

Remote I/O Card INSTRUCTIONS MANUAL

for Remote I/O DH+ PCI Cards

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

MOTOMAN INSTRUCTIONS

DX100 MOTOMAN INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR'S MANUAL
DX100 MAINTENANCE MANUAL

The operator's manual above corresponds to specific usage.
Be sure to use the appropriate manual.


Part Number: 156657-1CD

Revision: 1



YASKAWA

MANUAL NO.

156657-1CD 



MANDATORY

- This system manual provides an overview of the Motoman Remote I/O Card. Be sure to read and understand this manual thoroughly before installing and operating the Remote I/O Card.
- General items related to safety are listed in Section 2 of the DX100 Controller Manual. To ensure correct and safe operation, carefully read the DX100 Controller Manual before reading this manual.



CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure that 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 a modification is made, the revision 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.

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the Motoman Remote I/O Card system.

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. At any rate, be sure to follow these important items.



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



WARNING

- Before operating the manipulator, check that servo power is turned OFF by pressing the EMERGENCY STOP buttons on the front door of the DX100 controller and on the Programming Pendant (refer to *Figure 1*). When servo power is turned OFF, the SERVO ON LED on the Programming Pendant is turned OFF.

Injury or damage to machinery may result if the Emergency Stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the EMERGENCY STOP buttons do not function.

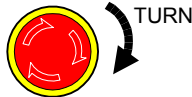
Figure 1: EMERGENCY STOP Button



- Release the EMERGENCY STOP button (refer to *Figure 2*). Once this button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Figure 2: Release of EMERGENCY STOP Button



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
 - View the manipulator from the front whenever possible.
 - Always follow the predetermined operating procedure.
 - Ensure that you have a safe place to retreat to in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
 - Turning on the power for the DX100 controller.
 - Moving the manipulator with the Programming Pendant.
 - Running the system in the check mode.
 - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an EMERGENCY STOP immediately if there is a problem. The EMERGENCY STOP buttons are located on the right of the front door of the DX100 controller and on the Programming Pendant.

Remote I/O Card

**CAUTION**

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately and be sure that all other necessary processing has been performed.
 - Check for problems in manipulator movement.
 - Check for damage to insulation and sheathing of external wires.
- Always return the Programming Pendant to the hook on the cabinet of the DX100 controller after use.

The Programming Pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX100 Controller Manual before using the Remote I/O Card.

Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product.

The manipulator usually consists of the controller, the Programming Pendant, and supply cables.

In this manual, the equipment is designated as follows:

| Equipment | Manual Designation |
|--|---------------------|
| DX100 controller | DX100 |
| DX100 Programming Pendant | Programming Pendant |
| Cable between the manipulator and the controller | Manipulator cable |

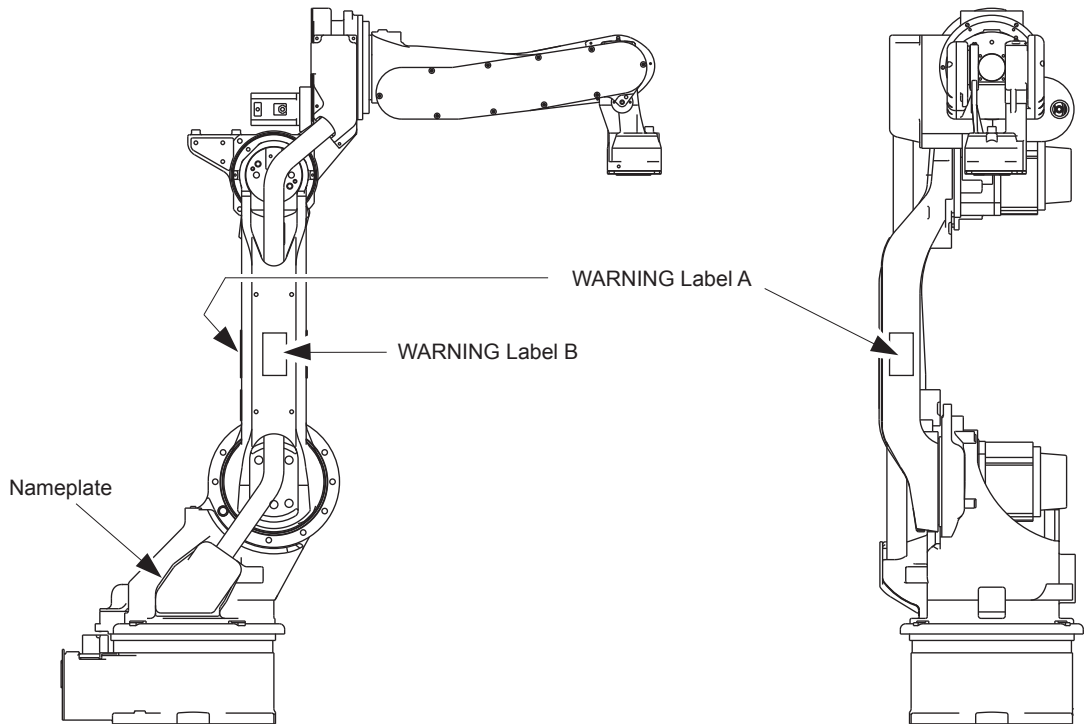
Explanation of Warning Labels

The following warning labels are attached to the manipulator (refer to *Figure 3*).


Always follow the warnings on the labels.

Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.

Figure 3: Warning Labels Location



Nameplate:

| | |
|--|----------------|
| MOTOMAN | |
| TYPE □□□□□ | |
| PAYLOAD □□ kg | MASS □□□ kg |
| ORDER NO. □□□□□□ | DATE □□ |
| SERIAL NO. □□□□□□ | |
|  YASKAWA ELECTRIC CORPORATION JAPAN | |

WARNING Label A:



WARNING Label B:



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|-----------------|-----|----------------------|
| | 1 | Introduction |
| Remote I/O Card | 1.1 | System Configuration |

1 Introduction

This manual provides instructions for the Motoman Remote I/O PCI Interface cards (P/N 154611-1). The application of this board allows the transmission of DX100's general-purpose I/O data with other devices connected to Remote I/O.

The Remote I/O card provides connectivity for your robot controller to Allen-Bradley Data Highway Plus (DH+) and 1771 Remote I/O (RIO) (adapter or scanner mode) networks.

This manual contains the following sections:

Section 1 – Introduction

This section provides general information about the Remote I/O Card and its components, a list of reference documents, and customer service contact information.

Section 2 – Hardware Specifications

This section provides specifications for the Remote I/O Card.

Section 3 – Installation

This section provides installation instructions for the Remote I/O Card.

Section 4 – Network Configurations and Connections

This section provides network configuration information for the Remote I/O Card.

1.1 System Configuration

The Remote I/O Card interfaces with the controller, and does not require an I/O expansion rack. One free PCI slot is required.

1.1.1 Functionality of the Remote I/O Card

- Connector Type: 6-pin screw terminal connector (Phoenix)
- Speeds Supported: 57.6, 115.2, and 230.4 kBaud rates on Data Highway Plus
- I/O Size: 1/4, 1/2, 3/4, or 1 Rack (32, 64, 96, 128 bits)
- Rack Numbers:
 - 0 to 37 (octal)
 - 0 to 31 (decimal)

| | | |
|-----------------|-----|-------------------------|
| Remote I/O Card | 1 | Introduction |
| | 1.2 | Reference Documentation |

1.2 Reference Documentation

For additional information on individual components of the Remote I/O Card system, refer to the following documentation that is included with your delivered system:

- Motoman *DX100 Controller Manual* (P/N 155494-1CD)
- Motoman *Operator's Manual for Arc Welding* (P/N 155490-1CD)
- Motoman *Operator's Manual for Handling & General Purpose* (P/N 155507-1CD)
- Motoman *DX100 Concurrent I/O Manual* (P/N 155491-1CD)
- Motoman *INFORM User's Manual* (P/N 155493-1CD)
- Vendor manuals for system components not manufactured by Motoman

1.3 Customer Support Information

If you need technical assistance with any aspect of your Remote I/O Card system, please contact Motoman Customer Support at the following 24-hour support telephone number:

| |
|-----------------------|
| (937) 847-3200 |
|-----------------------|

Please have the following information ready before you call:

- | | |
|----------------------------|--|
| • System | Remote I/O Card |
| • Robot | MA1400, MH6, etc. |
| • Primary Application | Welding, Handling, etc. |
| • Controller | DX100 |
| • Software Version | Access this information on the Programming Pendant display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION} |
| • Robot Serial Number | Located on a data plate on the rear of each robot arm |
| • Robot Sales Order Number | Located on a data plate on the front door of the controller |

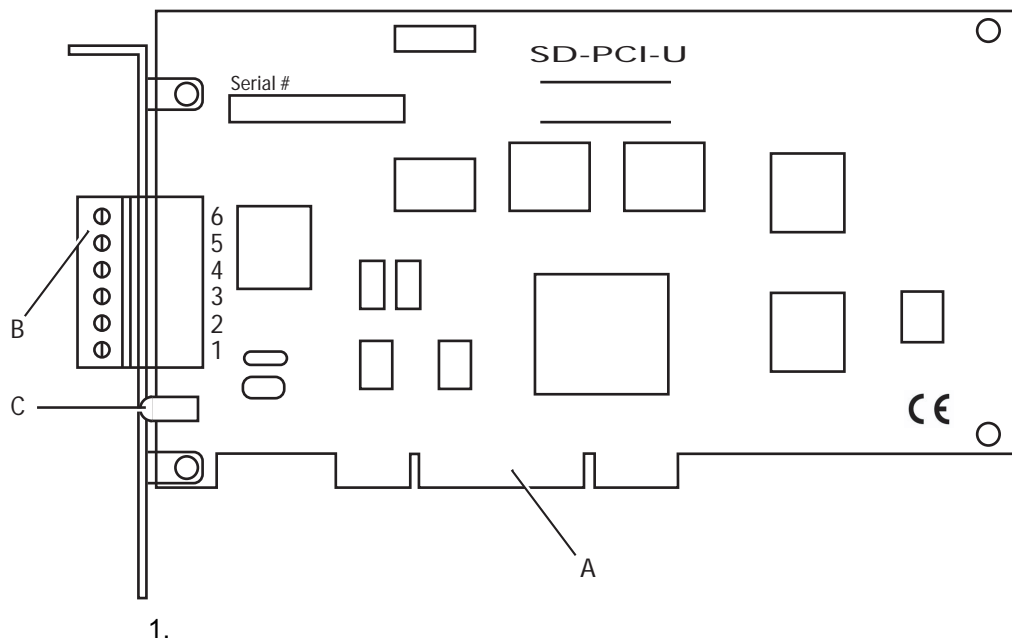
2 Hardware Specifications

When the card is configured in the controller, the first byte of data is a status byte. The information defined in each byte is outlined in the chart below:

| Signal | Description |
|--------------------------|---|
| 2xxx0 2xxx3 (bit 0 to 3) | Reserved |
| 2xxx4 (bit 4) | Master PLC Status: 0: Run 1: Program Mode |
| 2xxx5 (bit 5) | Reserved |
| 2xxx6 (bit 6) | Network Status: 0: OK 1: Error |
| 2xxx7 (bit 7) | PCI Board Status: 0: OK 1: Error |

2.1 Card Components

Figure 2-1: Card Components

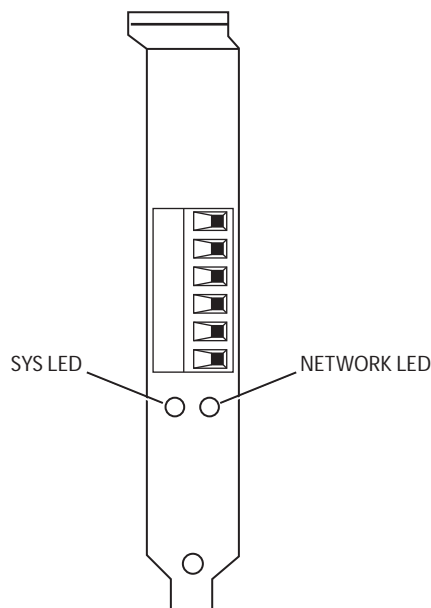


■ Miscellaneous Characteristics

- Size of the PCI board: 174 x 106 mm (excluding connectors and rear panel)
- Consumption: 150 mA (5V)
- Operating temperature: 0 to +50° C
- CE compliant (CE)

2.2 SST-DHP-PCI Wiring and Indicators

Figure 2-2: Wiring and Indicators



2.2.1 LEDs

There are two (2) bi-color LEDs on the card, visible through the mounting bracket. The LED closest to the card's printed circuit board is the Network LED; the LED furthest from the card's printed circuit board is the SYS LED.

After the controller has booted and before a firmware module is downloaded to the card, the SYS LED is red. After the firmware module successfully downloads, it turns the SYS LED off. If the loader does not run, the LED remains red.



Third-party applications may not use the SYS LED, as described above, to change the state of the LEDs. Refer to the application's documentation for information on how it controls the SYS LED.

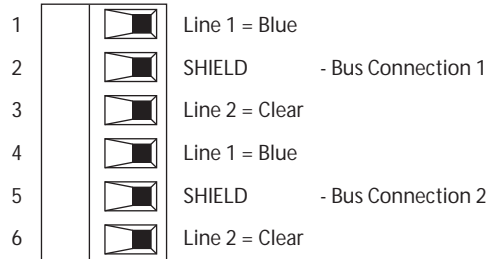
The Network LED is controlled by the software module running on the card. The Data Highway Plus module turns the Network LED green whenever the card is active (transmitting) on the network. If the Network LED flickers rapidly, it means that the card is active on the network. In some cases the Network LED flickers so rapidly that it may appear to be solid green. The Network LED should never go off if there are other nodes on the network; however, it may be dim. Since the card must pass the token, it transmits on the network even if it is not sending commands or replies. If there is an error on the network, the Network LED will flicker red and return to solid green.

| | | |
|-----------------|-----|-----------------------------------|
| | 2 | Hardware Specifications |
| Remote I/O Card | 2.2 | SST-DHP-PCI Wiring and Indicators |

2.2.2 Pin Numbering

Connect the card to a network using the green 6-pin solderless Phoenix Combicon connector.

Figure 2-3: Phoenix Combicon Connector



Pin 1 is closest to the LEDs, and pin 6 is furthest from the LEDs. Pin 1 is internally connected to 4, pin 2 to pin 5, and pin 3 to pin 6 to make it easy to daisy-chain connections. Any connections to pins 1, 2, or 3 can also be made to pins 4, 5, and 6 respectively.



If you daisy chain in this fashion and then remove the connector from the card, the connection through the card will be broken. In other words, this is like cutting the Blue Hose cable at the point where it is connected to the card.

| | | |
|-----------------|-----|--------------|
| Remote I/O Card | 3 | Installation |
| | 3.1 | Materials |

3 Installation



CAUTION

- The Remote I/O Card should be installed by qualified personnel who are familiar with the installation and setup of a robotic system.
- The Remote I/O Card is not extremely fragile. It is, however, a sophisticated robotic component that can be damaged by rough handling. Be sure to handle all system components with care.

The following procedures outline how to configure the Remote I/O Card (P/N 154611-1). The settings below should only be used if the end-user has not specified the card configuration.

3.1 Materials

- Remote I/O Card (P/N 154611-1)

3.1.1 Board Settings

No board settings are required.

3.1.2 Card Installation



WARNING

- Remove all power from the controller before installing the Remote I/O Card! Failure to remove power may result in injury or death!



CAUTION

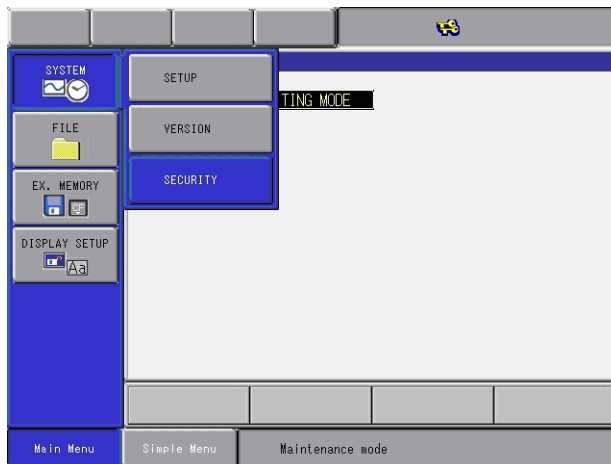
- Follow all Electrical Static Discharge procedures, including use of anti-static straps, to avoid damage to the board. Never touch the mounting surfaces of the board parts directly with fingers.

1. Remove PCI card from static shielding bag.
2. Insert card in the controller's CPU rack slot: CPU OPTION 1.
3. Secure card with M3 x 10 screw.

3.2 Card Configuration

The DX100 controller must be properly configured to use the Remote I/O Card. The following modifications require the user to be in Maintenance Mode with Management Mode selected. Make certain Remote I/O Card is correctly mounted inside the controller and the main power supply is OFF before proceeding.

1. Turn ON main power to the controller while simultaneously pressing the Main Menu button on the programming pendant. The Main Menu appears.
2. From the Main Menu select System > Security.



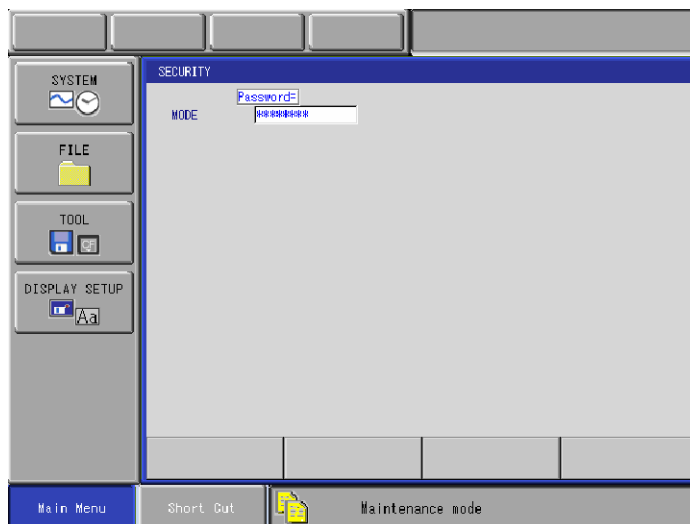
3. Select Management Mode.



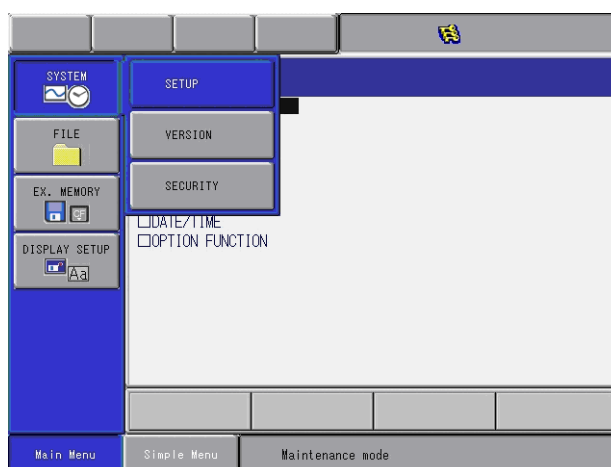
3 Installation

3.2 Card Configuration

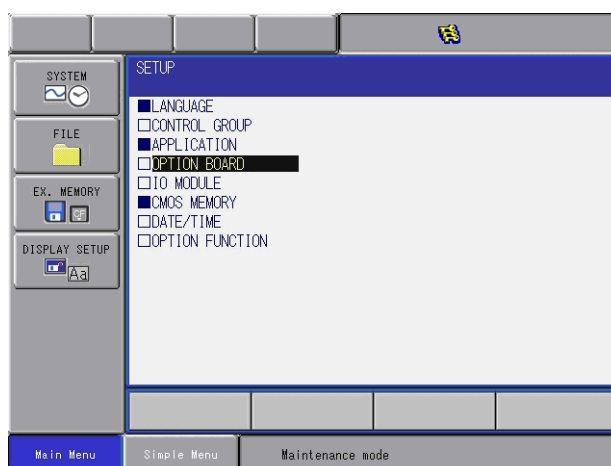
4. Enter password 999999.



5. Select System > Setup.



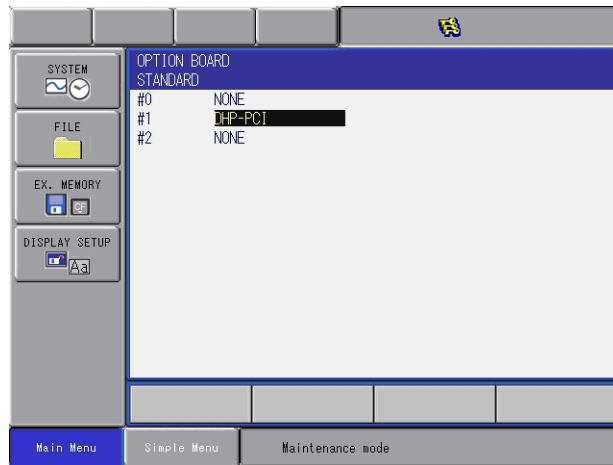
6. Select Option Board.



3 Installation

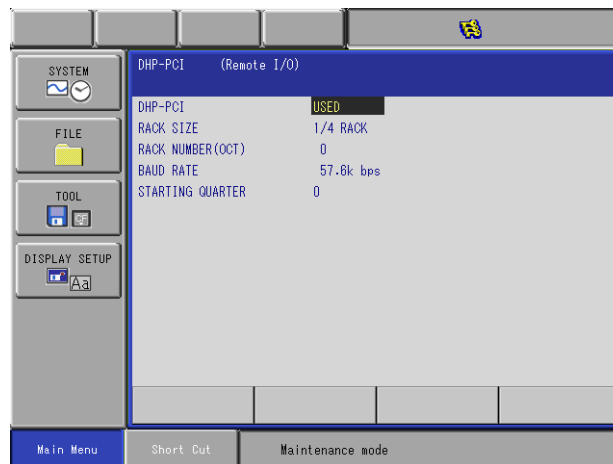
3.2 Card Configuration

7. Verify Remote I/O Card is detected. The board is identified in slot #1 as DHP-PCI.



If this is the only board installed, it must be in slot 1. If another board is also being used (such as a Devicenet board) the Remote I/O PCI Data Highway Plus board (154611-1) must be in slot 2.

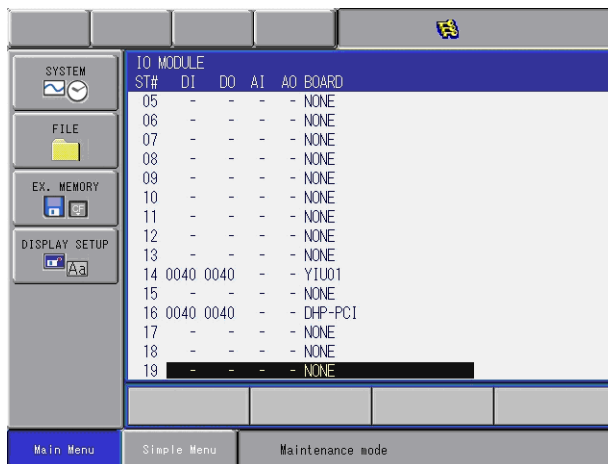
8. Press Select. DHP-PCI should be displayed with configuration options set to used.



9. Set RACK SIZE, RACK NUMBER, BAUD RATE, and STARTING QUARTER. Refer to Section 3.3 for configuration information.
10. When all settings are established, press Enter. The Modify prompt appears. Select YES.

| | |
|-----------------|-------------------|
| Remote I/O Card | 3 Installation |
| | 3.3 Configuration |

11. At the IO Module Screen, press ENTER once. Verify that DHP-PCI is registered as Station #16 with appropriate IO Count.

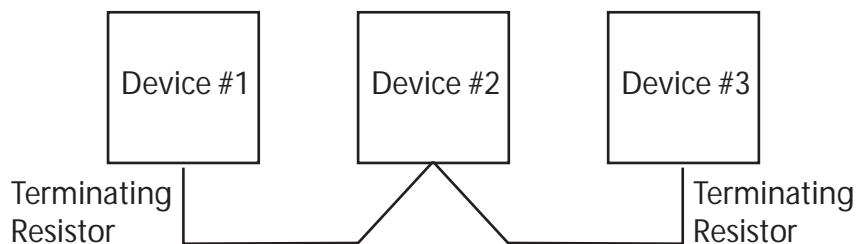


12. Press ENTER again. At the Modify prompt select Yes.

13. This completes the software setup in Maintenance Mode. Cycle power to the controller and restart normally.

3.3 Configuration

Sample Network



NOTE The Remote I/O Card can be in any location in the network.

| Speed | Register |
|----------------|----------------|
| 57.6k / 115.2k | 150 ohms 1/2 W |
| 230.4k | 82 ohms 1/2 W |

| | | |
|-----------------|-----|---------------|
| | 3 | Installation |
| Remote I/O Card | 3.3 | Configuration |

Table 3-1: Configuration Options

| Item | Option |
|-------------------|--|
| DHP-PCI | "USED" |
| RACK SIZE | 1/4, 1/2, 3/4, or 1 RACK |
| RACK NUMBER (OCT) | 0 to 37 (Octal notation) (0 to 31 at decimal notation) |
| BAUD RATE | 57.6, 115.2, or 230.4 k bps |
| STARTING QUARTER | 0, 1, 2, or 3 (AB PLC calls this Group 0, 2, 4, or 6 for each rack) |

Table 3-2: Rack Size & Starting Quarter Combinations

| RACK SIZE | STARTING QUARTER |
|-----------|------------------|
| 1/4 | 0,1,2,3 |
| 1/2 | 0,1,2 |
| 3/4 | 0,1 |
| 1 | 0 |

Table 3-3: Available I/O

| RACK SIZE | I/O SIZE (BITS) | I/O SIZE with status bits assigned on DX100 |
|-----------|-----------------|---|
| 1/4 | 32 | 40 |
| 1/2 | 64 | 72 |
| 3/4 | 96 | 104 |
| 1 | 128 | 136 |

Table 3-4: Status Bits and Definitions

| Address | Item | Value |
|---------------|-------------------|------------------------|
| 2xxx0 - 2xxx3 | Reserved | 0 |
| 2xxx4 | Master PLC Status | 0: Run 1: Program Mode |
| 2xxx5 | Reserved | 0 |
| 2xxx6 | Network Status | 0: OK 1: Error |
| 2xxx7 | PCI Board Status | 0: OK 1: Error |

4 Network Configurations and Connections

For information on network configurations and connections for Remote I/O communications, please refer to the Allen Bradley / Rockwell Automation website located at:
www.ab.com/en/epub/catalogs/12762/2181376/214372/1526378/.

Remote I/O Card

INSTRUCTIONS MANUAL

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

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