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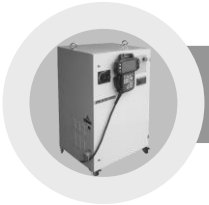
WARNING

INSTALLATION SHOULD ONLY BE PERFORMED BY QUALIFIED INSTALLATION PERSONNEL AND MUST CONFORM TO ALL NATIONAL AND LOCAL CODES

Hyundai Robot

Hi5PD141001FMEN1



Hi5 Controller Function Manual

BD525 PROFIBUS-DP

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Printed in Korea – Oct. 2014 1st Edition

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1 Overview

1.1. Prior knowledge

The users should have the following knowledge to understand this manual well.

- Method to use the Hi5/Hi5a robot controller
- Basic knowledge about field bus

1.2. About the field bus

Field bus is an open industrial standard for operating systems in factories, such as sensors, buttons, motor drivers, and operation interfaces by connecting them to a PLC (Programmable Logic Controller) through a single cable.

Field bus provides intelligent services, such as monitoring the state of the overall network state from the center or reconfiguring it. For example, it is advantageous in terms of sending and receiving more detailed information (including operation mode setting and defectiveness of sensors) about sensors and switches and not just the on or off state.
As field bus uses a single cable, the time and cost for wiring can be reduced, and maintenance can be carried out easily because of the simple wiring configuration.
In addition, different from the protocols with the nondeterministic response property, such as Ethernet, the data response speed is guaranteed, making it satisfactorily appropriate for industries in which the threshold time property is critical.

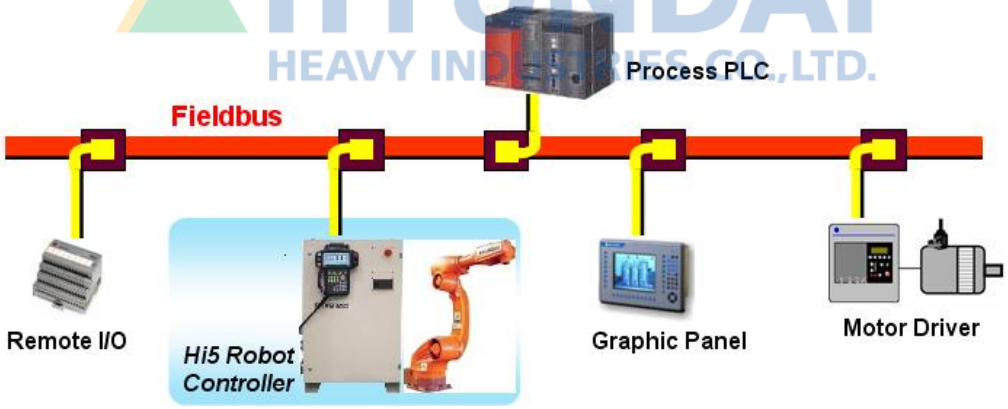

Figure 1.1 Field bus network, master, and slave units

One field bus network includes one master unit and multiple slave units connected. The master unit is for searching and managing the overall network and exchange data with slave units. In general, PLC is the master and the other units, such as sensors, buttons and controllers, are slave units.

1.3. PROFIBUS-DP specification

Maximum number of slave stations	Up to 32 stations per line segment with a total of 126 stations									
Repeater	Can be extended up to 4 repeaters									
Input and output data per station	244 byte input/output (In case of BD525, 120 byte can be supported)									
Maximum number of segments to be connected	Up to 4 repeaters between two stations (More than 4 repeaters can be supported depending on types of repeaters)									
Transmission ratio (kbit/s)	9.6	19.2	45.45	93.75	187.5	500	1,500	3,000	6,000	12,000
Maximum segment length (m)	1,200	1,200	1,200	1,200	1,000	400	200	100	100	100

1.4. GSD file

Each PROFIBUS-DP slave unit has its own unique GSD file, which is a property file, to ensure that each can be recognized. For the master to configure the network, the eBD525 communication board GSD file is necessary.

When the property file is registered in the network and the network browsing is executed, the devices connected through the field bus network will be searched. The network management S/W will download the information to the PLC's field bus scanner module, meaning the master. Once the network information is downloaded to the scanner module, the PLC scanner module will operate the whole network without any help from the network management.

For more details about the procedure, refer to the software manual for setting PLC products and networks.

1.5. Appearance of the BD525 board

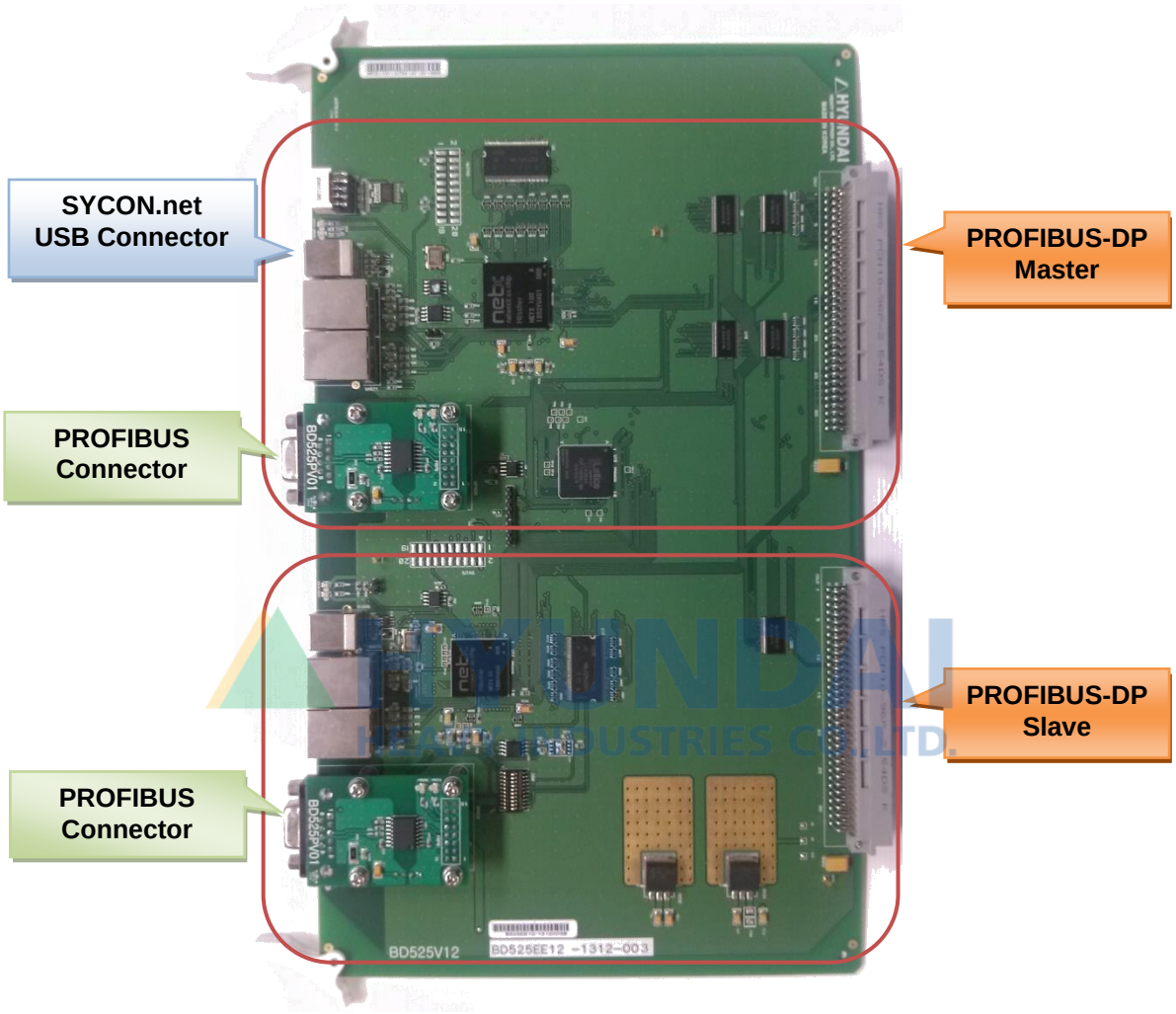

Figure 1.2 BD525 communication board

The BD525 PROFIBUS-DP communication boards supports one channel for master and one channel for salve. However, depending on necessities, the board can be delivered only with a master channel or a slave channel assembled.

In case of PROFIBUS-DP Master, SYCON.net, which is separate software for setting the network, is needed. SYCON.net and BD525 is connected through the USB.

In case of PROFIBUS-DP Slave, there is no need for separate software. It is possible to set the station numbers as well as the input and output data size through a teaching pendant.

1.6. BD525 PROFIBUS-DP specification

Input and output data	PROFIBUS-DP master: FB1 object
	PROFIBUS-DP slave: FB3 object
Cyclic communication	Max. 120 byte
Acyclic communication	Not supported
Communication speed	Master: 9600 Bits/s ~ 12 Mbit/s (Sycon.net setting)
	Slave: Auto recognition (9600 Bits/s ~ 12Mbit/s)
Slave station address	0 ~ 126
Data transport layer	PROFIBUS FDL

1.7. BD525 communication cable connection

The PROFIBUS connector of the BD525 board is a D-SUB 9-pin connector. As shown in the following figure, the PROFIBUS communication cable is connected and the terminating resistor is installed at the devices at the both ends.

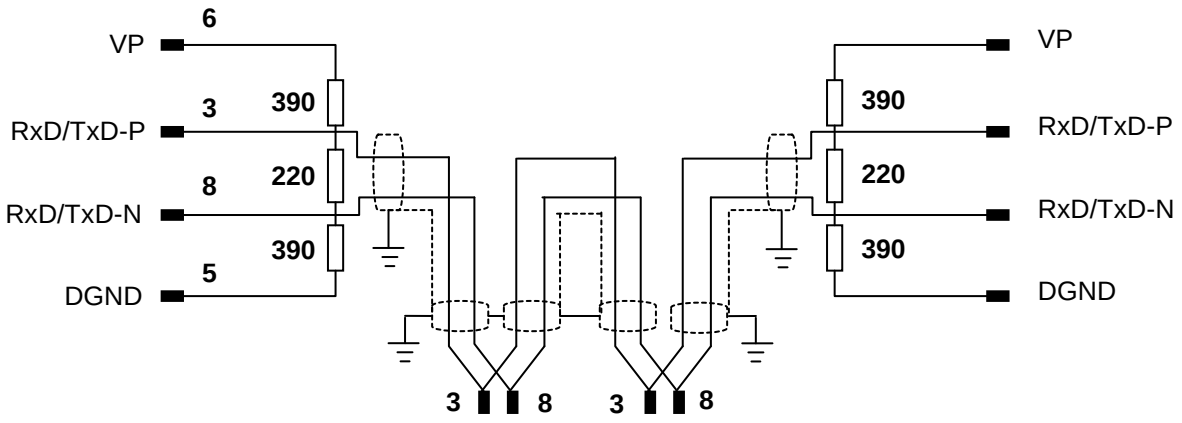

Figure 1.3 Connection of the PROFIBUS communication cable connection

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BD525 PROFIBUS Slave

2.1. Robot controller's PROFIBUS slave setting

To use the BD525 PROFIBUS-DP slave, it is necessary to set the station numbers as well as the input and output data size for example. The setting shall be carried out according to the following procedures:

(1) Select『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『15: BD525 fieldbus setting and diagnosis』.

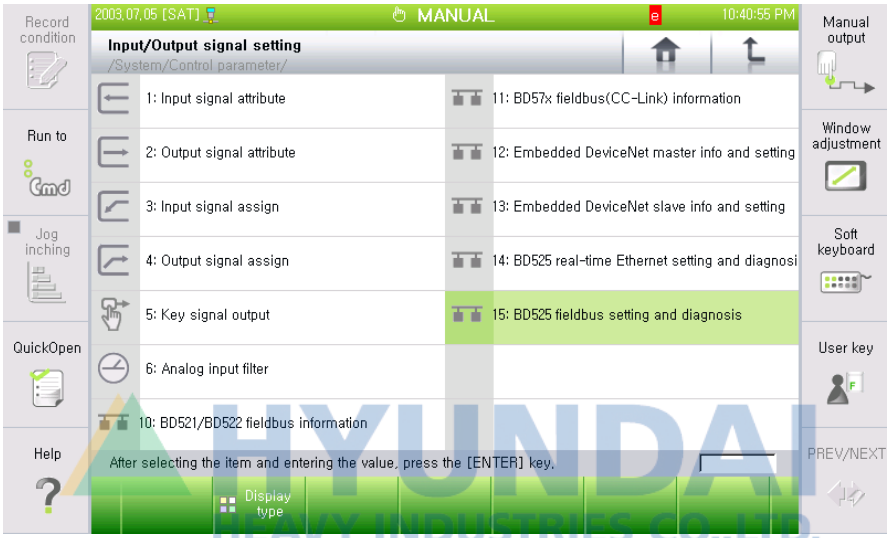


Figure 2.1 BD525 field bus setting and diagnosis menu

(2) Considering that the PROFIBUS-DP slave corresponds to the channel 3, use the 『[F3]: Previous』 or 『[F4]: Next』 key to move to the channel 3 and check whether the device type shows “RPOFIBUS-DP slave”.

If the device type shows “RPOFIBUS-DP slave,” it means that the BD525 board is installed normally. If it shows “Not installed,” it means that there is a problem with the installation of BD525. In that case, it is required to check whether the board is installed normally.

In addition, if the function is turned on, the BD525 software version information will be displayed in the bracket of the device type.

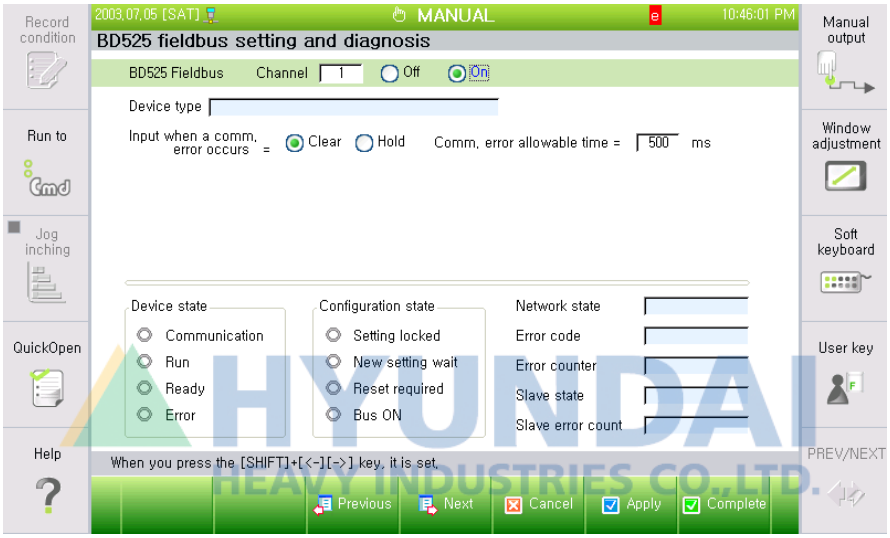


Figure 2.2 PROFIBUS-DP slave setting screen

(3) Sets the station number on the PROFIBUS-DP bus. It should match with the station number set in the master and the allowable station number ranges from 0~126.

(4) Sets the input and output data size. Input is thus defined when seen from the master while it will be output, in other words FB3.Y, when seen from the controller. On the contrary, output is thus defined when seen from the master while it will be input, in other words FB3.X, when seen from the controller.

(5) Sets the input data processing option when there is an error with communication. This is an option to process the input data when an error occurs with communication. When it is set as clear, all the input data will be cleared to be 0 when there is an error with communication. When it is set as hold, the last valid value will be maintained when there is an error with communication.

(6) To use the PROFIBUS-DP slave function, it is required to shift to the on position before clicking the Apply or Complete button.

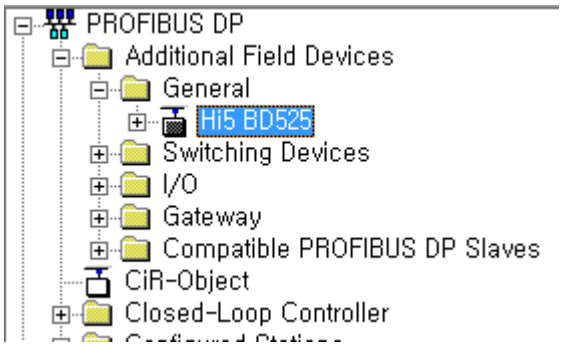
Reference

- Once the setting is changed, resetting (On➔Off➔On) or rebooting of the controller should be carried out for the newly set value to be applied.

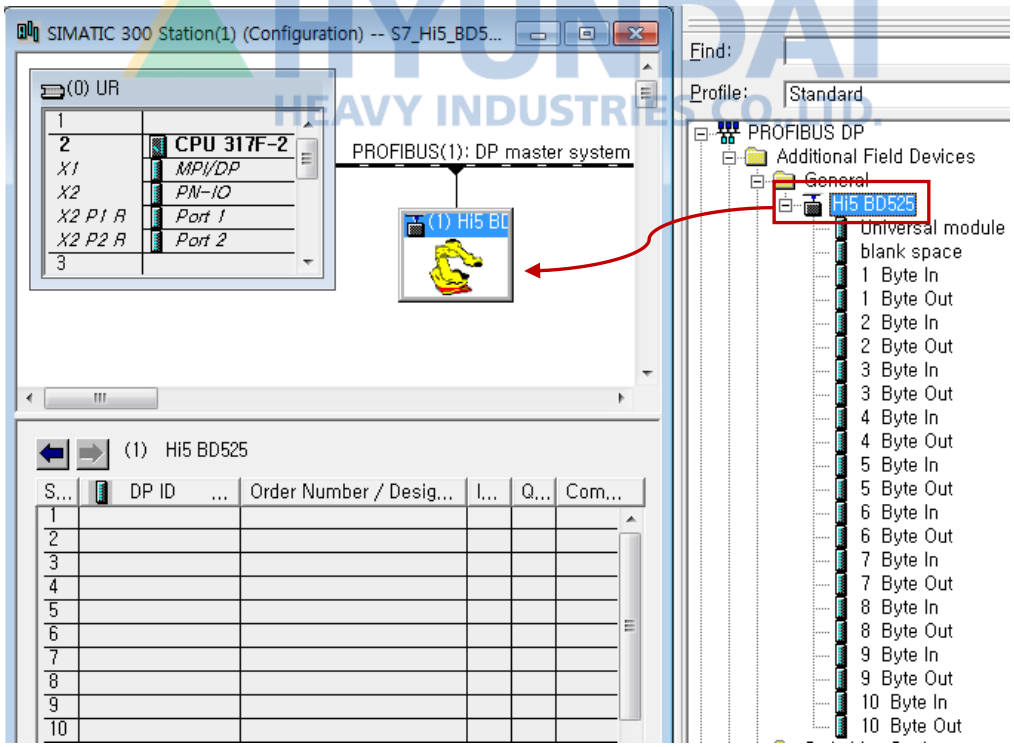
2.2. PROFIBUS master BD525 setting

The next is an example of the setting method for using the BD525 PROFIBUS-DP slave for Step 7.

(1) Install the BD525 PROFIBUS-DP slave GSD file (HI5_0A12.GSD). Once installation is completed, Hi5 BD525 will be displayed in the General folder under the Additional Field Devices of the HW Config catalogue window.

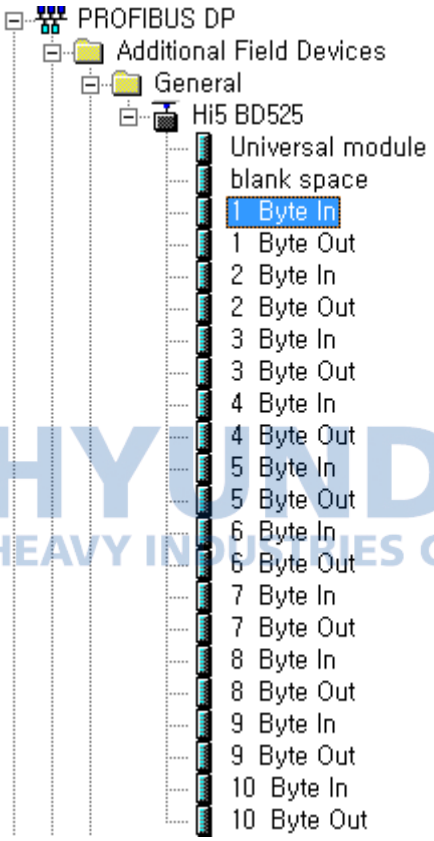


(2) Add Hi5 BD525 to the PROFIBUS-DP master device.



(3) The BD525 PROFIBUS-DP slave input and output consist of combination of input or output modules with the size ranging from 1 to 10 byte individually (INPUT=Input data size, OUTPUT=Output data size)

- Input module = 10 byte input module (INPUT/10) unit(s) + (INPUT%10) byte input module 1 unit
- Output module = 10 byte output module (OUTPUT/10) unit(s) + (OUTPUT%10) byte input module 1 unit



Example 1) When the BD525 PROFIBUS-DP slave input and output are 120 byte individually
⇒ 10 byte input module 12 units + 10 byte output module 12 units

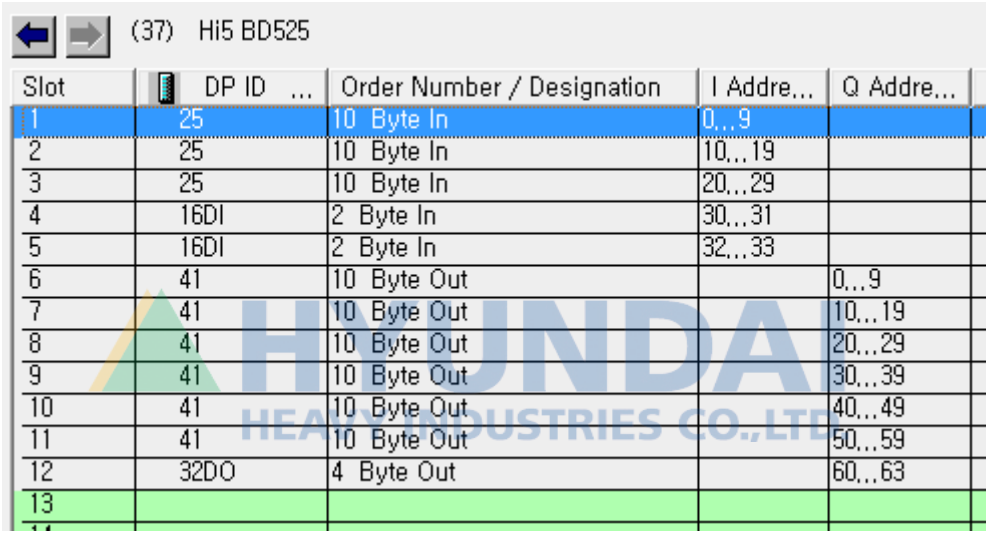
Example 2) BD525 PROFIBUS-DP slave input and output are 9 byte and 16 byte individually
⇒ 9 byte input module 1 unit + 10 byte output module 1 unit + 6 byte output module 1 unit

Example 3) BD525 PROFIBUS-DP slave input and output are 16 byte and 1 byte individually
⇒ 10 byte input module 1 unit + 6 byte output module 1 unit + 1 byte output module 1 unit

(4) Set the IO module of BD525. For example, when the input is 32 byte and the output is 64 byte, the module configuration and the slot configuration of HW Config in actual Step 7 will be as shown below.

- Input module configuration (32 byte): 10 byte input module 3 units + 2 byte input module 1
- Output module configuration (64 byte): 10 byte output module 6 units + 4 byte output module 1

- In slot configuration, the input modules must be placed prior to the output modules always.



(37) Hi5 BD525

Slot	DP ID ...	Order Number / Designation	I Addre...	Q Addre...
1	25	10 Byte In	0...9	
2	25	10 Byte In	10...19	
3	25	10 Byte In	20...29	
4	16DI	2 Byte In	30...31	
5	16DI	2 Byte In	32...33	
6	41	10 Byte Out		0...9
7	41	10 Byte Out		10...19
8	41	10 Byte Out		20...29
9	41	10 Byte Out		30...39
10	41	10 Byte Out		40...49
11	41	10 Byte Out		50...59
12	32DO	4 Byte Out		60...63
13				

(5) For more details about other procedures and methods for network configuration, refer to the manual for the master.

2.3. BD525 PROFIBUS-DP slave diagnosis

It is possible to check the diagnosis information, such as communication status, setting status and error information from the teaching pendant.

(1) Select 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『15: BD525 fieldbus setting and diagnosis』.

(2) Considering that the PROFIBUS-DP slave corresponds to the channel 3, use the 『[F3]: Previous』 or 『[F4]: Next』 key to move to the channel 3 and check the diagnosis information.

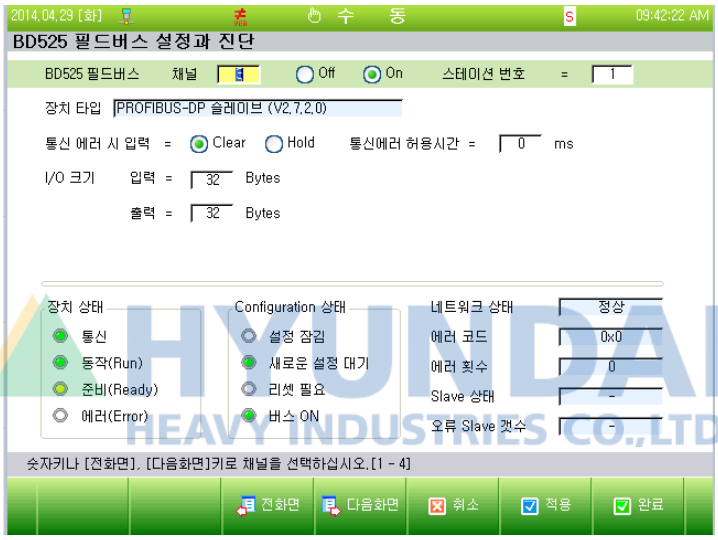


Figure 2.3 PROFIBUS-DP slave diagnosis screen

- System status

LED	Meaning	Color	Status	Remarks
Communication	PROFIBUS-DP communication status	(Green)	Communication in progress	
		(White)	Communication stopped	
Run	PROFIBUS-DP setting status	(Green)	Setting normal	
		(White)	Setting abnormal	
Ready	PROFIBUS-DP installation status	(Yellow)	System normal	
		(White)	System abnormal	
Error	PROFIBUS-DP error status	(Red)	Error generated	Refer to the error code
		(White)	No error	

- Setting status

LED	Meaning	Color	Status	Remarks
Setting locked	Setting locked	(Green)	Locked	
		(White)	Unlocked	
New setting wait	Whether to wait for new setting	(Green)	Setting wait	
		(White)	No setting	
Resetting needed	System resetting required	(Green)	Resetting needed	
		(White)	Resetting not needed	
Bus on	Bus in the communication status	(Green)	Communication started	
		(White)	Communication stopped	

- Network status

Status	Meaning
Normal	PROFIBUS-DP communication in progress (Normal IO data exchange needs to be checked through the communication LED that shows the system status)
Normal	PROFIBUS-DP communication stopped
IDLE	PROFIBUS-DP communication not in progress
Off-line	Network off-line

- Error code

Error code	Meaning
0x00000000	No error
0xC0000120	Configuration fault
0xC0000124	Parameter error
0xC0000125	Station address error
0xC0000140	Network fault occurred
0xC0000141	Communication connection ended
0xC0000142	Communication connection time limit exceeded
0xC0000145	Communication cable connection defective
Others	Inquiry

- Error count: Communication error accumulated count

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BD525 PROFIBUS Master

3.1. SYCON.net

While the BD525 PROFIBUS-DP slave can be set and diagnosed using a teaching pendant, SYCON.net, which is Windows software for network configuration, is needed to set the master.
USB connection is supported between SYCON.net and the BD525 board.

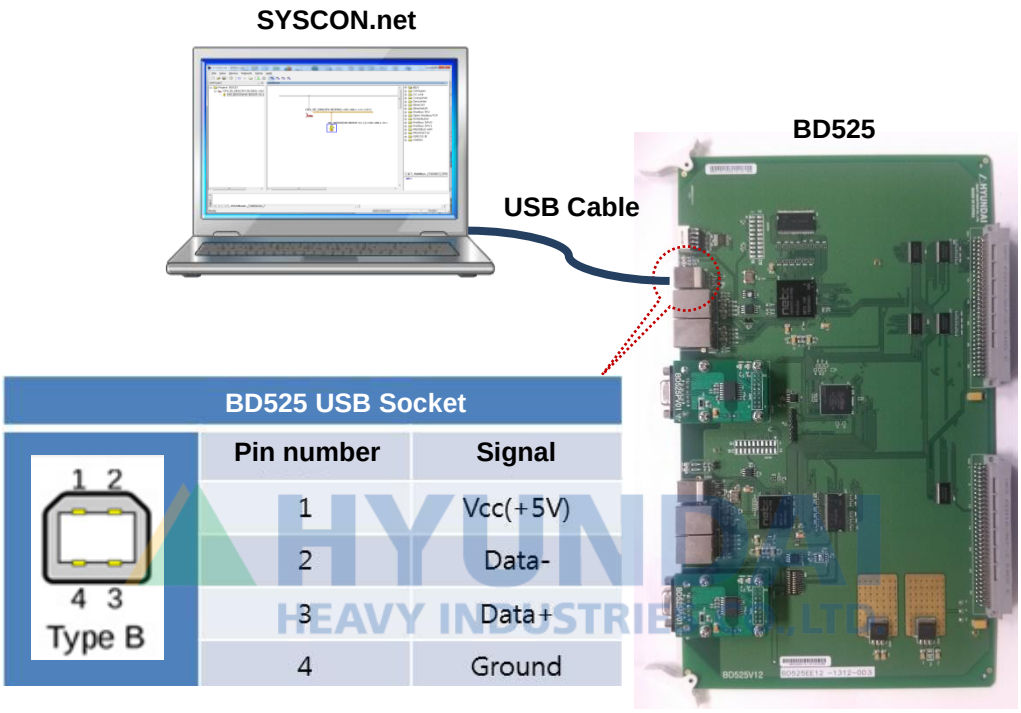


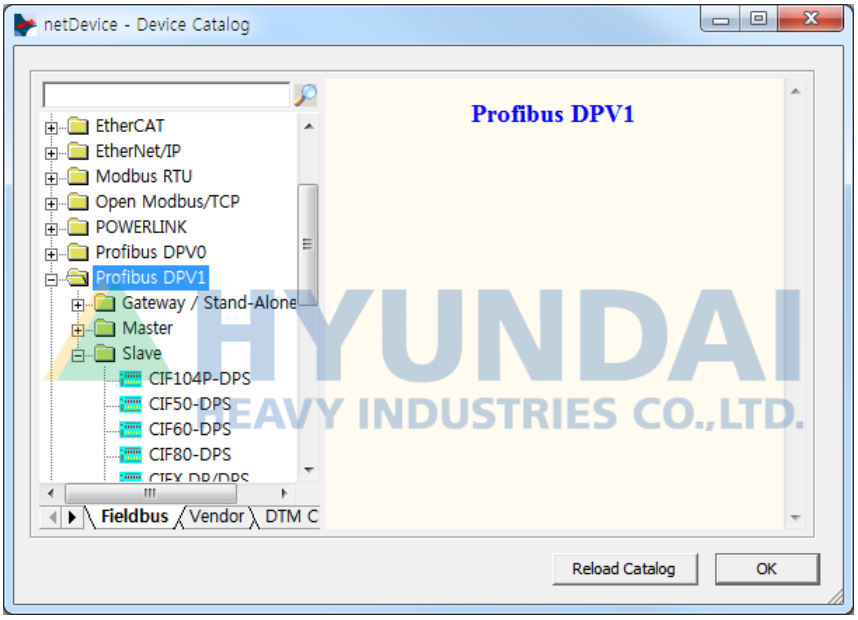
Figure 3.1 USB connections between SYCON.net and BD525

3.2. BD525 PROFIBUS master network setting

To set the BD525 PROFIBUS-DP master network, the following procedure should be executed. For more details, refer to a separate SYCON.net manual.

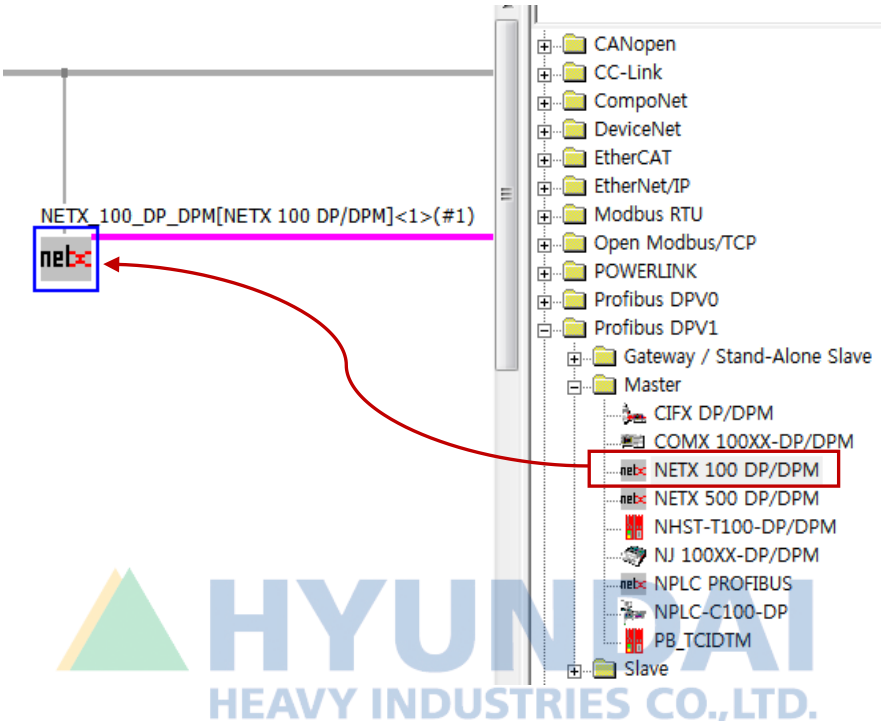
(1) **Installing a slave GSD file in SYCON.net**
Network > Import Device Description needs to be executed to install the EDS file of the slave system that needs to be connected to the BD525 PROFIBUS-DP master.

(2) **Reloading the Device Catalog**
Network > Device Catalog needs to be executed before pressing the ***Reload Catalog button*** to reload the Device Catalogue of SYCON.net to show newly registered devices.



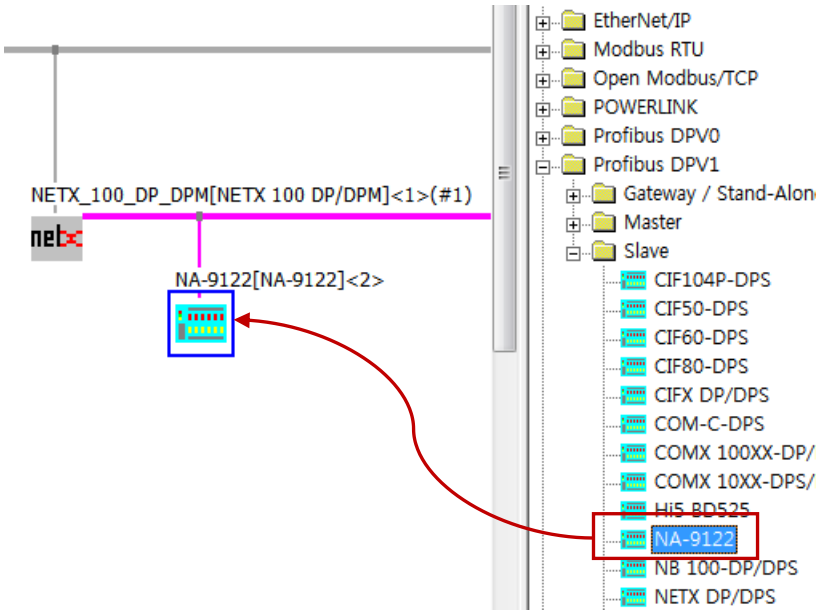
(3) **Inserting the master in the project**

In the Device Catalog of SYCON.net, drag and drop NETX 100 DP/DPM, which is the BD525 PROFIBUS-DP master, into the network view line.



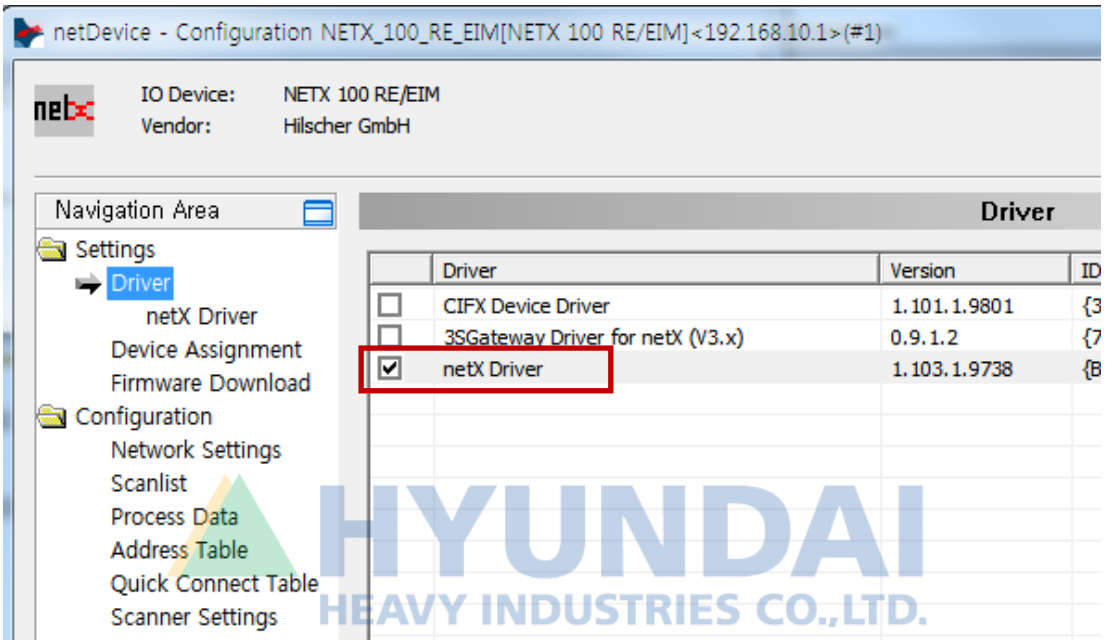
(4) **Adding the slave device to the master**

In the Device Catalog of SYCON.net, drag and drop a slave device that needs to be connected to BD525 PROFIBUS-DP master, into the network view line.

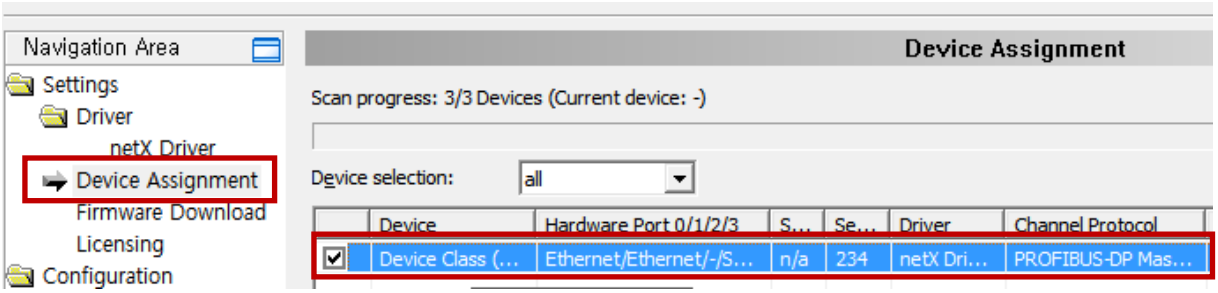


(5) **Setting the USB connection between Sycon.net and BD525 master**
Connect the USB cable to the BD525 master USB connector, and double-click the master icon of Sycon.net to select a driver and carry out various types of icon settings.

① Select ***Settings > Driver*** and then select “netX Driver” before selecting “Apply” button (Check the “netX Driver” check box before clicking the “Apply” button).

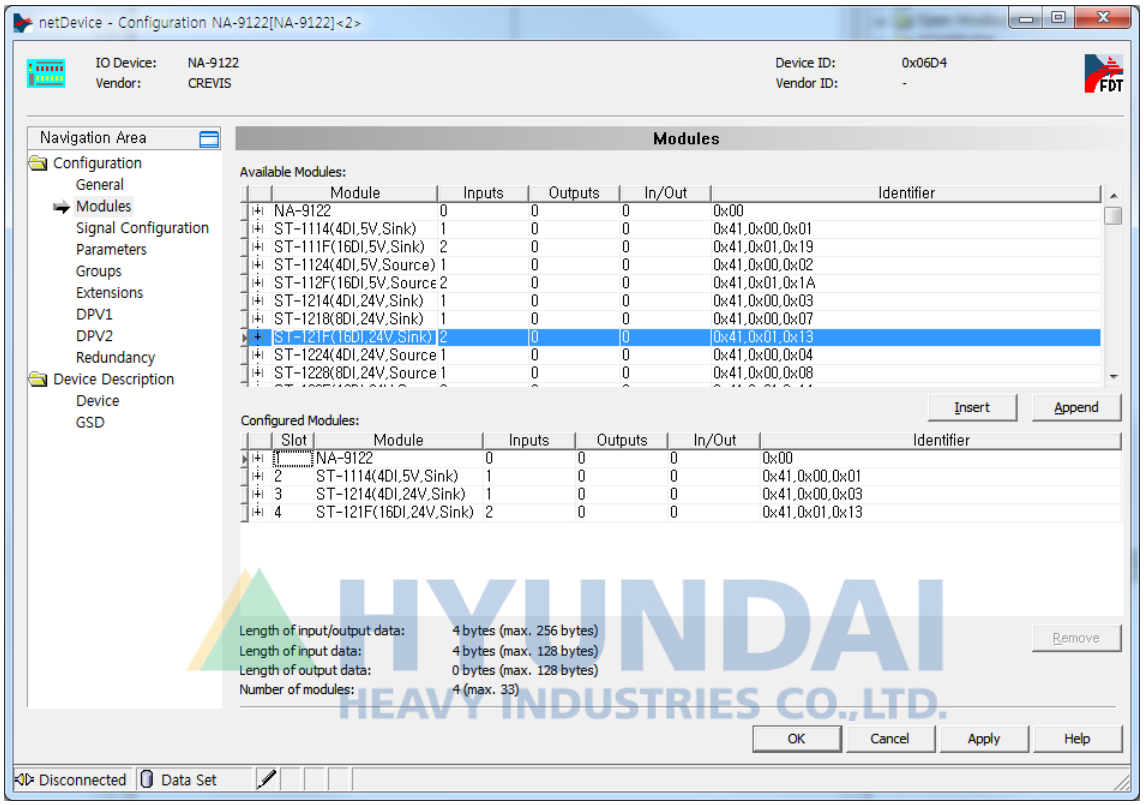


② Select ***Settings > Device Assignment*** and select a scanner device before clicking the “Apply” button. If the PROFIBUS-DP master is not displayed, change from “Device selection” to “all” before clicking the “Scan” button.

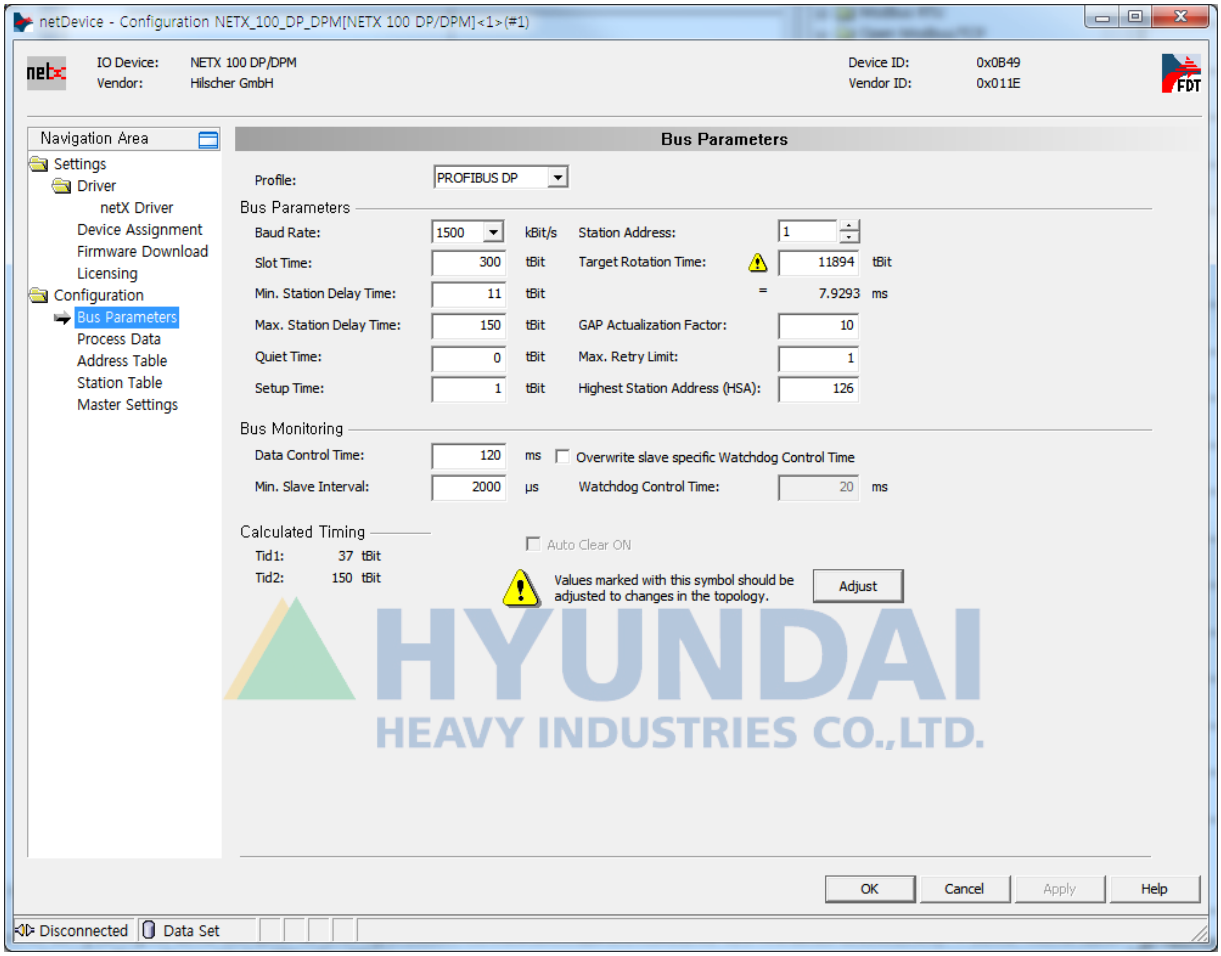


(6) **Setting the slave**

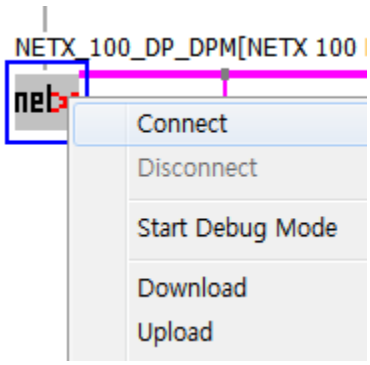
Double-click the slave device that needs to be set, and set individual items, such as General and Modules.



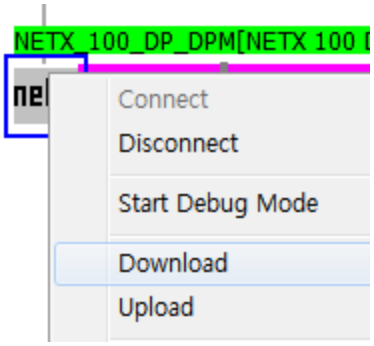
(7) **Setting the BD525 master**
Double-click the master to set individual items of configuration.



(8) **Connecting BD525 with USB**
Select “Connect” by clicking the right mouse button on the master icon.

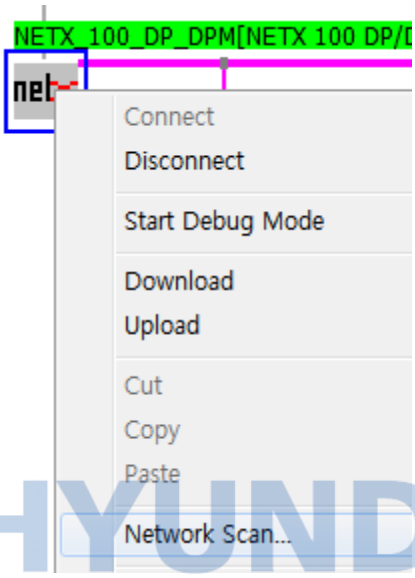


(9) **Downloading the setting result**
Select “Download” by clicking the right mouse button on the master icon.

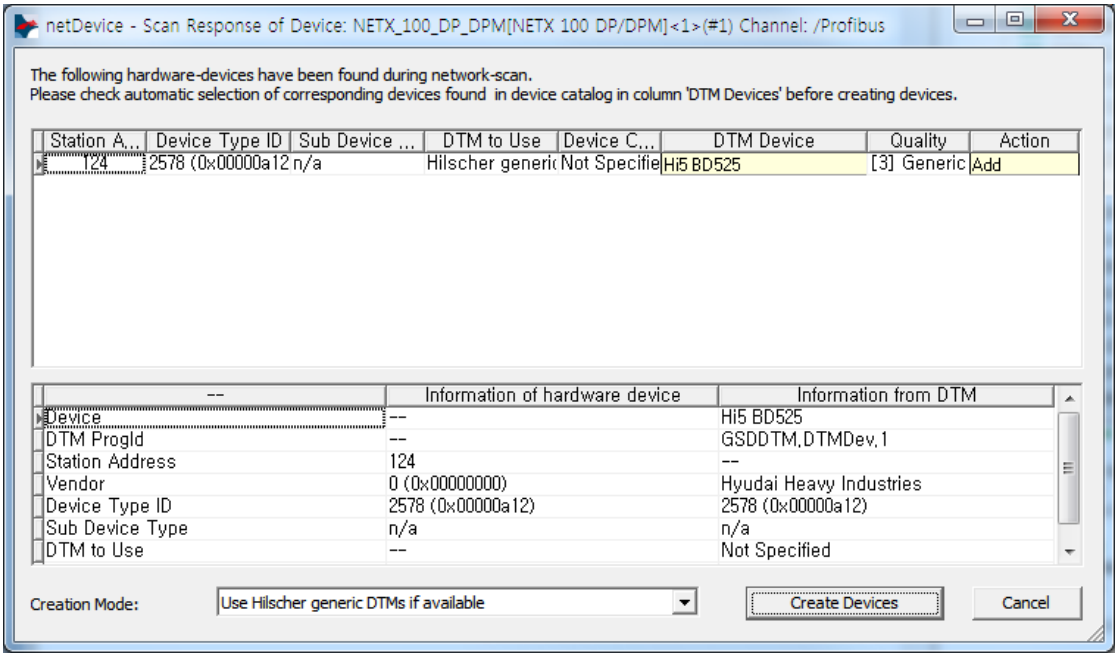


Reference

- In addition to the methods of connecting slave devices manually, it is also possible for the slave devices connected to the master to be searched automatically when the Network Scan menu is executed.



Thus, searched slave devices can be added automatically by clicking the Create Devices button after setting in a desired way in the Scan Response of Device dialog box that will be displayed when Network Scan is executed.



3.3. Robot controller's PROFIBUS master setting

To set the teaching pendant to use the BD525 PROFIBUS-DP master, the following procedures should be executed:

(1) Select 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『15: BD525 fieldbus setting and diagnosis』

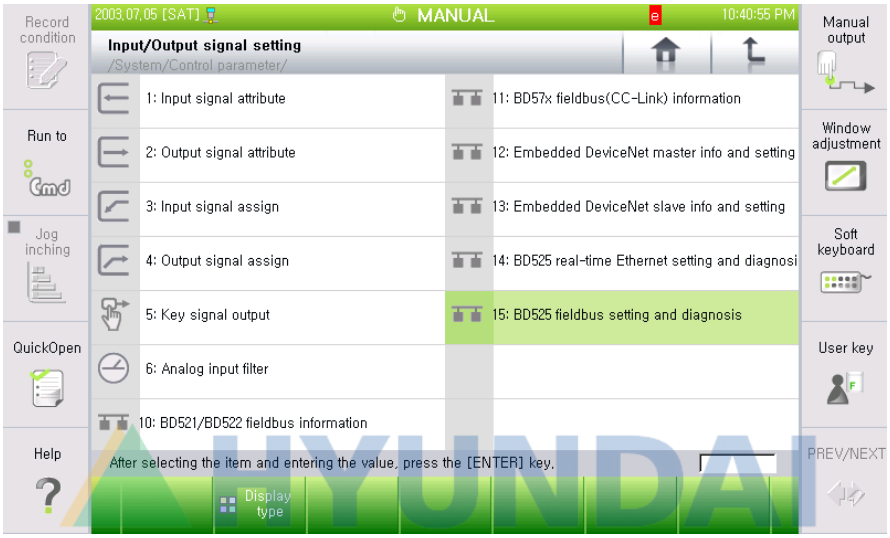


Figure 3.2 BD525 field bus setting and diagnosis menu

(2) Considering that the PROFIBUS-DP master corresponds to the channel 1, use the 『[F3]: Previous』 or 『[F4]: Next』 key to move to the channel 1 and check whether the device type shows “RPOFIBUS-DP master”.

If the device shows “RPOFIBUS-DP master,” it means that the BD525 board is installed normally. If it shows “Not installed,” it means that there is a problem with the installation of BD525. In that case, it is required to check whether the board is installed normally.

In addition, if the function is turned on, the BD525 software version information will be displayed in the bracket of the device type.

Figure 3.3 PROFIBUS-DP master setting screen

(3) Sets the I/O size.

(4) Sets the input option when there is an error with communication. When the option for processing the input data (FB1.X) is set as clear, all the input data will be cleared to 0 when there is an error with communication. When it is set as hold, the last valid value will be maintained when there is an error with communication

(5) To use the PROFIBUS-DP master function, it is required to shift to the on position before clicking the Apply or Complete button.

Reference

- Once the setting is changed, resetting (On ➔ Off ➔ On) or rebooting of the controller should be carried out for the newly set value to be applied.

3.4. BD525 PROFIBUS-DP master diagnosis

It is possible to check the diagnosis information, such as communication status, setting status and error information from the teaching pendant.

(1) Select 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『15: BD525 field bus setting and diagnosis.

(2) Considering that the PROFIBUS-DP master corresponds to the channel 1, use the 『[F3]: Previous』 or 『[F4]: Next』 key to move to the channel 1 and check the diagnosis information.

Figure 3.4 PROFIBUS-DP master diagnosis screens

4 I/O Mapping

4.1. I/O Mapping

The input and output data of BD525 PROFIBUS-DP master and slave are to be mapped to the robot language and the embedded PLC's FB1 and FB3 individually. There are 960 X inputs and 960 Y outputs. As shown in the table, it is possible to access in 5 types individually.

Table 4-1 Input and output data

Classification		Command statement grammar	Size	Description	Remarks
BD525 PROFIBUS-DP Master	Controller output	FB1.Y1~960	960	Bit signal output	
		FB1.YB1~120	120	Byte signal output	
		FB1.YW1~60	60	Word signal output	
		FB1.YL1~30	30	Double word signal output	
		FB1.YF1~30	30	Float signal output	
	Controller input	FB1.X1~960	960	Bite signal input	
		FB1.XB1~120	120	Byte signal input	
		FB1.XW1~60	60	Word signal input	
		FB1.XL1~30	30	Double word signal input	
		FB1.XF1~30	30	Float signal input	
BD525 PROFIBUS-DP Slave	Controller output	FB3.Y1~960	960	Bit signal output	
		FB3.YB1~120	120	Byte signal output	
		FB3.YW1~60	60	Word signal output	
		FB3.YL1~30	30	Double word signal output	
		FB3.YF1~30	30	Float signal Output	
	Controller input	FB3.X1~960	960	Bite signal input	
		FB3.XB1~120	120	Byte signal input	
		FB3.XW1~60	60	Word signal input	
		FB3.XL1~30	30	Double word signal input	
		FB3.XF1~30	30	Float signal input	

4.2. Output signal assignment related to communication error

It is possible to set the designated hardwired output signal to be turned on when a communication error occurs.

(1) Select 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『4: Output signal assign』.

(2) Move by using the 『[F4]: Previous』 or 『[F5]: Next』 key, enter the signal number in the "Fieldbus error" and save it using the 『[F7]: Complete』 key.

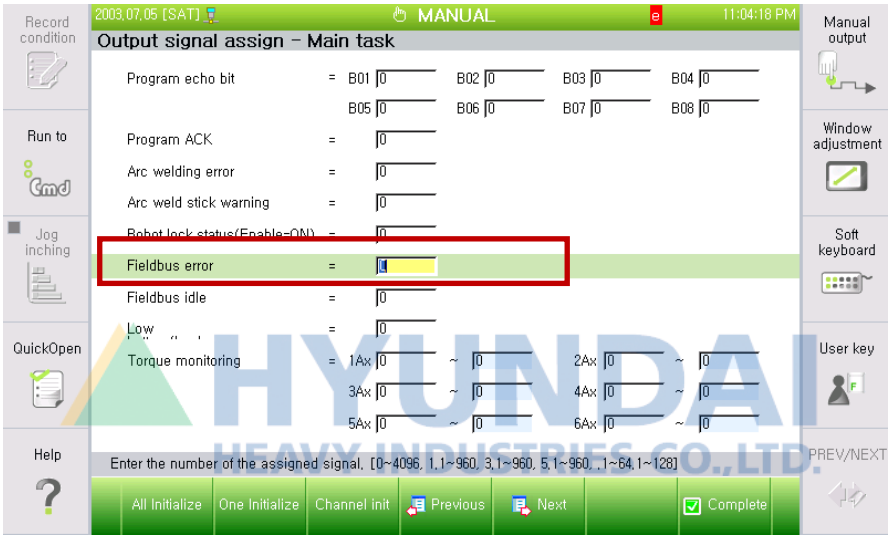


Figure 4.1 Communication error output signal assignment

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