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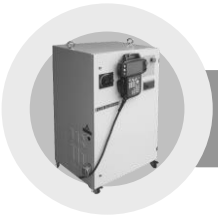
THE INSTALLATION SHALL BE MADE BY QUALIFIED INSTALLATION PERSONNEL AND SHOULD CONFORM TO ALL NATIONAL AND LOCAL CODES



Hi5 Controller Function Manual

BD52x Multi communication

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1 Introduction

1.1. Knowledge required before reading

In order to understand this manual clearly, the user should possess the following information:

- Instructions on how to use the Hi5 controller
- Instructions on how to install and utilize a Fieldbus network (DeviceNet, Profibus-DP, Interbus)

1.2. About fieldbus

Fieldbus is an open industry standard for operating devices, including sensors, buttons, motor drivers and control interfaces, by connecting these devices to a PLC (Programmable Logic Controller) via a single cable.

Fieldbus provides intelligent services, such as monitoring the status of the whole network or reconstructing the whole network from the central host. For example, it has the advantage of being able to exchange information (operating mode setting, faulty sensor, etc.) in detail through sensors or switches.
As Fieldbus uses a single cable, the time and expense required for wiring can be reduced, and maintenance is made easier by the simplicity of the wiring formation. Also, unlike protocols with non-deterministic response characteristics such as Ethernet, the data response speed of fieldbus is secured, making it appropriate for industrial purposes where timing is critical.

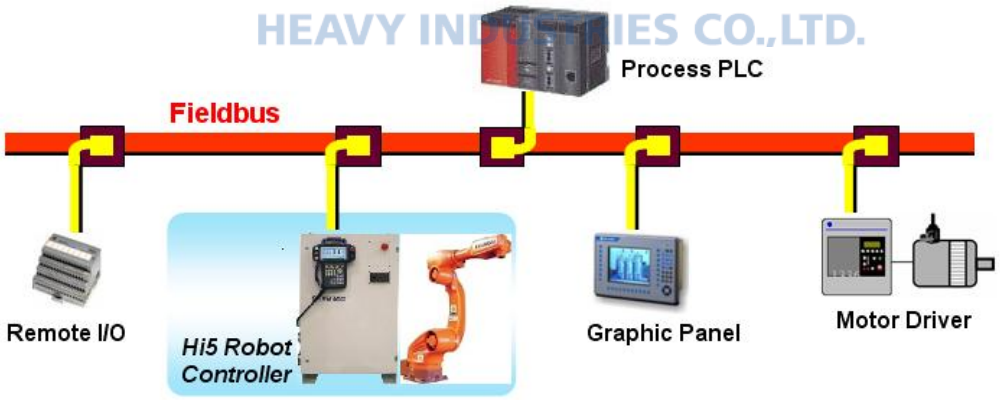

Figure 1.1 Fieldbus network and master, slave devices

1 master device and various slave devices are connected in 1 Fieldbus network. The master device scans and controls the whole network, and exchanges data with slave devices. Generally, PLC is the master device, and the other sensors, buttons and controllers are slave devices.

1.3. 2 Forms of fieldbus functions of Hi5 controller

The Hi5 controller supports fieldbus functions in 2 forms, as described in [Table 1-1] below.

Table 1-1 2 types and characteristics of fieldbus functions in the Hi5 controller

Item	BD57x CC-Link board BD58A LDIO board (for Hi5-C)	BD52x Multi communication board
Mounted module	-	COM module of Hilscher
Number of modules which can be mounted	1	1 or 2
Support function	Slave	Both master and slave can be supported at the same time
Support protocol	CC-Link	DeviceNet Profibus-DP Interbus (expected to be supported in the future)
Connection with the main board	CAN	Bus of BD500 motherboard
Utilization of Fieldbus input in robot language	Input from X area of FB5 object Example: WAIT FB5.X5	Input from X area of FB1, FB3 object Example: WAIT FB1.X5
Utilization of Fieldbus output in robot language	Output to Y of FB5 object Example: FB5.Y12=1	Output to Y of FB1, FB3 object Y Example: FB3.Y12=1
Utilization of Fieldbus input in embedded PLC	Input from X of FB5 object	Input from X of FB1, FB3 object
Utilization of Fieldbus output in embedded PLC	Output to Y of FB5 object	Output to Y of FB1, FB3 object

This manual only explains the Fieldbus functions that use a BD52x multi communication board.

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2

Basic Fieldbus Specifications

The following are the basic specifications of DeviceNet, Profibus-DP and Interbus. Please refer to each fieldbus function manual for more details.

2.1. Basic specifications of DeviceNet

Table 2-1 Basic specifications of DeviceNet

Transfer rate	The cable can have :			
	Trunk length	Maximum drop length	Maximum number of nodes	Cumulative drop length
125k bit/s	500 m (1,640 ft)	6m (20 ft)	64	156 m (512 ft)
250k bit/s	250 m (820 ft)			78 m (256 ft)
500k bit/s	100 m (328 ft)			39 m (128 ft)
Terminating resistance	121Ω, 1% metal film, 1/4 Watt			
Potential difference between V+ and V-	24 Volt			

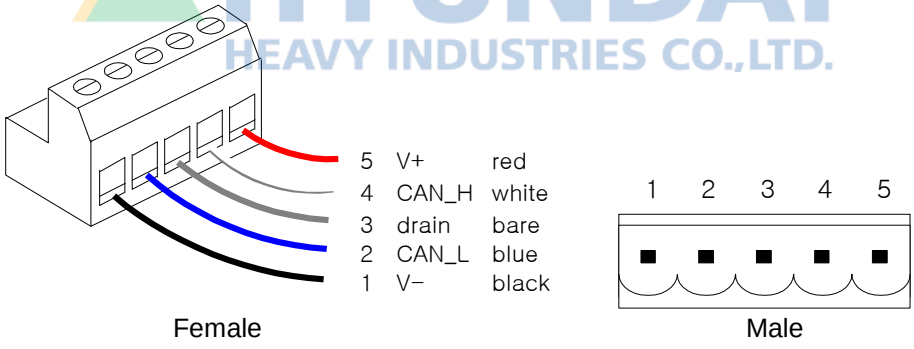

Figure 2.1 Open-type connector pin out of DeviceNet

2.2. Basic specifications of Profibus - DP

Table 2-2 Basic specifications of Profibus-DP

Maximum number of stations	32 stations per line segment, maximum of 126 stations									
Repeater	Extended to a maximum of 4 repeaters									
Input and output data per station	244 input and output bytes									
Maximum number of segments to be connected	Maximum of 4 repeaters between two stations (More than 4 repeaters may be supported, depending on the repeater type)									
Transfer rate (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

2.3. Basic specifications of Interbus

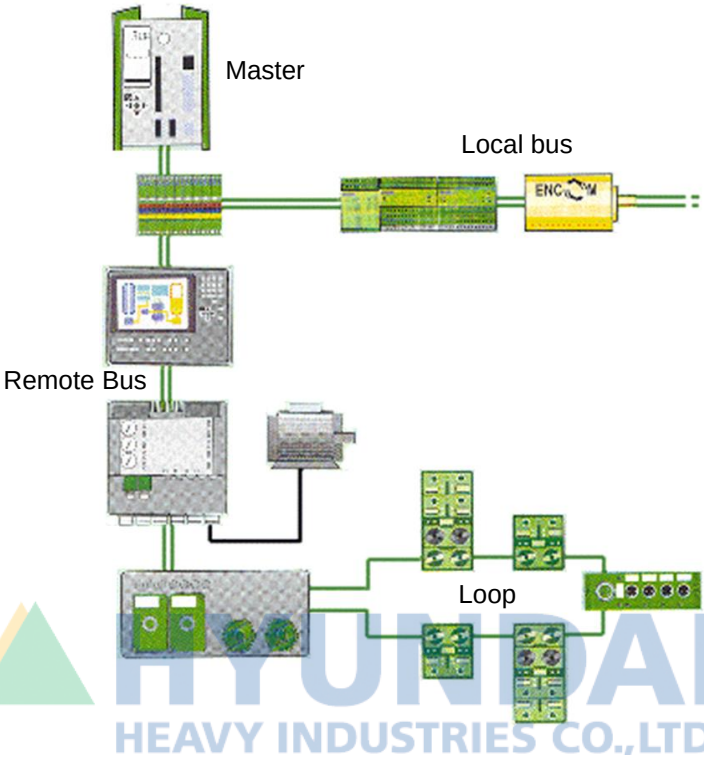

Figure 2.2 Formation of Interbus

Table 2-3 Basic specifications of Interbus remote bus

Maximum number of nodes	512
Maximum number of levels in the network	16
Maximum I/O points	4,096 points (512byte)
Transfer rate	500 kbps
Maximum length of bus between two remote bus devices	400m (1312.336 ft.)
Maximum length of all buses combined	13km (8.078 mi.)
Topology	Active ring

Table 2-4 Basic specifications of Interbus loop

Maximum number of nodes	63
Maximum bus length between two remote bus devices	20m (65.617 ft.)
Maximum length of all buses combined	200m (656.168 ft.)
Current	1.8A
Power connection and communication with a single cable	

2.4. ESD file, GSD file

Each fieldbus device has its own characteristics file for its identification. For DeviceNet or Interbus devices, it is the EDS file (though the file format is different between the two), while for Profibus-DP devices, it is the GSD file. The Hi5 controller also has an EDS file and a GSD file.

When registering the characteristics file to network control S/W and executing network browsing, devices connected to the Fieldbus network are detected. The network control S/W downloads this information to the fieldbus scanner module of PLS, which is the master. When network information is downloaded to the scanner module, the PLC scanner module operates the entire network without any help from the network control S/W.

Please refer to the manuals for the PLC product and the network setting S/W for details regarding this procedure.

3

Module installation and H/W settings of BD52x

3.1. Installation of Fieldbus module

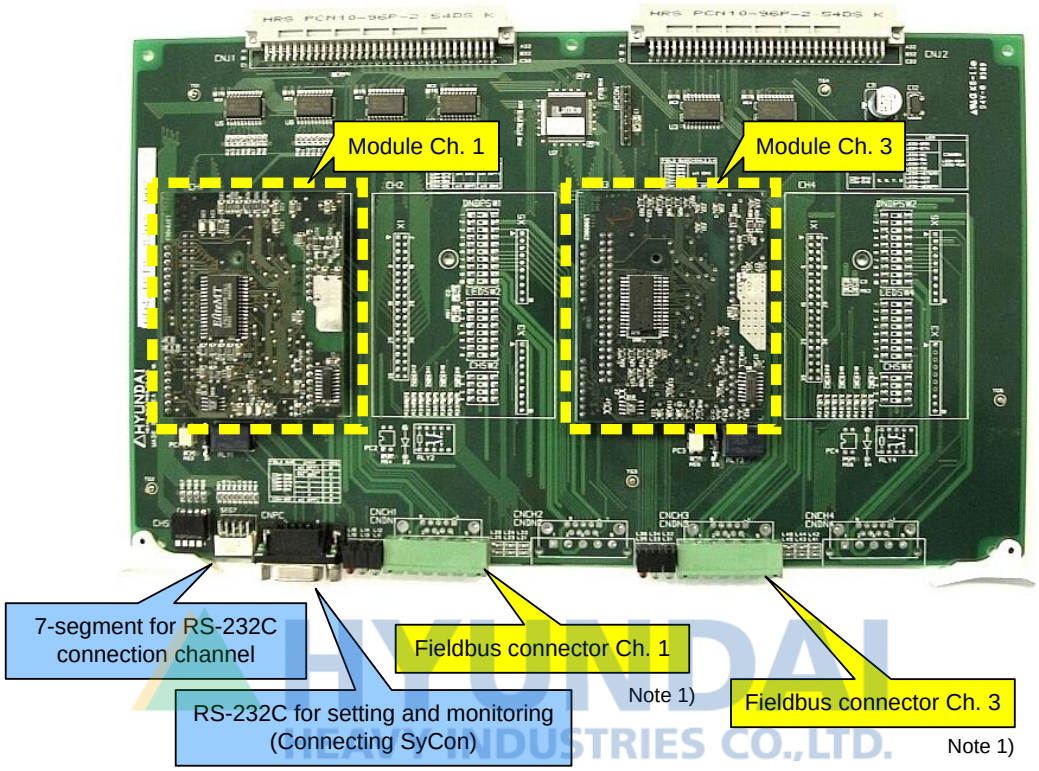

Figure 3.1 2 Channels for installation of the Fieldbus module

- The board numbers for DeviceNet, Profibus and Interbus are BD521, BD522, and BD523, respectively, and all board numbers can be represented by BD52x.
  Up to 2 Fieldbus modules can be mounted on BD52x. The locations of each module are channels 1 and 3.

- It is not necessary to mount modules from Channel 1 in regular sequence, but the channel number of each specific module that is mounted must be known. This is because this Channel Number is used when Fieldbus input and output is used in the robot work program or the embedded PLC ladder.

- Setting and monitoring RS-232C and 7-segment will be explained in the contents on Fieldbus master setting.

Note 1) The connectors of Ch.1, Ch3 depend on the specification of their own fieldbus.

3.2. BD52x dip switches

There are various dip switches on the BD52x board. These dip switches are set in the factory according to type of fieldbus of the module to be mounted on each channel. Do not change dip switch settings without first consulting with maintenance personnel.

4

Fieldbus information and setting

4.1. BD52x Fieldbus information and setting

Network parameters should be set before using a fieldbus module.

(1) Select 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『10: BD52x fieldbus information』 from the menu.
The Hi5 controller supports 2 types of Fieldbus functions, as shown in [Table 1-1].

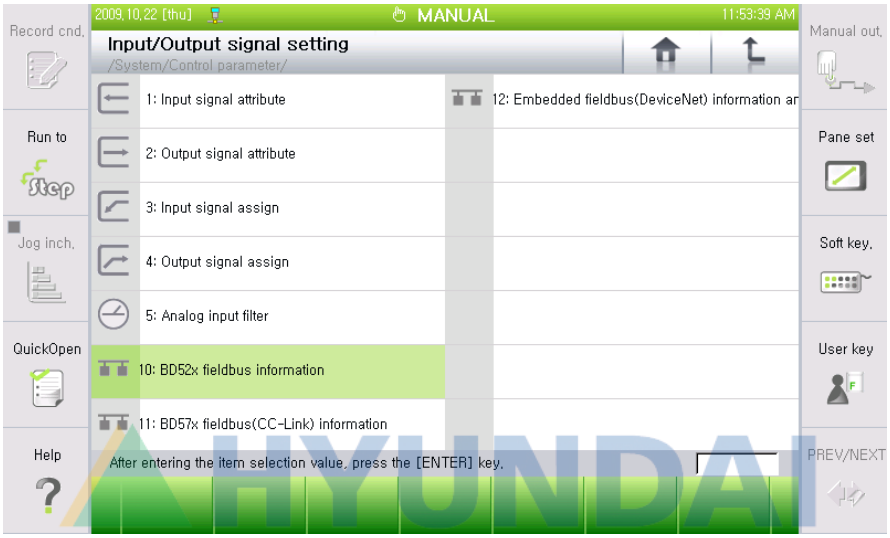

Figure 4.1 BD52x Fieldbus information and settings menu

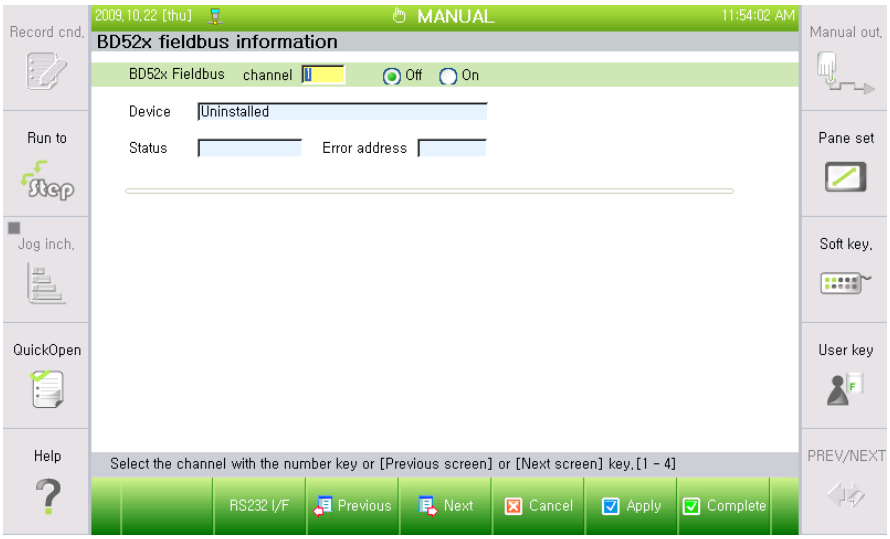

Figure 4.2 BD52x Fieldbus information and settings screen

(2) This screen is composed of 4 pages, with each page representing a channel. You can change channels by using the 『[F3]: Previous』 and 『[F4]: Next』 keys.

- Channel: Shows the number of the currently selected channel
- <Off, On>: Allows the user to select whether to operate the Fieldbus module of a corresponding channel
- Baudrate: Shows the network speed setting
- Device: Shows the name of the module mounted on the corresponding channel
- State: Shows whether or not a module is performing network operations normally
- Error address:
  For a Fieldbus master module, it shows the address (Node No, etc.) of a slave when the slave that created a problem in the network is detected
- Bus error count: The number of bus errors that have occurred is displayed
- Time out count: The number of timeouts that have occurred is displayed

(3) Below the dotted line is the Fieldbus parameter, which is displayed differently according to the type of Fieldbus protocol. When the parameter has been set, click the 『[F6]: Apply』 button on the Fieldbus slave module, and the settings will be saved in ROBOT.FBU, which is the Fieldbus setting file. (For the master module, the parameter setting screen will not be displayed, and settings should be done using SyCon.)
The saved settings will now be applied whenever the controller is turned on.

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5 Setting the Fieldbus Master

5.1. Fieldbus Master

When the Fieldbus master module is mounted and used on BD52x, the Hi5 controller will control its own Fieldbus network, as shown in [Figure 5.1]. When utilized with the embedded PLC, the Hi5 controller can control the unit sequence that is connected to the Fieldbus.

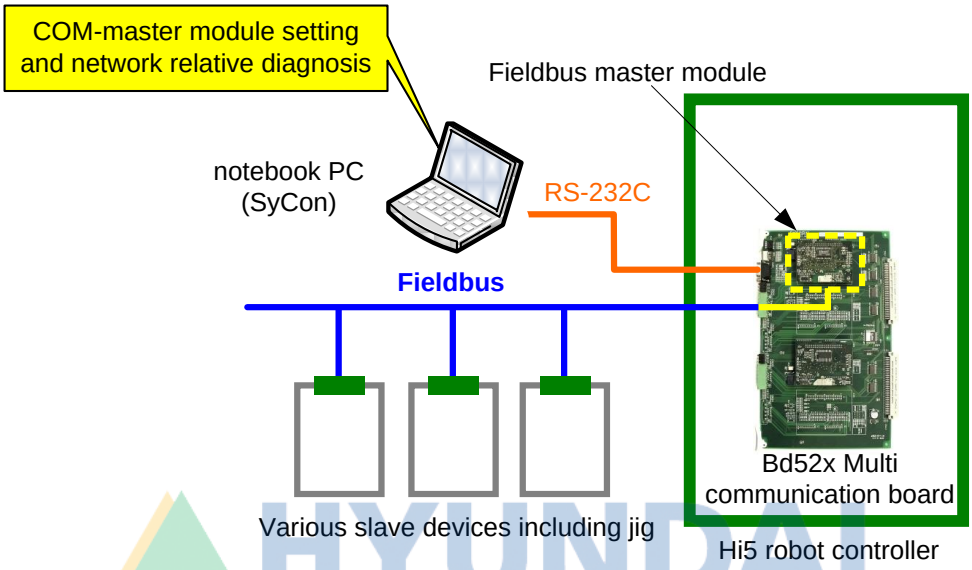


Figure 5.1 Hi5 performing Fieldbus network control

Unlike a slave, for which parameter setting is done by the teach pendant, the setting of the master module is done using a Windows application called SyCon (Hilscher). Setting information is transferred to the Fieldbus Master Module through RS-232C, and recorded to flash-Rom inside the module. That is, the setting will be enforced when the network is configured or modified again.

5.2. RS-232C cable structure for connection with SyCon

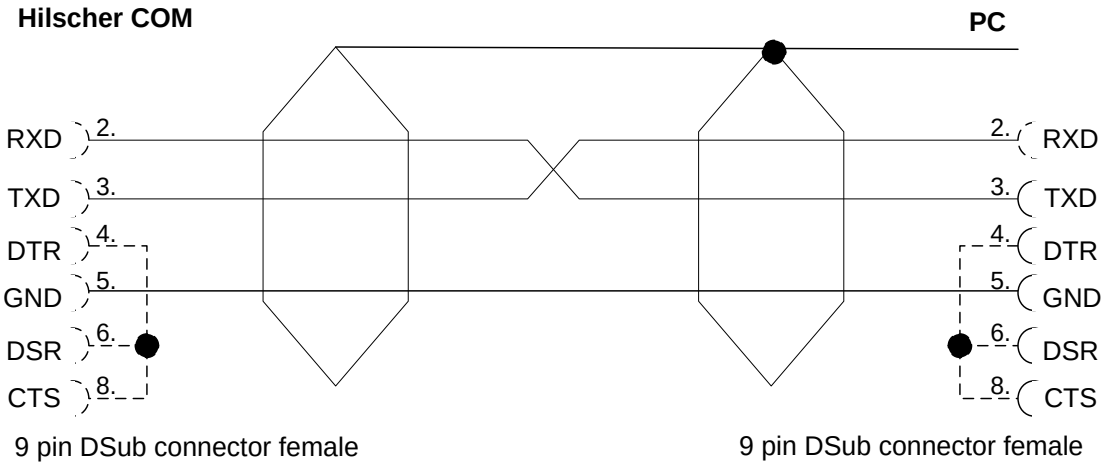


Figure 5.2 Structure of RS-232C cable for connection with SyCon

The RS-232C cable between PC and Hilscher COM module should be wired as shown in [Figure 5.2].

5.3. Selecting a channel of the RS-232C port for connection with SyCon

SyCon can communicate with only 1 fieldbus module through the RS-232C cable. Therefore, before executing SyCon, the RS-232C port of BD52x should be connected to a channel where a fieldbus module is mounted.

Let's assume that we are trying to connect SyCon to a fieldbus module that is connected to channel 3.

(1) Select 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/Output signal setting』 → 『10: BD52x fieldbus information』 from the menu.

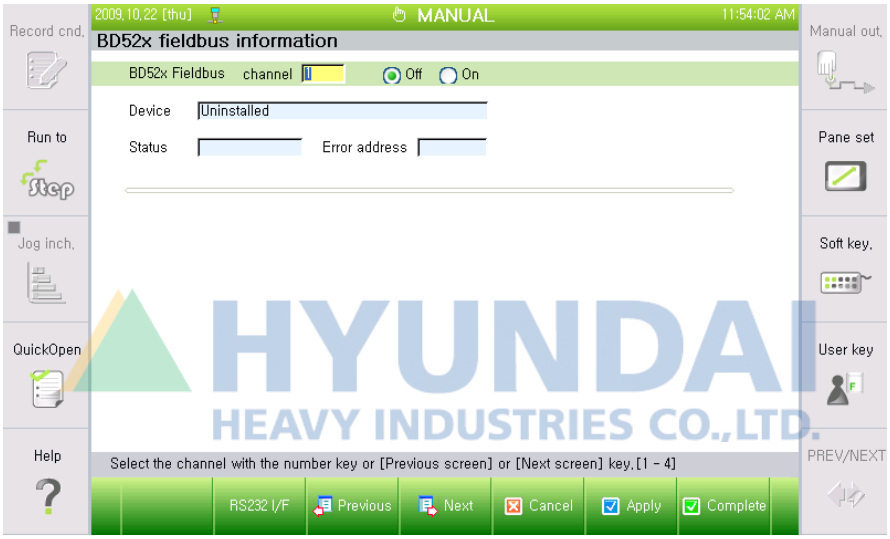


Figure 5.3 BD52x Fieldbus information and setting screen

(2) Press 『[F4]: Next』 to move to the Channel No. 3 screen.

(3) When you press 『[F2]: RS232 I/F』 button in the status window, the RS-232C port will be connected to the channel that is currently selected, which is Channel No. 3.

(4) 7-segment mounted on the side of BD52x board shows the number of the channel to which RS-232C is currently connected, so the Channel number can be confirmed in this way.

5.4. Method of master setting using SyCon

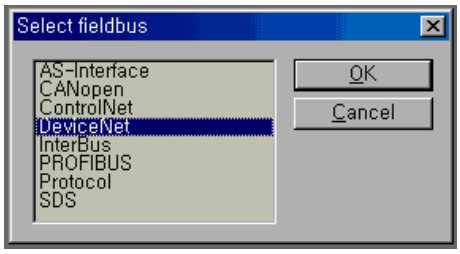


Figure 5.4 Selecting a type of Fieldbus

(1) After SyCon is executed, select 『File – New』 from the menu to configure the network. When the dialog box shown in [Figure 5.4] appears, select the fieldbus type that you want. (DeviceNet or PROFIBUS)

(2) After clicking the [OK] button, the state will be initialized, as shown in [Figure 5.5].

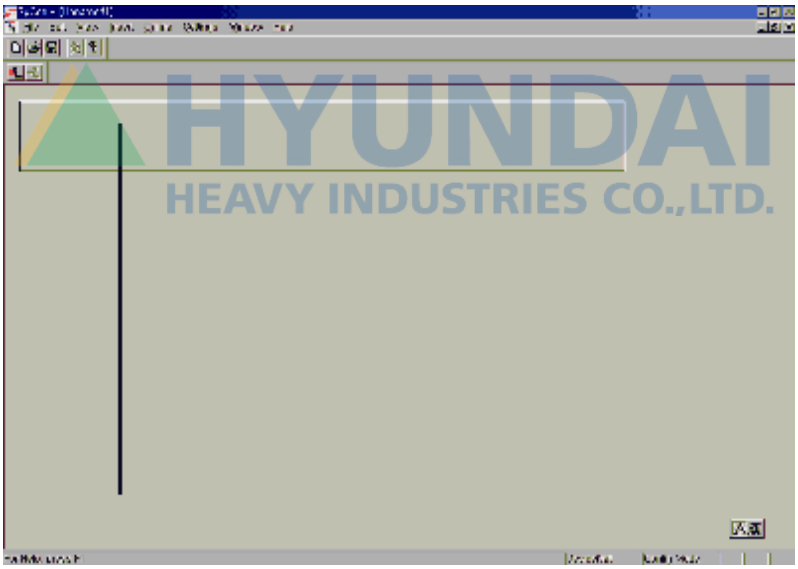


Figure 5.5 Initial project state of SyCon

Figure 5.6 Master insert button

(3) Master should be set first. When you click the master insert button shown in [Figure 5.6], a dialog box will be displayed as shown in [Figure 5.7].

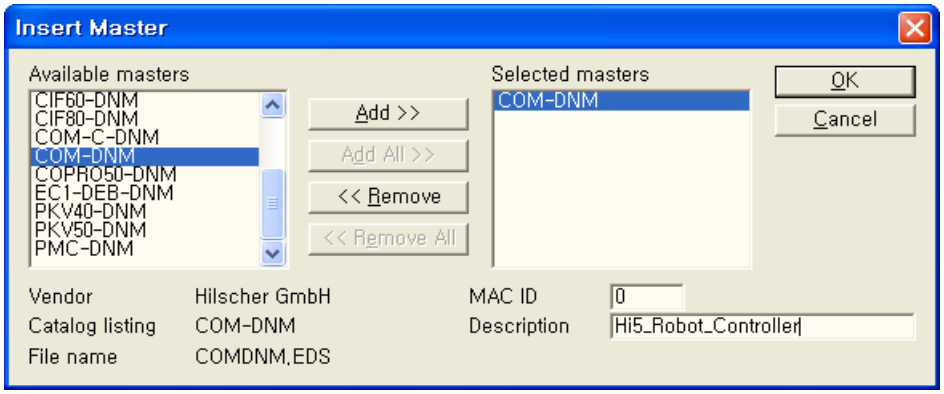


Figure 5.7 Master insert dialog box (Example of DeviceNet)

(4) Select the master module name of the network mounted on BD52x from the list on the left side, and move the name to the right side using the Add button. The module name for each protocol is shown in [Table 5-1].

Table 5-1 Module name for each protocol

Protocol	Module name
DeviceNet	COM-DNM
Profibus-DP	COM-DPM

(5) Set the MAC ID (usually 0) of the master and attach the description (blank spaces are not allowed). After clicking OK, the state will be as shown in [Figure 5.8].

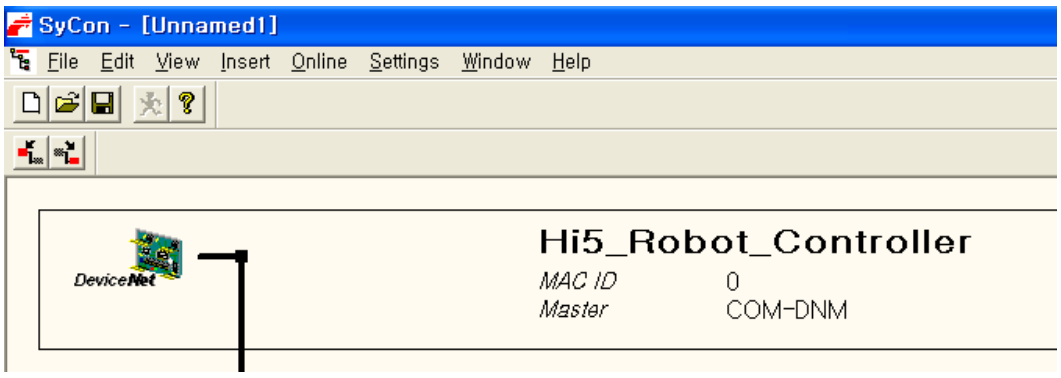


Figure 5.8 State of master entered (Example of DeviceNet)

(6) If you right-click on the master icon and select 『Master Settings… 』, the dialog box shown in [Figure 5.9], will be displayed. Apply the setting as shown in Figure 5.9 and click [OK].

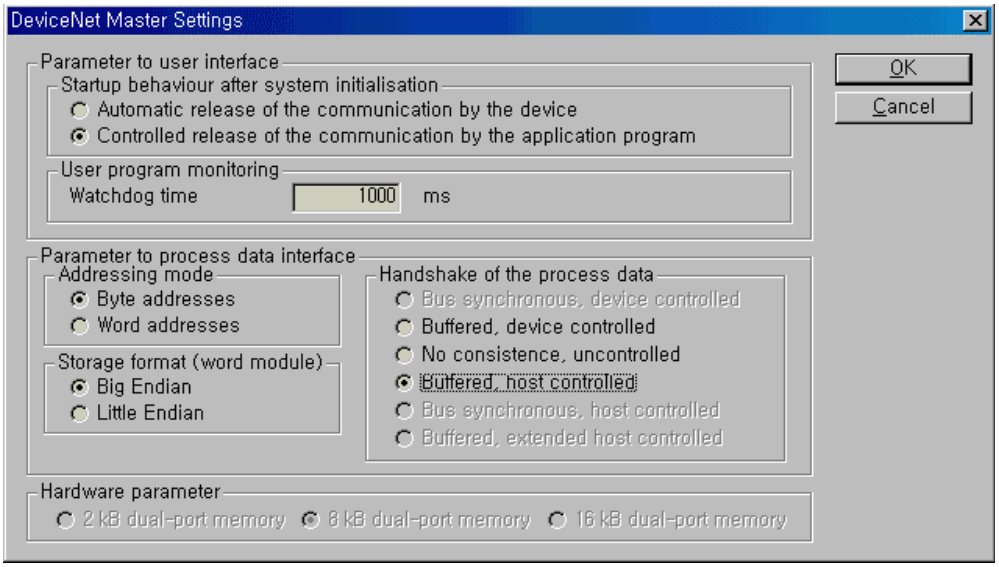


Figure 5.9 Master Setting dialog box

(7) For Profibus-DP, when you right-click and select 『Master Settings… 』from the menu, a dialog box will be displayed as shown in [Figure 5.9]. Apply the settings shown in Figure 5.9 and click [OK] button.

(8) When you select the master icon and select 『Settings – Bus Parameters』from the menu, a dialog box will be displayed, as shown in [Figure 5.10] or [Figure 5.11],

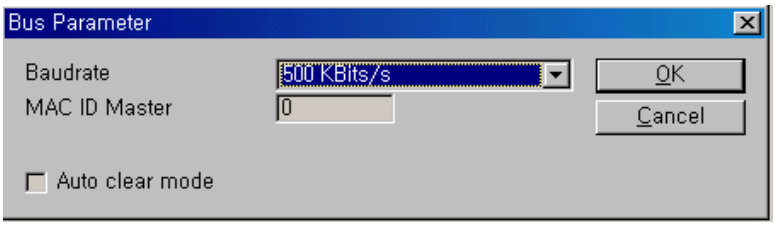


Figure 5.10 Bus Parameter dialog box (DeviceNet)

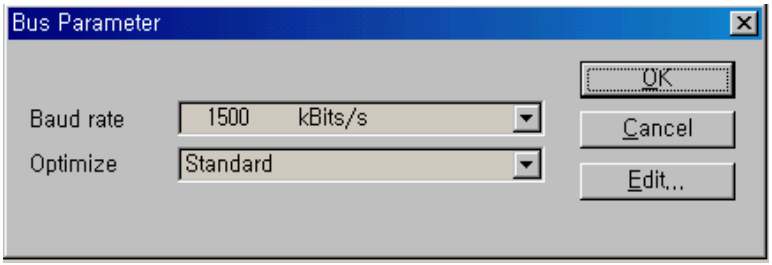


Figure 5.11 Bus Parameter dialog box (Profibus-DP)

Set the baud rate to be the same as the network speed of Fieldbus, and click [OK].

- For DeviceNet:
  The speed of the master should be the same as that of all slaves within the network.

- For Profibus-DP:
  Slaves within the network will automatically follow the speed of the master.
  Set Optimize in [Figure 5.12] as the standard.

5.5. Registration of EDS and GSD file

For the Fieldbus master to recognize the slaves correctly, the characteristics files of the corresponding slaves are required.
All characteristics files of the slaves to be used should be registered on SyCon.
Names of characteristics files for each protocol are as shown in [Table 5-2].

Table 5-2 Name of characteristics file for each protocol

Protocol	Name of attribute file
DeviceNet	EDS
Profibus-DP	GSD

(1) Select the menu item 『File – Copy EDS (or Copy GSD)』 from SyCon.

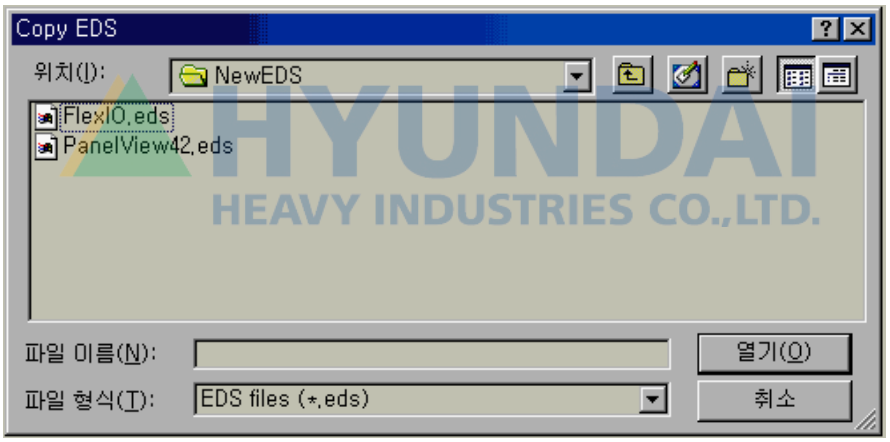


Figure 5.12 Copy EDS dialog box (DeviceNet)

The registration steps will be explained here based on DeviceNet being used. However, the registration steps are the same for other protocols.

When moving to a directory in which EDS (or GSD) files are saved, from the dialog box shown in [Figure 5.12] select the EDS (or GSD) files and click [OPEN] button. The corresponding files will be registered to SyCon.
(More than one file can be selected at once by holding down the Ctrl key and clicking multiple items.)

Figure 5.13 Registering the corresponding bitmap files

Next, you will be asked whether you with to register the corresponding bitmap files, with the dialogue box show in [Figure 5.13]. Click Yes (Y) if the bitmap files have been prepared, and click No (N) if the bitmap files have not been prepared.
Please refer to [note 5-1] and [note 5-2] on the method for preparing bitmap files.

Note 5-1: Method of preparing bitmap files for EDS

3 bitmap files should be prepared for each slave device in order to express the 3 states of setting, operating and diagnosing. The bitmap images are 16-color (4-bit) images, and are 70x40 pixels in size.
Assuming that the EDS file name is PhoSens.eds, assign the names of 3 bitmap files as follows, and place the files in the same directory as the EDS file to be registered.

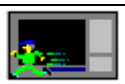
(1) Setting: PhoSens_s.dib	
(2) Operating: PhoSens_r.dib	
(3) Diagnosing: PhoSens_d.dib	

Note 5-2: Method of preparing bitmap files for GSD

3 bitmap files should be prepared for each slave device in order to express the 3 states of setting, operating and diagnosing. The bitmap images are 16-color (4-bit) images, and are 70x40 pixels in size.
When opening the GSD file to be registered, the items used to assign bitmap names should exist next to the Implementation_Type item, as follows.

…
Implementation_Type = "SPC3"
Bitmap_Device = "GP_run"
Bitmap_Diag = "GP_dia"
Bitmap_SF = "GP_sf"
…

Assign the names of 3 bitmap files as follows, and place the files in the same directory as the EDS file to be registered.

(1) Setting: GP_sf.dib	
(2) Operating: GP_run.dib	
(3) Diagnosing: GP_dia.dib	

5.6. Manual setting of slave devices

There are 2 methods of setting slave devices connected to the network, which are automatic setting and manual setting. Manual setting will be explained first.

Figure 5.14 Insert Device toolbar button

(1) Click the Insert Device button shown in [Figure 5.14], and click the bottom part of the master on the network picture by cursor.

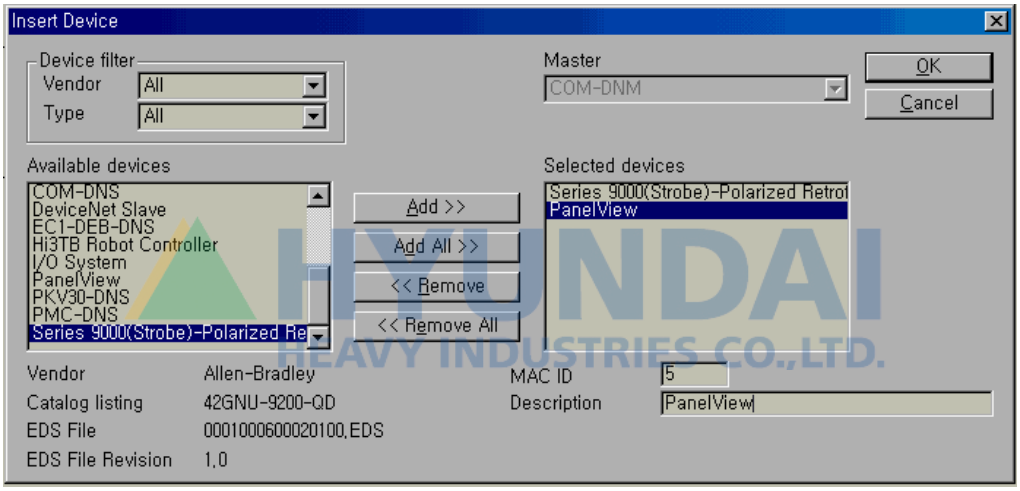


Figure 5.15 Insert Device dialog box (DeviceNet)

(2) A dialog box will be displayed, as shown in [Figure 5.15]. You can find slave names of registered EDS (or GSD) in the list on the left side. If you select a slave for setting and click the [Add >>] button, it will be registered in the list on the right side.

(3) Select a slave device from the list on the right side, then input its MAC ID below and enter a description in the Description field.

(4) After registering all slave devices to the list on the right side, click [OK] to finish.

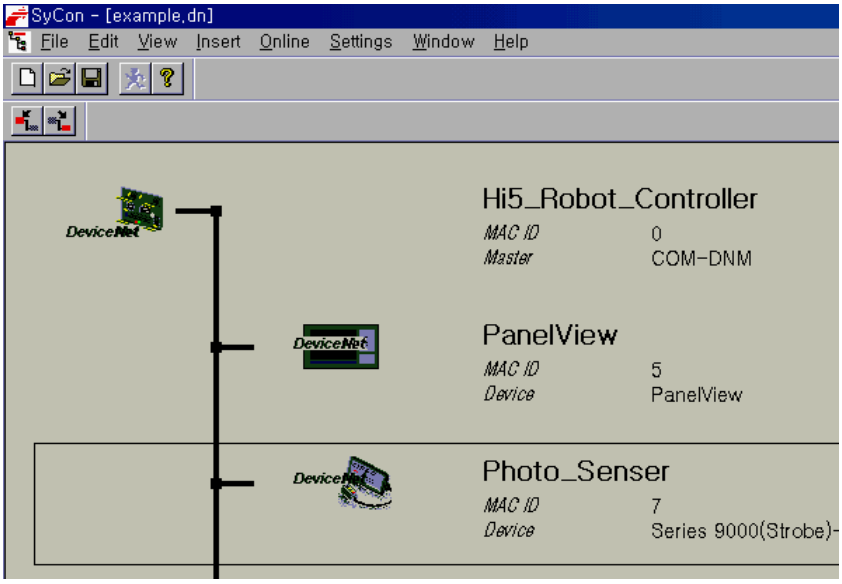


Figure 5.16 Registered slaves (DeviceNet)

(5) Now, the state of the network will be as shown in [Figure 5.16]. Parameter and I/O mapping setting should be done for each slave. When you double-click a slave to perform settings, a dialog box will be displayed as shown in [Figure 5.17].

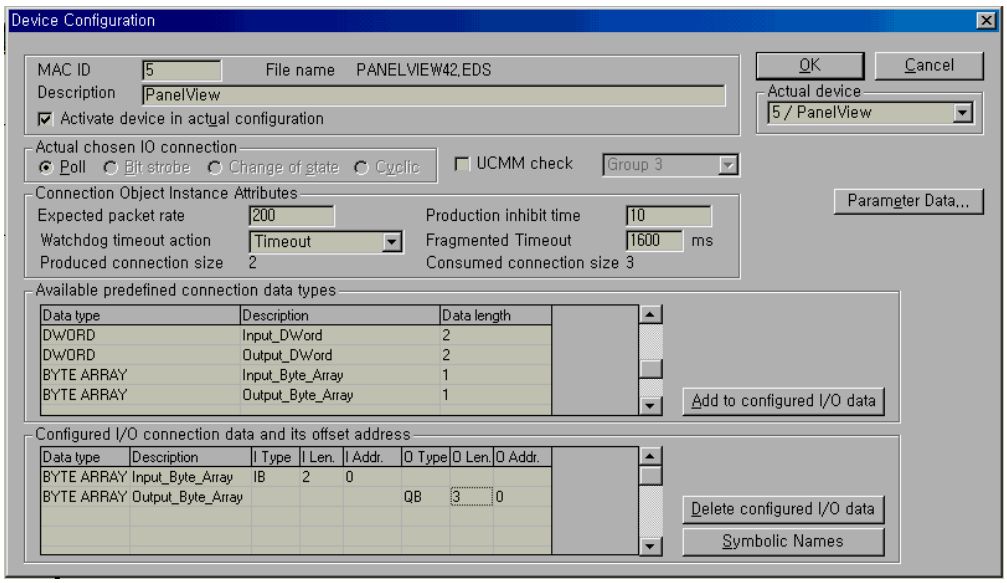


Figure 5.17 Device Configuration dialog box (DeviceNet)

(6) Execute the necessary parameter edit. The two list boxes at the bottom are for I/O mapping. For example, register the input and output of BYTE_ARRAY in the list box at the top of the screen by double-clicking each input and output of BYTE_ARRAY once, then select each value of I Len and O Len and enter 2 and 3, respectively.

Other parameter settings can be made through a very similar method.

The manner in which the master I/O mapping will be performed is also important. If the 『Settings – Auto Addressing』 function is turned on by checking it, one-by-one mapping according to the registered sequence will be applied automatically. This application is realized when downloading all settings to the master module.

If the 『Auto Addressing』function is turned off, each “I Addr.” and “O Addr.” value of the list box on the bottom should be set appropriately.

5.7. Automatic setting of slave devices using the automatic network scan function

If all slave devices are already connected to the Fieldbus network, simple automatic setting can be used.

(1) Set Master and Bus Parameter in a new project first.

(2) Select 『Online – Auto Network Scan』 from the menu.
If communication has been established, a dialog box will be displayed immediately, as shown in [Figure 5.18]. Please refer to [Note 5-3: Establishing communication] if another type of dialog box is displayed.

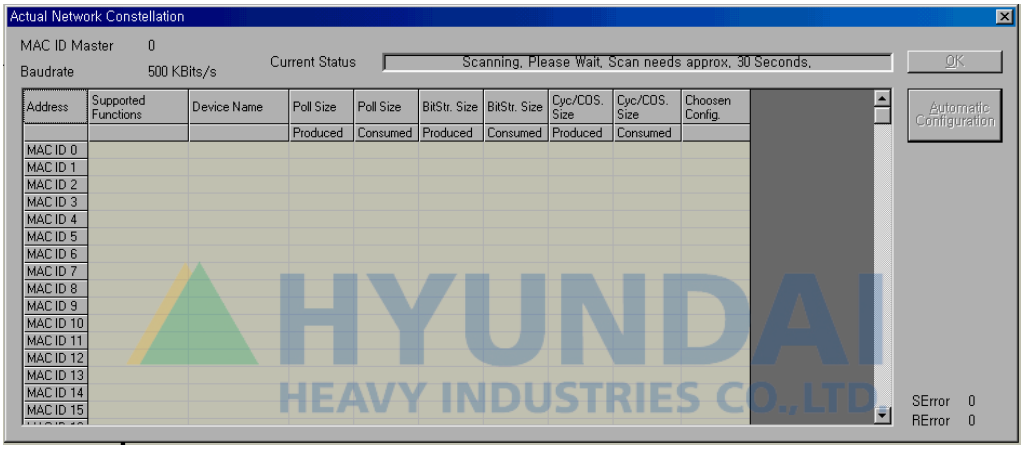


Figure 5.18 Actual Network Constellation dialog box – Scanning

(3) Be prepared to wait for a while, as the network scan will take about 30 seconds. When the scan is completed successfully, the state will become as shown in [Figure 5.19]. In this example, it was assumed that “Panel View” and “UCS-EV2” device are set as MAC ID 5 and 6, respectively, and are connected to the network.

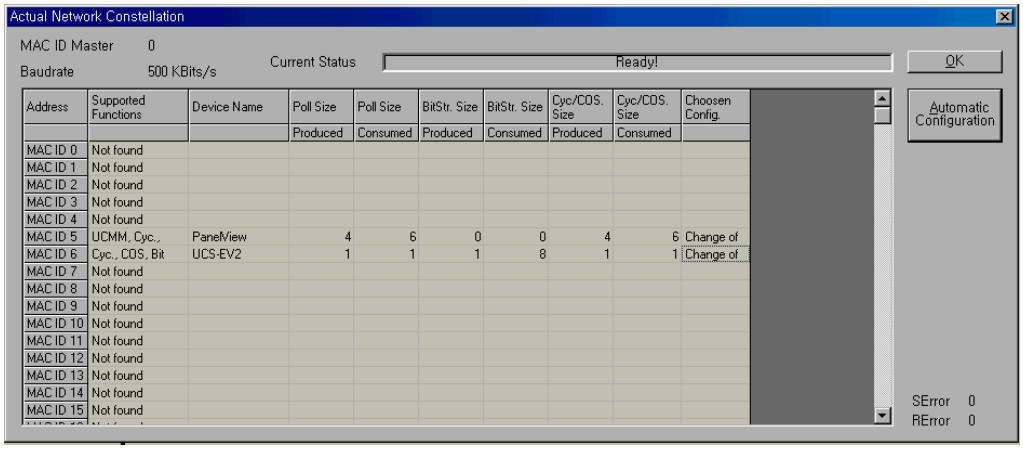


Figure 5.19 Actual Network Constellation dialog box – Scan finished.

(4) Communication method can be changed by double-clicking the 『Chosen Config.』 field in this list. If the result is satisfactory, the contents of the scan can be reflected in the project by clicking the [Automatic Configuration] button.

(5) After clicking [OK] and closing the dialog box, the result of reflecting the contents on the project will be shown as in [Figure 5.20].

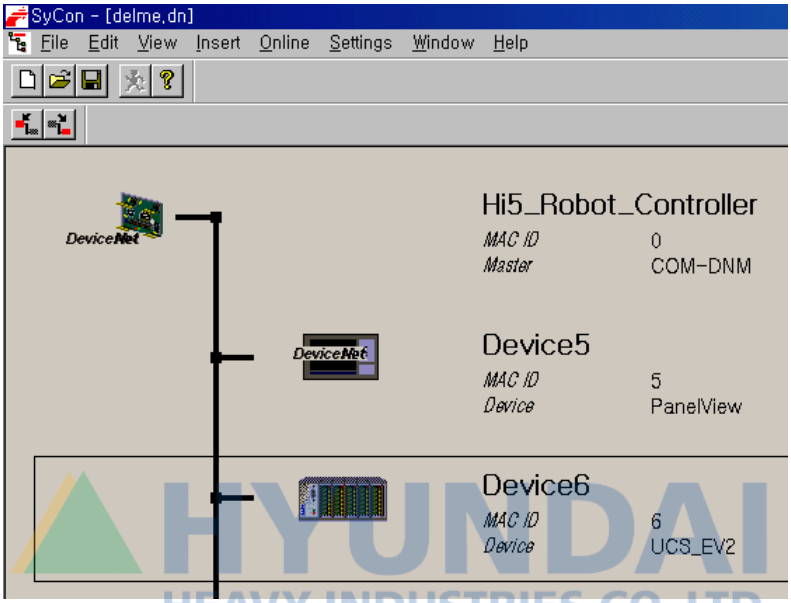


Figure 5.20 Result of reflecting the contents of scan (DeviceNet)

(6) To adjust the settings of each slave, double-click the slave picture that you want to adjust as in the manual setting.

Note 5-3: Establishing communication

If communication is not established, a dialog box will be shown, as in [Figure 5.21].

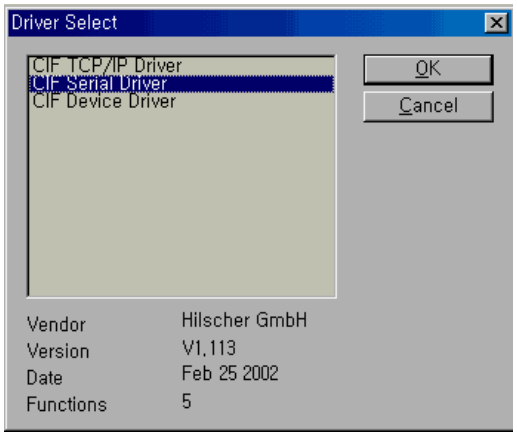


Figure 5.21 Driver Select dialog box

After selecting CIF Serial Driver from the list box and clicking “OK”, a dialog box will be displayed as in [Figure 5.22].

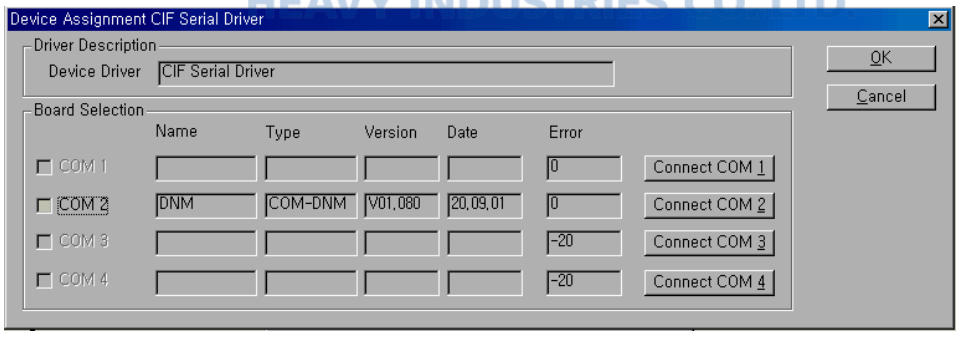


Figure 5.22 Device Assignment CIF Serial Driver

Confirm the RS-232C COM port number of the PC connected to the master module, and click the corresponding [Connect COM ?] button. If the connection is normal, the name and version of the module will be displayed immediately, and the checkbox on the left side will be activated. If this does not occur, the connection will not be established correctly.

Check to determine that the wiring and connection of the cable has been done correctly, that the type of master module is correct, and that power is being supplied.

There may also be connection problems in the event that another project window is opened, or if it is already connected to another channel of BD52x. In these cases, save the project, turn SyCon off and on, and retry.

When the connection is made successfully, check it by clicking the checkbox and click [OK] button.

5.8. Download

(1) When all settings have been made, download all network settings to the master module. Click and select the picture of the master module first, and select 『Online – Download』 from the menu. If the connection is made, a message will be displayed as shown in [Figure 5.23].

(2) If you click [Yes (Y)] here, the download will be executed, as in [Figure 5.24].

(3) Refer to [Note 5-3: Establishing communication] if a dialog box of a different type is displayed.

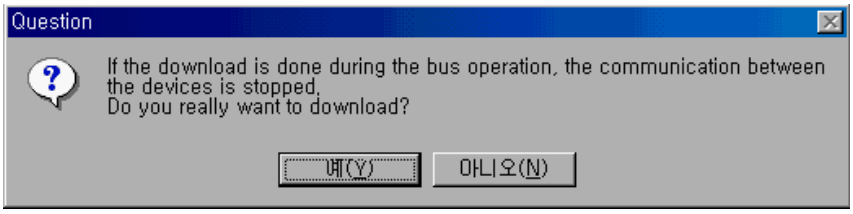


Figure 5.23 Advance message for fieldbus operation stop

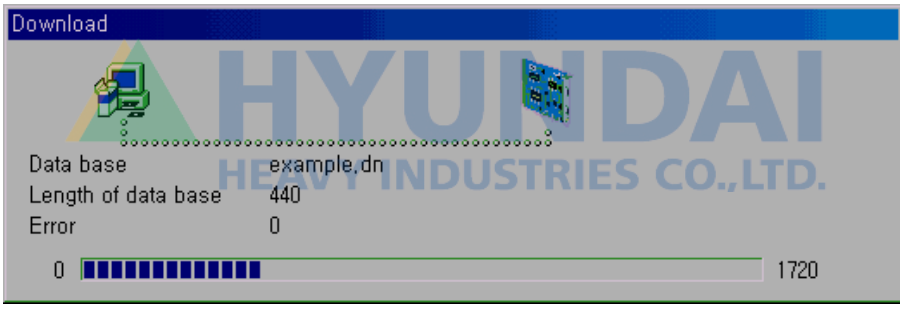


Figure 5.24 Executing download

(4) After downloading, turn the Hi5 controller off and on. Confirm that the fieldbus is operating normally. If the fieldbus is operating normally, the RS-232C cable can be separated. (Separate it when the Hi5 controller is turned off.)

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6 Access of Fieldbus I/O

6.1. Configuration of BD52x Fieldbus relay

The 2 channels of BD52x correspond with the FB1 and FB3 object, respectively, in robot language. Each channel object has 960 X inputs and 960 Y outputs, and can access in 5 types, as shown in [Table 6-1].

Table 6-1 BD52x Fieldbus relay

Classification	Statement grammar	Maximum Signal No.	Explanation and example
Output	FB{Channel No.}.Y{Signal No.}	960	Bit signal output
	FB{Channel No.}.YB{Signal No.}	120	Byte signal output
	FB{Channel No.}.YW{Signal No.}	60	Word signal output
	FB{Channel No.}.YL{Signal No.}	30	Double word signal output
	FB{Channel No.}.YF{Signal No.}	30	Float signal output
Input	FB{Channel No.}.X{Signal No.}	960	Bit signal input
	FB{Channel No.}.XB{Signal No.}	120	Byte signal input
	FB{Channel No.}.XW{Signal No.}	60	Word signal input
	FB{Channel No.}.XL{Signal No.}	30	Double word signal input
	FB{Channel No.}.XF{Signal No.}	30	Float signal input

※ Word, double word and real are not supported below V30.20-00, and bit output, byte output, bit input and byte input are abbreviated as DO, GO, DI, and GI, respectively.

6.2. Using robot language

Examples of access to Fieldbus values in robot language are provided in [Table 6-2].

Table 6-2 Examples of Fieldbus access in robot language

Classification	Statement grammar	Explanation
Output	FB3.Y17=1	Turn on No. 17 output bit in FB3 channel
	FB1.YB5=255	Turn on all output bits of No. 5 byte in FB1 channel
	FB1.YW[5+V8%]=&HFC00	Turn on the upper 6 output bits of No (5+V8%) word in FB1 channel, and turn off the remaining output bits
	FB[V4%].YL2=284000	Output 284000 as No.2 output double word in No. V4% FB channel
	FB1.YF3=V5!*2.5	Output V5!*2.5 as No. 3 output real in No. FB1 channel
Input	WAIT FB3.X15	Wait for No. 15 input bit value in FB3 channel to be ON
	IF FB3.XB2=9 THEN 99	Branch to row No. 99 if No. 2 input byte value in FB3 channel is 9
	V20%=FB1.XW3	Substitute No. 3 input word value in FB1 channel for V20%
	WAIT FB1.XL5>12000	Wait for No. 5 input double word value in FB1 channel to be larger than 12000
	V7!=V25!*FB3.XF3/2.0	Substitute the value obtained by multiplying No. 3 input real value in FB3 channel with V25! and divide the result by 2 for V7!

6.3. Using in embedded PLC

[Figure 6.1] is the block diagram of the embedded PLC I/O, including the FB channel.

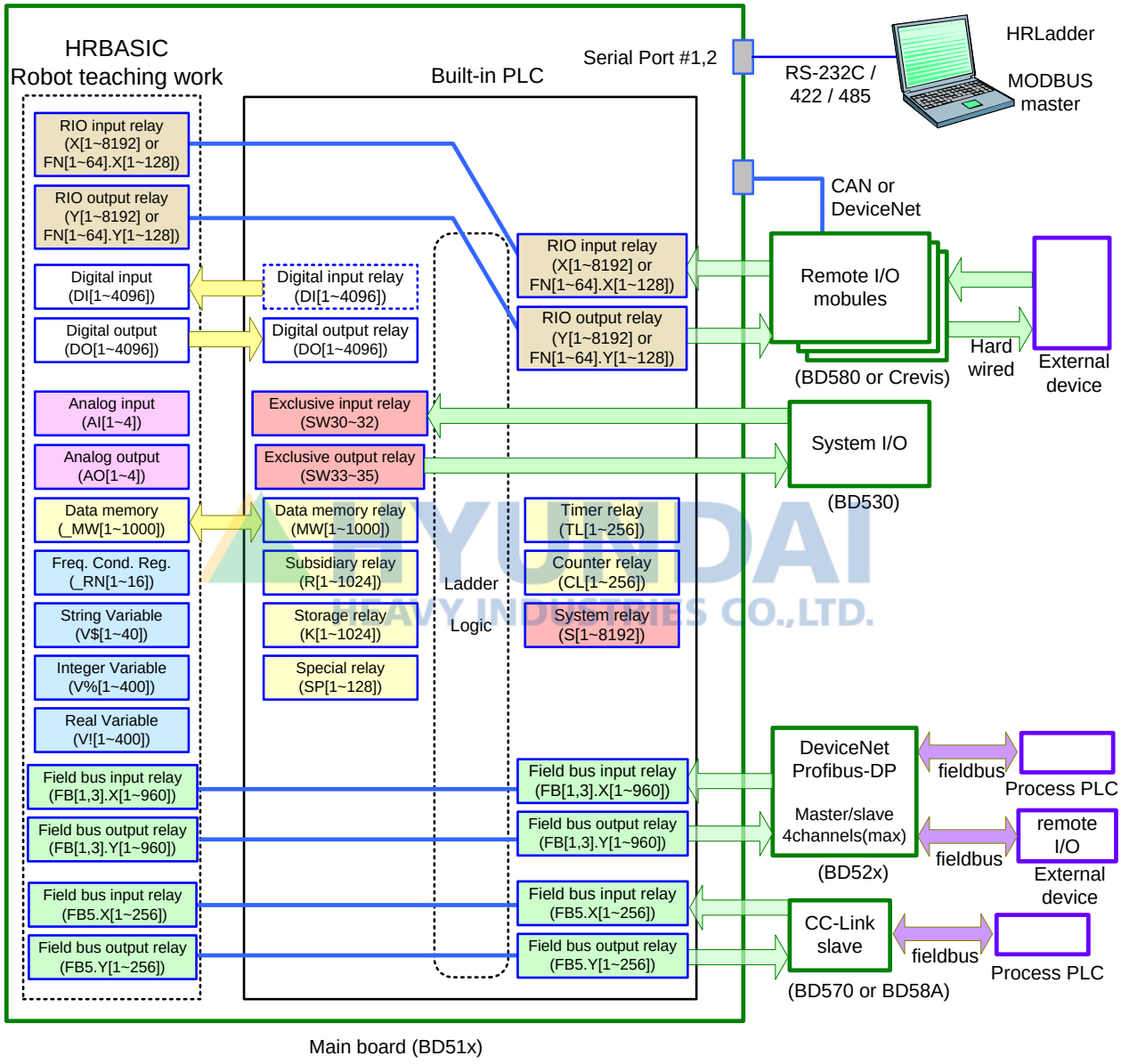

Figure 6.1 Block diagram of embedded PLC I/O

[Figure 6.2] shows an example of an embedded PLC connection. 4 words are connected to both Input and Output.

“DOW13 ~ DOW16” output of robot language is mapped to “FB2.YW1 ~ FB2.YW4” output of Fieldbus.

“FB2.XW1 ~ FB2.XW4” input of Fieldbus is mapped to “DIW13 ~ DIW16” input of robot language.

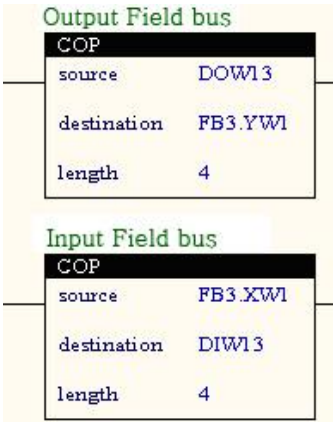

Figure 6.2 Example of embedded PLC ladder with robot language input and output mapping on Fieldbus

6.4. Characteristics and assignment of input and output signal

(1) The signal of BD52x can be assigned to characteristics and assignment of input and output signal by selecting 『[F2]: System』 → 『2: Control parameter』 → 『2: Input/output signal setting』.

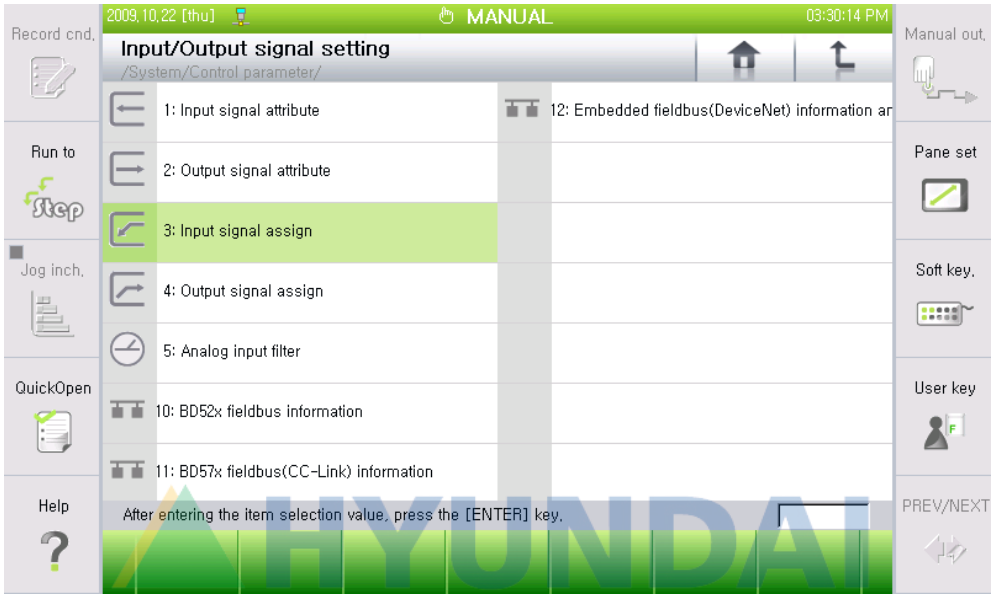

Figure 6.3 Input and output signal setting menu

(2) For example, input “3.18” in the edit field, and click [ENTER] if you want to receive an external RESET signal from the input signal assignment screen as the No. 18 input signal in No. 3 channel of BD52x. 3.18 will be changed to FB3.18 automatically. Click 『[F7]: Complete』 to complete the setting.

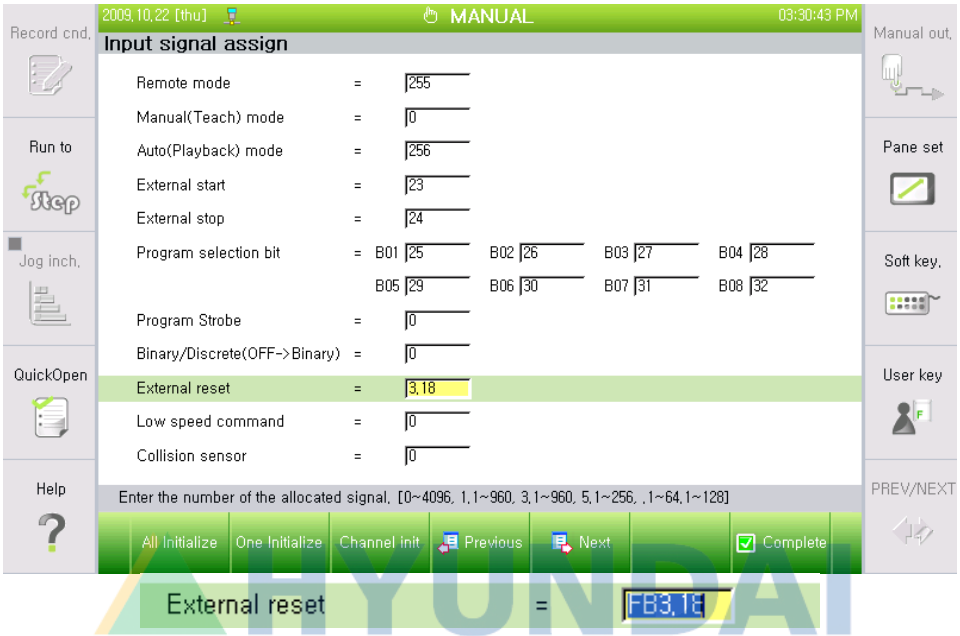

Figure 6.4 Input signal assign

(3) “0” means non-assigned and “1~4,100” means hard wired input. “1.n, 3.n” means 1, 3 channels of BD52x Fieldbus, and “5.n” means BD57x CC-Link.

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7 Troubleshooting

7.1. Diagnostic function

(1) When selecting a screen where the master module is mounted, bus error count and timeout count will be displayed as in [Figure 7.1], and error address (Node number of the slave that caused the error) will also be displayed. Current error code and code description in English will be displayed below. The first sentence will give the reason for the error, and the remaining sentences will be the countermeasures.

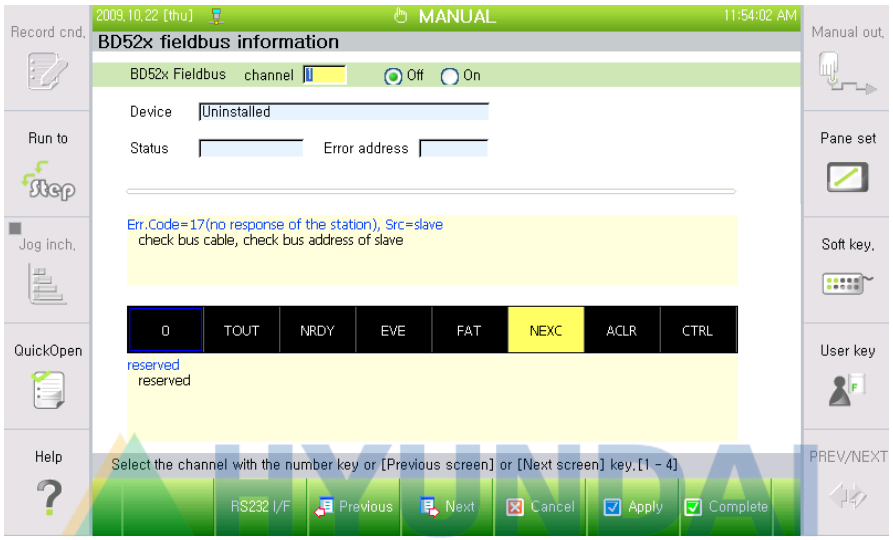

Figure 7.1 Diagnosis information of BD52x Fieldbus information and setting screen

(2) Global state bits will be displayed under the description, as in [Figure 7.2]. Black indicates that the bit is turned off, while yellow indicates that the bit is turned on. One of the bits is selected with a blue outline, and this indicates only that the help cursor is placed over the bit, and does not reflect the bit state. The help cursor is for indicating the meaning of each bit, and can be moved using the right and left arrow keys. The meaning of the bit where the help cursor is located will be displayed under the bit.
(The formation of global bits varies according to protocol. The example of [Figure 7.2] is a case of Profibus master.)

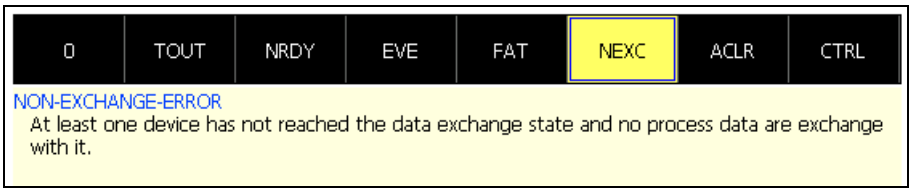

Figure 7.2 Global state bit

Figure 7.3 Diagnosis menu

(3) The number of disconnects or the number of retries for each slave will be displayed respectively by clicking 『[F3]: Disconnect』or 『[F4]: Retry』.

.

Figure 7.4 Disconnect dialog box and retry dialog box

(4) The slave table will be displayed as in [Figure 7.5] after clicking 『[F2]: Slave table』.

Figure 7.5 Fieldbus slave table

Table 7-1 Meaning of the Node No. color for each slave

Indication	Description
Blue number	Slave is registered on master using SyCon
Yellow background	Slave performs communication with the master normally
Red d	Slave has diagnostic information

(5) In this context, diagnostic information is the record of fieldbus errors occurring on a specific slave device. The master can obtain diagnostic information from a slave and display it. For example, if slave of No. 3 node is indicated inversely to have diagnostic information, as in [Figure 7.6], the slave diagnostic screen can be displayed by inputting 3 on the number blank of slave to be diagnosed and clicking 『[F7]: Execute』.

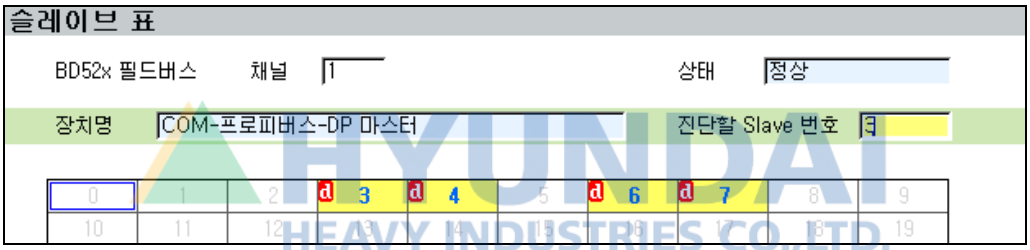

Figure 7.6 Input the Slave number to be diagnosed

(6) The slave diagnostic screen is the same as in [Figure 7.7]. Various slave status bits will be displayed on top of the screen. Like the global bit, yellow means that it is in ON status and the blue outline means that it has been selected by the help cursor. The meaning of a bit, which is shown in an inverse image, can be displayed by moving the help cursor with the arrow keys.

(7) The address of the master handling a corresponding slave and the identification number of the corresponding slave device will be displayed on the bottom of the screen.
(Screen arrangement varies according to protocol. The example on the picture above uses a Profibus master.)

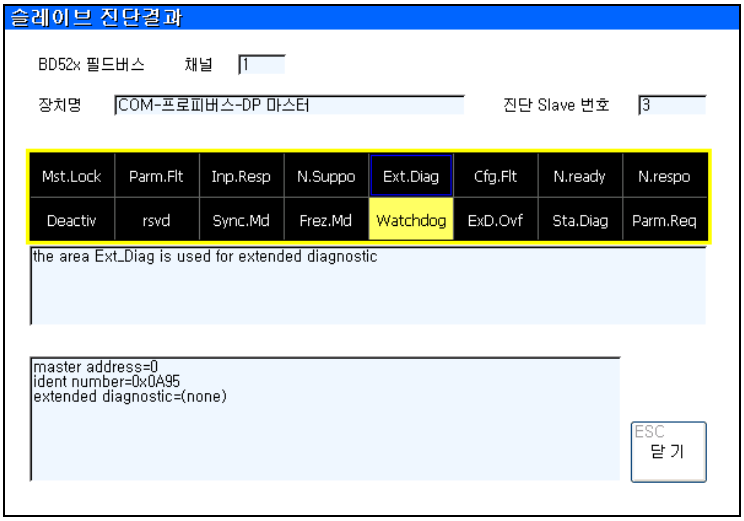

Figure 7.7 Slave diagnostics screen

(8) In this context, extended diagnostic information is the proper product information determined for each product (For example, measurement error of sensor device, faulty remote I/O device), not information defined in the Fieldbus as standard specification. Extended diagnostic information is displayed without any interpretation by receiving a column of hex data. Please refer to manual of the relevant slave product to determine the meaning.

7.2. Controller side error message

[Table 7-2] shows the error message that can be displayed on the teach pendant of the controller while using the fieldbus, and its countermeasures.

Table 7-2 Controller side error message and countermeasures

Error message	Countermeasures
W0015 Fieldbus general error	Confirm that there is a problem on the Fieldbus network, and determine whether the parameter setting of module has been done correctly.

Confirm the error, solve the problem, and turn the controller on and off to retry the Fieldbus connection.

7.3. Status check by BD52x LED

6 LEDs for each channel are mounted on BD52x. Each of the 4 LEDs on the left side has a different role according to fieldbus protocol.
However, the meanings of the 2 LEDs on the right side are as given in [Table 7-3], regardless of protocol.

Table 7-3 Common LED status and meaning

Name	Color	Status	Meaning
RDY	Yellow	Turned on ☼	Ready
		Blinking ⊙	Bootstrap loader active
		Turned off ●	Hardware or system error
RUN	Green	Turned on ☼	Communication is on
		Blinking ⊙	Parameter error
		Turned off ●	Communication stop

[Figure 7.1] to [Figure 7.3] and [Table 7-3] to [Table 7-6] provide LED name and the explanation of each fieldbus protocol.

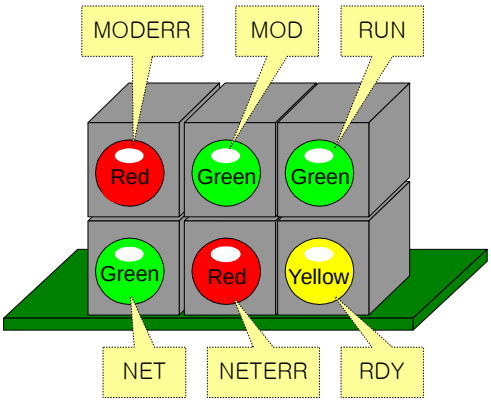

Figure 7.8 LED of DeviceNet master and slave module

Table 7-4 LED status and the meaning of DeviceNet master and slave module

Name	Color	Status	Meaning
NET	Green	Turned on ☼	Online, connected
		Blinking ⊙	Online, not connected
		Turned off ●	Refer to NETERR
NETERR	Red	Turned on ☼	Critical link failure
		Blinking ⊙	Connection timeout
		Turned off ●	Refer to NET
MOD	Green	Turned on ☼	Normal operation
		Blinking ⊙	Setting failure
		Turned off ●	Refer to MODERR
MODERR	Red	Turned on ☼	Irrecoverable error
		Blinking ⊙	Insignificant error
		Turned off ●	Refer to MOD

※ If NET and NETERR are turned off, it may indicate a problem with the DeviceNet power (24V) supply.

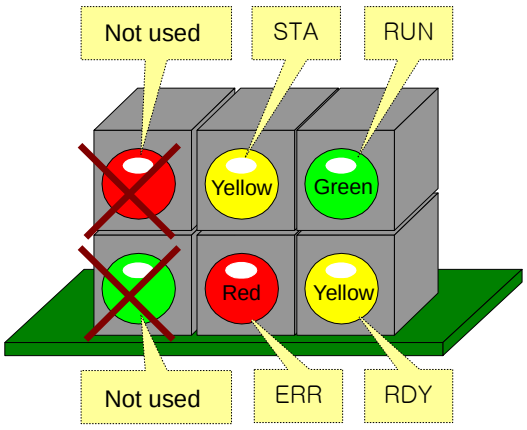

Figure 7.9 LED of Profibus-DP master, slave and Interbus master module

Table 7-5 LED status and the meaning of Profibus-DP master, slave and Interbus master module

Name	Color	Status	Meaning
STA	Yellow	Turned on ☼	DP master: Hold token DP slave: Data exchange Interbus: Data telegrams active
		Turned off ●	Master: No hold token Slave: No data exchange Interbus: No data telegrams active
		Turned on ☼	Error on the communication line
MODERR	Red	Turned off ●	No error on the communication line

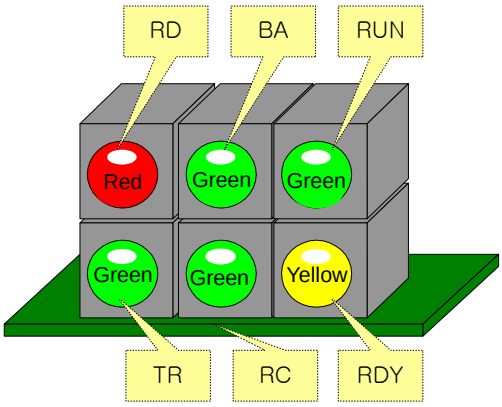

Figure 7.10 LED of Interbus slave module

Table 7-6 LED status and the meaning of Interbus slave module

Name	Color	Status	Meaning
RC	Green	Turned on ☼	Remote bus cable check OK
		Turned off ●	No connection with previous slave
BA	Green	Turned on ☼	Data message alive
		Turned off ●	Data message dead
TR	Green	Turned on ☼	PCP data transfer
		Turned off ●	No PCP data transfer

7.4. Fieldbus related output signal assign

When fieldbus error or fieldbus IDLE (master PLC STOP condition) occurs, you can set the assigned hard-wired output signal to be ON.

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

(2) Find “Fieldbus error” and “Fieldbus idle” by navigating using the 『[F4]: Previous』 and 『[F5]: Next』 key.

(3) Insert the DO signal number that you want on this item, and save it using the『[F7]: Complete』 key.

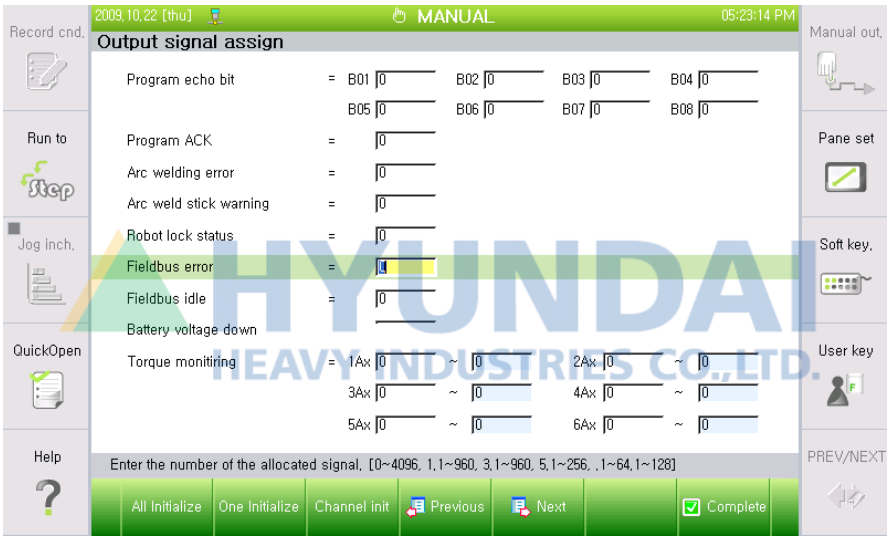

Figure 7.11 Fieldbus related output signal assign

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