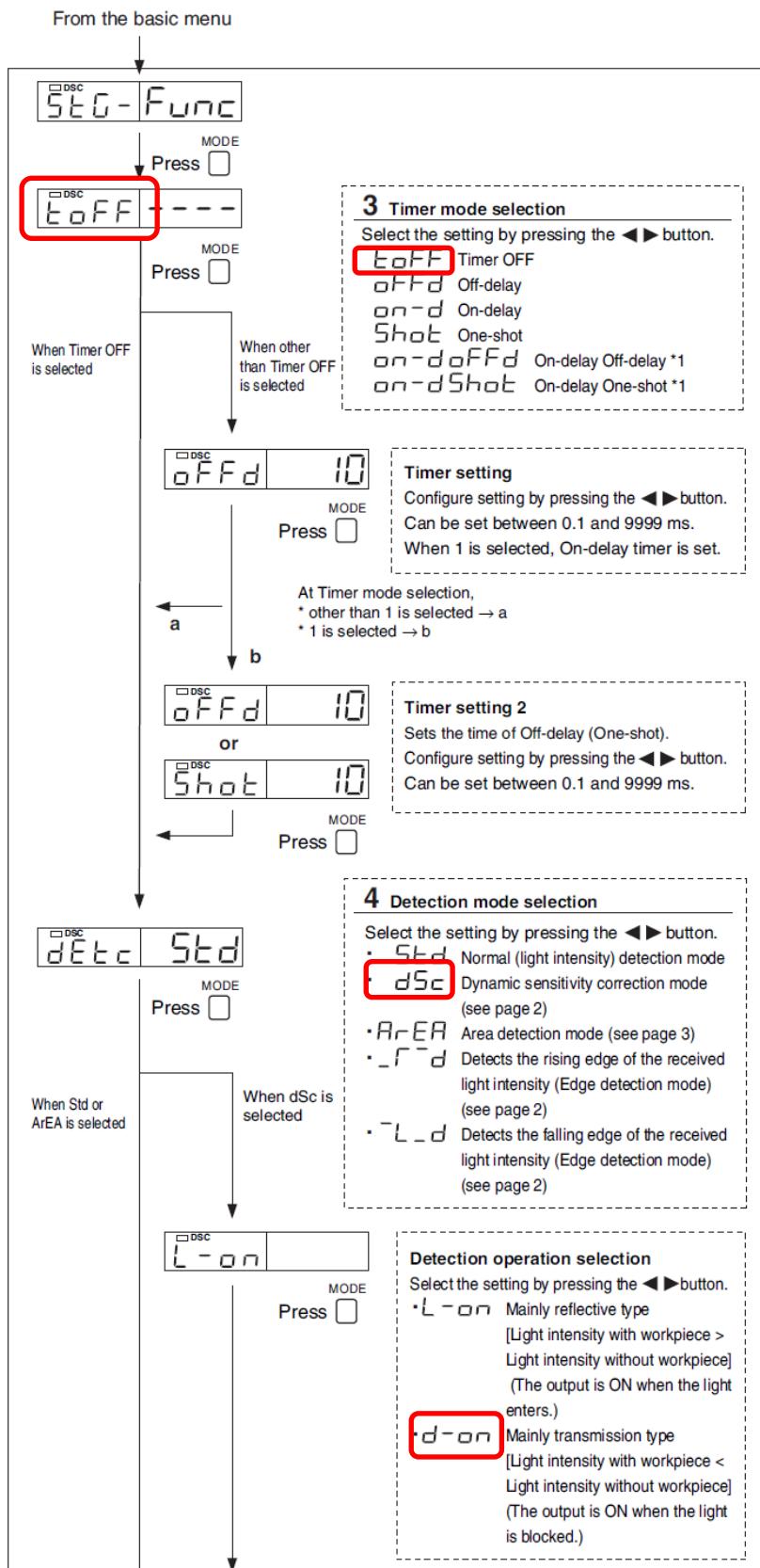
8.4.2.2 Mapping Sensor Amplifier Setup Procedure

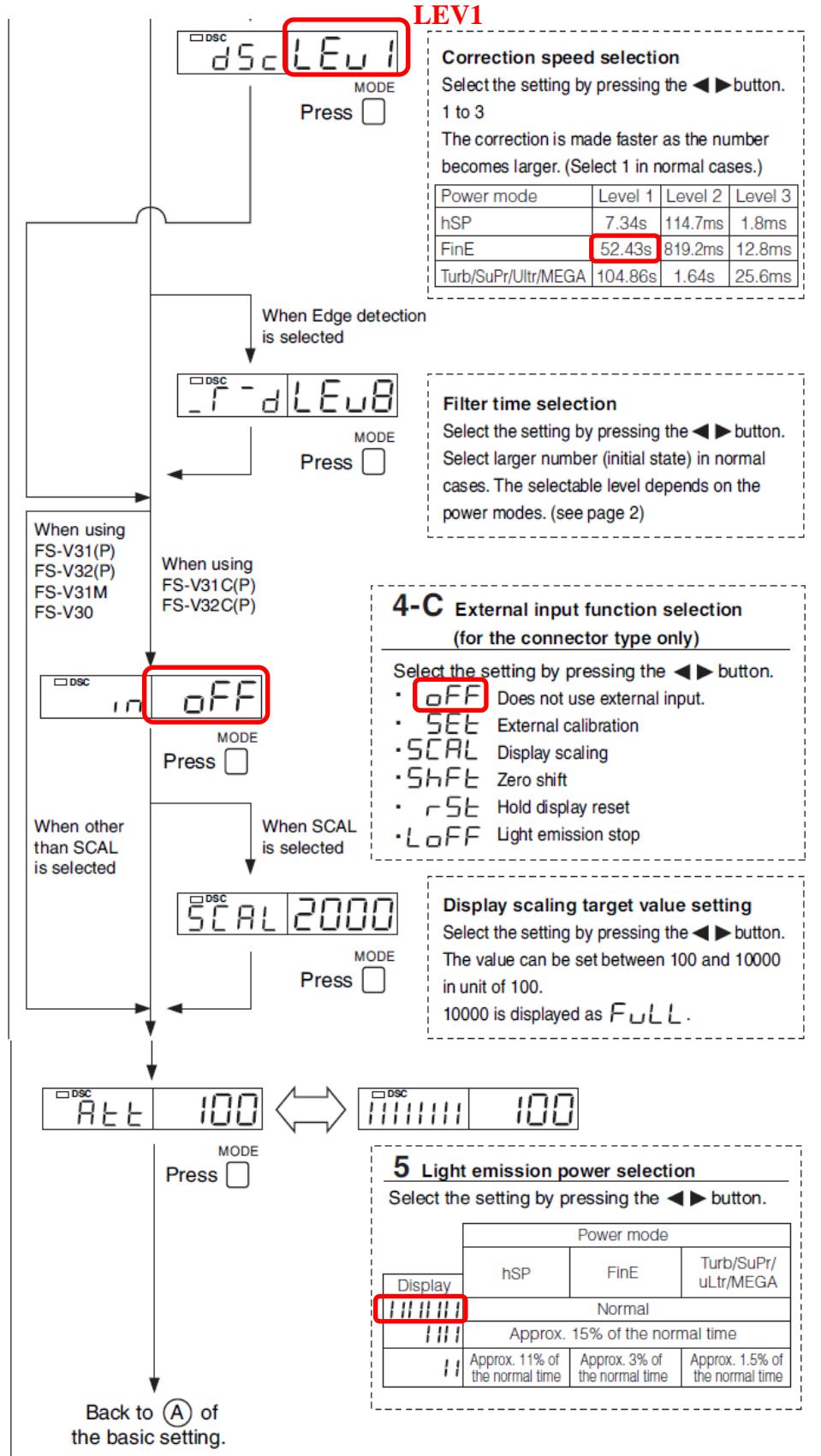
- Excerpt from KEYENCE Operation Manual -

Basic Setting Menu



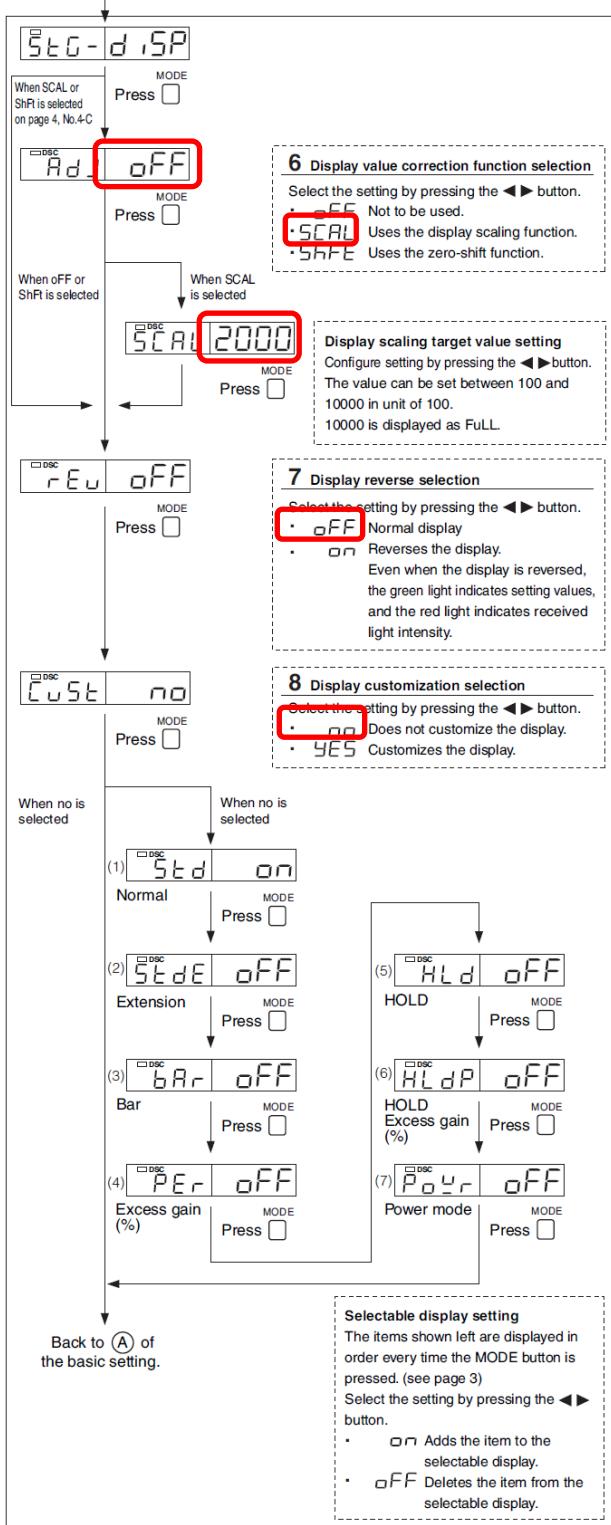
Detection Setting Menu





Display Setting Menu

From the basic menu

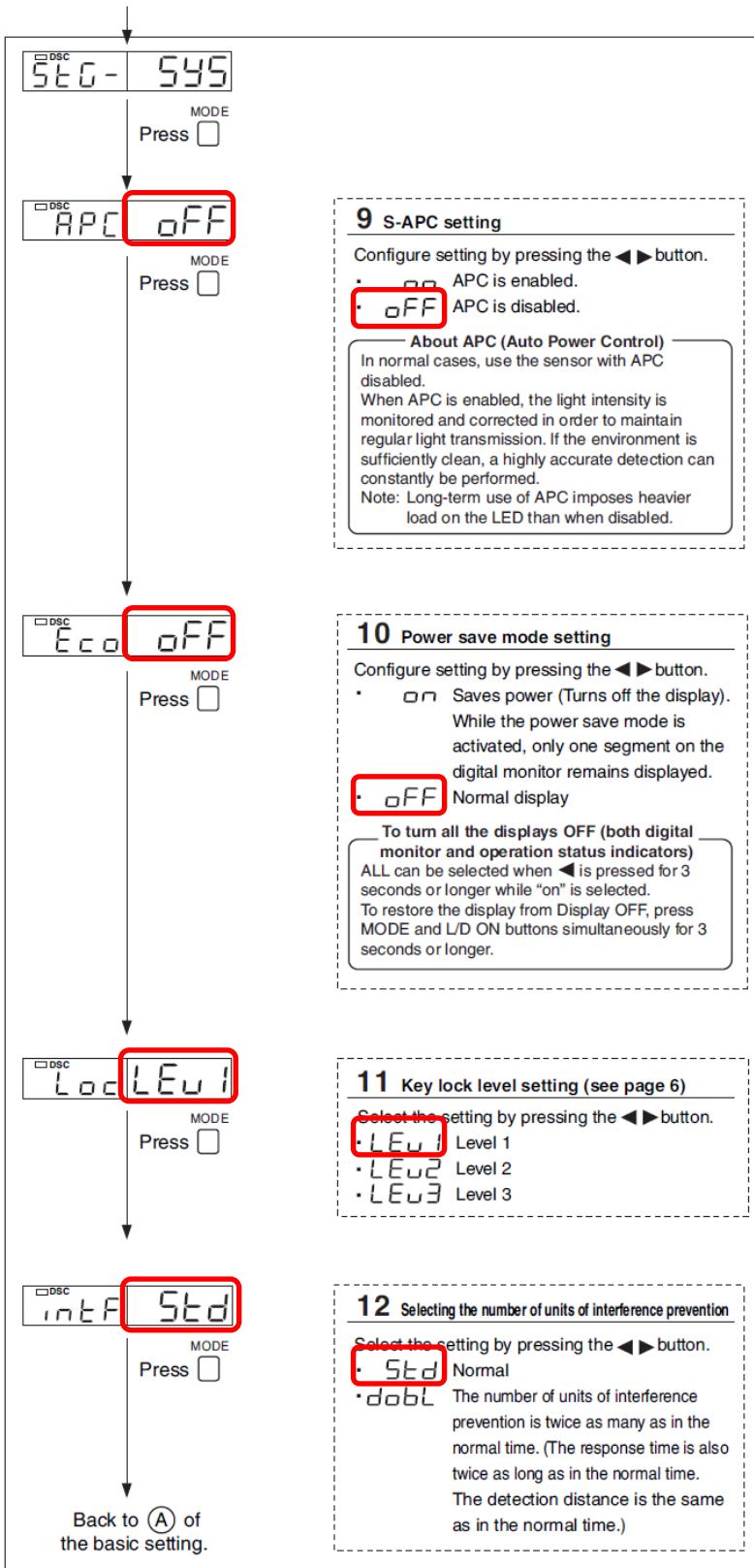


Reference

When setting each mode, the display returns normal by pressing the **MODE** button for 3 seconds or longer.

System Setting Menu

From the basic menu



8.5 Mapping Setting

Mapping setting of this machine is done with the standard thickness wafer (775 μ m) before factory shipment. If mapping is not normally performed for some reason or special wafer is used, however, set the mapping taking the following procedures.

8.5.1 About Mapping Data

The mapping data creation is started from the mapping measurement start position, and the data is created based on the position when the mapping sensor is changed from OFF to ON and from ON to OFF. The data creation is completed at the mapping end position.

The mapping measurement start position is set to the position where the cassette pitches of this machine mapping parameter from the first wafer position is offset.

The mapping data is created from the top to the bottom in the cassette.

8.5.2 Mapping Auto Calibration

Mapping auto calibration of this machine has completed before factory shipment. If a mapping data error occurs for use of nonconforming container or some other reason, execute the mapping auto calibration again.

8.5.2.1 Functional Overview

“Mapping auto calibration” is the function to automatically detect the mapping start and end positions and set the parameters for FOUP and cassette. This function is executed by “MAP ACAL”, and the parameters “MAP.Start (um)” and “MAP. End (um)” are set. The parameters can be checked with “KWF-12F2 Maintenance Tool”.

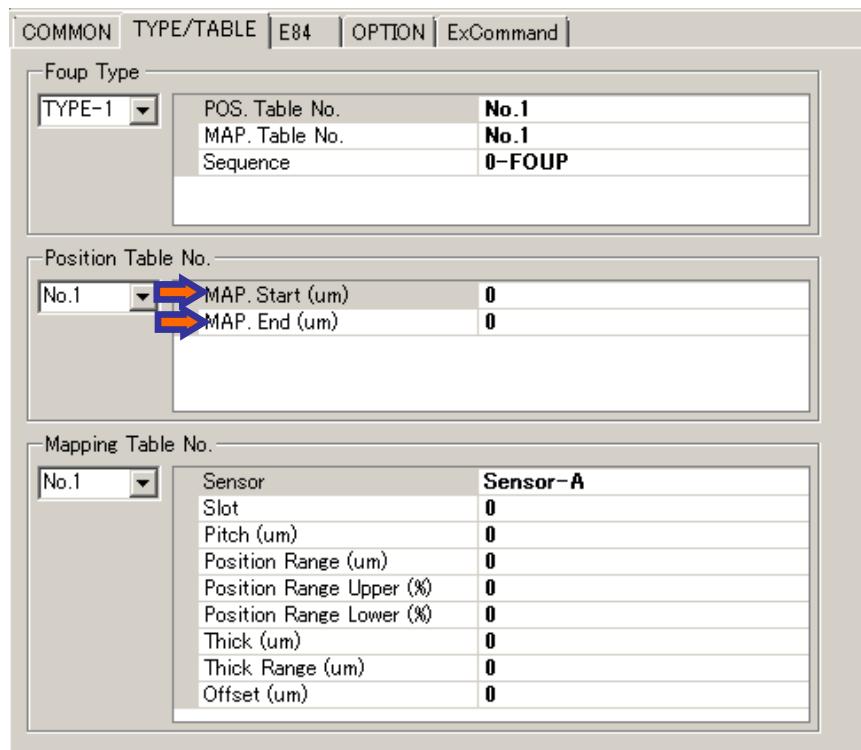


Fig 8.4 TYPE/TABLE Parameter Screen



NOTE

Make sure that the parameters such as the number of slots (Slot), the pitch (Pitch) and the wafer thickness (Thick) are properly set beforehand.

When “MAP ACal” is normally completed, “MAP ACal Status” turns green. If not, it turns red. The following example shows that MAP ACal for Type 1 is normally completed, and MAP ACal for Type 2 – Type 5 is not.

After MAP ACal completion, the wafer thickness is automatically offset. The offset value is the difference between the average of wafer thickness detected during MAP ACal and the setting value of the parameter for “Thick”.

“Offset” = “Average of detected thickness” - “Thick”

When not to offset, check the box corresponding to each type and press “Clear” button at “MAP ACal Status”. The thickness offset is made invalid, but the parameters “MAP.Start (um)” and “MAP.End (um)” are not affected.

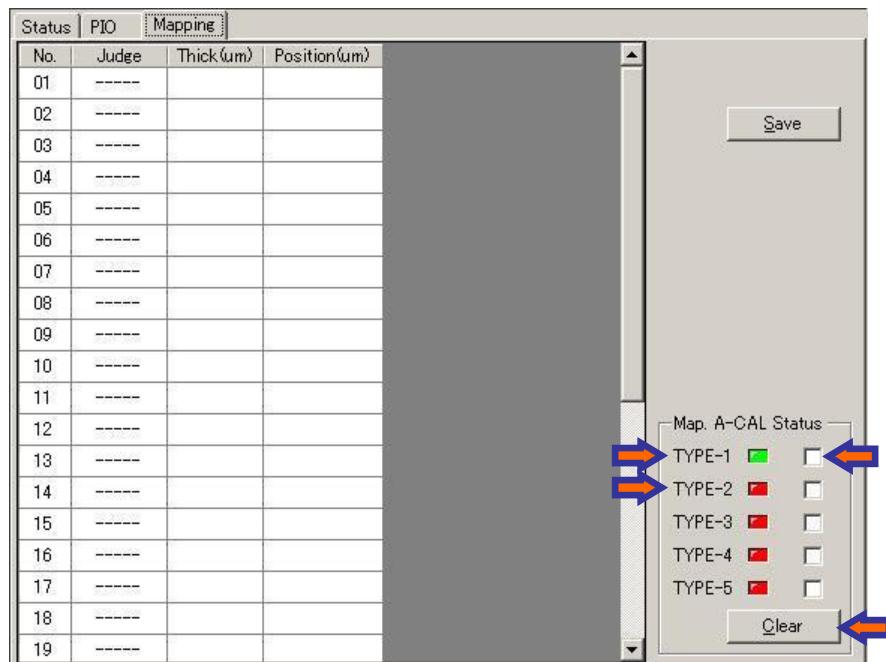


Fig 8.5 Mapping Auto Calibration Status Screen

8.5.2.2 Operating Procedures

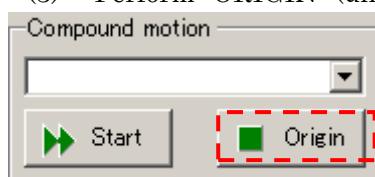
Perform the mapping auto calibration by following the procedures below.

- (1) Upload the parameters and save in a file.
(Parameter backup)

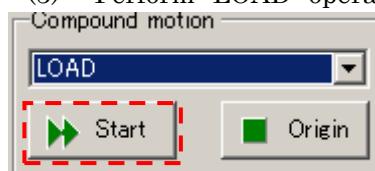


Be sure to back up the parameters prior to MAP ACAL operation.

- (2) Prepare a FOUP which has one wafer on the top stage and one wafer on the bottom stage for mapping.
- (3) Perform "ORIGIN" (unloading) operation.



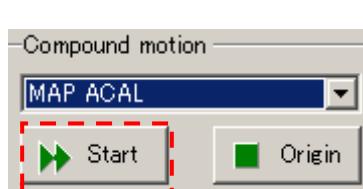
- (4) Properly place the FOUP in (2) on this machine.
- (5) Perform "LOAD" operation.



- ① Select motion.
② Click "START".

- (6) Start "MAP ACAL" operation.

* When MAP ACAL is normally completed, uploading of parameters is automatically started.



- ① Select motion.
② Click "START".

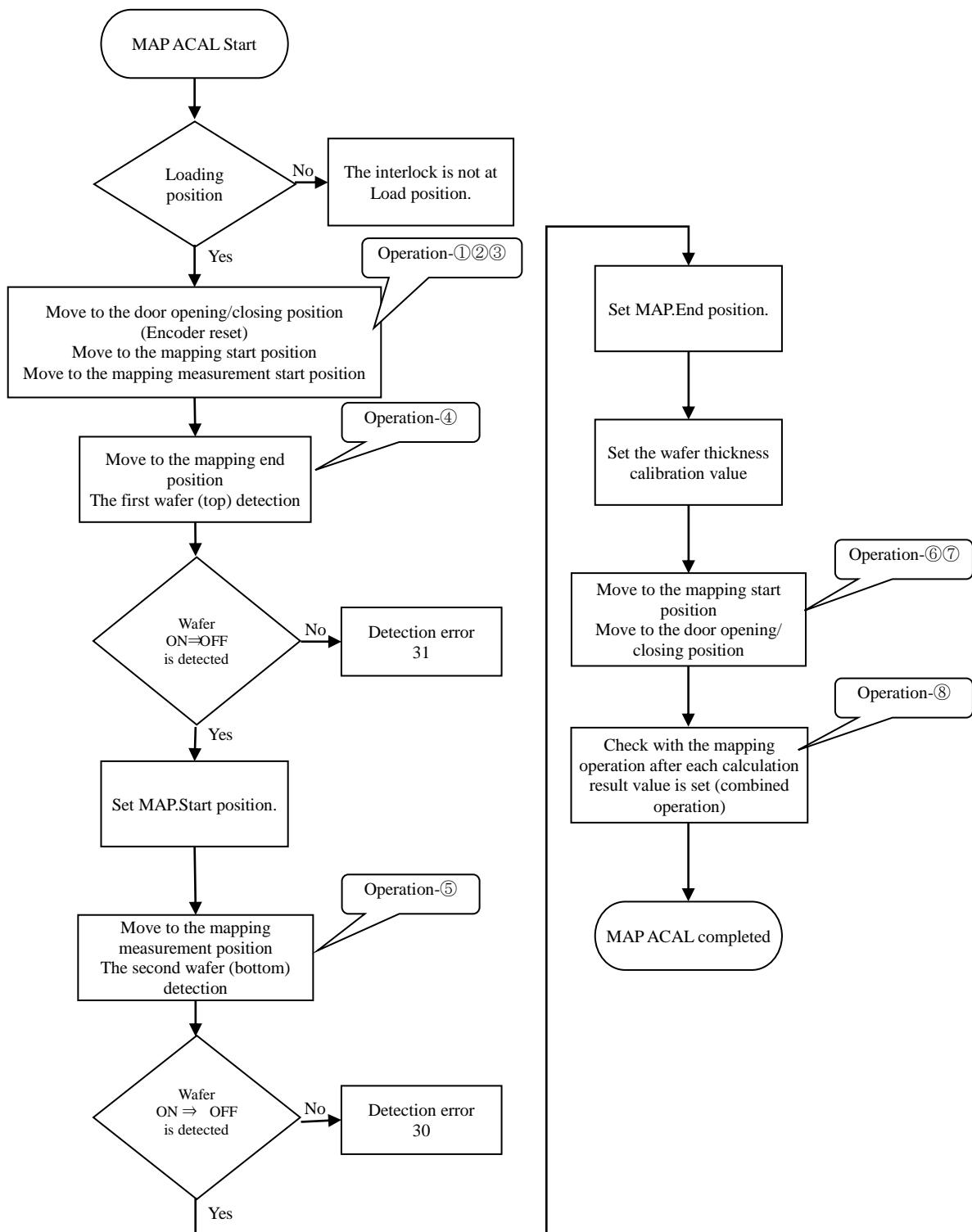


If MAP ACAL is not completed, download the saved parameter before operation to this machine.

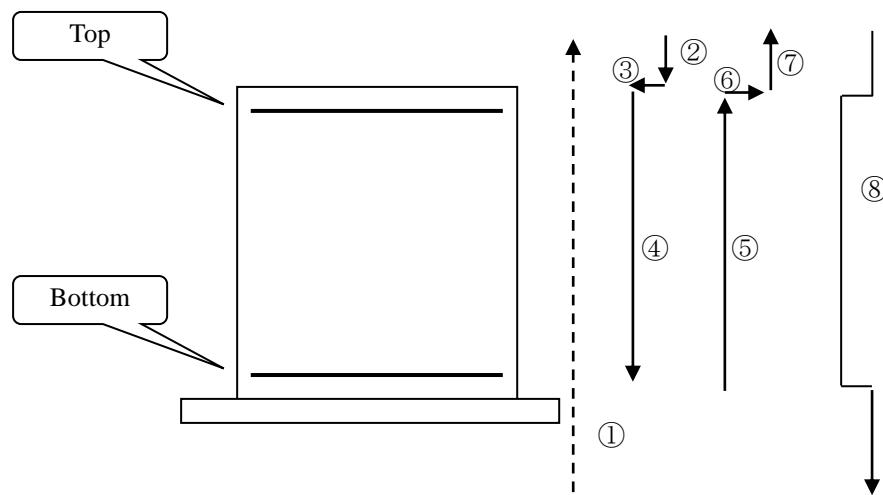
- (7) Perform "ORIGIN" (unloading) operation.
- (8) Remove the FOUP from this machine.

8.5.2.3 Operation Flow

The operation flow of "MAP ACAL" is shown as below.



8.5.2.4 Sequence of Motions



8.5.2.5 Error and Remedy

Error code	Contents	Remedy
30 No bottom wafer	Can't detect the bottom wafer	<ul style="list-style-type: none"> - Make sure that a wafer is properly set at the bottom of the container. - Make sure that the parameters such as Pitch and Slot are properly set.
31 No top wafer	Can't detect the top wafer	<ul style="list-style-type: none"> - Make sure that a wafer is properly set at the top of the container. - Make sure that the parameters such as Pitch and Slot are properly set.

APPENDIX

APPENDIX A

Material Safety Data Sheet

for THK AFF Grease

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	AFF GREASE
Version #	01
Revision date	12-27-2010
CAS #	Mixture
Product code	AFF+70, AFF+400
MSDS Number	1030-T25002-USA
Product use	Industrial lubricating grease (Package size 70gr and 400gr)
Manufacturer/Supplier	THK Co.,LTD HEAD OFFICE: 3-11-6, Nishi-Gotanda, Shinagawa-ku, Tokyo 141-8503 Japan THK America, Inc.:200 East Commerce Drive, Schaumburg, IL. 60173, USA Telephone: (847) 310-1111 (THK America) between the hours of 8 am - 5 pm Emergency telephone: (847) 310-1111 (THK America) between the hours of 8 am - 5 pm E-mail: chicago@thk.com, thk022@thk.co.jp

2. Hazards Identification

Physical state	Solid.
Appearance	Buttery.
Emergency overview	WARNING! Causes skin, eye and respiratory tract irritation.
OSHA regulatory status	This product is considered not hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Skin contact. Eye contact. Inhalation.
Eyes	Causes eye irritation. May cause redness and pain.
Skin	Causes skin irritation. Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping and oil acne. The harmful effects may increase when exposed to used grease.
Inhalation	Causes respiratory tract irritation. Inhalation of oil mist or vapours formed during heating of the product will irritate the respiratory system and provoke coughing.
Ingestion	May cause discomfort if swallowed.
Chronic effects	Prolonged and repeated contact with used grease may cause serious skin diseases, such as dermatitis and skin cancer.
Signs and symptoms	Skin irritation. Irritation of nose and throat.
Potential environmental effects	Greases are generally hazardous to the environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
N-1-naphthylaniline	Proprietary	1-5
Diphenyl phosphonate	Proprietary	1-5
Lithium stearate	Proprietary	10-30

Composition comments * All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume. The full text for all R- and H-phrases is displayed in section 16.

4. First Aid Measures

First aid procedures	
Eye contact	Immediately flush with plenty of water for up to 15 minutes. Remove contact lenses, if present and easy to do. Get medical attention if irritation develops and persists.
Skin contact	Remove contaminated clothing. Wash with soap and water. Get medical attention promptly if symptoms occur after washing.
Inhalation	Move affected person into fresh air and keep warm. If breathing is difficult, give oxygen. Get medical attention if any discomfort continues.

Ingestion	Immediately rinse mouth and drink plenty of water. Never give anything by mouth to an unconscious person. Get medical attention if any discomfort continues.	
Notes to physician	Treat symptomatically. The effects might be delayed.	
5. Fire Fighting Measures		
Flammable properties	The product is not flammable.	
Extinguishing media		
Suitable extinguishing media	Extinguish with foam, carbon dioxide or dry powder.	
Unsuitable extinguishing media	Do not use water or halogenated extinguishing media.	
Protection of firefighters		
Specific hazards arising from the chemical	Thermal decomposition may produce smoke, oxides of carbon and lower molecular weight organic compounds whose composition have not been characterized.	
Protective equipment and precautions for firefighters	Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace. Self-contained breathing apparatus, operated in positive pressure mode and full protective clothing must be worn in case of fire.	
Specific methods	Move container from fire area if it can be done without risk. Use standard firefighting procedures and consider the hazards of other involved materials.	
6. Accidental Release Measures		
Personal precautions	Avoid inhalation of vapors and contact with skin and eyes. Wear necessary protective equipment. In case of spills, beware of slippery floors and surfaces. For personal protection, see section 8 of the MSDS.	
Environmental precautions	Do not contaminate water. Contact local authorities in case of spillage to drain/aquatic environment.	
Methods for cleaning up	Absorb spillage with non-combustible, absorbent material. Clean contaminated area with oil-removing material. For waste disposal, see section 13 of the MSDS.	
7. Handling and Storage		
Handling	Avoid prolonged and repeated contact with grease, particularly used grease. Always remove grease with soap and water or skin cleaning agent, never use organic solvents. Wear appropriate personal protective equipment. Be aware of potential for surfaces to become slippery. Observe good industrial hygiene practices.	
Storage	Keep container in a well-ventilated place. Store away from incompatible materials.	
8. Exposure Controls / Personal Protection		
Occupational exposure limits		
US. ACGIH Threshold Limit Values		
Components	Type	Value
Lithium stearate (Proprietary)	TWA	10 mg/m ³
Engineering controls	ACGIH Threshold Limit Values for mineral oil mist: The 8-Hour Exposure Limit (TLV-TWA) is 5 mg/m ³ . The 15-minute STEL is 10 mg/m ³ . Provide adequate ventilation and minimize the risk of inhalation of vapors and oil mist. Provide access to washing facilities including soap, skin cleanser and fatty cream.	
Personal protective equipment		
Eye / face protection	Wear approved safety goggles.	
Skin protection	Wear protective gloves. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier. Wear appropriate clothing to prevent repeated or prolonged skin contact.	
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA Standard 63 FR 1152, January 8, 1998. Use a NIOSH/MSHA approved air purifying respirator as needed to control exposure. Consult with respirator manufacturer to determine respirator selection, use, and limitations. Use positive pressure, air-supplied respirator for uncontrolled releases or when air purifying respirator limitations may be exceeded. Follow respirator protection program requirements (OSHA 1910.134 and ANSI Z88.2) for all respirator use.	

General hygiene considerations Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical & Chemical Properties

Appearance	Buttery.
Color	Light yellow.
Odor	Slight.
Odor threshold	Not available.
Physical state	Solid.
Form	Soft, malleable. Soft, malleable.
pH	Not available.
Melting point	Not available.
Freezing point	Not available.
Boiling point	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	Not available.
Solubility (water)	Insoluble in water.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Heat, sparks, flames, elevated temperatures.
Incompatible materials	Oxidizing agents. Acids. Halogens. Halogenated compounds.
Hazardous decomposition products	Carbon oxides. Aldehydes.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Toxicological data

Components	Test Results
Lithium stearate (Proprietary)	Acute Oral LD50 Rat: 15000 mg/kg
N-1-naphthylaniline (Proprietary)	Acute Oral LD50 Rat: 1625 mg/kg
Acute effects	Causes skin, eye and respiratory tract irritation. Inhalation of oil mist or vapours formed during heating of the product will irritate the respiratory system and provoke coughing. The harmful effects may increase when exposed to used grease. Ingestion may cause irritation and malaise.
Local effects	Causes skin, eye and respiratory tract irritation.
Sensitization	None known.
Chronic effects	Prolonged or repeated contact with skin may cause redness, itching, irritation, eczema/chapping and oil acne.

Carcinogenicity	Prolonged and repeated contact with used grease may cause serious skin diseases, such as dermatitis and skin cancer.
ACGIH Carcinogens	
Lithium stearate (CAS Proprietary)	A4 Not classifiable as a human carcinogen.
Epidemiology	Pre-existing skin conditions including dermatitis might be aggravated by exposure to this product.
Mutagenicity	None known.
Reproductive effects	None known.

12. Ecological Information

Ecotoxicity	Not classified.
Persistence and degradability	None known.
Bioaccumulation / Accumulation	None known.
Mobility in environmental media	The product contains substances, which are insoluble in water and which may spread on water surfaces.
Partition coefficient (n-octanol/water)	Not available.

13. Disposal Considerations

Waste from residues / unused products	Dispose in accordance with applicable federal, state, and local regulations.
Contaminated packaging	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport Information

DOT	Not regulated as dangerous goods.
DOT	Not regulated as dangerous goods.
IATA	Not regulated as dangerous goods.
IMDG	Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations	This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200. CERCLA/SARA Hazardous Substances - Not applicable.
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CERCLA (Superfund) reportable quantity (lbs)

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

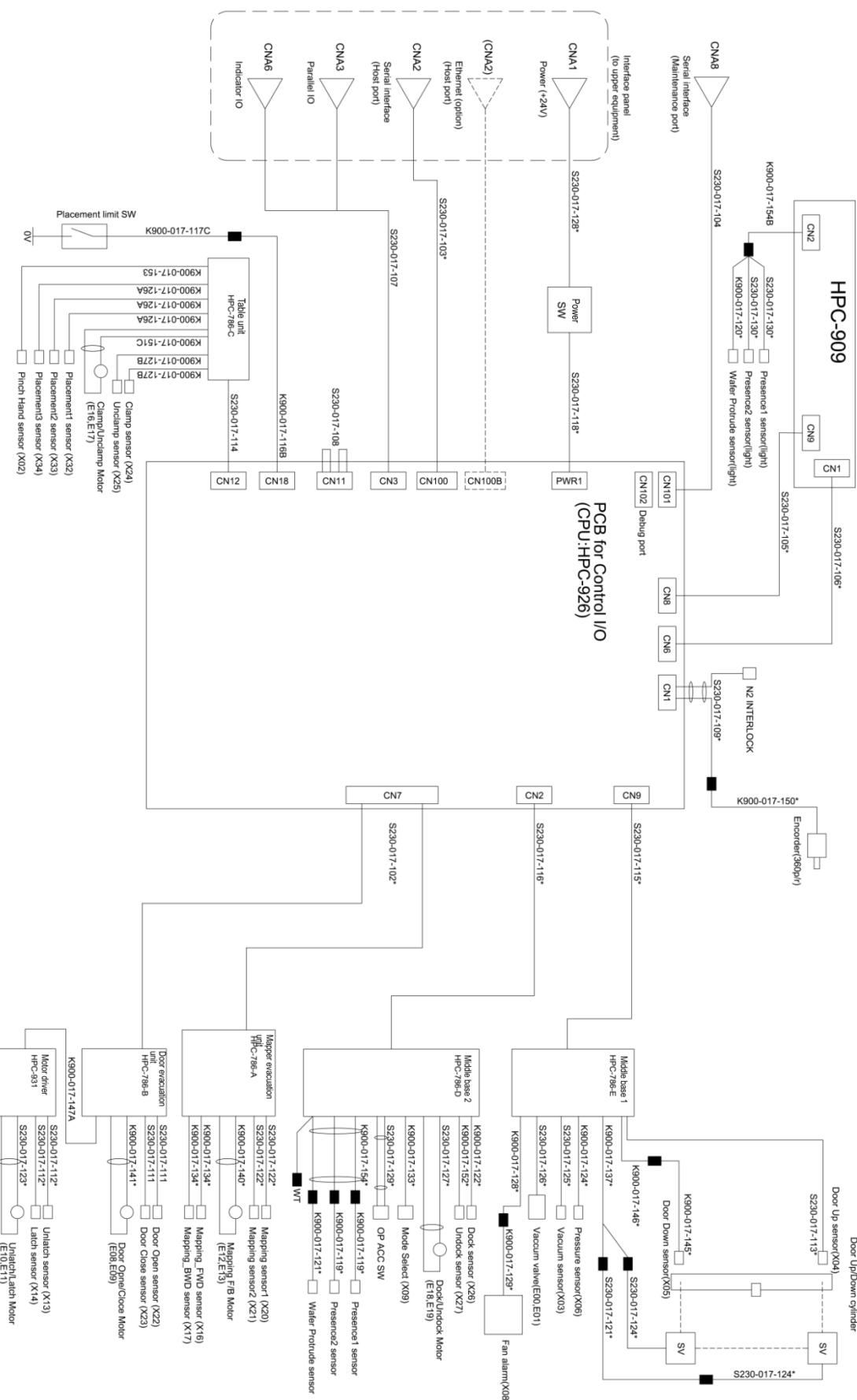
Hazard categories	Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No	
Section 302 extremely hazardous substance	No	
Section 311 hazardous chemical	Yes	
Inventory status		
Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	Yes
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes
*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)		
State regulations	This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.	
16. Other Information		
Further information	HMIS® is a registered trade and service mark of the NPCA. G - Safety Glasses, Gloves, Vapor Respirator	
HMIS® ratings	Health: 2 Flammability: 1 Physical hazard: 0 Personal protection: G	
NFPA ratings	Health: 2 Flammability: 1 Instability: 0	
Disclaimer	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.	
Issue date	12-27-2010	

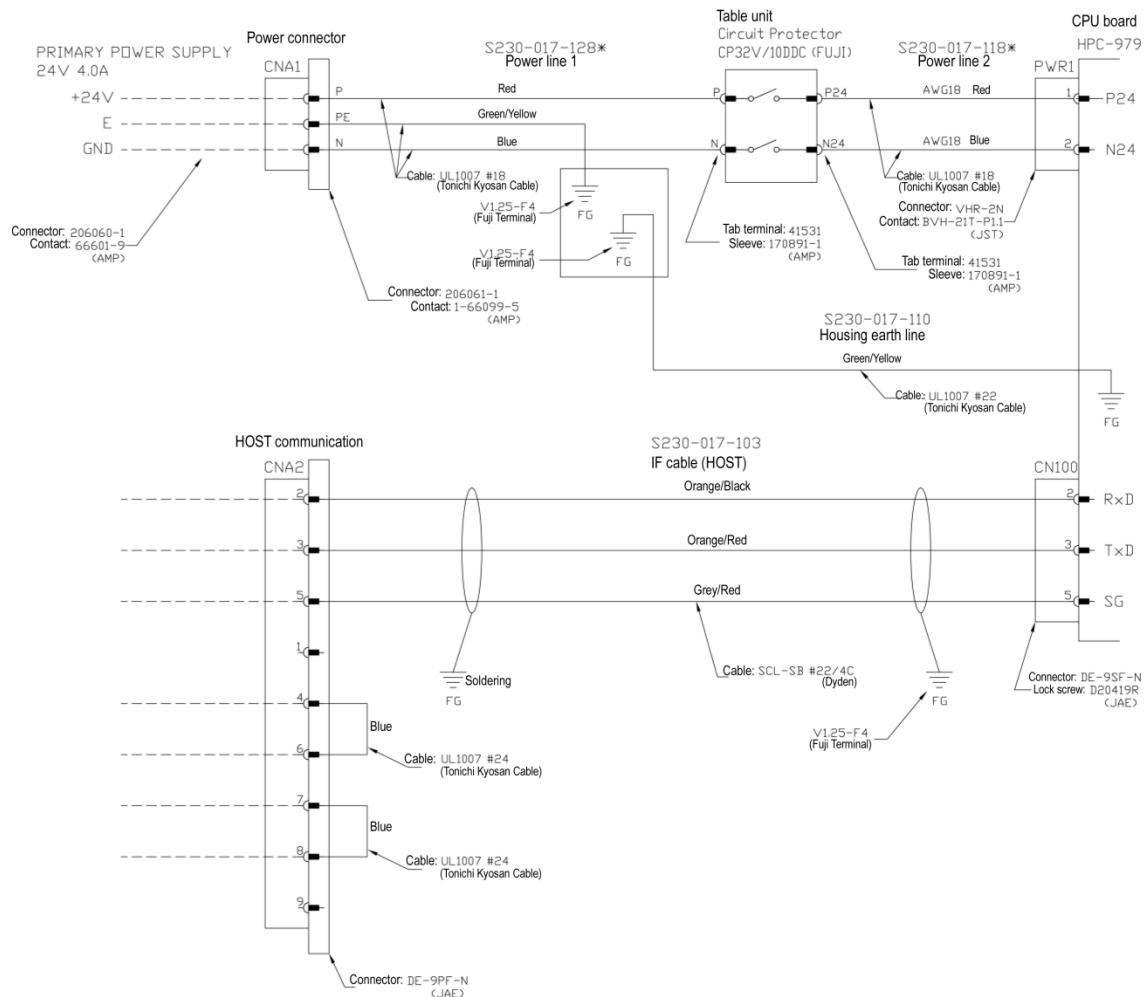
APPENDIX B

Wiring Diagram

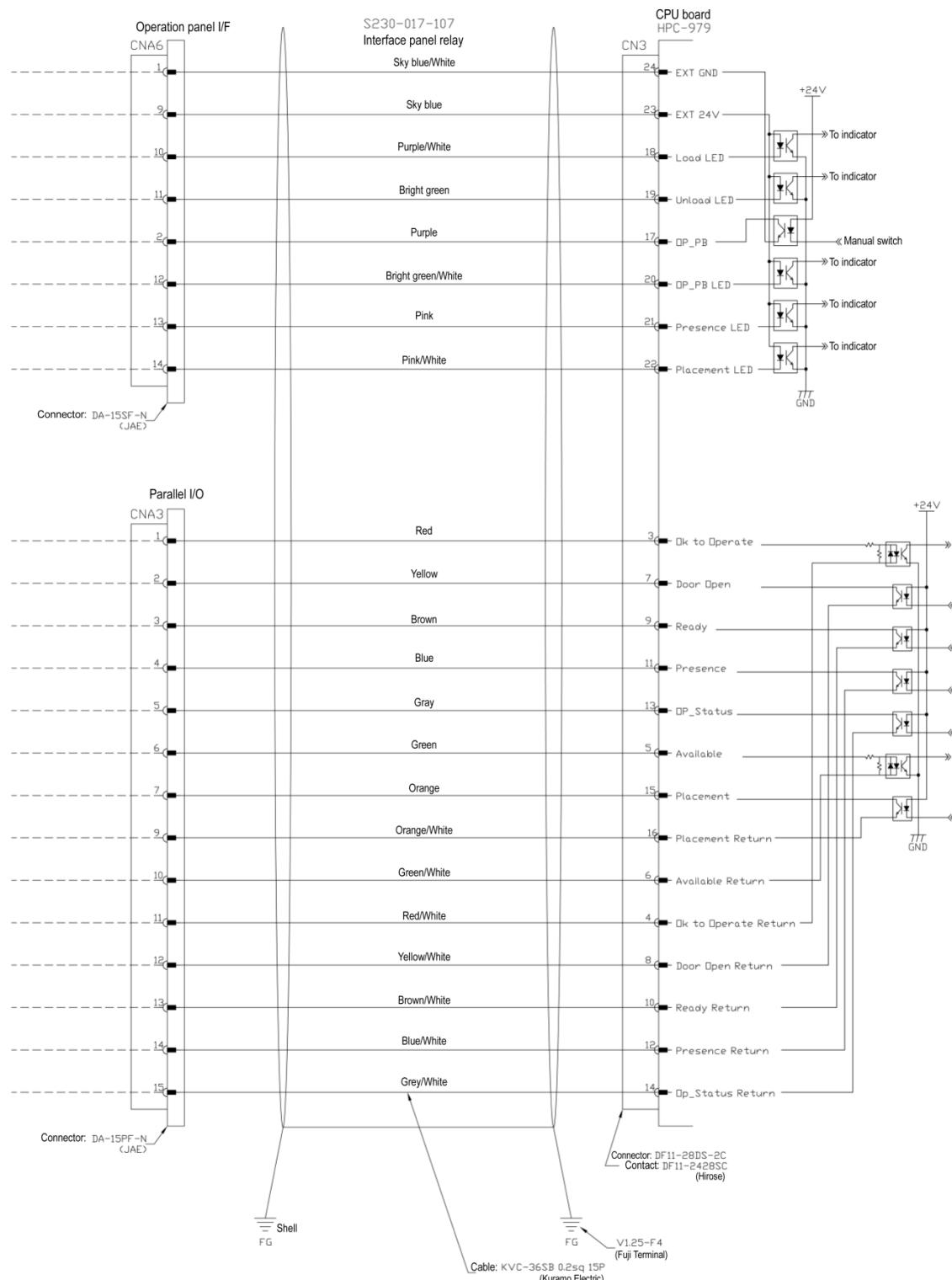
APPENDIX B.1 Block Diagram



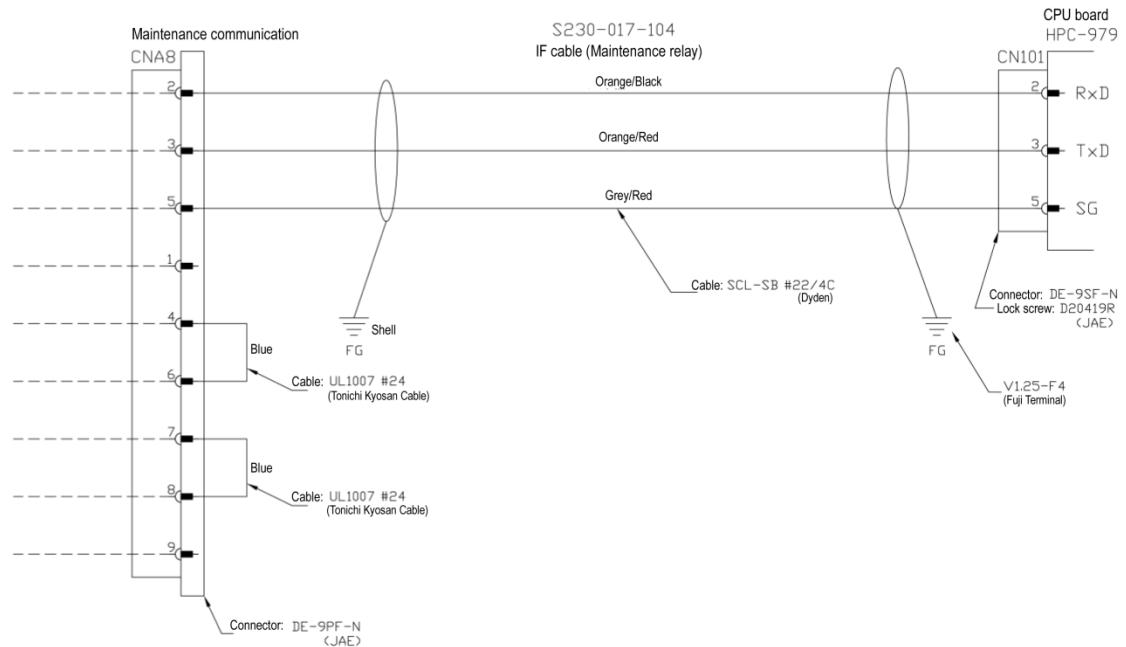
APPENDIX B. 2 Interface Panel 1



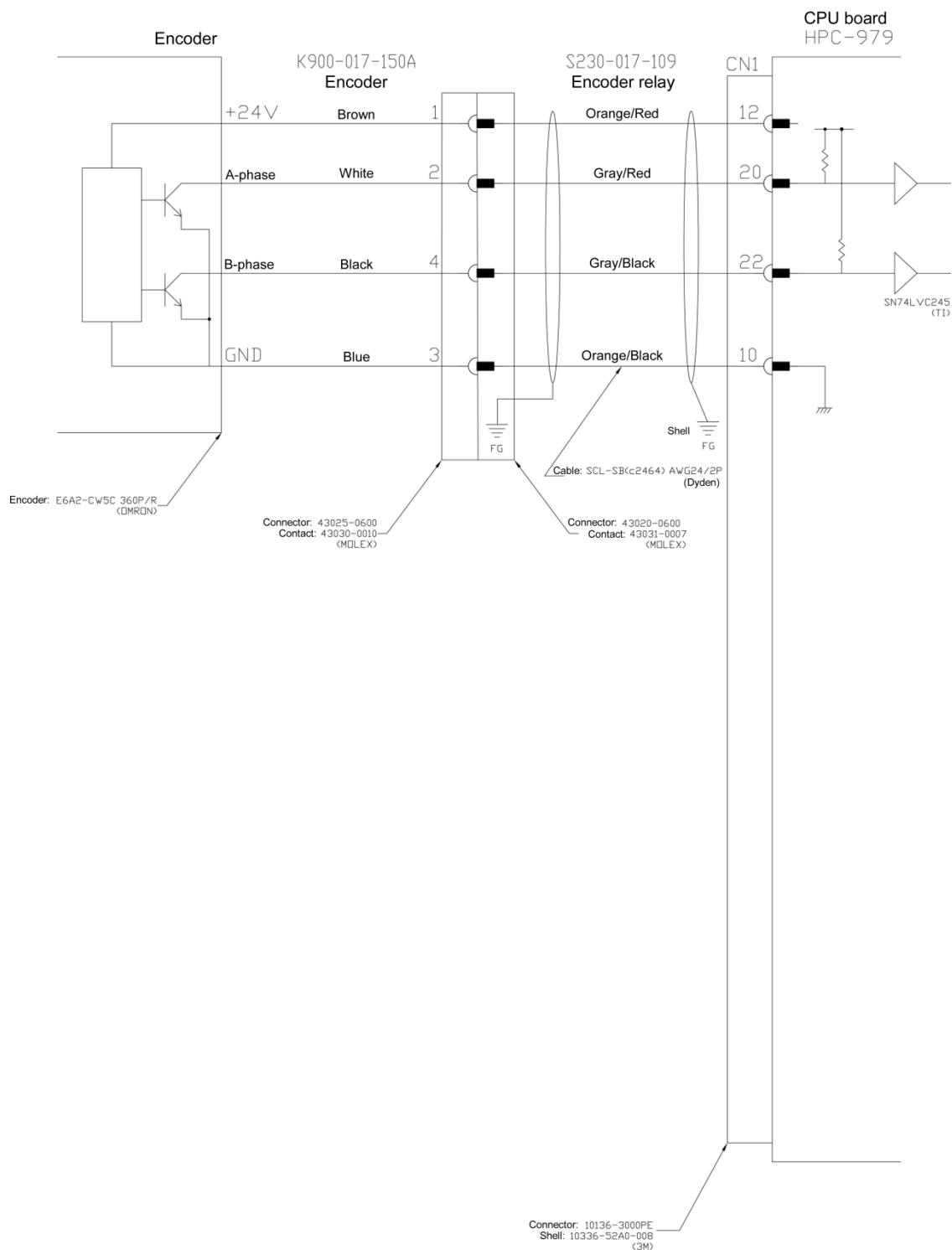
APPENDIX B. 3 Interface Panel 2



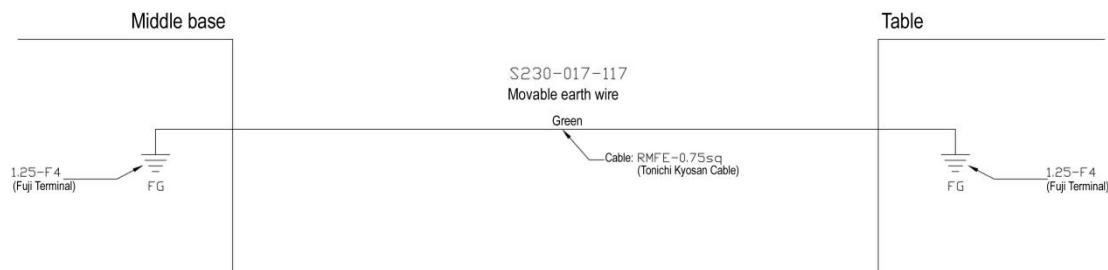
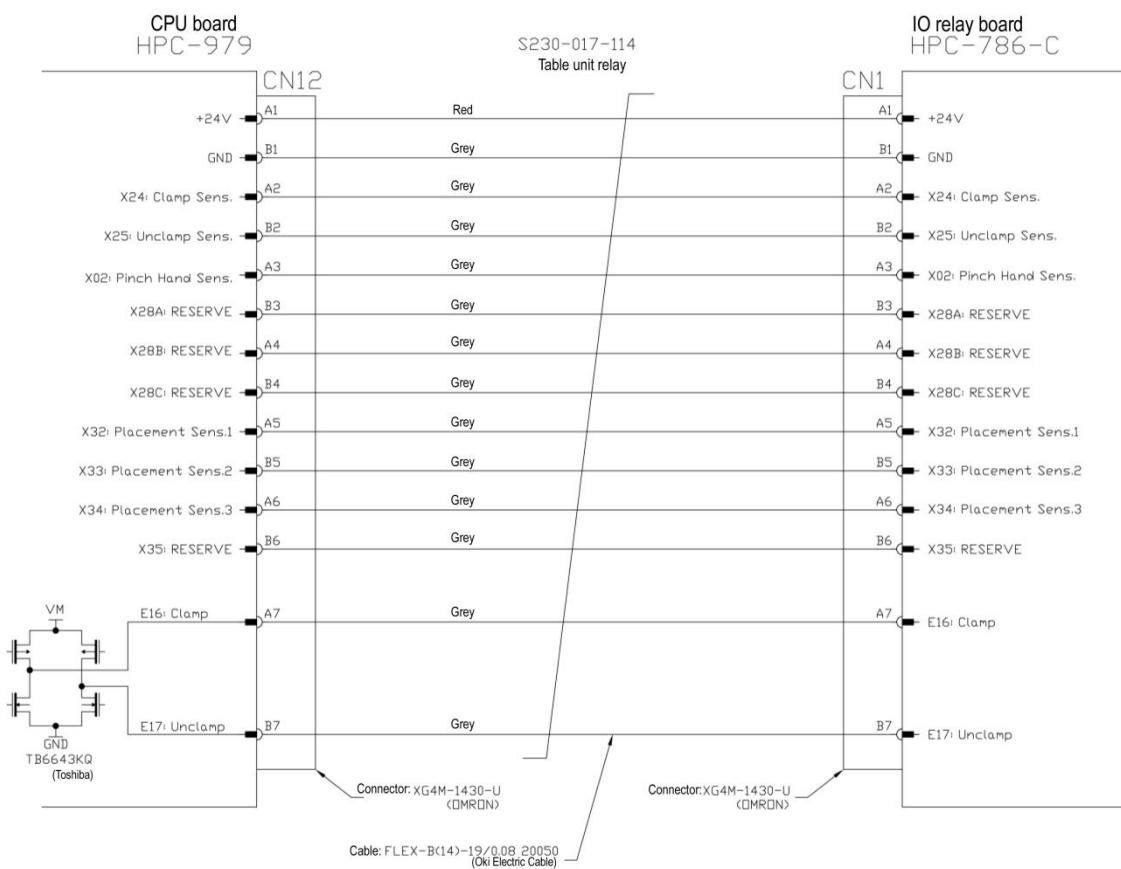
APPENDIX B. 4 Maintenance Port



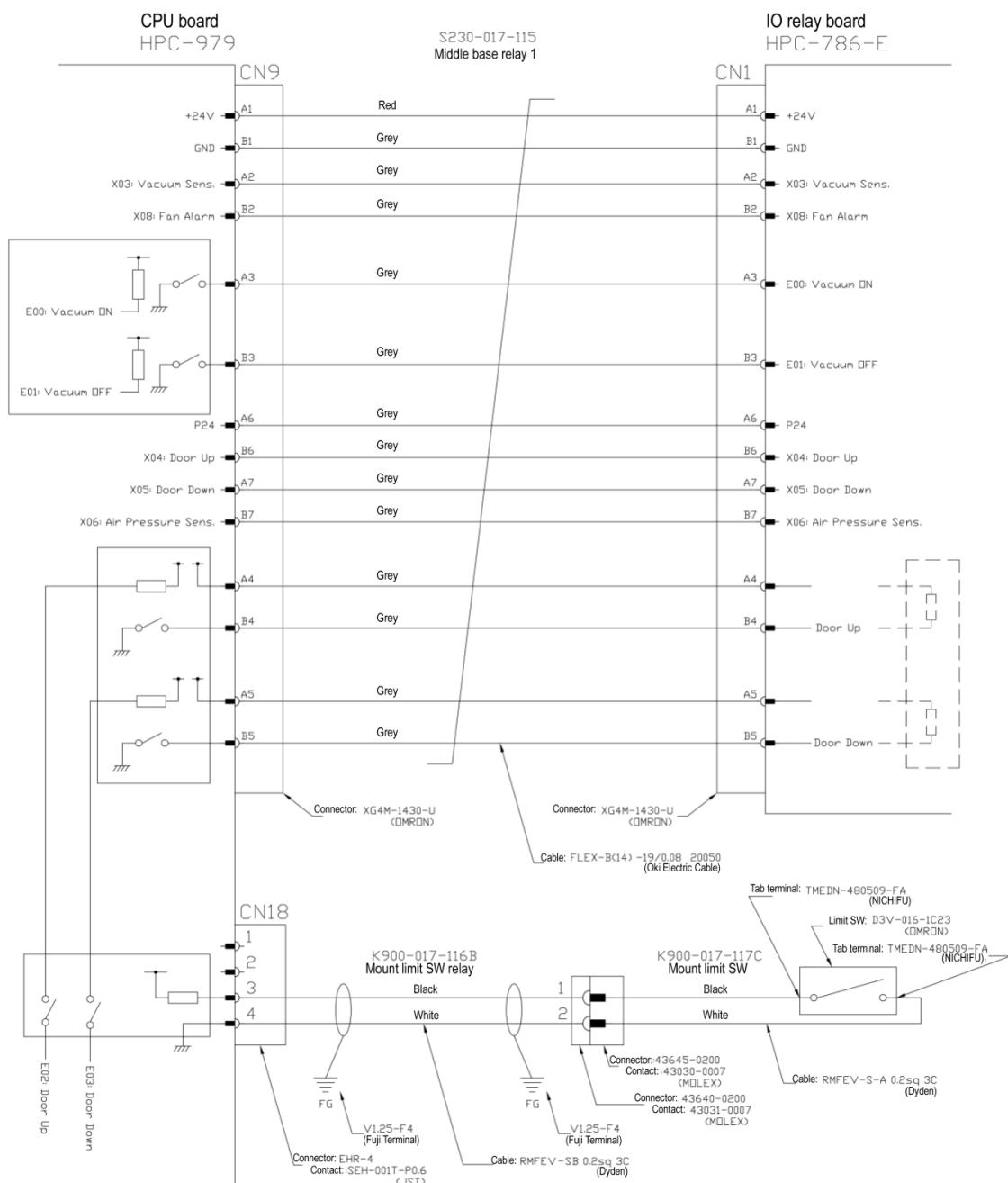
APPENDIX B. 5 Encoder



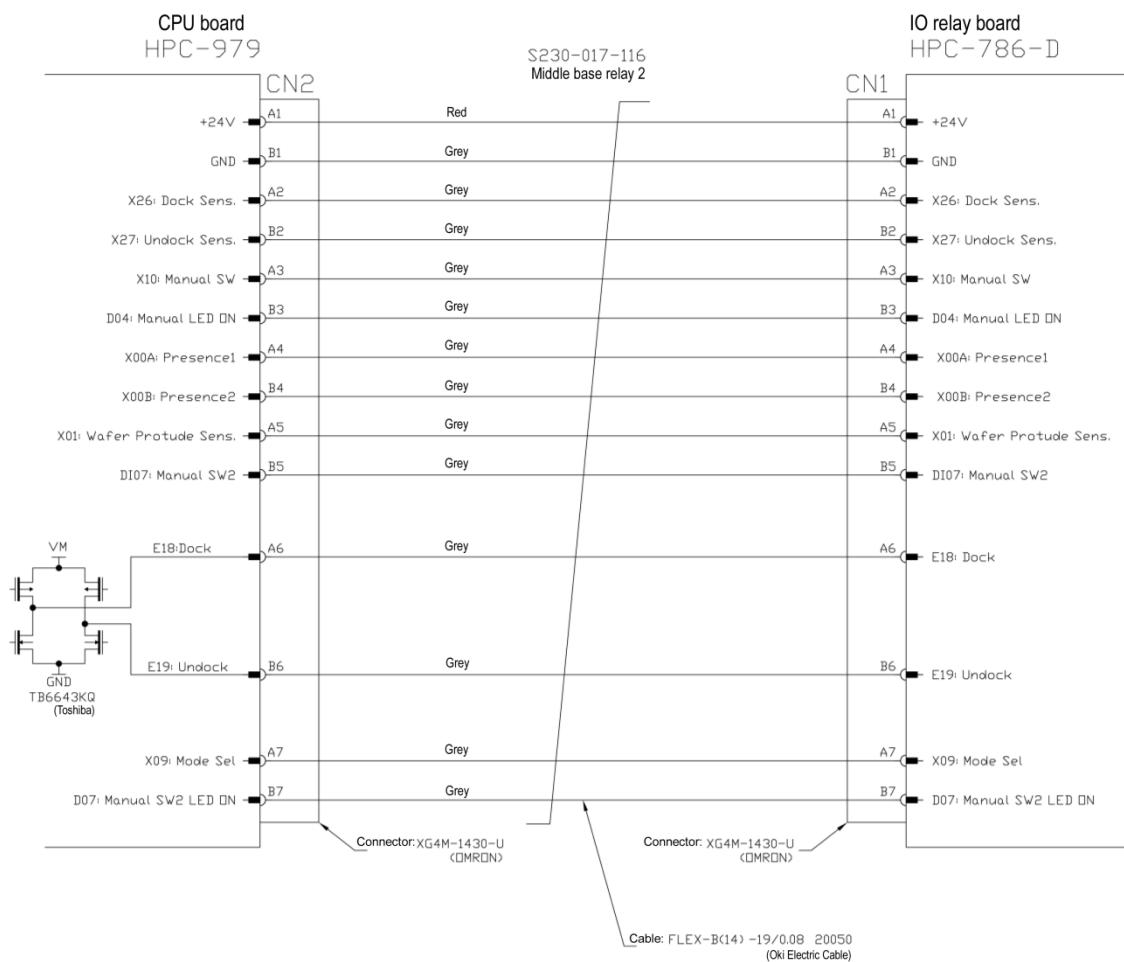
APPENDIX B. 6 Table Unit Relay



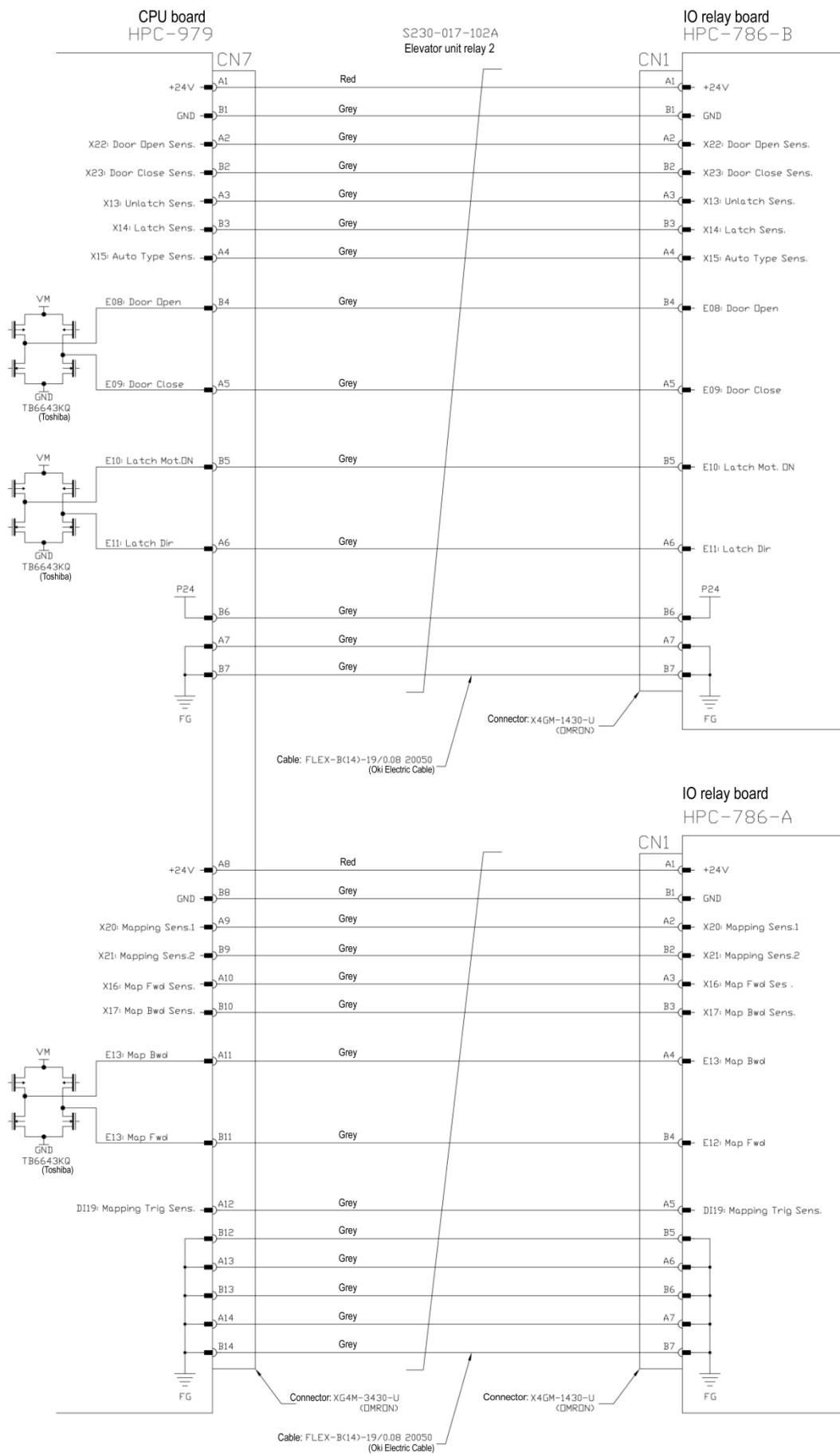
APPENDIX B. 7 Middle Base Relay-1



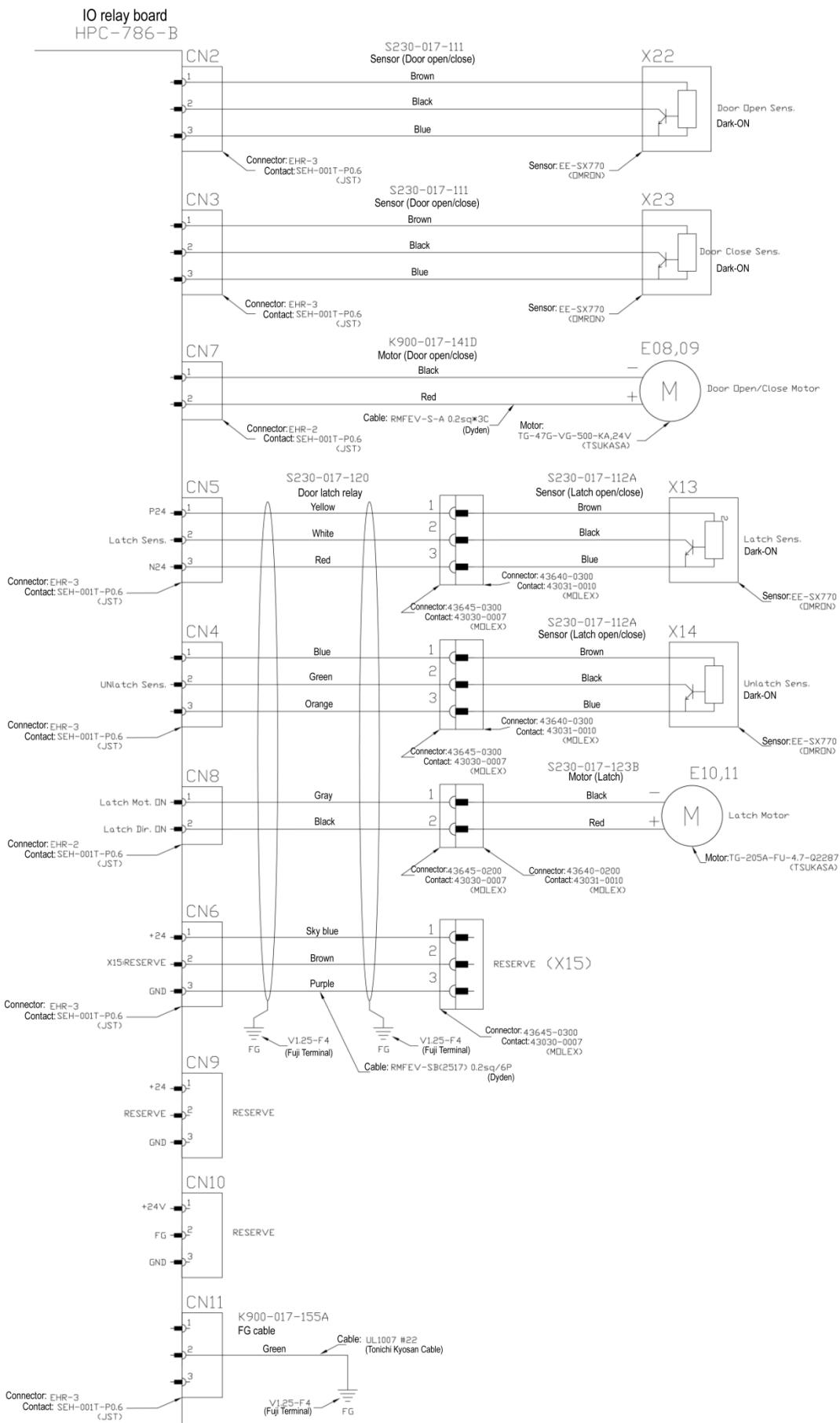
APPENDIX B.8 Middle Base Relay-2



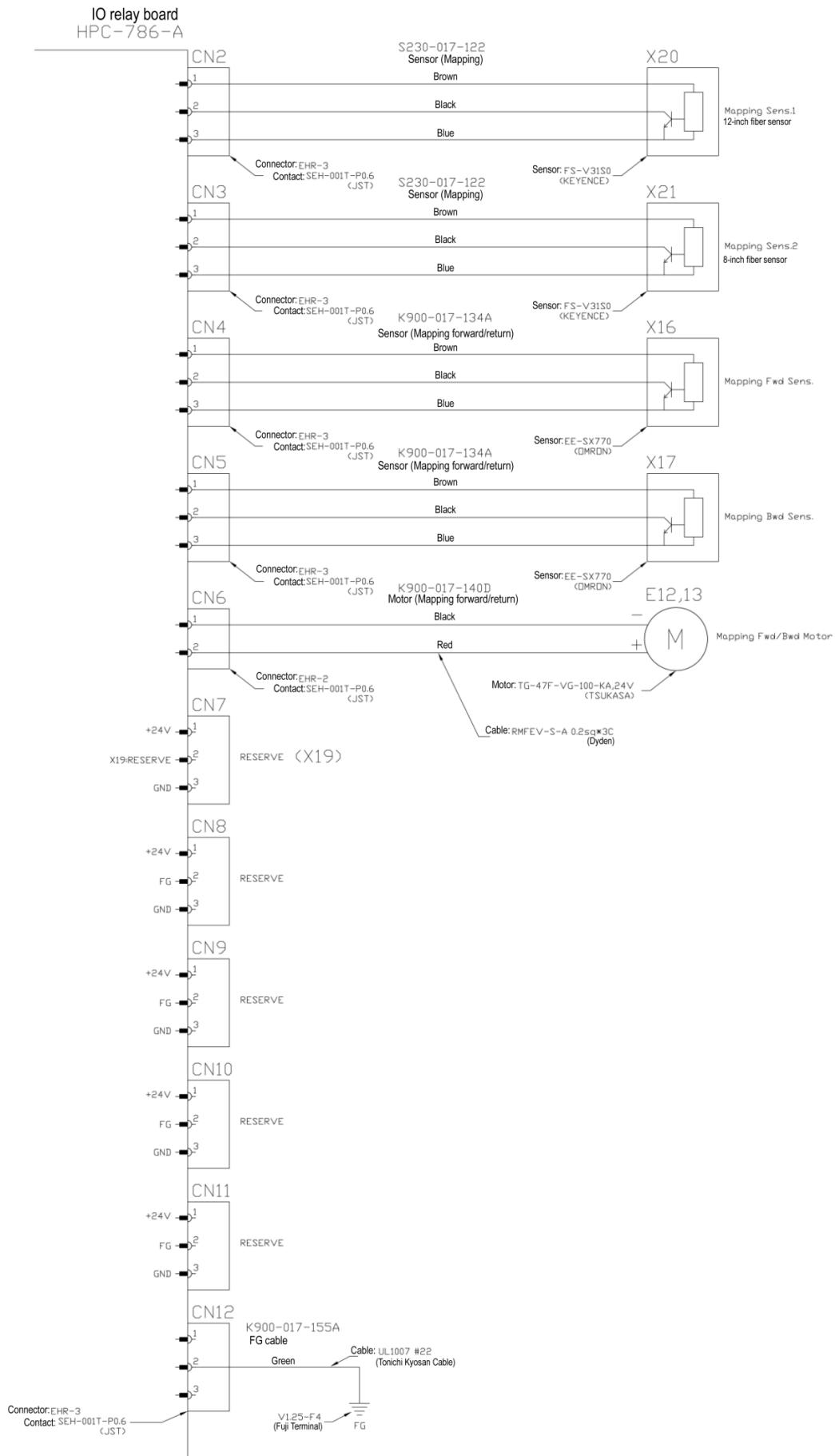
APPENDIX B.9 Elevator Unit Relay



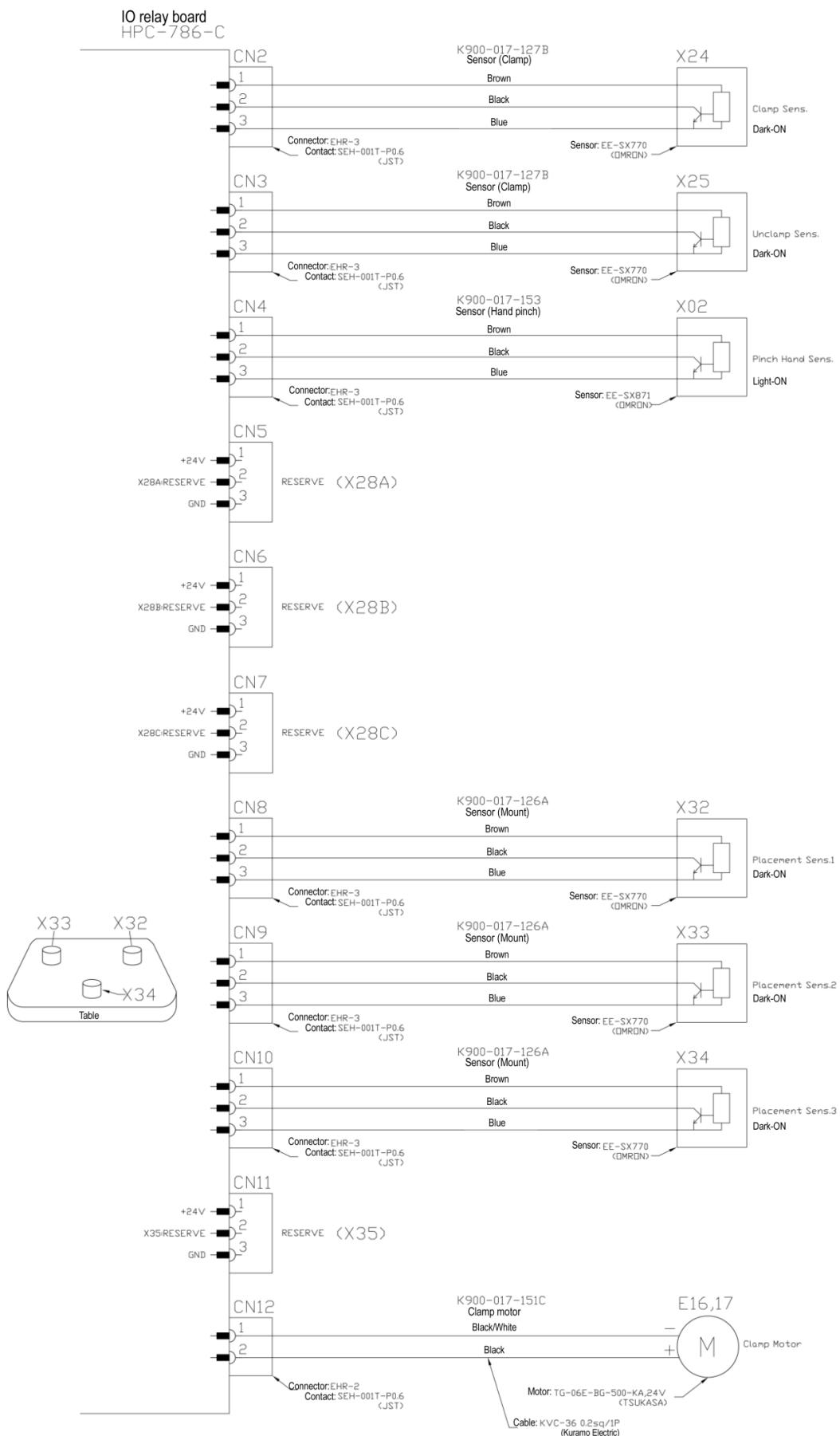
APPENDIX B. 10 Door Evacuation Unit



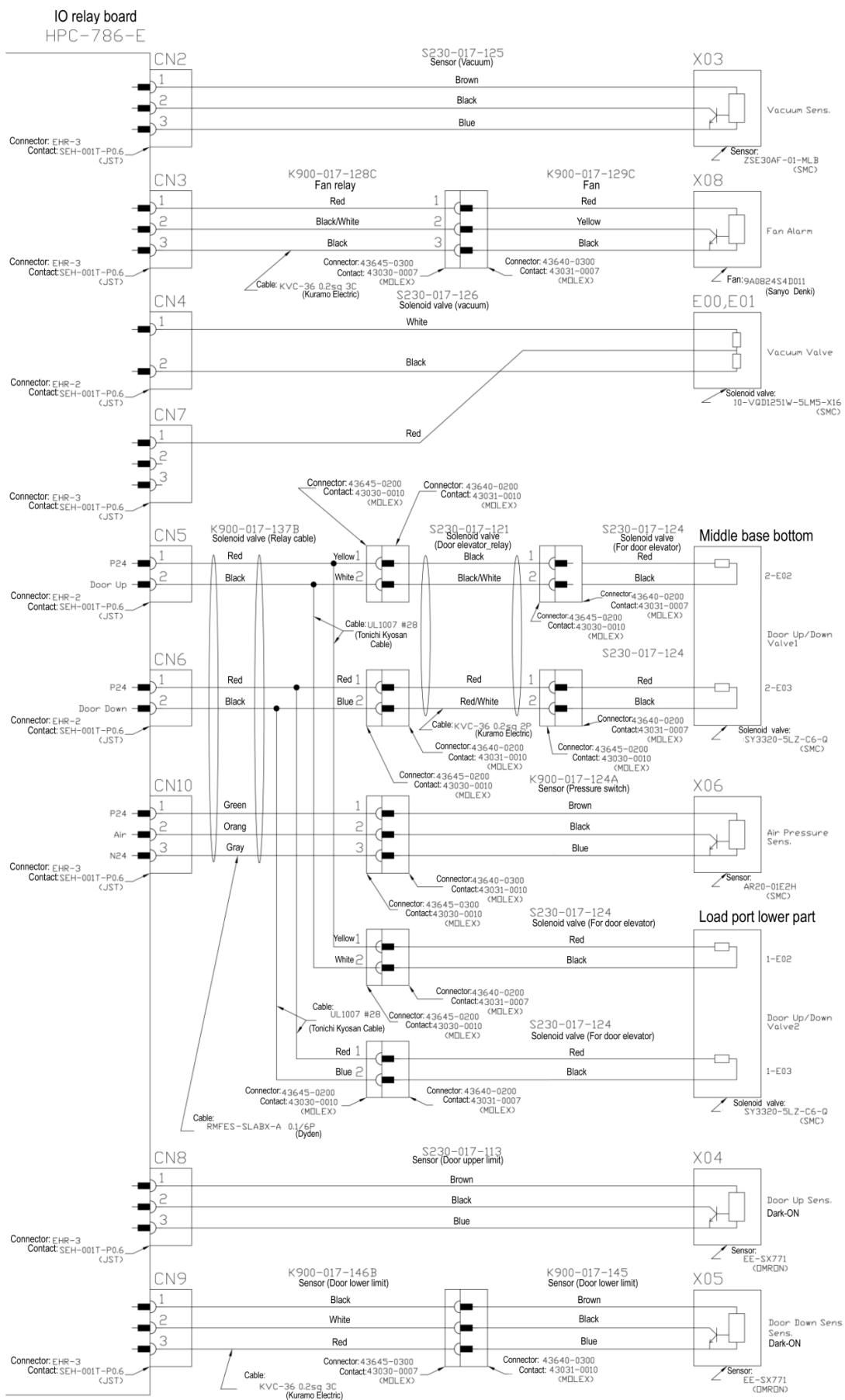
APPENDIX B. 11 Mapping Evacuation Unit



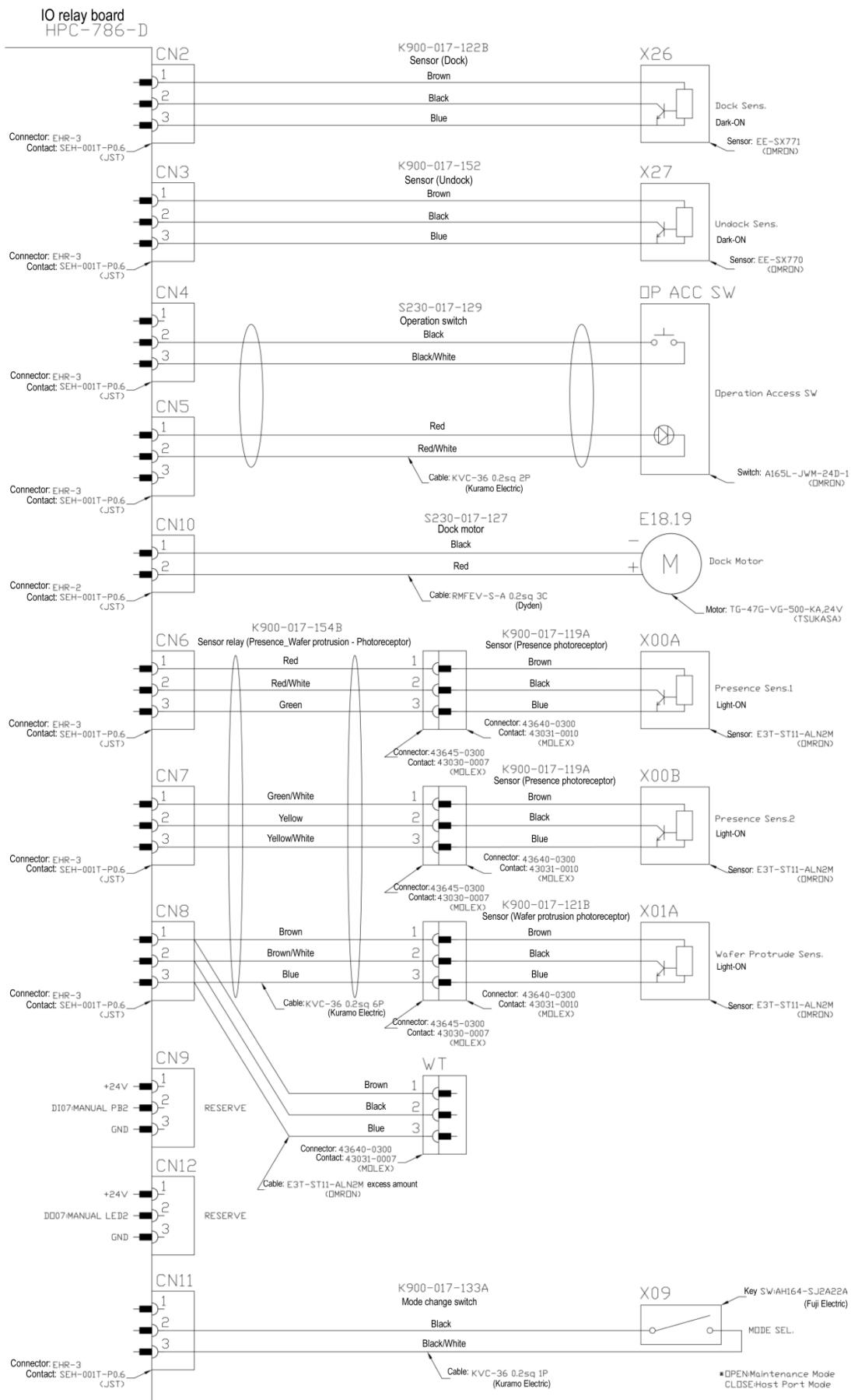
APPENDIX B. 12 Table Unit



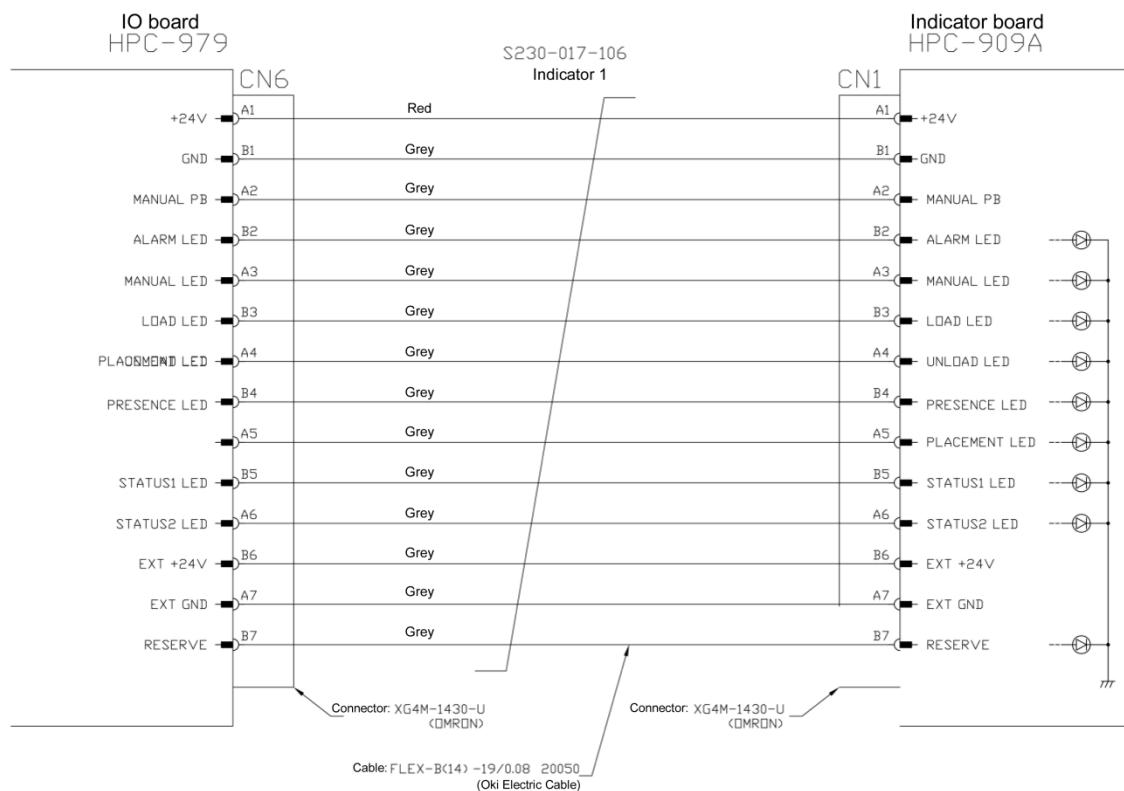
APPENDIX B. 13 Middle Base 1



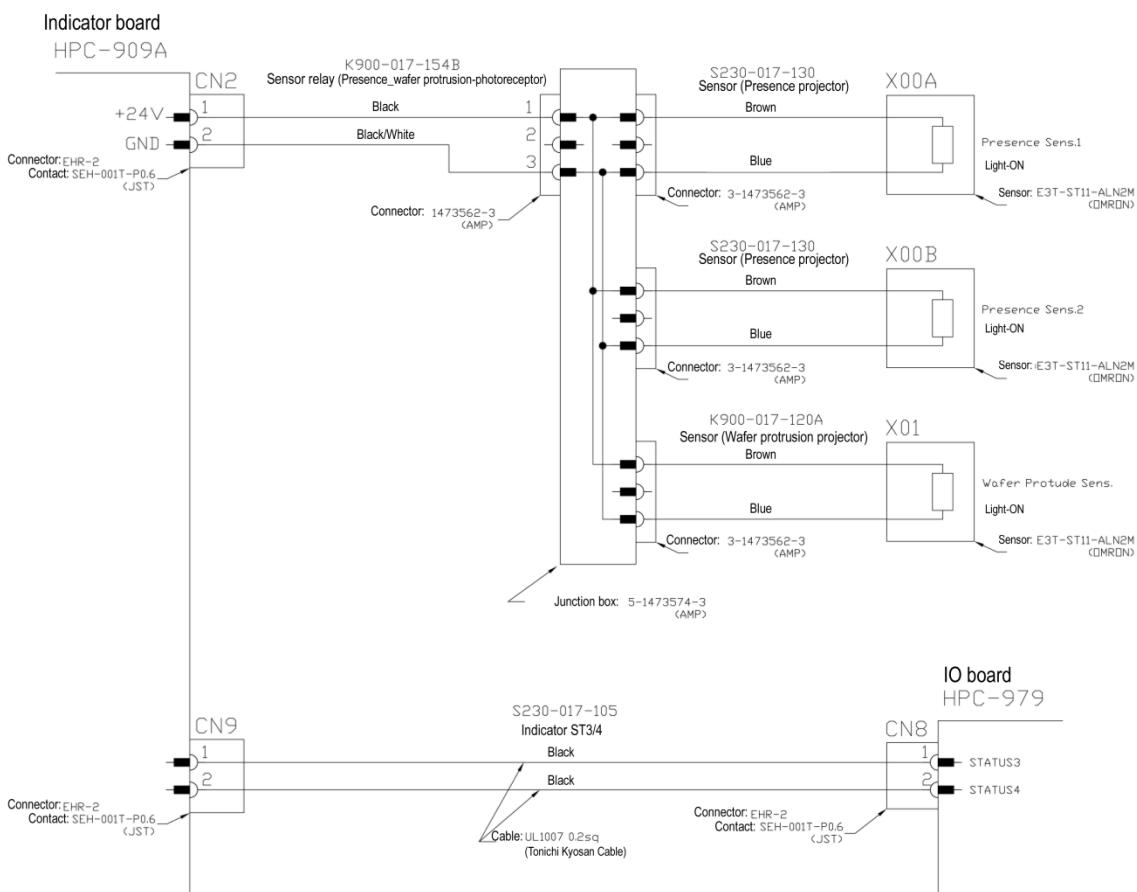
APPENDIX B. 14 Middle Base 2



APPENDIX B. 15 Indicator Relay

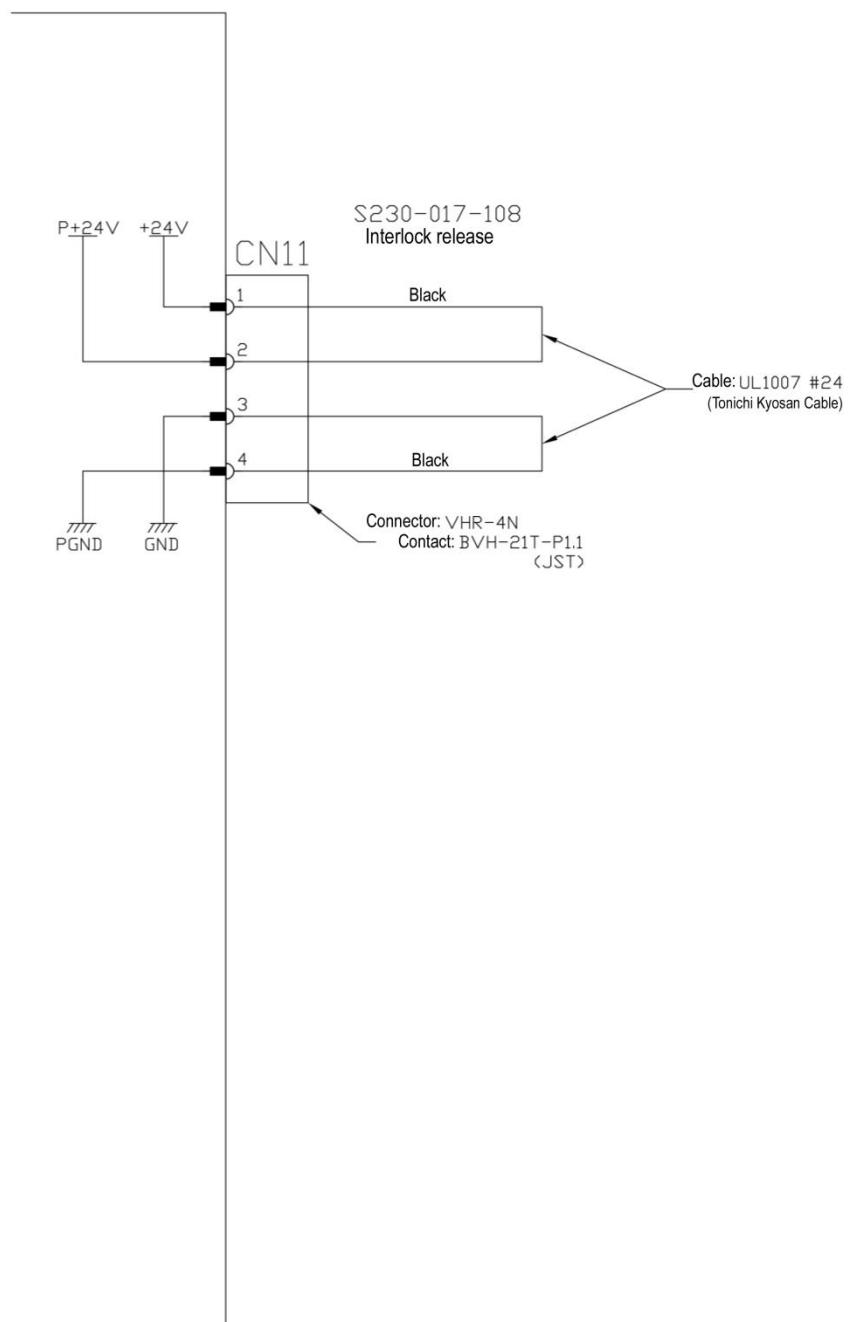


APPENDIX B. 16 Indicator



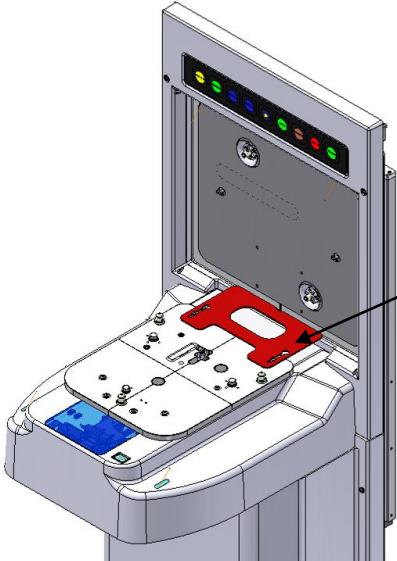
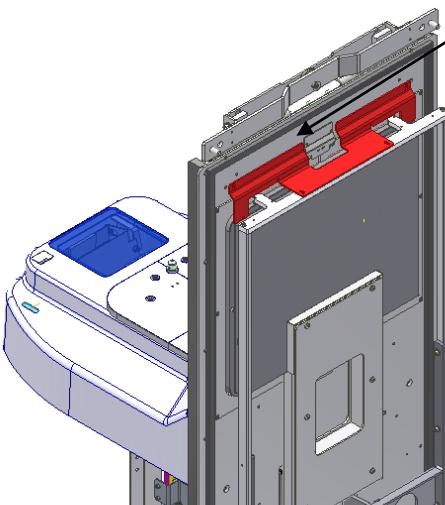
APPENDIX B.17 Interlock Release

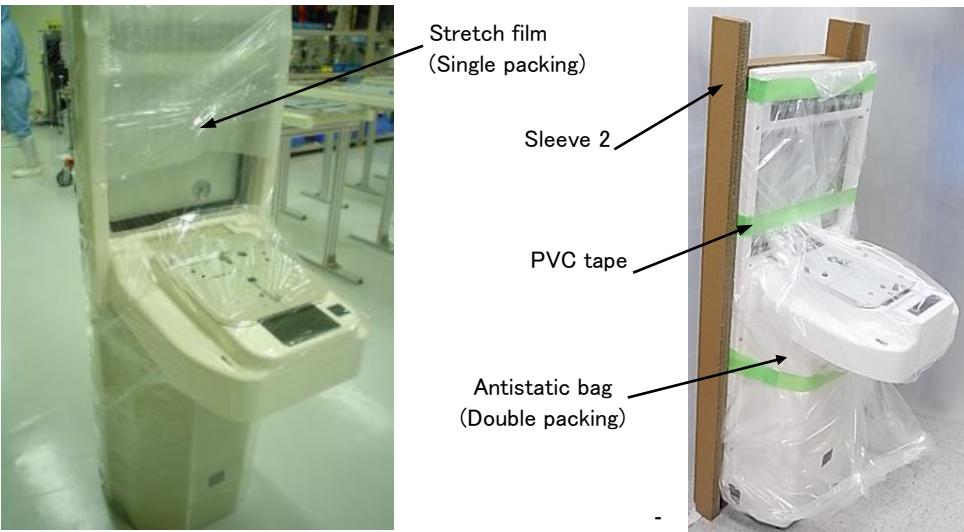
CPU board
HPC-979



APPENDIX C Packaging Procedures

Packing Procedures		No.	Q Equipment Dept.-*****		1/5	
Header	Packing Procedures for KWF-12F3-M	Approved	Checked	Prepared		
		Sakamoto	Matsuda	Muraoka		
Packing procedures have been defined in these specifications.		Rev No.	Date	Sign	Description	
1. Application						
Type	KWF-12F3-M					
2. Packing Conditions						
Product profile	1386H×470W×545D					
Product weight	63 kg					
Packed profile	1560D×620W×780H					
Packed weight	80 kg					
Packing type	<input type="checkbox"/> Crating <input checked="" type="checkbox"/> Carton <input type="checkbox"/> Dedicated case (Case + Carton)					
Details of packing	KWF-12 series packing box					
Cushion	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With (Air cell mat)					
Cleanliness	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With					
Double packing	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With (<input checked="" type="checkbox"/> Stretch film <input type="checkbox"/> PVC bag <input type="checkbox"/> Other)					
Barrier	<input checked="" type="checkbox"/> Without <input type="checkbox"/> With					
Protection sheet	<input checked="" type="checkbox"/> Without <input type="checkbox"/> With					
Antistatic measure	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With					
Other	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With About the attachment, see the attachment list.					
3. Packing Material List						
No.	Part Name	Type	Q'ty	Manufacturer		
1	Case pallet for KWF-12	K900-020-502	1	Hirata		
2	Door/mapping fixing bracket	S230-020-101*-00-**	1	Hirata		
3	Table fixing bracket	K410-020-012B	1	Hirata		
4	Stretch film	18 μ ×500W	Accordingly	Kyowa		
5	Antistatic bag	0.05×1100×2150 (mm)	1	General product		
6	PP band	General product	Accordingly	General product		
7	PVC tape	#600 50 mm×50 m	Accordingly	Denki Kagaku		
8	Attachment list	Specified format	1	Hirata		
9	Tilt/fall detector	Safe-Board	1 set	Nihon Kakoh Kizai		
10	Shock detector	MODEL L-35	1 set	Sumitomo 3M		

Packing Procedures	No.	Q Equipment Dept.-*****	2/5
4. Packing Procedures			
① Check that the table is in the undock position and the door and mapping are in their original positions. ② By a table fixing bracket, fix the main body with table and top cover pulled.			
 <p>Table fixing bracket</p> <p>③ Turn off the power and disconnect the air (positive pressure, negative pressure, exhaust). ④ Install the door and mapping fixing bracket to the main body.</p>			
 <p>Door and mapping fixing bracket</p>			

Packing Procedures	No.	Q Equipment Dept.*****	3/5
⑤ Except for the casters, wrap the main body with the stretch film and antistatic bag, and then install the sleeve 2.			
		 <p>Stretch film (Single packing)</p> <p>Sleeve 2</p> <p>PVC tape</p> <p>Antistatic bag (Double packing)</p>	
⑥ Slowly tilt down the main body. (Two persons are needed.)			
⑦ Load the main body onto the sleeve 1. (Two persons are needed.)		 <p>Sleeve 1</p>	

Packing Procedures

No.

Q Equipment Dept.-*****

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⑧ Apply the stretch film to the casters, and wrap them by the antistatic bag.

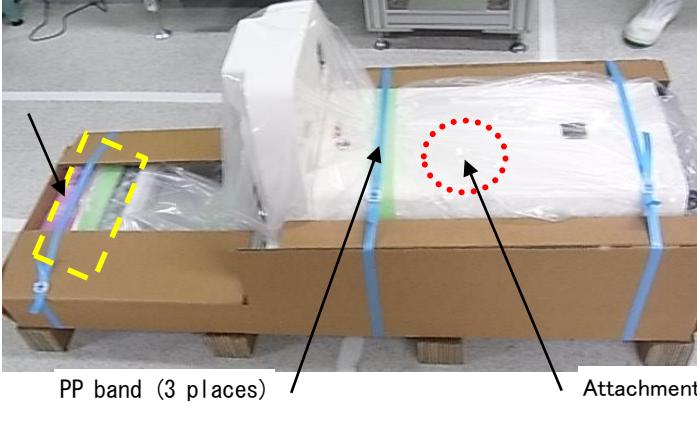


⑨ After packing the casters, load the packed main body service jig (upper and lower parts) onto the sleeve 1.

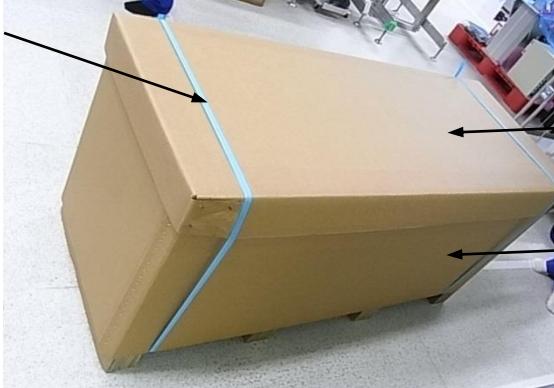


⑩ Bind them with the PP band (3 places), and affix the Unpacking Procedures.

⑪ Put the attachment and attachment list into a bag and affix it to the main body



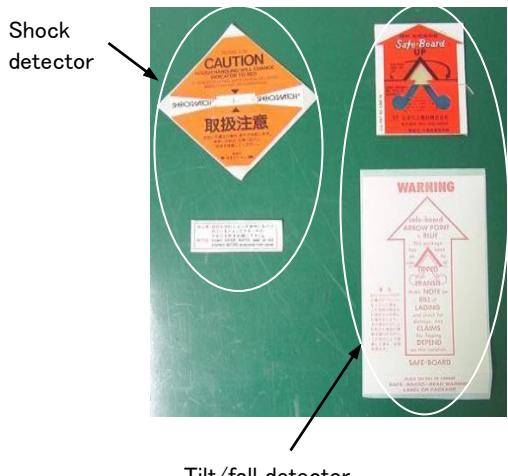
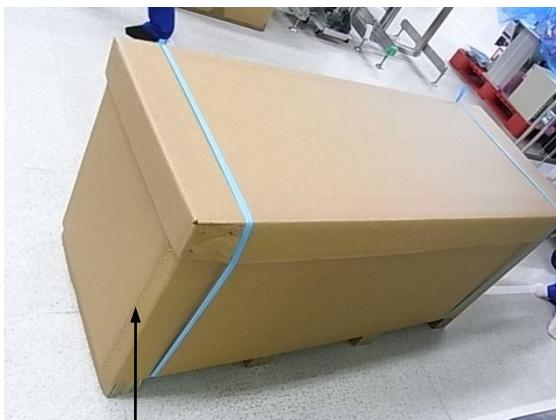
⑫ Cover the body with the sleeve 3 and cap, and bind them with the PP band (2 places).

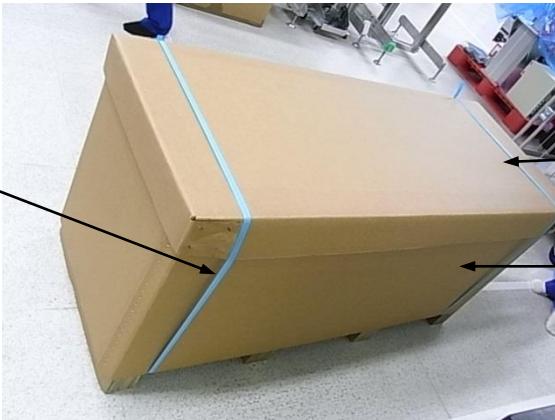
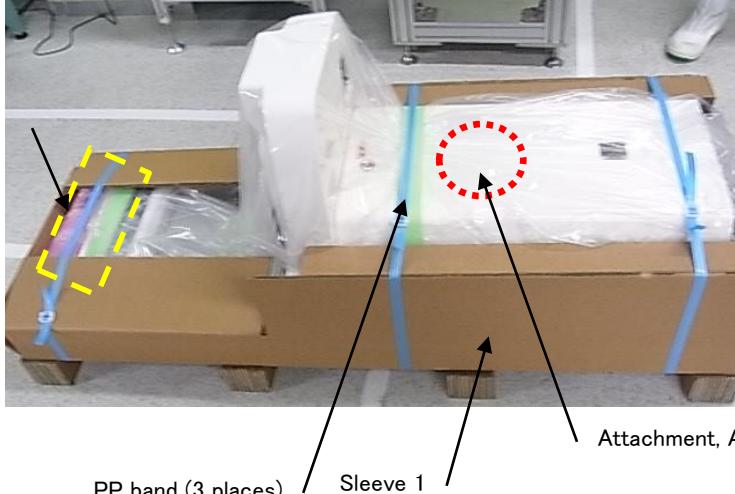


Packing Procedures	No.	Q Equipment Dept -*****	5/5
<p>⑧ Affix the tilt/fall detector and the shock detector to the specified position on the sleeve.</p> <p>The diagram shows a green sleeve with three labels. A small orange triangular label at the top left is labeled 'CAUTION' and 'SHOCK'. A white rectangular label below it is labeled 'WARNING' with an arrow pointing upwards. A third label is partially visible on the right. Two arrows point from the text 'Shock detector' and 'Tilt/fall detector' to these respective labels.</p>			

APPENDIX D Unpacking Procedures

Unpacking Procedures		No.	Q Equipment Dept.-*****		1/4	
Header	Unpacking Procedures for KWF-12F3-M	Approved	Checked	Prepared		
		Sakamoto	Matsuda	Muraoka		
Packaging procedures have been defined in these specifications.		Rev No.	Date	Sign	Description	
1. Application						
Type	KWF-12F3-M					
2. Unpacking Conditions						
Product profile	1386H×470W×545D					
Product weight	63 kg					
Packed profile	1560D×620W×780H					
Packed weight	80 kg					
Packing type	<input type="checkbox"/> Crating <input checked="" type="checkbox"/> Carton <input type="checkbox"/> Dedicated case (Case + Carton)					
Details of packing	KWF-12 series packing box					
Cushion	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With (Air cell mat)					
Cleanness	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With					
Double packing	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With (<input checked="" type="checkbox"/> Stretch film <input type="checkbox"/> PVC bag <input type="checkbox"/> Other)					
Barrier	<input checked="" type="checkbox"/> Without <input type="checkbox"/> With					
Protection sheet	<input checked="" type="checkbox"/> Without <input type="checkbox"/> With					
Antistatic measure	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With					
Other	<input type="checkbox"/> Without <input checked="" type="checkbox"/> With About the attachment, see the attachment list.					

Unpacking Procedures	No.	Q Equipment Dept.-*****	2/4
3. Unpacking Procedures			
<p>① Check the tilt/fall detector and the shock detector affixed on the sleeve 3 for abnormality.</p>  			

Unpacking Procedures	No.	Q Equipment Dept.-*****	3/4
<p>② Unbind the PP band (2 places), and remove the sleeve and cap.</p> 			
<p>③ Confirm the Unpacking Procedures, Attachment and Attachment list, and unbind the PP band (3 places).</p> 			

Unpacking Procedures	No.	Q Equipment Dept.-*****	4/4
<p>④ Remove the double packing of casters (bottom). When the bottom side appears, hold the sleeve 2 and slowly raise the main body. (Two persons are needed.)</p>   <p>Casters</p> <p>Sleeve 2</p> <p>⑤ Remove the sleeve 2 and raise the main body. Remove all the package to complete unpacking.</p>			

APPENDIX E Possible Error Cause and Recovery Method

H-TYPE code	Error description	Possible cause	Recovery method
10	Clamp time over * The clamp operation is not completed within the set time.	Deformation of container	Replace the container with another one.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Clamp sensor adjustment fault	Adjust the sensor position.
		Clamp sensor failure (X24)	Check the sensor is turned ON/OFF. Or replace it.
		Clamp motor failure	Check if the motor operates. Or replace it.
		Relay board failure (HPC-786-C)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
11	Unclamp time over * The unclamp operation is not completed within the set time.	CPU board failure	Replace the CPU board.
		Deformation of container	Replace the container with another one.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Unclamp sensor adjustment fault	Adjust the sensor position.
		Unclamp sensor failure (X25)	Check the sensor is turned ON/OFF. Or replace it.
		Clamp motor failure	Check if the motor operates. Or replace it.
		Relay board failure (HPC-786-C)	Insert and disconnect the connector of the relay board. Or replace it.
12	Dock time over * The dock operation is not completed within the set time.	Relay cable disconnection	Execute the continuity test.
		CPU board failure	Replace the CPU board.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Door elevator axis position fault	Adjust the door open/close position of the door elevator axis.
		Dock sensor adjustment fault	Adjust the sensor dog position.
		Dock sensor failure (X26)	Check the sensor is turned ON/OFF. Or replace it.
		Dock motor failure	Check if the motor operates. Or replace it.
13	Undock time over * The undock operation is not completed within the set time.	Relay board failure (HPC-786-D)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Door elevator axis position fault	Adjust the door open/close position of the door elevator axis.
		Undock sensor adjustment fault	Adjust the sensor position.
		Undock sensor failure (X27)	Check the sensor is turned ON/OFF. Or replace it.

H-TYPE code	Error description	Possible cause	Recovery method
14	Latch time over * The latch operation is not completed within the set time.	Door elevator axis position fault	Adjust the door open/close position of the door elevator axis.
		Latch sensor adjustment fault	Adjust the sensor position.
		Latch sensor failure (X13)	Check that the latch sensor is turned ON/OFF.
		Latch drive motor failure	Replace the latch drive motor.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector of the relay board.
		Relay cable disconnection	Execute the continuity test.
		CPU board failure	Replace the CPU board.
15	Unlatch time over * The unlatch operation is not completed within the set time.	Door elevator axis position fault	Adjust the door open/close position of the door elevator axis.
		Unlatch sensor adjustment fault	Adjust the sensor position.
		Unlatch sensor failure (X14)	Check the sensor is turned ON/OFF. Or replace it.
		Latch drive motor failure	Replace the latch drive motor.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
16	Vacuum time over * The vacuum operation is not completed within the set time.	Drop of vacuum source pressure	Check the vacuum source pressure.
		Deformation of container	Replace the container.
		Dust adhesion to container door face	Clean the container.
		Door elevator axis position fault	Adjust the door open/close position of the door elevator axis.
		Air hose breakage and coming-off	Replace the air hose.
		Absorbent pad deformation	Replace the absorbent pad.
		Registration pin error	Adjust or replace the registration pin.
		Threshold setting failure of vacuum switch (X03)	Adjust the threshold setting of the vacuum switch.
		Solenoid valve failure	Replace the solenoid valve.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay cable.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
17	Vacuum release time over * The vacuum release operation is not completed within the set time.	Air hose breakage	Replace the air hose.
		Threshold setting failure of vacuum switch (X03)	Adjust the threshold setting of the vacuum switch.
		Solenoid valve failure	Replace the solenoid valve.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay cable. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
18	Door open time over * The door open operation is not completed within the set time.	Door open sensor adjustment fault	Adjust the sensor position.
		Door open sensor failure (X22)	Check that the sensor is turned ON/OFF.
		Door open/close motor failure	Check if the motor operates properly.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector of the relay cable.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.

H-TYPE code	Error description	Possible cause	Recovery method
19	Door close time over * The door close operation is not completed within the set time.	Faulty setting of wafer (crossing, etc.)	Set the wafer correctly.
		Door close sensor adjustment fault	Adjust the sensor position.
		Door close sensor failure (X23)	Check the sensor is turned ON/OFF. Or replace it.
		Door open/close motor failure	Check if the motor operates. Or replace it.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector of the relay cable.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
1A	Mapping forward time over * The mapping forward operation is not completed within the set time.	Adjustment fault of mapping start position and end position	Adjust the start position and end position of mapping.
		Adjustment fault of mapping forward sensor	Adjust the sensor position.
		Mapping output sensor failure (X16)	Check the sensor is turned ON/OFF. Or replace it.
		Mapping in/out motor failure	Check that the motor operates properly. Or replace it.
		Relay board failure (HPC-786-A)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
1B	Mapping return time over * The mapping return operation is not completed within the set time.	Adjustment fault of mapping return sensor	Adjust the sensor position.
		Mapping output sensor failure (X17)	Check the sensor is turned ON/OFF. Or replace it.
		Mapping forward/return motor failure	Check that the motor operates properly. Or replace it.
		Relay board failure (HPC-786-A)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
1F	Communication error * Although reply for the event has been retried 3 times, normal command hand-shake is not established.	No response to event (T-TYPE only)	-
20	Home return time over * Because the home return operation has been performed with vacuumed state in the TYPE setting other than FOUP TYPE, the home return operation is unavailable, and an error is detected during the operation.	Detection of vacuumed state (FOUPFOUP container) during the home return operation in open cassette/FOSB TYPE	Change to a container corresponding the type at present. In case of the erroneous detection of the vacuum sensor, search the surroundings. (Reference: Content check on the code 16/17)

H-TYPE code	Error description	Possible cause	Recovery method
21	Loading time over * The loading operation is not completed within the set time.	Parameter setting fault	Extend the TIMER/Load time of the parameter.
22	Loading time over * The unloading operation is not completed within the set time.	Parameter setting fault	Extend the TIMER/Unload time of the parameter
23	Positioning time over * The retry operation by the elevator axis intermediate stop operation (mapping start/end position) is unavailable within the range.	Drop of source pressure	Check that the source pressure is applied properly. (Check the regulator set value.)
		Speed controller adjustment fault	Adjust the dial of the speed controller.
		Correction parameter adjustment fault	Perform the Z-elevation calibration.
28	Elevator axis door open/close position movement time over * The elevator axis door open/close position movement is not completed within the set time. * The door open/close operation is not completed.	Drop of source pressure	Check that the source pressure is applied properly. (Check the regulator set value.)
		Speed controller adjustment fault	Adjust the dial of the speed controller.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Adjustment fault of door rising limit sensor	Adjust the sensor dog position.
		Door rising limit sensor failure (X04)	Check the sensor is turned ON/OFF. Or replace it.
		Solenoid valve failure	Replace the solenoid valve.
		Cylinder operation fault	Replace the cylinder.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
29	Elevator axis mapping start position movement time over * The elevator axis mapping stat position movement is not completed within the set time.	Parameter setting fault	Extend the TIMER/Map.Door time of the parameter.
		Drop of source pressure	Check that the source pressure is applied properly. (Check the regulator set value.)
		Speed controller adjustment fault	Adjust the dial of the speed controller.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Solenoid valve failure	Replace the solenoid valve.
		Cylinder operation fault	Replace the cylinder.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
		Parameter setting fault	Extend the TIMER/Map Start time of the parameter.

H-TYPE code	Error description	Possible cause	Recovery method
2A	Elevator axis mapping end position movement time over * The elevator axis mapping end position movement is not completed within the set time.	Drop of source pressure	Check that the source pressure is applied properly. (Check the regulator set value.)
		Speed controller adjustment fault	Adjust the dial of the speed controller.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Solenoid valve failure	Replace the solenoid valve.
		Cylinder operation fault	Replace the cylinder.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
		Parameter setting fault	Extend the TIMER/Map.End time of the parameter.
2B	Elevator axis load position movement time over * The elevator axis door load position movement is not completed within the set time.	Drop of source pressure	Check that the source pressure is applied properly. (Check the regulator set value.)
		Speed controller adjustment fault	Adjust the dial of the speed controller.
		Caught of a foreign matter or interfering object	Remove the foreign matter or the interfering object.
		Adjustment fault of the door lowering limit sensors.	Adjust the sensor dog position.
		Door lowering limit sensor failure (X05)	Check the sensor is turned ON/OFF. Or replace it.
		Solenoid valve failure	Replace the solenoid valve.
		Cylinder operation fault	Replace the cylinder.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
30	Mapping Calibration error 1	No wafer on bottom stage (Maintenance mode only)	Set a wafer on the bottom stage.
	Mapping Calibration error 2	No wafer on top stage (Maintenance mode only)	Set a wafer on the top stage.
32	Mapping Calibration error 3	Calibration procedure error (Maintenance mode only)	Perform the calibration again.
40	Mapping data error	Setting fault of mapping start position and end position	Adjust the start position and end position of mapping.
		Adjustment fault of mapping sensor light axis	Adjust the mapping sensor light axis.
		Threshold setting failure of mapping sensor amplifier	Adjust the threshold setting of the mapping sensor amplifier.
41	Mode select error	The mode SW is switched during operation.	Be sure not to switch the mode SW during operation.
		Mode SW failure (X09)	Switch the mode SW for several times. Or replace the mode SW.
		Relay board failure (HPC-786-DA)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
50	Z-elevator axis Calibration error 1	Offset calculation result error (Maintenance mode only)	Perform the calibration again.

H-TYPE code	Error description	Possible cause	Recovery method
51	Z-elevator axis Calibration error 1	Not stopped within the stop range when checked after the calibration (Down operation start position) (Maintenance mode only)	Adjust the dial of the speed controller. Check the parameter setting. (PositCPUning Zone) Perform the calibration again.
52	Z-elevator axis Calibration error 1	Not stopped within the stop range when checked after the calibration (Down operation end position) (Maintenance mode only)	Adjust the dial of the speed controller. Check the parameter setting. (PositCPUning Zone) Perform the calibration again.
53	Z-elevator axis Calibration error 1	Not stopped within the stop range when checked after the calibration (Up operation start position) (Maintenance mode only)	Adjust the dial of the speed controller. Check the parameter setting. (PositCPUning Zone) Perform the calibration again.
54	Z-elevator axis Calibration error 1	Not stopped within the stop range when checked after the calibration (Up operation end position) (Maintenance mode only)	Adjust the dial of the speed controller. Check the parameter setting. (PositCPUning Zone) Perform the calibration again.
70	Clamp sensor error * The clamp sensor and unclamp sensor are detected simultaneously.	Clamp and unclamp sensor failure (X24, X25)	Check that the clamp and the unclamp sensors are turned ON/OFF. Or replace it.
		Connection failure of sensor wires	Check for damage on the sensor wire, and check the connection status of the connector. Or replace it.
		Relay board failure (HPC-786-C)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board
71	Dock sensor error * The dock sensor and undock sensor are detected simultaneously.	Dock/undock sensor failure (X26, X27)	Check that the dock and the undock sensors are turned ON/OFF. Or replace it.
		Connection failure of sensor wires	Check for damage on the sensor wire, and check the connection status of the connector. Or replace it.
		Relay board failure (HPC-786-D)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
72	Latch sensor error * The latch sensor and unlatch sensor are detected simultaneously.	Latch/unlatch sensor failure (X13, X14)	Check that the latch and the unlatch sensors are turned ON/OFF. Or replace it.
		Connection failure of sensor wires	Check for damage on the sensor wire, and check the connection status of the connector. Or replace it.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.

H-TYPE code	Error description	Possible cause	Recovery method
73	Door sensor error * The door open and door close sensor are detected simultaneously.	Door open/close sensor failure (X22, X23)	Check that the door open and the door close sensors are turned ON/OFF. Or replace it.
		Connection failure of sensor wires	Check for damage on the sensor wire, and check the connection status of the connector. Or replace it.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
74	Mapping sensor error * The mapping in sensor and mapping out sensor are detected simultaneously.	Mapping in/out sensor failure (X16, X17)	Check that the mapping in and the mapping out sensors are turned ON/OFF. Or replace it.
		Connection failure of sensor wires	Check for damage on the sensor wire, and check the connection status of the connector. Or replace it.
		Relay board failure (HPC-786-A)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.
77	Elevator axis sensor error * The door rising limit sensor and door lowering limit sensor are detected simultaneously.	Door rising/lowering limit sensor failure (X04, X05)	Check that the door rising/lowering limit sensor is turned ON/OFF. Or replace it.
		Connection failure of sensor wires	Check for damage on the sensor wire, and check the connection status of the connector. Or replace it.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
A0	Wafer drop * The door retention state is changed during door retention.	Coming-off of door vacuum sensor during door retention (X03)	Check the vacuum pressure and the connection status of the "Vacuum sensor". Or replace it.
		Coming-off of latch sensor during door retention (X13)	Check the connection status of the latch sensor. Or replace it.
		Relay board failure (HPC-786-B)	Insert and disconnect the connector. Or replace it.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board
A1	Wafer protrusion * The wafer protrusion sensor is detected during dock output.	Wafer storage position fault	Adjust the wafer storage position of the wafer transfer robot.
		Dust adherence to wafer protrusion sensor	Clean the wafer protrusion sensor.
		Wafer protrusion sensor failure (X01)	Check the wafer protrusion sensor is turned ON/OFF. Or replace it.
		Use of an unspecified adapter (when adapter is used)	Check the specifications of the cassette adapter.
A2	FOUP mount error (Mount sensor) * The state of mount sensor is not correct.	The cassette is deformed.	Replace the cassette.
		Mount sensor failure (X32, X33, X34)	Check the mount sensor is turned ON/OFF. Or replace it.
		Relay board failure (HPC-786-C)	Insert and disconnect the connector. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.

H-TYPE code	Error description	Possible cause	Recovery method
A3	FOUP mount error (Presence sensor) * The state of presence sensor is not correct.	Use of a transparent cassette	Adjust the load presence sensor light axis for the transparent container. Or replace the container.
		Incorrect type setting	Set a type corresponding to the container.
		Deviation of presence sensor light axis	Adjust the presence sensor light axis.
		Presence sensor failure (X00)	Check that the presence sensor is turned ON/OFF.
		Relay cable disconnection	Execute the continuity test.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector. Or replace it.
		CPU board failure	Replace the CPU board.
A5	Air pressure drop * The state of supplying air pressure is not correct.	Drop of source pressure	Check if the source pressure is properly provided.
		Air hose breakage and coming-off	Check for leakage from the air joint of the door elevator area and dock area cylinder.
		Threshold setting failure of pressure sensor	Set the threshold of the pressure sensor correctly.
		Pressure sensor failure (X06)	Replace the pressure sensor.
B0	Host error (with no PCPU input)	No input of available signal from upper level device	Check the signal status of the upper level device and the connection status of CNA3, and execute the insertion/disconnection of the connector and continuity test.
C0	Parameter error	Incorrect parameter checksum	Download the backup parameter. If this error often occurs, replace the CPU board.
E0	FAN stop alarm	Caught of a foreign matter by FAN	When the foreign matter is caught by FAN, remove it.
		Relay board failure (HPC-786-E)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		Fan failure (X08)	Replace the fan.
E3	Power supply voltage drop	Drop of power supply voltage	Check for the power supply voltage. (DC24V±5%, 4.0A)
FE	Dock hand pinch error	Detection of a foreign matter between the door and FOUP during dock operation	Execute the undock operation to remove the foreign matter or the interfering object.
		Door elevator axis position fault	Adjust the door open/close position of the door elevator axis
		Hand pinch sensor position fault	Adjust the hand pinch sensor position.
		Hand pinch sensor failure (X02)	Check that the hand pinch sensor is turned ON/OFF. Or replace it.
		Relay board failure (HPC-786-C)	Insert and disconnect the connector of the relay board. Or replace it.
		Relay cable disconnection	Execute the continuity test. Or replace it.
		CPU board failure	Replace the CPU board.