FNL (Fieldbus Network Link)

Installation Instructions

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1 Introduction

The present document shall describe the hardware installation of the FNL module and its corresponding interfaces i.e. interface modules. FNL is a gateway between IP-based Ethernet networks (10/100 Mbit/s) and the fieldbus PROFIBUS DP.

FNL supports PROFIBUS DP (RS485 bus) up to 12 Mbit/s as well as PROFIBUS PA (IEC1158-2 bus) with 31.25 Kbit/s. The current configuration is indicated on the side label of the FNL. FNL is not intrinsic save. To connect FNL to intrinsic save PROFIBUS PA networks intrinsic save barriers must be used.

Figure 1: FNL with PROFIBUS DP/12 Mbit/s

Figure 2: FNL with PROFIBUS PA/31.25 Kbit/s
2 Hardware Installation

2.1 Assembly on Hat Rail

The FNL module is designed for hat rail assembly according to DIN 50022. Take the device out of the box and hold it upright so that the letters are legible. Now, position the recess for the rail right above the hat rail and press the device downwards until it snaps in. For the disassembly, please use a screwdriver. With it, remove the notch at the lower bar, lift up the module and remove it.
2.2 Assignment of Connections and Plugs

2.2.1 FNL with PROFIBUS DP / 12 Mbit/s

Figure 3: Connections and Plugs FNL with PROFIBUS DP/12 Mbit/s
2.2.2 FNL with PROFIBUS PA/31.25 Kbit/s

PROFIBUS PA Connection (Clamp 13-16)

<table>
<thead>
<tr>
<th>Clamp</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Shield</td>
</tr>
<tr>
<td>14</td>
<td>+24 Volt Input of the internal PA Power Supply (bridge to clamp 5)</td>
</tr>
<tr>
<td>15</td>
<td>PA+ Signal line</td>
</tr>
<tr>
<td>16</td>
<td>PA- Signal line</td>
</tr>
</tbody>
</table>

For a detailed description see chapter 2.7

RS232 Service Interface and 24 Volt output for PA Power Supply (Clamp 5-8)

<table>
<thead>
<tr>
<th>Clamp</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>+24 V Output for internal PA Power supply</td>
</tr>
<tr>
<td>6</td>
<td>0 Volt</td>
</tr>
<tr>
<td>7</td>
<td>Transmit</td>
</tr>
<tr>
<td>8</td>
<td>Receive</td>
</tr>
</tbody>
</table>

Ethernet 10/100 RJ 45

Ethernet LEDs
For a detailed description see chapter 2.6

24 V Power Supply (Clamp 9-12)

<table>
<thead>
<tr>
<th>Clamp</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>0 Volt</td>
</tr>
<tr>
<td>10</td>
<td>0 Volt</td>
</tr>
<tr>
<td>11</td>
<td>+24 Volt</td>
</tr>
<tr>
<td>12</td>
<td>+24 Volt</td>
</tr>
</tbody>
</table>

Figure 4: Connection and Plugs FNL with PROFIBUS PA/31.25 Kbit/s
2.3 Power Supply Connection

The power supply basis for the FNL module is 24 V DC. The following options for a correct connection exist:

- 0 V is to be connected either to clamp 9 or 10 whereas +24 V to clamp 11 or 12.
- The resulting free clamps can be used for distributing the power supply to other 24 V devices in the cabinet.
- The four clamps are to be combined in one plug which is coded for the sake of an unmistakable assignment. It can be inserted manually and removed again with a screwdriver.
- The power up current impulse of FNL is round about 1.5 A. The used power supply may not switch off at this charge.

clamp 9 and 10: 0 V
clamp 11 and 12: +24 V

Figure 5: Power Supply Connection

2.4 Ethernet Connection

The Ethernet 10/100 baseTX is to be connected to the front part of the RJ45 connector. To do so, insert the corresponding plug until it snaps in. The shield is connected to the hat rail. Please note that the transmission rate adjusts itself automatically: the slowest rate on the network determines the speed. For connection to an existing network, connect the FNL onto the corresponding hub or switch via patch cable. For direct connection without use of a hub or a switch, a cross-wired Ethernet cable is required.
2.5 PROFIBUS DP RS485 Connection (if installed)

The PROFIBUS DP is connected to the front side of the module on the 9-pin DSUB, as depicted in Figure 3: Connections and Plugs FNL with PROFIBUS DP/12 Mbit/s. In case the FNL module is the last unit in the bus chain, a terminator will have to be installed. All common PROFIBUS plugs already include a terminator, which can be switched on or off. Please tighten the assembly screws of the plug. The shield is automatically connected to the hat rail.

<table>
<thead>
<tr>
<th>Pin-No.</th>
<th>Signal</th>
<th>Function</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>shielding</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>R x D / T x D - P</td>
<td>data+</td>
<td>input/output</td>
</tr>
<tr>
<td>5</td>
<td>0 V (potential free 80 mA)</td>
<td>supply terminator</td>
<td>output</td>
</tr>
<tr>
<td>6</td>
<td>5 V (potential free 80 mA)</td>
<td>supply terminator</td>
<td>output</td>
</tr>
<tr>
<td>8</td>
<td>R x D / T x D - N</td>
<td>Data-</td>
<td>input/output</td>
</tr>
</tbody>
</table>

Table 1: Pin Assignment

Note: For correct operation of the PROFIBUS a terminator has to be installed on each end of the bus.

![Figure 6: PROFIBUS Bus Terminator](image)
2.6 LEDs

The LEDs depicted above have the following meaning:

**BF:** bus failing, red, lighting whenever the PROFIBUS is not yet configured or cannot be operated

**Run:** bus running, green, lighting while the PROFIBUS is in operation

**Rec:** receiving, green, lighting while the FNL is receiving data on the Ethernet

**TX:** transmitting, green, lighting while the FNL is sending data on the Ethernet

**LNK:** link active, yellow, lighting when there is a logical connection between the FNL and the superior Ethernet partner

**100:** 100 Mbit/s, red, lighting while the Ethernet communication is running on 100 Mbit/s. At 10 Mbit/s the LED is off. The data rate adjusts automatically and cannot be manually selected.
2.7 PROFIBUS PA Connection (if installed)

The PROFIBUS PA (IEC1158-2) is accessible via clamps 13, 14, 15, 16, which are to be combined in one plug which is coded for the sake of an unmistakable assignment.

**Clamp 13** is the shield and is connected to the hat rail. It can be combined with a strain relief which is plugged into the clamp. This part is included in the package.

**Clamp 14** is the 24 V input of the internal PA power supply. If internal PA power supply is to be used, this input will have to be connected to the +24 V output (clamp 5, see next chapter) via an external wire. If an external PA power supply is used, this line will remain open. External power supplies are necessary when working with a large number of PA subscribers or at high temperatures. Please, find more details in the part „Technical Data“.

**Clamp 15** is the positive signal line to the PA bus.

**Clamp 16** is the negative signal line to the PA bus.

The PA bus terminator is installed inside the FNL. The terminator cannot be switched off. It is important for another terminator to be installed at the other end of the bus.

---

Figure 7: PROFIBUS PA Connection
2.8 RS232 Service Interface

To configure the FNL, terminals can be connected via the terminal connection (RS232/V24). In general, the terminal consists of a PC with corresponding terminal emulation. We recommend hyper terminal under Windows XX. What can be controlled or observed via the terminal is described in the section „Setting into Operation“.

Clamps 5 … 8 serve as terminal connection and as 24 V output for the internal PA power supply.

- **Clamp 5** supplies the 24 V that are needed to activate the internal PA power supply (only available with the PA Version of FNL)
- **Clamp 6** is the 0 V for the RS232 interface.
- **Clamp 7** is the outgoing data line of the RS232 interface from viewpoint of the FNL.
- **Clamp 8** is the incoming data line of the RS232 interface from viewpoint of the FNL.

2.8.1 Pin assignment RS232-Interface cable

![RS232 Interface cable diagram]

Figure 8: RS232 Interface cable
# Technical Data

<table>
<thead>
<tr>
<th>FNL</th>
<th>G61740x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>114.5 mm x 99 mm x 45 mm</td>
</tr>
<tr>
<td>Environmental temperature during operation</td>
<td>0 ... 40 °C</td>
</tr>
<tr>
<td>Environmental temperature during storage</td>
<td>-40 ... 100 °C</td>
</tr>
<tr>
<td>Safety</td>
<td>EN60950</td>
</tr>
<tr>
<td>Electromagnetic compatibility (EMV)</td>
<td>EN50081-2 and EN50082-2</td>
</tr>
</tbody>
</table>

Table 2: Technical Data I

<table>
<thead>
<tr>
<th>FNL NET+ARM Module</th>
<th>B617401</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>NET+ARM</td>
</tr>
<tr>
<td>Clock pulse frequency</td>
<td>31 MHz</td>
</tr>
<tr>
<td>Storage</td>
<td>16 MB SDRAM, 2 MB Flash</td>
</tr>
<tr>
<td>Power supply</td>
<td>12 … 36 V, nom. 24V DC</td>
</tr>
<tr>
<td>Current consumption</td>
<td>At 24 V: max. 120 mA</td>
</tr>
<tr>
<td>Ethernet</td>
<td>10/100 baseTX</td>
</tr>
<tr>
<td>Dielectric strength Ethernet</td>
<td>1500 VAC</td>
</tr>
</tbody>
</table>

Table 3: Technical Data II

<table>
<thead>
<tr>
<th>FNL DP Module</th>
<th>B617402</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFIBUS IC</td>
<td>ASPC2</td>
</tr>
<tr>
<td>Bus interface</td>
<td>Profibus in accordance to EN50170</td>
</tr>
<tr>
<td>Max. data rate</td>
<td>12Mbit/s</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>500VAC</td>
</tr>
<tr>
<td>Current consumption</td>
<td>At 24 V: max. 100 mA (is supplied by NET+ARM module)</td>
</tr>
</tbody>
</table>

Table 4: Technical Data III
### FNL PA Module

<table>
<thead>
<tr>
<th></th>
<th>B617403</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFIBUS IC</td>
<td>Find 1, alternatively SPC4-2</td>
</tr>
<tr>
<td>bus interface</td>
<td>IEC1158-2 or DIN EN 61158-2</td>
</tr>
<tr>
<td>Current consumption without bus supply</td>
<td>50 mA at 24 V (supplied by NET+ARM module)</td>
</tr>
<tr>
<td>Type of PROFIBUS PA bus supply</td>
<td>Internal or external</td>
</tr>
<tr>
<td>Supply voltage for internal PA bus supply</td>
<td>18 … 36V, nom. 24 V DC</td>
</tr>
<tr>
<td>Current consumption for internal PA bus supply</td>
<td>150 mA</td>
</tr>
<tr>
<td>Max. power supply for external PA bus subscribers and internal bus supply</td>
<td>100 mA</td>
</tr>
<tr>
<td>Max. power supply for external PA bus subscribers and external bus supply</td>
<td>Described in IEC1158-2 or. DIN EN 61158-2. depending on power supply</td>
</tr>
<tr>
<td>Isolation PA-circuit to FNL</td>
<td>500 VAC</td>
</tr>
<tr>
<td>EX-safety</td>
<td>None, use barrier!</td>
</tr>
</tbody>
</table>

Table 5: Technical Data IV
4 Software Installation

COMSOFT and TMG i-tec offer different software packages for the FNL:

- **COMSOFT Network Configurator Tool**
  Basic tool for FNL Network configuration

- **TMG i-tec DPE Programming Interface for Windows NT/2000**
  Windows DLL based programming interface for the TMG-Net protocol

- **COMSOFT OPC Server for Windows NT/2000/XP**
  Data Access 2.0 OPC Server incl. configuration tool and OPC test client

- **COMSOFT FDT comDTM**
  FDT 1.2 Communication DTM for FNL to be used with FDT compatible frame applications like PactWARE or FieldCare.

- **COMSOFT TCP/IP socket based programming interface**
  TCP/IP Socket based programming interface for the integration of FNL with any operating system platform. To compile the PROFIBUS DP configuration the configuration tool CONFIGURATOR II is included in scope of delivery.

- **COMSOFT Modbus TCP Interface**
  Modbus TCP Server V1.1 compatible Ethernet interface for the connection to any Modbus TCP Client application. To compile the PROFIBUS DP configuration the configuration tool CONFIGURATOR II is included in scope of delivery.
5 Setting into Operation

The FNL network configuration is performed via Ethernet by the tool **COMSOFT Network Configurator**.

The Ethernet based network configuration of FNL is possible from version 5.02. Older versions of FNL must be configured via the RS232 service interface.

Start the program **COMSOFT Network Configurator** from the Windows start menu **COMSOFT GmbH/COMSOFT Network Configurator**.

Click on the Search icon: **COMSOFT Network Configurator** scans the network and displays all found **COMSOFT Ethernet devices**:

![COMSOFT Network Configurator](image)

Figure 9: **COMSOFT Network Configurator**
5.1 Configuration of the FNL TCP/IP Adresse

Double click the appropriate FNL in the displayed list and enter the TCP/IP Address, Subnet mask und Gateway.

![Device Properties](image)

Figure 10: Configuration of TCP/IP Address and Timeout
5.2 Configuration of operation mode

FNL supports two operation modes to ensure the downwards compatibility to previous FNL versions.

![Device Properties](image)

Figure 11: Configuration of the FNL operation mode

5.2.1 COMSOFT interface

The operation mode COMSOFT interface is to be configured for the use of FNL in combination with the following applications:

- **COMSOFT** TCP/IP socket based programming interface
- **COMSOFT** Modbus TCP Server Interface
- **COMSOFT** FNL LabVIEW Treiber

For details refer to the related documentation within scope of delivery of the particular application.
5.2.2  TMG interface

The operation mode **TMG interface** ensures the downwards compatibility to previous FNL versions and is to be used with the following applications:

- TMG i-tec DPE programming interface
- COMSOFT FNL OPC Server
- COMSOFT FDT comDTM
If the operation mode TMG interface is selected and if a FNL symbolic name and Timeout are already configured, they are additionally displayed in the General Tab (see also chapter 5.3 Configuration of symbolic names for FNL):
5.3 Configuration of symbolic names for FNL

5.3.1 General

To use FNL with the DPE programming interface or the COMSOFT OPC Server a symbolic name and a timeout value must be assigned to the FNL. This can be performed by the TMG Setup program (TMGDEVICES.exe) within scope of delivery:

![Configuration Dialog TMG Setup](image)

Figure 12: Configuration Dialog TMG Setup
5.3.2 Configuration of a new FNL

If you wish to add a new FNL, click onto the Add button.

The following window will appear:

Figure 13: Property Dialog

Select the type FNL from the list box Board Type:

Figure 14: Selection of Board Type
A new window opens:

![Figure 15: FNL Properties](image)

In the field **IP Address**, enter the TCP/IP address of the FNL. The TCP/IP address must match with that assigned by the **COMSOFT Network Configurator Tool**. Otherwise the DPE Programming Interface or the OPC Server cannot communicate with the FNL via the symbolic name.

In the field **Timeout**, you may set a alive timeout value for network interruption. If the alive timeout expires, an error message will be generated by the driver interface of the PC and sent to the superior application. We recommend to keep the default value of 20.000 ms.
5.3.3 Changing an already configured FNL

Click onto the name of the FNL you wish to change. The command button **Properties** will be activated. Click onto it.

The following window will appear:

![Properties Window](image)

Figure 16: FNL Properties

The symbolic name, the TCP/IP address and the Timeout value can be changed.

5.4 FNL with DPE Programming Interface

After complete configuration of the FNL, the DPE programming interface is now ready for operation. For more details, please refer to the DPE programming interface documentation.

5.5 FNL with OPC Server

- Configuration of the PROFIBUS line and definition of the OPC tags with **configurator.exe**. The procedure is described in detail in the help context of the PROFIBUS /OPC Configurator.

- Start of the OPC Server **FNL_Server.exe**. Detailed annotations regarding the operation and settings of the user interface are to be found in the help context of the OPC Server.
5.6 FNL with FDT comDTM

Start after installation and network configuration of the FNL the FDT frame application and update the FDT device catalog. The procedure to get on line with the connected Slaves is described in detail in the comDTM's on line help system.

5.7 FNL socket based programming interface

Refer to the included Getting Started Document (GettingStarted.pdf).

5.8 Test of Network Connection (ping)

Accessibility of a correctly configured FNL, connected to both power supply and network, can be tested from a PC by using the command ping in Windows NT. Syntax: ping <TCP/IP-address>.