DX100 OPTIONS INSTRUCTIONS
FOR PROFINET BOARD (PCU-ETHIO-PN MADE BY Molex)

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

MOTOMAN INSTRUCTIONS
MOTOMAN—□□□ INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR’S MANUAL
DX100 MAINTENANCE MANUAL

The DX100 Operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.

Part Number: 158910-1CD
Revision: 1
## MANDATORY

- This manual explains the Profinet board (For PCU-ETHIO-PN made by Molex.) of the DX100 system and general operations. Read this manual carefully and be sure to understand its contents before handling the DX100.

- General items related to safety are listed in Chapter 1: Safety of the DX100 Instructions. To ensure correct and safe operation, carefully read the DX100 Instruction 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.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX100.

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

**NOTE**: To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.
• Do not use or keep the board in the following environmental conditions.
  – Where exposed to direct sunshine
  – Where vibration or impact occurs
  – Where high humidity exists
  – Where a strong magnetic field exists
  – Where much dust exists
  – Where a sudden change in the temperature occurs
  – Where corrosive gases occur
  – Where condensation occurs

Improper usage of the board may damage the board.
WARNING

- Before operating the manipulator, check that servo power is turned OFF when the emergency stop buttons on the front door of the DX100 and programming pendant are pressed. 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

- 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.
  - 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 persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the DX100 power
  - 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 are problems. The emergency stop buttons are located on the right of the front door of the DX100 and the programming pendant.

- Before wiring, be sure to turn OFF the power supply and put up a warning sign, such as “DO NOT TURN ON THE POWER.”

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

• Do not touch the inside of the panel for 5 minutes after the power is turned OFF.
  The remaining charged voltage in the capacitor may cause an electric shock or an injury.
• Be sure to close the door and install the protection cover while the power is turned ON.
  Failure to observe this warning may result in a fire or an electric shock.
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 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 Instructions before operating the manipulator:
• The wiring and mounting must be performed by authorized and qualified personnel.

Failure to observe this caution may result in a fire or an electric shock.
• Make sure that there is no foreign matter such as metal chips on the board.

In case of malfunction, etc. it may result in an injury or damage the board.
• Make sure that there is no damage or deflection of parts on the board.

In case of malfunction, etc. it may result in an injury or damage the board.
• Correctly connect each cable and connector.

Failure to observe this caution may result in a fire or damage the board.
• Set the switches, etc. correctly.

Malfunction, caused by an incorrect setting, may result in an injury or damage the board.
• Never touch the mounting surfaces of the board parts directly with fingers.

The generated static electricity may damage the IC.
• Never touch the soldered surfaces of the board directly with fingers.

Protrusions on the soldered surface may result in an injury.
• No shock to the board.

The shock may damage the board.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and supply cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DX100 controller</td>
<td>DX100</td>
</tr>
<tr>
<td>DX100 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

Descriptions of the programming pendant, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td>Character Keys</td>
</tr>
<tr>
<td></td>
<td>The keys which have characters printed on them are denoted with [ ]. ex. [ENTER]</td>
</tr>
<tr>
<td>Symbol Keys</td>
<td>The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. ex. page key</td>
</tr>
<tr>
<td></td>
<td>The cursor key is an exception, and a picture is not shown.</td>
</tr>
<tr>
<td>Axis Keys</td>
<td>&quot;Axis Keys&quot; and &quot;Number Keys&quot; are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Number Keys</td>
<td>Keys pressed simultaneously</td>
</tr>
<tr>
<td></td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them, ex. [SHIFT]+[COORD]</td>
</tr>
<tr>
<td>Displays</td>
<td>Displays</td>
</tr>
<tr>
<td></td>
<td>The menu displayed in the programming pendant is denoted with { }. ex. {JOB}</td>
</tr>
</tbody>
</table>
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 brand names for each company or corporation. The indications of (R) and TM are omitted.
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1 Outline

This instruction manual describes settings and other information required for the Profinet board PCU-ETHIO-PN (made by Molex, hereinafter referred to as ETHIO-PN) to be used with DX100.

The use of this board enables DX100 general IO data to be transferred to and from other Profinet communication stations.

**NOTE**
This board is designed specifically for the DX100, and cannot be used with general Profinet boards made by Molex.

**NOTE**
Changing this board communication settings requires the Molex “applicomIO Console” software application.

1.1 System Configuration

- Example of system configuration when using as Profinet IO Device
Example of system configuration when using as Profinet IO Controller
2 Hardware Specifications

2.1 Board External View

Profinet connector (RJ45)

PCU-ETHIO-PN

Discrete I/O allocation connector

Configuration connector (RS232C D-Sub 9 pin)

LED (Config Port Indicator. Recv)

LED (Config Port Indicator. Trans)

LED (Network Status)

LED (Module Status)

LED (Ethernet Link)

LED (Transmission speed)
2.2 Board Specifications

<table>
<thead>
<tr>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface to external devices</td>
<td>Profinet</td>
</tr>
<tr>
<td>Board mounting position</td>
<td>DX100 PCI Slot in controller</td>
</tr>
<tr>
<td>Error display</td>
<td>LED display</td>
</tr>
<tr>
<td>Maximum number of I/O</td>
<td>Input: 250 Bytes, Output: 250 Bytes</td>
</tr>
<tr>
<td></td>
<td>However the Input Byte and Output Byte numbers cannot be set individually.</td>
</tr>
</tbody>
</table>

**NOTE**

The maximum I/O numbers above (Input: 250 Bytes/Output: 250 Bytes) only applies when this board is used as the optional IO module. If optional IO modules other than this board have been installed, the I/O number above may not be possible.

2.3 Communication Specifications

<table>
<thead>
<tr>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection type</strong></td>
</tr>
<tr>
<td>Star (connected via a HUB)</td>
</tr>
<tr>
<td><strong>Communication speed</strong></td>
</tr>
<tr>
<td>10Mbps/100Mbps (detected automatically during startup)</td>
</tr>
<tr>
<td><strong>Communication media</strong></td>
</tr>
<tr>
<td>Use a Profinet cable</td>
</tr>
</tbody>
</table>
3 Setting and attaching of the board

WARNING

• Before wiring, be sure to turn OFF the power supply and put up a warning sign, such as “DO NOT TURN ON THE POWER.”

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

• Do not touch the inside of the panel for 5 minutes after the power is turned OFF.

The remaining charged voltage in the capacitor may cause an electric shock or an injury.

• Be sure to close the door and install the protection cover while the power is turned ON.

Failure to observe this warning may result in a fire or an electric shock.

CAUTION

• The wiring and mounting must be performed by authorized and qualified personnel.

Failure to observe this caution may result in a fire or an electric shock.

• Make sure that there is no foreign matter such as metal chips on the board.

In case of malfunction, etc. it may result in an injury or damage the board.

• Make sure that there is no damage or deflection of parts on the board.

In case of malfunction, etc. it may result in an injury or damage the board.

• Correctly connect each cable and connector.

Failure to observe this caution may result in a fire or damage the board.

• Set the switches, etc. correctly.

In case of malfunction, etc. it may result in an injury or damage the board.

• Never touch the mounting surfaces and the soldered surfaces of the board parts directly with fingers.

The generated static electricity may damage the IC, and protrusions on the soldered surface may result in an injury.

• Never give any shock to the board.

The shock may damage the board.
3 Setting and attaching of the board
3.1 Attaching the board

Attach the ETHIO-PN using the following steps.

3.1.1 Operating the Front Door of DX100 (controller)

1. Open the front door of the DX100.

   (1) Using a flathead screwdriver, rotate the door locks on the front of the DX100 (two places) 90 degrees clockwise.

   *Fig. 3-1: Rotating the Door Lock Clockwise*

   ![Door Lock Rotation Diagram]

   (2) Rotate the main power supply switch to the "OFF" position and open the door gently.

   *Fig. 3-2: Rotating the Main Power Supply Switch to the OFF Position*
3.1.2 Attaching the ETHIO-PN to the DX100

1. Remove the riser card (JANCD-YBB02-E) from the CPU rack.
2. Insert the ETHIO-PN into the PCI slot of the riser card, and tighten the support clamps to ensure it does not come lose.
3. Attach the riser card to the CPU rack.

**NOTE**
When attaching the ETHIO-PN to the riser card, always do so using slot1. Using the riser card with slot1 empty will mean the board cannot be detected, and the card may not operate correctly.

**NOTE**
Please do not use ETHIO-PN and PCU-ETHIO simultaneously. Controller may fail to operate correctly.

3.1.3 Connecting the cable

1. Connect the Profinet cable to the ETHIO-PN Profinet connector.
3.1.4 Closing the Front Door of the DX100

Close the DX100 door.

(1) Close the door gently.

(2) Rotate the door lock counterclockwise 90 degrees.

Fig. 3-3: Rotating the Door Lock Counterclockwise

**CAUTION**

- Always close the door of the controller (DX100) except for maintenance.
- Make sure to rotate all the door locks counterclockwise.
- If dust or water enter inside the controller, electric shock or breakdown of DX100 may result.
4 Allocating I/O Signals

4.1 Setting ETHIO-PN communication conditions

When using ETHIO-PN, network communication settings must first be changed using the Molex applicomIO Console.

While pressing [MAIN MENU], turn the power to the DX100 on, change the ETHIO-PN communication settings.

See the applicomIO Console instruction manual for more information on communication settings.

4.2 ETHIO-PN GSDML file

When ETHIO-PN is used as a Profinet IO Device, the ETHIO-PN GSDML file may be required to change network settings with the Profinet IO Controller.

The GSDML file is generated automatically when applicomIO Console is used to change communication settings. See the applicomIO Console instruction manual for more information on the GSDML file.

4.3 Option board and I/O Module Settings

**NOTE**

Set the option board and I/O Module, always do so in management mode after attaching the board.

Settings cannot be changed if a board is not attached, or from operating mode/editing mode.

To use the ETHIO-PN with the DX100, the option board and I/O module settings must be changed using the following steps.

1. Turn the power supply ON again while pressing [MAIN MENU] simultaneously.
   - The maintenance mode will be displayed

2. Change security mode to management mode.
3. Select [SYSTEM] under the main menu.
   - The sub menu will be displayed

4. Select [SETUP].
   - The SETUP window will be displayed

5. Select [OPTION BOARD].
   - The option board screen will be displayed.
6. Select [PCU-ETHIO-PN].

- The PCU-ETHIO-PN SETUP window will be displayed.

- (Description of each setting item)

  A: PCU-ETHIO-PN
  Set whether the PCU-ETHIO-PN will be used. "Use" and "Do not use" can be selected and switched using the toggle.

  B: IO size
  The communication byte number set with applicomIO Console will be displayed. This screen cannot be used to change the I/O size.

7. Change PCU-ETHIO-PN to "Use".

8. Press [ENTER].

- The confirmation dialog box will be displayed.
9. Select [Yes].
   – The I/O module screen will be displayed.

10. Press [ENTER].
    – The next I/O module screen will be displayed, and the ETHIO-PN I/O allocation results will be displayed.

11. Press [ENTER].
    – The confirmation dialog box will be displayed.
12. Select [Yes].

- Return to the setting screen.
4.4 Transmission Data

Data transferred from the ETHIO-PN to within the DX100 includes I/O data sent from other Profinet devices, as well as the ETHIO-PN board status.

Accordingly, in addition to the area for contact point data within the DX100, there are eight points (1 byte) for both input/output in the area for the ETHIO-PN board status (the output area cannot be used).

ETHIO-PN board communication data is allocated as the external I/O signal for the concurrent I/O signal.

If only the ETHIO-PN is installed as the 16Byte optional I/O board, concurrent I/O allocation is as follows (20010 to 20057 used by the DX100 standard I/O unit).

Table 4-1: Example of concurrent I/O allocation

<table>
<thead>
<tr>
<th>Kind of data</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O Data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20060 ~ 20067 board status (1)</td>
<td>30060 ~ 30067 not available</td>
<td></td>
</tr>
<tr>
<td>20070 ~ 20077 input data (1)</td>
<td>30070 ~ 30077 output data (1)</td>
<td></td>
</tr>
<tr>
<td>20080 ~ 20087 input data (2)</td>
<td>30080 ~ 30087 output data (2)</td>
<td></td>
</tr>
<tr>
<td>20090 ~ 20097 input data (3)</td>
<td>30090 ~ 30097 output data (3)</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td>...</td>
</tr>
<tr>
<td>20220 ~ 20227 input data (16)</td>
<td>30220 ~ 30227output data (16)</td>
<td></td>
</tr>
</tbody>
</table>

[ETHIO-PN board status]

The first 1 byte of the input data of ETHIO-PN allocated to the external input signal (20060 to 20067 in the allocation example above) represents the ETHIO-PN board status.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2xxx0 ~ 2xxx5</td>
<td>Reservation area with manufacturer</td>
</tr>
<tr>
<td>2xxx6</td>
<td>Represents the Profinet communication status. 0: Nomal status 1: Communication error</td>
</tr>
<tr>
<td>2xxx7</td>
<td>Represents the operating status of the board. 0: Nomal status 1: Communication error</td>
</tr>
</tbody>
</table>
4.5 Example of I/O allocation

Examples of external I/O signal allocation is shown below.

Example 1. Only for ETHIO-PN (16Byte communication settings)

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>20010 ~ 20057: JZNC-YIU01-E</td>
<td>30010 ~ 30057: JZNC-YIU01-E</td>
</tr>
<tr>
<td>20060 ~ 20227: ETHIO-PN</td>
<td>30060 ~ 30227: ETHIO-PN</td>
</tr>
</tbody>
</table>

Example 2. For XOI01 + ETHIO-PN (16Byte communication settings)

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>20010 ~ 20057: JJZNC-YIU01-E</td>
<td>30010 ~ 30057: JJZNC-YIU01-E</td>
</tr>
<tr>
<td>20060 ~ 20107: JJANCD-XOI01</td>
<td>30060 ~ 30107: JJANCD-XOI01</td>
</tr>
<tr>
<td>20110 ~ 20277: JETHIO-PN</td>
<td>30110 ~ 30277: JETHIO-PN</td>
</tr>
</tbody>
</table>
The ETHIO-PN has six LEDs, each of which is used to display the following information.

- **Configuration port Indicator: Trans**
  Status with the serial cable connected for changing board settings.
  (cannot be used with the DX100)

- **Configuration port Indicator: Recv**
  Status with the serial cable connected for changing board settings.
  (cannot be used with the DX100)

- **Network Status**
  Displays the Profinet communication status.

- **Module Status**
  Displays the ETHIO-PN board status.

- **Ethernet Link**
  Displays the Ethernet Link status.

- **Transmission speed**
  Displays the Ethernet transmission speed.

The position of each LED and detailed information are shown below.
### Network Status

<table>
<thead>
<tr>
<th>Network Status</th>
<th>Status</th>
<th>Details and Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>The communication target cannot be identified.</td>
<td>The presence of the station specified as the communication target cannot be identified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the Profinet cable, HUB, connector wiring and connection status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the communication speed of each device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the operating status of the target communication station.</td>
</tr>
<tr>
<td>Green light flashing</td>
<td>The communication target was identified, however a communication connection could not be established.</td>
<td>The device is online, however communication cannot be established.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the Profinet cable, HUB, connector wiring and connection status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the communication speed of each device.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the operating status of the target communication station.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check that the number of I/O allocation matches that set at the communication target station.</td>
</tr>
<tr>
<td>Green light on</td>
<td>Communication connection was established.</td>
<td>Normal status</td>
</tr>
<tr>
<td>Red light flashing</td>
<td>One or more communication connections have timed out.</td>
<td>Communications have been established with online status, however there are stations with a communication error.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the operating status of the target communication station.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check that the number of I/O allocation matches that set at the communication target station.</td>
</tr>
</tbody>
</table>
Module Status

<table>
<thead>
<tr>
<th>Module Status</th>
<th>Status</th>
<th>Details and Solutions</th>
</tr>
</thead>
</table>
| Off           | The power has not been turned on, or this board has not started. | This board has not been installed correctly, or settings may mean this board cannot be used.  
  • Check the installation status of this board.  
  • Check the setting status of this board. |
| Green light flashing | This board settings could not be changed correctly. | Cannot start normally as this board has not been set correctly.  
  • Check the connection status of this board.  
  • Check the setting status of this board. |
| Green light on | This board is operating normally. | Normal status |
| Red light flashing | A minor problem has occurred. | Check whether the alarm has been output by the DX100 side. |
| Red light on | A major problem has occurred. | Replace the ETHIO-PN board. |

Ethernet Link

<table>
<thead>
<tr>
<th>Module Status</th>
<th>Status</th>
<th>Details and Solutions</th>
</tr>
</thead>
</table>
| Off           | The Ethernet communication link has not been established. | (Physical) signals are not being sent or received at the Ethernet level.  
  Check the installation status of this board.  
  • Check the Profinet cable, HUB, connector wiring and connection status.  
  • Check the communication speed of each device. |
| Light on      | The Ethernet communication link is operating normally. | Normal status |

Transmission Speed

<table>
<thead>
<tr>
<th>Transmission Speed</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light on</td>
<td>Communication at 100Mbps</td>
</tr>
<tr>
<td>Off</td>
<td>Communication at 10Mbps</td>
</tr>
</tbody>
</table>
DX100 OPTIONS
INSTRUCTIONS
FOR PROFINET BOARD (PCU-ETHIO-PN MADE BY Molex)

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