

DX100 OPTIONS INSTRUCTIONS

FOR PROFIBUS BOARD (AB3601 AND AB3602 MADE BY HMS)

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

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: 164430-1CD
Revision: 0



MANDATORY

- This manual explains the Profibus Board (AB3601 and AB3602 made by HMS) 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 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.

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



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 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 pressing the emergency stop buttons on the front door of the DX100 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.

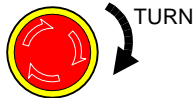
Figure 1: Emergency Stop Button



- 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.

Figure 2: 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 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.
 - 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 DX100 and the programming pendant.



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.

- 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.



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:

Equipment	Manual Designation
DX100 controller	DX100
DX100 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

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

Equipment	Manual Designation
Programming Pendant	Character Keys The keys which have characters printed on them are denoted with []. ex. [ENTER]
	Symbol Keys The keys which have a symbol printed on them are not denoted with [] but depicted with a small picture. ex. page key  The cursor key is an exception, and a picture is not shown.
	Axis Keys Number Keys "Axis Keys" and "Number Keys" are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. [SHIFT]+[COORD]
	Displays The menu displayed in the programming pendant is denoted with { }. ex. {JOB}

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 explains the necessary setting methods for using Profibus boards (AB3601/AB3602 made by HMS) in the DX100 and the relevant information.

These boards enable the DX100 to communicate general I/O data with other Profibus devices.

AB3601 and AB3602 are available in DS1.40.00A-00 or later.



AB3601 is used as a slave (Profibus DPV1 Slave). All the network settings for this board are available in the maintenance mode.

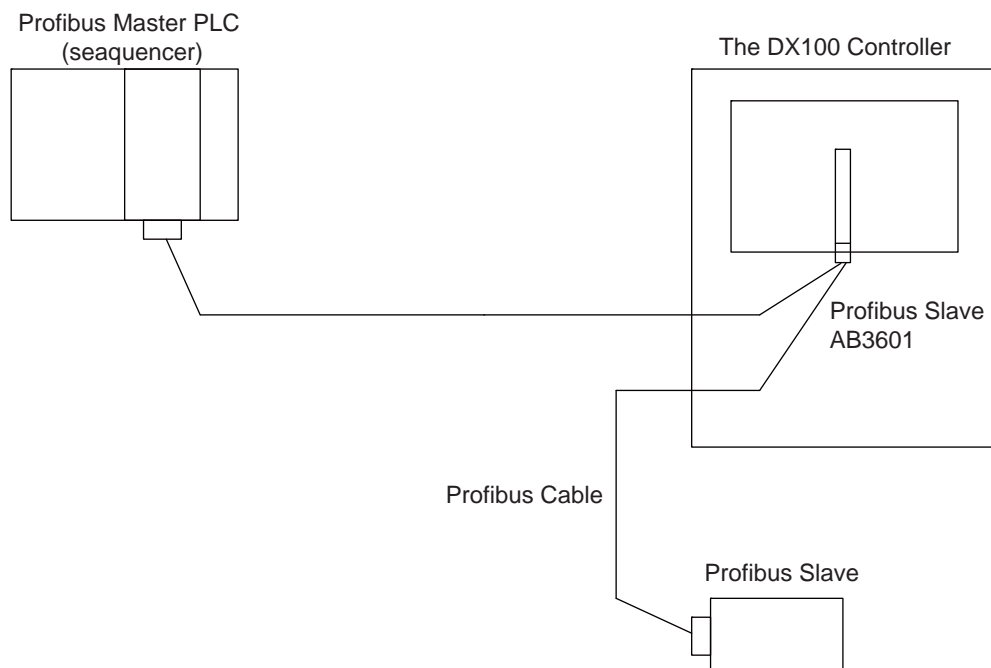


AB3602 is used as a master (Profibus DPV1 Master). Settings of the communication between the DX100 and this board are executed in the maintenance mode.

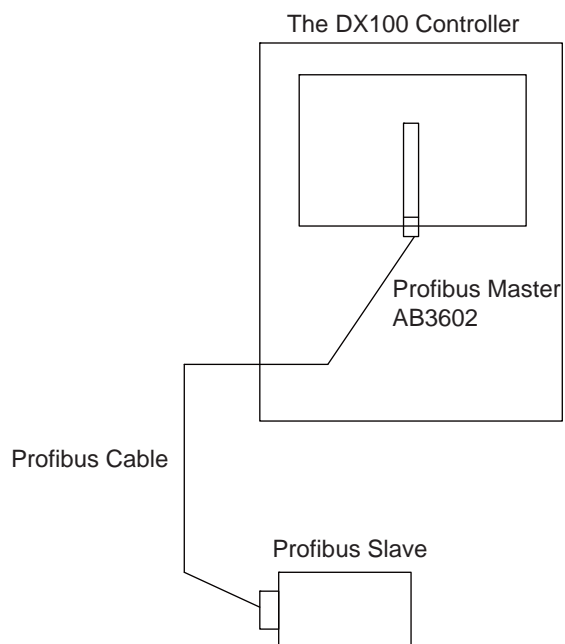
The network as Profibus is set with HMS AnyBus NetTool for PROFIBUS (Network setup software).

1.1 System Configuration

■ System Configuration: AB3601



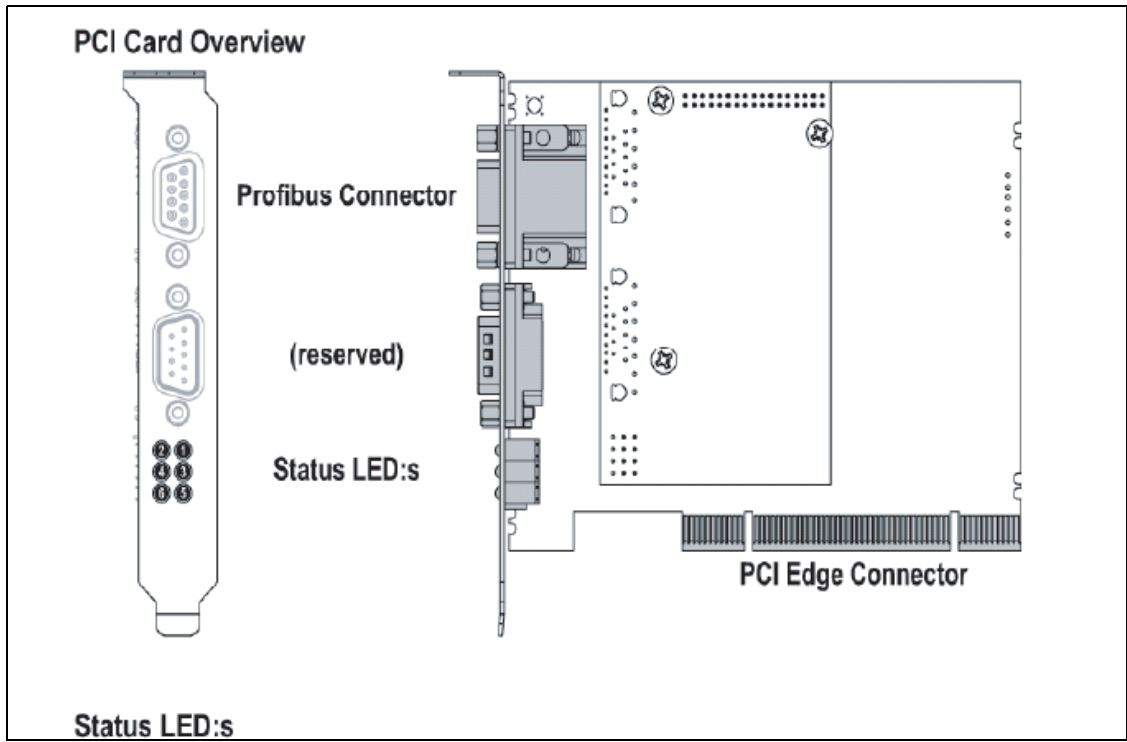
■ System Configuration: AB3602



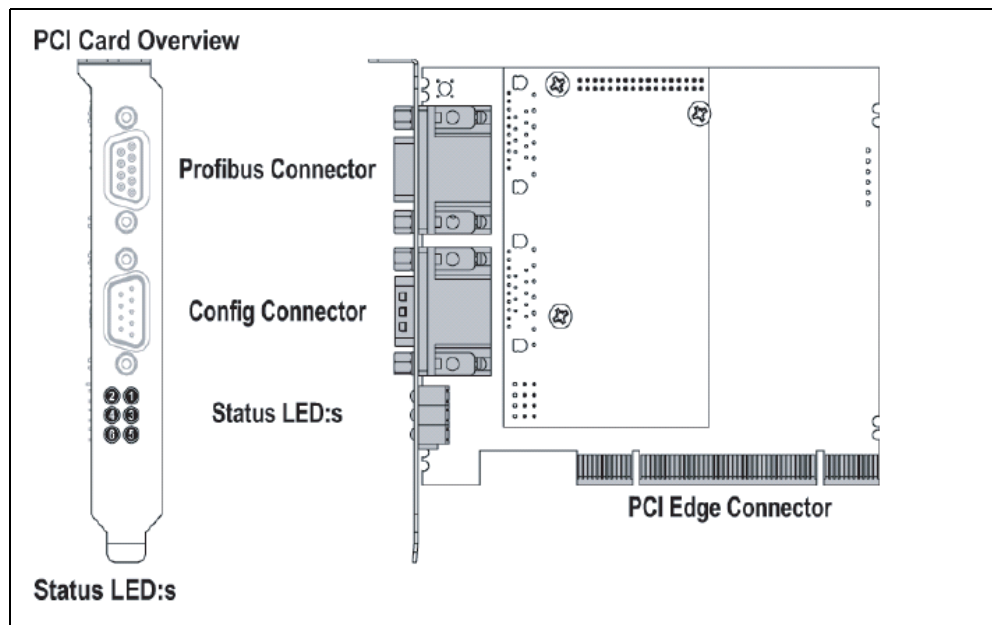
2 Hardware Specification

2.1 Board Diagram

■ AB3601



■ AB3602



2.2 Board Specification

Item	Specification
Interface between the external device	Profibus DP
Board location	PCI slot in the DX100 controller
Error display method	LED display
Number of I/O point	AB3601 Input: 164 Byte Output: 164 Byte AB3602 Input: 250 Byte Output: 250 Byte However, the input and output bytes cannot be set respectively

The above mentioned number of I/O points for AB3602 (Input: 250 Byte / Output: 250 Byte) are used when the attached optional I/O module is only this board.



On the other hand, the points cannot be used if other optional I/O modules than this board are attached.

Like above, the number of I/O points for AB3601 (Input: 164 Byte / Output: 164 Byte) cannot be used if the optional I/O module attached to other than this board uses the I/O points more than 84 Bytes.

2.3 Communication Specification

	Explanation
Physical layer	RS485
Baud rate	9.6 Kbps to 12 Mbps

2.4 Connector Specification

■ Profibus Connector

D-sub 9 pin (socket)

	Explanation
Frame	Cable shield
1	NC ¹⁾
2	NC
3	B-Line
4	RTS ²⁾
5	GND BUS ³⁾
6	+5V BUS ³⁾
7	NC
8	A-Line
9	NC

1 NC :Not
Connected

2 RTS: RTS is a signal which dictates data communication direction.
The ordinal application does not use RTS signal because it uses only A-Line, B-Line or the shield cable.

3 GND BUS / +5V
BUS
These two signal cables are used for bus transmission.
The power is supplied by this cable when a device like RS485 for optical fiber is used.

■ Configuration Connector (available for AB3602 only)

D-sub 9 pin (pin)

	Explanation
Frame	PE (protective earth)
1	NC ¹⁾
2	RxD
3	TxD
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC

1 NC: Not
Connected

3 Settings and Installation 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.

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.

3.1 Mounting the Board

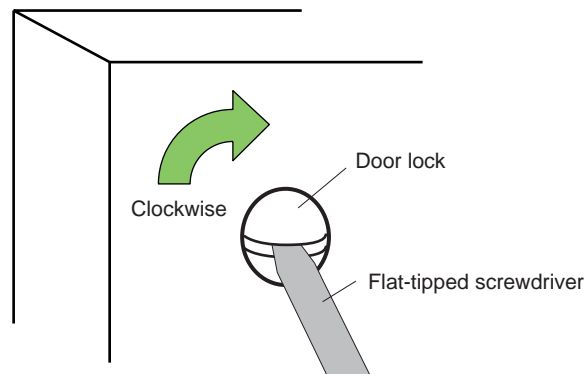
Mount AB3601 / AB302 board in the following manner.

3.1.1 Opening the DX100 Front Door

1. Open the front door of the DX100.

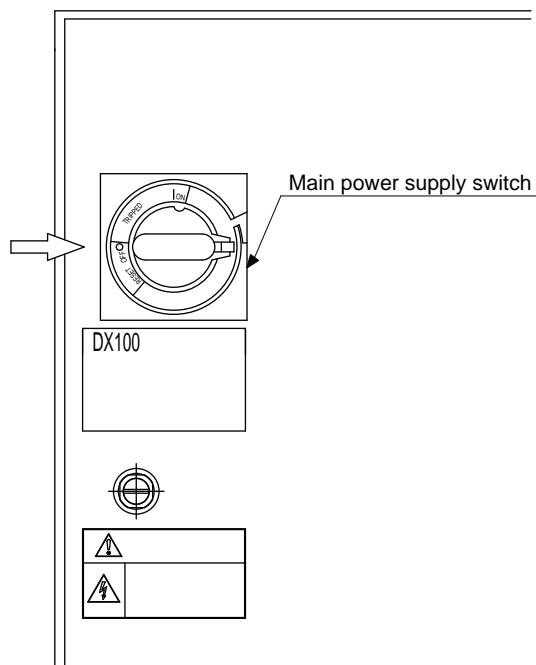
- (1) Turn the two door locks on the front face of the DX100 clockwise for 90° with a flat -tipped screw drive.

Fig. 3-1: Rotating the Door Lock Clockwise



- (2) With the door locks turned clockwise for 90°, turn the main switch handle to the "OFF" position, and slowly open the door.

Fig. 3-2: Rotating the Main Power Supply Switch to the OFF Position

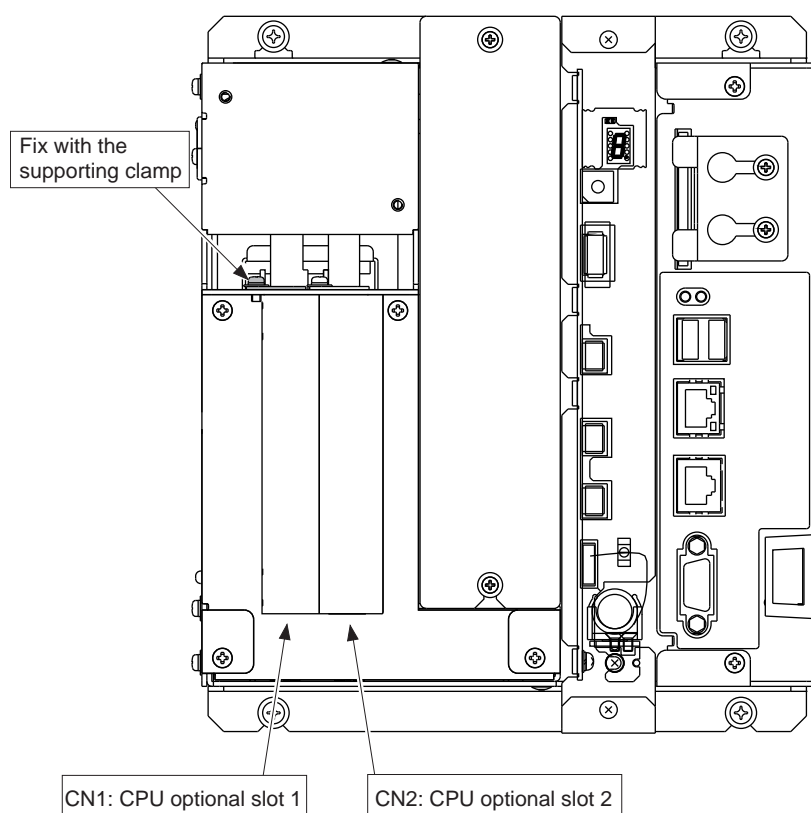


3.1.2 Mount AB3601 / AB3602 Board to the DX100

1. Uninstall the riser card (JANCD-YBB02-E) from the CPU rack.
2. Insert AB3601 or AB3602 to the PCI slot on the riser card, then fix it with the supporting clamp.
3. Reinstall the riser card to the CPU rack.



When inserting AB3601/AB3602 to the riser card, be sure to insert it in the order of slot1, then slot2. If the DX100 is used with the slot1 empty, the board is not recognized and it would not work appropriately.

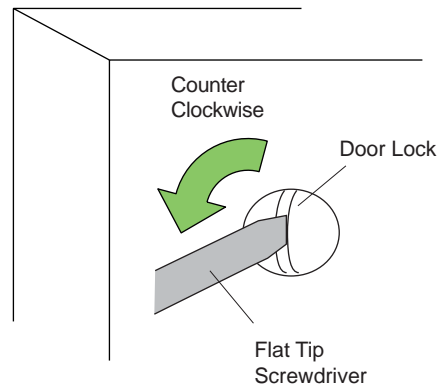


3.1.3 Connecting Cables

1. Connect the Profibus cable to the Profibus connector on AB3601 or AB3602.

3.1.4 Closing the Front Door of the DX100

1. Close the DX100 front door.
 - (1) Close the door gently.
 - (2) Turn the two door lock on the front face of the DX100 counterclockwise for 90 °.

Fig. 3-3: Rotating the Door Lock Counterclockwise**CAUTION**

- Please always keep the DX100 front door closed except maintenance time.
- Never fail to shut all the door tightly.
- If dust, dirt or water goes inside the DX100, it may result in a failure, a fire or an electric shock.

4 Allocating I/O Signals

4.1 Optional Board and I/O Module Setting



Before executing additional settings in management mode, install AB3601/AB3602 board.
The setting operation cannot be executed without the board or in the operation mode/editing mode.

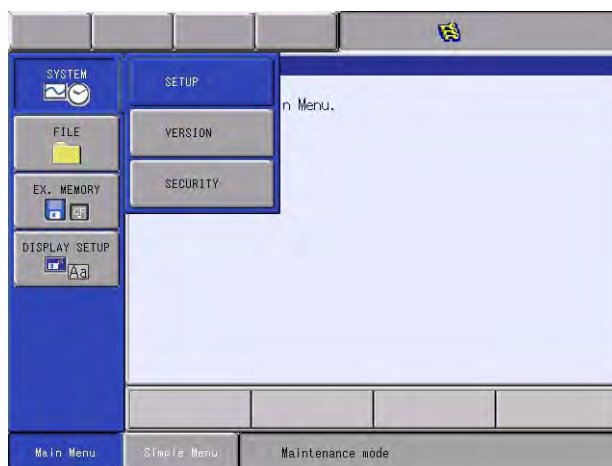
■ When Setting to AB3601 Board

When using AB3601 board in the DX100, it is necessary to set the optional board and the I/O module in the following manners.

1. Turn ON the power supply while pressing [MAIN MENU] simultaneously.
 - The maintenance mode starts up.



2. Change the security mode to management mode.
3. Select {SYSTEM} under the main menu.
 - The sub menu appears.



4 Allocating I/O Signals

4.1 Optional Board and I/O Module Setting

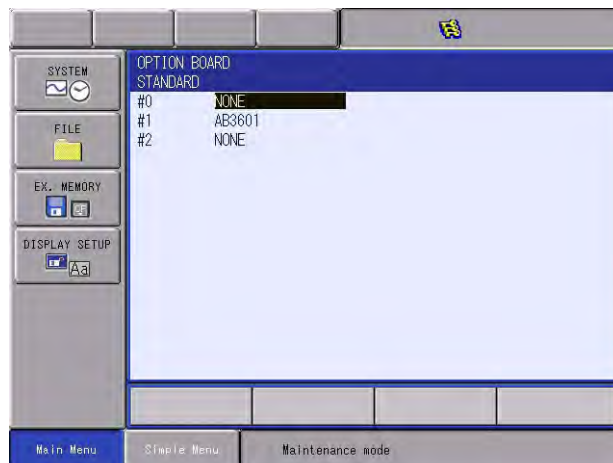
4. Select {SETUP}.

- The SETUP window appears.



5. Select {OPTION BOARD}

- The OPTION BOARD window appears.



4 Allocating I/O Signals

4.1 Optional Board and I/O Module Setting

6. Select {AB3601}.

– The AB3601 setting window appears.



– (Details of each setting item)

① AB3601

Determine the usage of this board.

“USED” or “NOT USED” toggles each time it is selected.

Select “USED” to use this board.

② IO SIZE

Set the transmitting I/O size within the range from 1 to 164.

③ NODE ADDRESS

Set the node address within the range from 0 to 125.

④ BAUD RATE

It cannot be set since It is automatically discriminated.

7. Input the desired value to each item.

8. Press [ENTER].

– The confirmation dialog box appears.



9. Select [YES].

- The I/O module window appears.



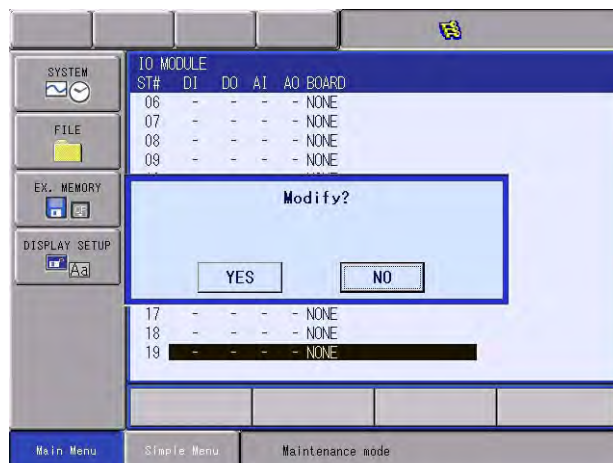
10. Press [ENTER].

- The next window to the above mentioned I/O module window as the result of AB3601 board's I/O allocation appears.



11. Press [ENTER].

- The confirmation dialog box appears.



12. Select [YES].

- The window returns to the SETUP window.



- **When Setting to AB3602 Board**

When using AB3602 board, set the optional board or the I/O module in the following manners.

1. Turn ON the power supply while pressing [MAIN MENU] simultaneously.

- The maintenance mode starts up.



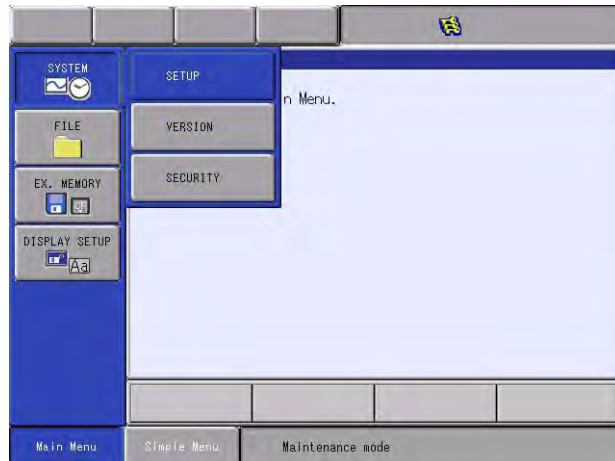
2. Change the security mode to the management mode.

4 Allocating I/O Signals

4.1 Optional Board and I/O Module Setting

3. Select {SYSTEM} under the main menu.

– The sub menu appears.



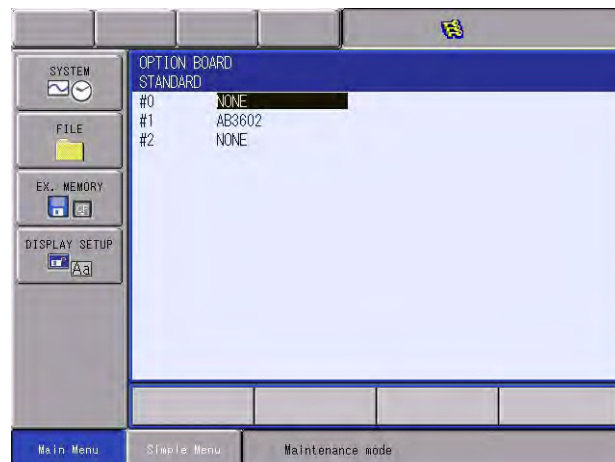
4. Select {SETUP}.

– The SETUP window appears.



5. Select {OPTION BOARD}

– The OPTION BOARD window appears.

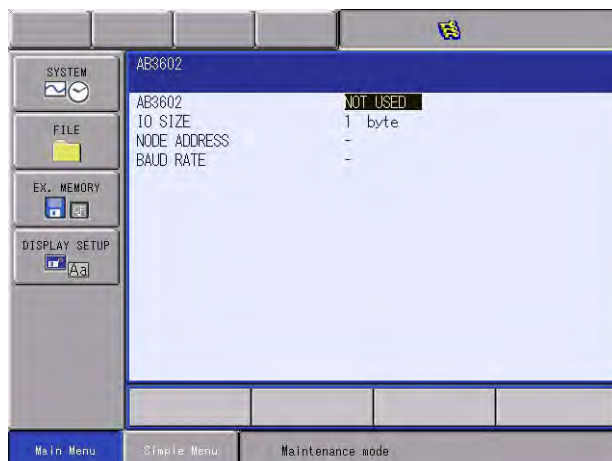


4 Allocating I/O Signals

4.1 Optional Board and I/O Module Setting

6. Select {AB3602}.

– The AB3602 setting window appears.



– (Details of each setting item)

① AB3602

Determine the usage of this board.

“USED” or “NOT USED” toggles each time it is selected.

Select “USED” to use this board.

② IO SIZE

Set the transmitting I/O size within the range from 1 to 250.

③ NODE ADDRESS

It cannot be set with this window but set by Anybus NetTool for PROFIBUS.

④ BAUD RATE

It cannot be set with this window but set by Anybus NetTool for PROFIBUS.

7. Input the desired value to each item.

8. Press [ENTER].

– The confirmation dialog box appears.



9. Select [YES].

- The I/O module window appears.

ST#	DI	DO	AI	AO	BOARD
00	-	-	-	-	NONE
01	-	-	-	-	NONE
02	-	-	-	-	NONE
03	-	-	-	-	NONE
04	-	-	-	-	NONE
05	-	-	-	-	NONE
06	-	-	-	-	NONE
07	-	-	-	-	NONE
08	-	-	-	-	NONE
09	-	-	-	-	NONE
10	-	-	-	-	NONE
11	-	-	-	-	NONE
12	-	-	-	-	NONE
13	-	-	-	-	NONE

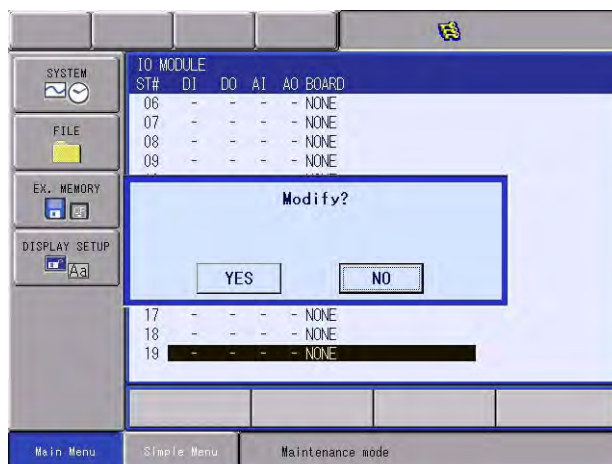
10. Press [ENTER].

- The next window to the above mentioned I/O module window as the result of AB3602 board's I/O allocation appears.

ST#	DI	DO	AI	AO	BOARD
06	-	-	-	-	NONE
07	-	-	-	-	NONE
08	-	-	-	-	NONE
09	-	-	-	-	NONE
10	-	-	-	-	NONE
11	-	-	-	-	NONE
12	-	-	-	-	NONE
13	-	-	-	-	NONE
14	0040	0040	-	-	YIU01
15	-	-	-	-	NONE
16	0136	0136	-	-	AB3602
17	-	-	-	-	NONE
18	-	-	-	-	NONE
19	-	-	-	-	NONE

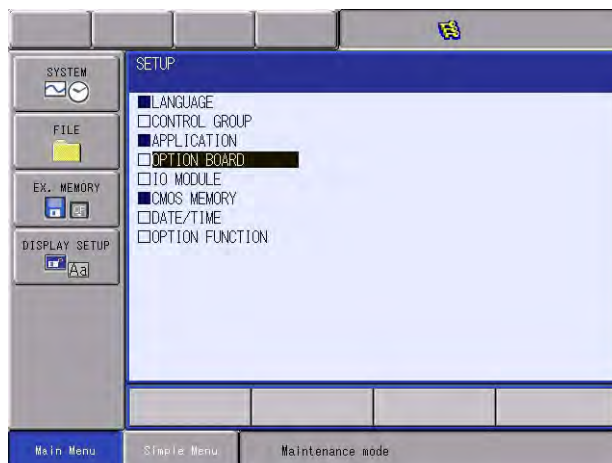
11. Press [ENTER].

- The confirmation dialog box appears.



12. Select [YES].

- The window returns to the SETUP window.

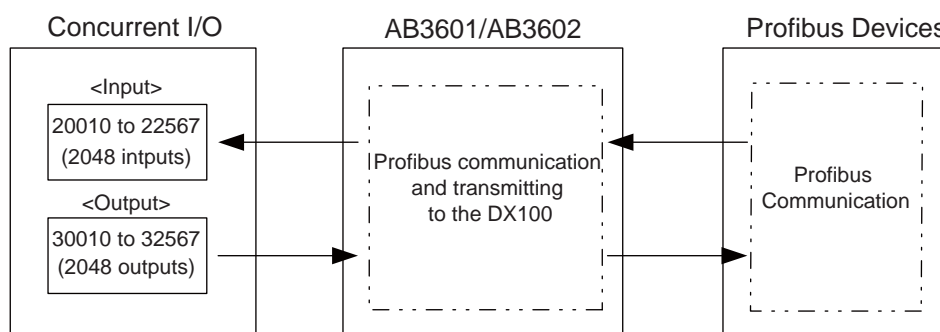


4.2 Transmitting Data

The data to be transmitted from AB3601/AB3602 to inside of the DX100 is not only the I/O data from the external Profibus devices, but the status of the AB3601/AB3602 board is also included.

Therefore, inside the DX100, 8 points (1 byte) each for input and output are reserved for the AB3601/AB3602 board status area beside the area for the I/O data.

The transmitting data from the AB3601/AB3602 board are allocated to the external I/O signals of the concurrent I/O.



When only AB3601 or AB3602 board (input/output: 16 Byte) is mounted as an optional I/O board, the concurrent I/O allocation is as follows.

(20010 to 20057 are used for standard I/O unit of the DX100)

Table 4-1: Example of Concurrent I/O Allocation

Data	Input	Output
I/O data	20060 to 20067 board status (1)	30060 to 30067 unusable (1)
	20070 to 20077 input data (1)	30070 to 30077 output data (1)
	20080 to 20087 input data (2)	30080 to 30087 output data (2)
	20090 to 20097 input data (3)	30090 to 30097 output data (3)
	• • •	• • •
	20220 to 20227 input data (16)	30220 to 30227 output data (16)

[AB3601/AB3602 Board Status]

The first 1 Byte of AB3601/AB3602's input data allocated to external input signal (which is 20060 to 20067 in the above allocation example) indicates the board status of AB3601/AB3602.

Signal	Contents
2xxx0 to 2xxx4	Reserved area for the manufacture
2xxx5	Indicates the existence of uncommunicative station 0: Communicating with all the defined station. (normal) 1: More than one uncommunicative stations are existing
2xxx6	Indicates the Profibus communication status 0: Communicating normally. (normal) 1: Not communicable
2xxx7	Indicates the operation status of the board. 1: Operating normally. (normal) 0: Not operating normally.

4.3 I/O Allocation

Followings are the examples of allocations to external I/O signals.

Example 1: Allocating to AB3601 (16 Byte) Only

Input	Output
20010 to 20057 : JZNC-YIU01-E 20060 to 20227 : AB3601	30010 to 30057 : JZNC-YIU01-E 30060 to 30227 : AB3601

Example 2: Allocating to XOI01 and AB3602 (16 Byte)

Input	Output
20010 to 20057 : JZNC-YIU01-E 20060 to 20107 : JANCD-XOI01 20110 to 20277 : AB3602	30010 to 30057 : JZNC-YIU01-E 30060 to 30107 : JANCD-XOI01 30110 to 30277 : AB3602

4.4 AB3601 GSD File

When using AB3601 board, sometimes the GSD file of the board is necessary to set the network with the Profibus communication master.

Please download the GSD file from the following site.

<http://www.hms.se/>

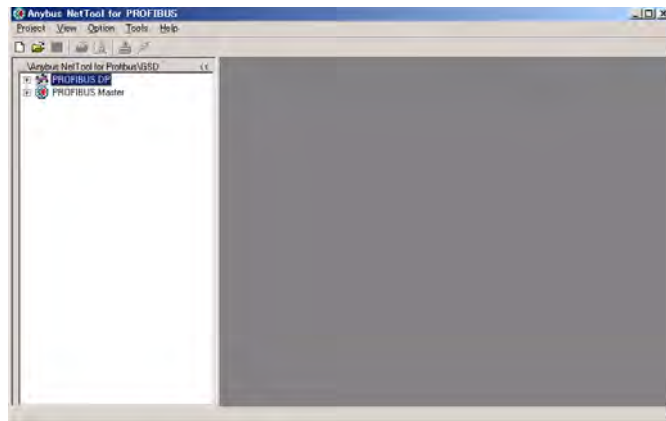
4.5 Setting of AB3602 Board Communication Condition

When using AB3602 board, the network is necessary to be configured with AnyBus NetTool for PROFIBUS (HMS made) (hereinafter referred to as NetTool).

Followings are the outline of the network configuration when A3601 (IN: 16 Byte, OUT: 6 Byte) is regarded as a slave.

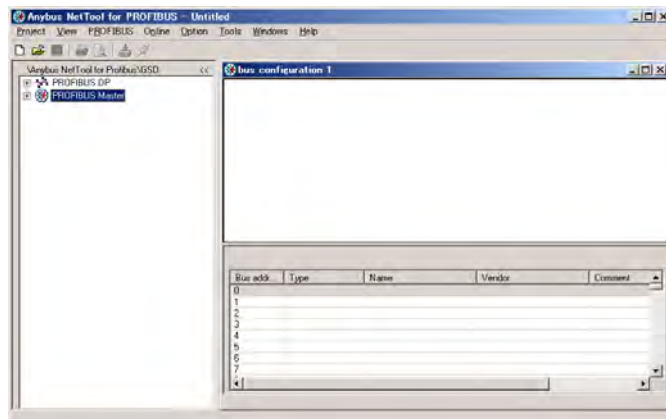
For the details of the settings, please refer to the documentations attached to NetTool.

1. Install NetTool on the PC.
2. With the serial cable, connect the PC and the AB3602 which is mounted to the DX100.
3. Turn ON the power supply while pressing [MAIN MENU] simultaneously.
4. Start-up NetTool.
 - The following window appears.



- All the subsequent procedures are operated on the NetTool window.

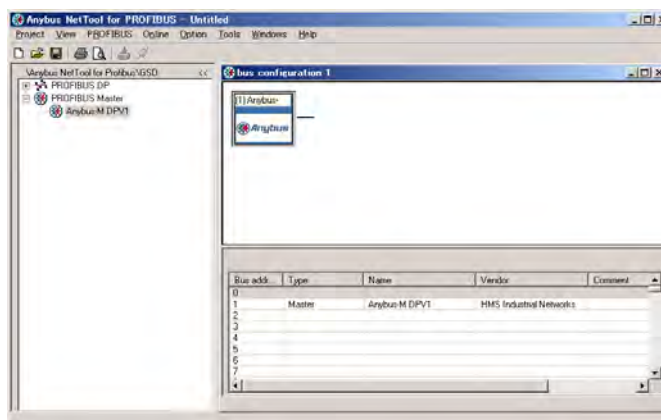
5. Select {Project} → {New}.
 - A new configuration window appears.



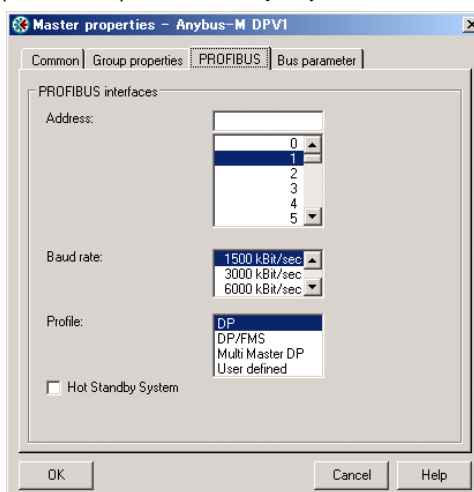
4 Allocating I/O Signals

4.5 Setting of AB3602 Board Communication Condition

6. In the GSD window, select {Profibus Master} and drag {Anybus-M DPV1} to the configuration window, then drop it.
 - Anybus-M icon appears in the configuration window.



7. Double click Anybus-M icon.
 - Master Properties window appears.
 - Select PROFIBUS tag. Set Address (Profibus node address) and Baudrate (baud rate), then click {OK}.

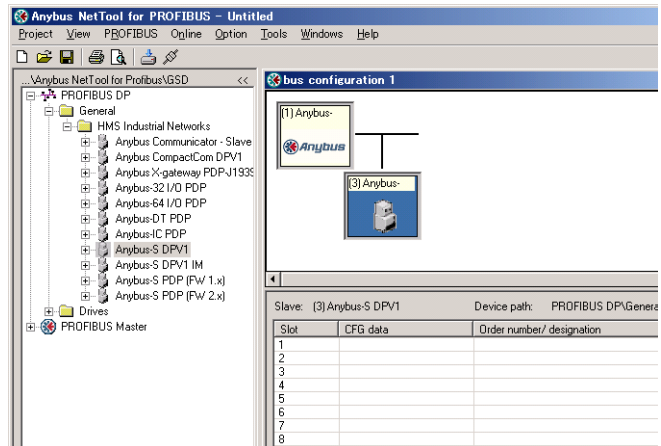


4 Allocating I/O Signals

4.5 Setting of AB3602 Board Communication Condition

8. In the GSD window, select {PROFIBUS DP} → {General} → {HMS Industrial Networks} and drag {Anybus -S DPV1} to the configuration window, then drop it.

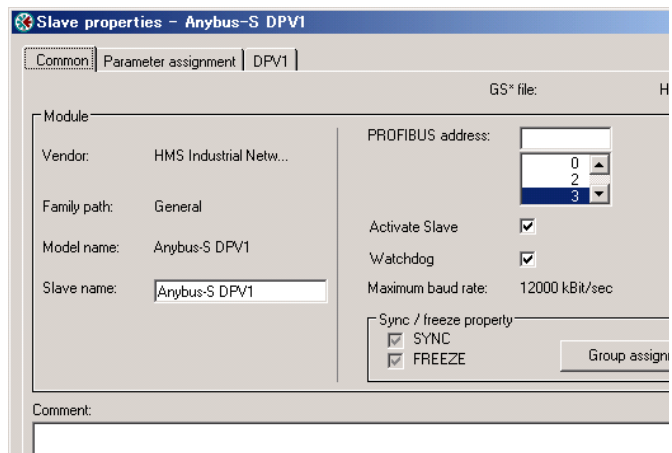
– The Anybus-S icon appears in the The Anybus-M network.



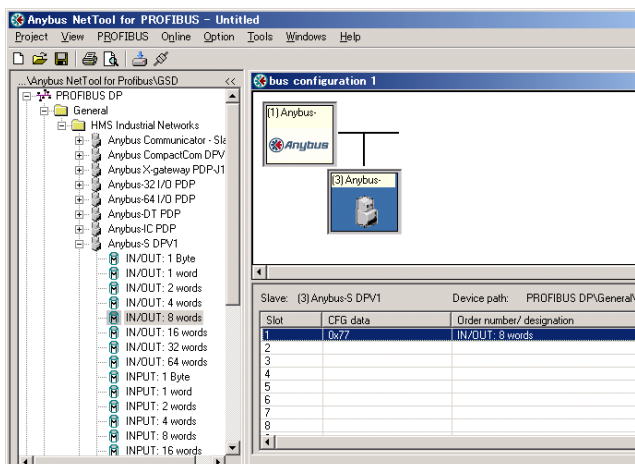
9. Double click the Anybus-S icon.

– Slave Properties window appears.

– Select Common tag. Set PROFIBUS Address (Profibus node address), then click {OK}.

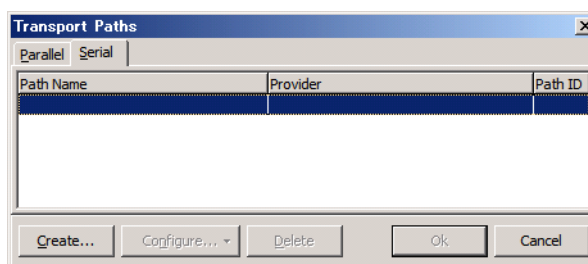


10. In the GSD window, select {PROFIBUS DP} → {General} → {HMS Industrial Networks} → {Anybus -S DPV1} and drag {IN/OUT: 8 word} to the slot 1 in the configuration window, then drop it.



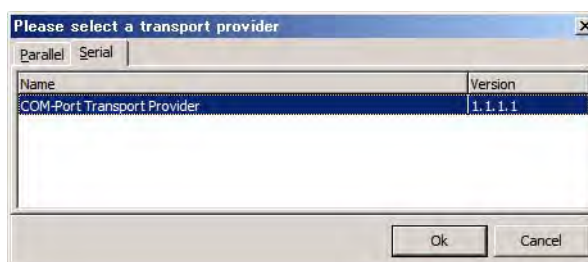
11. Select {Online} → {Download Configuration}.

– Transport Paths window appears.



12. Select Serial tag and click {Create}.

– Transport provider selecting window appears.



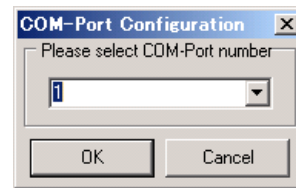
13. Click {OK}.

– Path name inputting window appears.



14. Click {OK}.

- COM-PORT selecting window appears.



15. Select {OK}.

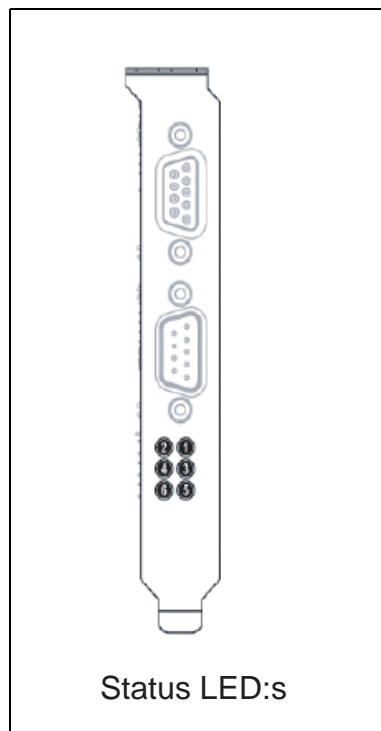
- Downloading of the configuration result starts.
- When downloading is completed, the following dialog box appears, then click {OK}.



5 Error Indication

5.1 LED Indication

Both AB3601 and AB3602 are provided with 6 LEDs for board status indication.



■ AB3601

No	Meaning	State	Meaning
1	Application Connecting Status	Green	Controlled by application
		Red	Standalone
2	I/O Access	Green Flashing	I/O accesses going on
		Red Flashing	I/O access failure (recoverable)
		OFF	No activity
3	Asynchronous Communication	OFF	Power is OFF or no DPV1 request is currently executed.
		Green	A DPV1 request is currently executed.
4	Profibus Network Status	OFF	Error is not occurring or power is OFF
		Red Flashing 1Hz	Error in configuration data
		Red Flashing 2Hz	Error in parameter data
		Red Flashing 4Hz	Profibus network IC Internal error occurred

No	Meaning	State	Meaning
5	Profibus: online	OFF	Profibus is not online or power is OFF
		Green	Profibus online and communicable
		Green Flashing	Clear mode
6	Profibus: offline	OFF	Profibus is not offline or power is OFF
		Red	Profibus offline

■ **AB3602**

No	Meaning	State	Meaning
1	Application Connecting Status	Green	Controlled by application
		Red	Standalone
2	I/O Access	Green Flashing	I/O accesses going on
		Red Flashing	I/O access failure (recoverable)
		OFF	No activity
3	Master Status	Green	Operation mode
		Green Flashing	Clear mode
		Red	Idle mode
		OFF	OFF line status
4	Token Hold	Green	Master has the token
		OFF	Master does not have the token
5	Database Status	Green	Database OK
		Green Flashing	Database download in progress
		Red	Database invalid
		OFF	No database downloaded
6	Communication Status	Green	Data exchange with all configured Slave
		Green Flashing	Data exchange with one or more configured Slaves
		Red	Network line control error Short circuit error or configuration error are the possible causes
		OFF	No data exchange with any of the configured Slaves.

DX100 OPTIONS INSTRUCTIONS

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