

DATE: December 22, 2005

ESTIMATE No.

ORDER No.

CUSTOMER

Synetics Solutions Inc.

USER

**YASKAWA**

CONTENTS

Pre-Aligner Maintenance Manual**Pre-Aligner Type : XU-ACP130-A13 (PV11)**

Upon receipt of this product and prior to initial operation,
read these instructions thoroughly, and retain for future reference.

<Related Unit>

Controller: ERCR-NS01-B004

NOTE	COPIES		YASKAWA ELECTRIC CORPORATION Technology Development section 2 Semiconductor Robot Plant Semiconductor Robot Business Division Robotics Automation Division
	CUSTOMER		
<1>P.5.6 Jan.10.'07 K.Yoshino/M.Ogasawara	USER		DR. Dec.22.'05 K.Yoshino
			CK. Dec.22.'05 M.Hagio
			APP. Dec.22.'05 T.Shiraki
			DOC. No.
			HU0480635 – 1/20



MANDATORY

- This Instruction manual is intended to explain setting up and operating the Pre-Aligner. Read this manual thoroughly to understand all precautions and safety information, before setting up and operating the robotic system.
- General Items related to safety are listed in Section 1 Safety. To ensure correct and safe operation, carefully read this section first.



CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating the product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice, when necessary, due to product improvements, modifications, or changes in specifications. If such modifications are made, the manual's revision history will be revised.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modifications will void your product's warranty.



WARNING

- The following "hazardous energy sources" exist in this product. Read this manual and related manuals thoroughly, before using this product.

Failure to observe these warnings may result in injury or damage.

Hazardous Energy Sources

Electrical

208V power in:
Cables

Stored Energy

Pinch warning:
Pre-Aligner weighs 3.9kg

NOTES FOR SAFE OPERATION

Read this manual and related documents thoroughly before installation, operation, maintenance or inspection of this product. Make sure you understand the product information and all precautions and safety information before using the product. In this manual, the Notes for Safe Operation are classified as “WARNING”, “CAUTION”, “MANDATORY” or “PROHIBITED”.



WARNING

:Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



CAUTION

:Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



MANDATORY

:Always be sure to follow explicitly the items listed under this heading.



PROHIBITED

:Must never be performed.

Even, items described as  **CAUTION** may result in a serious accident in some situations. Make sure these important items are followed.

Definition of Terms Used Often in This Manual

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
Pre-Aligner : XU-ACP130-A13	Pre-Aligner
Controller : ERCR-NS01-B004	Controller
Manipulator, Pre-Aligner and Controller	Robotic system

Explanation of Warning Labels <1>

The following warning labels are attached to the Pre-Aligner and/or controller.
Fully comply with all precautions on the warning labels.

WARNING

- Fully comply with all precautions on all warning labels.

Failure to observe these cautions may result in injury or damage to equipment.

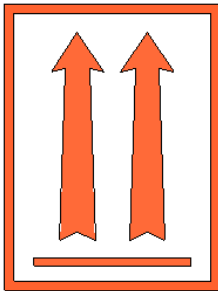


This label is for the Power Cable which contains "HAZARDOUS VOLTAGE".

208 VAC PRESENT

Contact may cause electric shock or burn.

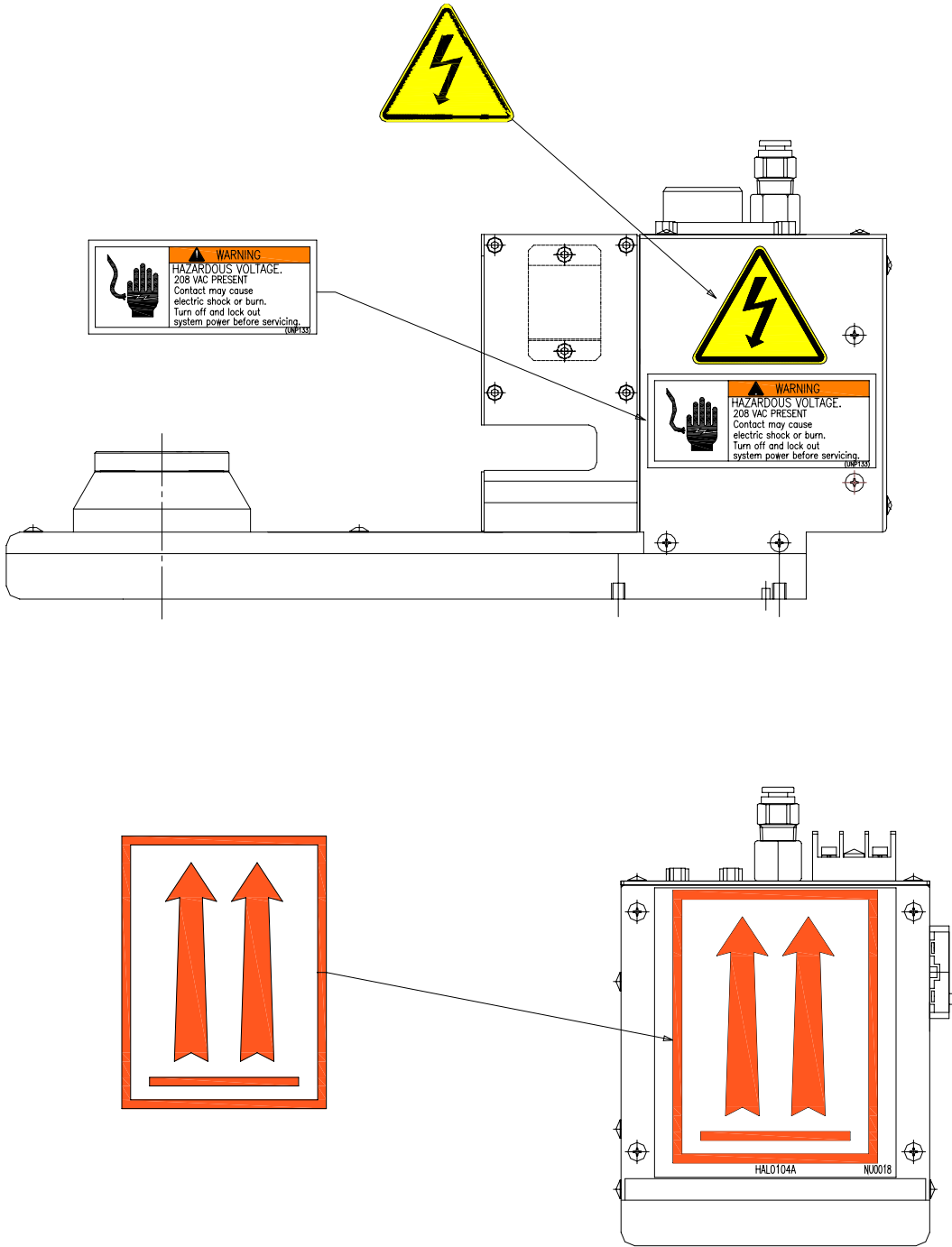
Turn off and lock out system power before connecting or disconnecting.



This label is "This Side Up".

Turn the direction of an arrow upwards in the case of installation and transportation.

Warning Label Location on Pre-Aligner <1>



APPENDIX

Revision History

Draw. No.	Item		Revised by	Approved by
HU0480635	Maintenance Manual for Pre-Aligner			
Date	Rev. No.	Contents		
Jan.10.'07	1	P.5 Addition of warning labels P.6 Change of warning label location	K.Yoshino	M.Ogasawara

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1. Maintenance Schedule



WARNING

- **Before conducting maintenance, inspection or wiring, turn OFF all power supplied (including the compressed air) to the robotic system, lock the power switch and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
The robotic system does not have switches for turning off the power. Turn off the switches in your system to which the robotic system is connected.

Failure to observe this warning may result in electric shock or injury.



CAUTION

- **Maintenance and inspections must be performed by specified personnel.**

Failure to observe this caution may result in electric shock or injury.

1.1 Scheduled Inspections Layout

Proper inspections are essential not only to ensure that the product will be able to function for a long period, but also to prevent malfunctions and ensure safe operation.

The inspection interval should be based on the power supply ON time. Inspection intervals are displayed in three levels: weekly inspections, every 6 months, every 1 year inspections and after 5 years inspections (overhaul) based on 6,000 hours in one year.

Weekly inspections, every 6 months and every 1 year inspections are essential to ensure safe operation and that the product will be able to function for a long period. These are the inspections, which can be conducted at the customer's facilities (on-site inspections). Conduct these on-site periodical inspections according to the inspection schedule in "1.2 Inspection Items".

In addition, YASKAWA recommends the complete check (including the items which can not be done on-site) at YASKAWA as a preventive maintenance after 5 years (30,000 hours). In this case, for the best adjustment, YASKAWA recommends to check Pre-Aligner, and Controller together.

1.2 Items for Scheduled Inspection

The inspection items are classified into three types of operation: operations which can be performed by personnel authorized by the user, operations which can be performed by trained personnel and operations which are performed by YASKAWA. Only qualified personnel are to do inspection work.

	Item	Schedule				Inspection Method	Operation	User engineer	Field Service	YASKAWA
		Weekly	Every 3,000H 6 months	Every 6,000H 1 year	After 30,000H After 5 years					
1	Vacuum	√	√	√		Spec = -80~-70kPa	Adjust as necessary.	√	√	
2	Cable	√	√	√		Visual	Check for excess ware. Fix or replace as necessary.	√	√	
3	Cable Connection	√	√	√		Screwdriver	Check for loose connections. Tighten loose screws.	√	√	
4	Appearance	√	√	√		Visual	Check for damage in each department.	√	√	
5	Pad			√		Visual	Check for abrasion and cleanliness. Clean as necessary, or replace as necessary.	√		
6	Pre-Aligner and Mounting Bolts		√	√		Wrench	Check for loose screws, tighten as necessary.	√	√	
7	Cover Screw		√	√		Wrench, Screwdriver	Check for loose screws, tighten as necessary.	√	√	
8	Belt Tension			√		Belt Tension Meter	Check for belt tension, adjust as necessary.		√	
10	Emergency Stop Button check	√	√	√		Function Check	Refer to '6.4 Inspection for Safety' in "Controller Instruction Manual".	√	√	
11	Safety Interlock check	√	√	√		Function Check	Refer to '6.4 Inspection for Safety' in "Controller Instruction Manual".	√	√	
12	Overhaul				√	Various	YASKAWA recommends the complete check at YASKAWA as a preventive maintenance			√

Note 1) for Item 1: The robotic system does not have any equipment for regulating the air. Adjust the air pressure in the host system and supply the air as being specified to the robotic system.

2) At item 2~20 the equipment is fully de-energized, which results in Type 1 task hazard rating defined by SEMI S2-0200.

- (4) Locate the CDA regulator and shut-off valve at your system.
 - i) Close the valve so that the air-supply is disconnected.

Note that compressed air still exists in the system.
 - ii) Release the stored air using the pressure regulator to slowly bleed the system.
- (5) Lock out or Tag out the CDA Valve and the main power switch in their de-energized positions.
 - i) Locks: Lock out the energy-isolating devices with designated locks. The person who does the service or maintenance work must place the locks and a personal identification tag. Secured locks must hold the energy-isolating devices in a “safe” or “off” position.
 - ii) Tags: The authorized employee who will be doing the service or maintenance work must place tags on the energy-isolating devices. Tags must clearly state that changing the energy-isolating devices from the “safe” or “off” position is prohibited. Because tags don’t eliminate the hazard, you must use additional methods such as blocking a control switch or opening an alternative disconnect. If you can’t place a tag on the energy-isolating device, you must place it as close as possible to the device.
 - iii) The switch with Lockout/Tagout provisions must be located outside of the enclosure where the Pre-Aligner and track are installed. For SEMI S8, it must be located less than 1.638m (64.5”) from the floor.

Lockout/Tagout must be located at the CDA valve and must be easily accessible.
 - iv) If the energy-isolating device is lockable, the employer will use a lock unless he or she can prove that the use of tags would provide the same protection at least as effective as a lock and would assure “full employee protection”.
 - v) When a tag has been attached it is not to be removed except by the person who applied it. The tag should never be bypassed, ignored or otherwise defeated.
 - vi) Tags must be legible and understandable by all employees. The person responsible for placing the tag on the equipment is required to put their name and the date on the tag.
- (6) Verify that the CDA source is isolated by checking that the pressure gauge at the regulator reads 0.
- (7) Verify that the main power supply is disconnected by moving the circuit protector on the controller to “on,” and verify that the LED lights on the controller do not alight.
- (8) Re-energizing Equipment after maintenance

Before you remove locks or tags and re-energize equipment, you must:

 - i) Remove all nonessential tools and equipment from the work area. Make sure all the equipment and components are back in place.
 - ii) Notify all affected employees that the lockout or tagout device(s) will be removed.
 - iii) Check the work area to be sure all workers are clear of the equipment.
- (9) Remove the lockout or tagout device.
- (10) Open CDA valve and operate the regulator to bring the air pressure to the operating pressure.
- (11) Move the circuit protector on the controller to the “on” position.
- (12) Switch the main power supply at your system to the “on” position.

2.5 Removing

The Scheduled inspections and maintenance do not require the removal of the robotic system. But, see “ ‘4.3 Removing Pre-Aligner’ in the Pre-Aligner’s Operator Manual, when it is necessary.

2. Notice



MANDATORY

- **Persons who teach, inspect or maintain the Pre-Aligner must undergo required training before using the Pre-Aligner.**
For more information on training, inquire at the nearest YASKAWA branch office.
The telephone numbers are listed in section “8. Other Information” of this manual.

2.1 Hazardous Energy Sources List

The robotic system (Pre-Aligner and Controller) has Hazardous Energy Sources as stated below. Fully comply with all precautions and safety information in the manuals and the warning labels.

Electrical

208V power in:

- Cables
- Controller Box

Stored Energy

Pinch warning:

- Pre-Aligner weighs 3.9 kgf
- Controller weighs 14kgf

2.2 Chemicals

No chemical is generated in the robotic system. But Grease is used for lubrication in Ball screws and Linear Guides. Grease is recommended in maintenance. And adhesive is recommended in servicing.

- 10% IPA (Isopropyl Alcohol) DI Water (Customer's equipment)
 Type: Isopropyl Alcohol
 Obtain the Material Safety Data Sheet of alcohol from your chemical

2.3 Solid Waste

- Alcohol (10% IPA (Isopropyl Alcohol) DI Water) wipes (clothes)
 When disposing of Alcohol wipes, follow the applicable national/local laws and regulations.

2.4 Hazardous Energies Isolation Procedure

The Following Energy Hazards Exist: Compressed Dry Air (CDA) Up to 0.61MPa (88 psi)
 Electrical Energy: 208V AC, 10 A

Follow this procedure to safely isolate the System before maintenance.

- (1) Stop motion
 - a) End cycle or other motion via host software or.
 - b) Use the teaching pendant's EMS button or.
 - c) Use the EMS at the Parallel I/O input of the controller X61.
- (2) Move the circuit protector on the controller to “off” position.
- (3) Switch the main power at your system to the “off” position.

3. Inspection/Maintenance Procedure for Scheduled Items



WARNING

- **Before conducting maintenance, inspection or wiring, turn OFF all power supply to the robotic system, lock the switch and put up a warning sign, such as "DO NOT TURN ON THE POWER".**
The robotic system does not have the switches for turning off the power. Turn off the switches in your system to which the robotic system is connected.
Failure to observe this warning may result in electric shock or injury.



CAUTION

- **LOCK OUT and TAG OUT compressed air supply in the off and non-pressurized state, before handling any air tube.**
Follow "2.3 Hazardous Energies Isolation Procedure".
Failure to observe this instruction may result in injury.
- **Maintenance and inspections must be performed by specified personnel.**
Failure to observe this caution may result in electric shock or injury.
- **Never remove cover excluding the specified cover in the procedures. Be sure all covers and shields are replaced before operating the robotic system.**
Failure to observe this caution may result in electric shock or injury.
- **Be sure to use our recommended parts for replacement.**
Failure to observe this caution may not perform as expected or affect the performance.

3.1 Weekly Items

3.1.1 Air pressure for Lifter and Vacuum for Wafer Holder

- Power supply status: OFF
- Required Items: None (depended on your system)

Check the air pressure of the vacuum pressure which is supplied to the Pre-Aligner from your system.

The air pressure should be within -80 ~ -70 kPa (-11.6 ~ -10.2 PSI)

3.1.2 External Cable and Air Tube

- Power supply status: OFF
- Required Items: None (Visual check)

Check for excess wear (cuts etc.) of the external cables and air tubes. Fix or replace as necessary.

Refer to the "Operator Manual" for further details regarding the external cables and air tubes

3.1.3 Cable and Tube Connections

- Power supply status: OFF
- Required Items: Screwdriver

Check for loose connections of the cables and air tubes. Make sure the connector from the Encoder cable is inserted completely, tighten any loose screws. Confirm that the air tubes are inserted into the fittings securely.

3.1.4 Wafer Holder and Contact pin

- Power supply status: OFF
- Required Items: None (Visual check)

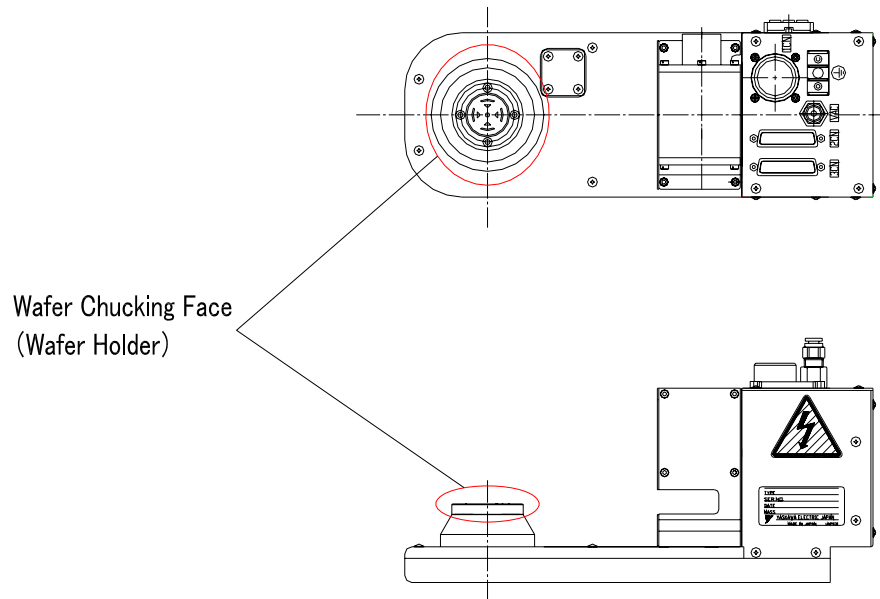
Check for abrasion and cleanness. Clean or replace as necessary.

- Cleaning:

! MANDATORY

- **Obtain from your chemical supplier the Material Safety Data Sheet of alcohol which you will use as cleaner. Read the Material Safety Data Sheet of the chemical to understand all safety information before using it.**

Wipe Wafer Chucking Face with a soft cloth dampen by alcohol etc. as necessary.



- Contact pin Replacement: (Refer to Appendix B.2 for further details)
- Required Items: New Lift Pin with Rubber
Hexagon Wrench
 1. Remove 2 Hexagon socket head screws of each Contact Pin.
 2. Replace with New Contact pin.

3.2 Every 3000H Items

Mounting Screw and Cover Screw

- Power supply status: OFF
- Required Items: Wrench and Screwdriver
Check for loose screws, tighten as necessary.

3.3 Every 6000H Items

3.3.1 Belt tension Check

(A) Pre-Aligner (Refer to appendix H.1 for details.)

Check the Belt tension value each part.

θ -axis

- Required Items: Wrench, Screwdriver and Tension meter (U-505)

- Procedure:

- (1) Move to HOME position.

- (2) Remove Side Cover.

- (3) Check the belt tension value with the Tension Meter.

Tension Meter type: U-505 (UNITTA)

- (4) Re-install Side cover.

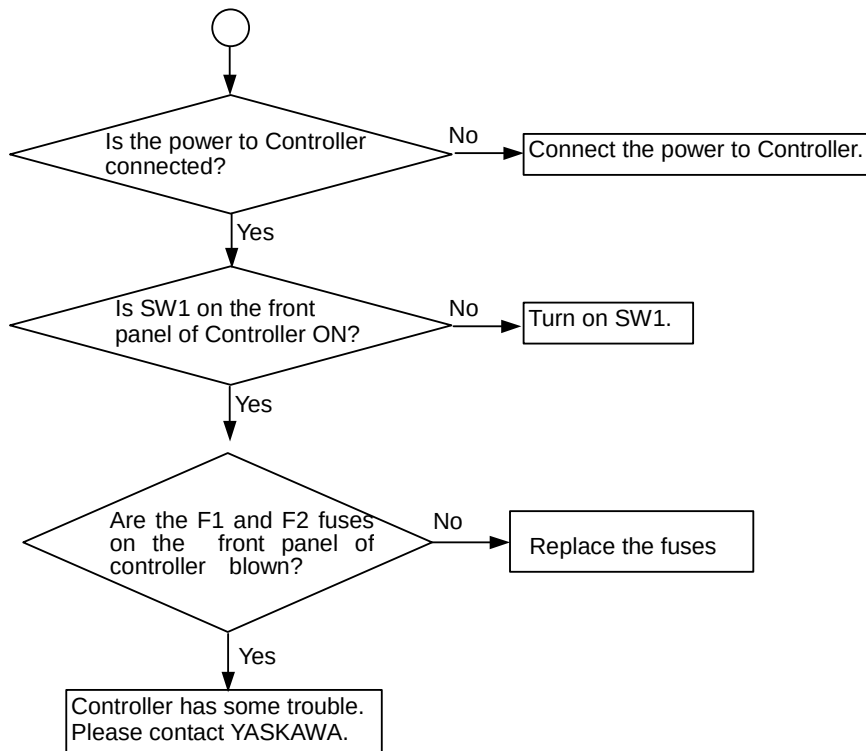
4. Troubleshooting

Controller indicates an error code in 7-segment LED on the front panel of Controller. Troubles you may have in the operations can be grouped into the following:

- Nothing is displayed in 7-segment LED. (The power is not supplied to Controller.)
- An error code is displayed in 7-segment LED. (Some error is occurred.)
- No error code is displayed in 7-segment LED but the actual Pre-Aligner position is difference from the expected position.

4.1 Nothing is displayed in 7-segment LED.

The power is not supplied to Controller.



4.2 An error code is displayed in 7-segment LED.

See “Error Code Table”.

If disassembly is necessary (ex. replacing the motors, boards or inner cables), contact YASKAWA.

4.3 No error code is displayed in 7-segment LED.

When no error code is displayed in 7-segment LED but the actual Pre-Aligner position is different from the expected position, it seems that the robotic system is operated normally. Check your Position Data.

If your Position Data is also right, check Standard Position of each axis.

See “Recording Standard Position” section 5.

5. Adjustments



CAUTION

- **Adjustments must be performed by qualified personnel.**
Failure to observe this caution may result in electric shock or injury.



MANDATORY

- **Select “TEACH” mode by Mode Selection Switch when operating the Pre-Aligner with the Teaching Pendant.**
(Refer to “4.6 LED Indicator, Operation Switch, etc” in Controller Instruction Manual.)
Failure to observe this instruction could result in injury or damage by unexpected operations from Host.
- **Persons who operate or maintain the Pre-Aligner must undergo required training before using the Pre-Aligner.**
For more information on training, inquire at the nearest YASKAWA branch office.
The telephone numbers are listed in section “8. Other Information” of this manual.

5.1 Pressure Sensor Threshold Value



CAUTION

- **Do not remove/insert the connector when operating the equipment and turning ON the power supply.**
Failure to comply with this instruction may result in electric shock, damage on the operation circuit.
- **Operate Teaching Pendant exactly. There is a possibility that an unexpected axis movement when the key is pressed and mistaken.**
Failure to this instruction may result in injury.

- Required Items: Vacuum Air supply
- Procedure: Refer to Appendix B.2-2

6. Recommended Spare Parts

When purchasing the Motors and cables, inform us of the serial No. of the product.

 CAUTION
• Be sure to use YASKAWA'S recommended parts for replacement. Failure to observe this caution may adversely affect the Pre-Aligners performance.

[Rank of Recommended Spare Parts]

Rank "A": Parts with high life expectancy.

Rank "B": Wearing / Moving parts with high frequency of operation.

Rank "C": Critical Parts (Part failure will cause the Pre-Aligner to be unusable.)

6.1 Spare Parts List

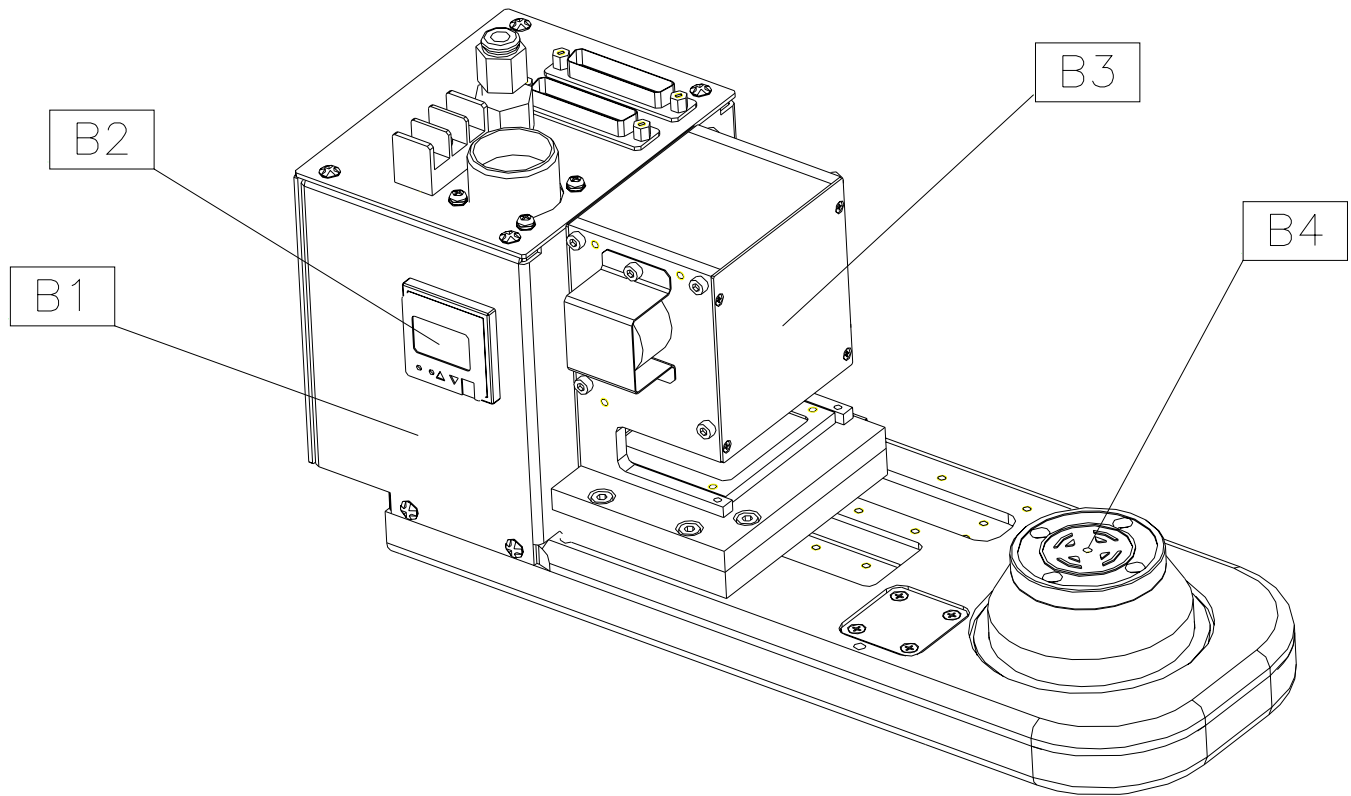
Recommended Spare Parts for Pre-Aligner

No.	Rank	Part Name	Part Number	Qty. Required/unit	Note
1	B	Pre-Aligner Solenoid Valve KIT	BR942102	1	Refer to Appendix B.1
2-1	B	Pre-Aligner Pressure Switch KIT	BR942103	1	Refer to Appendix B.2
2-1	-	(Pressure Switch threshold setup procedure)	(HU0480244)		
3	C	Linear Sensor KIT	HU0480245	1	Refer to Appendix B.3
4	A	Pad kit	HU0480655	1	Refer to Appendix B.4
5	A	Pre-Aligner KIT	HU0480518	1	Refer to Appendix B.5

6.2 Service Kit List

No.	Part Name	Part Number	Qty.	Remark
1	Teaching Pendant	HE0400944	1	
2	Belt Tension Meter	HU0480247	1	Refer to Appendix H.1

6.3 Location of Replacement Part(s) [Pre-Aligner]



7. Additional Information

Refer to the manuals listed below for additional information in work.

- Setup Manual
Setup procedures and Information for Safety are explained.
- Pre-Aligner Instruction Manual
Covers Pre-Aligner topics (ex. Specifications, Center of Gravity etc.)
- Controller Instruction Manual (including Error Code)
Covers Controller and Driver topics (ex. System configuration, Specifications etc)
- Teaching Operation Manual
Teaching procedure and teaching pendant operation are explained.

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