

B0EMCB08 Industrial Ethernet Gateway

PN912 PROFINET Module User Guide

Revision: 0.6

Purpose:

This document describes a variant of B0EMCB08 Industrial Ethernet Gateway. The specific model, “PN912”, is a bridging module designed to connect TC-net I/O Loop systems with the PROFINET IO protocol.

This user guide provides network designers and engineers with comprehensive instructions for utilizing the PN912 PROFINET Module within a TC-net I/O Loop and PROFINET IO networks. It includes detailed steps for hardware installation, interfaces description, example network configurations, and software settings required for an effective PN912 operation.

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PO Box 688
358 Main Street
Mornington
Victoria
Australia
3931

Phone: +61 3 5977 0722

Fax: +61 3 5977 0833

info@tmeic.com.au

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TABLE OF REFERENCES

- [1] *DT-3484 PN912 PROFINET Module External Datasheet.*
- [2] *PROFINET_Design_Guideline_8062_V138_Sep19.*
- [3] *6F8C1240 High-Speed Serial I/O System TC-net I/O.*
- [4] *6F8C1652 Controller typeS PLC CPU Functional Manual.*
- [5] *UM-3544 TMEIC Gateway Tool User Manual.*

TABLE OF ABBREVIATIONS AND DEFINITIONS

<i>Abbreviation</i>	<i>Definition</i>
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TMEIC	TMEIC Process Technology Application Centre Pty Ltd
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1 Introduction

1.1 Safety Precautions - Consignes de sécurité

This document will contain safety instructions that have to be followed to maintain safety during operation and avoid damaging the unit. The following table describes the meaning of symbols and notations used in this document.

Ce document contient des consignes de sécurité à respecter afin de garantir la sécurité pendant le fonctionnement et d'éviter tout endommagement de l'appareil. Le tableau suivant décrit la signification des symboles et des annotations utilisés dans ce document.

Symbol	Definition
	General Warning. The addition of this symbol to a "Caution" safety message indicates a potential safety hazard that will result in personal injury if the instructions are not followed.
	Prohibition. This symbol instructs the user to avoid actions that may damage the device or cause personal injury.
	Mandatory. This symbol requires users to follow specific instructions to ensure device functionality and prevent damage.

Table 1: List of symbols and their respective definition.

Symbol	Definition
	Avertissement général. L'ajout de ce symbole à un message de sécurité « Attention » indique un risque pour la sécurité, susceptible d'entraîner des blessures corporelles si les instructions ne sont pas respectées.
	Interdiction. Ce symbole demande à l'utilisateur d'éviter toute action susceptible d'endommager l'appareil ou de causer des blessures corporelles.
	Obligatoire. Ce symbole demande à l'utilisateur de suivre certaines instructions afin de garantir le bon fonctionnement de l'appareil et d'éviter tout dommage.

Tableau 1 : Liste des symboles et de leurs définitions respectives.

1.1.1 Servicing Safety - Sécurité d'entretien



Do not attempt to service; return to the manufacturer in case of defect.

No user serviceable parts. Do not open this equipment. Contact the manufacturer for support.



Ne tentez pas de réparer l'appareil, renvoyez-le au fabricant en cas de défaut.

Aucune pièce ne peut être réparée par l'utilisateur. N'ouvrez pas l'équipement. Contactez le fabricant pour obtenir de l'aide.

1.1.2 Daily Use Safety - Sécurité d'utilisation quotidienne



Ensure the power supply rating is adequate based on the device specification.

Ensure the power supply voltage and current match the specifications. Otherwise, the unit may malfunction or catch fire due to overheating.



Assurez-vous que l'alimentation électrique est suffisante conformément aux spécifications de l'appareil.

Assurez-vous que la tension et le courant d'alimentation sont conformes aux spécifications. Sinon, l'appareil pourrait mal fonctionner ou prendre feu en cas de surchauffe.



Ensure correct operational environment.

Check datasheet [1] for operating temperature, humidity, and other parameter ratings. Failing to meet the rating can cause device malfunction.



Assurez-vous que l'environnement d'utilisation est correct.

Consultez la fiche technique [1] pour connaître la température de fonctionnement, l'humidité et les autres paramètres nominaux. Le non-respect des spécifications peut entraîner un dysfonctionnement de l'appareil.



Do not block the ventilation.

A lack of air circulation can cause overheating, leading to component damage or a fire.



Ne bloquez pas la ventilation.

Un manque de circulation d'air peut entraîner une surchauffe, provoquant des dommages aux composants ou un incendie.

1.2 Scope

This document is intended to assist the installation team to understand the connectivity of the PN912 PROFINET Module and each of its components to ensure a correct installation and to help any issues during the commissioning. For further supports and details refer to the Table of References.

System designers, automation engineers, and maintenance personnel using a PN912 PROFINET Module should refer to these documents for information about how these components can be used.

1.3 Purpose

This document is provided as a guide to ensure proper installation of the module and minimize risks of reliability issues due to incorrect connectivity of the interface.

The objective of this document is to set up the basic rule for a correct installation and usage.



An inadequate installation may lead to reliability issues.

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

This procedure is an obligation for contractors to provide installation instructions to reduce possible mistakes, errors, misinterpretations, loss of time to find the correct information, etc during the software installation phase for the integration team.

1.4 Liability Exclusion

These instructions do not purport to cover all details or variations in equipment or provide for every possible contingency to be met during installation, operation, and maintenance. If further information is desired or if particular problems arise that are not covered sufficiently for the purchaser's purpose, the matter should be referred to TMEIC Process Technology Application Centre Pty Ltd.

The information in this document has been carefully checked and is believed to be entirely reliable. While all reasonable efforts to ensure accuracy have been taken in the preparation of this manual, TMEIC Corporation (also referred to as "TMEIC") assumes no responsibility resulting from omissions or errors in this manual, or from the use of information contained herein. TMEIC reserves the right to make any changes, without notice, to this or any TMEIC products or systems to improve reliability, performance, function, or design. TMEIC does not assume any liability arising out of the application or use of any product or circuit described herein; nor does TMEIC convey any license under its patent rights or the rights of others. For warranty and repair policies, refer to TMEIC's Standard Conditions of Sale.

The operation limitations, defined by PROFINET IO [2] and TC-net I/O Loop protocols, are applicable to the PN912 PROFINET Module. User must strictly ensure that all system designs and implementations utilising the PN912 comply with each protocol-specific restriction.

1.5 Overview

The B0EMCB08 is an Industrial Ethernet Gateway supporting multiple protocols, designed with an architecture that makes it capable of bridging Toshiba TC-net IO Loop and Real Time Ethernet (RTE) protocols like PROFINET, Ethernet IP, Ether CAT, Modbus, CC-Link, etc.

The TMEIC PN912 PROFINET Module is a Gateway that bridges TC-net I/O (developed by Toshiba) and PROFINET (developed by Siemens and the members of the PROFIBUS User Organisation (PNO)), utilising the B0EMCB08 hardware.

PROFINET Controller capability is the first capability to be implemented and will be followed later by PROFINET Device capability according to needs.

Other RTE protocols may be added in future releases as needed, utilising the same B0EMCB08 hardware.

1.6 General Specifications

NOTE: Refer to the most recent datasheet [1] for the most up-to-date information.

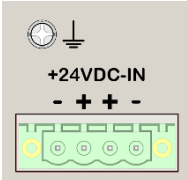
Item	Specification	
	Input Voltage	Input: 12/24VDC, 0.70/0.35A Range: 10-28VDC
	Power Consumption	8.5W (typical operation)
	SELV Isolation	SELV DC Input to FG 500VDC for 60 seconds
	Insulating Rating	SELV/PELV Class III
	Power Supply Protection	Overvoltage, undervoltage, reverse polarity, overcurrent and thermal protection.
	Pollution Degree Rating	Pollution Degree 2
	Earth Terminal	Earth is present - Functional for EMI noise immunity. The terminal on the front panel
	Temperature Operating	0 to 55 °C (ambient)
	Temperature Storage	-20 to 70 °C (ambient)
Interfaces	LAN1	Management/Host port - Ethernet 10/100/1000 Mbps Isolation: PHY side to Line side 500VDC
	CH0 & CH1	Real Time Ethernet Ports CH0 & CH1 – 100 Mbps Isolation: PHY side to Line side 500VDC
	LP1 & LP2	Optical Interface TC-net 100Mbps
Environmental IEC 60068-2-30 IEC 60068-2-1 IEC 60068-2-2 IEC 60068-2-6 IEC 60068-2-27	Operating Humidity	30 to 90% RH non-condensing
	Vibration	10 - 55Hz (1 minute sweep), 19.6m/s ² not operating
	Shock	IEC-68-2-27, 20G (196.1m/s ²), 11ms, half sinewave
	Atmosphere	Free from corrosive gas
	Dust Ingress Protection	IP20 - Not evaluated by UL
	Moisture Protection	Use in a Dry location
	Ground	< 0.5ohm
	Altitude	Up to 2000 m
	Cooling	Natural Convection. No Fan Forced.
Dimensions (single unit) Installation	220mm (W) x 210mm (D) x 45mm (H)	
	Shelf Mount Stand Alone 19" Rack Mount, Single and Double Configuration DIN Rail Vertical Mount	
Net Weight	1450g	
Reliability Document TMRP2512	MTBF [Hours]	330981
	Failure Rate [FIT]	3021.32
UL Certification	UL	E528495-D1001-1/A0/C0-UL
PROFINET Certification	Certificate	Scheduled for May 2026
CE Certification	CE	Future for the European market
EMC – IEC Industrial Generic Emissions	EN 61000-6-4	Radiated & Conducted Emission DC
EMC – IEC Industrial Generic Immunity	EN 61000-6-2	Radiated & Conducted Immunity DC
	ESD Immunity	± 4 kV Contact, ± 8 kV Air
FCC USA	FCC Part 15B	EMC requirements - USA

Table 2: General Specifications

1.7 FCC Part 15 B Information to the user

Warning Statement Subpart § 15.19 (3)	This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation
Information to the user. Subpart § 15.21	The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.
Information to the user. Subpart § 15.105	Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Table 3: FCC Information to the user

1.8 PROFINET Controller Operational Specifications

NOTE: Refer to the most recent datasheet [1] for the most up-to-date information.

Feature	Specification
PROFINET IO specification	V2.4 Maintenance Update 3, PNIO Version 2.43
Supported Conformance Class for IO-Controller	A, B and (future C)
Supported Conformance Classes of connected IO Devices	A, B and (future C)
Maximum total number of ARs for communication	128 Note: nV-Tool RAS diagnostics limit to 123 connected devices
Maximum number of ARs for IRT communication	64 (Future)
Maximum number of DA-ARs	1
Maximum number of total cyclic input data	5652 bytes (including IOPS and IOCS) Note: TC-net IO and nV-Tool limit input data to 768 WORDS
Maximum number of total cyclic output data	5700 bytes (including IOPS and IOCS) Note: TC-net IO and nV-Tool limit output data to 768 WORDS
Supported send clock for RT mode	1 ms, 2 ms, 4 ms (fastest SendClockFactor 32)
Supported send clock for IRT mode (Future)	250 μ s, 500 μ s, 1 ms, 2 ms, 4 ms (fastest SendClockFactor 8)
Performance Limits of ARs	max. 8 ARs if any Sendclock < 500 μ s max. 16 ARs if any Sendclock < 1 ms max. 64 ARs if any Sendclock < 2 ms The maximum number of possible ARs is limited by the minimum send clock value used in the configuration.
Maximum amount of data for acyclic read/write record access	65536 bytes
Number of IOCRs per AR	1x Input IOCR 1x Output IOCR
Maximum amount of data per IOCR	1440 bytes
Maximum number of submodules	2048 submodules (subject to device constraint of 123 devices)
Media Redundancy protocol (Future)	Client, Manager The PROFINET controller implements the Media Redundancy Protocol required to configure a ring topology.
DCP functions via API	■ Name Assignment IO-Devices (DCP SETNameOfStation) ■ Set IO-Devices IP (DCP SET IP) ■ Signal IO-Device (DCP SET SIGNAL) ■ Reset IO-Device to factory settings (DCP Reset FactorySettings) ■ Bus scan (DCP IDENTIFY ALL) ■ DCP GET
Supported protocols	■ RTC, Real time protocol cyclic ■ RTA, Real time protocol acyclic ■ DCP, Discovery and Configuration Protocol ■ CL-RPC, Connectionless Remote Procedure Call ■ LLDP, Link Layer Discovery Protocol ■ PTCP, Precision Transparent Clock Protocol ■ MRP, Media Redundancy Protocol (Future) ■ SNMP V1, Simple Network Management Protocol
Topology recognition	■ LLDP ■ SNMP V1 ■ Physical Device Record Objects ■ Line ■ Star
Additional supported features	■ Automatic alarm handling ■ Fast Startup (FSU) ■ Automatic Name Assignment ■ Device Access AR ■ Security Class 1 (Future) ■ SystemRedundancy (Future)

Feature	Specification
Baud rate	100 MBits/s
Data transport layer	Ethernet II, IEEE 802.3
UDP ports	161 (SNMP), 34964 (PROFINET RPC EndPointMapper), 49152 (PROFINET RPC Client)
Restrictions and Limitations	■ The usable (minimum) cycle time depends on the number of used IO-Devices, the number of used input and output data. See technical data for details ■ RT over UDP not supported ■ Multicast communication not supported ■ DHCP is not supported (neither for PROFINET IO-Controller nor for the IO-Devices) ■ NameOfStation and IP of IO-Controller CANNOT be set using the DCP SET NameOfStation service but only at start-up while configuring the IO-Controller ■ Only one IOCR per IO-Device per direction ■ Only one instance of DeviceAccess AR can be used at the same time ■ Only one fragmented acyclic service can be used at the same time ■ Planning of IRT is not done by the PROFINET IO-Controller protocol stack ■ Sync Slave is not supported ■ Multiple Sync Masters are not supported ■ MRPD is not supported ■ MRP Manager requires an additional license in the security memory ■ MRP Manager(Auto) (so called Auto Manager) is not supported ■ Multiple MRP Managers are not supported ■ Only one DCP Service can be used in parallel ■ Shared Input is not supported ■ The IO-Controller does not support or offer an IO-Device interface (so called 'iDevice') ■ Concurrent usage of IRT and SystemRedundancy for the same IO-Device is not possible (by definition of PROFINET specification) ■ Concurrent usage of IRT and SystemRedundancy (e.g. one IO-Device with IRT and a different one with SystemRedundancy) is not supported ■ SystemRedundancy communication to R1 and R2 IO-Devices is not supported. ■ Dynamic Reconfiguration is not supported

Table 4: PROFINET Controller Operational Specifications

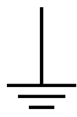
1.9 TC-net IO Loop General Specifications

NOTE: Refer to the most recent datasheet [1] for the most up-to-date information.

Item	Specification
Transmission Speed	100MBps
MAC control	DOMA (Deterministic Ordered Multiple Access)/LP
Transmission Distance	Maximum distance between nodes (optical 2km) Maximum loop length 4km
Number of nodes	Maximum 254 nodes/system
Transmission mode	Scan transmission Message transmission
Scan transmission capacity	64kword(16bit/word), 2048 block (maximum 64words/block)
Scan send capacity	32k words
Scan transmission mode	High speed scan 0.1ms to 10ms in 0.1ms steps Medium speed scan 2ms to 1000ms in 1ms steps Scan time defined on 64 word block by block basis.
Redundancy	Double loop transmission line
Maintenance function	Scan healthy map Node information Bus diagnostic Counter loopback

Table 5: TC-net IO Loop Controller Operational Specifications

2 Installation Guide



Ground the device.

Connect the unit to the earth. Functional earth for EMI noise immunity.
The terminal on the front panel



ESD Sensitive Apparatus.

Do not open this equipment. To be serviced by qualified personnel with electrostatic protective gear.

Install the PN912 inside an IP5x cabinet for harsh environments. Ventilation is required to prevent the unit from overheating and to maintain the environment within the operating temperature range. Refer to 1.6 for more environmental specifications.

2.1 Power Supply Recommendations

User power supply must be a UL-rated SELV/PELV Class III Certified. The input is 24V nominal with a typical power consumption of 8.5W. Refer to 1.6 for more information.

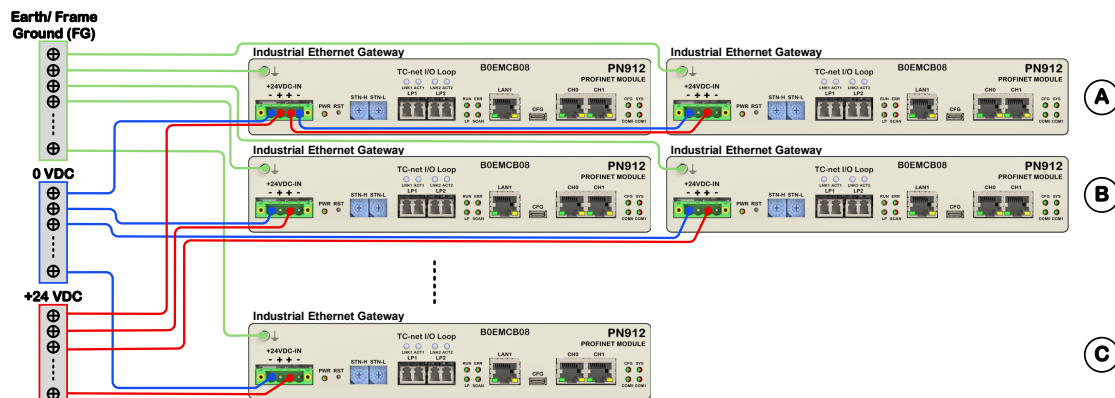


Figure 1: Recommended power distribution diagram

When installing multiple PN912, each unit must be individually connected to Earth or Frame Ground to minimize electrical noise. Units should not share the same Earth connection.

Figure 1 illustrates three acceptable wiring configurations for connecting PN912 modules to the power rail:

- **Configuration A:** Two PN912 units mounted together (2.2.2.2 Double Box Rack Mounted) can share a cascading power supply connection. However, no more than two units are permitted in this cascading arrangement.
- **Configuration B:** Two PN912 units mounted together (2.2.2.2 Double Box Rack Mounted) can each be powered separately from the power rail.
- **Configuration C:** A single PN912 unit can be connected directly to power supply.

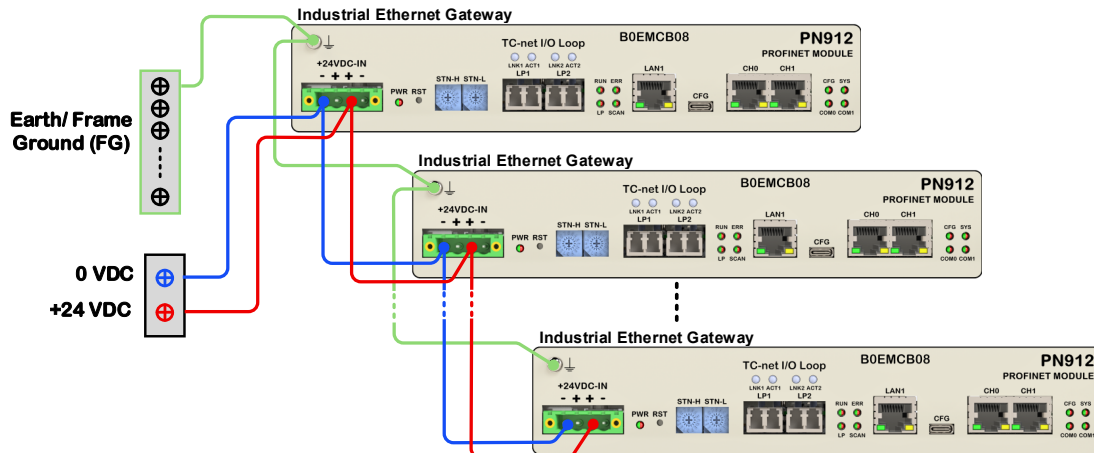


Figure 2: Not recommended power distribution diagram example

Figure 2 provide examples of power distribution violation:

- More than two units should not share the same power supply, in a cascading or daisy-chained manner.
- Multiple units must not share the same Earth / Frame Ground connection.

2.2 Mounting Options

2.2.1 Horizontal Shelf Mounting

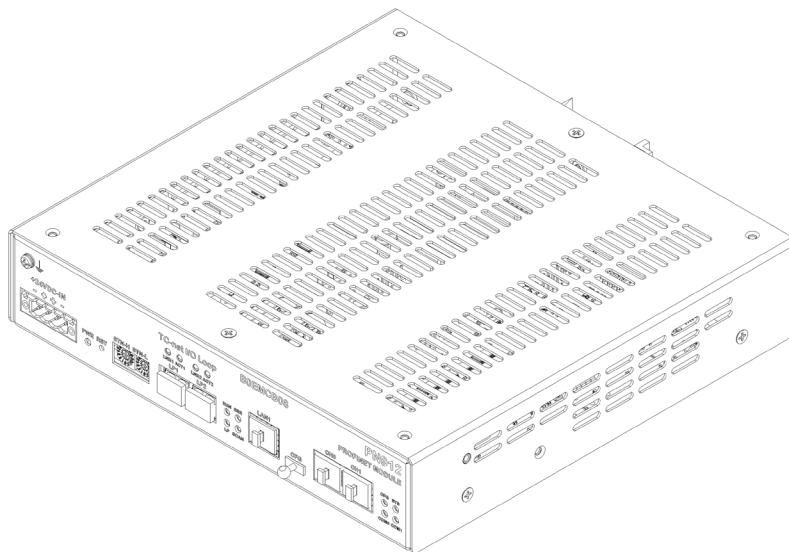


Figure 3: PN912 Horizontal Installation on Shelf

The PN912 module can be installed horizontally on a shelf. Use the supplied feet to maintain the required clearance for adequate ventilation.

2.2.2 Horizontal Rack Mounting

2.2.2.1 Single Box Rack Mounted

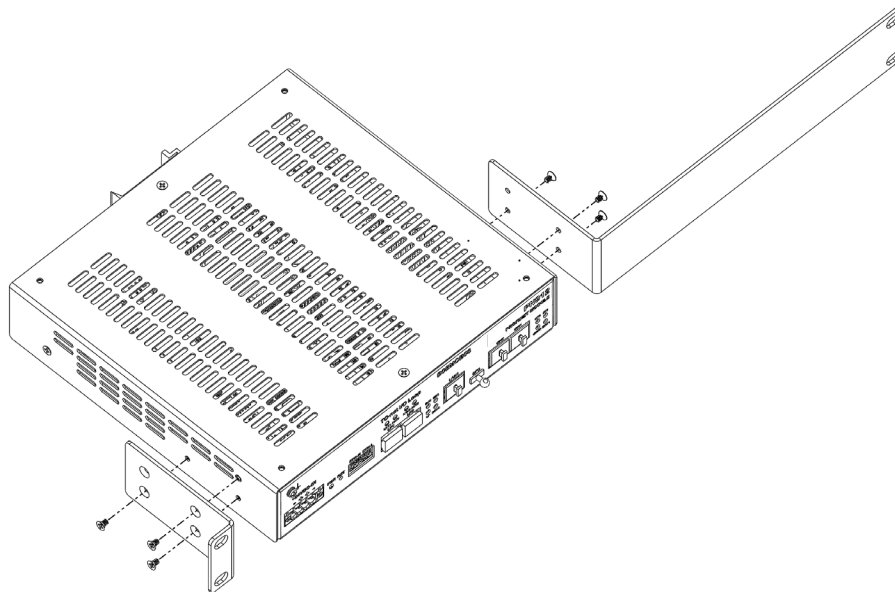


Figure 4: Single PN912 Horizontal Mounting with brackets

A single PN912 can be horizontally mounted using the provided short and long L plates.

Required:

- ✓ 1x Short L-Bracket
- ✓ 1x Long L-Bracket
- ✓ 6x screws (3 for each bracket)

2.2.2.2 Double Box Rack Mounted

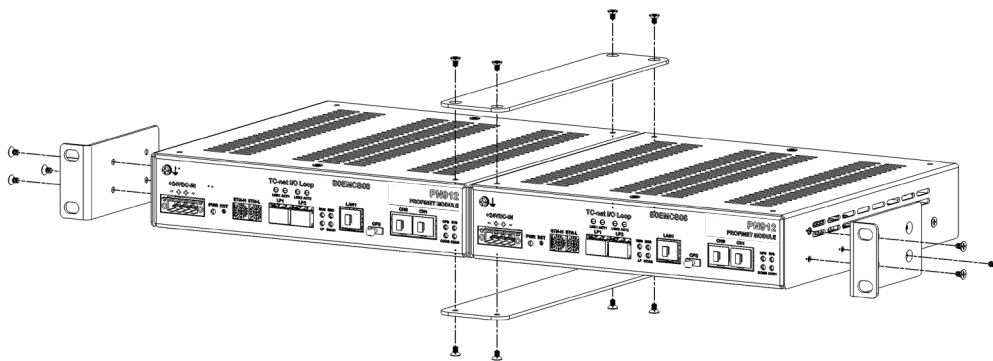


Figure 5: Double PN912 Horizontal Mounting with brackets

For double configuration mounting, boxes can be joined together using plates before mounting the brackets.

Required component:

- ✓ 2x longitudinal plates
- ✓ 2x short L-brackets
- ✓ 14x screws

First, use the 2x4 screws to fasten each top and bottom longitudinal plates. Then, 2x3 screws for each short L-brackets on the side.

2.2.2.3 Mounting to Rack

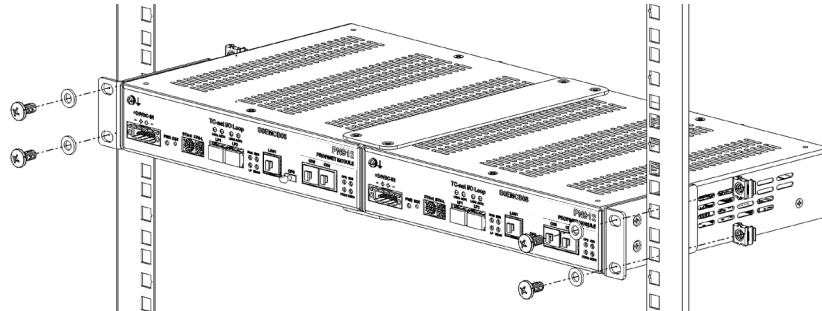


Figure 6: Mounting PN912 to Rack

After L-brackets are mounted, the device is ready to be mounted to a rack using the included rack mounting kit.

Required component:

- ✓ 4 screws
- ✓ 4 flat washers
- ✓ 4 rack washers

Each L-bracket are mounted with 2 screws with 2 washers in between and held tight with 2 railing washers.

2.2.3 Vertical Mounting

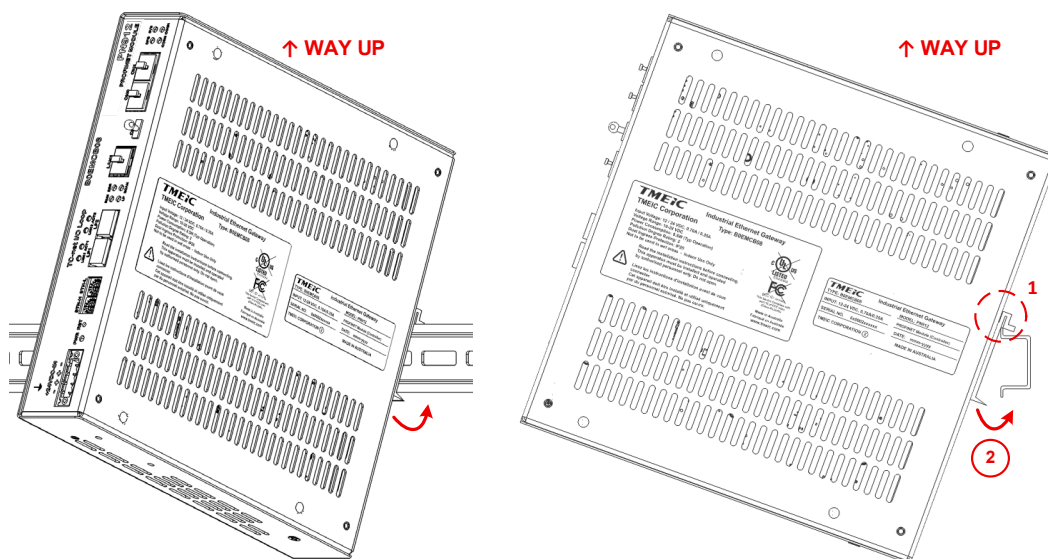


Figure 7: Vertical PN912 Mounting

PN912 can be vertically mounted using the installed back plate and locking it to a DIN rail. First, pitch the device upwards and rest the top part of the mount to the DIN rail. A spring locking mechanism will prevent any horizontal movement (along the length of the rail). Finally, pitch the device downwards to fully rest the mounting to the rail and complete the installation process.

3 Interfaces



Cables must be installed in accordance with industry best practices and standards.

To ensure connection quality and avoid damage to cables and ports.

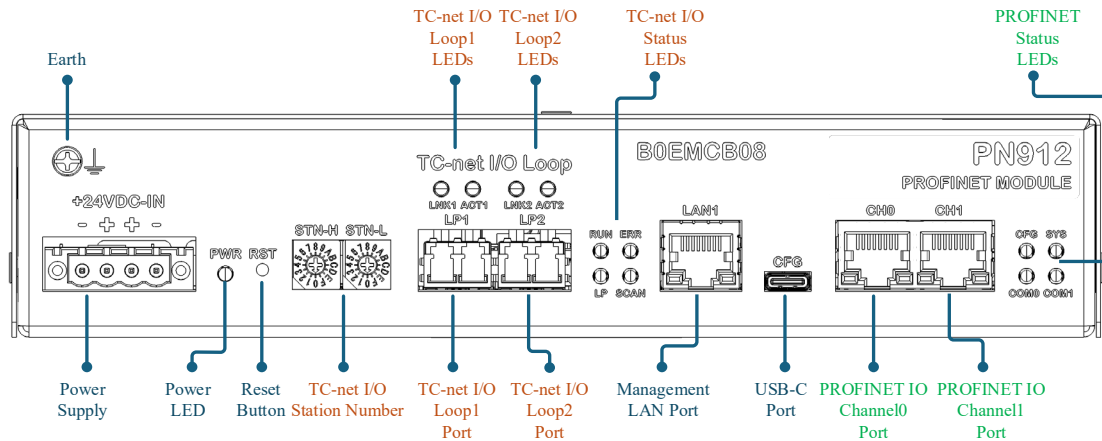


Figure 8: PN912 Front Panel View

Figure 8 shows the interface ports are accessible via the front panel. The port connection status of each interface is described by the port LEDs and interface status LEDs to help user understanding of the system activity.

3.1 Management Port

The LAN1, “Management Port”, is used to connect the PN912 to a supervisory Ethernet network. This allows the module to be configured via the TMEIC Gateway Tool.

The Ethernet port supports 10/100/Gigabit ethernet speed. It is recommended that a Cat6A Shielded Ethernet cable no greater than 3 metres in length is used.

3.2 TC-net I/O Loop

The PN912 PROFINET Module is equipped with Toshiba TC-net I/O Loop communication protocol. For more information, refer to [3].

3.2.1 Station Number

The TC-net I/O Loop station number can be set using two hexadecimal switches, located on the front of the module, which can be turned using a Phillips head screwdriver (see Figure 9). Valid station addresses range from decimal 3 to 34 inclusively, which is hex for 0x3 to 0x22. If an address outside this range is selected, the module will be inoperable.

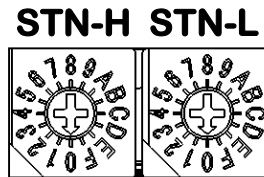


Figure 9: TC-net I/O Loop Station switches.

Specify the device station address that has been assigned in the system configuration using hex value. For example, configured station number decimal 26 or hex 0x1A:

STN-H will be “1”,
STN-L will be “A”.

Ensure the station number does not overlap with other TC-net devices when configuring the network.

3.2.2 Optical Ports

The TC-net I/O Loop interface is equipped with two RX/TX optical ports, named Loop1 (LP1) and Loop2 (LP2).

TMEIC recommends LC-to-LC Duplex OM4 Multimode cable for the optimal communication functionality.



Figure 10: LC-to-LC Duplex cable.

3.2.3 LEDs

The TC-net I/O Loop interface is equipped with 4 port LEDs to describe 2 optical ports and 4 status LEDs. In normal operation, the status LEDs describes the interface, communication statuses, and error indication. Refer to *Section 5.1* for LED patterns and meaning during normal operation.

Additionally, the status LEDs show the state of the PN912 module boot up sequence and software update. These specific use cases are described in *Section 3.5* and *Section 4*, respectively.

3.3 PROFINET IO

3.3.1 Ethernet Ports:

The PROFINET IO interface consists of a 2-port Ethernet switch. TMEIC recommends the use of PROFINET or Cat6A shielded Ethernet cables to reduce Electromagnetic Interference (EMI) and Radio Frequency Interference (RFI).

3.3.2 LEDs

There are 2 standard Ethernet LEDs on each port and 4 status LEDs: SYS, COM0, COM1, and CFG. Refer to *Section 5.2* for LED patterns and meaning during normal operation.

3.4 USB-C

The USB-C port in the PN912 supports the USB 2.0 standard. The port is used for the purpose of updating software and firmware images via a USB stick.

3.5 Reset & Recovery



Do not initiate a reboot or updates on a running network.

Reboot and updates will render the device inoperable for a period. Thoughtlessly rebooting the device may result in property damages and losses.



Do not use sharp objects to press the reset button.

Although the reset button can only be pressed using small object, using a sharp pointy object such as a pin or knife may damage the button and scratch the case surface.

The reset button can be used to reboot the device by holding it pressed for ~5 seconds and releasing when the PWR LED starts flashing orange. The device will then restart with the indication of the start-up LED test (refer to *Section 4* for LED test information).

Recovery updates can be initiated with the following instructions:

1. Power on but not online controlling a network
2. Connect the USB stick containing the recovery updates file.
3. Hold the reset button. The power LED will flash orange. Keep holding until the start-up LED sequence has started, refer to Figure 12. This whole process will take about ~10seconds.

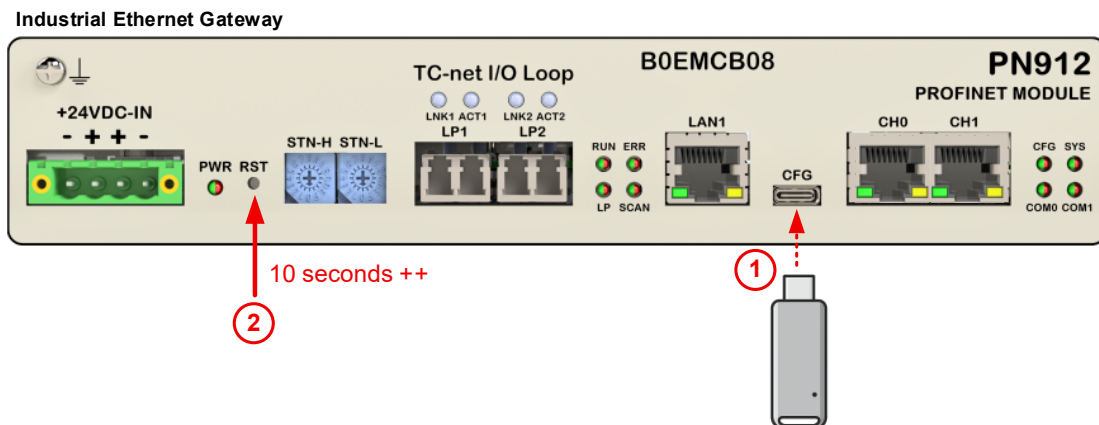


Figure 11: Instruction for recovery updates

During the recovery updates installation process, the TC-net I/O Loop LED shows the following sequence:

TC-net I/O Status LEDs				State
RUN	ERR	LP	SCAN	
 ON_(G)	 Off	 1Hz Flash_(G)	 Off	Update Start
 ON_(G)	 Off	 Off	 1Hz Flash_(G)	Update Verify
 Off	 Off	 ON_(G)	 Off	Update Done*
 Off	 4Hz Flash_(R)	 ON_(R)	 Off	Update Fail
 ON_(G)	 Off	 1Hz Flash_(G)	 1Hz Flash_(G)	Backup Start
 Off	 Off	 Off	 ON_(G)	Backup Done
 Off	 4Hz Flash_(R)	 Off	 ON_(R)	Backup Fail
 ON_(G)	 Off	 ON_(G)	 ON_(G)	Diagnostic
 ON_(G)	 4Hz Flash_(R)	 ON_(G)	 1Hz Flash_(G)	External Config

Table 6: Recovery updates installer LED sequences.

*Upon completion, the LED will be on “Update Done” stage, user may remove the USB and reboot (power cycle) the unit to boot to the updated system.

4 Start-up guide

Ensure that the device is earthed before powering up the device. To start the device, simply connect the 24V power supply to the device.

Industrial Ethernet Gateway

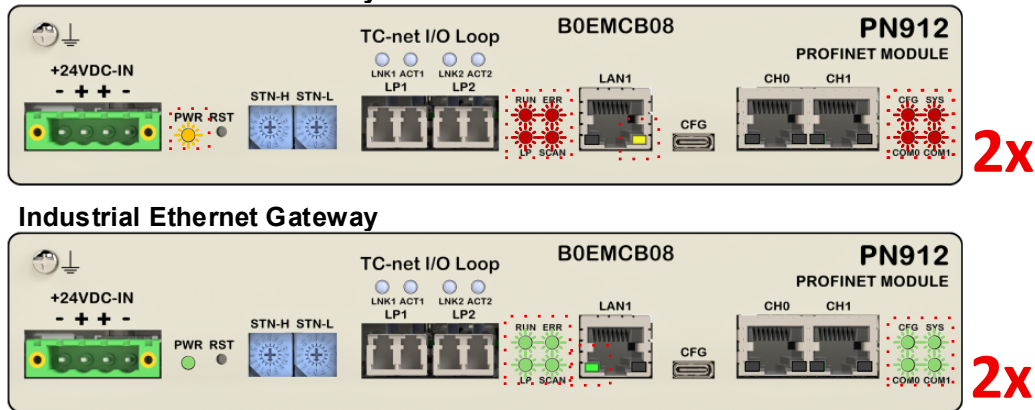


Figure 12: PN912 start up LED test

First sign of a device start up is a LED test, as shown in Figure 12:

- Red/orange LEDs flash twice.
- Green LEDs flash twice.

Then all LEDs will turn off and 20-30 sec later, the system will do an initialisation shown in the following table. Refer to *Appendix A* for LED labelling information.

TC-net I/O Status LEDs				State
RUN	ERR	LP	SCAN	
1Hz Flash _(G)	Off	ON _(G)	Off	Early Start
1Hz Flash _(G)	Off	1Hz Flash _(G)	Off	Early FPGA
1Hz Flash _(G)	Off	Off	Off	Early Done
1Hz Flash _(G)	Off	Off	ON _(G)	Main Start
1Hz Flash _(G)	Off	ON _(G)	ON _(G)	Main Arch
1Hz Flash _(G)	Off	1Hz Flash _(G)	1Hz Flash _(G)	Main Config
ON _(G)	Off	Off	Off	Main Done
4Hz Flash _(R)	ON _(R)	Off	Off	Main Error

Table 7: PN912 initialisation LED sequence

In the circumstances when TC-net interface status LEDs are unpowered and the PWR LED is red on power up, refer to the troubleshooting guide [TBD].

5 LED Display and Operations

The following sections describe the states of the PROFINET IO and TC-net I/O Loop interfaces based on the LEDs combination. Refer to *Appendix A* for LED labelling information.

5.1 TC-net I/O Loop LEDs Behaviour

TC-net I/O Loop Status LEDs		State
LED Name	Display	
RUN	● ON(G)	Module is normal or waiting for parameter download
	● Off	Module is abnormal
ERR	● ON(R)	Module is abnormal
	● Off	Module is normal
LP	● ON(G)	TC-net I/O loop is normal
	● Off	Disconnection of TC-net I/O loop exists
SCAN	● ON(G)	TC-net I/O loop side scan transmission is running normally
	● Off	TC-net I/O loop side scan transmission is in suspension
	☀ Flash(G)	TC-net I/O loop side scan block is overlapping

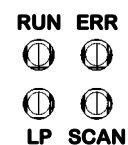


Table 8: TC-net I/O Loop status LED patterns and meaning

TC-net I/O Loop Port LEDs		State
LED Name	Display	
LNK1	● ON(G)	LP1 link established (normal)
	● Off	LP1 link is not established (abnormal)
ACT1	☀ 4Hz Flash(O)	LP1 transmission is running (normal)
	● Off	LP1 transmission is not running (abnormal)
LNK2	● ON(G)	LP2 link established (normal)
	● Off	LP2 link is not established (abnormal)
ACT2	☀ 4Hz Flash(O)	LP2 transmission is running (normal)
	● Off	LP2 transmission is not running (abnormal)

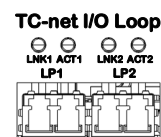


Table 9: TC-net I/O Loop ports LEDs patterns and meaning

5.2 PROFINET IO LEDs Behaviour

PROFINET I/O Status LEDs			State
SYS	COM0 (System Failure)	COM1 (Bus Failure)	
Firmware and Configuration			
 Off	 Off	 Off	Missing power supply or hardware defect
 ON_(R)	 Off	 Off	No second stage bootloader found in the Flash memory
 Flash_(G/R)  cyclic	 Off	 Off	No firmware file found in Flash file system
 ON_(G)	 ON_(R)	 Off	PROFINET IO Controller not configured
 ON_(G)	 Off	 ON_(R)	No Ethernet port has a link. E.g., no cable connected to any of the ethernet ports.
 ON_(G)	 Off	 2Hz Flash_(R)	PROFINET IO Controller not online (Bus is switched to OFF)
PROFINET Communication			
 ON_(G)	 ON_(R) or  Off	 1Hz Flash_(R)	Not all configured devices are in data exchange
 ON_(G)	 ON_(R)	 Off	One IO Device connected to the PROFINET IO Controller reports a problem
 ON_(G)	 Off	 Off	All devices are in data exchange, and no problem has been reported by any device
PROFINET IO Controller operation			
 ON_(G)	 1Hz Flash_(R), 3Sec	 Off	A PROFINET DCP Set Signal has been received
 ON_(G)	 2Hz Flash_(R)	 2Hz Flash_(R)	The PROFINET IO Controller has detected an address conflict. Another device in the network is using the same Name of Station or IP address as the PROFINET IO Controller. Or Watchdog error
 ON_(G)	 ON_(R)	 ON_(R)	No valid master license

CFG SYS
● ●
● ●
COM0 COM1

Table 10: PROFINET IO status LEDs patterns and meaning

PROFINET I/O Port LEDs		State
LED Name	Display	
CH0 LNK	● ON_(G)	CH0 device is linked to Ethernet (normal)
	● Off	CH0 device is not linked to Ethernet (abnormal)
CH0 ACT	Flash _(O)	CH0 device sends/receives Ethernet frames (normal)
	● Off	CH0 device does not send/receive Ethernet frames (abnormal)
CH1 LNK	● ON_(G)	CH1 device is linked to Ethernet (normal)
	● Off	CH1 device is not linked to Ethernet (abnormal)
CH1 ACT	Flash _(O)	CH1 device sends/receives Ethernet frames (normal)
	● Off	CH1 device does not send/receive Ethernet frames (abnormal)

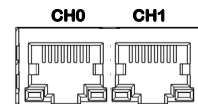


Table 11: PROFINET IO ports LEDs patterns and meaning

6 Network Configurations

6.1 PROFINET Configuration

The following topologies illustrate typical PROFINET topologies to use when integrating the PN912 Module into the system. Refer to the PROFINET Design Guidelines document [2] for in-depth details on configuring PROFINET.

6.1.1 Line Topology

PROFINET devices can be connected in a line topology to the PN912 acting as the controller using one or both PROFINET interface ports. In this setup, devices are daisy-chained in series, allowing communication to flow from one device to the next.

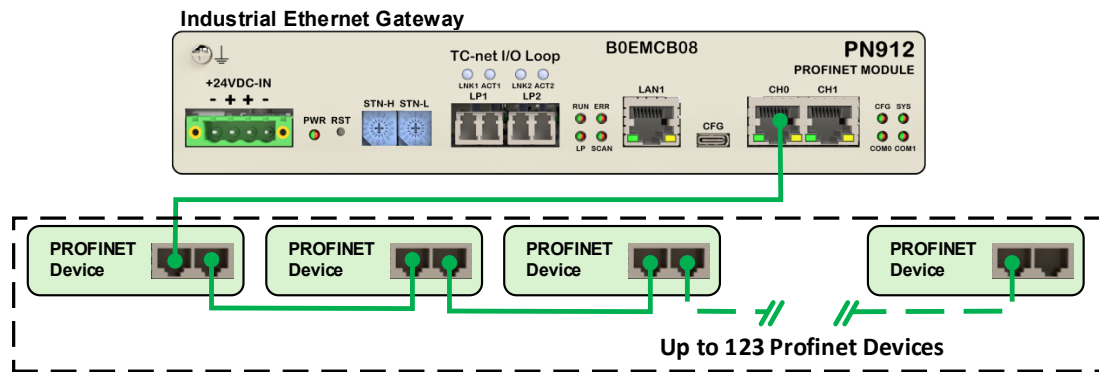


Figure 13: Single port PROFINET line topology

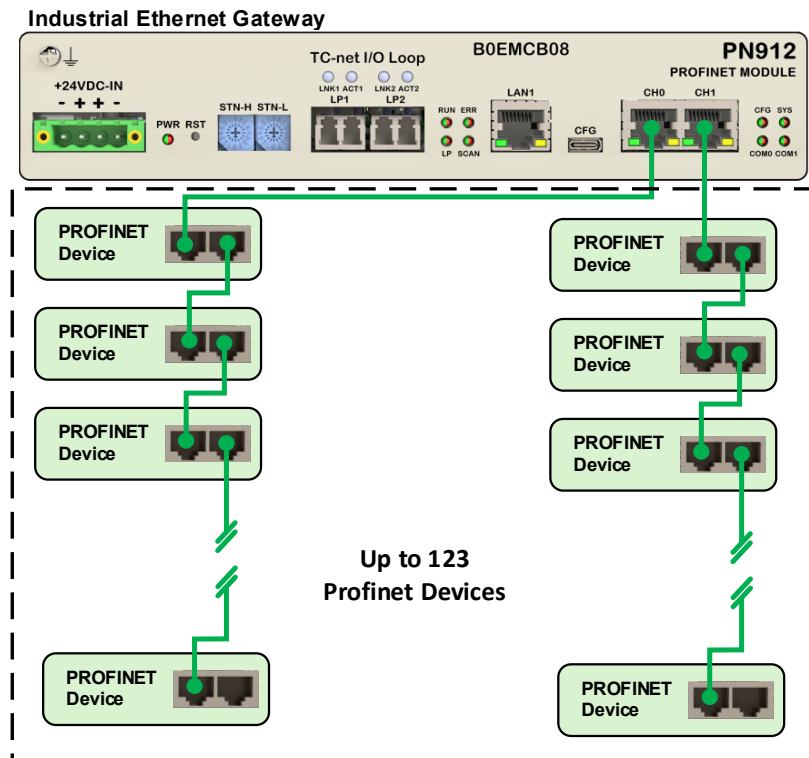


Figure 14: Dual port PROFINET line topology

6.1.2 Star Topology

PROFINET devices can also be connected in a star topology, utilising switches to connect the devices in parallel. This configuration can help prevent network disruption when a device is down.

The figures below show some examples.

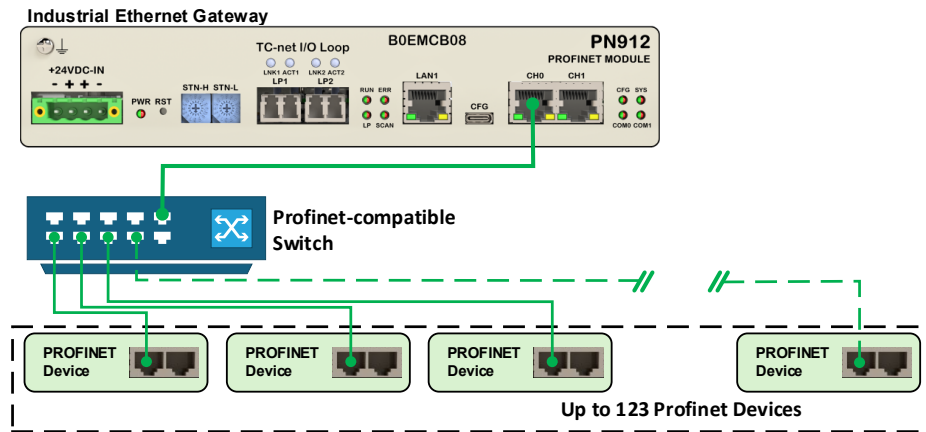


Figure 15: Single port PROFINET star topology

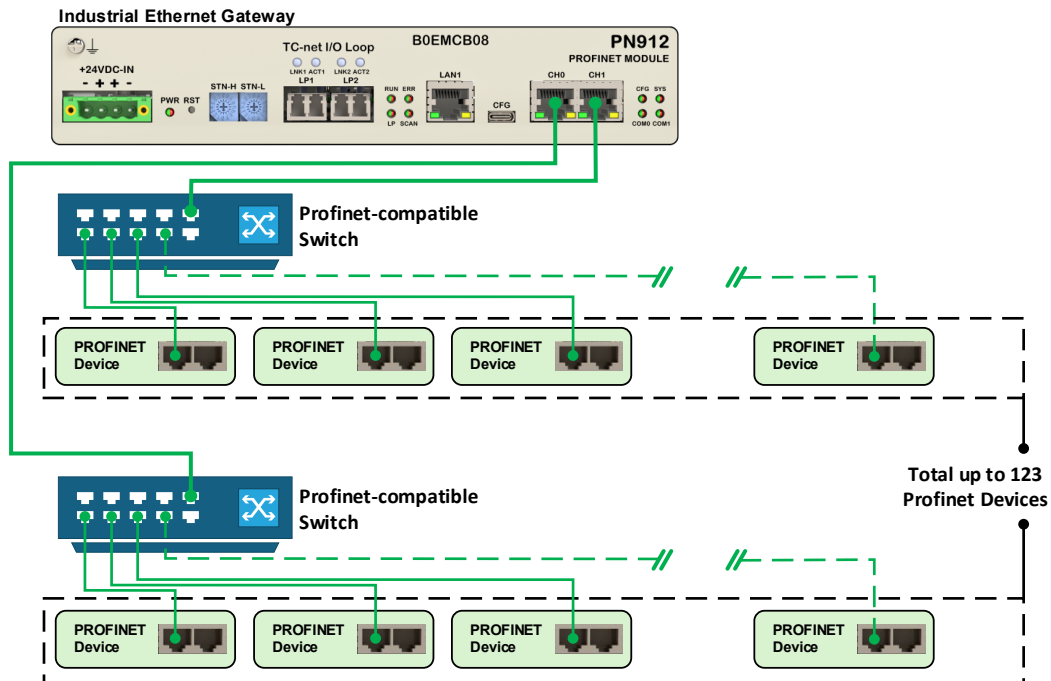


Figure 16: Dual port PROFINET star topology

6.2 TC-net Configuration

Refer to the TC-net I/O Loop documents [3] [4] for in-depth details on configuring TC-net.

6.2.1 TC-net I/O Loop direct to PN912

The PN912 can be configured to connect to the Toshiba typeS controller [4] directly via fibre optic cables. The PN912 can be connected as a singular device or daisy-chained to another units.

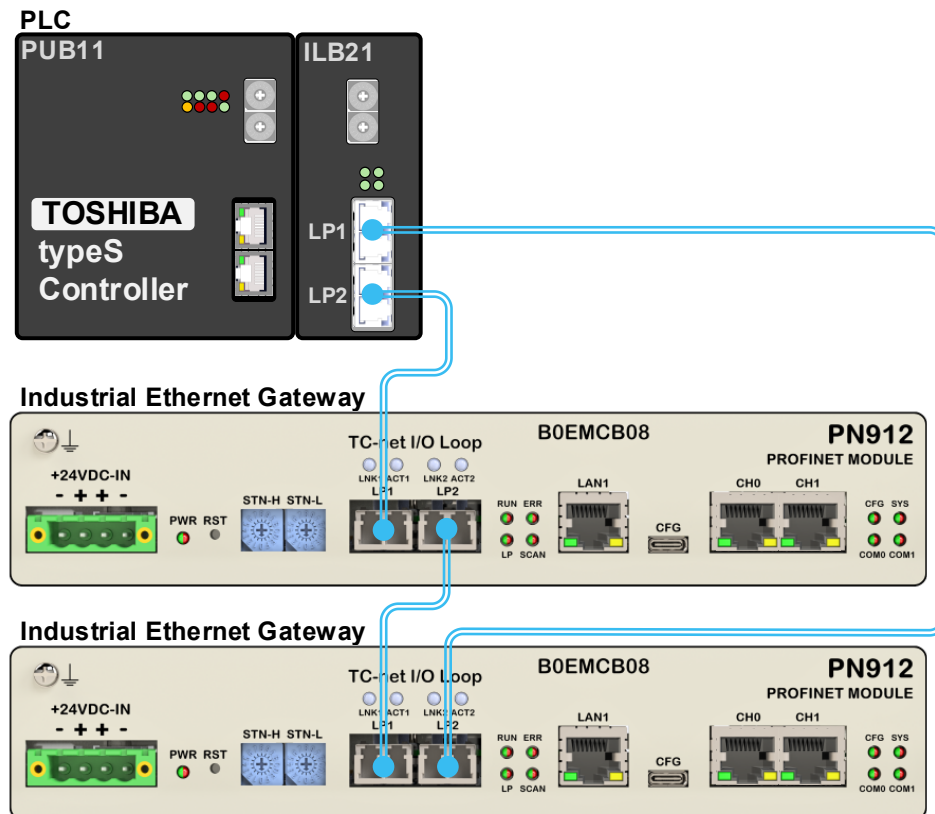


Figure 17: TC-net I/O Loop configuration with PN912

6.2.2 TC-net I/O Loop connection to PN912 with hub

In the scenario where more ports are required, a ULTH21 TC-net I/O Loop hub, can be utilised to bridge the typeS controller and the PN912. Like the non-hub configuration, the PN912 can be configured as a singular device or daisy-chained to one another.

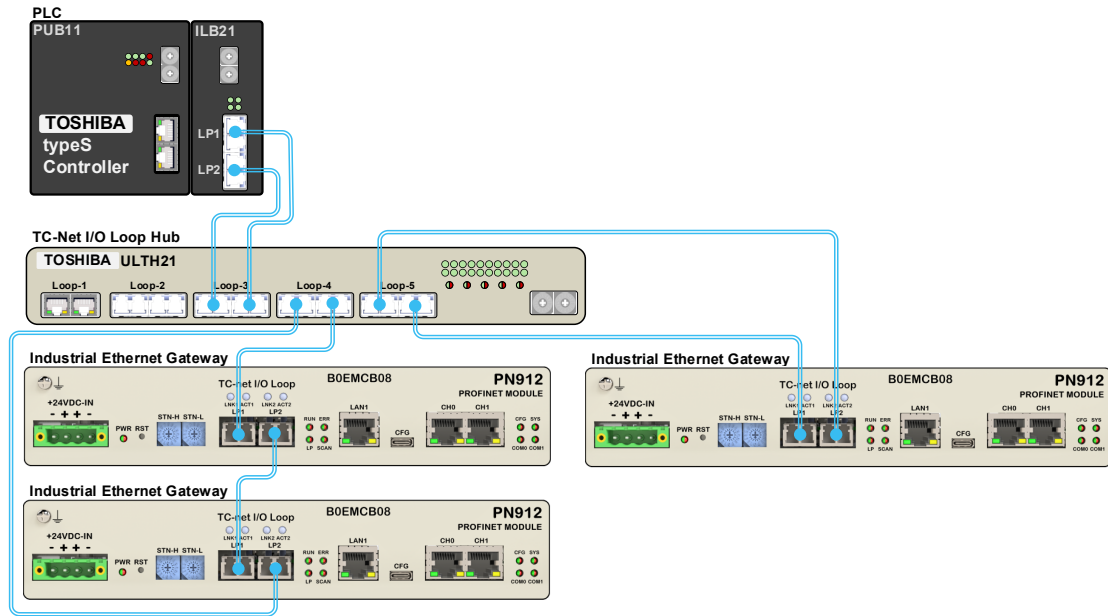


Figure 18: TC-net I/O Loop configuration with hub and PN912

7 Software Installation

7.1 SYCON.net and related applications

There are three (3) Hilscher products that are required to be installed. These are:

- SYCON.net (V2)
- Device Library
- Ethernet Device Configuration Tool

At the time of writing, the latest software versions can be downloaded from the following locations:

<https://hilscher.atlassian.net/wiki/spaces/SYCON/pages/107087290/SYCON.net+V2>

<https://hilscher.atlassian.net/wiki/spaces/DEVLIB/overview>

<https://hilscher.atlassian.net/wiki/spaces/ETHDEVCFG/overview>

NOTE: It is recommended these are installed on the same machine as the TMEIC Gateway Tool.

7.1.1 SYCON.net (V2)

The procedure to install SYCON.net (V2) is as follows:

1. Right-click the setup.exe file (e.g. SYCON.net V2.0.112.50940 Setup.exe) and select “Run as administrator”.
2. Follow the prompts to install SYCON.net, accepting all defaults.
3. When installation is complete, click Finish.

7.1.2 Device Library

Once SYCON.net has been installed, install the Device Library as follows:

1. Right-click the setup.exe file (e.g. Device Library V1.6.75.54323 Setup.exe) and select “Run as administrator”.
2. Follow the prompts to install the Device Library, accepting all defaults.
3. When installation is complete, click Finish.

7.1.3 Ethernet Device Configuration Tool

Finally, install the Ethernet Device Configuration Tool as follows:

1. Right-click the setup.exe file (e.g. Ethernet Device Configuration Tool V3.0000.4.9962 Setup.exe) and select “Run as administrator”.
2. Follow the prompts to install the Ethernet Device Configuration Tool, accepting all defaults.
3. When installation is complete, click Finish.

7.2 TMEIC Gateway Tool

The procedure to install the TMEIC Gateway Tool is as follows:

1. Right-click the setup.exe file, and select “Run as administrator”
2. Follow the prompts to install the TMEIC Gateway Tool, accepting all defaults.
3. When installation is complete, click Finish.

7.3 nV-Tool

An installation of Toshiba’s Unified Controller Engineering Tool 5 (nV-Tool) is required for configuring the TC-net IO and PLC program side of the PN912. However, the nV-Tool installation procedure is beyond the scope of this guide. Refer to Operation Manual – Setup – 6F8C1627 for instructions.

8 Software Configuration

Once the required software is installed, the configuration must be created. The general flow of the configuration/definition files imported and exported into each program is shown in Figure 19 below.

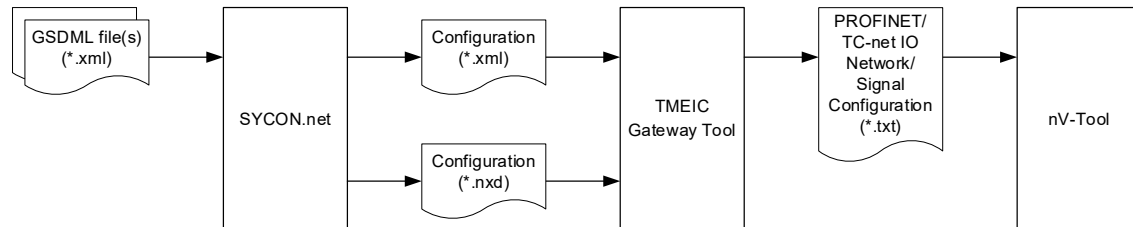


Figure 19: Configuration/definition file import/export general flow

The following sections describe how to configure the software for the PN912, using an example configuration. The topology for this is shown below in Figure 20. For further information related to the TMEIC Gateway Tool functions mentioned in these sections, see [5].

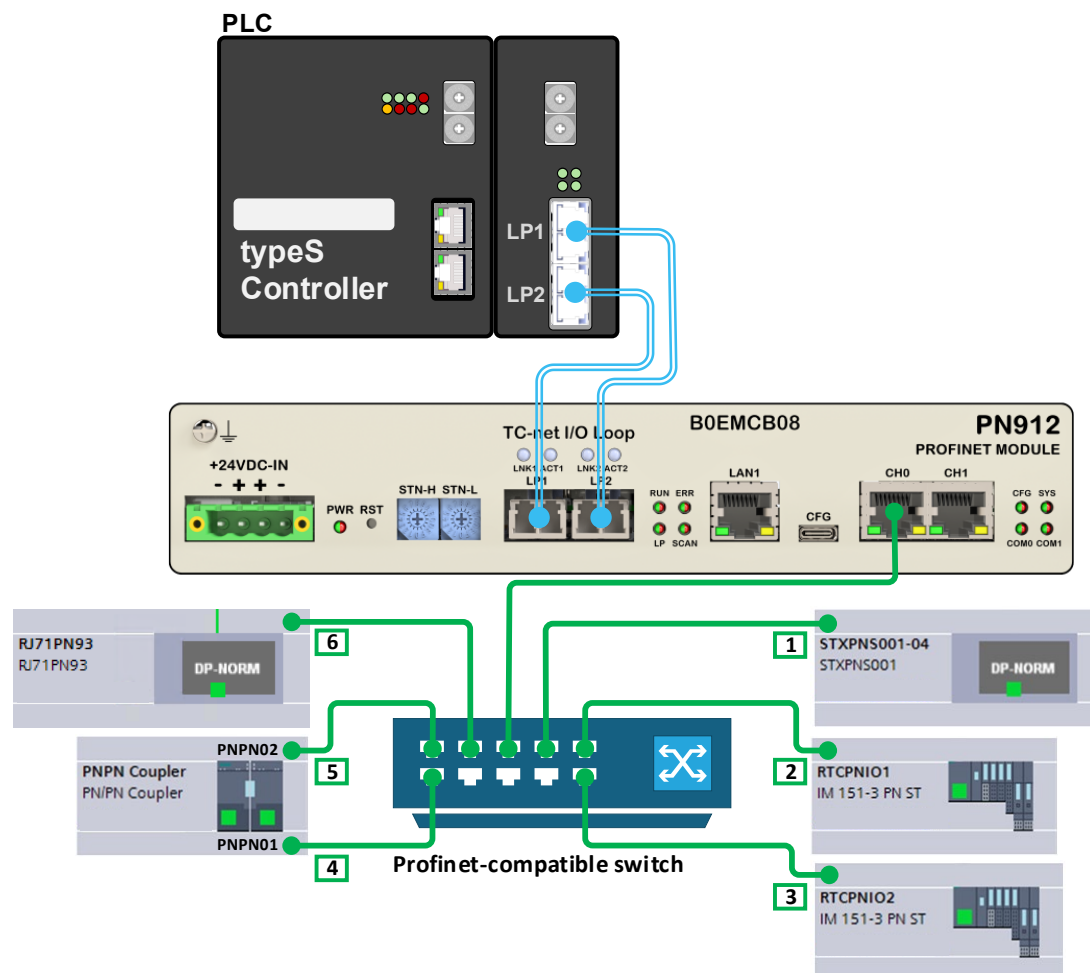


Figure 20: Sample configuration with the PN912

8.1 SYCON.net

8.1.1 Import required GSDML files

A GSDML file is required for each type of PROFINET IO-Device that will be configured for communication with the PN912. To import GSDML files into SYCON.net:

1. In SYCON.net, navigate to Network → Import Device Descriptions.
2. Select a PROFINET GSDML (*.xml) file and click Open.
3. A Browse for Folder dialog may be opened to select the location for the bitmap/icons file for the GSDML file. Navigate to the location if known, otherwise, click Cancel (many vendors don't provide a bitmap/icons file).
4. When prompted to reload the catalog, click Yes.
5. When prompted to load the project again, click Yes.
6. Repeat for remaining required GSDML files.

For this example, four GSDML files were imported:

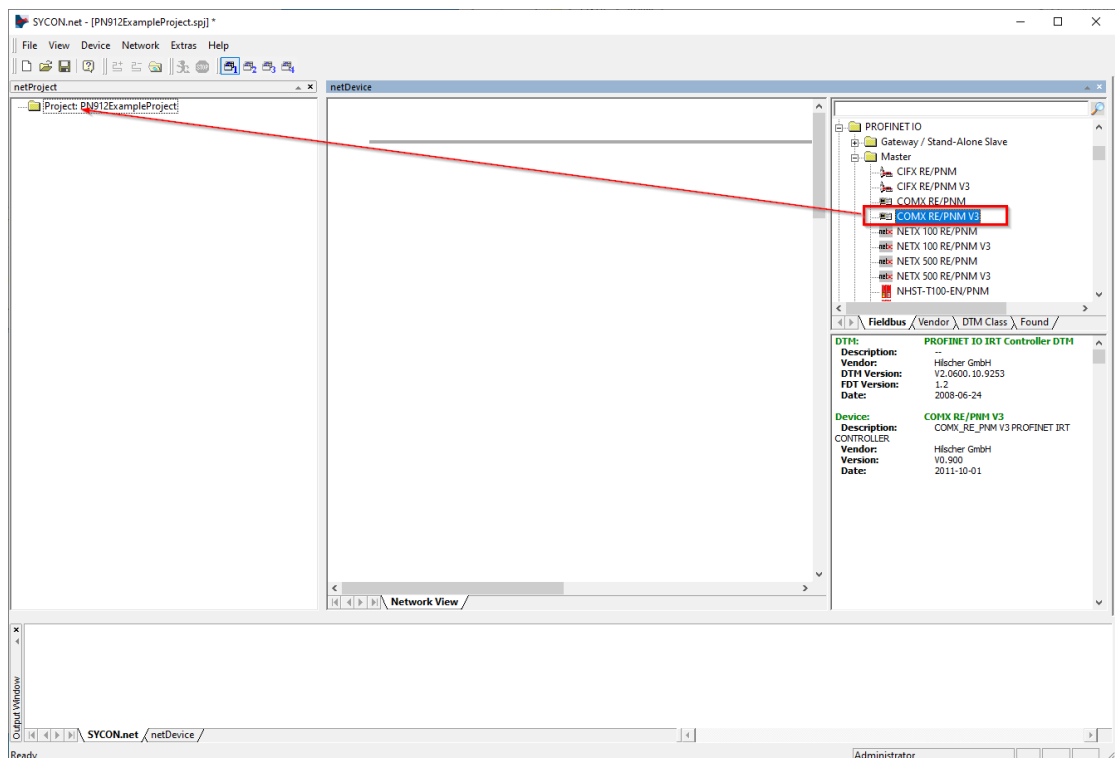
- GSDML-V2.0-GEIP-RSTi-STXPNS-20131112.xml
- GSDML-V2.25-Siemens-ET200S-20140317.xml
- GSDML-V2.34-Siemens-PNPNIOC-20191106.xml
- GSDML-V2.35-MitsubishiElectric-RJ71PN93-20201124.xml

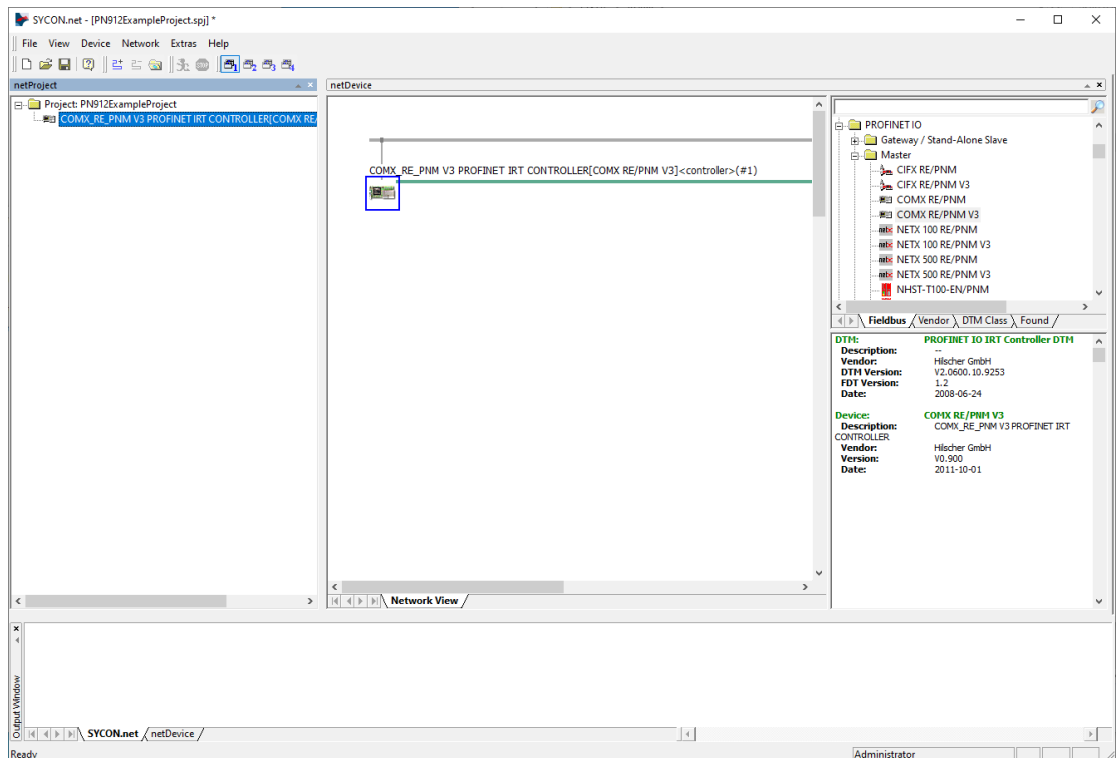
NOTE: Since the PN912 IO-Controller supports PNIO_Version 2.43 and earlier, it is recommended to also use GSDML files with PNIO_Version 2.43 or earlier specified. This will help to prevent PNIO_Version 2.44+ features from being selected that are not supported by the PN912.

8.1.2 Build PROFINET network configuration

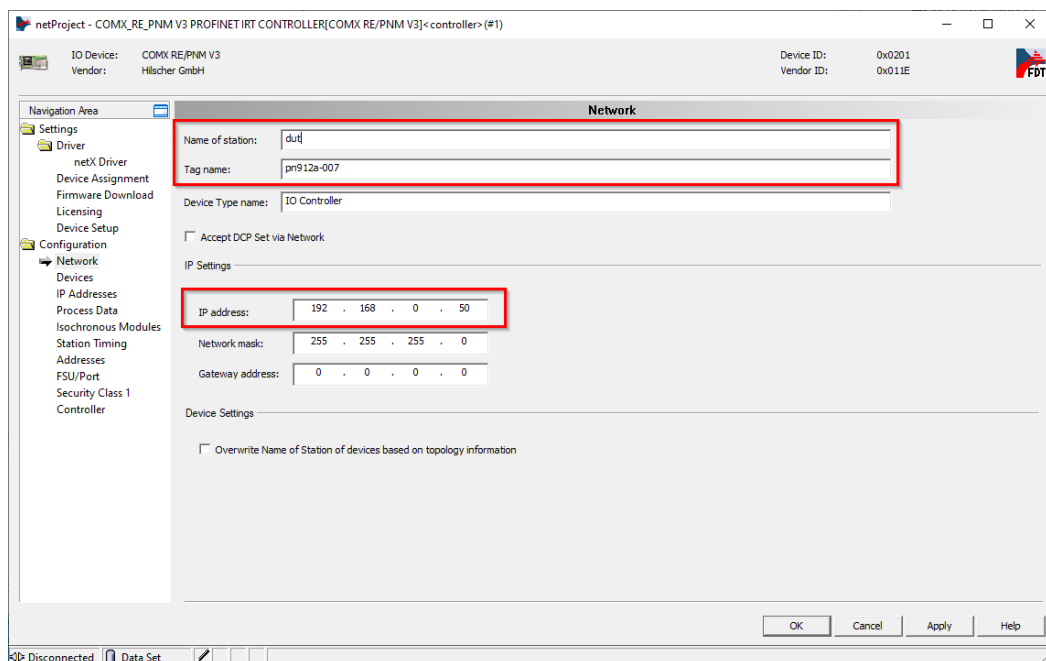
8.1.2.1 Add PROFINET IO-Controller

1. From the Fieldbus tab on the right-hand side, navigate to PROFINET IO → Master.
2. Select COMX RE/PNM V3 and drag it over to the Project tree under netProject. This device represents the PN912 IO-Controller.





3. Once the COMX RE/PNM V3 controller has been added, right-click the controller in the netProject tree, and select Configuration.
4. Under Configuration → Network, set appropriate values for each field where required (optional). In this example, the following values were changed to match the topology:
 - Name of station: dut
 - Tag name: pn912a-007
 - IP address: 192.168.0.50

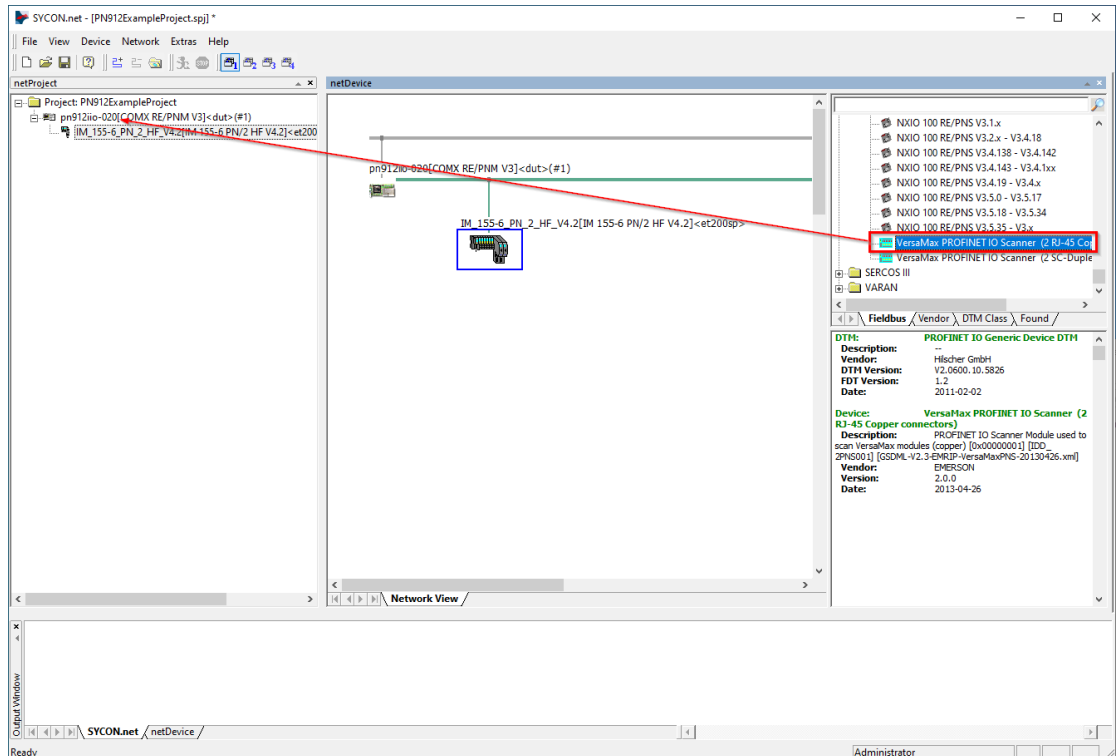


5. Click OK.

8.1.2.2 Add PROFINET IO-Devices

8.1.2.2.1 Example device (GE-IP RSTi I/O)

1. From the Fieldbus tab on the right-hand side, navigate to PROFINET IO → Slave.
2. Select STXPNS001 and drag it over to the Project tree under netProject. This device represents the PN912 IO-Device.



3. Once the device has been added, right-click the device and select Configuration.
4. Under Configuration → Network, the Name of Station and IP settings will be greyed out. These are configured by the controller and will be done later. There is a message “Note: These values are set by the controller of the network!”

netProject - STXPNS001[STXPNS001]<stxpns001-address>

IO Device: STXPNS001 Device ID: 0x9187
Vendor: GE Intelligent Platforms Vendor ID: 0x015A

Network

Name of station: stxpns001-address
Tag name: STXPNS001

IP settings

IP address: 192.168.0.51
Network mask: 255.255.255.0
Gateway address: 0.0.0.0

Note: These values are set by the controller of the network!

Supported features

☐ Shared Device

Process data representation

☐ Enable Bit-Signals

OK Cancel Apply Help

Disconnected Data Set

5. Navigate to Configuration → Modules.
6. Click the Add Module button to add a new slot and select the appropriate module.
7. After adding a module, expand each slot, and select the submodule. Under submodule details, select Parameter from the Dataset drop-down and configure the submodule as required.
8. Repeat steps 6 and 7 for each module.

netProject - STXPNS001[STXPNS001]<stxpns001-address>

IO Device: STXPNS001 Device ID: 0x9187
Vendor: GE Intelligent Platforms Vendor ID: 0x015A

Modules

Slot	Sub Slot	Module	Full A...
0		STXPNS001 [STXPNS001]	
1		ST-3214(4AI,4~20mA) [ST-3214]	
2		ST-4212(2AO,4~20mA) [ST-4212]	
3		ST-1214(4DI,24V) [ST-1214]	
4		ST-2424(4DO,24V) [ST-2424]	

Add Module Add Submodule Remove ☐ Alpha-sorted module selection

Use of slots: 5/33
State of data length: Input 19/252 Octets, Output 14/252 Octets, In-Output 33/504 Octets

Submodule details

Dataset: I/O data Display mode: Decimal

Direction	Consistence	Data type	Text ID	Length

OK Cancel Apply Help

Disconnected Data Set

9. Once complete, click OK to close the device configuration.

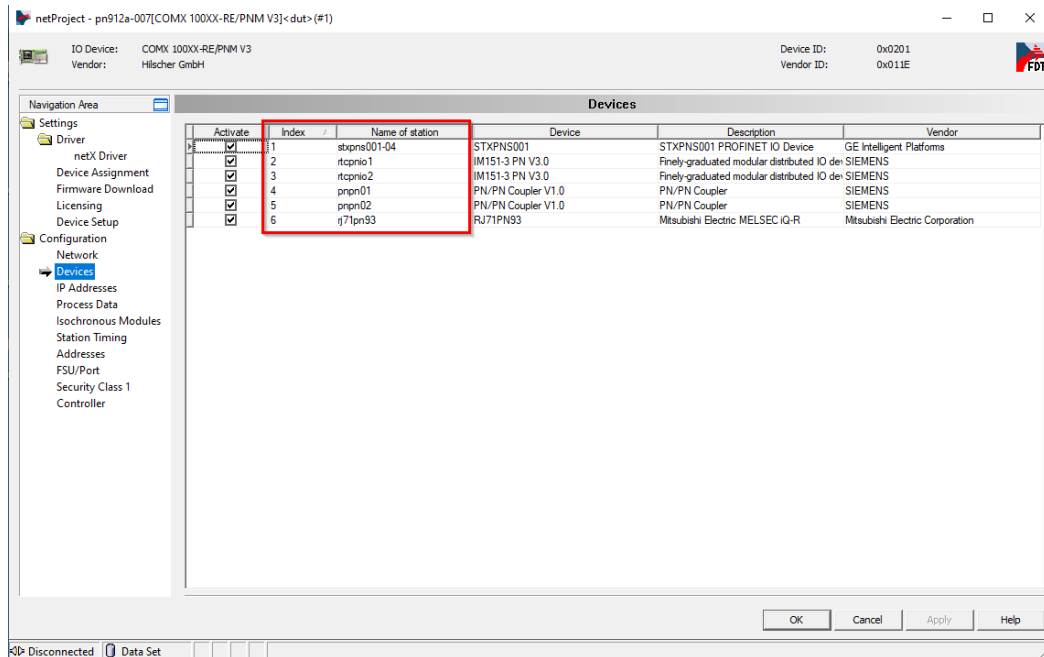
Repeat the above steps for all devices.

8.1.2.3 Configure PROFINET IO-Devices at controller level

The following sections detail how to configure the PROFINET IO-devices at the controller level. This includes name, IP address, station timing, addresses etc.

8.1.2.3.1 Devices

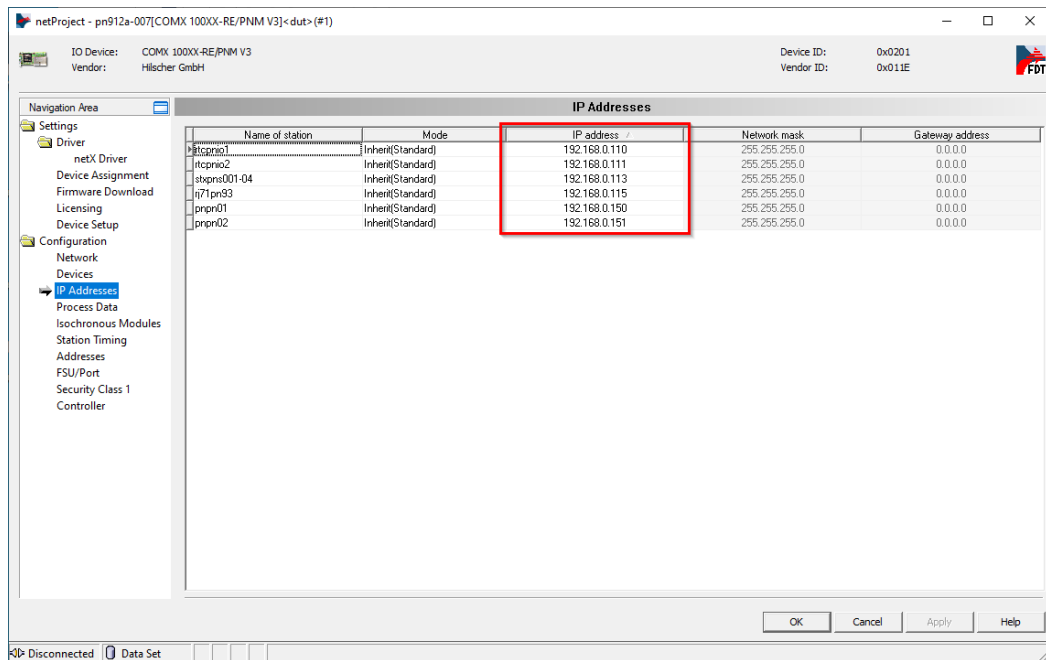
1. Right-click the controller in the netProject tree and select Configuration.
2. Under Configuration → Network, select Devices.
3. Set the Index for all devices as required.
4. Set the Name of station for all devices as required.



5. Once completed, click OK.

8.1.2.3.2 IP Addresses

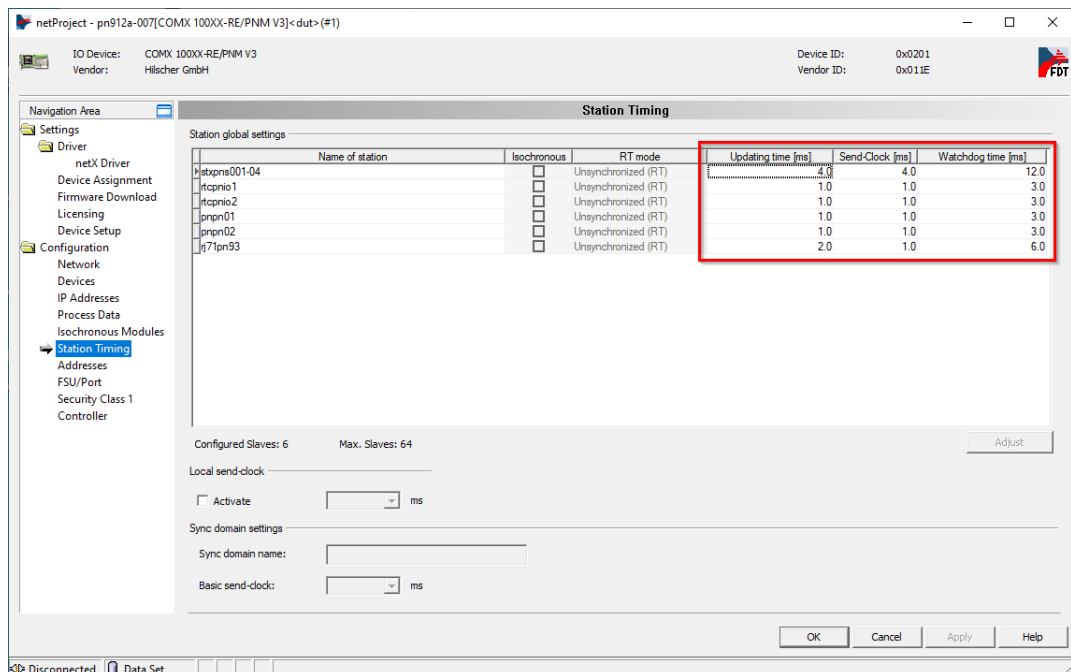
1. Under Configuration → Network, select IP Addresses.
2. Set the Mode, IP address, Network mask and Gateway address for all devices as required.



- Once completed, click OK.

8.1.2.3.3 Station Timing

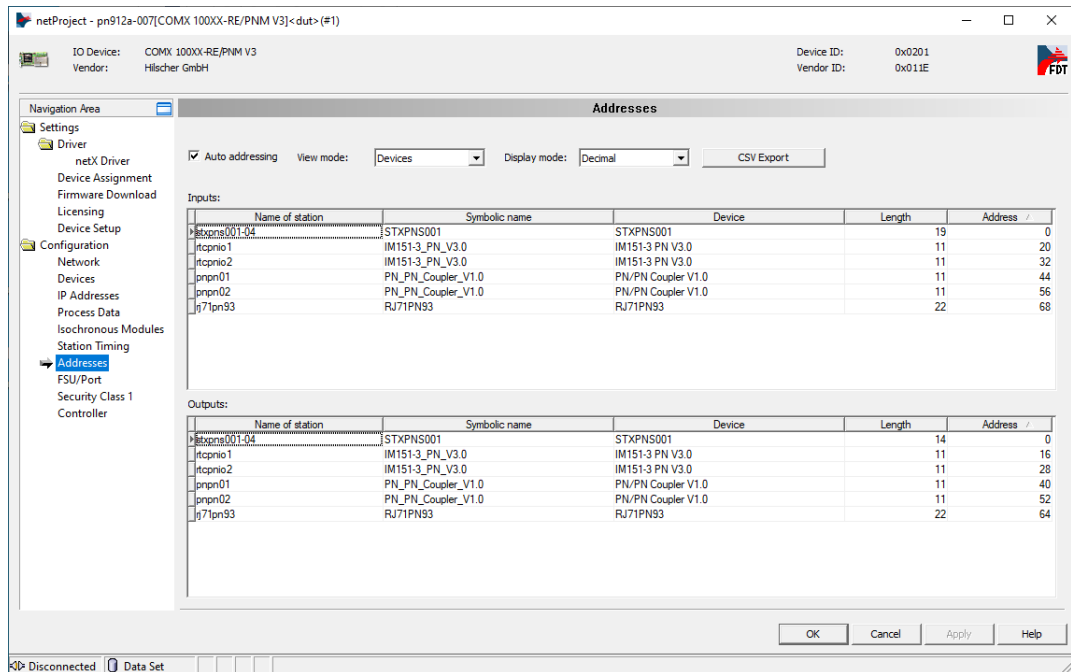
- Under Configuration → Network, select Station Timing.
- Set the Updating time, Send-Clock and Watchdog time for all devices as required.



- Once completed, click OK.

8.1.2.3.4 Addresses

- Under Configuration → Network, select Addresses.
- Review and adjust the addresses if required.



- Once completed, click OK.

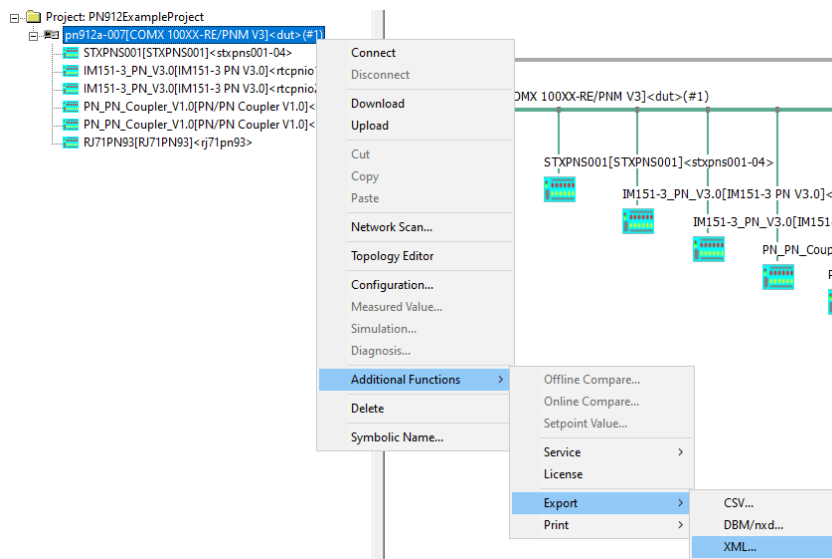
8.1.3 Export configuration files

The following sections describe how to export the SYCON.net configuration to import into the TMEIC Gateway Tool.

IMPORTANT: Both the XML and NXD files are required by the TMEIC Gateway Tool and should both be exported every time a change is made to the SYCON.net configuration.

8.1.3.1 Export XML

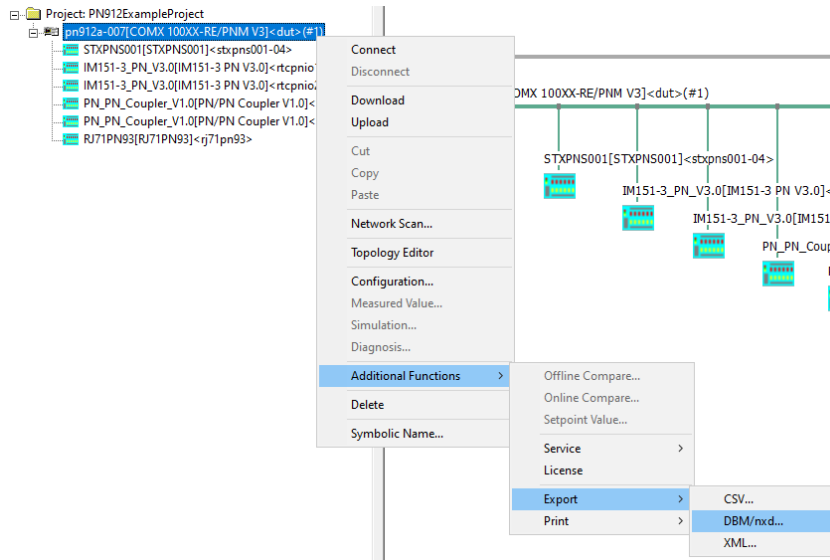
- Right-click the controller and navigate to Additional Functions → Export → XML.



2. Save the XML file. E.g.
D:\PN912Configuration\SYCON.net\PN912ExampleProject_export.xml

8.1.3.2 Export NXD

1. Right-click the controller and navigate to Additional Functions → Export → DBM/nxd.



2. Save the NXD file. E.g.
D:\PN912Configuration\SYCON.net\PN912ExampleProject_export.nxd

8.2 nV-Tool – part 1

The nV-Tool configuration is done in two main parts. The first part includes adding one or more PROFINET Stations into the project and then adding one or more PROFINET Networks.

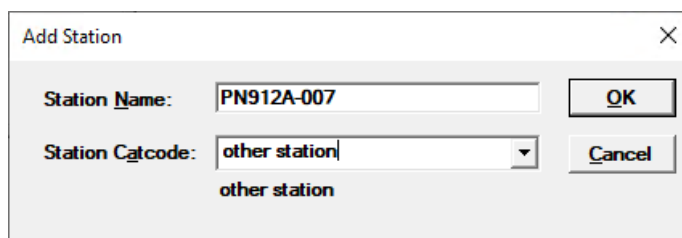
8.2.1 Open or create a typeS controller (Vm station) project

Launch nV-Tool and open or create a project that contains at least one typeS controller (Vm station). This Vm station must contain at least one TC-net I/O interface module (e.g. ILB21).

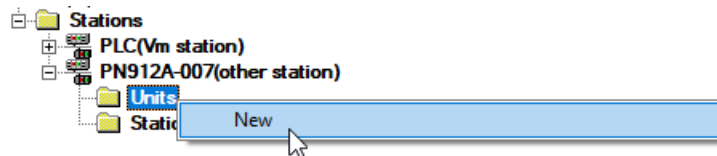
8.2.2 Add PROFINET station

In the open nV-Tool project:

1. Right-click Stations, select New. This will open the Add Station dialog.
2. In the Station Name field, enter a name for the PN912 station e.g. PN912A-007
3. In the Station Catcode field, select other station.

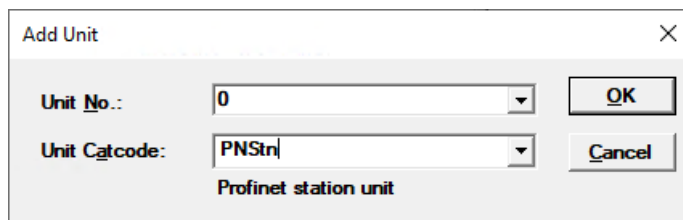


4. Click OK. This will add the station to the system tree.
5. Click Cancel to close the Add Station dialog.
6. Under the new other station, right-click Units and select New.

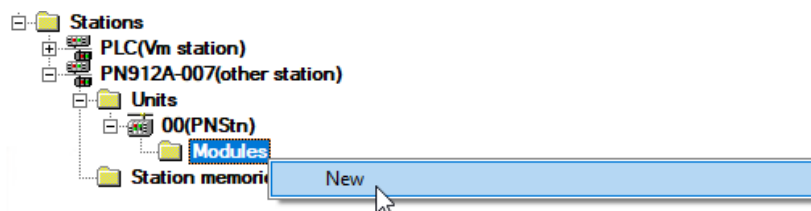


This will open the Add Unit dialog.

7. In the Unit No. field, leave the default value 0.
8. In the Unit Catcode field, select PNStn.

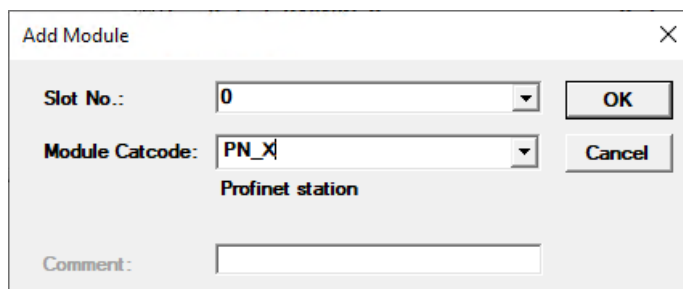


9. Click OK. This will add the unit to the system tree and close the Add Unit dialog.
10. Under the new PNStn, right-click Modules and select New.



This will open the Add Module dialog.

11. In the Slot No. field, leave the default value 0.
12. In the Module Catcode field, leave the default value PN_X.



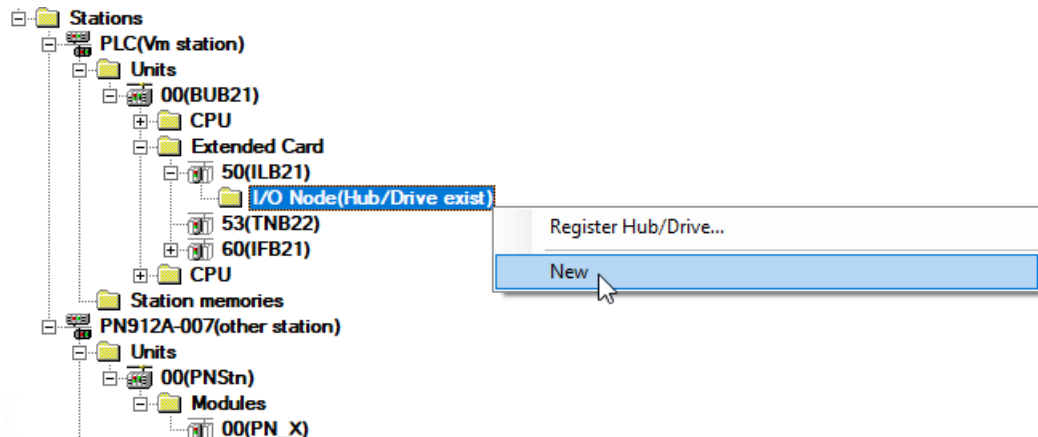
13. Click OK. This will add the module to the system tree.
14. Click Cancel to close the Add Module dialog.

This completes the addition of a PROFINET Station. Repeat this procedure for additional PROFINET stations.

8.2.3 Assign PROFINET station to a TC-net I/O network

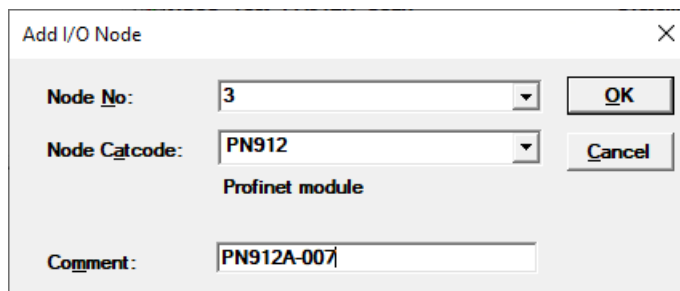
Once a PROFINET station has been added, it can be assigned to a TC-net I/O network. In the open nV-Tool project:

1. Drill down to the TC-net I/O interface (e.g. ILB21). Right-click I/O Node, select New.



This will open the Add I/O Node dialog.

2. In the Node No field, select the TC-net I/O node number for the PN912 module e.g. 3.
3. In the Node Catcode field, select PN912.
4. In the comment field, enter the PN912 station name (for reference).



5. Click OK.
6. Click Cancel to close the Add I/O Node dialog.

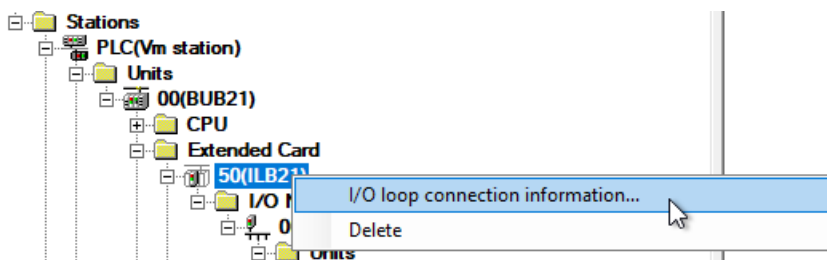
NOTE: A PN_Munit unit and PN912-M module will automatically be added under the PN912 node.

This completes the assignment of a PROFINET Station to a TC-net I/O network. Repeat this procedure for additional PROFINET stations.

8.2.4 Configure I/O loop connection information

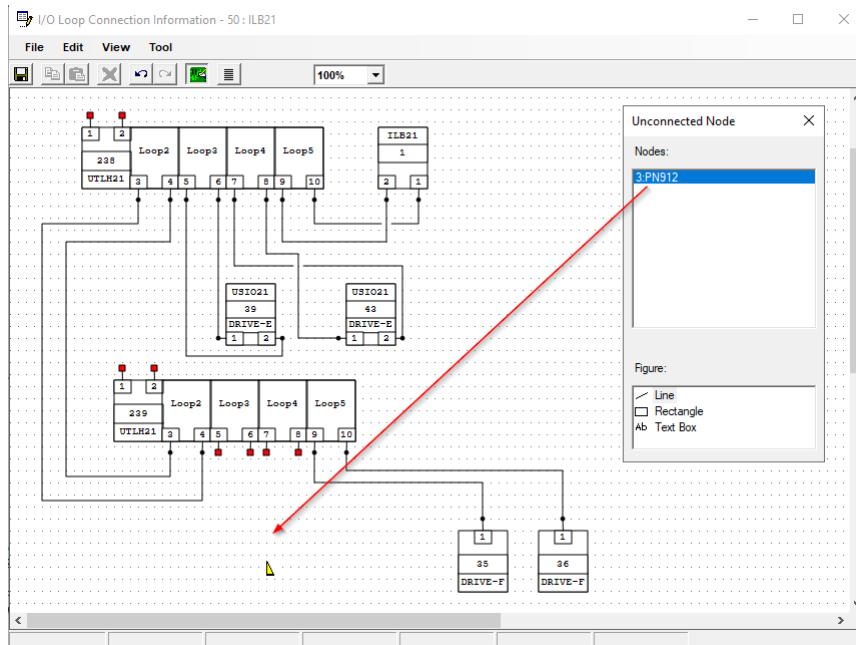
After adding all required PROFINET stations to the TC-net I/O interface module:

1. Right-click the TC-net I/O interface module (e.g. ILB21) and select I/O loop connection information.

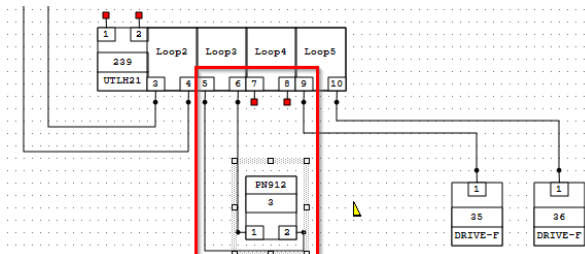


This will open the I/O Loop Connection Information dialog.

2. Click Edit → Enable to enable edit mode.
3. Click View → Unconnected Node to bring up the Unconnected Node dialog.
4. Drag the unconnected PN912 node(s) onto the worksheet.



5. Connect the PN912 node(s) to a hub as per the physical connection.



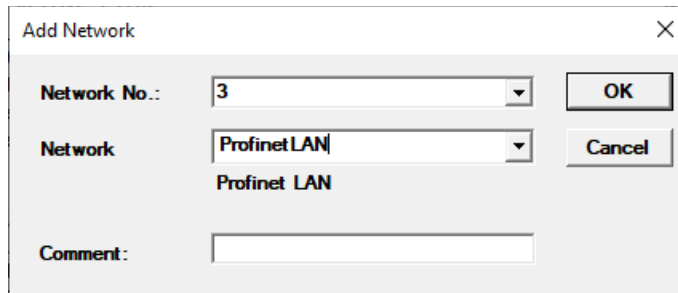
6. Click File → Save. When prompted that “Save was finished”, click OK.
7. Close the I/O Loop Connection Information dialog.

8.2.5 Add PROFINET network

In the open nV-Tool project:

1. Right-click Networks, select New. This will open the Add Network dialog.
2. The Network No. field will automatically allocate the next available number. Change this if you wish or leave as default.

3. In the Network field, select PROFINETLAN.



The 'Add Network' dialog box has a title bar with a close button (X). It contains three fields: 'Network No.' with a dropdown menu showing '3', 'Network' with a dropdown menu showing 'Profinet LAN' and a list of 'Profinet LAN' below it, and 'Comment' with an empty text box. There are 'OK' and 'Cancel' buttons on the right side.

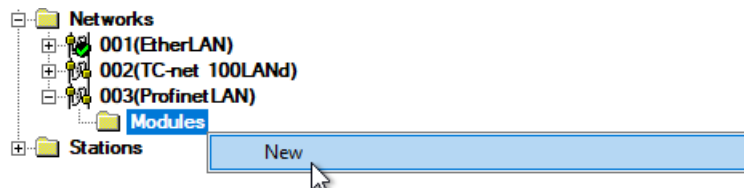
4. Click OK.
5. Click Cancel to close the Add Network dialog.

This completes the addition of a PROFINET network. Repeat this procedure for additional PROFINET networks.

8.2.6 Assign modules to a PROFINET network

The procedure to assign modules to a PROFINET network is as follows:

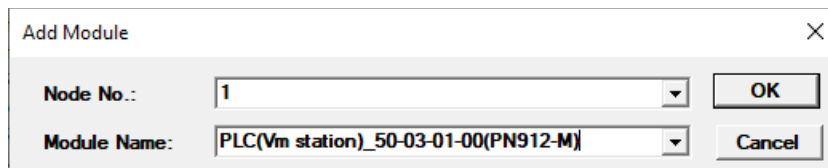
1. Under the newly created PROFINETLAN, right-click Modules, select New.



This will open the Add Module dialog.

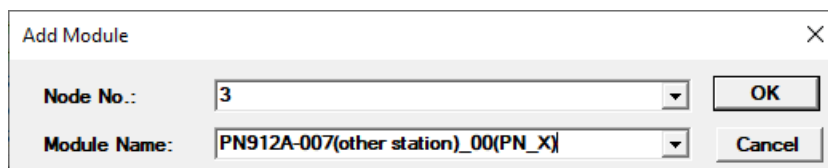
NOTE: The following PROFINET node allocations are specified so that they match the TC-net I/O node numbers. This is not a requirement.

2. In the Node No. field, select 1.
3. In the Module Name field, select the Vm station e.g. PLC(Vm station).



The 'Add Module' dialog box has a title bar with a close button (X). It contains two fields: 'Node No.' with a dropdown menu showing '1', and 'Module Name' with a dropdown menu showing 'PLC(Vm station)_50-03-01-00(PN912-M)'. There are 'OK' and 'Cancel' buttons on the right side.

4. Click OK. The dialog will remain open.
5. In the Node No. field, select 3.
6. In the Module Name field, select the PN912 station e.g. PN912A-007(other station).



The 'Add Module' dialog box has a title bar with a close button (X). It contains two fields: 'Node No.' with a dropdown menu showing '3', and 'Module Name' with a dropdown menu showing 'PN912A-007(other station)_00(PN_X)'. There are 'OK' and 'Cancel' buttons on the right side.

7. Click OK. The dialog will remain open.

8. Repeat steps 5-7 for additional PN912 stations. Otherwise, click Cancel to close the Add Module dialog.
9. Right-click the Vm station and select Module Parameters. This will open the Module Parameters dialog.

Name	Kind	Updated
001(PLC(Vm station)_50-03-01-00(PN912-M))	Module	2025-10-09 11:06:17
003(PN912A-007(other station)_00(PN_X))	Module Parameters...	
	Delete	

Set the values as appropriate, for example:

- High-speed scan byte size (Output) = 128
- High-speed scan byte size (Input) = 128
- Transmission operation at emg. = Trans1

Module parameters {Profinet}-{50-003-01-00:PN912-M}

Module name: 00:PN912-M

Profinet master module

Parameter: Byte-swap(IN) | Byte-swap(OUT)

Item	Tool
High-speed scan byte size (Output)	128
High-speed scan byte size (Input)	128
Transmission operation at emg.	Trans1

Buttons: Refresh, Write, Download, Print, Close, Help

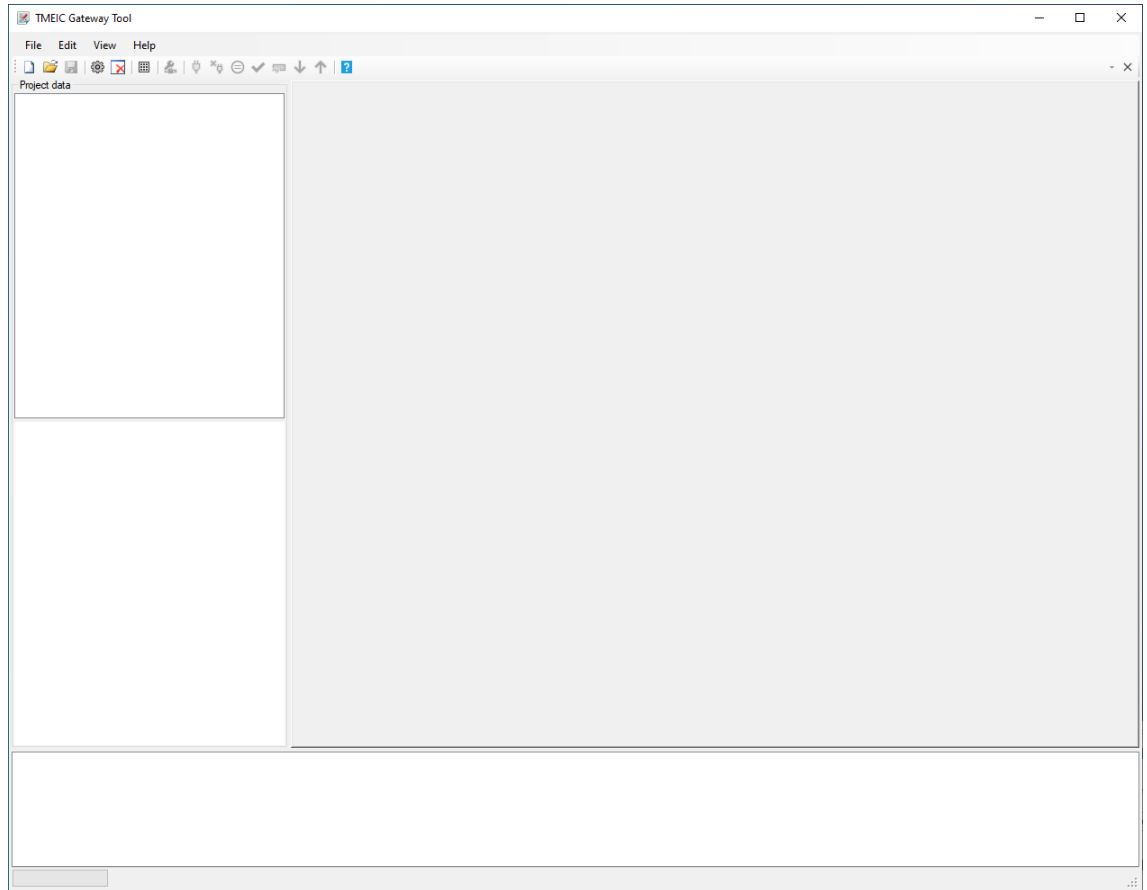
10. Click Close.

This completes the assignment of modules to a PROFINET network. Repeat this procedure for additional PROFINET networks.

8.3 TMEIC Gateway Tool – part 1

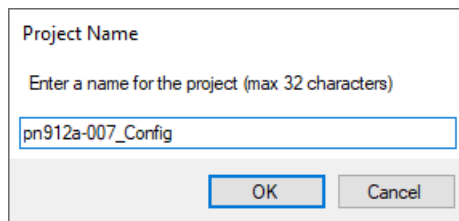
8.3.1 Launch the TMEIC Gateway Tool

1. Launch the TMEIC Gateway Tool.



2. Navigate to File → New. This will open the Save Project File as... dialog.
3. Navigate to the desired path and enter a filename e.g.
D:\PN912Configuration\GatewayTool\pn912a-007_Config.xml
4. Click Save.

The Project Name dialog will be opened and populated with the project file name.

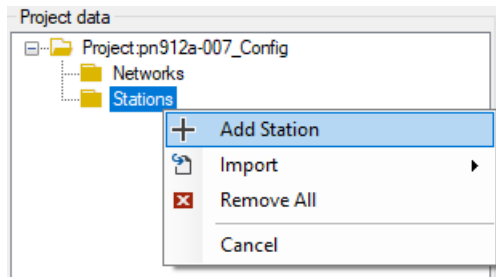


5. Click OK.

8.3.2 Add PN912 Station

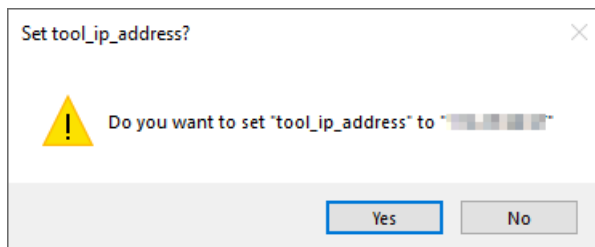
To add a PN912 station:

1. Right-click Station and select Add Station.

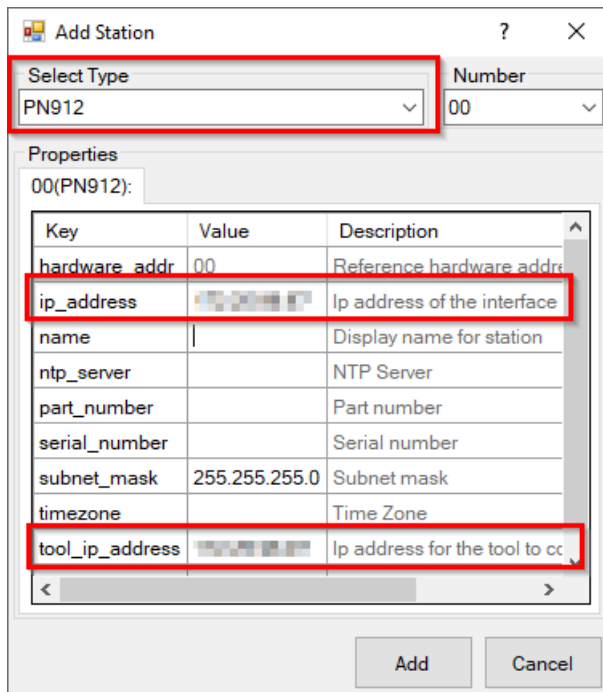


This will open the Add Station dialog.

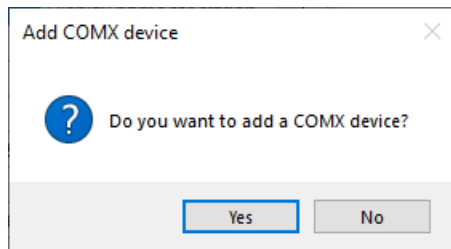
2. In the Select Type dropdown, select PN912. You can leave Number as the default (this will automatically increment as you add more stations).
3. Under Properties, set the ip_address to the IP address of the PN912 station. This will automatically ask if you also want to set the tool_ip_address to the same address. Click Yes.



This will add the PN912 station.

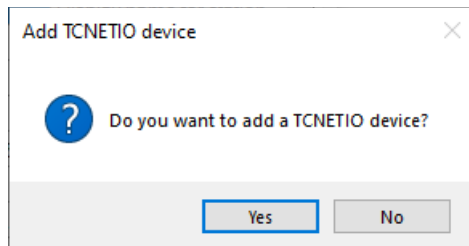


4. Click the Add button. This will prompt if you want to add a COMX device.



5. Click Yes.

This will prompt if you want to add a TCNETIO device.

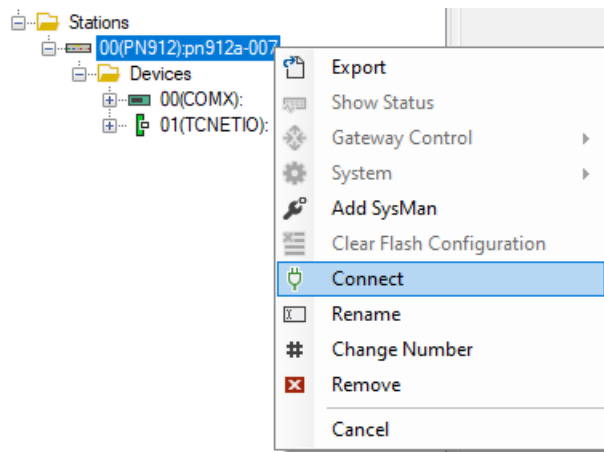


6. Click Yes.

8.3.2.1 Update name

This example assumes the PN912 station has already been allocated an IP address and a name. To update (upload) the name:

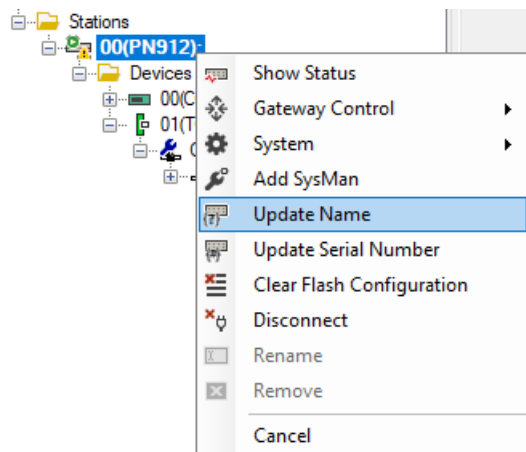
1. Right-click the PN912 station and click Connect.



The log messages will state that there is a name (and serial number) mismatch.

```
09:54:23.550 WAR 00(PN912): Name mismatch: Name="" NodeName="pn912a-007"
09:54:23.551 WAR 00(PN912): SerialNo mismatch: Serial="" SerialNo="0x1c66d2c"
09:54:23.551 ERR 00(PN912): Configuration not equal
```

2. Right-click the PN912 station, select Update Name.



This will upload the name into the configuration.

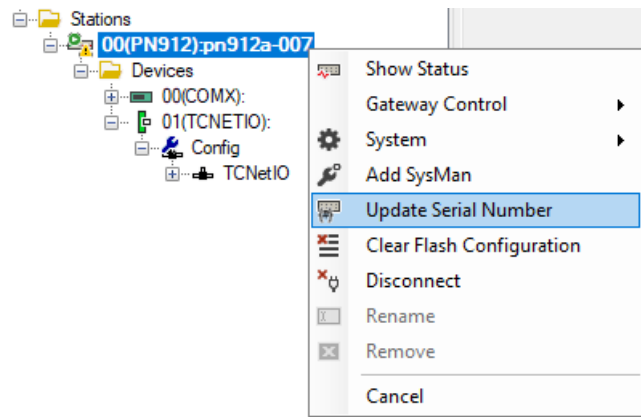
3. Confirm the name is equal in the log messages:

```
09:55:26.099 INF 00(PN912): property changed: name was "" now "pn912a-007".
09:55:26.118 INF 00(PN912):pn912a-007 Verifying name: pn912a-007
09:55:26.118 INF 00(PN912):pn912a-007 Name is equal
```

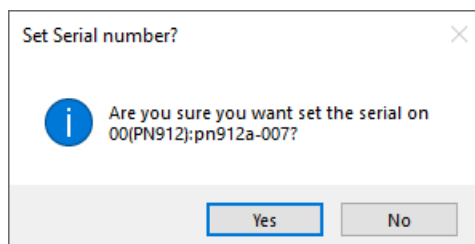
8.3.2.2 Update serial number

To update (upload) the serial number:

1. Right-click the PN912 station, select Update Serial Number (ensure you are connected to the station first).



2. Click Update Serial Number. The Set Serial number dialog will open asking you to confirm the action.



3. Click Yes. This will upload the serial number into the configuration.
4. Confirm the name is equal in the log messages:

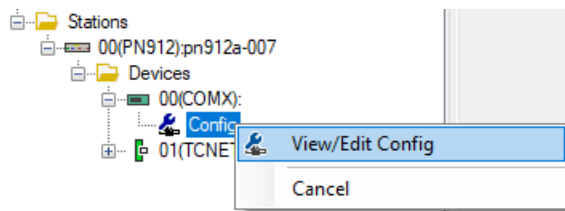
```
10:05:38.855 INF 00(PN912):pn912a-007 property changed: serial_number was "" now "0x1c66d2c".
10:05:38.856 INF 00(PN912):pn912a-007 Verifying serial number: 0x1c66d2c
10:05:38.856 INF 00(PN912):pn912a-007 Serial number is Equal
```

8.3.3 Configure PN912 station

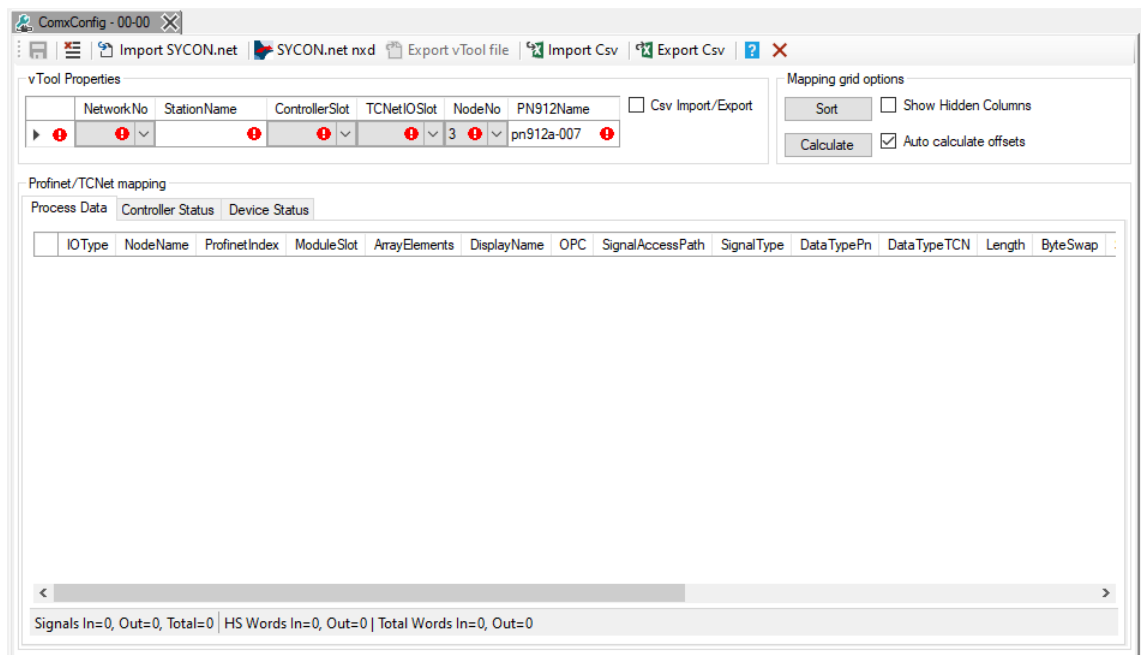
8.3.3.1 Configure COMX device

To configure the COMX device:

1. Right-click the COMX device under the PN912 station and select View/Edit Config.



This will open the ComxConfig tabbed window.



8.3.3.1.1 Configure nV-Tool Properties

The first step in the COMX configuration is to configure the nV-Tool Properties. These are manually populated based on the configuration already created in the nV-Tool project. Refer to Table 12 for details.

Property	Description
NetworkNo	The network number of the PROFINET LAN
StationName	The name of the Vm station
ControllerSlot	The slot number of the controller with the TC-net I/O interface module
TCNetIOSlot	The slot number of the TC-net I/O interface module in the Vm station
NodeNo	The TC-net I/O node number allocated to the PN912
PN912Name	The name of the PN912 station (this should also match the PN912 station name defined in the TMEIC Gateway Tool)

Table 12: vTool Properties

The correlation between the nV-Tool system tree and these properties is shown in Figure 21.

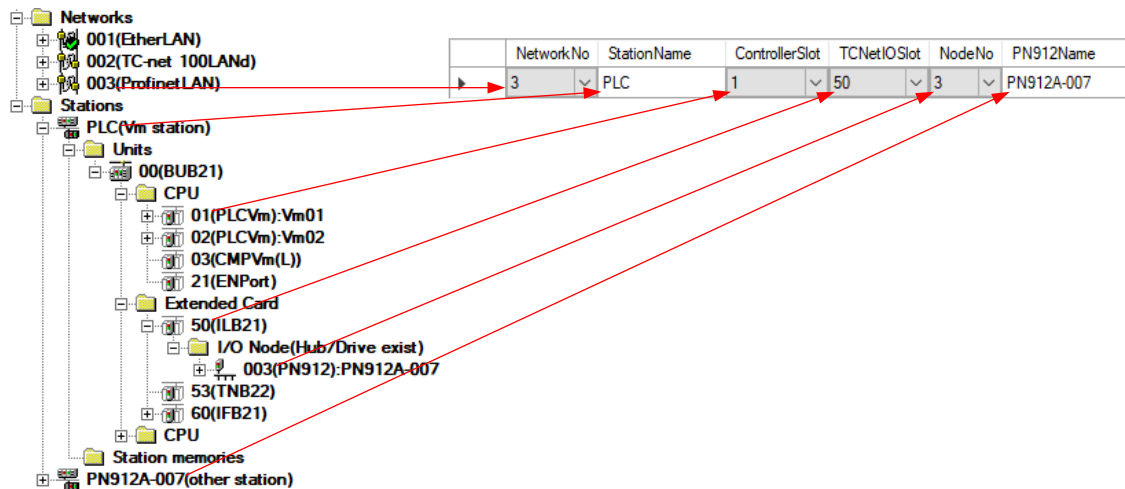


Figure 21: nV-Tool system tree and TMEIC Gateway Tool COMX configuration

8.3.3.1.2 Import SYCON.net configuration XML file

To import a SYCON.net configuration XML file:

1. In the ComxConfig tabbed window, click the Import SYCON.net file button. This will open the dialog to select the XML configuration file.
2. Select the XML file exported from SYCON.net in section 8.1.3.1 and click Open.

This will import the signal configuration into the PROFINET/TCNetIO Mapping grid.

Profinet/TCNet mapping																						
Process Data			Controller Status			Device Status																
	IOType	NodeName	ProfinetIndex	ModuleSlot	ArrayElements	DisplayName	OPC	SignalAccessPath	SignalType	Data TypePn	Data TypeTCN	Length	ByteSwap	SignalName	AltName	Offset	TakerBlock	TakerWord	Bit	SlotSpeed	Speed	Ti
▶	STXPN5001	steps001-04	1	1	0	Analog_input_data_Ch_0	1	4	input	unsigned16	UINT	1	Y	L_03_03_004		6144	96	0		MS	MS	Sc
	STXPN5001	steps001-04	1	1	0	Analog_input_data_Ch_1	1	6	input	unsigned16	UINT	1	Y	L_03_03_006		6145	96	1		MS	MS	Sc
	STXPN5001	steps001-04	1	1	0	Analog_input_data_Ch_2	1	8	input	unsigned16	UINT	1	Y	L_03_03_008		6146	96	2		MS	MS	Sc
	STXPN5001	steps001-04	1	1	0	Analog_input_data_Ch_3	1	10	input	unsigned16	UINT	1	Y	L_03_03_010		6147	96	3		MS	MS	Sc
	STXPN5001	steps001-04	1	2	0	Analog_output_data_Ch_0	1	5	output	unsigned16	UINT	1	Y	O_03_03_005		40960	640	0		MS	MS	Sc
	STXPN5001	steps001-04	1	2	0	Analog_output_data_Ch_1	1	7	output	unsigned16	UINT	1	Y	O_03_03_007		40961	640	1		MS	MS	Sc
	STXPN5001	steps001-04	1	3	0	Input_data_Ch_0_3	1	14	input	unsigned8	WORD	1	Y	L_03_03_014		6148	96	4		MS	MS	Sc
	STXPN5001	steps001-04	1	4	0	Diagnostic_data_Ch_0_3	1	16	input	unsigned8	WORD	1	Y	N/A		6148	96	4	8	MS	MS	Sc
	STXPN5001	steps001-04	1	4	0	Output_data_Ch_0_3	1	11	output	unsigned8	WORD	1	Y	O_03_03_011		40962	640	2		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno1	2	2	0	Inputs	1	22	input	unsigned8	WORD	1	Y	L_03_03_022		6149	96	5		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno1	2	3	0	Outputs	1	19	output	unsigned8	WORD	1	Y	O_03_03_019		40963	640	3		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno1	2	4	0	I_channel_0	1	25	input	signed16	INT	1	Y	L_03_03_025		6150	96	6		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno1	2	4	0	I_channel_1	1	27	input	signed16	INT	1	Y	L_03_03_027		6151	96	7		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno1	2	5	0	O_channel_0	1	22	output	signed16	INT	1	Y	O_03_03_022		40964	640	4		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno1	2	5	0	O_channel_1	1	24	output	signed16	INT	1	Y	O_03_03_024		40965	640	5		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno2	3	2	0	Inputs	1	34	input	unsigned8	WORD	1	Y	L_03_03_034		6152	96	8		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno2	3	3	0	Outputs	1	31	output	unsigned8	WORD	1	Y	O_03_03_031		40966	640	6		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno2	3	4	0	I_channel_0	1	37	input	signed16	INT	1	Y	L_03_03_037		6153	96	9		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno2	3	4	0	I_channel_1	1	39	input	signed16	INT	1	Y	L_03_03_039		6154	96	10		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno2	3	5	0	O_channel_0	1	34	output	signed16	INT	1	Y	O_03_03_034		40967	640	7		MS	MS	Sc
	IM151-3_PN_V3.0	rtcpno2	3	5	0	O_channel_1	1	36	output	signed16	INT	1	Y	O_03_03_036		40968	640	8		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp01	4	1	0	Output_O_00	1	41	output	unsigned32	DWORD	2	Y	O_03_03_041		40970	640	10		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp01	4	1	0	Output_O_01	1	45	output	unsigned32	DWORD	2	Y	O_03_03_045		40972	640	12		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp01	4	2	0	Input_I_00	1	46	input	unsigned32	DWORD	2	Y	L_03_03_046		6156	96	12		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp01	4	2	0	Input_I_01	1	50	input	unsigned32	DWORD	2	Y	L_03_03_050		6158	96	14		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp02	5	1	0	Input_I_00	1	57	input	unsigned32	DWORD	2	Y	L_03_03_057		6160	96	16		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp02	5	1	0	Input_I_01	1	61	input	unsigned32	DWORD	2	Y	L_03_03_061		6162	96	18		MS	MS	Sc
	PN_PN_Coupler_V1.0	prnp02	5	2	0	Output_O_00	1	54	output	unsigned32	DWORD	2	Y	O_03_03_054		40974	640	14		MS	MS	Sc
◀	PN_PN_Coupler_V1.0	prnp02	5	2	0	Output_O_01	1	58	output	unsigned32	DWORD	2	Y	O_03_03_058		40976	640	16		MS	MS	Sc
Signals In:17, Out:14, Total:31 HS Words In:0, Out:0 Total Words In:27, Out:25																						

8.3.3.1.3 Import SYCON.net configuration NXD file

To import a SYCON.net configuration NXD file:

1. In the ComxConfig tabbed window, click the Import SYCON.net file button. This will open the dialog to select the NXD configuration file.
2. Select the NXD file exported from SYCON.net in section 8.1.3.2 and click Open.
3. Click Save to save the current configuration.

8.3.3.1.4 Configure PROFINET/TC-net Mapping

There are various options available when configuring the PROFINET TC-net mapping. This includes breaking out signals, converting and changing data types, changing speeds, bytswapping etc. There is also a facility to provide an alternate signal name (AltName) other than the default for importing into nV-Tool. Refer to [XX] for further details of these options.

8.3.3.1.5 Save COMX configuration

To save the COMX configuration, click the Save button in the ComxConfig tabbed window. It is recommended to do this prior to exporting the nV-Tool file in section 8.3.3.1.6.

8.3.3.1.6 Export nV-Tool File

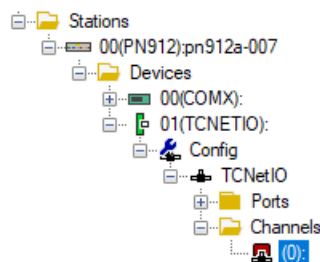
Once the PROFINET/TC-net I/O mapping has been configured, perform the following steps to export the file for importing into a PROFINET network in nV-Tool:

1. In the ComxConfig tabbed window, click the Export vTool File button. This will bring up the Export vTool config save dialog.
2. Navigate to the desired directory and click Save.

8.3.3.2 Configure TCNETIO device

To configure the TCNETIO device

1. Under the TCNETIO device under the PN912 station, navigate down to Channels and select channel 0.



2. In the Channel 0 properties window, change the parameters as applicable to the system. In this example, the following changes were made:
 - hs_txblocks = 96
 - ms_txblocks = 110-111

Key	Value	Description
channel_number	0	Channel number
cycle_master	N	Only values Y or N permitted
hardware_addr	00-01-C0	Hardware address
hs_scan	10	High speed scan in units of 0.1msec
hs_txblocks	96	Comma separated list of high speed blocks owned by this station 0-100,201-202,300,400 etc
max_noded	1	This defines the maximum inter-node distance in km
max_reptr	1	This defines the maximum number of repeaters
ms_scan	10	Medium speed scan in units of 1msec
ms_txblocks	110-111	Comma separated list of medium speed blocks owned by this station 0-100,201-202,300,400 etc
name		Display name for channel
scan_state	enabled	When "enabled" tcnet card is transmitting
station_number	3	Station number
type	tcnetio_channel	Node type

For details on how the TC-net I/O loop blocks for PN912 are allocated, refer to Table 13 and Figure 22.

Block description	Block No.	E.g. Stn=3
Station RAS block	Station number	3
Station input data area start block	$96 + (\text{station number} - 3) * 16$	96
Station input data area controller status block	$96 + (\text{station number} - 3) * 16 + 14$	110
Station input data area device status block	$96 + (\text{station number} - 3) * 16 + 15$	111
Station output data area start block	$640 + (\text{station number} - 3) * 16$	640

Table 13: Scan block number allocation

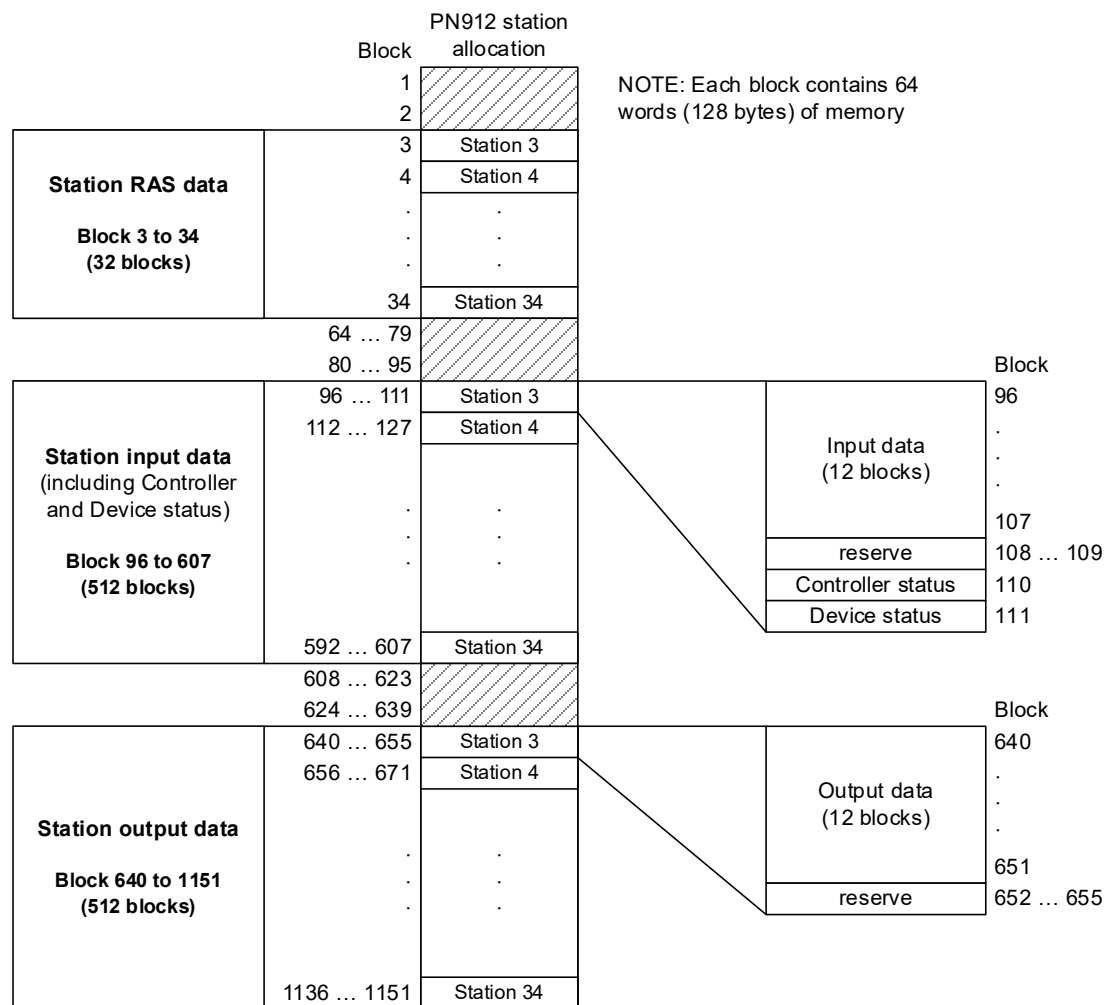


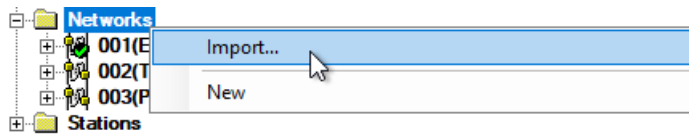
Figure 22: TC-net I/O loop scan block allocations for PN912 stations

8.4 nV-Tool – part 2

8.4.1 Import PROFINET network signals

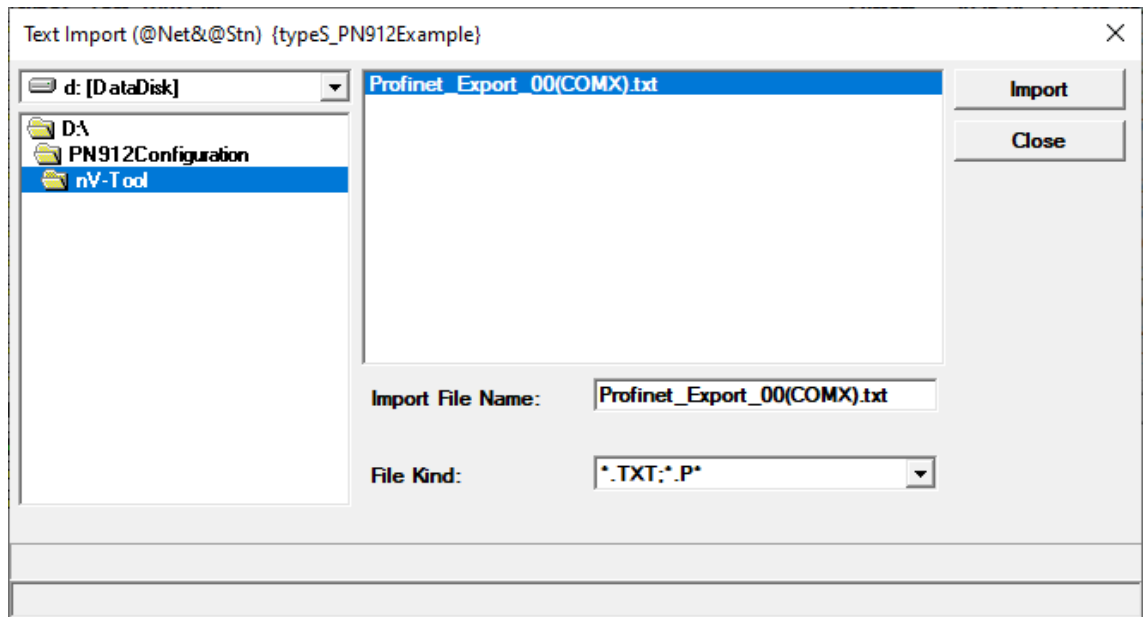
To import PROFINET network signals into nV-Tool:

1. Open the nV-Tool project containing the PN912 stations.
2. Under Networks, right-click the PROFINETLAN and select Import.



This will open the Text Import dialog.

3. Navigate to the PROFINET configuration exported from the TMEIC Gateway Tool in section 8.3.3.1.6.



4. Click Import.
5. When completed, click OK.
6. Review the V2PortLog.TXT file and ensure there are no errors.

```

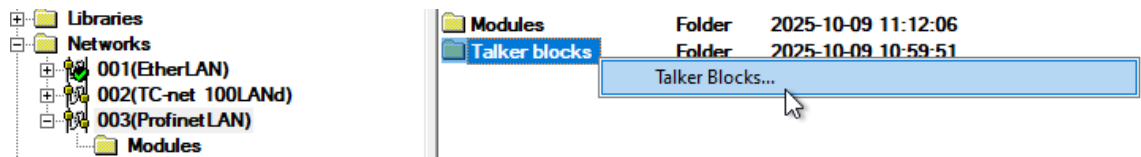
V2PortLog.TXT - Notepad
File Edit Format View Help
Importing text to Tool at '10/10/2025 3:31:43 PM'
=====
+ Importing @Net := 'NetNo:3, Catcode:ProfinetLAN'
++ Importing @LanConfig
++ Importing @SysBlocks
++ Importing @SysVarsOut
    [Note] No @SysVarsIn data
=====
Finished at '10/10/2025 3:31:49 PM'
|

```

7. Close the V2PortLog.TXT file.
8. Close the Text Import dialog.

8.4.2 Assign PROFINET network variables

1. Click on the PROFINET LAN. This will show Modules and Talker Blocks on the right-hand side.
2. Right-click Talker blocks and select Talker Blocks.

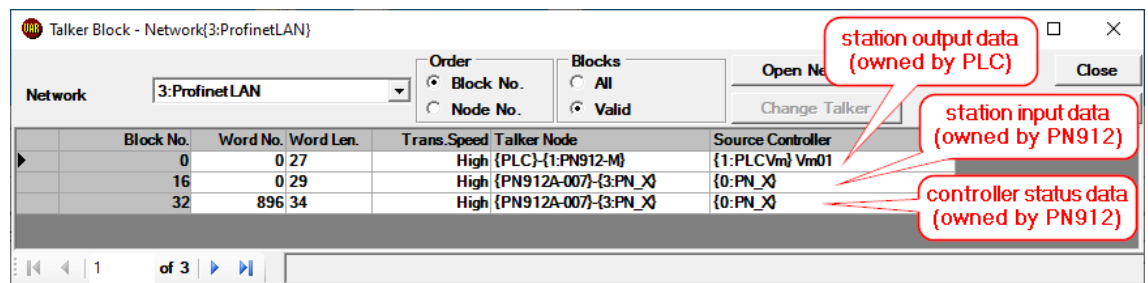


The Talker Blocks configuration for the PROFINET network will be shown.

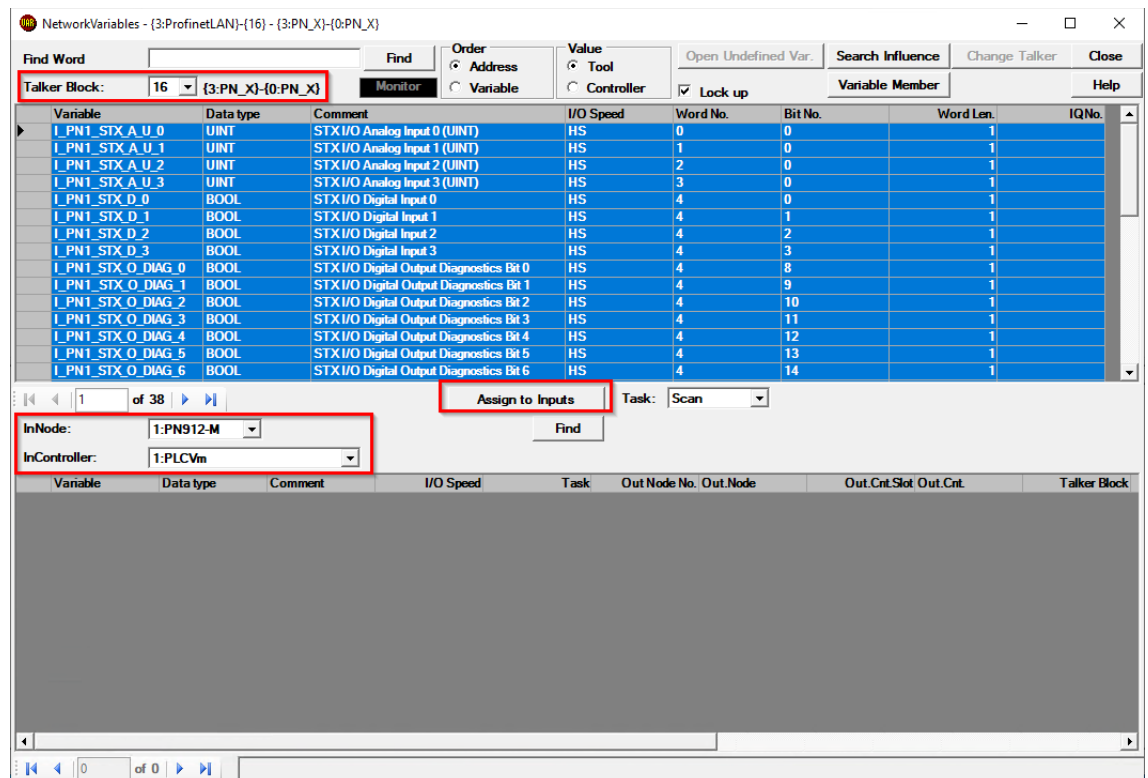
- Under Blocks, click the Valid radio button, which will show only the defined talker blocks.

There will be between three and five valid blocks:

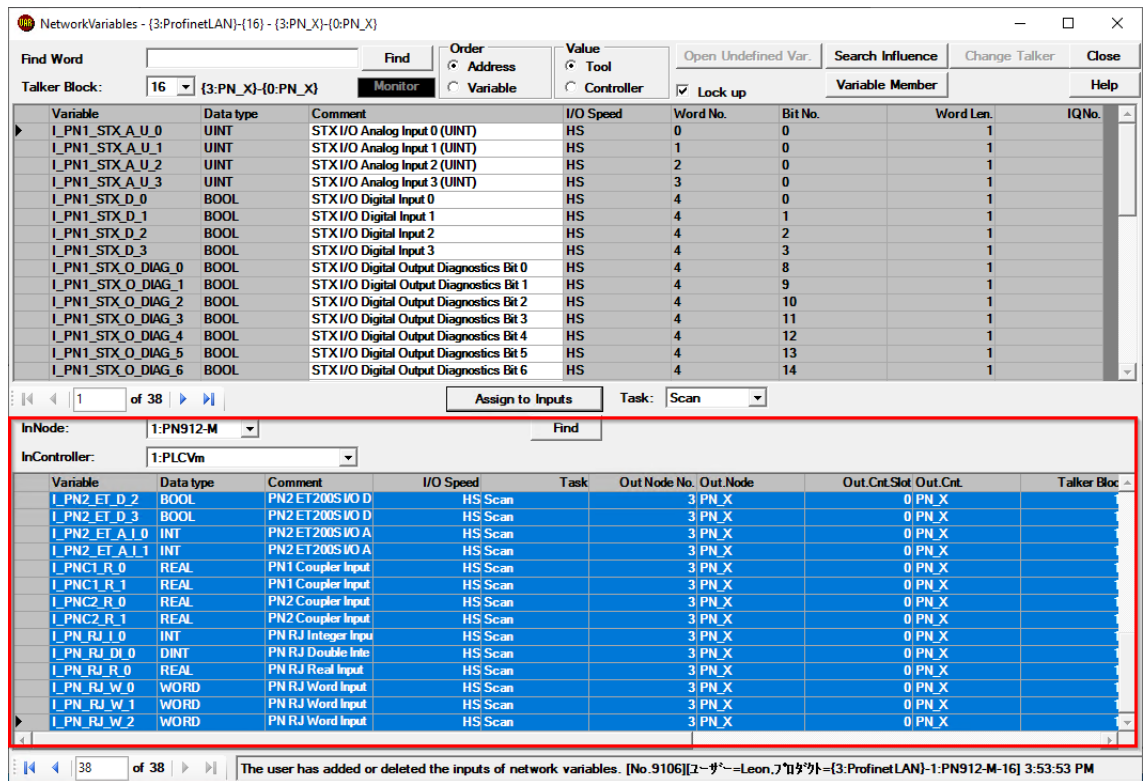
- Block No. 0 – station output data (owned by PLC) [HS if defined, otherwise MS]
- Block No. 1 – station output data (owned by PLC) [MS if defined]
- Block No. 16 – station input data (owned by PN912) [HS if defined, otherwise MS]
- Block No. 17 – station input data (owned by PN912) [MS if defined]
- Block No. 32 – station controller status data (owned by PN912)



- Double-click Block No. 16 to open the NetworkVariables form.
- Ensure the correct InNode and InController is selected and click Assign to Inputs.



- Confirm the station input signals have been assigned to the PLCVm inputs.

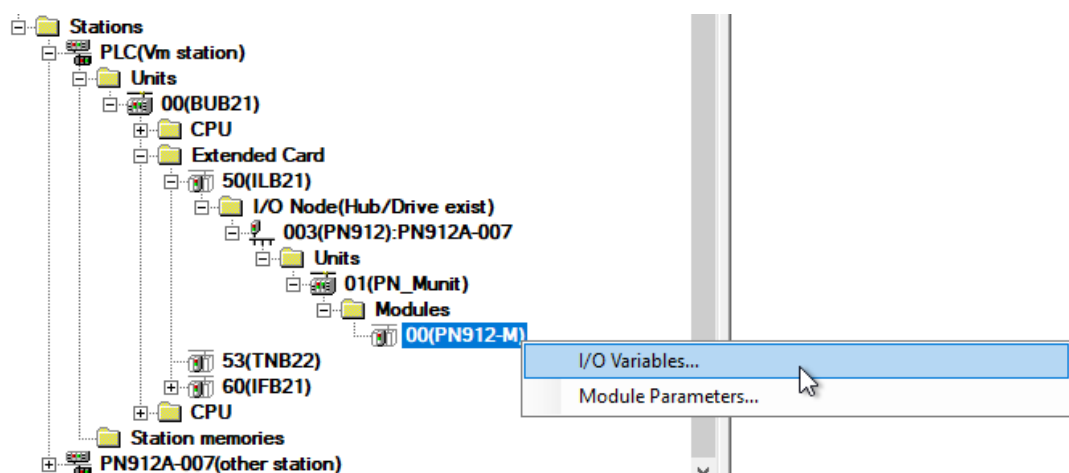


7. Select Talker Block 32 and repeat steps 6 and 7 to assign the controller status signals to the PLCVm.

8.4.3 Create RAS data

To create the RAS data for the PN912 station:

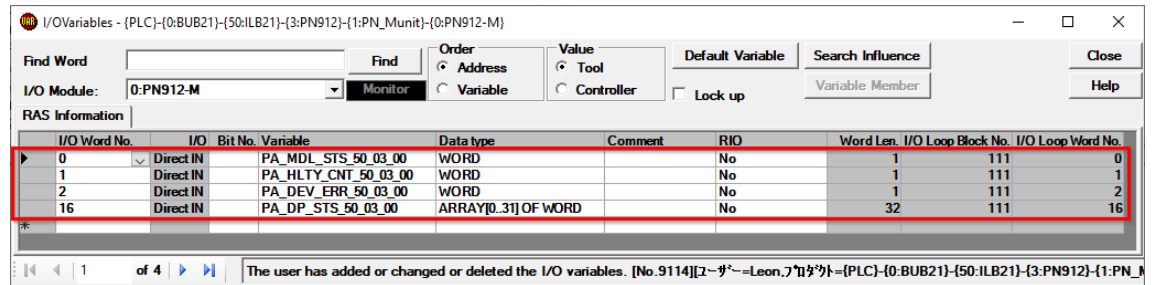
1. Navigate to the PN912-M module under the PN912 station. Right-click the module and select I/O Variables.



This will open the I/O Variables form.

2. Uncheck Lock up to make the variable declarations editable (when prompted if you want to edit the variable declarations, click Yes).
3. Click the Default Variable button. When prompted to confirm, click Yes.
4. Click OK when notified that the default variables were registered.

The default RAS variables will be created.

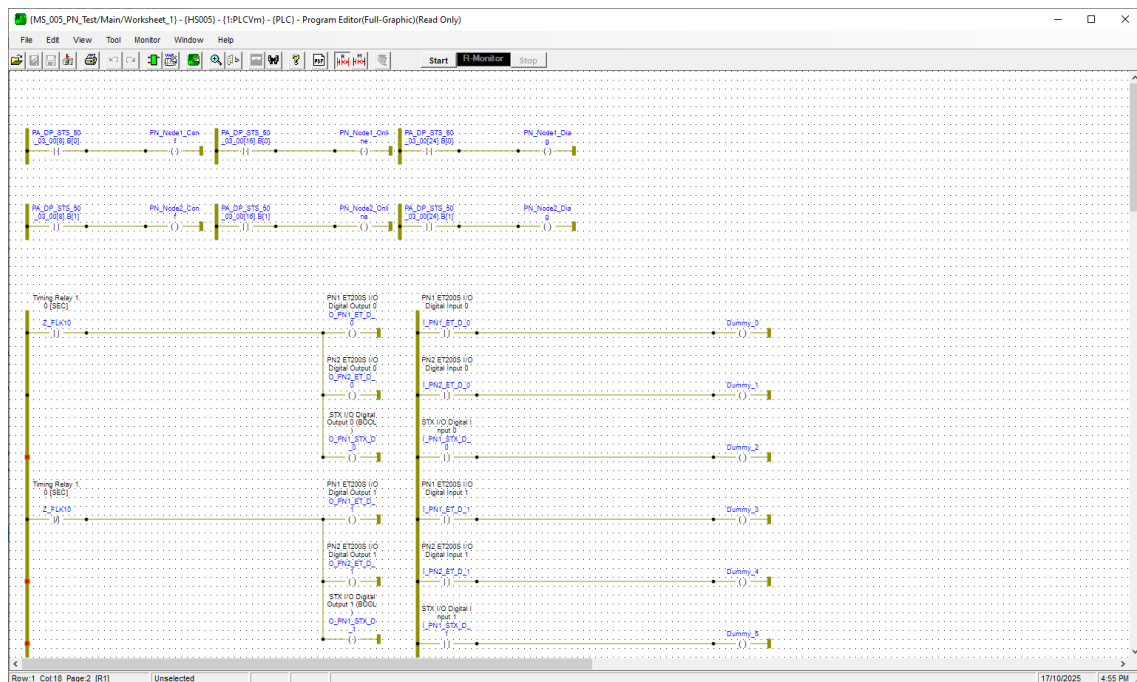


NOTE: To use the PA_DP_STS_** word array data as Booleans in a task, manually change the Datatype from ARRAY[0..31] OF WORD to ARRAY[0..31] OF TYPE16BITS.

5. Close the I/O Variables form.

8.4.4 Create program task(s) using PROFINET variables

Create program tasks using the newly created and assigned PROFINET variables in the associated PLCVm (example task shown below). Refer to Toshiba documentation for instructions on how to do this.



8.4.5 Download PLC configuration

Refer to Toshiba nV-Tool documentation [4] [3] for details on downloading the Vm station and TC-net I/O configuration.

8.5 TMEiC Gateway Tool – part 2

This section describes the downloading of the configuration to the PN912. Refer to [5].

9 Appendix A: LED Labelling

The following tables shows the description and meaning of words used to indicate the state of PN912 LEDs.

LED State	Description
 ON	LED is static ON.
 Off	LED is static OFF or unenergized.
 <f>Hz Flash	LED turns on/off with <f>Hz frequency. 1Hz: 500ms ON and 500ms OFF. Flash period is 1sec. 2Hz: 250ms ON and 250ms OFF. Flash period is 500ms. 4Hz: 125ms ON and 125ms OFF. Flash period is 250ms.
 Flash, <n>sec	LED flashes for <n> seconds.
 Flickering	The indicator turns on/off with a frequency of approximately 10Hz to indicate high Ethernet activity. The indicator turns on/off in irregular intervals to indicate low Ethernet activity.
(G)(R)(O)	LED colour indicator: (G) = Green (R) = Red (O) = Orange

Table 14: LED states and meaning.

Example of the combining the LED colours and states is shown below.

LED Icon	Description
 Flash(R)	Red-coloured LED Flashing.
 ON(R)	Red-coloured LED static ON.
 Flash(G)	Green-coloured LED Flashing.
 ON(G)	Green-coloured LED static ON.
 Flash(O)	Orange-coloured LED Flashing.
 ON(O)	Orange-coloured LED static ON.
 Off	The LED is unpowered.

Table 15: LED colour and states example used in this document.

10 Appendix B: Configuration Symbols and meaning

The document will go through various valid network configuration that can be implemented to both PROFINET IO and TC-net I/O Loop configurations. The following table describes the varying colours used to address the respective network cable.

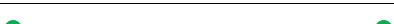
Lines Type	Name	Description
	Ethernet LAN cable	Dark Blue, single line
	TC-net I/O Loop Cable	Light blue, double compound line representing RX/TX in a cable
	PROFINET IO Cable	Green, single line

Table 16: Different coloured lines to distinguish TC-net and PROFINET network cable.