



**PROFIBUS Adapter User Manual**  
*FnIO S-Series*  
**NA-9122**

**List of Revisions**

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|     |            |         |          |
|     |            |         |          |
|     |            |         |          |
|     |            |         |          |
|     |            |         |          |

# Contents

## 1. Product Specification

- 1) General Specifications
- 2) PROFIBUS Communication Specification

## 2. PROFIBUS Setting

- 1) Communication parameter setting
- 2) I/O allocation
- 3) GSD & I/O Module setting

## 3. PROFIBUS Network Installation

- 1) General information
- 2) PROFIBUS layer 1 (Physical Layer)
- 3) Choice of PROFIBUS data transfer cable type
- 4) Bus stub lines
- 5) Bus connectors and PROFIBUS-DP/FMS interface
- 6) Power supply for the terminating resistors

## 4. Check Operation Status

- 1) MOD : Module Status LED
- 2) NET : Network Status LED
- 3) I/O : Expansion Module Status LED
- 4) Field Power : Field Power Status LED

## Appendix. A

# 1. Product Specifications

## 1) General Specifications

| Item                     |           | Specifications  | Remarks |
|--------------------------|-----------|---|---------|
| Temperature              | Operating | -20°C to +60°C (32°F to 140°F)  |         |
|                          | Storage   | -40°C to +85°C (-40°F to 185°F)   |         |
| Humidity                 | Operating | 5 to 95% RH (Non-condensing)  |         |
|                          | Storage   | 5 to 95% RH (Non-condensing)  |         |
| Vibration/Shock immunity |           | Displacement: 0.012 inch p-p from 10-57Hz<br>Acceleration: 2G's from 57-500Hz<br>Sweep Rate: 1 octave per minute<br>Axes to Test : x,y,z<br>Frequency Sweeps per Axis: 10 |         |
| Capsuling                |           | Din rail or Screw tightening  |         |

## 2) PROFIBUS Communication Specification

| Item                        | Specifications   | Remarks                 |
|-----------------------------|--|-------------------------|
| Communication Specification | I/O Slave messaging (Only Slave)<br>Redundancy : Not Support<br>Repeater Control Signal : RS-485 Signal<br>Freeze Mode : Support<br>Sync Mode : Support<br>Fail safe Mode : Support<br>FMS Support : Not Support |                         |
| Communication Distance      | 9.6k ~ 12M (1.2Km ~ 100m)  |                         |
| Node Settings               | Max 100 stations (Using Front Rotary switch)   |                         |
| Communication Speed         | 9.6 to 12000 Kbps  | Auto baudrate selection |
| Number of Expansion I/O     | Max. 32 Slots  |                         |
| Isolation                   | I/O and internal circuit : Photocoupler isolation<br>System Power : Non-isolation<br>System to Logic : Isolation   |                         |
| System Power                | Supply Voltage : 24Vdc nominal<br>Supply Voltage range : 11~28.8Vdc<br>Protection : Output current limit(Min.1.5A)<br>Reverse polarity protection  |                         |
| Field Power                 | Supply Voltage : 24Vdc nominal<br>Supply Voltage range : 11~28.8Vdc  |                         |

## 2. PROFIBUS Setting

**PROFIBUS settings include the following configurations :**

- Communication parameter setting
- I/O allocation
- GSD & I/O Module setting

### 1) Communication Parameter Setting

#### ◆ Node Address Setting

- Node address is determined by the node address rotary switch on the front panel of adapter module.
- Set node address is recognized on the power-on of adaptor module.

Ex) When node address is set as 27  
Station Address (  $2 * 10 + 7 * 1$  ) = 27



X 10 (MSD)<sup>+</sup>



X 1 (LSD)<sup>+</sup>

Rotary Switch

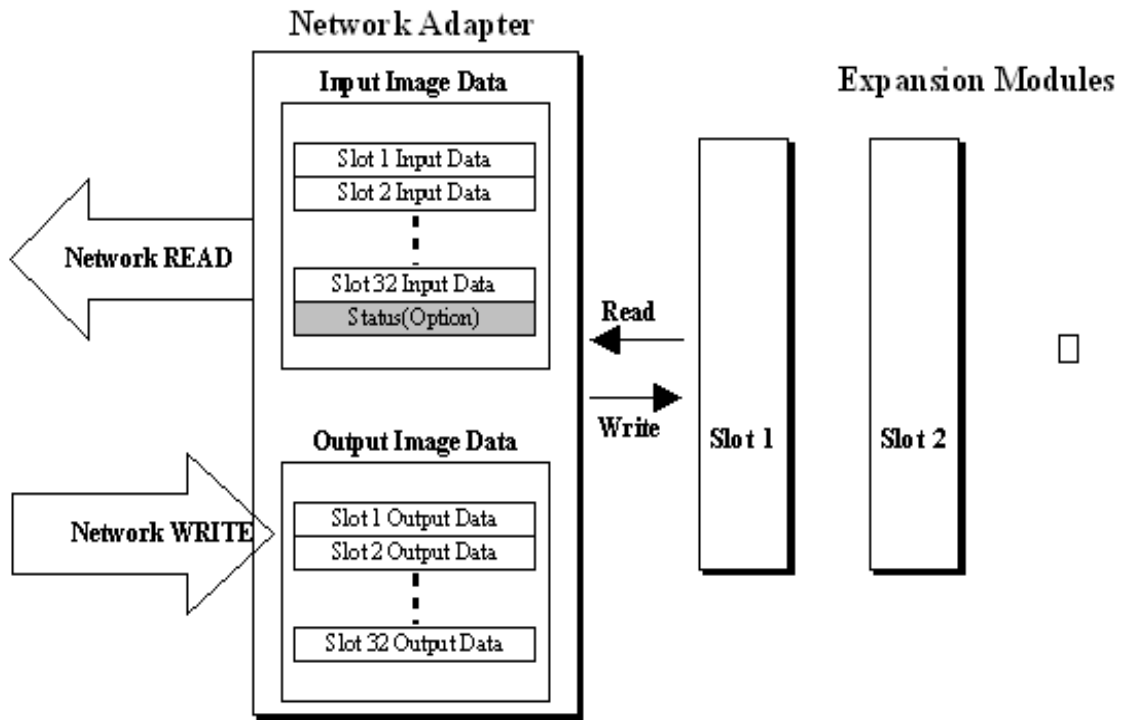
\* Each PROFIBUS Adaptor has Station Address No. from 0 to 99

#### ◆ Communication Speed Setting

- See Master Module Setting about communication speed setting.

## 2) I/O Allocation

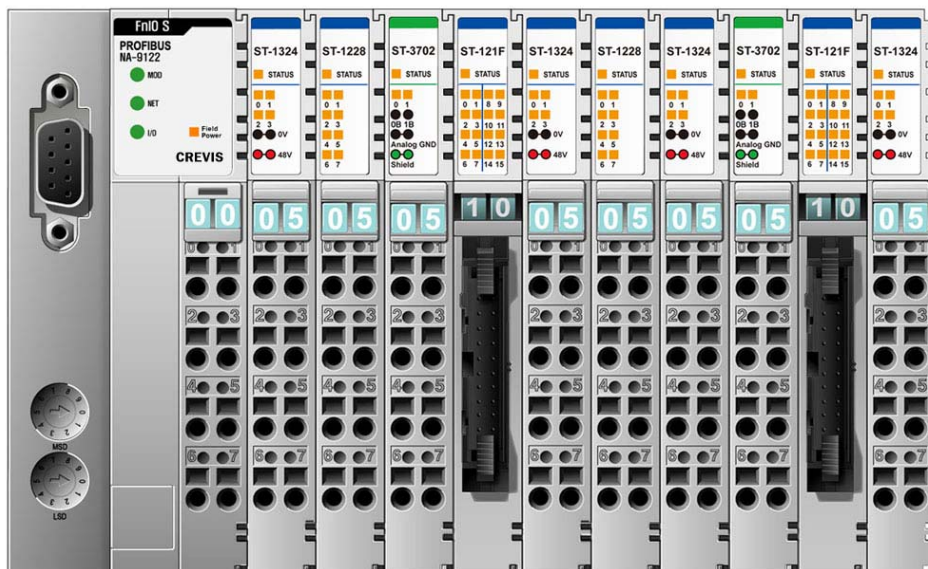
- The data of Expansion Module connecting to Adaptor are exchanging I/O Process image Data via FnBus Protocol between modules as below ;



### ◆ I/O Allocation Example

#### I/O Configuration Input Module Example

- Input Image Data is determined by the position of Slot and Expansion Module.



| Slot Address | Module Description |
|--------------|--------------------|
| 0            | PROFIBUS Adaptor   |
| 1            | 4-Discrete input   |
| 2            | 8-Discrete input   |
| 3            | 2-Analog input     |
| 4            | 16-Discrete input  |
| 5            | 4-Discrete input   |
| 6            | 8-Discrete input   |
| 7            | 4-Discrete input   |
| 8            | 2-Analog input     |
| 9            | 16-Discrete input  |
| 10           | 4-Discrete input   |

| Byte | Bit7                                  | Bit6 | Bit5 | Bit4 | Bit3                              | Bit2 | Bit1 | Bit0 |
|------|---------------------------------------|------|------|------|-----------------------------------|------|------|------|
| 0    | Reserved                              |      |      |      | Discrete Input 4 points (Slot#1)  |      |      |      |
| 1    | Discrete Input 8 points (Slot#2)      |      |      |      |                                   |      |      |      |
| 2    | Analog Input CH0 low byte (Slot#3)    |      |      |      |                                   |      |      |      |
| 3    | Analog Input CH0 high byte (Slot#3)   |      |      |      |                                   |      |      |      |
| 4    | Analog Input CH1 low byte (Slot#3)    |      |      |      |                                   |      |      |      |
| 5    | Analog Input CH1 high byte (Slot#3)   |      |      |      |                                   |      |      |      |
| 6    | Discrete Input low 8 points (Slot#4)  |      |      |      |                                   |      |      |      |
| 7    | Discrete Input high 8 points (Slot#4) |      |      |      |                                   |      |      |      |
| 8    | Reserved                              |      |      |      | Discrete Input 4 points (Slot#5)  |      |      |      |
| 9    | Discrete Input 8 points (Slot#6)      |      |      |      |                                   |      |      |      |
| 10   | Reserved                              |      |      |      | Discrete Input 4 points (Slot#7)  |      |      |      |
| 11   | Analog Input CH0 low byte (Slot#8)    |      |      |      |                                   |      |      |      |
| 12   | Analog Input CH0 high byte (Slot#8)   |      |      |      |                                   |      |      |      |
| 13   | Analog Input CH1 low byte (Slot#8)    |      |      |      |                                   |      |      |      |
| 14   | Analog Input CH1 high byte (Slot#8)   |      |      |      |                                   |      |      |      |
| 15   | Discrete Input low 8 points (Slot#9)  |      |      |      |                                   |      |      |      |
| 16   | Discrete Input high 8 points (Slot#9) |      |      |      |                                   |      |      |      |
| 17   | Reserved                              |      |      |      | Discrete Input 4 points (Slot#10) |      |      |      |

◆ I/O Configuration Output Module Example

- Output Image Data is determined by the position of Slot and Expansion Module.



| Slot Address | Module Description |
|--------------|--------------------|
| 0            | PROFIBUS Adaptor   |
| 1            | 4-Discrete Output  |
| 2            | 8-Discrete Output  |
| 3            | 2-Analog Output    |
| 4            | 16-Discrete Output |
| 5            | 4-Discrete Output  |
| 6            | 8-Discrete Output  |
| 7            | 2-Relay Output     |
| 8            | 2-Relay Output     |
| 9            | 2-Analog Output    |
| 10           | 16-Discrete Output |
| 11           | 4-Discrete Output  |



| Byte | Bit7                                    | Bit6 | Bit5 | Bit4 | Bit3                               | Bit2 | Bit1                     | Bit0 |
|------|---|------|------|------|------------------------------------|------|--------------------------|------|
| 0    | Not used                                |      |      |      | Discrete Output 4 points (Slot#1)  |      |                          |      |
| 1    | Discrete Output 8 points (Slot#2)       |      |      |      |                                    |      |                          |      |
| 2    | Analog Output CH0 low byte (Slot#3)     |      |      |      |                                    |      |                          |      |
| 3    | Analog Output CH0 high byte (Slot#3)    |      |      |      |                                    |      |                          |      |
| 4    | Analog Output CH1 low byte (Slot#3)     |      |      |      |                                    |      |                          |      |
| 5    | Analog Output CH1 high byte (Slot#3)    |      |      |      |                                    |      |                          |      |
| 6    | Discrete Output low 8 points (Slot#4)   |      |      |      |                                    |      |                          |      |
| 7    | Discrete Output high 8 points (Slot#4)  |      |      |      |                                    |      |                          |      |
| 8    | Not used                                |      |      |      | Discrete Output 4 points (Slot#5)  |      |                          |      |
| 9    | Discrete Input 8 points (Slot#6)        |      |      |      |                                    |      |                          |      |
| 10   | Not used                                |      |      |      |                                    |      | Output 2 points (Slot#7) |      |
| 11   | Not used                                |      |      |      |                                    |      | Output 2 points (Slot#8) |      |
| 12   | Analog Output CH0 low byte (Slot#9)     |      |      |      |                                    |      |                          |      |
| 13   | Analog Output CH0 high byte (Slot#9)    |      |      |      |                                    |      |                          |      |
| 14   | Analog Output CH1 low byte (Slot#9)     |      |      |      |                                    |      |                          |      |
| 15   | Analog Output CH1 high byte (Slot#9)    |      |      |      |                                    |      |                          |      |
| 16   | Discrete Output low 8 points (Slot#10)  |      |      |      |                                    |      |                          |      |
| 17   | Discrete Output high 8 points (Slot#10) |      |      |      |                                    |      |                          |      |
| 18   | Reserved                                |      |      |      | Discrete Output 4 points (Slot#11) |      |                          |      |

### 3) GSD & I/O Module Setting

GSD (Electronic data sheet of a device) files contain and describe the functions and characteristics of PROFIBUS devices. The abbreviation GSD means Generic Station Description (Device Base Files). All the available GSD files together form the device database.

When the program is started, the System Configurator automatically retrieves all the GSD files stored in the GSD directory.

The device names are placed into an internal into an list. During the configuration, the device-specific data is retrieved directly from the GSD files.

If a DP Slave device does not appear in the selection list, a corresponding GSD file can be copied into the GSD directory **File > Copy GSD**.

Another possibility is to copy the GSD file into GSD directory with the Windows Explore and then retrieve the GSD files into the GSD directory with **Setting > Path** and **OK**.

The GSD files can be viewed with the **Tools > GSD Viewer** menu.



- Hilscher Devices : The GSD files for Hilscher devices are already included and installed.
- Other Devices : The respective device manufacturer provides the GSD files for other devices. The GSD files of many vendors are available on the PROFIBUS user organization home page.

The GSD directory is adjustable. In order to alter the directory from a previous setting in another directory, use the Setting > Path menu.

All GSD files must be placed in this directory.

No GSD files are used for PROFIBUS-FMS. Hilscher PROFIBUS-FMS devices as well as Other FMS Devices for all vendors are available in the selection list of the Master.

The GSD Files for PROFIBUS-FMS specified by the PNO (PROFIBUS User Organization) are not supported by the System Configurator.

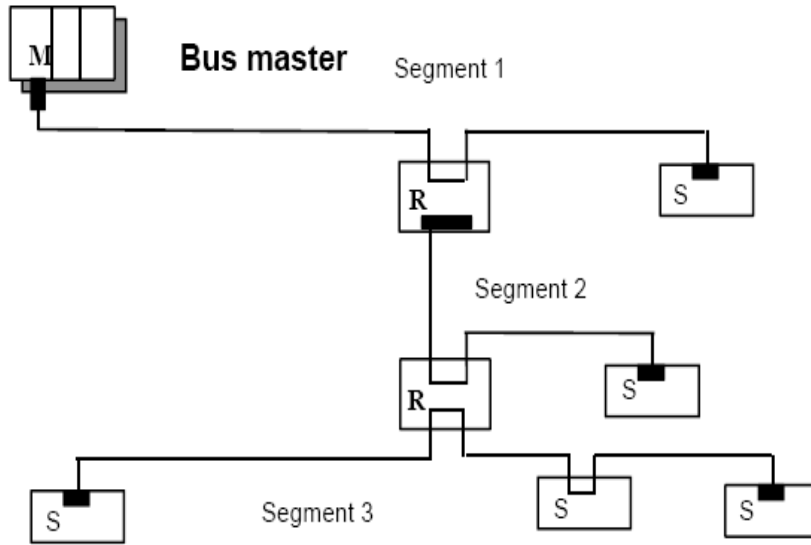
# 3. PROFIBUS Network Installation

## 1) General information

Table 1, which contains general information on dimensioning a PROFIBUS installation, includes important parameters for plant designers. As described in the PROFIBUS RS485 specification, each bus segment can have a maximum of 32 active devices. In order to be able to connect a larger number of PROFIBUS DP/FMS stations, it is necessary to segment the bus. The segments interconnected with repeaters which amplify and refresh the data signals. Repeaters can also be used for galvanic isolation of bus segments or bus sections. Each repeater allows the PROFIBUS system to be extended by an additional bus segment with the admissible cable length and the Maximum number of fieldbus devices. Repeaters increase the signal propagation times. This should be taken into account during planning.

|   |   |
|---|---|
| Maximum number of stations participating in the exchange of user data | DP : 126 (address from 0..125)<br>FMS : 127 (address from 0..126)   |
| Maximum number of stations per segment including repeaters            | 32  |
| Available data transfer rates in Kbit/s                               | 9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000  |
| Max.number of segments in series                                      | According to EN 50170, a maximum of 4 repeaters are allowed between any two stations. Dependent on the repeater type and manufacturer, more than 4 repeaters are allowed in some cases. Refer to the manufacture technical specification for details. |

Table 1 : PROFIBUS installation



Legende:

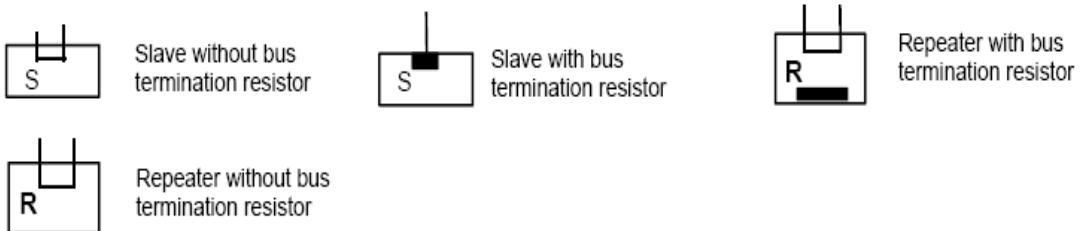


Figure 1 : Segmenting of a PROFIBUS installation

Figure 1 illustrates the layout and segmenting of an example PROFIBUS installation which uses repeaters. Repeaters with galvanic isolation can be used.



## 2) PROFIBUS layer 1 (Physical Layer)

PROFIBUS layer 1 describes the data transmission technology, the pin assignments of the bus connectors and the technical parameters to be compiled with. It also contains rules on the design of PROFIBUS-DP/FMS devices with respect to bus physics.

## 3) Choice of PROFIBUS data transfer cable type

Depending on the application, the user can choose between electrical and optical fiber data transfer cables. The following types of electrical data cables can be used:

- **Standard bus cable**
- **Standard bus cable with halogen-free sheath (type FRNC)**
- **Cable with PE Sheath** for use in the food and manufacturing industries. (it differs from the standard bus cable solely in the cable sheath).
- **Direct buried cable** with additional protective sheath for laying in the ground.
- **Trailing cable** (this is a special cable type which is used where parts of the machine move occasionally or continuously).
- **Festooned cable.** Compared to a trailing cable, a festooned cable has an additional strain relief element.

The bus cable is specified in EN 50170 part 8-2 as "Cable Type A", and should comply with the parameters in the following table. Cable Type B, which is also described in EN 50170, is outdated and should no longer be used.

Table 2. show the parameters for standard type A bus cables.

| Parameter                              | Cable type A                          |
|--|---------------------------------------|
| Characteristic impedance in $\Omega$   | 135..165 at a frequency of (3..20MHz) |
| Operating capacity (pF/m)              | < 30                                  |
| Loop resistance ( $\Omega/\text{km}$ ) | $\leq 110$                            |
| Core diameter (mm)                     | >0.64 *                               |
| Core cross-section (mm)                | >0.34 *                               |

Table 2 : Bus cable parameter

\* The cable cross-sections used should be compatible with the mechanical specifications of the bus interface connector

The cable parameters specified for standard Type A bus cables result in the maximum length of each bus segment for the respective data transfer rate shown in Table 3.

| Baudrate                 | 9.6  | 19.2 | 45.45 | 93.75 | 187.5 | 500 | 1500 | 3000 | 6000 | 12000 |
|--------------------------|------|------|-------|-------|-------|-----|------|------|------|-------|
| Max. segment length in m | 1200 | 1200 | 1200  | 1200  | 1000  | 400 | 200  | 100  | 100  | 100   |

Table 3 : Maximum cable lengths per segment

**Important :** In a PROFIBUS-DP/FMS installation, you must choose a data transfer rate which is supported by all devices connected to the bus. The chosen data transfer rate then determines the maximum segment lengths as shown above.

The maximum admissible distance between two bus stations in each PROFIBUS network can be calculated as follows:

**(NO\_REP+1)\*Segment length**

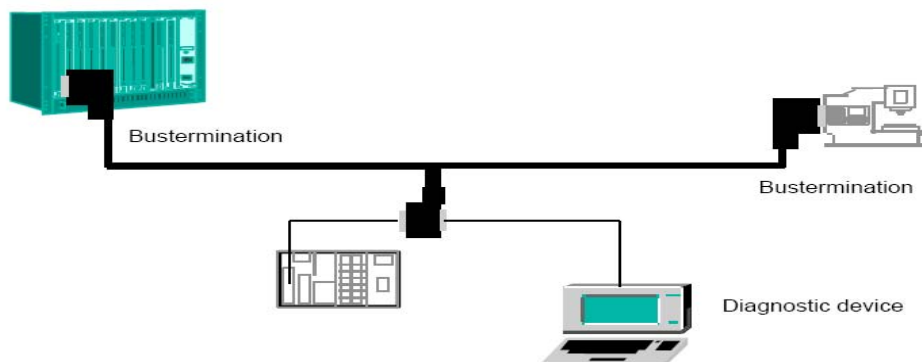
NO\_REP=The maximum number of repeaters connected in series(depends on repeater type).

**Example :** The repeater manufacture specifications allow nine repeaters to be connected in series. The maximum distance between two bus stations at a data transfer rate of 1500 kbit/s is then as follow :  $(9+1)*200m=2000\text{ m}$

**4) Bus stub lines**

The use of passive bus stub lines should be avoided.

Programming and diagnostic device which are attached to the bus e.g.during commissioning are generally connected using their own cable which acts as a bus tap-off cable. In such cases, you should use active bus tap-off devices (e.g. bus terminals, repeaters, active cables, etc.).



**Bus termination to EN 50170 Volume 2**

In order to minimize cable reflections and ensure a defined noise level on the data lines, the data transfer cable must be terminated at both ends with a terminating resistor combination as follows.

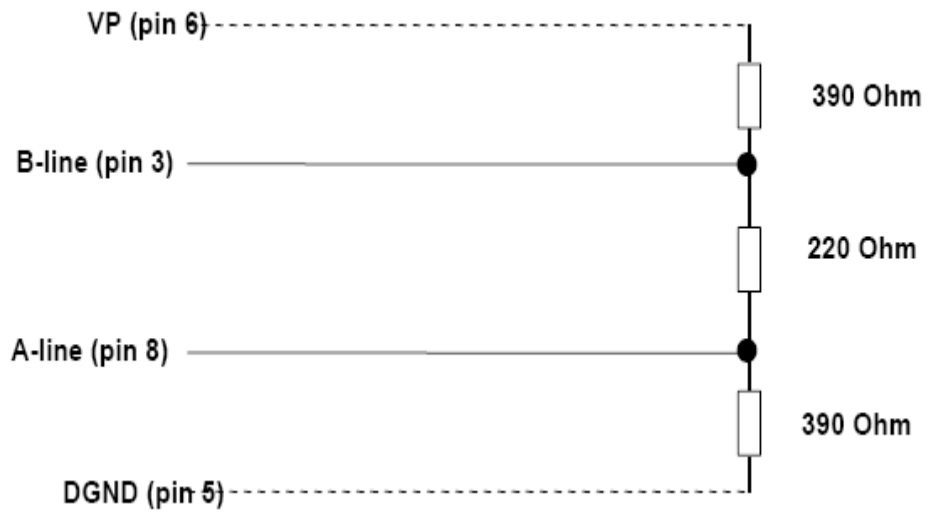


Figure 2 : Cable termination of the PROFIBUS cable to EN 50170(Pin numbers for a 9-pin D-Sub connector)

### 5) Bus connectors and PROFIBUS-DP/FMS interface

A bus connector is used to connect the bus cable to the PROFIBUS device. Bus connectors are available with a variety of protection classes and mechanical designs. The choice of connector is mainly determined by the space available in the vicinity of the PROFIBUS device (i.e. PC interface, PLC or special fieldbus device).

EN 50170 Volume 2 recommends the use of a 9-pin D-Sub connector. Depending on the required protection class and the application of the fieldbus device, other connector designs are also allowed.

Table 4 : shows the pin assignment if a 9-pin D-Sub connector is used:

| Pin. | Signal      | Significance  |
|------|-------------|---|
| 1    | Shield      | Shield/functional ground                                |
| 2    | M24         | Ground for +24 V output Voltage                         |
| 3    | RxD/TxD-P * | Receive/Transmit data-plus (B wire)                     |
| 4    | CNTR-P      | Repeater control signal (direction control), RTS signal |
| 5    | DGND *      | Data ground (reference potential for VP)                |
| 6    | VP *        | Supply voltage-Plus (P5V)                               |
| 7    | P24         | Output voltage +24V                                     |
| 8    | RxD/TxD-N * | Receive/Transmit data-minus (A wire)                    |
| 9    | CNTR-N      | Repeater Control Signal (direction control)             |

\* Signals marked in bold and with an asterisk are mandatory and must be provided. Other signals are optional.

Figure 3 : Pin assignments of a 9-pin D-Sub connector for a fieldbus device

All fieldbus devices which use a standard 9-pin D-Sub connector should provide the VP and DGND signals on the bus connector in addition to the receive and transmit signals. With all other connector types, only the receive and transmit signals need to be connected.

Make sure that the connector type used is suitable for the selected baud rate.

If optional signal are provided, they must also comply with EN50170 Volume 2 and they must be correctly described in the respective GSD file.

To prevent EMC interface from entering the device, the cable shield should be connected to the functional ground of the device (generally the electrically conductive case). This is done by connecting the cable shield to the metal case of the D-Sub connector and the functional ground over a larger area. The bus connector must have a low-impedance connection to the cable shield.

The data transfer technology of the serial bus system, which uses a shielded twisted pair data cable, is described in the specification of the interface-immune RS 485 interface standard. To allow correct bus termination, each station must connect the signals DGND and VP (5V) to pins 5 and 6 of the connector, respectively. The 5V supply for the terminating resistors (VP) should have a minimum current rating of 10mA (the current load can increase to 12mA if a NULL signal is sent through the bus). The current rating should be increased to app. 90mA if you need to be able to supply other types of devices on the bus such as bus terminals and optical fiber cable drivers. Due to the capacitive load of the station and the resulting cable reflections, bus connectors should be provided with built-in series inductors as shown below.

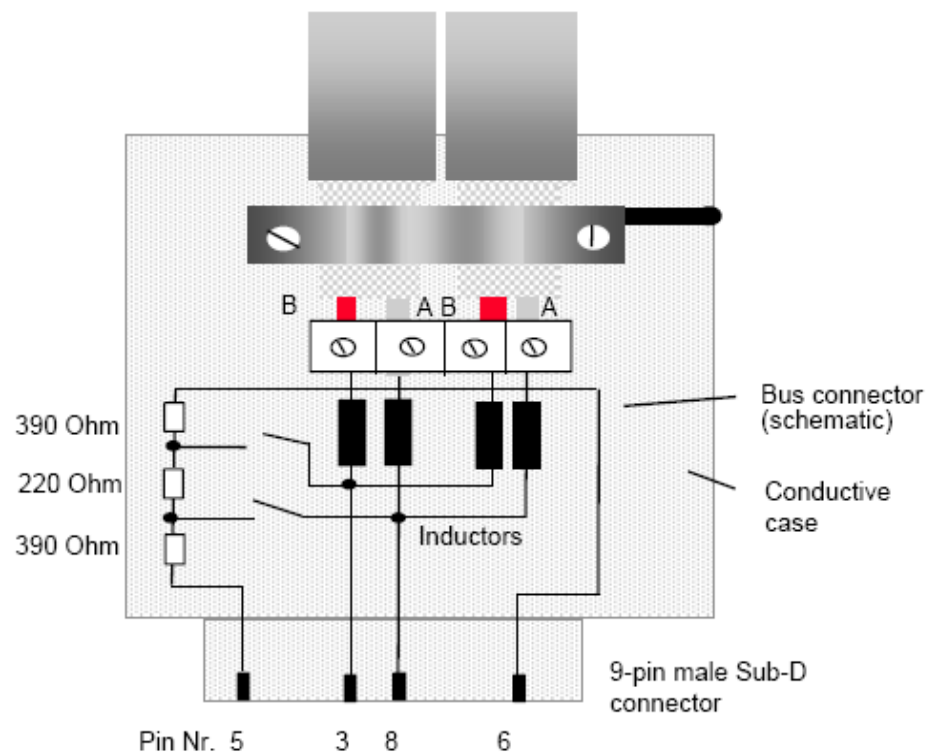


Figure 4 : Bus connector with built-in terminating resistors and series inductors

Due to the built-in series inductors in the bus connectors, all bus connectors in the network should be attached to fieldbus devices to ensure that the necessary capacitive load is provided by the device input capacitance.



## 6) Power supply for the terminating resistors

The active bus termination using a resistor combination avoids signal reflections during data transfer and ensures a defined zero-signal voltage on the data lines when none of the stations on the bus are active. Active termination must be provided at the beginning and end of each RS 485 bus segment.

If the bus termination is missing, this can cause errors during data transfer. Problems can also arise if too many bus terminators are fitted since each bus terminator also represents an electrical load and reduce the signal levels and thus the signal-to-noise ratio.

Too many or missing bus terminators can also cause intermittent data transfer errors, particularly if the bus segment is operated close to the specified limits for maximum numbers of stations, maximum bus segment length and maximum data transfer rate.

The Power required by the active bus termination is usually obtained through the bus connector from stations connected to the bus. Alternative measures must be taken if there is no guarantee that the power required by the bus termination is permanently provided while the bus is operating. For example, in a particular installation the station providing the power to the bus termination may need to be repeatedly switched off or removed from the for operational reasons. In such case, the bus termination should use an external power supply or repeater should be used for bus termination instead.

## 4. Check Operation Status

When all installation and configuration processes are complete, the adaptor module status LED (MOD LED) and network status LED (NET LED) shall be lit in a green color. If not, it indicates that an error has occurred. See the following table for proper measures.

### 1) MOD : Module Status LED

| State              | LED is | Description   |
|--------------------|--------|---|
| No Power           | Off    | No power is supplied to the unit  |
| Device Operational | Green  | The unit is operating in normal condition   |
| Unrecoverable      | Red    | The unit has occurred unrecoverable fault in self-testing <ul style="list-style-type: none"> <li>- Invalid Module ID</li> <li>- Firmware fault</li> <li>- Hardware fault</li> </ul> |

### 2) NET : Network Status LED

| State   | LED is            | Description  |
|---|-------------------|--|
| No Powered<br>Baudrate Search mode<br>& No Data exchange mode | Off               | Device is in mode baudrate search or may be not powered.   |
| No Baudrate Search mode<br>& No Data exchange mode            | Flashing<br>Green | Device has searched baudrate and can be parameterizes by a master there is no cyclic user data exchange Parameter fault<br>Wait configuration telegram Configuration fault |
| Data exchange mode  | Green             | Device is in the cyclic data exchange mode with the parameterization master  |

### 3) I/O Module Status Checking

I/O status indicator LED. You can check the operation status of the Expansion Module

#### ◆ I/O : Expansion Module Status LED

| State                                   | LED is          | To Indicate  |
|---|-----------------|--|
| Not Powered<br>No Expansion Module      | Off             | Device has no expansion module or may be not powered   |
| FnBus On-line,<br>Do not Exchanging I/O | Green           | FnBus Normal Operation   |
| Expansion Configuration<br>Failed       | Flashing<br>Red | Failed to initialize expansion module<br><ul style="list-style-type: none"> <li>- Detected invalid expansion module ID</li> <li>- Overflowed Input/Output Size</li> <li>- Too many expansion module</li> <li>- Initial protocol failure</li> </ul> |
| FnBus connection fault                  | Red             | One or more expansion module occurred in fault state<br><ul style="list-style-type: none"> <li>- Changed expansion module configuration</li> <li>- FnBus communication failure</li> </ul>  |

### 4) Field Power : Field Power Status LED

| State                    | LED is | To Indicate                    |
|--------------------------|--------|--------------------------------|
| Not Supplied Field Power | Off    | Not supplied 24Vdc field power |
| Supplied Field Power     | Green  | Supplied 24Vdc field power     |

# Appendix.A

## 1. DPV1 SERVICE

### 1.1 MSAC1 Read (PROFIBUS-DP Extension to EN50170)

MSAC1 Read request

| Parameter      | Description                     |
|----------------|---------------------------------|
| Remote Address | Slave Address (0~99)            |
| Slot Number    | Slot Number (0~32), 0 : NA-9122 |
| Index          | 1 : Parameter<br>2 : Memory     |
| Length         | 1~128                           |

MSAC1 Read Confirm(+)

| Parameter      | Description          |
|----------------|----------------------|
| Remote Address | Slave Address (0~99) |
| Length         | 1~128                |
| Data           | User Data            |

MSAC1 Read Confirm(-)

| Parameter      | Description          |
|----------------|----------------------|
| Remote Address | Slave Address (0~99) |
| Error Decode   | -                    |
| Error_code 1   | -                    |
| Error_code 2   | Reserved             |

### 1.2 MSAC1 Write (PROFIBUS-DP Extension to EN50170)

MSAC1 Write request

| Parameter      | Description   |
|----------------|---|
| Remote Address | Slave Address (0~99)  |
| Slot Number    | Slot Number (0~32), 0 : NA-9122   |
| Index          | 1 : Parameter<br>2 : Memory   |
| Length         | 1~128   |
| Data           | 1. Parameter<br>2. Memory<br>▷ Data[0] : Offset Low<br>▷ Data[1] : Offset High<br>▷ Data[2] : User Data |

MSAC1 Write Confirm(+)

| Parameter      | Description          |
|----------------|----------------------|
| Remote Address | Slave Address (0~99) |
| Length         | 1~128                |

MSAC1 Write Confirm(-)

| Parameter      | Description          |
|----------------|----------------------|
| Remote Address | Slave Address (0~99) |
| Error Decode   | -                    |
| Error_code1    | -                    |
| Error_code2    | Reserved             |

### 1.3 MSAC2 Initiate (PROFIBUS-DP Extension to EN50170)

MSAC2 Initiate Request

| Parameter                    | Description  |
|------------------------------|--|
| C_Ref                        | PROFIBUS-DP Extension to EN50170                         |
| Rem_Add                      | Slave station address                                    |
| Send Timeout                 | PROFIBUS-DP Extension to EN50170                         |
| Features_Supported_1         | 0x03   |
| Features_Supported_2         | Reserved   |
| Profile_Features_Supported_1 | PROFIBUS-DP Extension to EN50170                         |
| Profile_Features_Supported_2 | PROFIBUS-DP Extension to EN50170                         |
| Profile_Ident_Number         | PROFIBUS-DP Extension to EN50170                         |
| Add_Addr_Param               | PROFIBUS-DP Extension to EN50170<br>(S-Addr=0, D-Addr=0) |

MSAC2 Initiate Confirm(+)

| Parameter                    | Description  |
|------------------------------|--|
| C_Ref                        | PROFIBUS-DP Extension to EN50170                         |
| Features_Supported_1         | PROFIBUS-DP Extension to EN50170                         |
| Features_Supported_2         | PROFIBUS-DP Extension to EN50170                         |
| Profile_Features_Supported_1 | 0  |
| Profile_Features_Supported_2 | 0  |
| Profile_Ident_Number         | 0  |
| Add_Addr_Param               | PROFIBUS-DP Extension to EN50170<br>(S-Addr=0, D-Addr=0) |

MSAC2 Initiate Confirm(-)

| Parameter    | Description             |
|--------------|-------------------------|
| C_Ref        | Communication-Reference |
| Error Decode | -                       |
| Error_code1  | -                       |
| Error_code2  | Reserved                |

#### 1.4 MSAC2 Abort (PROFIBUS-DS Extensions to EN50170)

- MSAC2 Initiate request

| Parameter   | Description  |
|-------------|--|
| C_Ref       | PROFIBUS-DP Extension to EN50170                           |
| Subnet      | Slave station address                                      |
| Instance    | PROFIBUS-DP Extension to EN50170                           |
| Reason_code | PROFIBUS-DP Extension to EN50170<br>MSAC2_Read,MSAC2_Write |

#### 1.5 MSAC2 Read (PROFIBUS-DP Extension to EN50170)

- MSAC2 Read request

| Parameter   | Description  |
|-------------|--|
| C_Ref       | Communication-Reference  |
| Slot Number | Slot Number (0~32), 0 : NA-9122  |
| Index       | 1 : Parameter<br>2 : Memory<br>252 : IO Module Vendor code (Not used by user)<br>253 : Revision (Not used by user)<br>254 : Vendor code (Not used by user) |
| Length      | 1~128  |

- MSAC2 Read Confirm(+)

| Parameter | Description             |
|-----------|-------------------------|
| C_Ref     | Communication-Reference |
| Length    | 1~128                   |
| Data      | -                       |

- MSAC2 Read Confirm(-)

| Parameter    | Description             |
|--------------|-------------------------|
| C_Ref        | Communication-Reference |
| Error Decode | -                       |
| Error_code1  | -                       |
| Error_code2  | Reserved                |



**1.6 MSAC2 Write (PROFIBUS-DP Extension to EN50170)**

MSAC2 Write request

| Parameter   | Description   |
|-------------|---|
| C_Ref       | Slave Address (0~99)  |
| Slot Number | Slot Number (0~32), 0 : NA-9122   |
| Index       | 1 : Parameter<br>2 : Memory<br>253 : Revision (Not used by user)<br>254 : Vender code (Not used by user)  |
| Length      | 1~128   |
| Data        | 1.Parameter<br>2.Memory<br>▷ Data[0] : Offset Low<br>▷ Data[1] : Offset High<br>▷ Data[2] : User Data<br>3.Revision (Not used by user)<br>▷ Data[0] : 0xAE<br>▷ Data[1] : 0xBE<br>▷ Data[2] : 0xCE<br>▷ Data[3] : 0xDE<br>▷ Data[4] : Revision code<br>4.Vender (Not used by user)<br>▷ Data[0] : 0xAE<br>▷ Data[1] : 0xBE<br>▷ Data[2] : 0xCE<br>▷ Data[3] : 0xDE<br>▷ Data[4] : Vender code |

MSAC2 Write Response(+)

| Parameter | Description             |
|-----------|-------------------------|
| C_Ref     | Communication-Reference |
| Length    | 1~128                   |

MSAC2 Write Response(-)

| Parameter    | Description             |
|--------------|-------------------------|
| C_Ref        | Communication-Reference |
| Error Decode | -                       |
| Error_code1  | -                       |
| Error_code2  | Reserved                |

**1.7 Error\_Decode (PROFIBUS-DP Extension to EN50170)**

- ▷ 0~127 : Reserved
- ▷ 128 : DPV1
- ▷ 129~253 : Reserved
- ▷ 254 : FMS
- ▷ 255 : HART



1.8 Error Code\_1 (PROFIBUS-DP Extension to EN50170)

| Bit | 7   | 6 | 5 | 4 | 3  | 2 | 1 | 0 |
|-----|---|---|---|---|--|---|---|---|
|     | <ul style="list-style-type: none"> <li>● Error Class</li> <li>√ 0xA : Application class</li> </ul>      |   |   |   | <ul style="list-style-type: none"> <li>● Error Code</li> <li>√ 0 : Read Error</li> <li>√ 1 : Write Error</li> <li>√ 2 : Module Failure</li> <li>√ 3~7 : Reserved</li> <li>√ 8 : Version conflict</li> <li>√ 9 : Feature not support</li> <li>√ 10~15 : User specific</li> </ul>  |   |   |   |
|     | <ul style="list-style-type: none"> <li>● Error Class</li> <li>√ 0xB : Access class</li> </ul>           |   |   |   | <ul style="list-style-type: none"> <li>● Error Code</li> <li>√ 0 : Invalid index</li> <li>√ 1 : Write length error</li> <li>√ 2 : Invalid slot</li> <li>√ 3 : Type conflict</li> <li>√ 4 : Invalid area</li> <li>√ 5 : state conflict</li> <li>√ 6 : access denied</li> <li>√ 7 : Invalid range</li> <li>√ 8 : Invalid parameter</li> <li>√ 9 : Invalid type</li> <li>√ 10~15 : User specific</li> </ul> |   |   |   |
|     | <ul style="list-style-type: none"> <li>● Error Class</li> <li>√ 0xC : Resource class</li> </ul>         |   |   |   | <ul style="list-style-type: none"> <li>● Error Code</li> <li>√ 0 : Read constrain conflict</li> <li>√ 1 : Write constrain conflict</li> <li>√ 2 : Resource busy</li> <li>√ 3 : Resource unable</li> <li>√ 4~7 : Reserved</li> <li>√ 8~15 : User specific</li> </ul>  |   |   |   |
|     | <ul style="list-style-type: none"> <li>● Error Class</li> <li>√ 0xD : NA-9122 Specific Class</li> </ul> |   |   |   | <ul style="list-style-type: none"> <li>● Error Code</li> <li>√ 1 : Slot Parameter Write error</li> <li>√ 2 : Read Memory error</li> <li>√ 3 : Write Memory error</li> </ul>  |   |   |   |





## 2. Diagnostic

| Byte | Item  | Description                                 |
|------|---|---|
| 0    | Station status 0                                | PROFIBUS Standard Diagnostic                |
| 1    | Station status 0                                |   |
| 2    | Station status 0                                |   |
| 3    | Master Address                                  |   |
| 4    | PNO Ident Number High                           |   |
| 5    | PNO Ident Number Low                            |   |
| 6    | ID Diagnostic Header                            | Extended Diagnostic (ID Related Diagnostic) |
| 7    | Diagnostic allocation (Slot0~7)                 |   |
| 8    | Diagnostic allocation (Slot8~15)                |   |
| 9    | Diagnostic allocation (Slot16~23)               |   |
| 10   | Diagnostic allocation (Slot24~31)               |   |
| 11   | Diagnostic allocation (Slot32~39)               | Reserved                                    |
| 12   |   |   |
| 13   |   |   |
| 14   |   | Extended Diagnostic (Device Status)         |
| 15   | Device Status Diagnostic Header                 |   |
| 16   | Status Type (0xA0 : Manufacture-specific)       |   |
| 17   | Slot Number                                     |   |
| 18   | Status differentiation (0 : No differentiation) |   |
| 19   | Status Message                                  | Reserved                                    |
| 20   |   |   |

ID Related Diagnostic

| Byte | Bit7                        | Bit6   | Bit5   | Bit4   | Bit3   | Bit2   | Bit1   | Bit0   |
|------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| 6    | ID Diagnostic Header (0x45) |        |        |        |        |        |        |        |
| 7    | Slot7                       | Slot6  | Slot5  | Slot4  | Slot3  | Slot2  | Slot1  | NA9122 |
| 8    | Slot15                      | Slot14 | Slot13 | Slot12 | Slot11 | Slot10 | Slot9  | Slot8  |
| 9    | Slot23                      | Slot22 | Slot21 | Slot20 | Slot19 | Slot18 | Slot17 | Slot16 |
| 10   | Slot31                      | Slot30 | Slot29 | Slot28 | Slot27 | Slot26 | Slot25 | Slot24 |
| 11   | Reserved                    |        |        |        |        |        |        | Slot32 |

Device Related Diagnostic (Status message byte)

- ▷ 0x21 : No response from expansion slot
- ▷ 0x22 : Response error (Type)
- ▷ 0x23 : Response error (Slot Number)
- ▷ 0x24 : Response error (Length)
- ▷ 0x25 : Response error (Protocol)
- ▷ 0x26 : Response error (ID)
- ▷ 0x27 : Response error (Function code)
- ▷ 0x28 : Response error (CRC)
- ▷ 0x29 : Response error (Data)
- ▷ 0x2A : Response error (Sequence)

- ▷ 0x2B : NA9122 Request error
- ▷ 0x2C : NA9122 Broadcasting error
- ▷ 0x41 : FnBus Rx Timeout
- ▷ 0x42 : Faulty input data (Type)
- ▷ 0x43 : Faulty input data (Slot number)
- ▷ 0x44 : Faulty input data (Length)
- ▷ 0x45 : Faulty input data (CRC)
- ▷ 0x46 : Faulty input data (Slot diag.)
- ▷ 0x47 : Input update timeout
- ▷ 0x48 : FnBus token fault
- ▷ 0xC1 : Resource error of slot
- ▷ 0xC2 : Not supported service from slot
- ▷ 0xC3 : Attribute error from slot
- ▷ 0xC4 : Slot is already in this mode
- ▷ 0xC5 : object conflict from slot
- ▷ 0xC6 : Attribute not settable
- ▷ 0xC7 : Insufficient data
- ▷ 0xC8 : Not Supported attribute
- ▷ 0xC9 : Too much data
- ▷ 0xCA : Object not exist
- ▷ 0xCB : Invalid slot parameter
- ▷ 0xCC : Store fail
- ▷ 0xCD : Access denied
- ▷ 0xCE : FnBus token error
- ▷ 0xCF : Object not exist
- ▷ 0xD0 : Slot memory size over
- ▷ 0xE1 : No expansion slot
- ▷ 0xE2 : Too many slots
- ▷ 0xE3 : Input data size overflow
- ▷ 0xE4 : Output data size overflow
- ▷ 0xE5 : Invalid product code
- ▷ 0xE6 : Set output-offset error
- ▷ 0xE7 : Set slot active-flag error
- ▷ 0xE8 : Set slot parameter error
- ▷ 0xE9 : Set FnBus parameter error
- ▷ 0xEA : Slot warmstart error
- ▷ 0xEB : Get slot catalog number error
- ▷ 0xEC : Invalid slot request
- ▷ 0xED : Firmware fault
- ▷ 0xEE : Set word-type error
- ▷ 0xF0 : Vendor code fault
- ▷ 0xFF : Not ready



### **CREVIS Co., Ltd**

D-11F, Digital Empire Bldg., 980-3, Youngtong-Dong,  
Youngtong-Gu, Suwon, GyeongGi-Do, Korea

TEL : +82-31-206-8077~8

Sales : +82-31-273-6452

FAX : +82-31-206-8079

E-mail : [crevis@crevis.co.kr](mailto:crevis@crevis.co.kr)

Homepage : <http://crevis.co.kr>