# Profibus Network Slave Module

October 2001 GFK-1538B

## *Product Description*

| | |
|---|---|
| Firmware version: | 1.00 |
| Firmware upgrades: | The Network Slave Module (NSM) firmware resides in FLASH memory. This firmware may be upgraded with future versions via serial download from an appropriate personal computer connected to the serial port of the headend device. |
| Profibus Certification: | Certificate available upon request. |

## *Specifications*

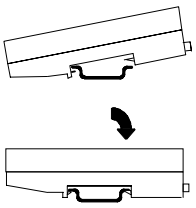
| | |
|---|---|
| Profibus network address | 1 to 125. Software-configurable |
| Profibus network data rate | 9.6Kbaud to 12Mbaud, auto-detected |
| I/O data | 384 bytes maximum. Up to 244 bytes of inputs or 244 bytes of outputs. |
| Indicators (2) | OK LED indicates health of the NSM<br>Com LED indicates communications status. |
| Power Consumption | +5V@350mA |

## *Preinstallation Check*

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

## *Quick Start Guide*

1. **Install the Communications Carrier on the DIN Rail** by simply clicking it into place.



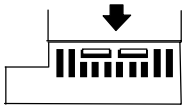
Note: Connecting carriers must be installed on the same section of 35mm x 7.5mm DIN rail.

The DIN rail must have a conductive (unpainted) finish for proper grounding.

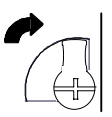
(*Refer to the heading* **Module Installation** *for information about space requirements or module orientation, or if you are installing the NSM in an area of excessive vibration).*

2. **Install the Module on the Communications Carrier**.

The latch on the module must be in the unlocked position.



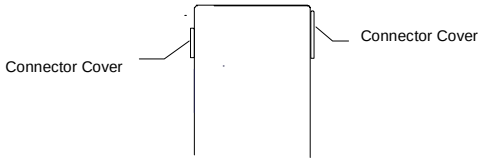
Align the connectors and the latch post and press the NSM down until the two tabs on the bottom of the NSM click into place.



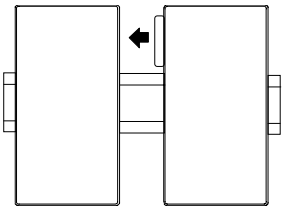
Turn the latch to the locked position to secure the NSM to the top of the carrier.

3. **Connect the communications bus to the** to the connector on the front of the Network Slave Module. (*Refer to the heading* **Bus Installation Guidelines** *for detailed bus installation instructions.)*

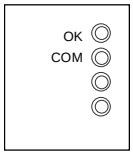
4. **Remove the connector cover on the right-hand side of the Communications Carrier**. Do not discard this cover; you will need to install it on the last carrier. It protects the connector pins from damage and ESD during handling and use. Do not remove the connector cover on the left-hand side.




5. **Install additional modules** by mounting modules on their carriers and sliding them along the DIN rail to fully engage the connectors in the sides of the carriers.



6. **Power up the System, and Observe the Module LEDs**. The LEDs indicate the presence of power and show the operating mode and status of the NSM.




**OK** Green indicates the NSM has completed powerup diagnostics and is successfully communicating over the PLC backplane.

Blinking green indicates that the NSM is in boot mode or its firmware is being updated.

Amber when the NSM has detected a fault, is not communicating over the PLC backplane, or has received an invalid configuration.

Blinking amber means the NSM has either detected a fault, is not communicating over the PLC backplane, or has received an invalid configuration.

OFF when the NSM is not receiving power.

**COM** Green indicates the NSM is online and in network data transfer state.

Blinking green indicates that the NSM is in network data transfer state but not exchanging communications with the CPU (CPU is stopped).

Amber when the NSM is communicating on the Profibus network but its configuration does not match the Profibus master.

Blinking amber means the NSM has rejected the configuration from the CPU, or the configuration contains no network I/O specifications (eg. the default configuration).

OFF when the NSM is offline and has not yet received its configuration from the CPU.

## *Bus Installation Guidelines*

The proper cable for a Profibus network is a shielded twisted pair cable. Profibus cable is sold as "Profibus Network Cable". The twisted pair cable consists of a Green and a Red wire. Below are some of the cable characteristics of Profibus cable.

| | |
|---|---|
| Network Topology | Linear bus, terminated at both ends. Stubs possible. |
| Medium | Shielded twisted pair cable. Shielding may be omitted, depending on the environment. |
| Number of Stations | 32 stations in every segment without repeaters. With repeaters, extendible up to 127. |
| Transmission Speed | 9.6, 19.2, 93.75, 187.5, 500, 1500 Kbits, 3 Mbits, 6 Mbits, 12 Mbits. |
| Connector | 9-pin D-sub connector |
| **Cable Type** | **Profibus DP** |
| Impedance | 135 to 165 Ohms (3 to 20 MHz) |
| Capacity | < 30 pF per meter |
| Resistance | < 110 Ohms per Kilometer |
| Wire Gauge | > 0.64 mm |
| Conductor Area | > 0.34 mm2 |

### *Bus Length*

The maximum bus length using shielded, twisted-pair cable for a single network segment is 1200 meters. Total network length may be increased with the use of repeaters, up to a maximum of 3 repeaters per network. Other cable types may be restricted to shorter bus lengths. The maximum bus length also depends on the data rate, as shown in the following table.

| Maximum Bus Length in Meters | Kbits per Second |
|---|---|
| 1,200 | 9.6 |
| 1,200 | 19.2 |
| 1,200 | 93.75 |
| 600 | 187.5 |
| 400 | 500 |
| 200 | 1,500 |
| 100 | 3,000; 6,000; 12,000 |

Often, it is the required bus length that determines the data rate.

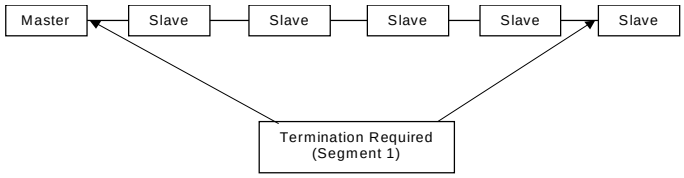
For data rates up to 500 kbits/second, follow the stub recommendations of Profibus Part 1. At 1500 kbits/second the overall drop capacity should be less than 0.2nF. The maximum length of the stub at 1500 kbits/second is 6.6 meters. Cable shielding is recommended at higher baud rates, to maintain communications integrity in the industrial environment.

### *Bus Connectors and Termination*

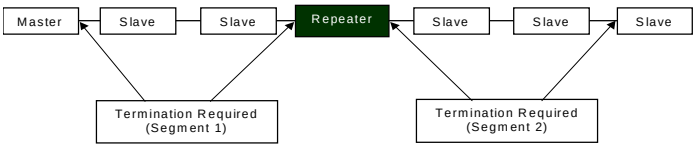
The Network Slave Module provides the Profibus standard female 9-pin D subminiature connectors. Cable connectors are available from most fieldbus parts distributors as "Profibus 9-pin D connectors". These connectors provide termination resistors and a switch on the connector to enable/disable termination. Connectors with and without termination are also available. The connectors label the connections for the twisted pair as cable A and cable B. The following table illustrates the proper assignment of wire to connector to pin to signal.

| Wire Color | Connector | Pin | Signal |
|---|---|---|---|
| Red | B | 3 | RxD/TxD-P |
| | | 5 | DGND |
| | | 6 | VP |
| Green | A | 8 | RxD/TxD-N |

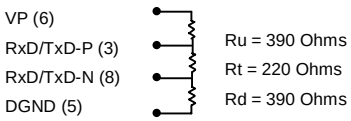
Termination resistors are needed, as defined in Profibus Specification DIN 19245 Part 1 section 3.1.2.5.



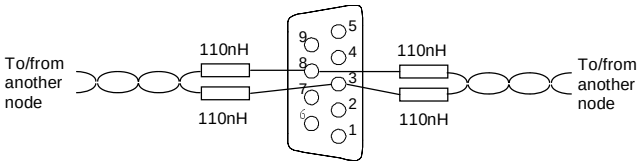

One terminator must be applied at each end of a network segment.




**Important**: For proper network termination, the terminating devices must provide and maintain power. Power is provided by the device on Pin 6 and Ground is provided on Pin 5. If power is lost to either terminating device, the network may not operate correctly. Generally, the network master device is one of the terminating devices. The other terminating device may be a critical slave device or a separately powered, stand-alone terminator.



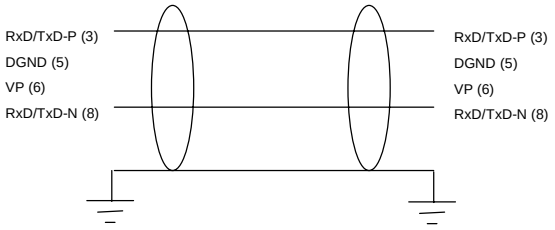

In addition to the termination shown above, the following compensation should be added for 12 Mbit bus technology:




### *Bus Grounding*

Generally, it is only necessary to ensure that the cable shields are attached to ground. In most cable connectors, the shield is attached to the metal housing of the conductor on the cable side and this is brought to ground by the metal connector on the NIU.

In some installations with large networks or higher data rates, large ground potentials (greater than ±7V) may arise. In these cases, it may be necessary to ensure all Profibus devices are attached to the same Protective Earth ground.




## Operating Notes/Restrictions

This module may not be hot-inserted into a system or I/O station.