YASKAWA

REMOTE I/O CARD
INSTRUCTION MANUAL

for PCI REMOTE I/O CARD, SST-DHP-PCI, DX200

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

MOTOMAN INSTRUCTIONS

DX200 MOTOMAN INSTRUCTIONS
DX200 INSTRUCTIONS
DX200 OPERATOR'S MANUAL
DX200 MAINTENANCE MANUAL

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

Part Number: 165982-1CD
Revision: 1

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ⓘ MANDATORY

- This system manual provides an overview of the Motoman PCI Remote I/O Card, DX200. Be sure to read and understand this manual thoroughly before installing and operating the PCI Remote I/O Card, DX200.

- General items related to safety are listed in chapter 1 of the DX200 Controller Manual. To ensure correct and safe operation, carefully read the DX200 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.

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 of the PCI Remote I/O Card, DX200.

In this manual, the Notes for Safe Operation are classified as "DANGER", "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".

⚠	**DANGER**	Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.
⚠	**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.

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

⚠ **DANGER**

- Maintenance and inspection must be performed by specified personnel.

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

- For disassembly or repair, contact your YASKAWA representative.
- Do not remove the motor, and do not release the brake.

Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.

Notes for Safe Operation

⚠️ WARNING

- Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX200 and the programming pendant.
  When the 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.

Fig. : Emergency Stop Button

- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Fig. : Release of Emergency Stop

TURN

- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:

  – Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.

  – View the manipulator from the front whenever possible.

  – Always follow the predetermined operating procedure.

  – Keep in mind the emergency response measures against the manipulator's unexpected motion toward you.

  – Ensure that you have a safe place to retreat 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 DX200.

  – 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 button immediately if there is a problem.

The emergency stop buttons are located on the right of front door of the DX200 and the programming pendant.

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⚠ **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 DX200 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 DX200 Instructions before operating the manipulator:

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
DX200 controller	DX200
DX200 Programming Pendant	Programming Pendant
Cable between the manipulator and the controller	Manipulator cable

Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select • • •" means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or bland names for each company or corporation. The indications of (R) and ^{TM} are omitted.
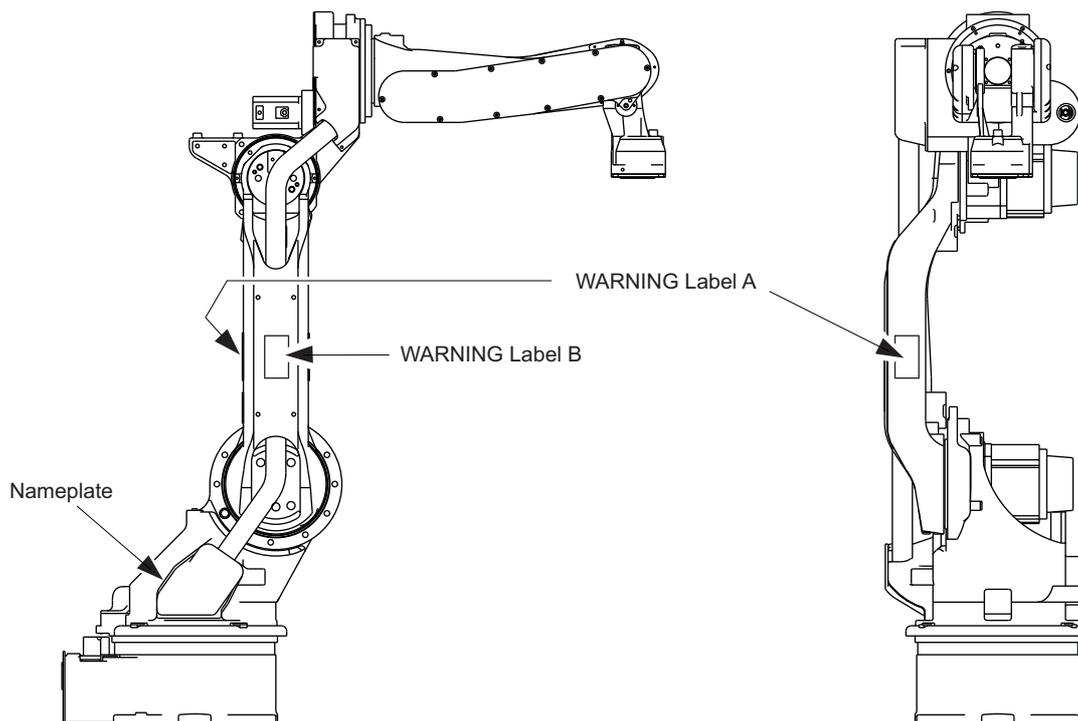
Explanation of Warning Labels

The following warning labels are attached to the manipulator
(refer to *Fig. "Warning Labels Location"*).

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.

Fig. : Warning Labels Location

WARNING Label A

WARNING Label B

Nameplate

Nameplate:

YASKAWA
MODEL
MOTOMAN-
TYPE

PAYLOAD
kg

MASS
kg

ORDER NO.

DATE

SERIAL NO.

YASKAWA ELECTRIC CORPORATION
2-1 Kurosakishiroishi, Yahatanishi-ku,
Kitakyushu 806-0004 Japan
MADE IN JAPAN   NJ3878

WARNING Label A:

⚠ WARNING

Moving parts
may cause
injury

WARNING Label B:

⚠ WARNING

Do not enter
robot
work area.

Safeguarding Tips

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.

- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

- The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.

- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

Mechanical Safety Devices

The safe operation of this equipment is ultimately the users responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety barriers
- Door interlocks
- Emergency stop palm buttons located on operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

Programming, Operation, and Maintenance Safety

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.

- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.

- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from YASKAWA will void the warranty.

- Some operations require a standard passwords and some require special passwords.

- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.

- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.

- Use proper replacement parts.

- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by YASKAWA-trained, qualified personnel.

Summary of Warning Information

This manual is provided to help users establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by YASKAWA. Address any questions regarding the safe and proper operation of the equipment to YASKAWA Customer Support.

Table of Contents

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 DX200'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:

chapter 1 "Introduction"

This section provides general information about the PCI Remote I/O Card, DX200 and its components, a list of reference documents, and customer service contact information.

chapter 2 "Hardware Specifications"

This section provides specifications for the PCI Remote I/O Card, DX200.

chapter 3 "Installation"

This section provides installation instructions for the PCI Remote I/O Card, DX200.

chapter 4 "Network Configurations and Connections"

This section provides network configuration information for the PCI Remote I/O Card, DX200.

1.1   System Configuration

The PCI Remote I/O Card, DX200 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 PCI Remote I/O Card, DX200

- 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)

1.2   Reference Documentation

For additional information on individual components of the PCI Remote I/O Card, DX200 system, refer to the following documentation that is included with your delivered system:

- Motoman *Controller Manual* (P/N 165292-1CD)

- Motoman *Operator's Manual for Arc Welding* (P/N 166346-1CD)

- Motoman *Operator's Manual for Handling & General Purpose* (P/N 165300-1CD)

- Motoman *Concurrent I/O Manual* (P/N 165294-1CD)

- Motoman *INFORM Language Manual* (P/N 165301-1CD)

- Vendor manuals for system components not manufactured by Motoman

1.3   Customer Support Information

If you need technical assistance with any aspect of your PCI Remote I/O Card, DX200 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   PCI Remote I/O Card, DX200

- Robot   MA1440, MH12, etc.

- Primary Application   Welding, Handling, etc.

- Controller   DX200

- 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

Fig. 2-1: Card Components
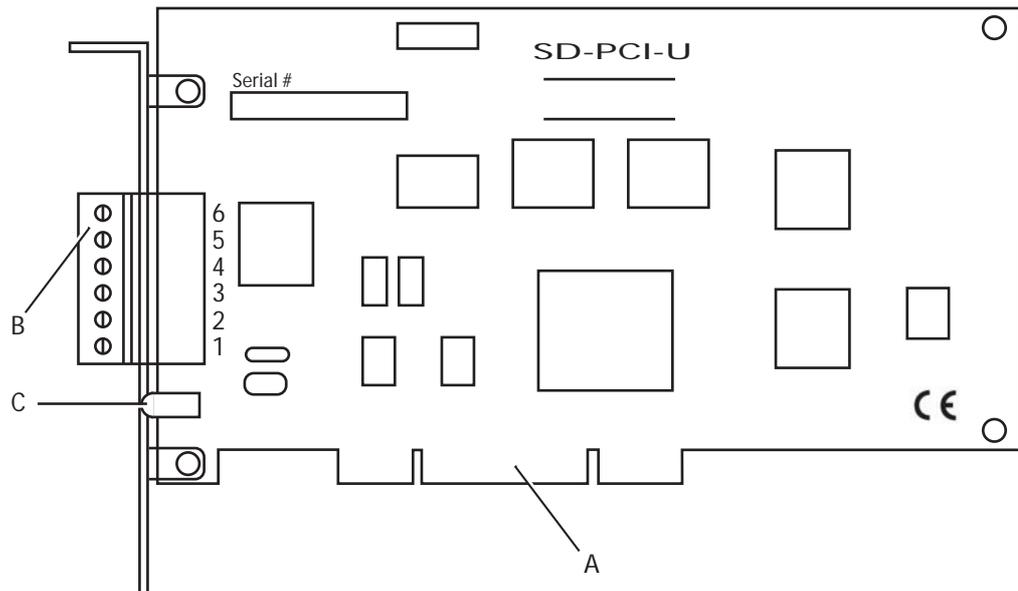
■ **Miscellaneous Characteristics**
   • Size of the PCI board: 174 x 106 mm (excluding connectors and rear panel)

   • Consumption: 150 mA (5V)

   • Operating temperature: 0 to +50°C

   • CE compliant (C€)

2.2   SST-DHP-PCI Wiring and Indicators

Fig. 2-2: Wiring and Indicators
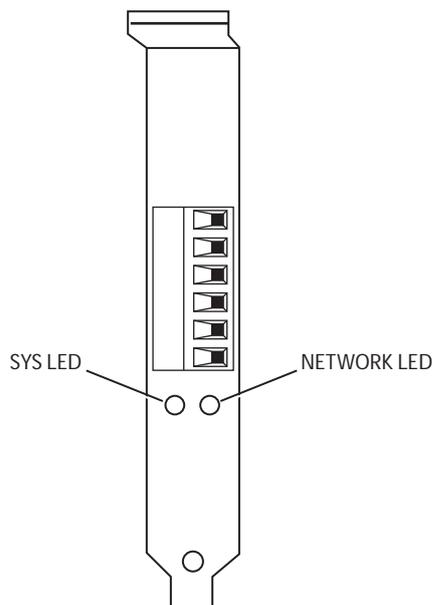
2.2.1   LEDs

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.

> **NOTE**
>
> 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.

2.2.2 Pin Numbering

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

Fig. 2-3: Phoenix Combicon Connector

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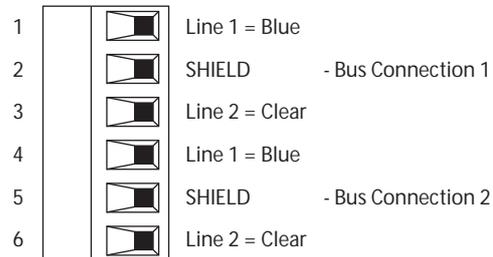
Pin 1 is closest to the LEDs, and pin 6 is furthest from the LEDs. Pin 1 is internally connected to 4, pin 2 to pin 5, and pin 3 to pin 6 to make it easy to daisy-chain connections. Any connections to pins 1, 2, or 3 can also be made to pins 4, 5, and 6 respectively.

> **NOTE**
>
> 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.

3   Installation

<div style="border:1px solid">

⚠ CAUTION

- The PCI Remote I/O Card, DX200 should be installed by qualified personnel who are familiar with the installation and setup of a robotic system.

- The PCI Remote I/O Card, DX200 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.

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The following procedures outline how to configure the PCI Remote I/O Card, DX200 (P/N 154611-1). The settings below should only be used if the end-user has not specified the card configuration.

3.1   Materials

- PCI Remote I/O Card, DX200 (P/N 154611-1)

3.1.1 Board Settings

No board settings are required.

3.1.2 Card Installation

<div style="border:1px solid">

⚠ WARNING

- Remove all power from the controller before installing the PCI Remote I/O Card, DX200!

Failure to remove power may result in injury or death!

</div>

<div style="border:1px solid">

⚠ 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.

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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 DX200 controller must be properly configured to use the PCI Remote I/O Card, DX200. The following modifications require the user to be in Maintenance Mode with Management Mode selected. Make certain PCI Remote I/O Card, DX200 is correctly mounted inside the controller and the main power supply is OFF before proceeding.
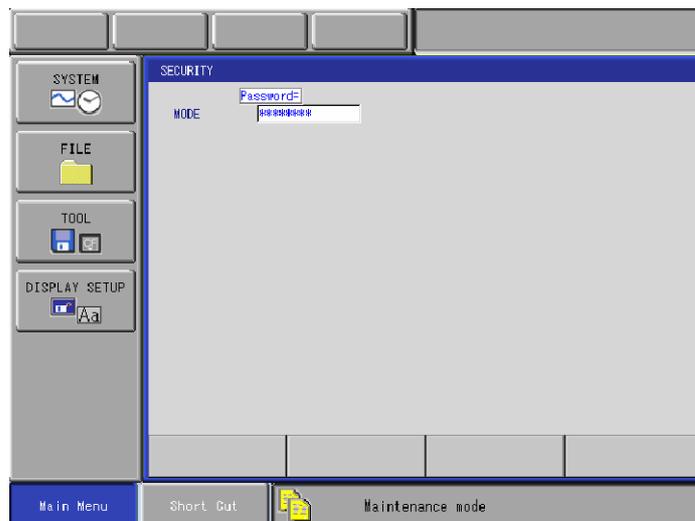
1. Turn ON main power to the controller while simultaneously pressing the Main Menu button on the programming pendant. The Main Menu appears.

2. From the Main Menu select System > Security.
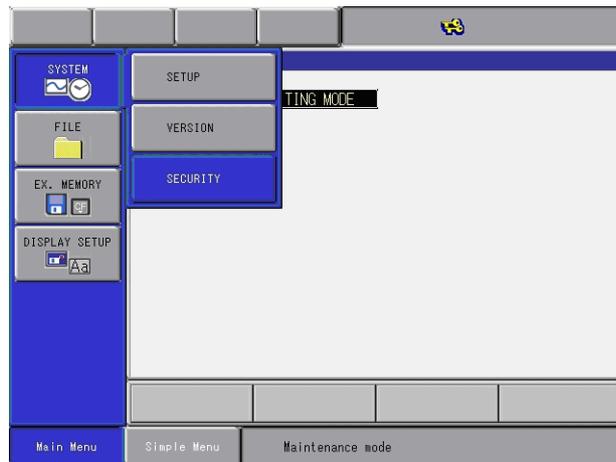
3. Select Management Mode.

PCI Remote I/O Card,
DX200

3   Installation
3.2 Card Configuration

4. Enter password 999999.

5. Select System > Setup.
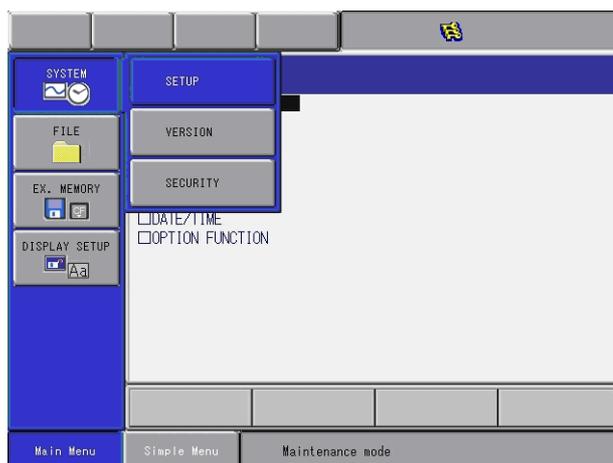
6. Select Option Board.
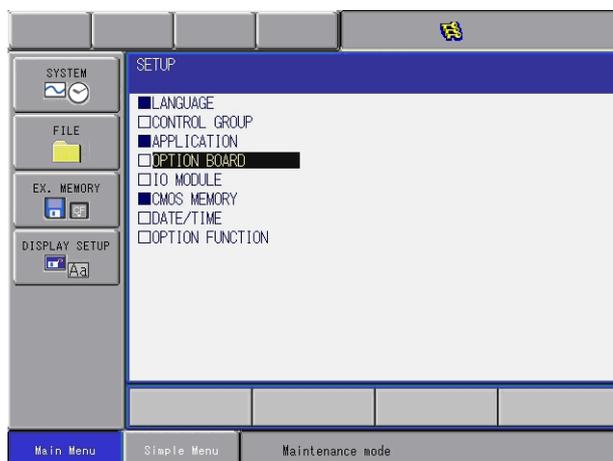
7. Verify PCI Remote I/O Card, DX200 is detected. The board is identified in slot #1 as DHP-PCI.
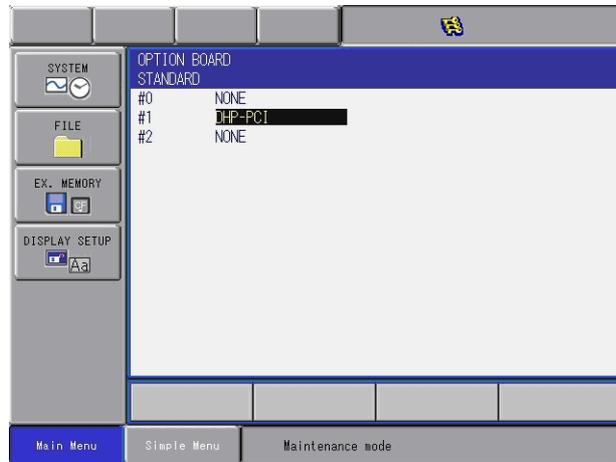
| NOTE | If this is the only board installed, it must be in slot 1. If another board is also being used (such as a Devicenet board) the Remote I/O PCI Data Highway Plus board (154611-1) must be in slot 2. |

8. Press Select. DHP-PCI should be displayed with configuration options set to used.
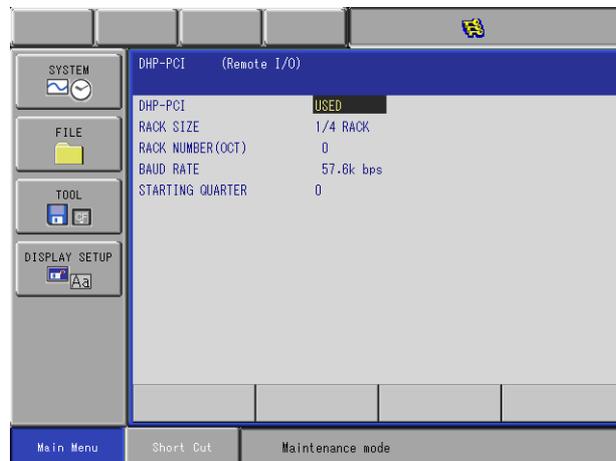
9. Set RACK SIZE, RACK NUMBER, BAUD RATE, and STARTING QUARTER. Refer to *section 3.3 "Configuration" on page 3-5.*

10. When all settings are established, press Enter. The Modify prompt appears. Select YES.

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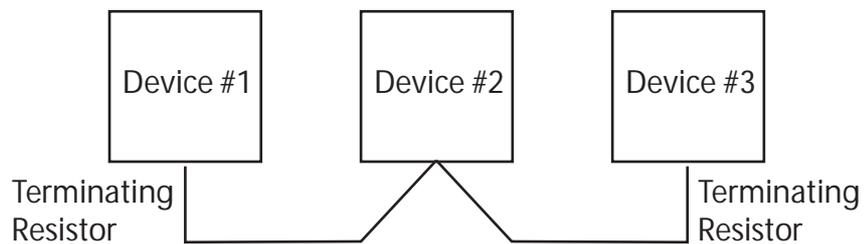
The Remote I/O Card can be in any location in the network.

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

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 kbps
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 DX200
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
INSTRUCTION MANUAL

for PCI REMOTE I/O CARD, SST-DHP-PCI, DX200

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

YASKAWA