Panasonic®

PROGRAMMABLE CONTROLLER

FPΣ/FP2 Fieldbus Slave Units

Technical Manual

BEFORE BEGINNING

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Important symbols

One or more of the following symbols may be used in this documentation:

DANGER!

The warning triangle indicates especially important safety instructions. If they are not adhered to, the results could be fatal or critical injury.

◆ CAUTION

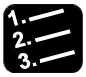
Indicates that you should proceed with caution. Failure to do so may result in injury or significant damage to instruments or their contents, e.g. data.

◆ NOTE

Contains important additional information.

◆ EXAMPLE

Contains an illustrative example of the previous text section.



◆ Procedure

Indicates that a step-by-step procedure follows.

◆ REFERENCE

Indicates where you can find additional information on the subject at hand.

Table of Contents

Chapter 1

Features and Restrictions

1.1 Fieldbus Slave Units

FP2 and FPΣ (Sigma) Fieldbus Slave Units are preassembled to include a Flexible Network Slave (FNS) unit and the corresponding FP-FNS block. Panasonic decided to offer customers these preassembled products to save them time and to prevent damage to the pins in the FNS units, which bend if the FP-FNS blocks are inserted improperly.

You can still order the FNS units and FP-FNS blocks separately. Please contact your local sales office.

You can download convenient function blocks for Control FPWIN Pro to help you program the FP-FNS blocks free of charge from the Panasonic Electric Works Europe AG Web site: http://www.panasonic-electric-works.com.

FP2 Fieldbus Slave Units

Name	Specifications	Part no.
FP2 PROFIBUS DP Slave Unit	PROFIBUS DP	FP2-DPV1-S
FP2 DeviceNet Slave Unit	DeviceNet	FP2-DEV-S
FP2 CANopen Slave Unit	CANopen	FP2-CAN-S
FP2 PROFINET IO Device Unit	PROFINET IO	FP2-PRT-S

FPΣ Fieldbus Slave Units

Name	Specifications	Part no.
FPΣ PROFIBUS DP Slave Unit	PROFIBUS DP	FPG-DPV1-S
FPΣ DeviceNet Slave Unit	DeviceNet	FPG-DEV-S
FPΣ CANopen Slave Unit	CANopen	FPG-CAN-S
FPΣ PROFINET IO Device Unit	PROFINET IO	FPG-PRT-S
FPΣ BACnet-IP Slave Unit	BACnet/IP	FPG-BACIP-S
FPΣ BACnet-MSTP Slave Unit	BACnet MS/TP	FPG-BACMSTP-S

1.2 Expansion Restrictions and Current Limitations

1.2.1 Expansion Restrictions for the FP2-FNS Unit

The number of FP2-FNS units is restricted by the size of the FP2 backplane.

1.2.2 Expansion Restrictions for the FPΣ FNS Unit

The FPΣ-FNS units are connected to the left side of the control unit via the FPΣ expansion connector. Up to 4 expansion units can be connected to the left side of the control unit.

1.2.3 Limitations on Current Consumption

The 5V DC power used to drive the internal circuit of each unit is supplied from the power supply unit of the FP2 through the internal bus of the backplane or from the FPΣ control unit through the expansion connector.

Pay attention to the combination of units so that the rated capacity of the power supply is not exceeded.

Chapter 2

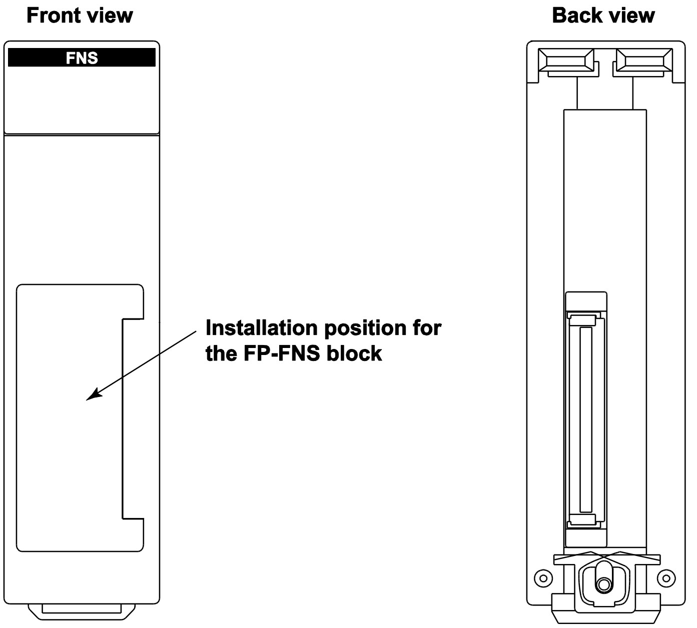
Parts and Functions

2.1 Fieldbus Slave Units

FP2 and FPΣ Fieldbus Slave Units (see page 8) are preassembled to include:

- an FP2 FNS unit (see page 13)
- or an FPΣ FNS unit (see page 14)
- and the corresponding FP-FNS block (see page 15).

2.2 FP2 FNS Unit

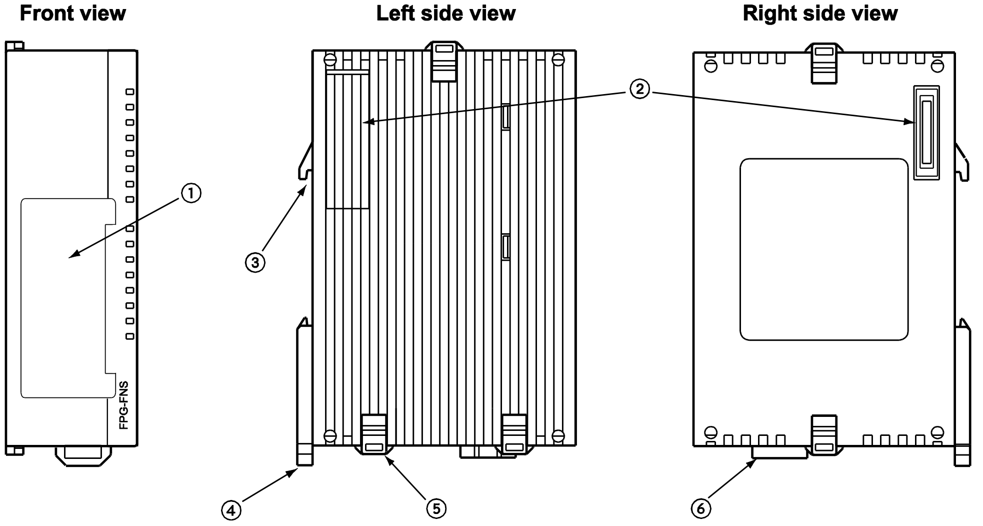


Front view

Back view

Installation position for the FP-FNS block

2.3 FPΣ FNS Unit



① **Installation position for FP-FNS block**

② **FPΣ expansion connector**

Used to connect the unit to the **control unit or other expansion units.**

③ **DIN standard rail attachment**

④ DIN rail attachment lever

⑤ **Expansion hook**

Used to secure an expansion unit. The hook is also used for installation on the flat type mounting plate (part no. AFP0804).

⑥ **Function earth connector**

At least one of the pins must be connected to function earth to achieve proper EMC behavior.

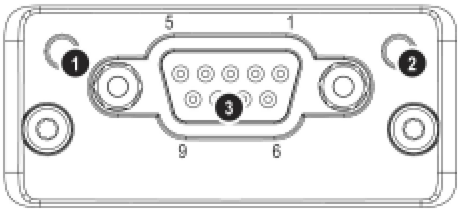
The FPΣ-FNS unit is connected to the left side of the control unit via the FPΣ expansion connector.

2.4 FP-FNS Blocks

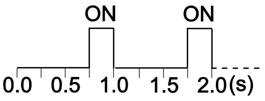
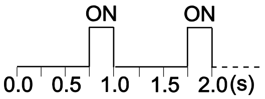
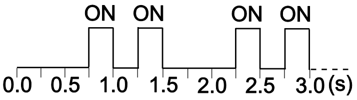
Various FP-FNS blocks are available to meet your networking needs.

2.4.1 FP-FNS Block PROFIBUS DP

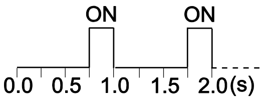
This FP-FNS block connects the unit to a PROFIBUS network.

Front view	No.	Item
	**1**	Operation mode
	2	Status
	3	PROFIBUS connector (DB9F)

Operation Mode

State	Indication	Comments
Off	Not online/No power	-
Green	Online, data exchange	-
Flashing green 	Online, clear	-
Flashing red (1 flash) 	Parametrization error	-
Flashing red (2 flashes)  ON ON ON ON 0.0 0.5 1.0 1.5 2.0 2.5 3.0(s)	PROFIBUS configuration error	Slave configuration does not match master configuration

Status

State	Indication	Comments
Off	No power or not initialized	FP-FNS state = 'SETUP¨' or 'NW_INIT'
Green	Initialized	FP-FNS has left the 'NW_INIT' state
Flashing green 	Initialized, diagnostic event(s) present	Extended diagnostic bit is set
Red	Exception error	FP-FNS state = 'EXCEPTION'

PROFIBUS connector, DB9F, 9-pin Sub-D female

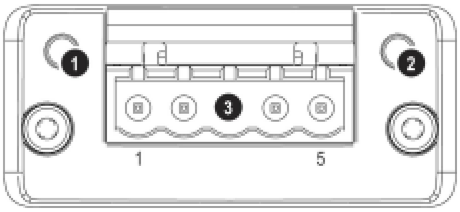
Pin	Signal	Description
1	-	-
2	-	-
3	B Line	Positive RxD/TxD, RS485 level
4	RTS	Request to send
5	GND	Bus ground (isolated)
6	+5V bus output (see note)	+5V termination power (isolated)
7	-	-
8	A Line	Negative RxD/TxD, RS485 level
9	-	-
Housing	Cable shield	• FPΣ: Internally connected to the function earth connector of the FNS unit. • FP2: Internally connected to the earth terminal of the power unit.

☞ ◆NOTE

Any current drawn from pin 6, the +5V bus output pin, will affect the total power consumption.

2.4.2 FP-FNS Block DeviceNet

This FP-FNS block connects the unit to a DeviceNet network.

Front view	No.	Item
	**1** **2** **3**	Network status LED Module status LED DeviceNet connector

Network Status

☞ ◆NOTE

During start-up, an LED test is performed according to the DeviceNet standard.

State	Indication
Off	Not online/No power
Green	Online, one or more connections are established
Flashing green (1Hz)	Online, no connections established
Red	Critical link failure
Flashing red (1Hz)	One or more connections timed out

Module Status

◆**NOTE**

During start-up, an LED test is performed according to the DeviceNet standard.

State	Indication
Off	No power or not initialized
Green	Operating in normal condition
Flashing green (1Hz)	Missing or incomplete configuration, device needs to be configured
Red	Unrecoverable fault(s)
Flashing red (1Hz)	Recoverable fault(s)

DeviceNet Connector

Pin	Signal	Description
1	V-	Negative bus supply voltage (see note)
2	CAN_L	CAN low bus line
3	SHIELD	Cable shield
4	CAN_H	CAN high bus line
5	V+	Positive bus supply voltage (see note)

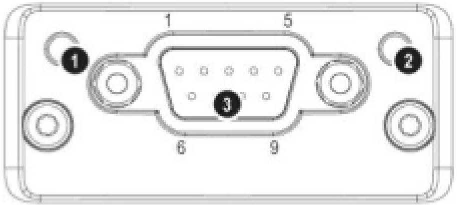
◆**NOTE**

Mandatory 24V bus power.

2.4.3 FP-FNS Block CANopen

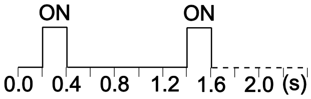
This FP-FNS block connects the unit to a CANopen network.

AFPN-AB6218

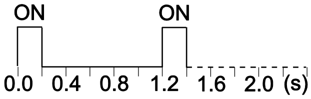
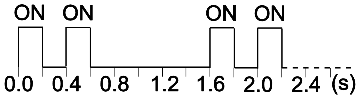
Front view	No.	Item
	**1**	RUN LED
	2	ERROR LED
	3	CANopen interface

RUN

State	Indication
Off	No power or device is in "Exception" state
Flickering green (10Hz)	Automatic baud rate detection
Single flash green	Device stopped

State	Indication
	
Blinking green (2.5Hz)	Device is in "pre-operational" state
Green	"Operational" state
Red	Fatal event encountered. Bus interface is in physically passive state.

ERROR

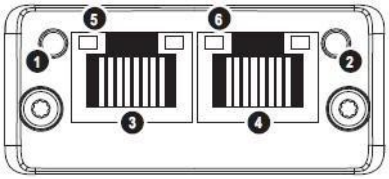
State	Indication
Off	No power or device is in working condition
Single flash red 	A bus error counter has reached warning limit
Flickering red (10Hz)	LSS (Layer Setting Service) in progress
Double flash red  ON ON ON ON 0.0 0.4 0.8 1.2 1.6 2.0 2.4 (s)	Error control event has occurred
Red	Bus off or fatal event

CANopen Interface for AFPN-AB6218

Pin	Signal	Description
1	—	—
2	CAN_L	CAN low bus line (dominant low)
3	CAN_GND	Negative bus power supply input
4	—	—
5	—	—
6	—	—
7	CAN_H	CAN high bus line (dominant high)
8	—	—
9	—	—

2.4.4 FP-FNS Block PROFINET IO

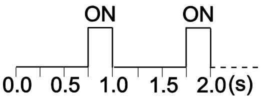
This FP-FNS block connects the unit to a PROFINET IO network.

Front view	No.	Item
	**1**	Network status LED
	2	Module status LED
	3	Ethernet port 1
	4	Ethernet port 2
	5	Link/Activity LED (port 1)
	6	Link/Activity LED (port 2)

Network Status

◆**NOTE**

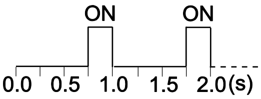
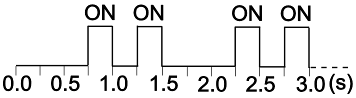
During start-up, a test sequence is performed on this LED.

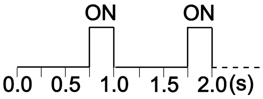
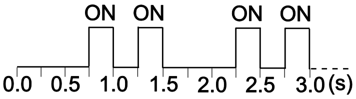
State	Indication	Comments
Off	Offline	No power, or no connection with the IO controller
Green	Online (RUN)	• Connection with IO controller established • IO controller in RUN state
Green, flashing 	Online (STOP)	• Connection with IO controller established • IO controller in STOP state

Module Status

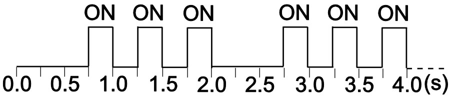
◆**NOTE**

During start-up, a test sequence is performed on this LED.

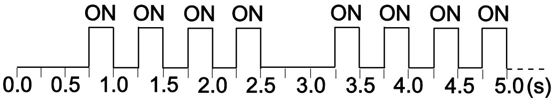
State	Indication	Comments
Off	No power or not initialized	FP-FNS state = 'SETUP'' or 'NW_INIT'
Green	Normal operation	FP-FNS has left the 'NW_INIT' state
Green, 1 flash 	Diagnostic event(s)	Diagnostic event(s) present
Green, 2 flashes  ON ON ON ON 0.0 0.5 1.0 1.5 2.0 2.5 3.0(s)	Blink	Used by engineering tools to identify the node on the network.

State	Indication	Comments
Red	Exception error	FP-FNS state = 'EXCEPTION'
Red, 1 flash 	Configuration Error	Expected configuration by controller differs from real configuration.
Red, 2 flashes  ON ON ON ON 0.0 0.5 1.0 1.5 2.0 2.5 3.0(s)	IP Address Error	IP address not set
Red, 3 flashes*	Station Name Error	Station Name not set
Red, 4 flashes*	Internal Error	FP-FNS has encountered a major internal error.

*3 flashes:



*4 flashes:



LINK/Activity LED

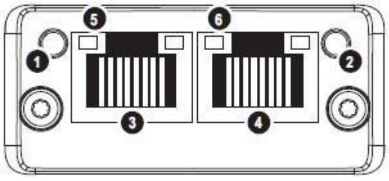
LED State	Indication	Comments
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering (10Hz)	Activity	Ethernet link established, communication present

Ethernet interface, RJ45

The Ethernet interface operates at 100Mbit, full duplex, as required by PROFINET.

2.4.5 FP-FNS Block BACnetIP

This FP-FNS block connects the unit to a BACnetIP network.

Front view	No.	Item
	1	Network status LED
	2	Module status LED
	3	Ethernet port 1
	4	Ethernet port 2
	5	Link/Activity LED (port 1)
	6	Link/Activity LED (port 2)

Network Status

◆NOTE

During start-up, a test sequence is performed on this LED.

State	Indication	Comments
Off	Offline	No power, or no IP address
Green	Online (RUN)	• On-line, one or more BACnet messages have arrived • Module has active COV subscriptions • At least one value object has one or more events enabled
Green,flashing	Online, waiting	Waiting for first BACnet message
Red	Duplicate IP address	FATAL error
Red, flashing	Connection timeout	• No BACnet message has been received within the configured 'process active timeout' time. • A COV or Alarm/Event notification could not be sent to its recipient.

Module Status

◆NOTE

During start-up, a test sequence is performed on this LED.

State	Indication	Comments
Off	No power	FP-FNS state = 'SETUP¨' or 'NW_INIT'
Green	Normal operation	FP-FNS has left the 'NW_INIT' state
Red/green, alternating	Firmware update from file system in progress	
Red	Major fault	EXCEPTION-state, FATAL error etc.
Red, flashing	Recoverable fault(s)	

LINK/Activity LED

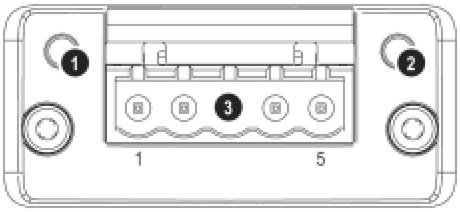
LED State	Indication	Comments
Off	No Link	No link, no communication present
Green	Link (100 Mbit/s) established	Ethernet link established, no communication present
Green, flickering (10Hz)	Activity (100 Mbit/s)	Ethernet link established, communication present
Yellow	Link (10 Mbit/s) established	Ethernet link established, no communication present
Yellow, flickering (10Hz)	Activity (10 Mbit/s)	Ethernet link established, communication present

Ethernet interface, RJ45

The Ethernet interface supports autonegotiation and Auto MDI-X, with 10/100Mbit, full or half duplex operation.

2.4.6 FP-FNS Block BACnet MS/TP

This FP-FNS block connects the unit to a BACnetMS/TP network.

Front view	No.	Item
	1	Network status LED
	2	Module status LED
	3	BACnet MS/TP connector

Network Status

◆ NOTE

During start-up, a test sequence is performed on this LED.

State	Indication
Off	No power
Green	On-line, one or more BACnet messages have arrived Module has active COV subscriptions At least one value object has one or more events enabled
Flashing green (1Hz)	On-line, waiting for first BACnet message
Red	FATAL error
Flashing red (1Hz)	Connection timeout. No BACnet message has been received within the configured ‘process active timeout’ time. A COV or Alarm/Event notification could not be sent to its recipient

Module Status

◆ NOTE

During start-up, a test sequence is performed on this LED.

State	Indication
Off	No power
Green	Operating in normal condition
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Flashing red (1Hz)	Recoverable fault(s)

BACnet MS/TP Connector

Pin	Signal	Description
1	Common	Signal common
2	Data-	Negative RS485 RxD/TxD
3	Shield	Cable shield
4	Data+	Positive RS485 RxD/TxD
5	(Not used)	(Not used)

Chapter 3

Specifications

3.1 FNS Unit General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes
Shock resistance	Shock of 98m/s^2 or more, 4 times on 3 axes
Operation condition	Free from corrosive gases and excessive dust
Current consumption	55mA or less at 5V
Weight (main unit)	FP2-FNS: 88g FPΣ-FNS: 61g

3.2 FP-FNS Block General Specifications

3.2.1 FP-FNS Block PROFIBUS DP General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes
Shock resistance	Shock of 98m/s^2 or more, 4 times on 3 axes
Immunity	EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6
Operation condition	Free from corrosive gases and excessive dust
Insulation resistance	Min. 100MΩ (measured with a 500V DC megger)
Breakdown voltage	500V AC, 1 min. between DC external terminal and ground terminal
Current consumption	230mA or less at 5V
Weight	31g

3.2.2 FP-FNS Block DeviceNet General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55 Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes
Shock resistance	Shock of 98m/s^2 or more, 4 times on 3 axes
Immunity	EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6
Operation condition	Free from corrosive gases and excessive dust
Insulation resistance	Min. 100MΩ (measured with a 500 V DC megger)
Breakdown voltage	500V AC, 1 min. between DC external terminal and ground terminal
Current consumption	65mA or less at 5V; additional 140mA for bus power at 24V
Weight	32g

3.2.3 FP-FNS Block CANopen General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes
Shock resistance	Shock of 98m/s^2 or more, 4 times on 3 axes
Immunity	EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6
Operation condition	Free from corrosive gases and excessive dust
Insulation resistance	Min. 100MΩ (measured with a 500V DC megger)
Breakdown voltage	500V AC, 1 min. between DC external terminal and ground terminal
Current consumption	65mA or less at 5V; additional 140mA for bus power at 24V
Weight	32g

3.2.4 FP-FNS Block PROFINET IO General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes
Shock resistance	Shock of 98m/s^2 or more, 4 times on 3 axes
Immunity	EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6
Operation condition	Free from corrosive gases and excessive dust
Insulation resistance	Min. 100MΩ (measured with a 500V DC megger)
Breakdown voltage	500V AC, 1 min. between DC external terminal and ground terminal
Current consumption	375mA or less at 5V
Weight	31g

3.2.5 FP-FNS Block BACnet/IP General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes

Item	Description
Shock resistance	Shock of $98m/s^2$ or more, 4 times on 3 axes
Immunity	EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6
Operation condition	Free from corrosive gases and excessive dust
Insulation resistance	Min. 100MΩ (measured with a 500V DC megger)
Breakdown voltage	500V AC, 1 min. between DC external terminal and ground terminal
Current consumption	380mA or less at 5V
Weight	31g

3.2.6 FP-FNS Block BACnet MS/TP General Specifications

Item	Description
Operating temperature	0 to +55°C/32 to +131°F
Storage temperature	-20 to +70°C/-4 to +158°F
Operating humidity	30 to 85% RH (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min: double amplitude of 0.75mm/0.030in., 10 min. on 3 axes
Shock resistance	Shock of $98m/s^2$ or more, 4 times on 3 axes
Immunity	EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6
Operation condition	Free from corrosive gases and excessive dust
Insulation resistance	Min. 100MΩ (measured with a 500V DC megger)
Breakdown voltage	500V AC, 1 min. between DC external terminal and ground terminal
Current consumption	200mA or less at 5V
Weight	31g

3.3 FP-FNS Block Communication Specifications

PROFIBUS, DeviceNet, CANopen

Item	PROFIBUS	DeviceNet	CANopen
Baud rate	• Automatic baud rate detection • 9.6kbaud to 12Mbaud	• Automatic baud rate detection • 125kbps to 500kbps	• Automatic baud rate detection • 10kbps to 1Mbps
Isolation	Galvanically isolated bus electronics	Galvanically isolated bus electronics	Galvanically isolated bus electronics
Connection types	DP-V0: process data is accessed from the PROFIBUS network as cyclical I/O data	• Cyclic connections • COS (Change of State) • Bit strobe connections • Polled connections • Explicit connections	PDO (Process Data Object) Exchange via: • Cyclic Synchronous • Acyclic Synchronous • COS • Timer-driven connections
Maximum inputs/outputs	76 words altogether for inputs and outputs (in units of 1, 2 or 4 words)	E.g. for cyclic connections: 128 words in each direction	128 words (for TPDOs and RPDOs)
Additional features	Diagnostic support	• UCMM capable • CIP Parameter Object • Diagnostic support	Diagnostic support
Interface	DB9F (9-pin Sub-D female)	5-pin terminal block	• 9-pin Sub-D male (AFPN-AB6218)

PROFINET IO, BACnet/IP, BACnet MS/TP

Item	PROFINET IO	BACnet/IP	BACnet MS/TP
Baud rate	• 100Mbit/s • Full duplex	• 100Mbit/s • 10Mbit/s • Full duplex • Half duplex	• 9600kbits/s • 19200kbits/s • 38400kbits/s • 76800kbits/s
Isolation	Galvanically isolated bus electronics	Galvanically isolated bus electronics	Galvanically isolated bus electronics
Connection types	• PROFINET IO conformance class B • Cyclic data exchange via PROFINET IO • Real Time (RT) communication, 2ms cycle time	• Change Of Value (COV) notification • Alarm/ Event functionality	• Change Of Value (COV) notification • Alarm/ Event functionality
Maximum inputs/ outputs	128 words of Real Time I/O data in each direction	256-byte write process data	256-byte write process data
Additional features	Diagnostic support	Diagnostic support	Diagnostic support
Interface	Integrated 2-port switch: 2 x RJ45 socket	Integrated 2-port switch: 2 x RJ45 socket	5-pin terminal block

Chapter 4

Installation and Wiring

4.1 Fastening the FP-FNS Block

◆ CAUTION

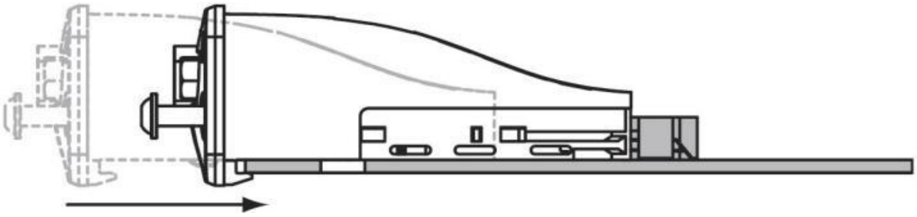
Pins may bend!
To ensure that the pins in the FP-FNS do not bend or break, which will ruin the FP-FNS unit, read the following installation instructions carefully and follow them precisely.

◆ NOTE

Make sure you are not electrostatically charged before you touch the FP-FNS block: the discharge of static electricity can damage parts and equipment.

◆ Procedure

1. CAREFULLY insert the FP-FNS block into the FNS unit's installation port. Do not force the block into the unit! Do not bend the pins!



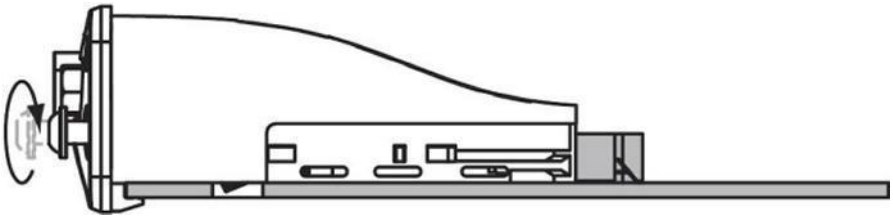
   Make sure that the FP-FNS block is properly placed in the installation port of the FNS unit and properly guided in the slot so that there is no space between the FP-FNS block and the PCB.

2. Push the FP-FNS block into the main unit until it stops. Do not force it!

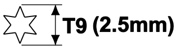
   If the block stops with 5mm of space remaining until it is flush with the surface of the FP-FNS unit, the pins are not alligned properly! Pull the block out and reinsert it carefully, making sure it is properly guided.

3. While flush with the unit's surface, tighten the mounting screws.

   Make sure the mounting mechanics fit into the fastening support holes of the PCB.



   When tightening the FP-FNS block, use a TORX driver with a blade size of T9. The recommended tightening torque is 0.25Nm.

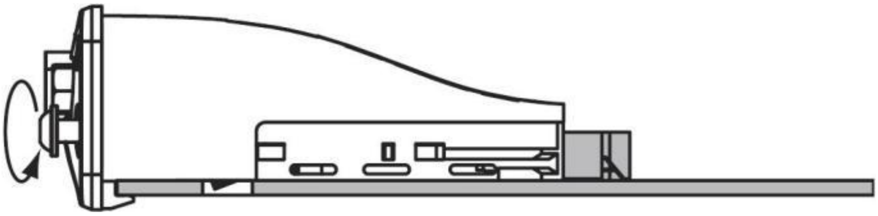


   TORX® are registered trademarks of Acument™ Global Technologies.

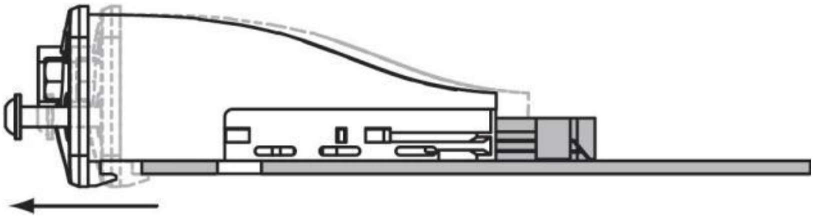
4.2 Removing the FP-FNS Block

◆**Procedure**

1. Loosen the mounting screws.



2. Pull the FP-FNS block out of the installation port of the FNS unit.



4.3 Installation of the FP2/FPΣ Unit

Warning!
Read the following notes carefully before installing the unit!

Failure to follow these instructions could lead to fire or damage the equipment.

Installation environment

- Be sure to install the unit in locations designed for electrical equipment, e.g. in a closed metal cabinet such as a switch cabinet.

Avoid installing the unit in the following locations:

- Ambient temperatures outside the range of 0°C to 55°C.
- Ambient humidity outside the range of 30% to 85% RH (at 25°C, non-condensing)
- Sudden temperature changes causing condensation
- Inflammable or corrosive gases
- Excessive airborne dust, metal particles or salts
- Benzine, paint thinner, alcohol or other organic solvents or strong alkaline solutions such as ammonia or caustic soda
- Excessive vibration or shock
- Direct sunlight
- Water or oil in any form including spray or mist

Static electricity

- Before touching the unit or equipment, always touch some grounded metal to discharge any static electricity you may have generated (especially in dry locations). The discharge of static electricity can damage parts and equipment.

Avoid noise interference from the following sources:

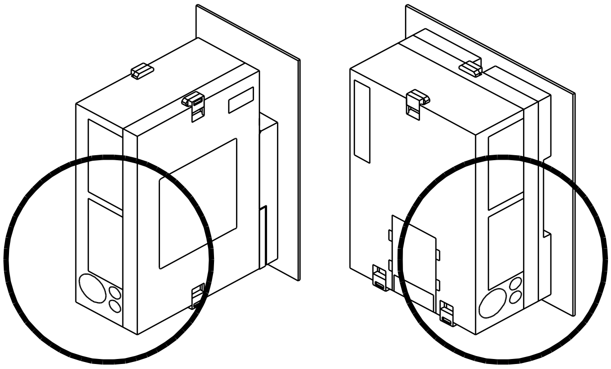
- Influence from power transmission lines, high voltage equipment, power cables, power equipment, radio transmitters, or any other equipment that would generate high switching surges.
- If noise occurs in the power supply line even after the above countermeasures are taken, it is recommended to supply power through an insulation transformer, noise filter, or the like.

Cleaning

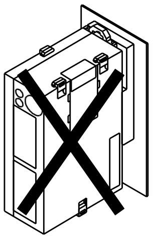
- Do not use thinner based cleaners because they deform the unit case and fade the colors.

Measures regarding heat discharge

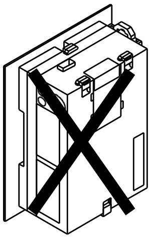
- Always install the CPU orientated with the TOOL port facing outward on the bottom in order to prevent the generation of heat.



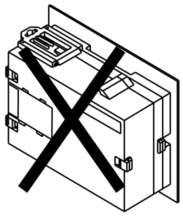
- Do **NOT** install the CPU as shown below.



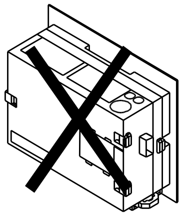
Upside-down



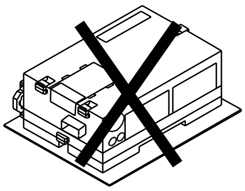
Air duct blocked



Input and output
connectors face down



Input and output
connectors on top

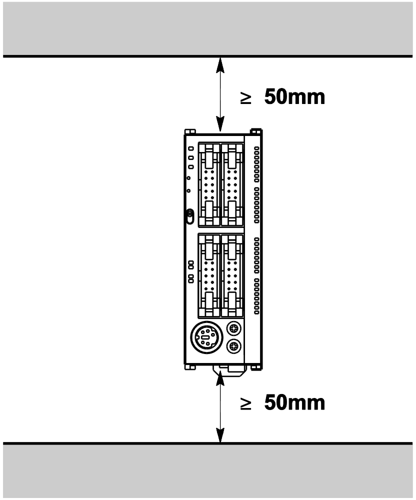


Horizontal
installation of the unit

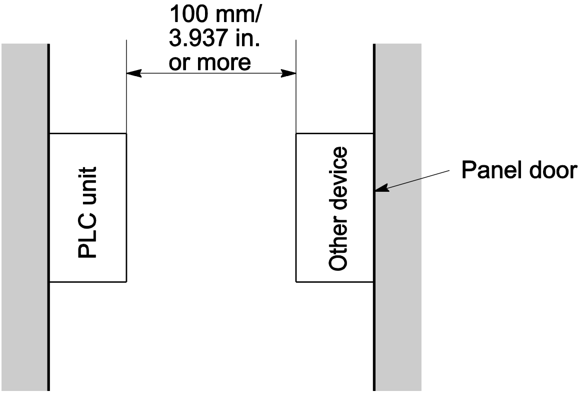
- Do not install the unit above devices which generate heat such as heaters, transformers or large scale resistors.

Installation space

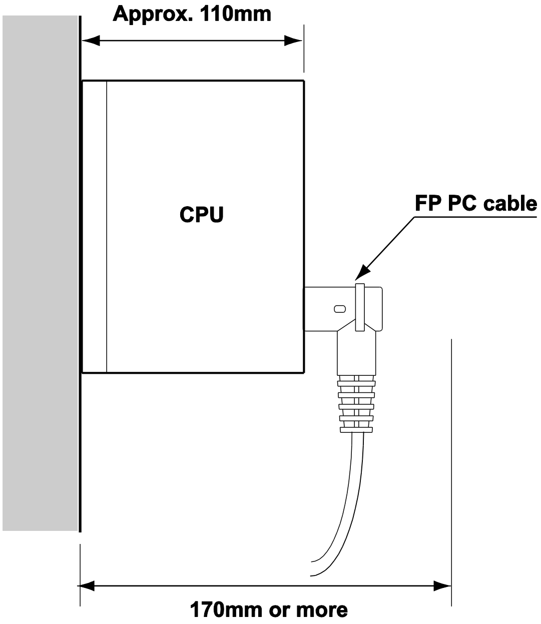
- Leave at least 50mm of space between the wiring ducts of the unit and other devices to allow heat radiation and unit replacement.



- Maintain a minimum of 100mm between devices to avoid adverse effects from noise and heat when installing a device or panel door to the front of the unit.



- For the FP2/FP2SH, keep the first 170mm from the PLC front surface clear of objects to allow the connecting of programming tools. For the FPΣ, the distance should be at least 130mm.



4.4 Mounting Methods

FPΣ-FNS Unit

You can attach up to 4 expansion units, including the FPΣ-FNS unit, to the left side of the FPΣ CPU. You can mount all units on a DIN rail.

◆REFERENCE

For more information, please refer to the FPΣ User's Manual.

FP2-FNS Unit

Install the FP2-FNS unit on the FP2 backplane. You can mount the backplane on a DIN rail.

◆REFERENCE

For more information, please refer to the FP2 Hardware Manual.

4.5 Cable Selection

Select a cable suitable for the network used.

PROFIBUS

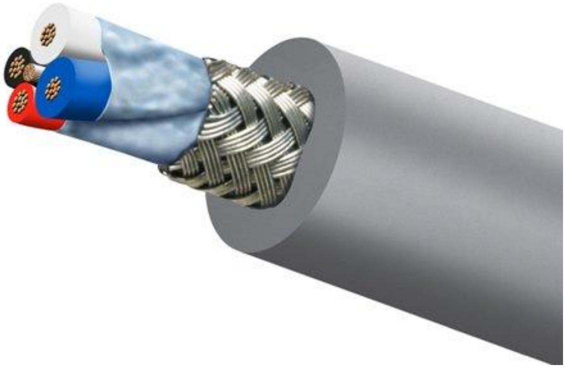
Use a standard PROFIBUS cable and a standard 9-pin Sub-D PROFIBUS connector.

CANopen

Use a standard CANopen cable and a standard 9-pin Sub-D CANopen connector.

DeviceNet

Use a standard DeviceNet cable.



The round cable contains five wires: one twisted pair (red and black) for 24V DC power, one twisted pair (blue and white) for signal, and a drain wire (bare).

You can find proposals for standard cables on the Open DeviceNet Vendor Association's Web site (ODVA): http://www.odva.org. (http://www.odva.org/default.aspx?tabid=84)

PROFINET

Use a standard PROFINET Ethernet cable and a standard RJ45 connector.

BACnet/IP

Use a standard Ethernet cable and a standard RJ45 connector.

BACnet MS/TP

Use a standard RS485 cable.

4.6 Wiring of the FP-FNS Blocks

4.6.1 FP-FNS Block PROFIBUS DP Wiring

Use a standard PROFIBUS cable and standard 9-pin Sub-D male PROFIBUS connectors.

We recommend using a straight (0°) bus interface connector (e.g. PR 103-658). When a horizontal (90°) bus interface connector is used, the cables will be directed toward the top of the unit, which may cause difficulties when installing other devices in a control cabinet.

4.6.2 FP-FNS Block DeviceNet Wiring

Open style connector/suitable wire

DeviceNet has a standard open style connector.

If additional connectors are needed, use the standard CAN 5-pin open style connectors manufactured by Phoenix Contact.

No. of contacts	Phoenix Contact product ID	
5	**Model no.**	**Product no.**
	MSTB 2,5/ 5-ST-5,08 ABGY AU	1849037

Terminal block for DeviceNet

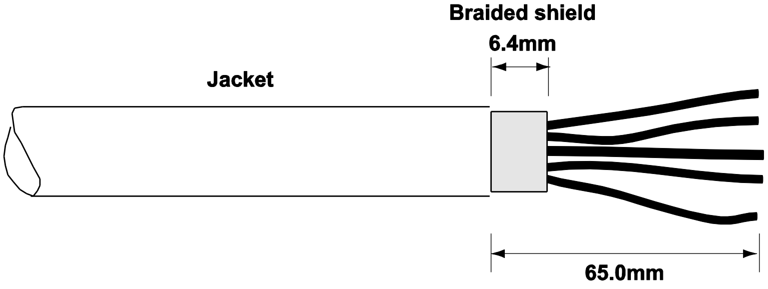
For a suitable wire, please refer to cable selection (see page 40).

Wiring method

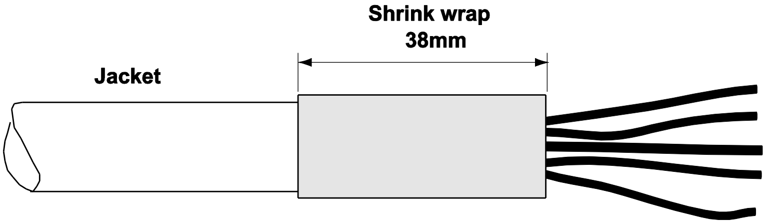
Attach a plug-in, open style connector to a cable.

Procedure

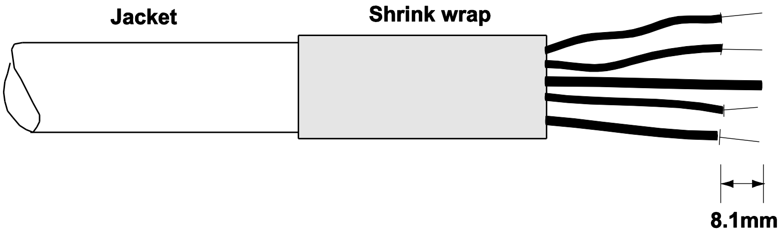
1. Strip 65mm (2.6in.) to 75mm (3in.) of the outer jacket from the end of the cable, leaving no more than 6.4mm (0.25in.) of the braided shield exposed.



2. Wrap the end of the cable with 38mm (1.5in.) of shrink wrap, covering part of the exposed conductors and part of the trunk line insulation.



3. Strip 8.1mm (0.32in.) of the insulation from the end of each of the insulated conductors.



4. Insert each conductor into the appropriate clamping cavity of the open style connector or the screw terminal on the device, according to the color of the cable insulation:

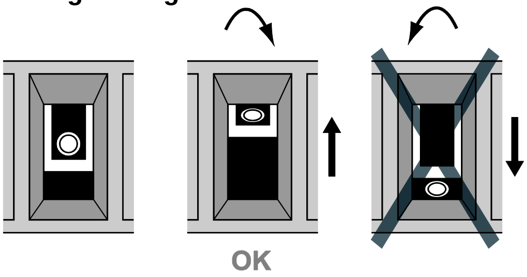
Wire color	Wire identity	Usage
White	CAN_H	Signal
Blue	CAN_L	Signal
Bare	Drain	Shield
Black	V-	Power
Red	V+	Power

5. Tighten the clamping screws to secure each conductor. The male contacts of the device connector must match the female contacts of the connector.

☞ ◆NOTE

- **When removing the wire's insulation, be careful not to scratch the core wire.**
- **Do not twist the wires to connect them.**
- **Do not solder the wires to connect them. The solder may break due to vibration.**

- **After wiring, make sure stress is not applied to the wire.**
- **In the terminal block socket, make sure to clamp the wire in place by turning the tightening screw clockwise.**



4.6.3 FP-FNS Block CANopen Wiring

Use a standard CANopen cable and standard 9-pin Sub-D female CANopen connectors.

We recommend using a straight (0°) bus interface connector. When a horizontal (90°) bus interface connector is used, the cables will be directed toward the top of the unit, which may cause difficulties when installing other devices in a control cabinet.

4.6.4 FP-FNS Block PROFINET IO Wiring

PROFINET uses a transmission rate of 100Mbit/s in full-duplex mode for data communication. Therefore, the cables used must fulfill these requirements. Use a standard, shielded, twisted-pair Ethernet cable (100 BASE TX) with a minimum category 5 rating and at least four wires. For example, STP5 is a shielded, twisted pair cable of category 5.

Please use standard RJ45 connectors. RJ45 connectors are available with different IP degrees of protection.

The maximum distance between two devices should not exceed 100m.

4.6.5 FP-FNS Block BACnetIP Wiring

BACnetIP uses a transmission rate of 10/100Mbit/s in full or duplex mode for data communication. Therefore, the cables used must fulfill these requirements. Use a standard, shielded, twisted-pair Ethernet cable (100 BASE TX) with a minimum category 5 rating and at least four wires. For example, STP5 is a shielded, twisted pair cable of category 5.

Please use standard RJ45 connectors. RJ45 connectors are available with different IP degrees of protection.

The maximum distance between two devices should not exceed 100m.

4.6.6 FP-FNS Block BACnet MS/TP Wiring

Open style connector/suitable wire

BACnet MS/TP has a standard open style connector.

If additional connectors are needed, use the standard 5-pin, open style connectors manufactured by Phoenix Contact.

No. of contacts	Phoenix Contact product ID	
5	**Model no.**	**Product no.**
	MSTB 2,5/ 5-ST-5,08 BK AU	1767915

Terminal block for BACnet MS/TP

For a suitable wire, please refer to cable selection (see page 40).

4.7 Wiring of the FPΣ-FNS Unit

The FPΣ-FNS unit has a spring-cage connection type (2-pin) or screw (3-pin) terminal block on its lower side to connect to function earth. As the pins are internally bridged, one of the pins should be connected to function earth for proper EMC behaviour. Use the following items for wiring.

Accessory terminal block

If additional connectors are needed, use the connector manufactured by Phoenix Contact.

No. of contacts	Phoenix Contact Model no.	Phoenix Contact Product no.
2	FK-MC 0.5/2-ST-2.5	18 81 32 5
3	MC 1,5/ 3-ST-3,5	18 40 37 9

Suitable wire for spring-cage connection type terminal (2-pin)

No. of wires	Size	Cross-sectional area
1	AWG 26-20	0.14-0.5mm²

Suitable wire for screw terminal (3-pin)

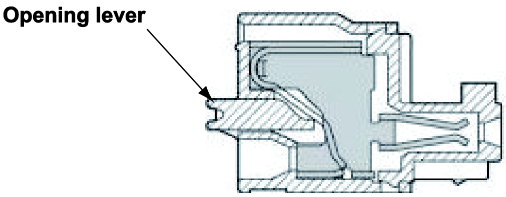
No. of wires	Size	Cross-sectional area
1	AWG 28-16	0.14-1.5mm²

◆**NOTE**

Either fixed or flexible wires can be used to connect the function earth.

Wiring method for the spring-cage connection type

Fixed wires with a diameter>0.2mm² and flexible wires with a wire end ferrule can be plugged in the clamp. When using smaller diameters or flexible wires without a ferrule, you must push the orange opening lever to plug in the wire.



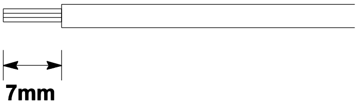
◆**CAUTION**

- **When removing the wire's insulation, be careful not to scratch the core wire.**
- **Do not twist the wires to connect them.**
- **Do not solder the wires to connect them. The solder may break from vibrations.**

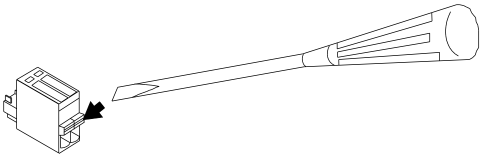
- **After wiring, make sure stress is not applied to the wire.**

◆Procedure

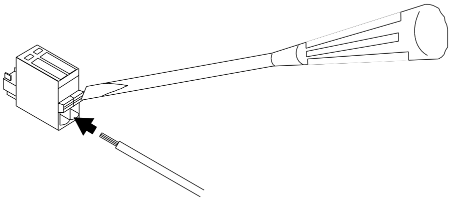
1. Remove a portion of the wire's insulation.



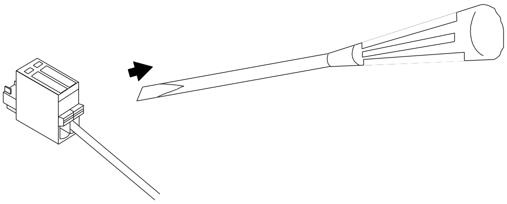
2. Press the orange opening lever of the connector using a tool such as a flat-blade screwdriver.



3. Insert the wire into the connector until it stops while pressing the opening lever.



4. Release the opening lever.



Chapter 5

Programming Examples for FPWIN Pro

5.1 General information

In these programming examples for Control FPWIN Pro, several different functions and function blocks are used, which are explained in the following sections.

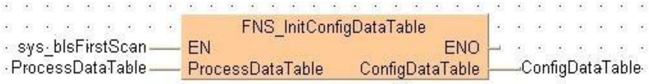
Make sure you use at least version 5.2.3 of FPWIN Pro, into which the functions necessary for programming the FP-FNS blocks are integrated.

These example programs are used to configure the various FNS units and to start communication with the specific network.

The functions and function blocks used in these programming examples depend on the FP-FNS block used. They can be used for either the FP2-FNS or FPΣ-FNS unit.

You can download the function blocks contained in the FNS library free of charge from the Panasonic Electric Works Europe AG Web site.

5.2 FNS_InitConfigDataTable Function



The FNS_InitConfigDataTable function creates a ConfigDataTable from the variable **ProcessDataTable**. This ConfigDataTable is necessary to configure the FP-FNS block.

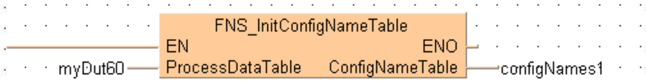
- **Make sure that the size of the variable** ConfigDataTable **corresponds to the structure of the ProcessDataTable, e.g. if the ProcessDataTable consists of three entries, then the** ConfigDataTable **variable should be an "Array[0..2] of WORD", whose size matches the number of entries. If the** ProcessDataTable **variable has only one entry (e.g. WORD), then the** ConfigDataTable **variable should be an "Array[0..0] of WORD" (with size 1).**
- **Allowed data types for the input of the FNS_InitConfigDataTable are all 16-bit (INT, WORD), 32-bit (DINT, DWORD, TIME (32 bits), REAL) and 64-bit variables or arrays of them. 64-bit variables are defined as 2-dimensional arrays, e.g. "Array[0..0,0..3] of INT" is a 64-bit variable, while "Array[0..3] of INT" represents an array with four elements of 16-bit variables.**
- **The data types BOOL, STRING and arrays of these types are NOT allowed at the input of the function FNS_InitConfigDataTable.**

The output **ConfigDataTable** of the function must be an array of WORD.

In the programming example, both variables **ConfigIn** and **ConfigOut** must have a size of three to accommodate the three elements of the DUT's inputs and outputs.

If no inputs or no outputs are used, just omit the corresponding network when creating the configuration data.

5.3 FNS_InitConfigNameTable Function

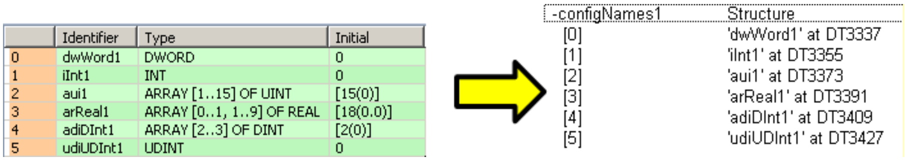


This function creates an array, e.g. **configNames1**, containing all the names and their addresses of the identifiers declared in the DUT ProcessDataTable.

NOTE

- **Make sure that the size of the variable** ConfigNameTable **corresponds to the structure of the ProcessDataTable, e.g. if the ProcessDataTable consists of three entries, then the** ConfigNameTable **variable should be an "Array[0..2] of WORD" whose size matches the number of entries. If the** ProcessDataTable **variable has only one entry (e.g. WORD), then the** ConfigNameTable **variable should be an "Array[0..0] of WORD" (with size 1).**
- **Allowed input data types are all 16-bit (INT, WORD), 32-bit (DINT, DWORD, TIME (32 bits), REAL) and 64-bit variables or arrays of them. 64-bit variables are defined as 2-dimensional arrays, e.g. "Array[0..0,0..3] of INT" is a 64-bit variable, while "Array[0..3] of INT" represents an array with four elements of 16-bit variables.**
- **The data types BOOL, STRING and arrays of these types are NOT allowed at the input variable.**
- **The output** ConfigNameTable **of the function must be an array of WORD.**

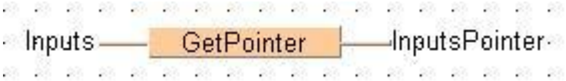
EXAMPLE



	Identifier	Type	Initial
0	dwWord1	DWORD	0
1	iInt1	INT	0
2	aui1	ARRAY [1..15] OF UINT	[15(0)]
3	arReal1	ARRAY [0..1, 1..9] OF REAL	[18(0.0)]
4	adiDInt1	ARRAY [2..3] OF DINT	[2(0)]
5	udiUDInt1	UDINT	0

-configNames1	Structure
[0]	'dwWord1' at DT3337
[1]	'iInt1' at DT3355
[2]	'aui1' at DT3373
[3]	'arReal1' at DT3391
[4]	'adiDInt1' at DT3409
[5]	'udiUDInt1' at DT3427

5.4 GetPointer Function



The GetPointer function outputs the size, area and offset of the input variable and writes it to the output variable of the type POINTER. Connect the output of this function directly to the respective input of the function block.

◆REFERENCE

For more information about the GetPointer function, please refer to the FPWIN Pro online help.

5.5 Programming Example, FP-FNS Block ProfibusDP

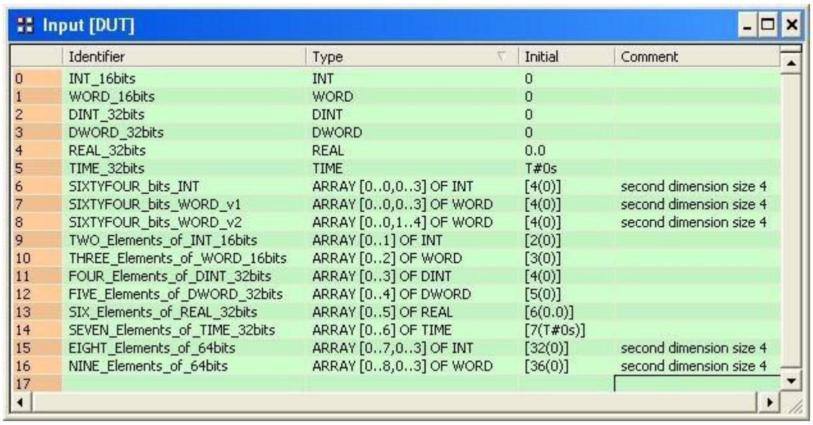
After you install the FNS Library, you can start programming.

◆ **Procedure**

1. Create the Data Unit Types (DUTs) for inputs and outputs.
2. Create input and output variables of the type of DUT generated in the previous step in the global variable list.
3. Generate the configuration data table for inputs and outputs by using the function FNS_InitConfigDataTable (see page 49). Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
4. Create pointers of the input, output and **ConfigDataTable** variables and provide them to the FNS_ProfibusDP function block together with the corresponding variables.

Data Unit Types (DUTs)

In the following picture you can see all possible data types and how the different variables (16-bit, 32-bit and 64-bit) can be defined.

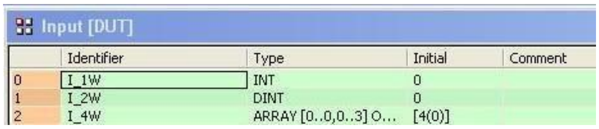


Input [DUT]

	Identifier	Type	Initial	Comment
0	INT_16bits	INT	0	
1	WORD_16bits	WORD	0	
2	DINT_32bits	DINT	0	
3	DWORD_32bits	DWORD	0	
4	REAL_32bits	REAL	0.0	
5	TIME_32bits	TIME	T#0s	
6	SIXTYFOUR_bits_INT	ARRAY [0..0,0..3] OF INT	[4(0)]	second dimension size 4
7	SIXTYFOUR_bits_WORD_v1	ARRAY [0..0,0..3] OF WORD	[4(0)]	second dimension size 4
8	SIXTYFOUR_bits_WORD_v2	ARRAY [0..0,1..4] OF WORD	[4(0)]	second dimension size 4
9	TWO_Elements_of_INT_16bits	ARRAY [0..1] OF INT	[2(0)]	
10	THREE_Elements_of_WORD_16bits	ARRAY [0..2] OF WORD	[3(0)]	
11	FOUR_Elements_of_DINT_32bits	ARRAY [0..3] OF DINT	[4(0)]	
12	FIVE_Elements_of_DWORD_32bits	ARRAY [0..4] OF DWORD	[5(0)]	
13	SIX_Elements_of_REAL_32bits	ARRAY [0..5] OF REAL	[6(0.0)]	
14	SEVEN_Elements_of_TIME_32bits	ARRAY [0..6] OF TIME	[7(T#0s)]	
15	EIGHT_Elements_of_64bits	ARRAY [0..7,0..3] OF INT	[32(0)]	second dimension size 4
16	NINE_Elements_of_64bits	ARRAY [0..8,0..3] OF WORD	[36(0)]	second dimension size 4
17				

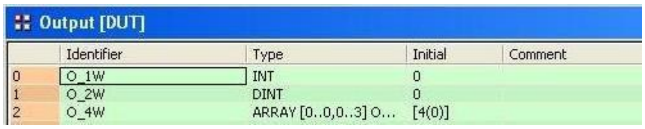
64-bit variables are declared by creating a two-dimensional array, whereas the second dimension must have a size of four. The first dimension specifies the number of elements of this type.

In this programming example both variables, the input and output process data, consist of three elements: a 16-bit, a 32-bit and a 64-bit variable:



Input [DUT]

	Identifier	Type	Initial	Comment
0	I_1W	INT	0	
1	I_2W	DINT	0	
2	I_4W	ARRAY [0..0,0..3] O...	[4(0)]	

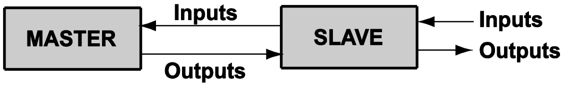


Output [DUT]

	Identifier	Type	Initial	Comment
0	O_1W	INT	0	
1	O_2W	DINT	0	
2	O_4W	ARRAY [0..0,0..3] O...	[4(0)]	

Input process data represents data that will be sent to the master. Thus, from the slave's point-of-view, it has to be regarded as output data.

Output process data represents data received from the master. Thus, from the slave's point-of-view, it has to be regarded as input data.

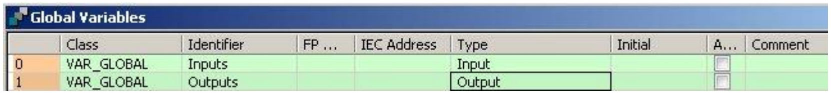


◆ **NOTE**

The order in which inputs and outputs are mapped to the process data is significant and must be replicated in the master configuration. Inputs are mapped to the process data previous to the outputs.

Global Variable List

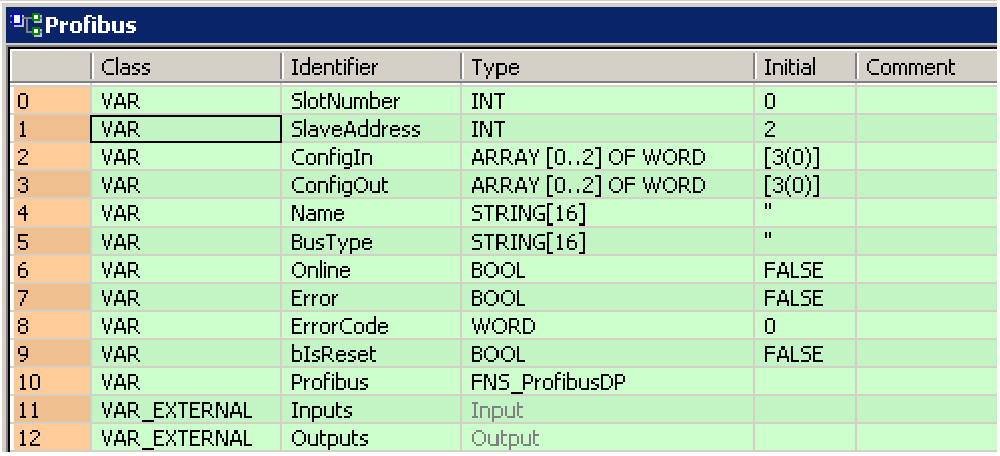
To use the DUTs for further programming and to pass on the process data to an application program declare the following global variable with the type of DUT that was created in the previous step. The global variables are afterwards accessed by the variable class VAR_EXTERNAL in the example program's header.



Global Variables

	Class	Identifier	FP ...	IEC Address	Type	Initial	A...	Comment
0	VAR_GLOBAL	Inputs			Input		□	
1	VAR_GLOBAL	Outputs			Output		□	

POU Header

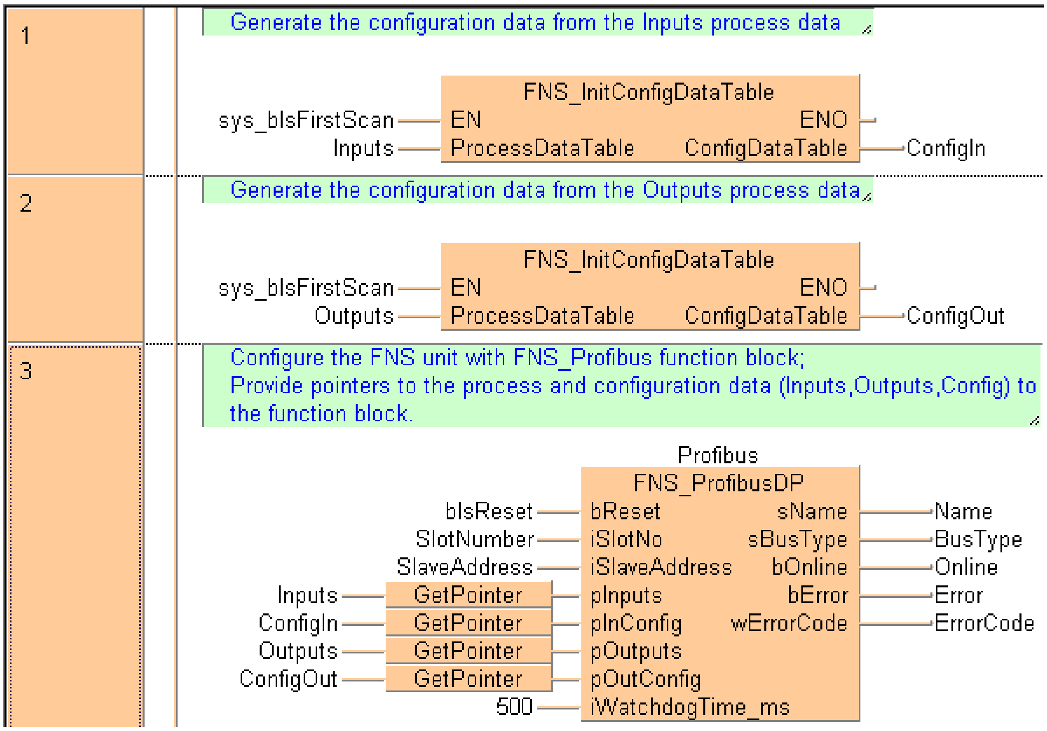


Profibus

	Class	Identifier	Type	Initial	Comment
0	VAR	SlotNumber	INT	0	
1	VAR	SlaveAddress	INT	2	
2	VAR	ConfigIn	ARRAY [0..2] OF WORD	[3(0)]	
3	VAR	ConfigOut	ARRAY [0..2] OF WORD	[3(0)]	
4	VAR	Name	STRING[16]	''	
5	VAR	BusType	STRING[16]	''	
6	VAR	Online	BOOL	FALSE	
7	VAR	Error	BOOL	FALSE	
8	VAR	ErrorCode	WORD	0	
9	VAR	bIsReset	BOOL	FALSE	
10	VAR	Profibus	FNS_ProfibusDP		
11	VAR_EXTERNAL	Inputs	Input		
12	VAR_EXTERNAL	Outputs	Output		

In the POU header, all variables that are required for the program are declared. The size of the variables **ConfigIn** and **ConfigOut** must correspond to the number of entries in the DUTs input and output.

Ladder Diagram Body



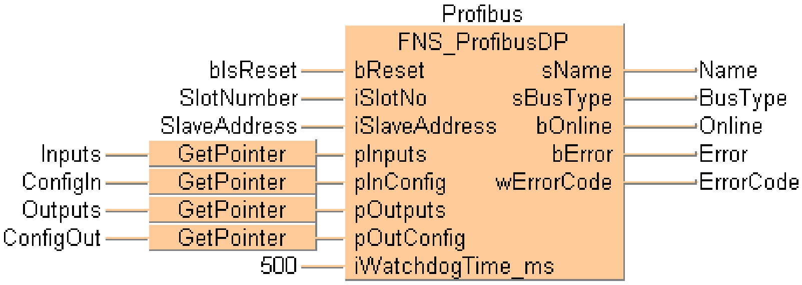
Generate the configuration data from the Inputs process data

Generate the configuration data from the Outputs process data

Configure the FNS unit with FNS_Profibus function block;
Provide pointers to the process and configuration data (Inputs,Outputs,Config) to the function block.

In the ladder diagram body you can see an instance of the FNS_ProfibusDP function block called ProfibusDP, and how the inputs, outputs and configuration data have to be supplied to the function block.

5.5.1 FNS_ProfibusDP Function Block



The FNS_ProfibusDP function block configures the FP-FNS block ProfibusDP. It has to be supplied with information about the configuration, the input and output size, and network-specific data.

If no inputs or no outputs are used, just leave the corresponding pins unconnected.

PLC types: available for FP2/FP2SH and FPΣ.

Variables of this function block have to be of one of the following data types:

Inputs

Input	Data Type	Function
bReset	BOOL	Reset pin; network block will be reset while bReset is set
iSlotNo	INT	Installation position of the FNS unit
iSlaveAddress	INT	PROFIBUS slave address. Values from 0 to 125.
pInputs	POINTER	Pointer to the input's process data table
pInConfig	POINTER	Pointer to the input's configuration data table
pOutputs	POINTER	Pointer to the output's process data table
pOutConfig	POINTER	Pointer to the output's configuration data table
iWatchdogTime_ms	POINTER	Watchdog timeout value for unit in ms. Valid values from 1 to 32767. 0: default of 700ms.

Outputs

Output	Data Type	Function
sName	STRING[16]	Name of installed FP-FNS block
sBusType	STRING[20]	Network type of installed FP-FNS block
bOnline	BOOL	Flag for online status
bError	BOOL	Error flag
wErrorCode	WORD	Error code if error flag is set

List of error codes for the FP-FNS block ProfibusDP

Errorcode	Indication
16#0000	No error
16#0001	PROFIBUS configuration error: master and slave configuration do not correspond
16#0002	Process data area is too large (max.76 words)
16#0005	FP-FNS block is not installed correctly
16#0007	FP-FNS block has incorrect provider ID
16#0008	Wrong FP-FNS block installed
16#0009	Invalid slave address
16#000A	Exception state entered; application watchdog timeout

5.6 Programming Example, FP-FNS Block DeviceNet

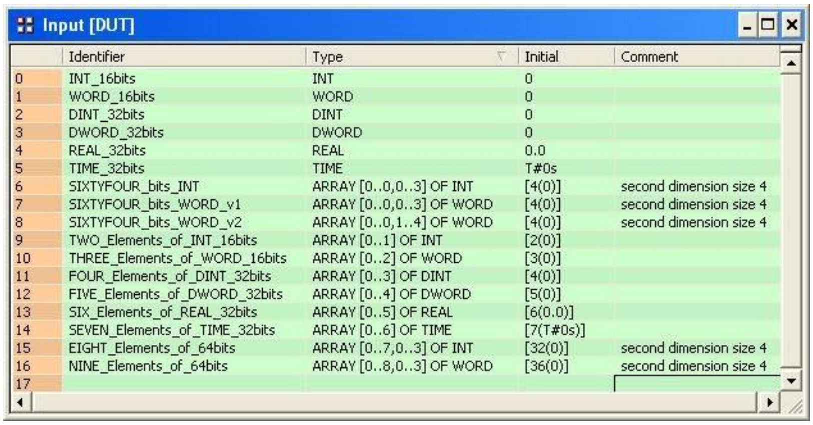
After you install the FNS Library, you can start programming.

Procedure

1. Create the Data Unit Types (DUTs) for inputs and outputs.
2. Create input and output variables of the type of DUT generated in the previous step in the global variable list.
3. Generate the configuration data table for inputs and outputs by using the function FNS_InitConfigDataTable (see page 49). Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
4. Create pointers of the input, output and ConfigDataTable variables and provide them to the FNS_DeviceNet function block together with the corresponding variables.

Data Unit Types (DUTs)

In the following picture you can see all possible data types and how the different variables (16-bit, 32-bit and 64-bit) can be defined.

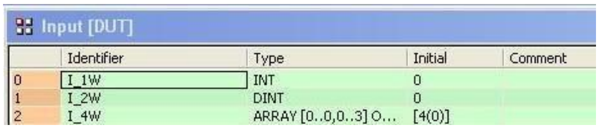


Input [DUT]

	Identifier	Type	Initial	Comment
0	INT_16bits	INT	0	
1	WORD_16bits	WORD	0	
2	DINT_32bits	DINT	0	
3	DWORD_32bits	DWORD	0	
4	REAL_32bits	REAL	0.0	
5	TIME_32bits	TIME	T#0s	
6	SIXTYFOUR_bits_INT	ARRAY [0..0,0..3] OF INT	[4(0)]	second dimension size 4
7	SIXTYFOUR_bits_WORD_v1	ARRAY [0..0,0..3] OF WORD	[4(0)]	second dimension size 4
8	SIXTYFOUR_bits_WORD_v2	ARRAY [0..0,1..4] OF WORD	[4(0)]	second dimension size 4
9	TWO_Elements_of_INT_16bits	ARRAY [0..1] OF INT	[2(0)]	
10	THREE_Elements_of_WORD_16bits	ARRAY [0..2] OF WORD	[3(0)]	
11	FOUR_Elements_of_DINT_32bits	ARRAY [0..3] OF DINT	[4(0)]	
12	FIVE_Elements_of_DWORD_32bits	ARRAY [0..4] OF DWORD	[5(0)]	
13	SIX_Elements_of_REAL_32bits	ARRAY [0..5] OF REAL	[6(0.0)]	
14	SEVEN_Elements_of_TIME_32bits	ARRAY [0..6] OF TIME	[7(T#0s)]	
15	EIGHT_Elements_of_64bits	ARRAY [0..7,0..3] OF INT	[32(0)]	second dimension size 4
16	NINE_Elements_of_64bits	ARRAY [0..8,0..3] OF WORD	[36(0)]	second dimension size 4
17				

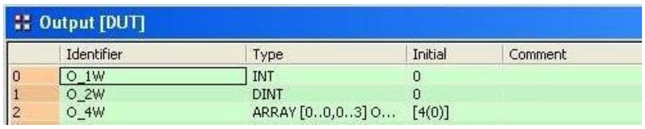
64-bit variables are declared by creating a two-dimensional array, whereas the second dimension must have a size of four. The first dimension specifies the number of elements of this type.

In this programming example both variables, the input and output process data, consist of three elements: a 16-bit, a 32-bit and a 64-bit variable:



Input [DUT]

	Identifier	Type	Initial	Comment
0	I_1W	INT	0	
1	I_2W	DINT	0	
2	I_4W	ARRAY [0..0,0..3] O...	[4(0)]	

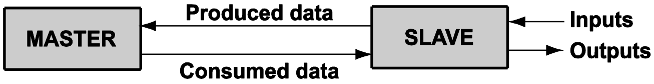


Output [DUT]

	Identifier	Type	Initial	Comment
0	O_1W	INT	0	
1	O_2W	DINT	0	
2	O_4W	ARRAY [0..0,0..3] O...	[4(0)]	

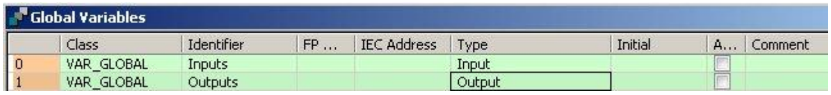
Produced data represents data that will be sent to the master. Thus, from the slave's point-of-view, it has to be regarded as output data.

Consumed data represents data received from the master. Thus, from the slave's point-of-view, it has to be regarded as input data.



Global Variable List

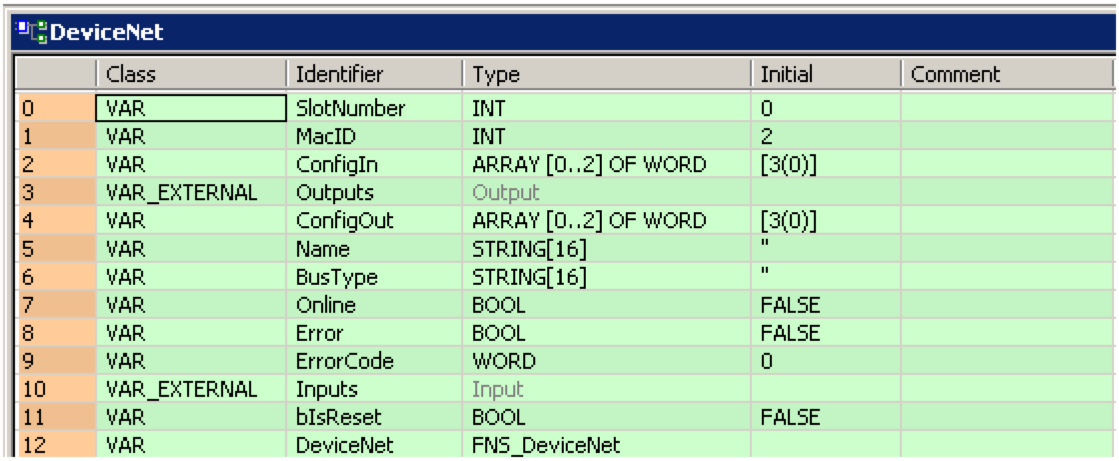
To use the DUTs for further programming and to pass on the process data to an application program declare the following global variable with the type of DUT that was created in the previous step. The global variables are afterwards accessed by the variable class VAR_EXTERNAL in the example program's header.



Global Variables

	Class	Identifier	FP ...	IEC Address	Type	Initial	A...	Comment
0	VAR_GLOBAL	Inputs			Input		☐	
1	VAR_GLOBAL	Outputs			Output		☐	

POU Header

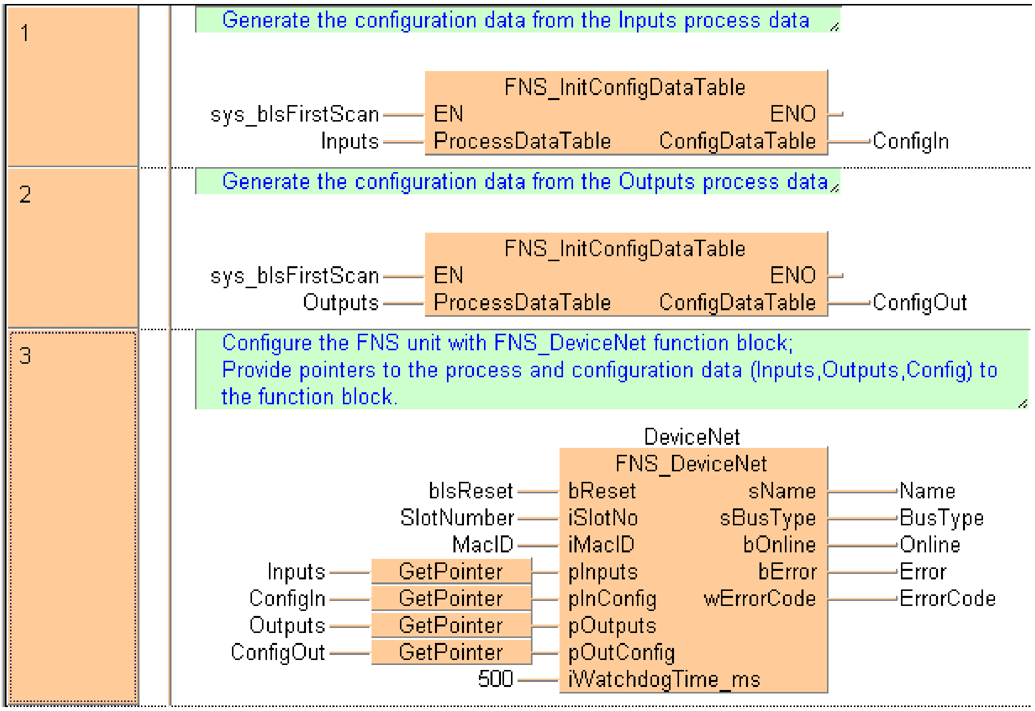


DeviceNet

	Class	Identifier	Type	Initial	Comment
0	VAR	SlotNumber	INT	0	
1	VAR	MacID	INT	2	
2	VAR	ConfigIn	ARRAY [0..2] OF WORD	[3(0)]	
3	VAR_EXTERNAL	Outputs	Output		
4	VAR	ConfigOut	ARRAY [0..2] OF WORD	[3(0)]	
5	VAR	Name	STRING[16]	''	
6	VAR	BusType	STRING[16]	''	
7	VAR	Online	BOOL	FALSE	
8	VAR	Error	BOOL	FALSE	
9	VAR	ErrorCode	WORD	0	
10	VAR_EXTERNAL	Inputs	Input		
11	VAR	bIsReset	BOOL	FALSE	
12	VAR	DeviceNet	FNS_DeviceNet		

In the POU header, all variables that are required for the program are declared. The size of the variables **ConfigIn** and **ConfigOut** must correspond to the number of entries in the DUTs input and output.

Ladder Diagram Body



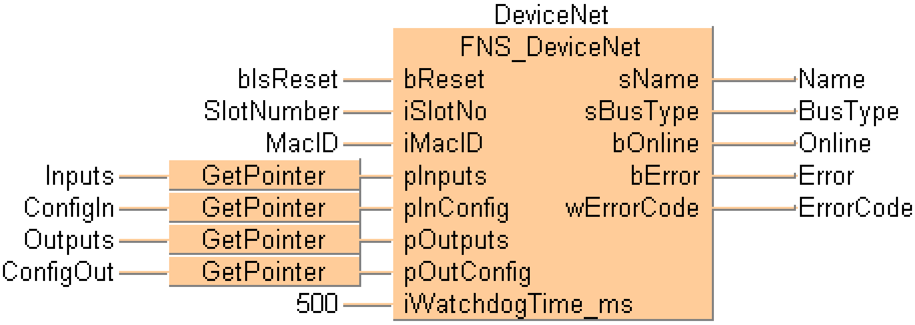
1 Generate the configuration data from the Inputs process data

2 Generate the configuration data from the Outputs process data

3 Configure the FNS unit with FNS_DeviceNet function block;
Provide pointers to the process and configuration data (Inputs,Outputs,Config) to the function block.

In the ladder diagram body you can see an instance of the FNS_DeviceNet function block called DeviceNet, and how the inputs, outputs and configuration data have to be supplied to the function block.

5.6.1 FNS_DeviceNet Function Block



The FNS_DeviceNet function block configures the FP-FNS block DeviceNet. It has to be supplied with information about the configuration, the input and output size and network-specific data.

If no inputs or no outputs are used, just leave the corresponding pins unconnected.

PLC types: available for FP2/FP2SH and FPΣ.

Variables of this function block have to be of one of the following data types:

Inputs

Input	Data Type	Function
bReset	BOOL	Reset pin; network block will be reset while bReset is set
iSlotNo	INT	Installation position of the FNS unit
iMacID	INT	DeviceNet address; Values from 0 to 63.
pInputs	POINTER	Pointer to the input's process data table
pInConfig	POINTER	Pointer to the input's configuration data table
pOutputs	POINTER	Pointer to the output's process data table
pOutConfig	POINTER	Pointer to the output's configuration data table
iWatchdogTime_ms	INT	Watchdog timeout value for unit in ms. Valid values from 1 to 32767. 0: default of 700ms.

Outputs

Output	Data Type	Function
sName	STRING[16]	Name of installed FP-FNS block
sBusType	STRING[20]	Network type of installed FP-FNS block
bOnline	BOOL	Flag for online status
bError	BOOL	Error flag
wErrorCode	WORD	Error code if error flag is set

List of error codes for FP-FNS block DeviceNet

Errorcode	Indication
16#0000	No error
16#0002	Process data area is too large (max.128 Words in each direction)
16#0003	Reset Request Error
16#0004	Bus off or cable disconnected, or no connection established between master and slave (wrong Mac ID or process data configuration)
16#0005	FP-FNS block is not installed correctly
16#0007	FP-FNS block has incorrect provider ID
16#0008	Wrong FP-FNS block installed
16#0009	Invalid Mac ID
16#000A	Exception state entered; application watchdog timeout; unit needs resetting

5.7 Programming Example, FP-FNS Block CANopen

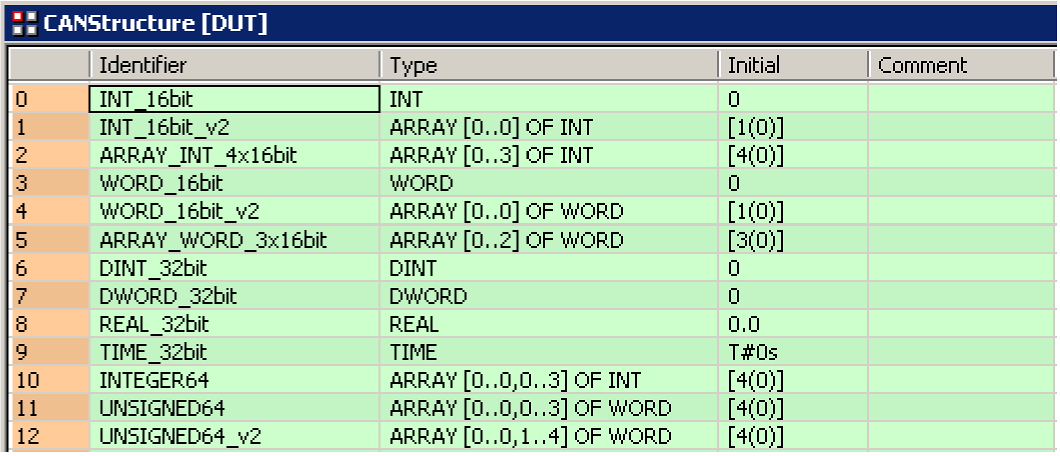
After you install the FNS Library, you can start programming.

Procedure

1. Create the Data Unit Types (DUTs) for inputs and outputs.
2. Create input and output variables of the type of DUT generated in the previous step in the global variable list.
3. Generate the configuration data table for inputs and outputs by using the function FNS_InitConfigDataTable (see page 49). Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
4. Create pointers of the **input**, **output** and **ConfigDataTable** variables and provide them to the **FNS_CANopen** function block together with the corresponding variables.

Data Unit Types (DUTs)

In the following picture you can see all possible data types and how the different variables (16-bit, 32-bit and 64-bit) can be defined.



CANStructure [DUT]

	Identifier	Type	Initial	Comment
0	INT_16bit	INT	0	
1	INT_16bit_v2	ARRAY [0..0] OF INT	[1(0)]	
2	ARRAY_INT_4x16bit	ARRAY [0..3] OF INT	[4(0)]	
3	WORD_16bit	WORD	0	
4	WORD_16bit_v2	ARRAY [0..0] OF WORD	[1(0)]	
5	ARRAY_WORD_3x16bit	ARRAY [0..2] OF WORD	[3(0)]	
6	DINT_32bit	DINT	0	
7	DWORD_32bit	DWORD	0	
8	REAL_32bit	REAL	0.0	
9	TIME_32bit	TIME	T#0s	
10	INTEGER64	ARRAY [0..0,0..3] OF INT	[4(0)]	
11	UNSIGNED64	ARRAY [0..0,0..3] OF WORD	[4(0)]	
12	UNSIGNED64_v2	ARRAY [0..0,1..4] OF WORD	[4(0)]	

64-bit variables are declared by creating a two-dimensional array, whereas the second dimension must have a size of four. The first dimension specifies the number of elements of this type.

In the CANopen network, each entry of the DUT is represented as one PDO (Process Data Object). Each PDO can carry up to 4 words (64 bits) of data. The FNS_CANopen function block supports up to 32 TPDOs and 32 RPDOs. The exact representation of the process data depends on the structure of the .eds file. Only the data types that are supported in each .eds file can be used.

The .eds files from Panasonic Electric Works Europe AG only support one data type for all 32 RPDOs and 32 TPDOs, so please choose the .eds file that best suits your needs. The following .eds files are available at the moment:

- FNS_32PDO_UNSIGNED.EDS, supports the data type unsigned16 (WORD) only

- FNS_32PDO_INTEGER.EDS, supports the data type integer16 (INT) only
- FNS_32PDO_64UNSIGNED.EDS, supports the data type unsigned64 only
- FNSCO4_64IO.EDS, only four RPDOs and four TPDOs are supported

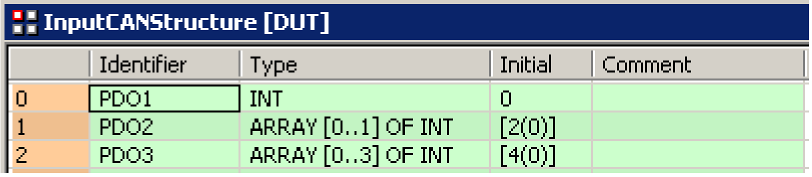
If a mixture of data types is used, you can either handle the data in your application program or use the file "FNSCO4_64IO.EDS". This file only supports up to four TPDOs and four RPDOs, but several different data types can be mixed. Please note: only one entry per PDO is allowed, so each PDO can consist of one data type only.

Independent of the .eds file used, due to the mapping scheme of the process data, a PDO can only be composed of variables of the same data type.

Each entry of the DUT is represented as an individual manufacturer-specific object in the CANopen object dictionary, whereas each element of a DUT is assigned to one subindex of the object, according to the table below. DUTs with one element can be regarded as a one-dimensional array with one element; DUTs with more than one element (arrays) are represented as a one-dimensional array with several elements.

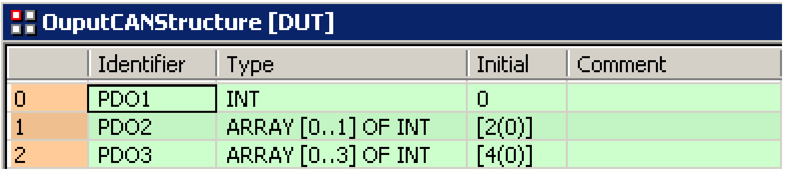
In this programming example both variables, the input and output process data, consist of three elements:

- a 16-bit integer variable (PDO1)
- an array of a 16-bit integer variable with 2 elements (PDO2)
- an array of a 16-bit integer variable with 4 elements (PDO3)



InputCANStructure [DUT]

	Identifier	Type	Initial	Comment
0	PDO1	INT	0	
1	PDO2	ARRAY [0..1] OF INT	[2(0)]	
2	PDO3	ARRAY [0..3] OF INT	[4(0)]	



OuputCANStructure [DUT]

	Identifier	Type	Initial	Comment
0	PDO1	INT	0	
1	PDO2	ARRAY [0..1] OF INT	[2(0)]	
2	PDO3	ARRAY [0..3] OF INT	[4(0)]	

Thus in this programming example, the input structure **InputCANStructure** can be found at the following indexes:

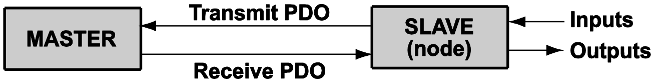
- InputsCAN PDO1: index **2001h**, subindex **01h**
- InputsCAN PDO2: index **2002h**, subindex **01h** and **02h**
- InputsCAN PDO3: index **2003h**, subindex **01h** to **04h**

According to the list above, the output structure **OutputCANStructure** can be found at the following indexes:

- OutputsCAN PDO1: index **2021h**, subindex **01h**
- OutputsCAN PDO2: index **2022h**, subindex **01h** and **02h**
- OutputsCAN PDO3: index **2023h**, subindex **01h** to **04h**

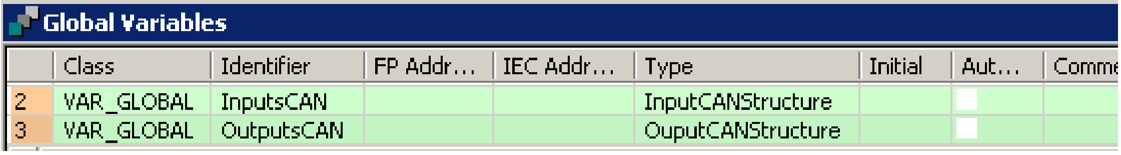
Transmit PDO represents data that will be sent to the master. Thus, from the slave's point-of-view, it has to be regarded as output data.

Receive PDO represents data received from the master. Thus, from the slave's point-of-view, it has to be regarded as input data.



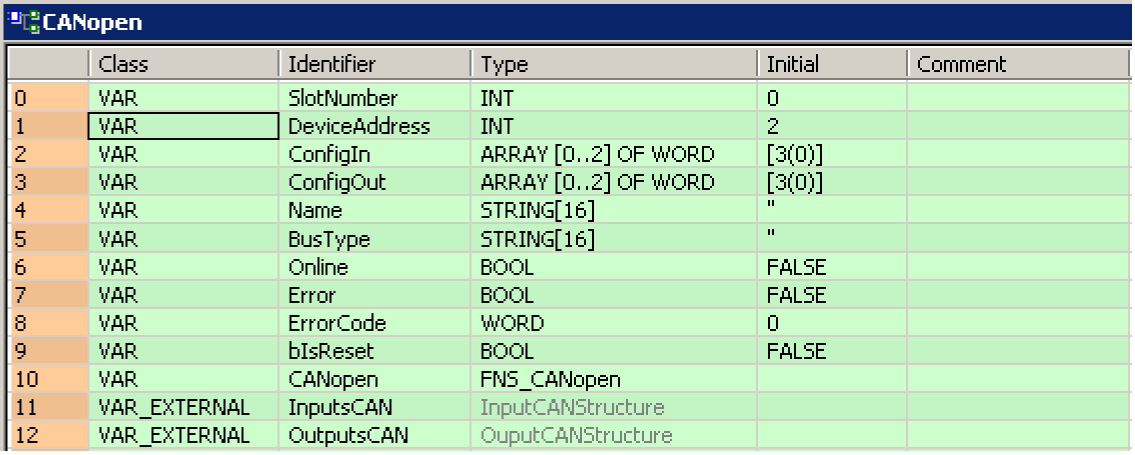
Global Variable List

To use the DUTs for further programming and to pass on the process data to an application program declare the following global variable with the type of DUT that was created in the previous step. The global variables are afterwards accessed by the variable class VAR_EXTERNAL in the example program's header.



	Class	Identifier	FP Addr...	IEC Addr...	Type	Initial	Aut...	Comme
2	VAR_GLOBAL	InputsCAN			InputCANStructure		□	
3	VAR_GLOBAL	OutputsCAN			OuputCANStructure		□	

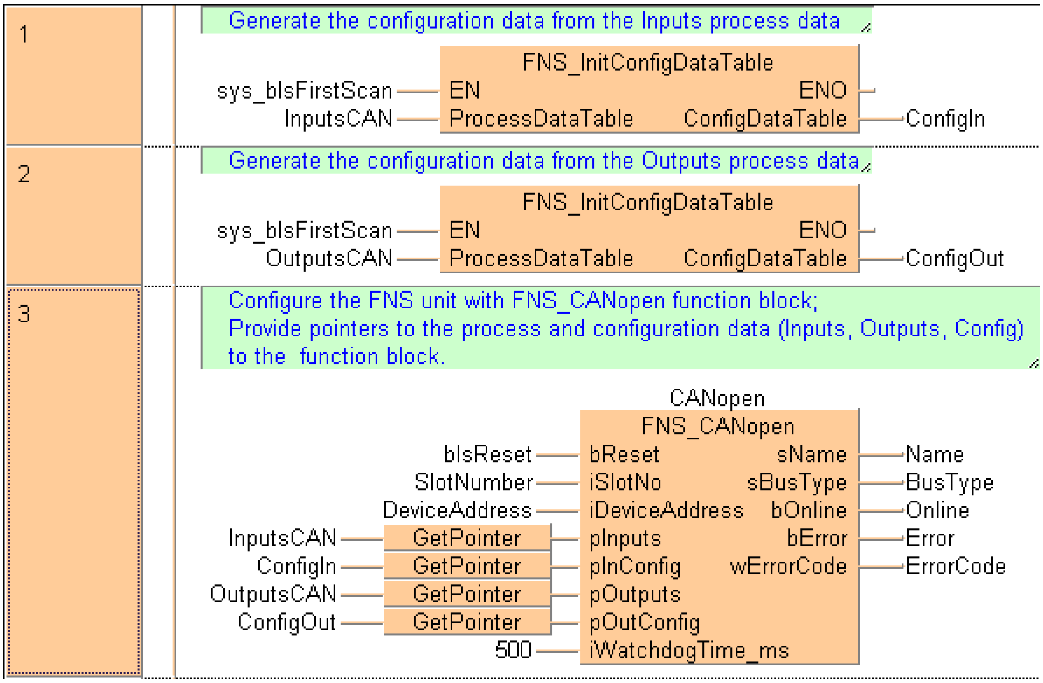
POU Header



	Class	Identifier	Type	Initial	Comment
0	VAR	SlotNumber	INT	0	
1	VAR	DeviceAddress	INT	2	
2	VAR	ConfigIn	ARRAY [0..2] OF WORD	[3(0)]	
3	VAR	ConfigOut	ARRAY [0..2] OF WORD	[3(0)]	
4	VAR	Name	STRING[16]	''	
5	VAR	BusType	STRING[16]	''	
6	VAR	Online	BOOL	FALSE	
7	VAR	Error	BOOL	FALSE	
8	VAR	ErrorCode	WORD	0	
9	VAR	bIsReset	BOOL	FALSE	
10	VAR	CANopen	FNS_CANopen		
11	VAR_EXTERNAL	InputsCAN	InputCANStructure		
12	VAR_EXTERNAL	OutputsCAN	OuputCANStructure		

In the POU header, all variables that are required for the program are declared. The size of the variables **ConfigIn** and **ConfigOut** must correspond to the number of entries in the DUTs input and output.

Ladder Diagram Body



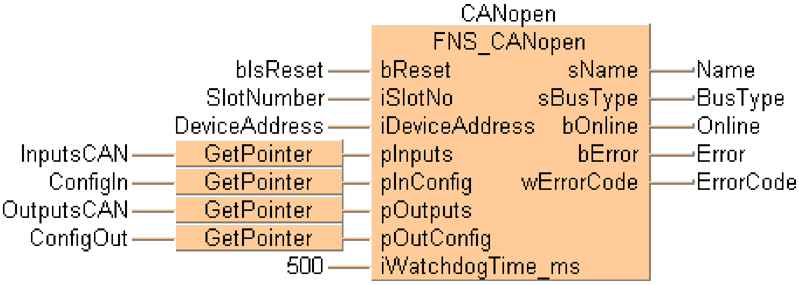
1 Generate the configuration data from the Inputs process data

2 Generate the configuration data from the Outputs process data

3 Configure the FNS unit with FNS_CANopen function block;
Provide pointers to the process and configuration data (Inputs, Outputs, Config) to the function block.

In the ladder diagram body you can see an instance of the FNS_CANopen function block called CANopen, and how the inputs, outputs and configuration data have to be supplied to the function block.

5.7.1 FNS_CANopen Function Block



The FNS_CANopen function block configures the FP-FNS block CANopen. It has to be supplied with information about the configuration, the input and output size and network-specific data.

If no inputs or no outputs are used, just leave the corresponding pins unconnected.

PLC types: available for FP2/FP2SH and FPΣ.

Variables of this function block have to be of one of the following data types:

Inputs

Input	Data Type	Function
bReset	BOOL	Reset pin; network block will be reset while bReset is set.
iSlotNo	INT	Installation position of the FNS unit
iDeviceAddress	INT	CANopen address; values from 1 to 127.
pInputs	POINTER	Pointer to the input's process data table
pInConfig	POINTER	Pointer to the input's configuration data table
pOutputs	POINTER	Pointer to the output's process data table
pOutConfig	POINTER	Pointer to the output's configuration data table
iWatchdogTime_ms	INT	Watchdog timeout value for unit in ms. Valid values from 1 to 32767. 0: default of 700ms.

Outputs

Output	Data Type	Function
sName	STRING[16]	Name of installed FP-FNS block
sBusType	STRING[20]	Network type of installed FP-FNS block
bOnline	BOOL	Flag for online status
bError	BOOL	Error flag
wErrorCode	WORD	Error code if error flag is set

List of error codes for FP-FNS block CANopen

Errorcode	Indication
16#0000	No error
16#0002	Process data area is too large (max. 32 PDOs, i.e. max. 128 words in each direction)
16#0003	Reset request error
16#0004	Bus off or cable disconnected, or no connection established between master and slave (wrong device address or process data configuration)
16#0005	FP-FNS block is not installed correctly
16#0007	FP-FNS block has incorrect provider ID
16#0008	Wrong FP-FNS block installed
16#0009	Invalid device address
16#000A	Exception state entered; application watchdog timeout; unit needs resetting

5.8 Programming Example, FP-FNS Block Profinet IO

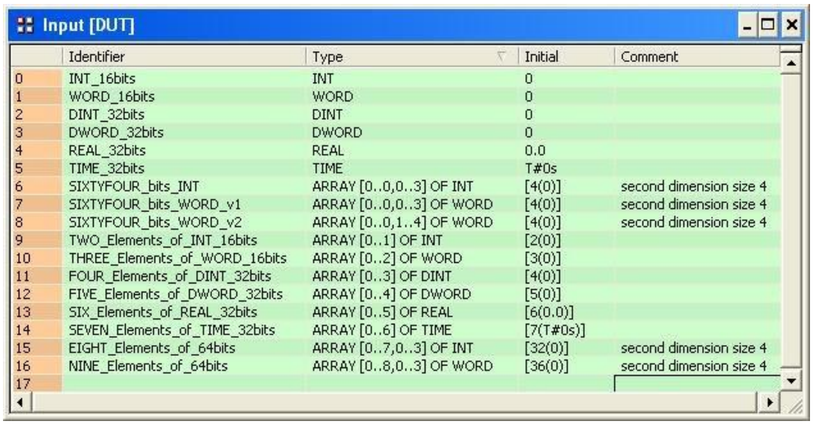
After you install the FNS Library, you can start programming.

Procedure

1. Create the Data Unit Types (DUTs) for inputs and outputs.
2. Create input and output variables of the type of DUT generated in the previous step in the global variable list.
3. Generate the configuration data table for inputs and outputs by using the function FNS_InitConfigDataTable (see page 49). Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
4. Create pointers of the **input**, **output** and **ConfigDataTable** variables and provide them to the **FNS_ProfinetIO** function block together with the corresponding variables.

Data Unit Types (DUTs)

In the following picture you can see all possible data types and how the different variables (16-bit, 32-bit and 64-bit) can be defined.



Input [DUT]

	Identifier	Type	Initial	Comment
0	INT_16bits	INT	0	
1	WORD_16bits	WORD	0	
2	DINT_32bits	DINT	0	
3	DWORD_32bits	DWORD	0	
4	REAL_32bits	REAL	0.0	
5	TIME_32bits	TIME	T#0s	
6	SIXTYFOUR_bits_INT	ARRAY [0..0,0..3] OF INT	[4(0)]	second dimension size 4
7	SIXTYFOUR_bits_WORD_v1	ARRAY [0..0,0..3] OF WORD	[4(0)]	second dimension size 4
8	SIXTYFOUR_bits_WORD_v2	ARRAY [0..0,1..4] OF WORD	[4(0)]	second dimension size 4
9	TWO_Elements_of_INT_16bits	ARRAY [0..1] OF INT	[2(0)]	
10	THREE_Elements_of_WORD_16bits	ARRAY [0..2] OF WORD	[3(0)]	
11	FOUR_Elements_of_DINT_32bits	ARRAY [0..3] OF DINT	[4(0)]	
12	FIVE_Elements_of_DWORD_32bits	ARRAY [0..4] OF DWORD	[5(0)]	
13	SIX_Elements_of_REAL_32bits	ARRAY [0..5] OF REAL	[6(0.0)]	
14	SEVEN_Elements_of_TIME_32bits	ARRAY [0..6] OF TIME	[7(T#0s)]	
15	EIGHT_Elements_of_64bits	ARRAY [0..7,0..3] OF INT	[32(0)]	second dimension size 4
16	NINE_Elements_of_64bits	ARRAY [0..8,0..3] OF WORD	[36(0)]	second dimension size 4
17				

64-bit variables are declared by creating a two-dimensional array, whereas the second dimension must have a size of four. The first dimension specifies the number of elements of this type.

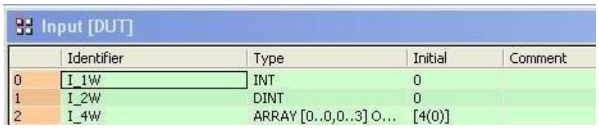
The FNS PROFINET IO Device handles the plugging of modules and submodules automatically according to the following scheme:

- A DAP (Device Access Point) is plugged into Slot 0
- Modules are added beginning with the DUT Inputs followed by the DUT Outputs
- Each module occupies a single slot
- Each entry of a DUT results in one module being added
- One-dimensional array entries in a DUT result in an equal number of modules being added
- Two-dimensional array entries in a DUT (used for 64-bit variables) result in the same number of modules being added as the size of the first dimension of the array.

- One sub-module per module

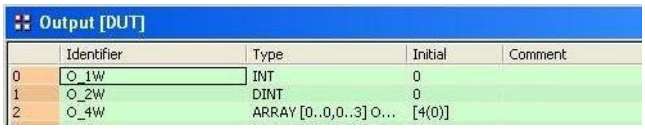
Each slot can carry up to 4 words (64 bits) of data. The FNS_ProfinetIO function block supports up to 64 slots for input and/or output process data. Only the data types that are supported in the GSDML-file (.xml) can be used.

In this programming example both variables, the input and output process data, consist of three elements: a 16-bit, a 32-bit and a 64-bit variable:



Input [DUT]

	Identifier	Type	Initial	Comment
0	I_1W	INT	0	
1	I_2W	DINT	0	
2	I_4W	ARRAY [0..0,0..3] O...	[4(0)]	

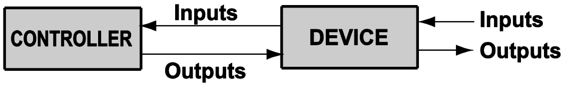


Output [DUT]

	Identifier	Type	Initial	Comment
0	O_1W	INT	0	
1	O_2W	DINT	0	
2	O_4W	ARRAY [0..0,0..3] O...	[4(0)]	

Input process data represents data that will be sent to the controller. Thus, from the device's point-of-view, it has to be regarded as output data.

Output process data represents data received from the controller. Thus, from the device's point-of-view, it has to be regarded as input data.

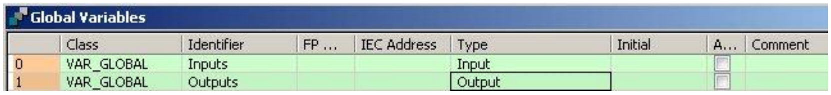


◆NOTE

The order in which inputs and outputs are mapped to the process data is significant and must be replicated in the master configuration. Inputs are mapped to the process data previous to the outputs.

Global Variable List

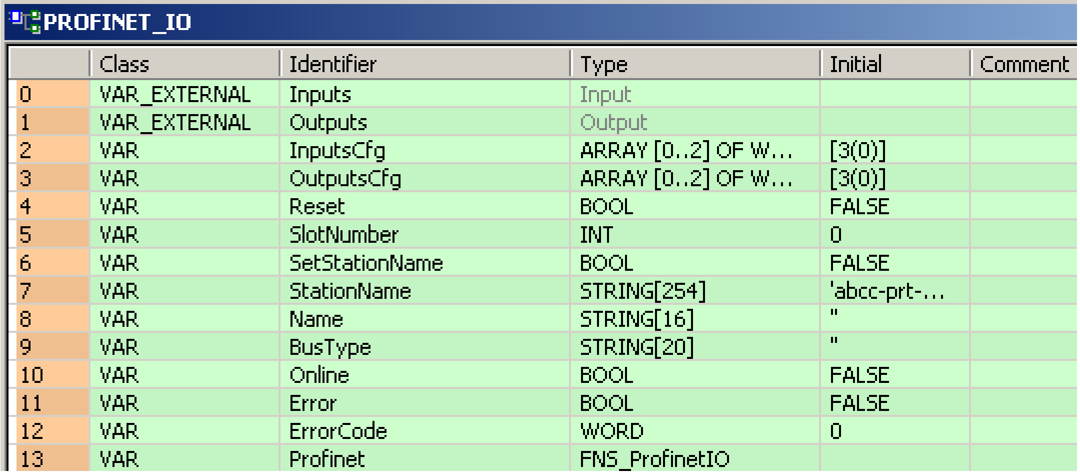
To use the DUTs for further programming and to pass on the process data to an application program declare the following global variable with the type of DUT that was created in the previous step. The global variables are afterwards accessed by the variable class VAR_EXTERNAL in the example program's header.



Global Variables

	Class	Identifier	FP ...	IEC Address	Type	Initial	A...	Comment
0	VAR_GLOBAL	Inputs			Input		□	
1	VAR_GLOBAL	Outputs			Output		□	

POU Header

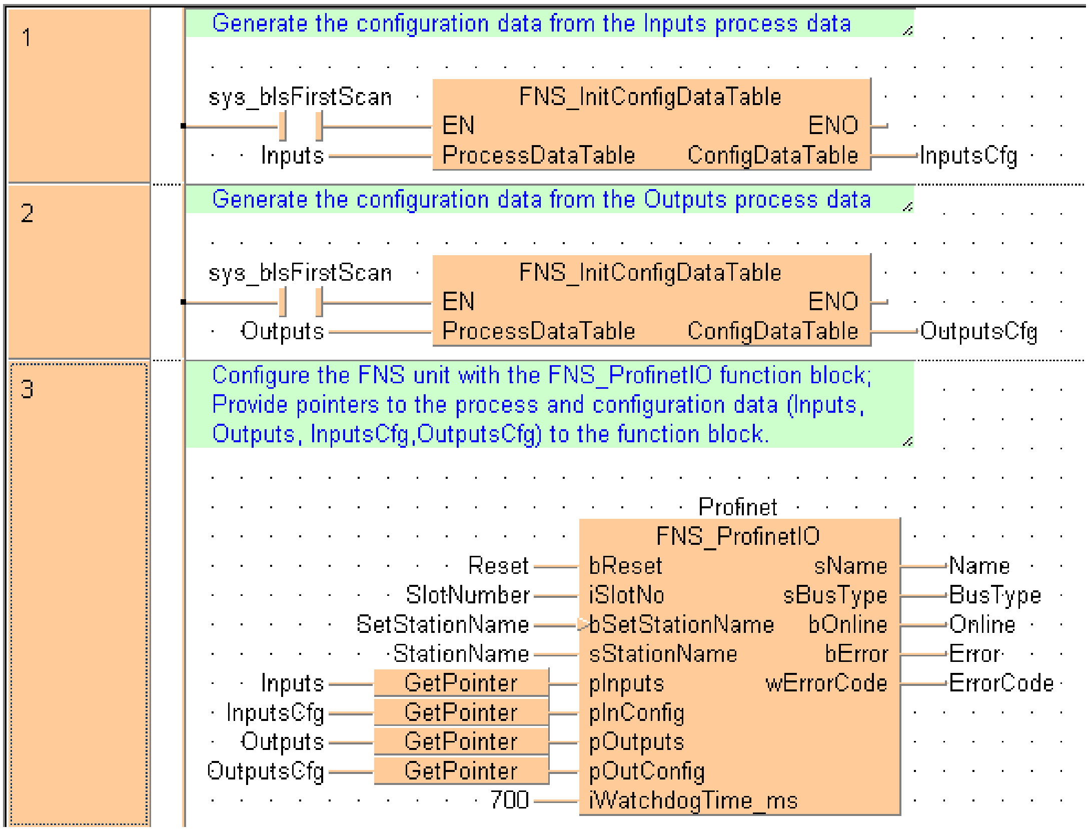


PROFINET_IO

	Class	Identifier	Type	Initial	Comment
0	VAR_EXTERNAL	Inputs	Input		
1	VAR_EXTERNAL	Outputs	Output		
2	VAR	InputsCfg	ARRAY [0..2] OF W...	[3(0)]	
3	VAR	OutputsCfg	ARRAY [0..2] OF W...	[3(0)]	
4	VAR	Reset	BOOL	FALSE	
5	VAR	SlotNumber	INT	0	
6	VAR	SetStationName	BOOL	FALSE	
7	VAR	StationName	STRING[254]	'abcc-prt-...	
8	VAR	Name	STRING[16]	''	
9	VAR	BusType	STRING[20]	''	
10	VAR	Online	BOOL	FALSE	
11	VAR	Error	BOOL	FALSE	
12	VAR	ErrorCode	WORD	0	
13	VAR	Profinet	FNS_ProfinetIO		

In the POU header, all variables that are required for the program are declared. The size of the variables **InputsCfg** and **OutputsCfg** must correspond to the number of entries in the DUTs Input and Output.

Ladder Diagram Body



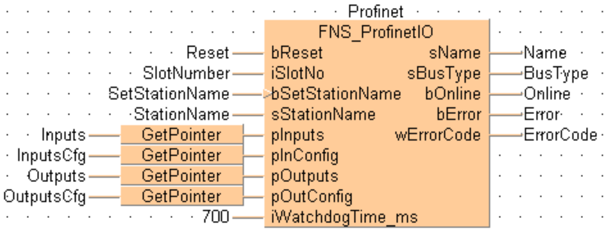
1 Generate the configuration data from the Inputs process data

2 Generate the configuration data from the Outputs process data

3 Configure the FNS unit with the FNS_ProfinetIO function block; Provide pointers to the process and configuration data (Inputs, Outputs, InputsCfg,OutputsCfg) to the function block.

In the ladder diagram body you can see an instance of the FNS_ProfinetIO function block called Profinet, and how the inputs, outputs and configuration data have to be supplied to the function block.

5.8.1 FNS_ProfinetIO Function Block



The FNS_ProfinetIO function block configures the FP-FNS block ProfinetIO. It has to be supplied with information about the configuration, the input and output size and network-specific data.

If no inputs or no outputs are used, just leave the corresponding pins unconnected.

PLC types: available for FP2/FP2SH and FPΣ.

Variables of this function block have to be of one of the following data types:

Inputs

Input	Data Type	Function
bReset	BOOL	Reset pin; network block will be reset while bReset is set.
iSlotNo	INT	Installation position of the FNS unit
bSetStationName	BOOL	A rising edge of this input sets the string stored in sStationName as the station's name and performs a power-up reset of the unit.
sStationName	STRING	The Station Name identifies the PROFINET IO unit in the PROFINET network. If this value is set with bSetStationName while the connection with the IO controller is established, the unit will reset so changes can take effect. Changes made through DCP will take immediate effect without reset.
pInputs	POINTER	Pointer to the input's process data table
pInConfig	POINTER	Pointer to the input's configuration data table
pOutputs	POINTER	Pointer to the output's process data table
pOutConfig	POINTER	Pointer to the output's configuration data table
iWatchdogTime_ms	INT	Watchdog timeout value for unit in ms. Valid values from 1 to 32767. 0: default of 700ms.

Outputs

Output	Data Type	Function
sName	STRING[16]	Name of installed FP-FNS block
sBusType	STRING[20]	Network type of installed FP-FNS block
bOnline	BOOL	Flag for online status
bError	BOOL	Error flag
wErrorCode	WORD	Error code if error flag is set

List of error codes for FP-FNS block CANopen

Errorcode	Indication
16#0000	No error
16#0001	Controller and Device process data configuration do not match
16#0002	Process data area is too large (max. 64 slots, max. 128 words in each direction)
16#0004	Bus off or cable disconnected, or no link established between controller and device.
16#0005	FP-FNS block is not installed correctly
16#0007	FP-FNS block has incorrect provider ID
16#0008	Wrong FP-FNS block installed
16#000A	Exception state entered; application watchdog timeout; unit needs resetting

5.9 Programming Example, FP-FNS Block BACnetIP

After you install the FNS Library, you can start programming.

Procedure

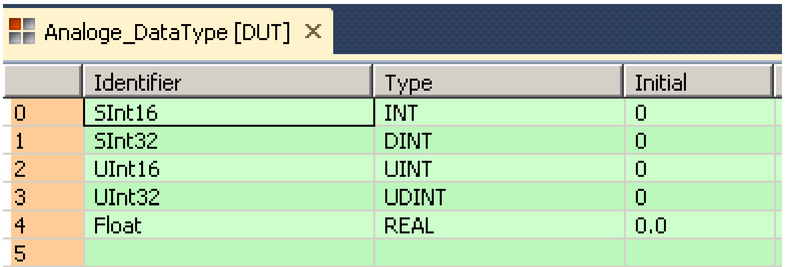
1. Create the Data Unit Type (DUT) for analog values.
2. Create the Data Unit Type (DUT) for binary values.
3. Create the Data Unit Type (DUT) for multistate values
4. Create output variables of the type of DUT generated in the previous steps in the global variable list
5. Generate the configuration data table for analog values by using the function FNS_InitConfigDataTable (see page 49).

   Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
6. Generate the configuration name table for analog values, binary values, and multistate values by using the function FNS_InitConfigNameTable (see page 49).

   Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
7. Create pointers of the analog values, binary values, multistate values,ConfigNameTable and **ConfigDataTable** variables and provide them to the **FNS_BACnetIP** function block together with the corresponding variables.

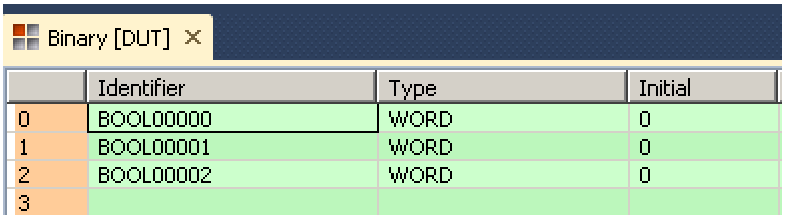
Data Unit Types (DUTs)

In the following picture you can see all possible data types for analog values and how the different variables (16-bit, 32-bit) can be defined.



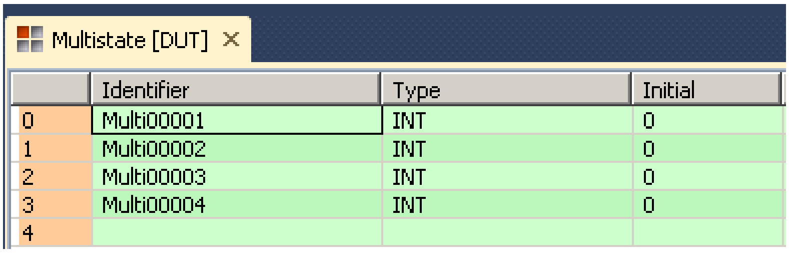
	Identifier	Type	Initial
0	SInt16	INT	0
1	SInt32	DINT	0
2	UInt16	UINT	0
3	UInt32	UDINT	0
4	Float	REAL	0.0
5			

In the following picture you can see how the different variables for binary values can be defined.



	Identifier	Type	Initial
0	BOOL00000	WORD	0
1	BOOL00001	WORD	0
2	BOOL00002	WORD	0
3			

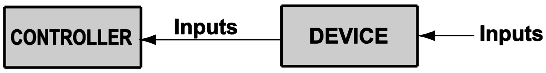
In the following picture you can see how the different variables for multistate values can be defined.



Multistate [DUT]

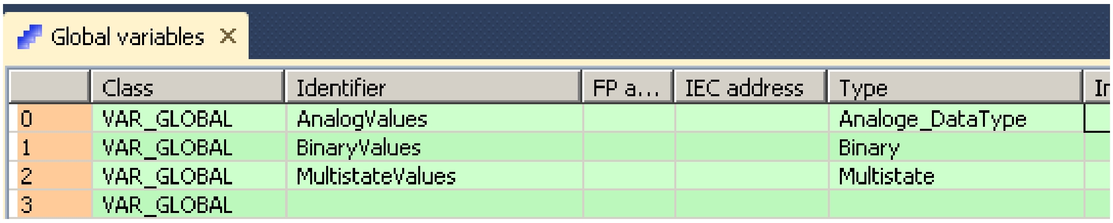
	Identifier	Type	Initial
0	Multi00001	INT	0
1	Multi00002	INT	0
2	Multi00003	INT	0
3	Multi00004	INT	0
4			

Input process data represents data that will be sent to the controller. Thus, from the device's point-of-view, it has to be regarded as output data.



Global Variable List

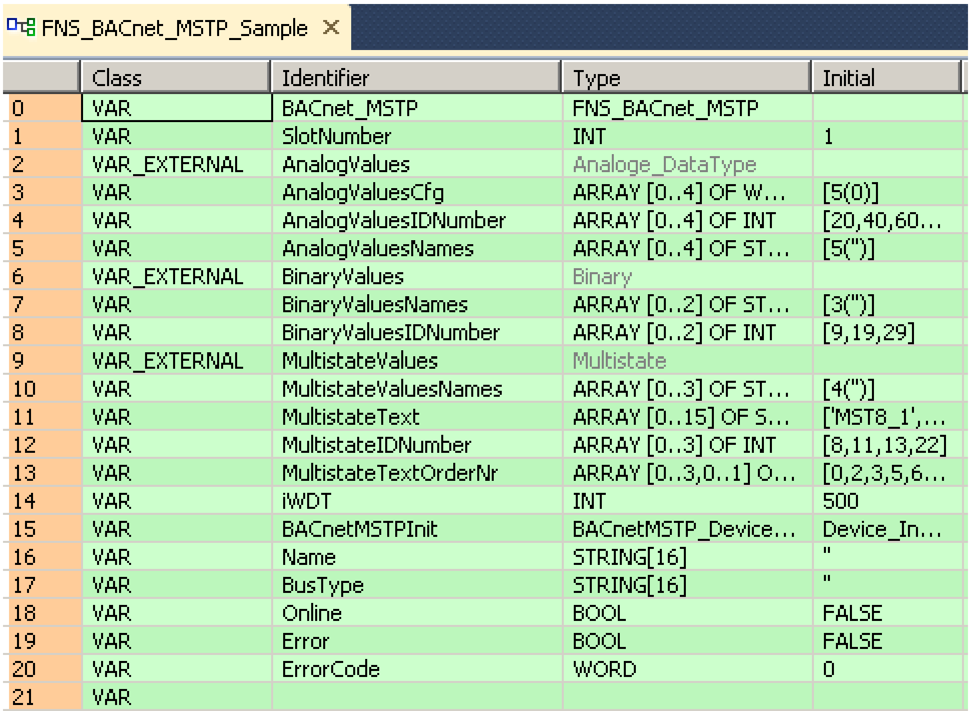
To use the DUTs for further programming and to pass on the process data to an application program, declare the following global variable with the type of DUT that was created in the previous step. The global variables are afterwards accessed by the variable class VAR_EXTERNAL in the example program's header.



Global variables

	Class	Identifier	FP a...	IEC address	Type	Ir
0	VAR_GLOBAL	AnalogValues			Analoge_DataType	
1	VAR_GLOBAL	BinaryValues			Binary	
2	VAR_GLOBAL	MultistateValues			Multistate	
3	VAR_GLOBAL					

POU Header

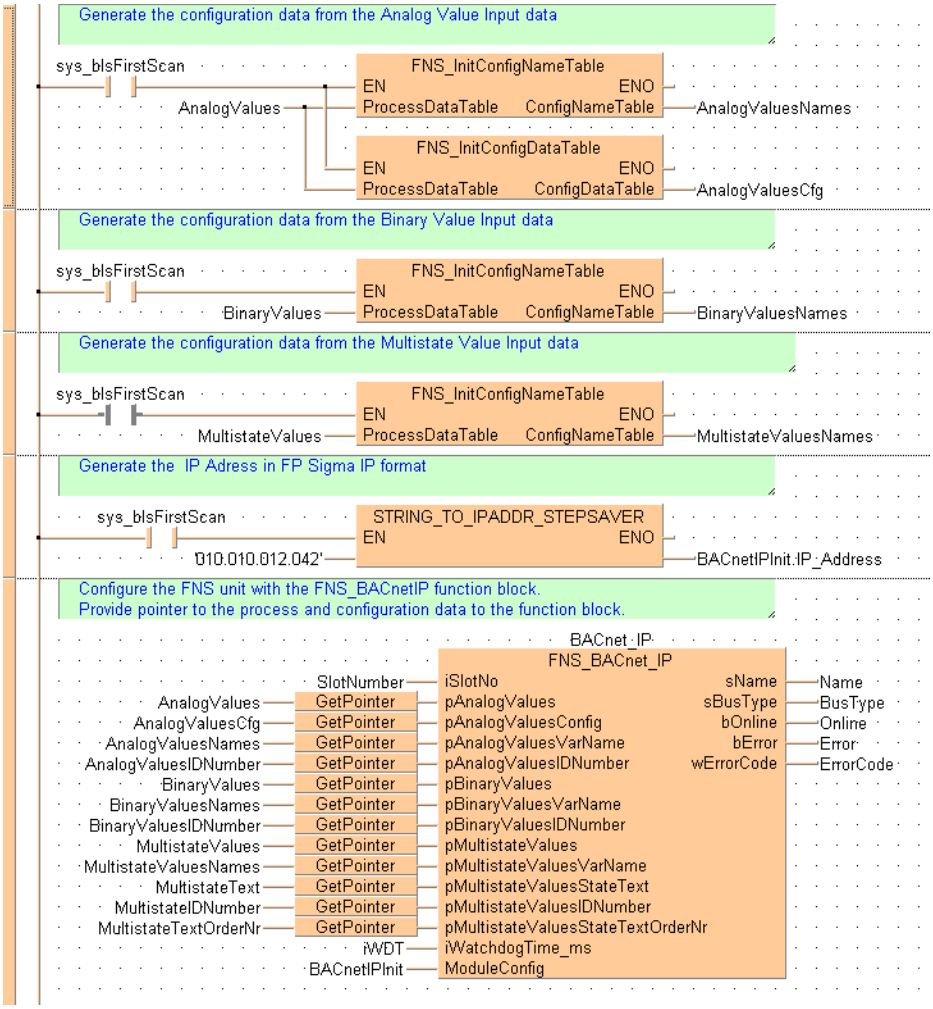


FNS_BACnet_MSTP_Sample

	Class	Identifier	Type	Initial
0	VAR	BACnet_MSTP	FNS_BACnet_MSTP	
1	VAR	SlotNumber	INT	1
2	VAR_EXTERNAL	AnalogValues	Analoge_DataType	
3	VAR	AnalogValuesCfg	ARRAY [0..4] OF W...	[5(0)]
4	VAR	AnalogValuesIDNumber	ARRAY [0..4] OF INT	[20,40,60...
5	VAR	AnalogValuesNames	ARRAY [0..4] OF ST...	[5('')]
6	VAR_EXTERNAL	BinaryValues	Binary	
7	VAR	BinaryValuesNames	ARRAY [0..2] OF ST...	[3('')]
8	VAR	BinaryValuesIDNumber	ARRAY [0..2] OF INT	[9,19,29]
9	VAR_EXTERNAL	MultistateValues	Multistate	
10	VAR	MultistateValuesNames	ARRAY [0..3] OF ST...	[4('')]
11	VAR	MultistateText	ARRAY [0..15] OF S...	['MST8_1',...
12	VAR	MultistateIDNumber	ARRAY [0..3] OF INT	[8,11,13,22]
13	VAR	MultistateTextOrderNr	ARRAY [0..3,0..1] O...	[0,2,3,5,6...
14	VAR	iWDT	INT	500
15	VAR	BACnetMSTPInit	BACnetMSTP_Device...	Device_In...
16	VAR	Name	STRING[16]	''
17	VAR	BusType	STRING[16]	''
18	VAR	Online	BOOL	FALSE
19	VAR	Error	BOOL	FALSE
20	VAR	ErrorCode	WORD	0
21	VAR			

In the POU header, all variables that are required for the program are declared. The size of the variable **AnalogValues** and **AnalogValuesCfg** must correspond to the number of entries in the DUTs Input and Output.

Ladder Diagram Body



Generate the configuration data from the Analog Value Input data

Generate the configuration data from the Binary Value Input data

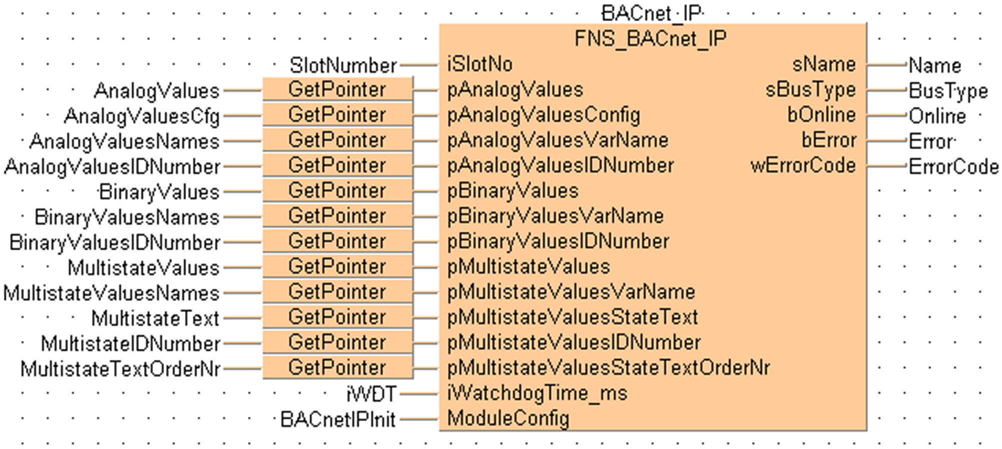
Generate the configuration data from the Multistate Value Input data

Generate the IP Adress in FP Sigma IP format

Configure the FNS unit with the FNS_BACnetIP function block.
Provide pointer to the process and configuration data to the function block.

In the ladder diagram body you can see an instance of the FNS_BACnetIP function block called BACnet_IP, and how the inputs, outputs and configuration data have to be supplied to the function block.

5.9.1 FNS_BACnetIP Function Block



The FNS_BACnetIP function block configures the FP-FNS block BACnetIP. It has to be supplied with information about the configuration, the input size and network-specific data.

If inputs are not used, just leave the corresponding pins unconnected.

PLC types: available for FPΣ.

Variables of this function block have to be of one of the following data types:

Inputs

Input	Data Type	Function
iSlotNo	INT	Installation position of the FNS unit
pAnalogValues	POINTER	Pointer to the Analog Value input process data table
pAnalogValuesVarConfig	POINTER	Pointer to the Analog Value input's configuration data table
pAnalogValuesVarNames	POINTER	Pointer to the Analog Value input's process data variable names
pAnalogValuesIDNumbers	POINTER	Pointer to the Analog value ID numbers
pBinaryValues	POINTER	Pointer to the Binary Value input process data table
pBinaryValuesVarNames	POINTER	Pointer to the Binary Value input's process data variable names
pBinaryValuesIDNumber	POINTER	PPointer to the Binary Value ID Numbers
pMultistateValues	POINTER	Pointer to the Multistate Value input process data table
pMultistateValuesVarNames	POINTER	Pointer to the Multistate Value input's process data variable names
pMultistateValuesVarText	POINTER	Pointer to the Multistate Value input's process data variables' text
pMultistateValuesIDNumber	POINTER	Pointer to the Multistate Value ID Numbers
pMultistateValuesStateTextOrderNr	POINTER	Pointer to the Multistate Value State Text Order Number

Input	Data Type	Function
iWatchdogTime_ms	INT	Watchdog timeout value for the unit in ms. Valid values from 1 to 32767. 0: default of 700ms.
ModuleConfig	DUT BACnetIP_DeviceInit	Data unit type to configure the module.

Outputs

Output	Data Type	Function
sName	STRING[16]	Name of installed FP-FNS block
sBusType	STRING[20]	Network type of installed FP-FNS block
bOnline	BOOL	Flag for online status
bError	BOOL	Error flag
wErrorCode	WORD	Error code if error flag is set

List of error codes for FP-FNS block BACnet

Error code	Indication
16#0000	No error
16#0005	FP-FNS block is not installed correctly
16#0007	FP-FNS block has incorrect provider ID
16#0008	Wrong FP-FNS block installed
16#000A	Exception state entered; application watchdog timeout; unit needs resetting
16#0056	Process data area is too large (max. 256 bytes)
16#0057	pMultistateValues and pMultistateValuesVarName variable: different number of elements
16#0058	pBinarValues and pBinaryValuesVarName variable: different number of elements
16#0059	pAnalogrValues and pAnalogValuesVarName variable: different number of elements
16#005A	pAnalogrValuesConfig and pAnalogrValuesIDNumber: different number of elements
16#005B	pBinarValues and pBinaryValuesIDNumber variable: different number of elements
16#005C	pMultistateValues and pMultistateValuesIDNumber: different number of elements
16#0060	Stringsize pMultistateValuesStateText > 32
16#0061	Stringsize pMultistateValuesVarName > 32
16#0062	Stringsize pBinaryValuesVarName > 32
16#0063	Stringsize pAnalogValuesVarName > 32
16#0064	AnalogValuesIDNumber > 2039
16#0065	AnalogValuesIDNumber < 0
16#0066	BinaryValuesIDNumber > 2039
16#0067	BinaryValuesIDNumber < 0
16#0068	MultiStateValueValuesIDNumber > 2039
16#0069	MultiStateValueValuesIDNumber < 0
16#0070	AnalogValueConfig: array not allowed
16#0071	AnalogValueConfig: not a valid datatype

Error code	Indication
16#0090	Error in adi mapping AnalogValue
16#0091	Error in adi mapping BinaryValue
16#0092	Error in adi mapping MultistateValue

5.10 Programming Example, FP-FNS Block BACnet MS/TP

After you install the FNS Library, you can start programming.

Procedure

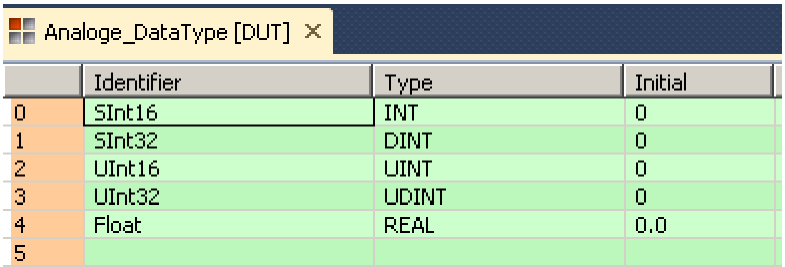
1. Create the Data Unit Type (DUT) for analog values.
2. Create the Data Unit Type (DUT) for binary values.
3. Create the Data Unit Type (DUT) for multistate values
4. Create output variables of the type of DUT generated in the previous steps in the global variable list
5. Generate the configuration data table for analog values by using the function FNS_InitConfigDataTable (see page 49).

   Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
6. Generate the configuration name table for analog values, binary values, and multistate values by using the function FNS_InitConfigNameTable (see page 49).

   Make sure that the size of the FNS_InitConfigDataTable output variable corresponds to the DUT.
7. Create pointers of the analog values, binary values, multistate values, ConfigNameTable and **ConfigDataTable** variables and provide them to the **FNS_BACnet MS/TP** function block together with the corresponding variables.

Data Unit Types (DUTs)

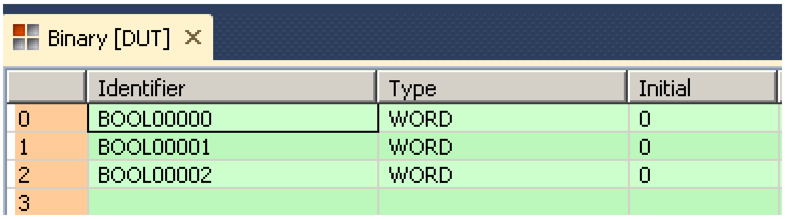
In the following picture you can see all possible data types for analog values and how the different variables (16-bit, 32-bit) can be defined.



Analoge_DataType [DUT]

	Identifier	Type	Initial
0	SInt16	INT	0
1	SInt32	DINT	0
2	UInt16	UINT	0
3	UInt32	UDINT	0
4	Float	REAL	0.0
5			

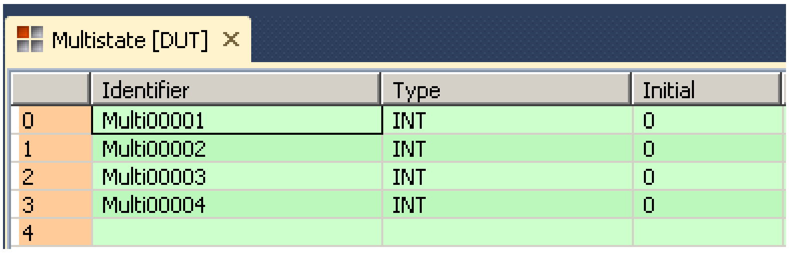
In the following picture you can see how the different variables for binary values can be defined.



Binary [DUT]

	Identifier	Type	Initial
0	BOOL00000	WORD	0
1	BOOL00001	WORD	0
2	BOOL00002	WORD	0
3			

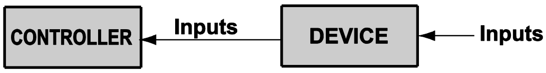
In the following picture you can see how the different variables for multistate values can be defined.



Multistate [DUT]

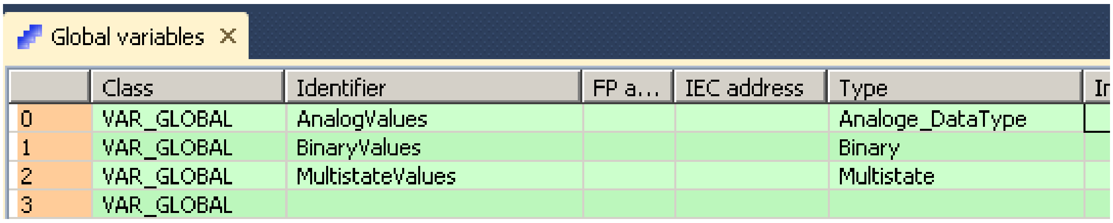
	Identifier	Type	Initial
0	Multi00001	INT	0
1	Multi00002	INT	0
2	Multi00003	INT	0
3	Multi00004	INT	0
4			

Input process data represents data that will be sent to the controller. Thus, from the device's point-of-view, it has to be regarded as output data.



Global Variable List

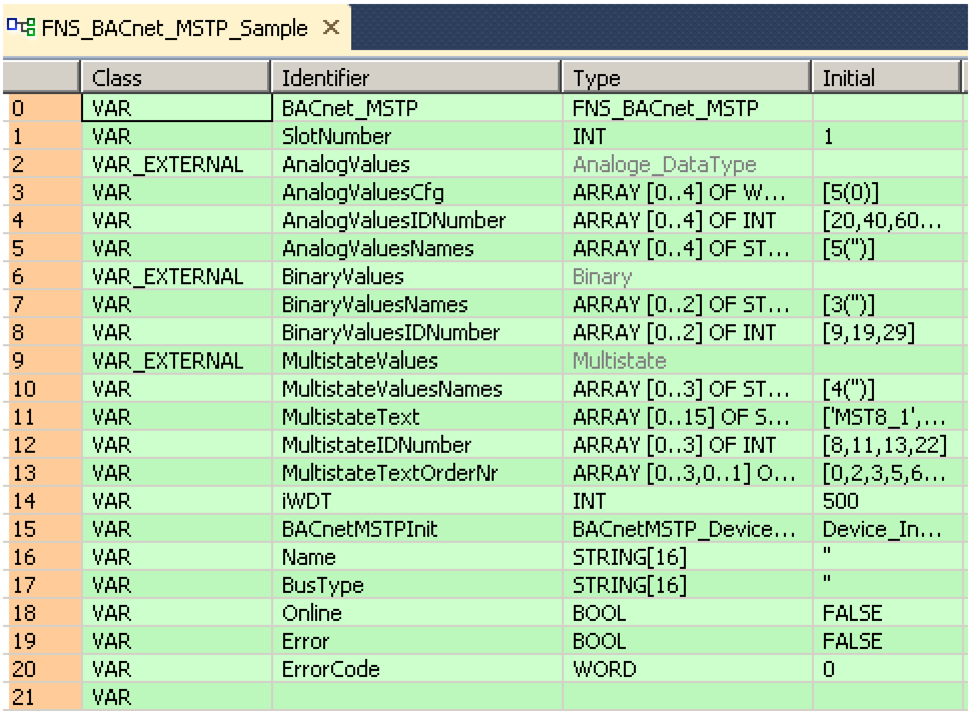
To use the DUTs for further programming and to pass on the process data to an application program declare the following global variable with the type of DUT that was created in the previous step. The global variables are afterwards accessed by the variable class VAR_EXTERNAL in the example program's header.



Global variables

	Class	Identifier	FP a...	IEC address	Type	Ir
0	VAR_GLOBAL	AnalogValues			Analoge_DataType	
1	VAR_GLOBAL	BinaryValues			Binary	
2	VAR_GLOBAL	MultistateValues			Multistate	
3	VAR_GLOBAL					

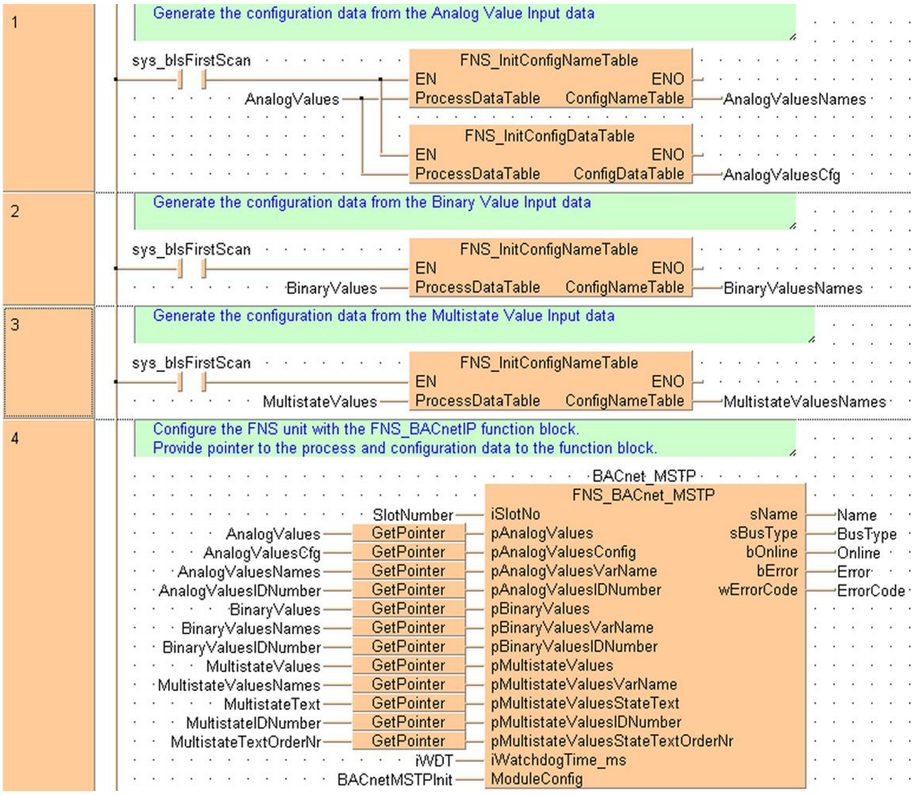
POU Header



	Class	Identifier	Type	Initial
0	VAR	BACnet_MSTP	FNS_BACnet_MSTP	
1	VAR	SlotNumber	INT	1
2	VAR_EXTERNAL	AnalogValues	Analoge_DataType	
3	VAR	AnalogValuesCfg	ARRAY [0..4] OF W...	[5(0)]
4	VAR	AnalogValuesIDNumber	ARRAY [0..4] OF INT	[20,40,60...
5	VAR	AnalogValuesNames	ARRAY [0..4] OF ST...	[5('')]
6	VAR_EXTERNAL	BinaryValues	Binary	
7	VAR	BinaryValuesNames	ARRAY [0..2] OF ST...	[3('')]
8	VAR	BinaryValuesIDNumber	ARRAY [0..2] OF INT	[9,19,29]
9	VAR_EXTERNAL	MultistateValues	Multistate	
10	VAR	MultistateValuesNames	ARRAY [0..3] OF ST...	[4('')]
11	VAR	MultistateText	ARRAY [0..15] OF S...	['MST8_1',...
12	VAR	MultistateIDNumber	ARRAY [0..3] OF INT	[8,11,13,22]
13	VAR	MultistateTextOrderNr	ARRAY [0..3,0..1] O...	[0,2,3,5,6...
14	VAR	iWDT	INT	500
15	VAR	BACnetMSTPInit	BACnetMSTP_Device...	Device_In...
16	VAR	Name	STRING[16]	''
17	VAR	BusType	STRING[16]	''
18	VAR	Online	BOOL	FALSE
19	VAR	Error	BOOL	FALSE
20	VAR	ErrorCode	WORD	0
21	VAR			

In the POU header, all variables that are required for the program are declared. The size of the variables **AnalogValuesCfg** and **AnalogValuesCfg** must correspond to the number of entries in the DUTs Input and Output.

Ladder Diagram Body



1 Generate the configuration data from the Analog Value Input data

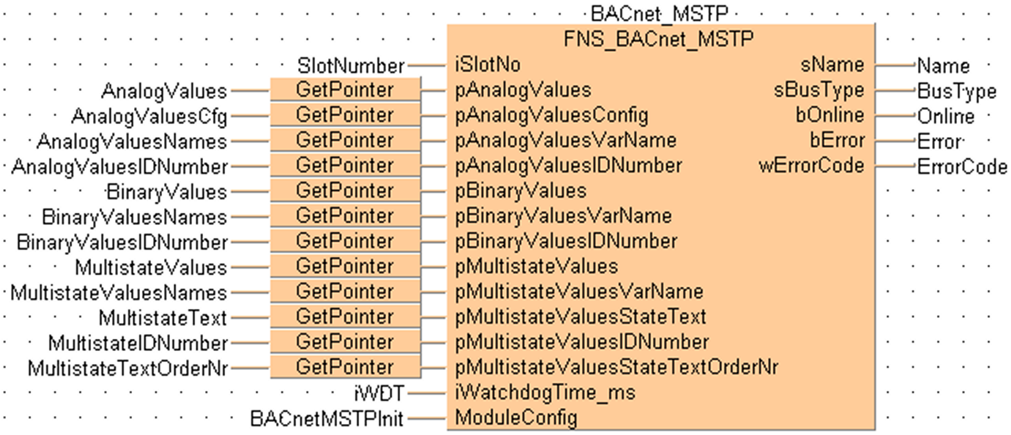
2 Generate the configuration data from the Binary Value Input data

3 Generate the configuration data from the Multistate Value Input data

4 Configure the FNS unit with the FNS_BACnetIP function block.
Provide pointer to the process and configuration data to the function block.

In the ladder diagram body you can see an instance of the FNS_BACnetMSTP function block called BACnet_MSTP, and how the inputs, outputs and configuration data have to be supplied to the function block.

5.10.1 FNS_BACnetMSTP Function Block



The FNS_BACnetMSTP function block configures the FP-FNS block BACnet MS/TP. It has to be supplied with information about the configuration, the input size and network-specific data.

If inputs are not used, just leave the corresponding pins unconnected.

PLC types: available for FPΣ.

Variables of this function block have to be of one of the following data types:

Inputs

Input	Data Type	Function
iSlotNo	INT	Installation position of the FNS unit
pAnalogValues	POINTER	Pointer to the Analog Value input process data table
pAnalogValuesVarConfig	POINTER	Pointer to the Analog Value input's configuration data table
pAnalogValuesVarNames	POINTER	Pointer to the Analog Value input's process data variable names
pAnalogValuesIDNumbers	POINTER	Pointer to the Analog value ID numbers
pBinaryValues	POINTER	Pointer to the Binary Value input process data table
pBinaryValuesVarNames	POINTER	Pointer to the Binary Value input's process data variable names
pBinaryValuesIDNumber	POINTER	PPointer to the Binary Value ID Numbers
pMultistateValues	POINTER	Pointer to the Multistate Value input process data table
pMultistateValuesVarNames	POINTER	Pointer to the Multistate Value input's process data variable names
pMultistateValuesVarText	POINTER	Pointer to the Multistate Value input's process data variables' text
pMultistateValuesIDNumber	POINTER	Pointer to the Multistate Value ID Numbers
pMultistateValuesStateTextOrderNr	POINTER	Pointer to the Multistate Value State Text Order Number
iWatchdogTime_ms	INT	Watchdog timeout value for the unit in ms. Valid values from 1 to 32767. 0: default of 700ms.
ModuleConfig	DUT BACnetMSTP_DeviceInit	Data unit type to configure the module.

Outputs

Output	Data Type	Function
sName	STRING[16]	Name of installed FP-FNS block
sBusType	STRING[20]	Network type of installed FP-FNS block
bOnline	BOOL	Flag for online status
bError	BOOL	Error flag
wErrorCode	WORD	Error code if error flag is set

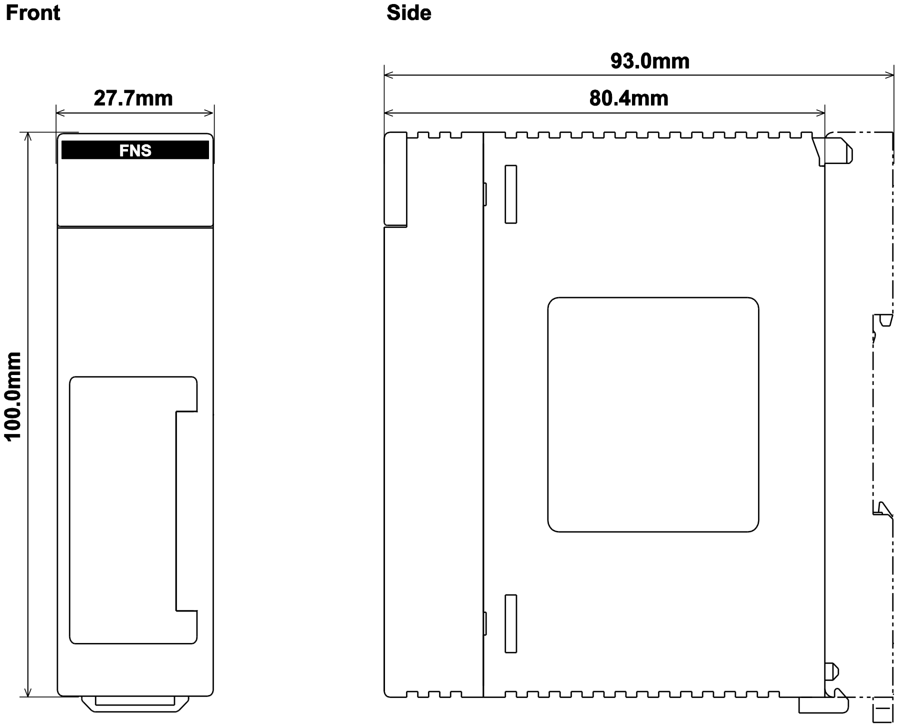
List of error codes for FP-FNS block BACnet

Error code	Indication
16#0000	No error
16#0005	FP-FNS block is not installed correctly
16#0007	FP-FNS block has incorrect provider ID
16#0008	Wrong FP-FNS block installed
16#000A	Exception state entered; application watchdog timeout; unit needs resetting
16#0056	Process data area is too large (max. 256 bytes)
16#0057	pMultistateValues and pMultistateValuesVarName variable: different number of elements
16#0058	pBinarValues and pBinaryValuesVarName variable: different number of elements
16#0059	pAnalogrValues and pAnalogValuesVarName variable: different number of elements
16#005A	pAnalogrValuesConfig and pAnalogrValuesIDNumber: different number of elements
16#005B	pBinarValues and pBinaryValuesIDNumber variable: different number of elements
16#005C	pMultistateValues and pMultistateValuesIDNumber: different number of elements
16#0060	Stringsize pMultistateValuesStateText > 32
16#0061	Stringsize pMultistateValuesVarName > 32
16#0062	Stringsize pBinaryValuesVarName > 32
16#0063	Stringsize pAnalogValuesVarName > 32
16#0064	AnalogValuesIDNumber > 2039
16#0065	AnalogValuesIDNumber < 0
16#0066	BinaryValuesIDNumber > 2039
16#0067	BinaryValuesIDNumber < 0
16#0068	MultiStateValueValuesIDNumber > 2039
16#0069	MultiStateValueValuesIDNumber < 0
16#0070	AnalogValueConfig: array not allowed
16#0071	AnalogValueConfig: not a valid datatype
16#0090	Error in adi mapping AnalogValue
16#0091	Error in adi mapping BinaryValue
16#0092	Error in adi mapping MultistateValue

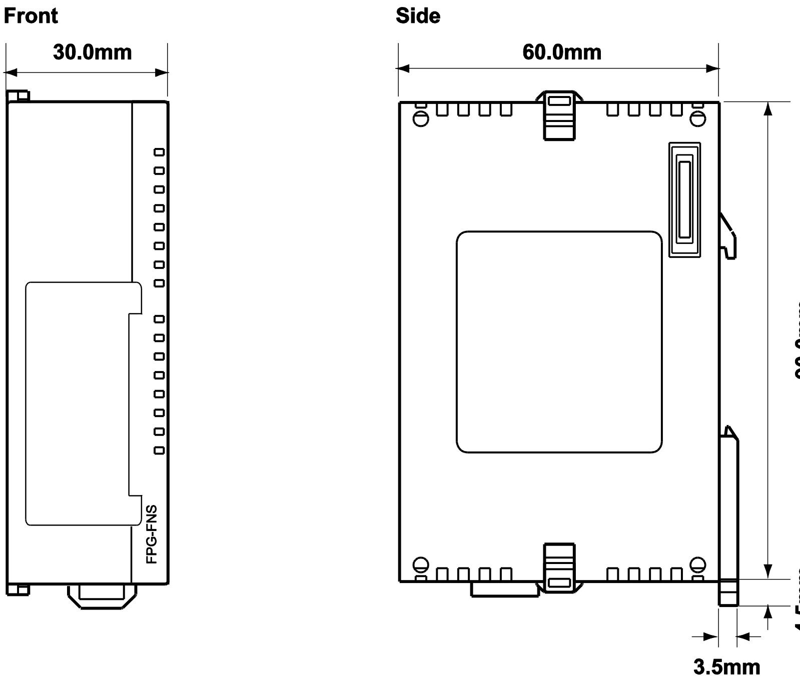
Chapter 6

Outline Dimensions

6.1 Outline Dimensions of FP2-FNS Unit

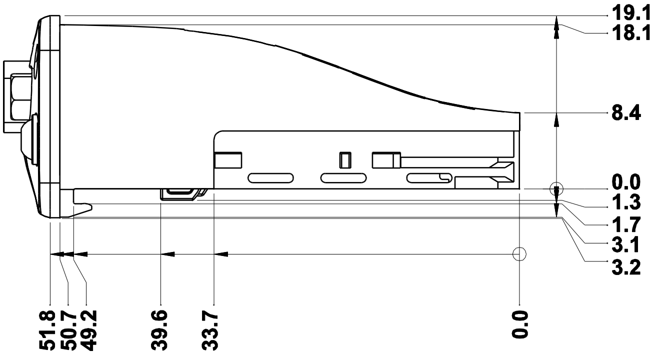


6.2 Outline Dimensions of FPΣ FNS Unit

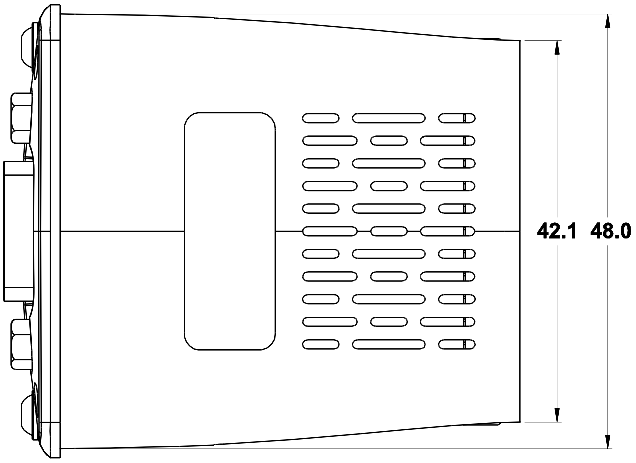


6.3 Dimensions of the FP-FNS Blocks

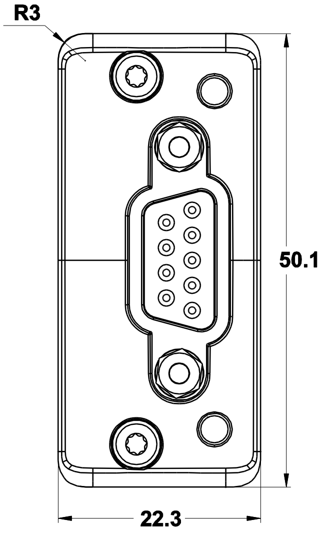
Side



Top

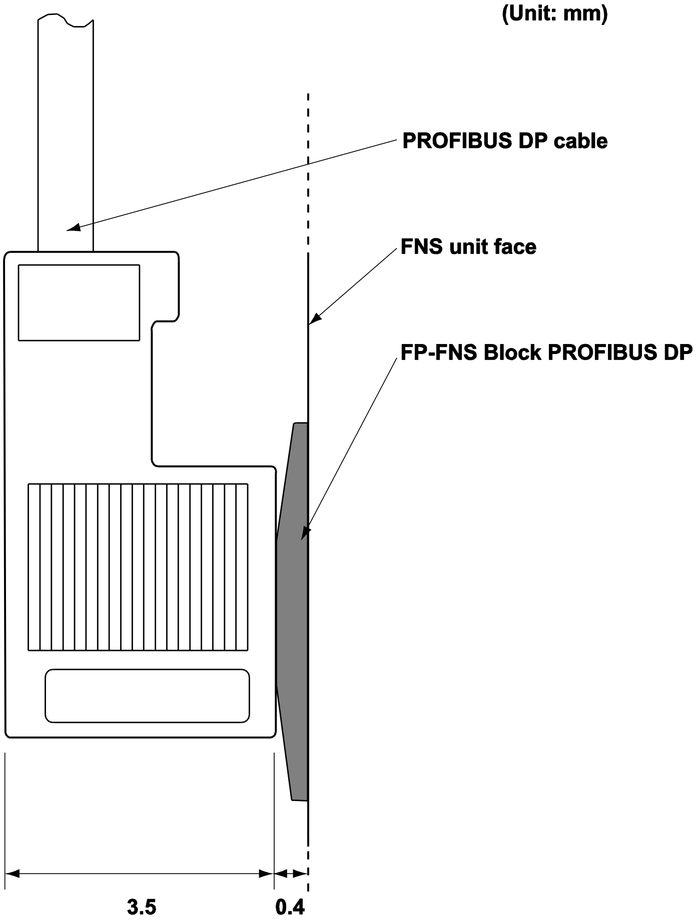


Front



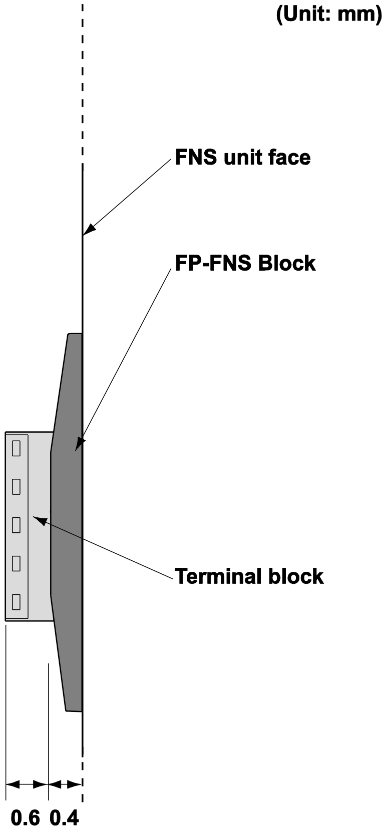
6.4 Dimensions with FNS Blocks and Cables

FP-FNS Block PROFIBUS DP or CANopen, example



FP-FNS Block DeviceNet, PROFINET IO or BACnet MS/TP

For these modules, how far the cable protrudes from the FNS unit face depends on the cable and connector you choose and how you connect it.



Index

Record of Changes

Manual No.	Date	Description of changes
ACGM0160V10END	March 2007	First edition
ACGM0160V11END	May 2007	• Product nos. for FNS units and blocks removed (part nos. and product nos. have been harmonized) • Addition of CANopen function block for Control FPWIN Pro
ACGM0160V20END	May 2008	• New CANopen block (9-pin Sub-D male interface) • Improvements in function blocks for FPWIN Pro for all networks
ACGM0160V21EN	November 2008	Note added to Profibus programming example that inputs are mapped to the process data before outputs.
ACGM0160V30EN	March 2009	FP2 and FPΣ Fieldbus Slave Units added. These products are preassembled and include the FNS Unit and corresponding FP-FNS Block. Manual renamed to reflect this change.
ACGM0160V4EN	October 2009	PROFINET IO Fieldbus Slave Unit added. CANopen block, standard 5-pole open type connector (AFPN-AB6202), discontinued and removed.
ACGM0160V5EN	December 2011	BACnet/IP and BACnet MS/TP Fieldbus Slave Units added.
ACGM0160V6EN	December 2012	Minor corrections in the descriptions of the function blocks for BACnet/IP and BACnet MS/TP.

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