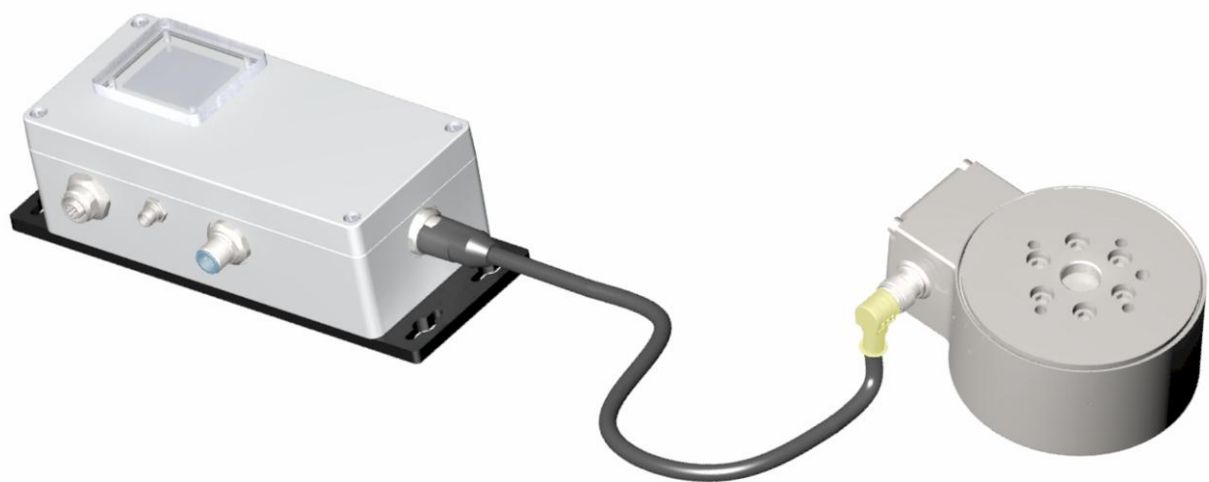


Force/Torque Sensor Systems with PROFINET Interface

Quickstart



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1 Changes and New Features

Compared to the standard Net Box (9105-NETB and 9105-NETBA) there are several differences on the new Net Box

1.1 New Features

- ➔ A PROFINET interface is available as an option (9105-NETB-PN and 9105-NETBA-PN) in addition to the EtherNet/IP and DeviceNet interface.
- ➔ The Monitor threshold relay is a solid state relay (not a mechanical relay).

Note

The current/voltage specification and connector pin assignment for the Monitor Relay connector has changed

1.2 Changes to existing features

- ➔ The position of the Net Box LEDs and DIP switches was moved slightly
- ➔ Power-over-Ethernet is not available when the -PN option is installed
- ➔ New LED assignment

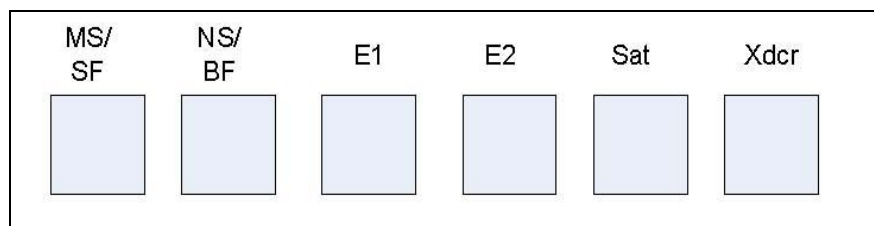


Figure 1

MS/SF	Module Status / System Failure (PROFINET)
NS/BF	Network Status / Bus Failure (PROFINET)
E1	Ethernet 1 (Basic-System) Link/Activity LED
E2	Ethernet 2 (PROFINET Interface) Link/Activity LED
SAT	Sensor Saturation
Xdcr	Sensor Communication

Tab. 3

2 Threshold Relay

The threshold relay closes its contacts when *Threshold Latched* is true. This allows external electrical equipment to react when this occurs. Possible uses include control of E-stop circuits.

Note

To use thresholding, *Threshold Monitoring* must be enabled and each desired threshold condition needs to be set to *On*.

! NOTICE

Output is polarity dependant

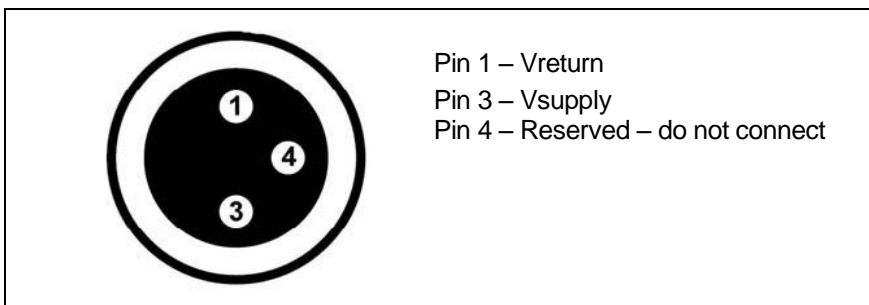


Figure 2

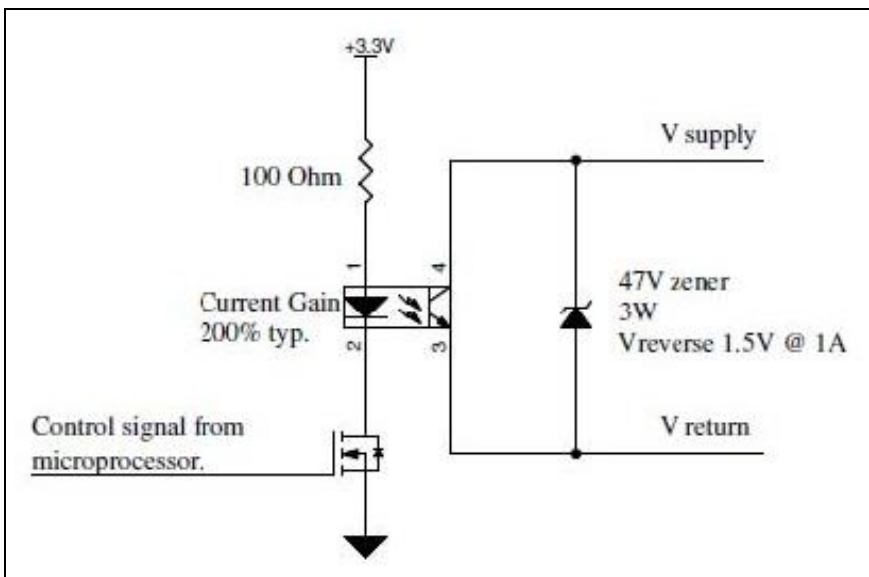


Figure 3

Maximum parameters

- 30 VDC across V_{supply} and V_{return}
- 35 mA supply current.

Maximum delay from fault condition to photocoupler turn on is 500 μ Seconds.

Output is voltage clamped at 47V and reverse polarity protected up to 1 Amp.

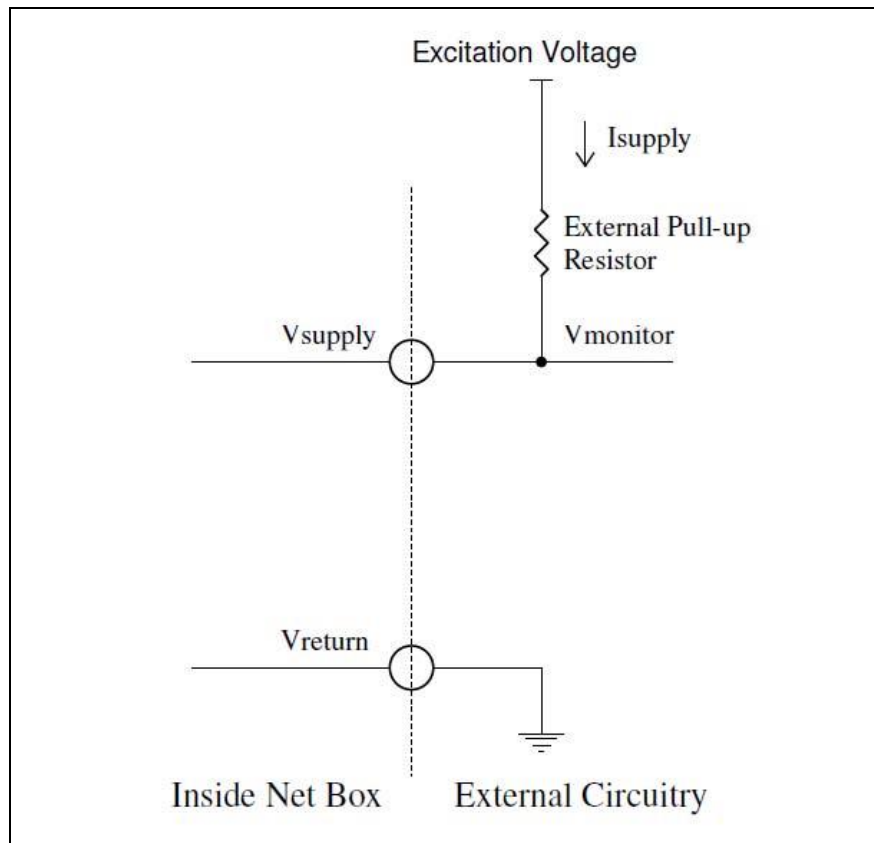


Figure 4

I_{supply} (mA)	5	7.5	10	15	20	30	35
$V_{supply} - V_{return}$ (V)	0.20	0.25	0.30	0.80	1.57	3.60	5.03

Table 1 typical operational values

	Value	Unit
Excitation Voltage	24	V
I_{supply}	10	mA

Table 2 recommended operational vaues

3 PROFINET Interface

A Net Box with the –PN option installed provides a PROFINET interface to access the F/T data and control certain Net F/T functions. The standard EtherNet/IP and DeviceNet interfaces are still available as well.

The PROFINET interface is a second Ethernet interface with its own MAC and IP address.

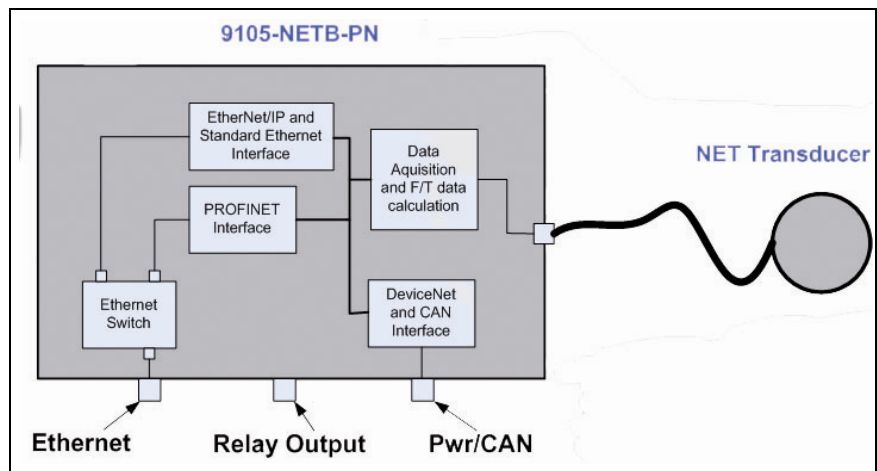


Figure 4 Block diagram of NETB-PN



Abb. 5 view from the side NETB-PN

3.1 PROFINET Interface Information

The following table lists the PROFINET interface parameters employed in the –PN Net Box:

Parameter	Description
DCP	supported
Used Protocols (subset)	UDP, IP, ARP, ICMP (Ping)
Topology recognition	LLDP, SNMP V1, MIB2
VLAN- and priority tagging	yes
Context Management	by CL-RPC
Minimum cycle time	2ms
F/T data update rate	20 Hz
Baud rate	100 MBit/s
Data transport layer	Ethernet II, IEEE 802.3

Table 3 PROFINET Interface Parameter

A GSDML file will be available from the ATI website (http://www.ati-ia.com/Products/ft/software/net_ft_software.aspx) or by e-mail. Reference the part number given below:
Net F/T PROFINET GSDML file 9031-05-1021

3.2 PROFINET Interface in the Communications Web Page

The PROFINET interface can be enabled/disabled on the Net FT Communications Web Page under Fieldbus Module Settings:

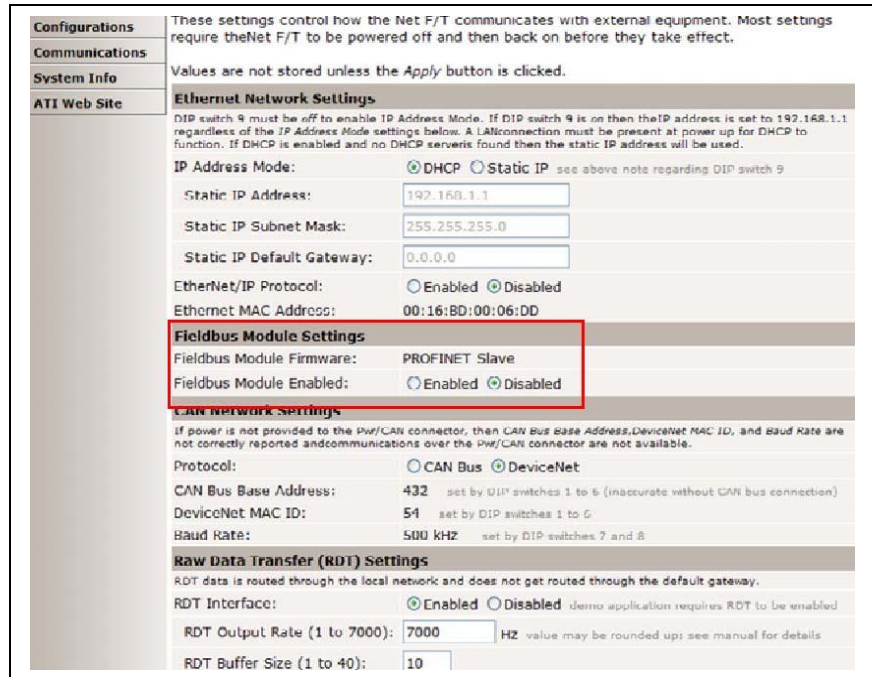


Figure 6

3.3 Bitmap

Robot Input
(= Net F/T Output)

WORD (16-bit)	Bit	Name	Description/Function
0	0-15	Status	Net F/T status word, bits 16 through 31
1	0-15	Fx (16-bit)	Force in X-direction
2	0-15	Fy (16-bit)	Force in Y-direction
3	0-15	Fz (16-bit)	Force in Z-direction
4	0-15	Tx (16-bit)	Torque around X-axis
5	0-15	Ty (16-bit)	Torque around Y-axis
6	0-15	Tz (16-bit)	Torque around Z-axis
7	0-15	Update Counter	Is incremented with each update of the bitmap

Table 4

**Robot Output
(= Net F/T Input)**

WORD (16-bit)	Bit	Name	Description/Function
0	0	Bias	null transducer (removes offset)
0	1	Reset Latch	reset threshold latch
0	2	reserved	
0	3	reserved	
0	4	reserved	
0	5	reserved	
0	6	reserved	
0	7	reserved	
1	0	Config Select bit 0	Select Net F/T Configuration 0 to 15
1	1	Config Select bit 1	
1	2	Config Select bit 2	
1	3	Config Select bit 3	
1	4	reserved	
1	5	reserved	
1	6	reserved	
1	7	reserved	
2	0-7	Threshold 8-15	Select mask for threshold high order byte
2	0-7	Threshold 0-7	Select mask for threshold low order byte

Table 5

3.4 SF and BF LEDs

The MS/SF (System Failure) status LED provides device status for power and proper operation.

When the PROFINET interface is enabled the MS/SF LED has the following behavior

Status	SF LED	Note
No Power	Off	No power applied. Check if voltage is 24 VDC.
Operational	Green	Normal operation
Fault	Red blinking	One of the following faults has occurred: <ul style="list-style-type: none"> - Internal Diagnostic Error - Transducer communication error or no transducer connected - Transducer overload (saturation)

Table 6

When the PROFINET interface is enabled the NS/BF (Bus Failure) LED provides PROFINET status information:

Status	BF LED	Note
OK	Off	Device not on line. Device may not have an IP address or may be powered off.
Not OK	RED	No data exchange
Not OK	RED blinking	No configuration

Table 7

3.5 Reset-To-Factory DIP switch

When the PROFINET interface is enabled DIP switch 10 allows the user to perform a “Reset-To-Factory” function which clears the PROFINET Name Of Station and the IP address of the PROFINET interface. This is useful when already configured NETB-PN devices get swapped or a broken NETB-PN device gets replaced by an already configured device.

→ See Appendix A for a detailed device replacement procedure.

Note:

The “Reset-To-Factory” function does not affect the standard Ethernet and EtherNet/IP interface.

3.6 Calculating F/T Values

Like in the DeviceNet and CAN interface of the Net F/T the force and torque values in the PROFINET bitmap are reduced to 16 bits using the “Scaling Factor for DeviceNet and CAN values”. Please refer to the Net F/T manual section 12.4.2 for details.

3.7 Select Net F/T Configurations

The bits “Config Select 0 to 3” in the PROFINET output bitmap allow the selection of 16 user-defined Net F/T configurations. This allows the change of tool transformations and sensor calibrations. There is a delay of up to one second before a new configuration becomes usable. During the change of configurations the Net F/T does not supply valid data.

3.8 Threshold Select Mask

Up to 16 threshold monitoring conditions can be programmed into the Net Box.

➔ See Net F/T manual section 4.6 for details.

The Threshold select mask allows enabling/disabling individual conditions by setting/resetting the corresponding bit in the “Threshold Select Mask” in the PROFINET output bitmap.

NOTICE

While the PROFINET interface is enabled, the threshold conditions are under PROFINET control and cannot be changed via the website:

Thresholding Setup

Monitor Condition: Floating Latching

Operation:

Floating Monitor: x 100 milliseconds.

Condition Relay Reset Time: **WARNING:** In systems without the solid-state relay option, setting this value to 0 could cause premature relay failure due to excessive activation.

Output Code Combination: Logical OR Logical AND

Threshold Monitoring: Enable Disable

Threshold Conditions: **NOTICE:** The Fieldbus Module is enabled on the [Communications](#) page. In this mode, the Fieldbus Module is responsible for enabling and disabling individual monitor conditions, so your changes to these properties will not be saved. However, you can edit the other properties of the individual monitor conditions.

N	On	Off		Axis	Comparison	Counts	Units	Then	Output Code
0	<input type="radio"/>	<input checked="" type="radio"/>	If	<input type="text" value=""/>	>	<input type="text" value="0"/>	0 N	Then	<input type="text" value="0x00"/>
1	<input type="radio"/>	<input checked="" type="radio"/>	If	<input type="text" value=""/>	>	<input type="text" value="0"/>	0 N	Then	<input type="text" value="0x00"/>
2	<input type="radio"/>	<input checked="" type="radio"/>	If	<input type="text" value=""/>	>	<input type="text" value="0"/>	0 N	Then	<input type="text" value="0x00"/>
3	<input type="radio"/>	<input checked="" type="radio"/>	If	<input type="text" value=""/>	>	<input type="text" value="0"/>	0 N	Then	<input type="text" value="0x00"/>

Abb. 6

Appendix

Net F/T PROFINET Device Replacement Procedures

Assumptions

The Net F/T PROFINET replacement procedures are based on the following assumptions:

1. The topology of the PROFINET network was properly defined with the PROFINET engineering tool.
2. The PROFINET controller supports automatic device replacement.

Replacement of a Net Box with a new “out-of-the-box” Net Box

1. Remove “old” Net Box from PROFINET network and power.
2. Connect new Net Box to PROFINET network and power.
3. The new Net Box will automatically get the name and IP address of the old Net Box assigned.
4. After a few seconds it should be operating on the network.

Replacement of a Net Box with an already-commissioned Net Box

1. Remove “old” Net Box from PROFINET network and power.
2. Connect “new” (= already commissioned replacement) Net Box to power.
3. Remove Net Box cover (four screws)
4. Locate DIP switch 10.

5. Use a non-conductive tool (e.g. plastic stylus) to set the switch to ON and then OFF again. ->
The Net Box will clear its name and IP address after the next power-cycle.
6. Re-apply Net Box cover.
7. Remove “new” Net Box from power.
8. Connect “new” Net Box to PROFINET network and power.

The “new” Net Box will automatically get the name and IP address of the old module assigned.

After a few seconds it should be operating on the network.

The SF LED should be GREEN.

