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

This manual explains the starting point detecting circuit board Pr(OP2)-001 of the MOTOWELD-RL350 system. Read this manual carefully and be sure to understand its contents before handling. General items related to safety are listed in Chapter: Notes for Safe Operation. To ensure correct and safe operation, carefully read the MOTOWELD-RL350 Instructions before reading this manual.

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 this 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 modification is made, the manual number will also be revised.

If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection. In this manual, the Notes for Safe Operation are classified as “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>![Warning Icon]</td>
<td><strong>WARNING</strong> Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.</td>
</tr>
<tr>
<td>![Caution Icon]</td>
<td><strong>CAUTION</strong> 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.</td>
</tr>
<tr>
<td>![Mandatory Icon]</td>
<td><strong>MANDATORY</strong> Always be sure to follow explicitly the items listed under this heading.</td>
</tr>
<tr>
<td>![Prohibited Icon]</td>
<td><strong>PROHIBITED</strong> Must never be performed.</td>
</tr>
</tbody>
</table>

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

| Note Icon | To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”. |

To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.
PROHIBITED

Do not use or maintain this board under the following conditions:
- Direct sunlight
- Excessive vibration and shock
- High humidity
- Proximity to a strong magnetic field source
- Excessive dust
- Large temperature change
- Corrosive gas
- Condensation

Failure to observe this instruction may result in the failure of the board.

WARNING

- **Before maintenance, inspection, or wiring, be sure to turn OFF the switch in the primary side switch gear.**
  Failure to observe this warning may result in electric shock or injury.

- **During power on, make sure to close the door and mount the protective cover, and do not touch the board.**
  Failure to observe this warning may result in fire or electric shock.
CAUTION

- **Check to be sure that there is no foreign matter (metal piece, etc.) on the board.**
  Failure to observe this caution may result in personal injury or equipment damage because of malfunction.

- **Check to be sure that there is no problem (damage, bend, etc.) with the components of the board.**
  Failure to observe this caution may result in personal injury or equipment damage because of malfunction.

- **Connect the cables and connectors properly.**
  Failure to observe this caution may result in fire or equipment failure.

- **Make sure to properly perform the setting of the switches, etc.**
  Failure to observe this caution may result in personal injury or equipment damage because of malfunction.

- **Do not touch the component-mounting surface of the board directly with a finger.**
  Failure to observe this caution may result in the failure of IC, etc. because of static electricity.

- **Do not touch the solder surface of the board directly with a finger.**
  Failure to observe this caution may result in personal injury because of solder projection, etc.

- **Avoid shock on the board.**
  Failure to observe this caution may result in the failure of the board.

- **To connect a nylon connector, insert the connector after matching the connector number and confirm that it is locked. Do not apply excessive force to the printed board when inserting the connector.**
  Failure to observe this caution may result in the failure of the board.

- **Never change the positions of the internal wiring or modify the connections.**
  Failure to observe this caution may result in device problems.
Customer Support Information

If you need assistance with any aspect of your DX100 Controller Maintenance system, please contact Motoman Customer Support at the following 24-hour telephone number:

For routine technical inquiries, you can also contact Motoman Customer Support at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Motoman Customer Support at the telephone number shown above.

Please have the following information ready before you call:

- System: MOTOWELD-RL350
- Robots
- Primary Application: Welding
- Controller
- Software Version: Access this information on the Programming Pendant’s LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}
- Robot Serial Number: Located on the robot data plate
- Robot Sales Order Number: Located on the controller data plate
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<th>Page</th>
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1 Introduction

This manual is an instruction manual for the Starting Point Detecting Circuit Board Pro (OP2)-001.

The described contents are as follows;
   i)  Product Confirmation
   ii)  Hardware Setup
   iii) Connection with Robot Controller
   iv)  Connection with Indicator Light

For contents that are not described in this manual, refer to the "MOTOWELD-RL350 INSTRUCTIONS", "DX200/DX100/NX100 INSTRUCTIONS", "DX200/DX100/NX100 OPTIONS INSTRUCTIONS FOR BASIC OPERATION OF STARTING POINT DETECTING FUNCTION", and all other related documents.
2 Product Confirmation

In order to add starting point detecting function to MOTOWELD-RL350, starting point detecting module (HS1370463-A) and the cable for starting point detecting module (HS1470368-A) is required. Confirm the contents of the product before hardware setup.

![Fig. 2-1 Starting Point Detecting Module](image1)

**Fig. 2-1** Starting Point Detecting Module

![Fig. 2-2 4 x Spacer (included in HS1370463-A)](image2)

**Fig. 2-2** 4 x Spacer (included in HS1370463-A)

![Fig. 2-3 Cable for Starting Point Detecting Module](image3)

**Fig. 2-3** Cable for Starting Point Detecting Module
3 Hardware Setup

3.1 Setup Position Confirmation

Remove the top cover of MOTOWELD-RL350 and confirm position where the starting position detecting module is set. The module is set above the Pr(IF) circuit board of the MOTOWELD-RL350. The power of the module is supplied by the “200V” connector of the MOTOWELD-RL350.

![Top view of MOTOWELD-RL350 (without top cover)](image)

Fig. 3-1  Top view of MOTOWELD-RL350 (without top cover)
### 3.2 Preparation of Setup

1. Remove four screws fixing Pr(IF) circuit board and disconnect RC5 connector, and set four spacers included in starting position detecting module. Do not lose the removed four screws because they are used for fixing the module.

---

**Fig. 3-2** Positions of the screws and the RC5 connector on the Pr(IF) circuit board

**Fig. 3-3** Setting of the four spacers to the Pr(IF) circuit board
2. Cut and remove the cable tie shown in the following figure in order to adjust the RC5 connector position easily.

Fig. 3-4 Cable tie
3.3 Setting the Base

Fix the starting point detecting module to the four spacers using four screws that are removed at chapter 3.2. Remove the Pr(OP2)-001 circuit board on the module provisionally when setting the module.

Fig. 3-5 Setting the starting point detecting module (without circuit board)
3.4 Connection with Pr(IF) Circuit Board

1. Connect “RC5” harness that is disconnected from Pr(IF) circuit board to “OP1” connector on reverse side of the Pr(OP2)-001 circuit board.

![Fig. 3-6 “RC5” harness connection](image)

2. Connect “OP2” connector on the Pr(OP2)-001 circuit board with “RC5” connector on the Pr(IF) circuit board with the cable for starting point detecting module.

![Fig. 3-7 Connection of the cable for starting point detecting module](image)
3. Fix the Pr(OP2)-001 circuit board to the base of the starting point detecting module after connecting cables.

![Pr(OP2)-001 circuit board fixing](image)

Fig. 3-8  Pr(OP2)-001 circuit board fixing
3.5 Connecting Other Cables

Connect “200V” cable of the starting point detecting module to “200V” connector inside of the MOTOWELD-RL350.

![Connecting Other Cables](image)

Fig. 3-9 “200V” cable connection

3.6 Checking Cable Connections

Make sure that the cable connections are the same as follows.

Connectors on the Pr(OP2)-001 circuit board.
- “OP1” : “RC5” harness is connected.
- “OP2” : Connected with “RC5” connector on the Pr(IF) circuit board by the cable for starting point detecting module.
- “OP4” : Connected to the transformer on the starting point detecting module.

Connectors from transformer.
4 Connection with Robot Controller

Connect starting point detection cables to the “TB1” terminal as follows.

Table 4-1 “TB1” terminal function allocation

<table>
<thead>
<tr>
<th>“TB1” terminal index</th>
<th>Marker tube indexes of the starting point detection cable</th>
<th>Function allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>520</td>
<td>520</td>
<td>+24V&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>521</td>
<td>521</td>
<td>Starting point detection signal</td>
</tr>
<tr>
<td>522</td>
<td>522</td>
<td>GND</td>
</tr>
<tr>
<td>523</td>
<td>523</td>
<td>Starting point search signal</td>
</tr>
</tbody>
</table>

Fig. 4-1 Connection of starting point detection cable
5 Connection with Indicator Light

- In case of using the indicator light to recognize detecting starting point, connect the indicator light cables as follows.
- Rated supply voltage of the indicator light has to be $24\text{V}_{\text{DC}}$.
- During detecting starting point, indicator light turns on.

<table>
<thead>
<tr>
<th>“TB1” terminal index</th>
<th>Function allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>540</td>
<td>Indicator light (+)</td>
</tr>
<tr>
<td>541</td>
<td>Indicator light (-)</td>
</tr>
</tbody>
</table>

Fig. 5-1 Connection of indicator light
MOTOWELD-RL350
STARTING POINT DETECTING CIRCUIT
BOARD Pr(OP2)-001 INSTRUCTIONS

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Specifications are subject to change without notice
for ongoing product modifications and improvements.