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ILX56-PND

PROFINET Device

ControlLogix®

May 7, 2025

USER MANUAL

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ILX56-PND User Manual
For Public Use.

May 7, 2025

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Table of Contents

1 Preface

1.1 Introduction to the ILX56-PND

This document describes the installation, operation, and diagnostics of the ProSoft ILX56-PND PROFINET Device module. The ILX56-PND operates as a PROFINET Device allowing a PROFINET Controller to configure, parameterize, and exchanging data with the module.

The ILX56-PND slots into a 1756 ControlLogix backplane and operates as a PROFINET Device, allowing the data from a PROFINET Controller to be exchanged with the ControlLogix controller.

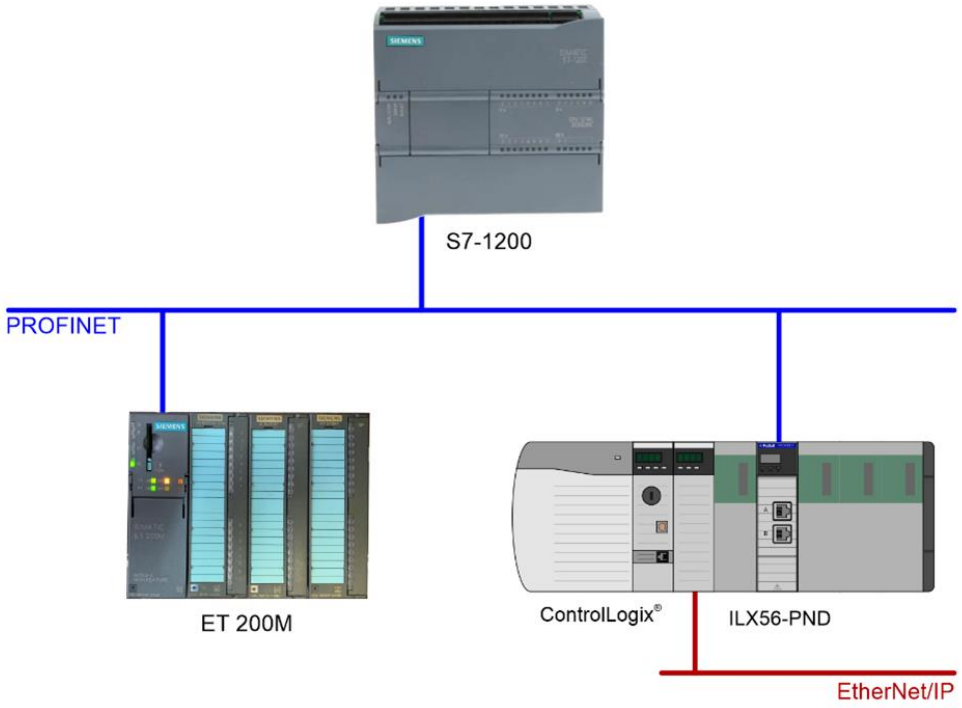


Figure 1.1 – Typical ILX56-PND PROFINET architecture

The module is configured using the PLX50 Configuration Utility software from ProSoft.

1.2 Features

- The ILX56-PND module operates as a PROFINET Device.
- Exchange up to 1440 bytes of input (and status) data and 1440 bytes of output (and control) data between the ControlLogix controller and the PROFINET Controller.
- Cyclic communication with a PROFINET Controller using PROFINET Real Time (RT) data exchange.
- Data formatted into engineering units for ControlLogix platform by using the automatically generated mapping imports for Logix User Defined Data Types (UDTs).
- The module supports Media Redundancy Protocol (MRP) and can operate as a MRP Client.
- SD Card can be used for firmware and configuration backup.
- The module supports PROFINET Controllers using System Redundancy S2.
- Complies with PROFINET conformance class B.
- Statistics and diagnostics supported for the PROFINET device.
- PI Certified

1.3 Architecture

The figures below provide some typical examples of network configurations.

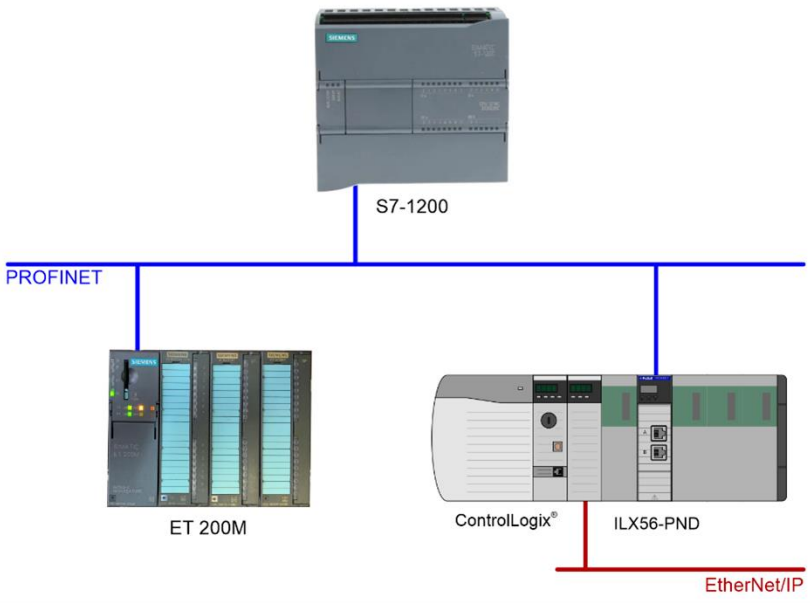


Figure 1.2 – Basic Configuration

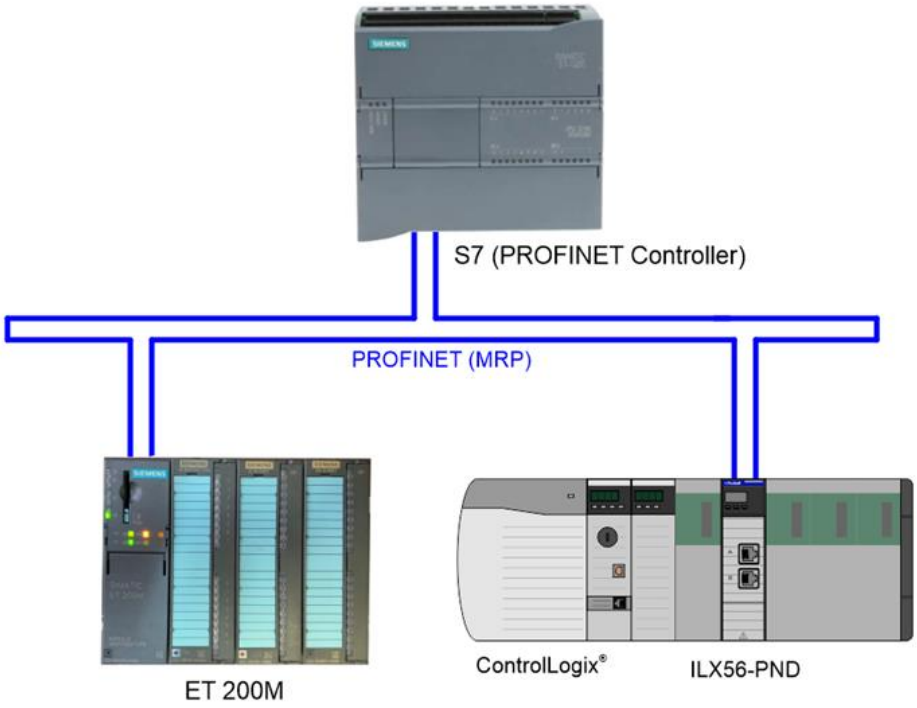


Figure 1.3 – Basic Configuration with PROFINET MRP

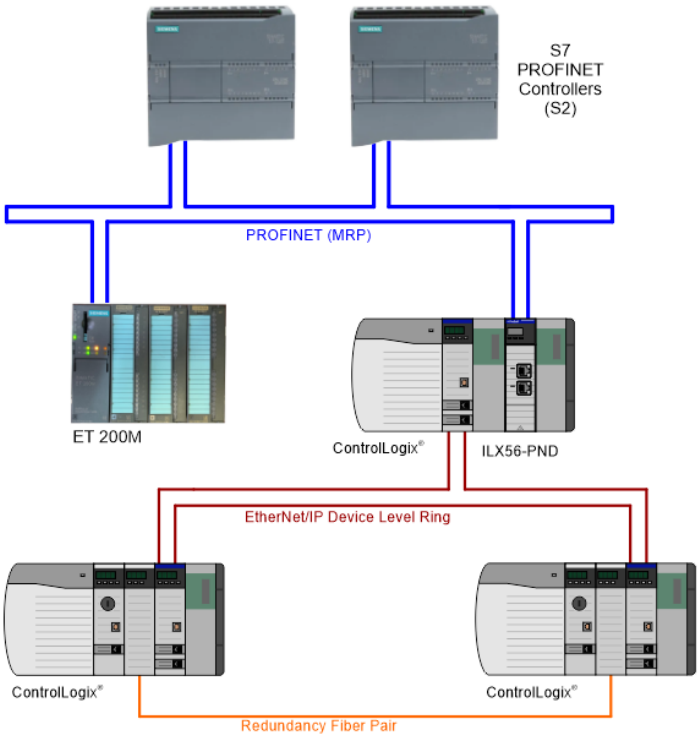


Figure 1.4 – Redundant ControlLogix and S2 Redundant PND Configuration with PROFINET MRP

1.4 Additional Information

The following documents contain additional information that can assist with installation and operation.

Resource	Link
PLX50 Configuration Utility Installation	www.prosoft-technology.com
ILX56-PND User Manual ILX56-PND Datasheet	www.prosoft-technology.com

Table 1.1 - Additional Information

1.5 Support

Technical support is provided via the Web (in the form of User Manuals, FAQ, Datasheets etc.) to assist with installation, operation, and diagnostics.

Additional support:

Resource	Link
Contact us	www.prosoft-technology.com
Support email	ps.support@belden.com

Table 1.2 - Support Details

2 Installation

2.1 Module Layout

The ILX56-PND module has two PROFINET (Ethernet) ports on the front of the module. These ports support Full- and Half-duplex, at speeds of 10Mbit/s, 100Mbit/s, or 1Gbit/s.

Note: All required power for the module is derived from the ControlLogix backplane.

The module provides 3 diagnostic LEDs and a 4-character alpha-numeric LED display. The LED display provides the mode and status of the module.

Figure 2.1 – ILX56-PND front view

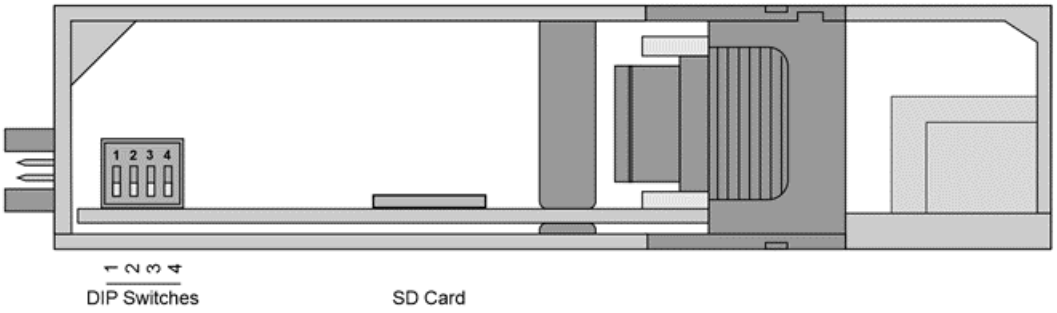


Figure 2.2 – ILX56-PND bottom view

Located at the bottom of the module are four DIP Switches and an SD memory card slot. These switches can only be accessed when the module is removed from the ControlLogix chassis.

DIP Switch	Description
DIP Switch 1	Used to force the module into **Safe Mode**. When in **Safe Mode**, the module will not load the application firmware and will wait for new firmware to be downloaded. This should only be used in the rare occasion when a firmware update was interrupted at a critical stage.
DIP Switch 2	Used to prevent changes to the configuration.
DIP Switch 3	Reserved
DIP Switch 4	Reserved

Table 2.1 – DIP Switch Settings

This section of the document will walk you through the set-up process needed to use the ILX56-PND module properly.

3 Setup

This chapter covers the ILX56-PND configuration process.

3.1 Install Configuration Software

The ILX56-PND configuration is done in the ProSoft PLX50 Configuration Utility. This software can be downloaded from www.prosoft-technology.com.

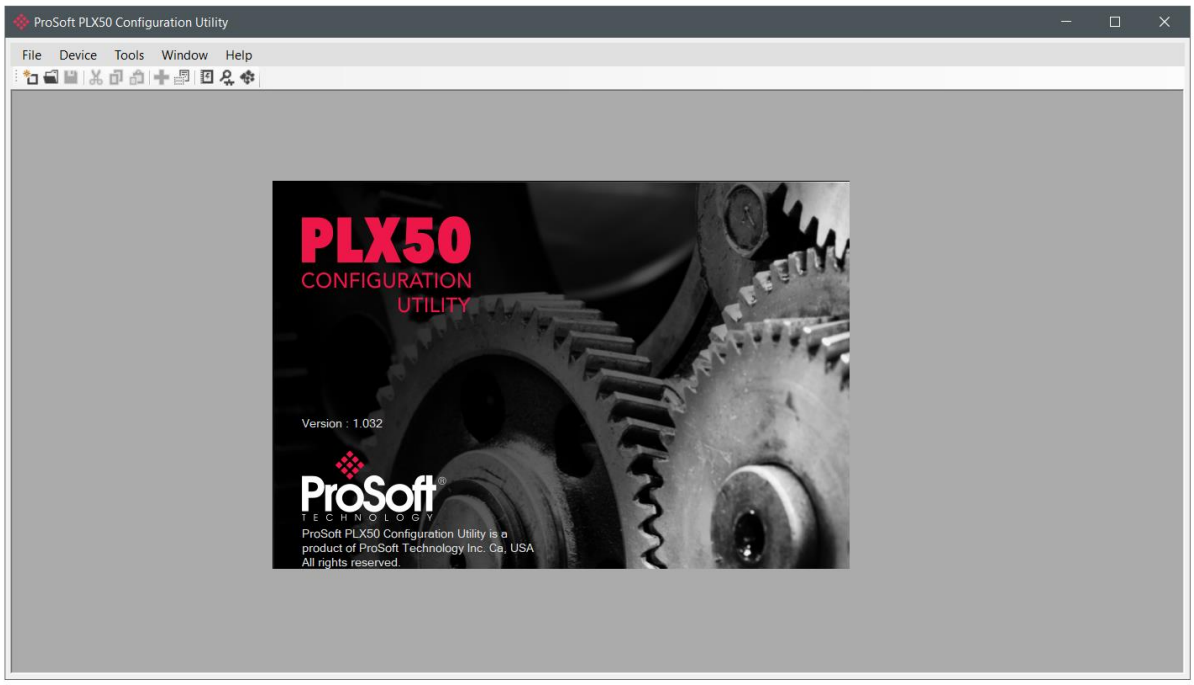


Figure 3.1 – PLX50 Configuration Utility Environment

3.2 Creating a New Project

Before configuring the ILX56-PND, a new PLX50 Configuration Utility project must be created.

1 Under the *File* menu, select **NEW**. A PLX50 Configuration Utility Design Tool project is created, displaying the *Project Explorer* tree view.

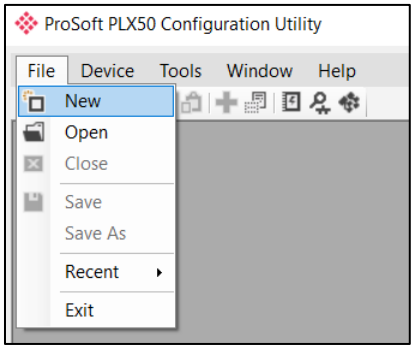


Figure 3.2 - Creating a new project

2 Add a new device by selecting **ADD** under the *Device* menu.

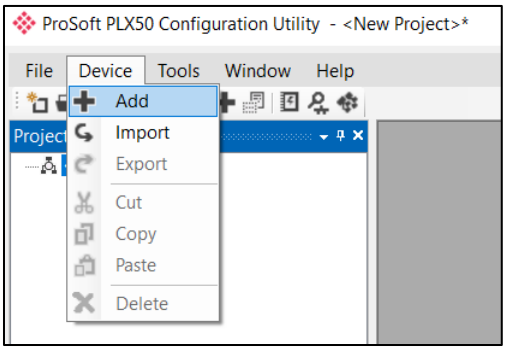


Figure 3.3 - Adding a new device

3 In the *Add New Device* window select the **ILX56-PND** and click the **OK** button.

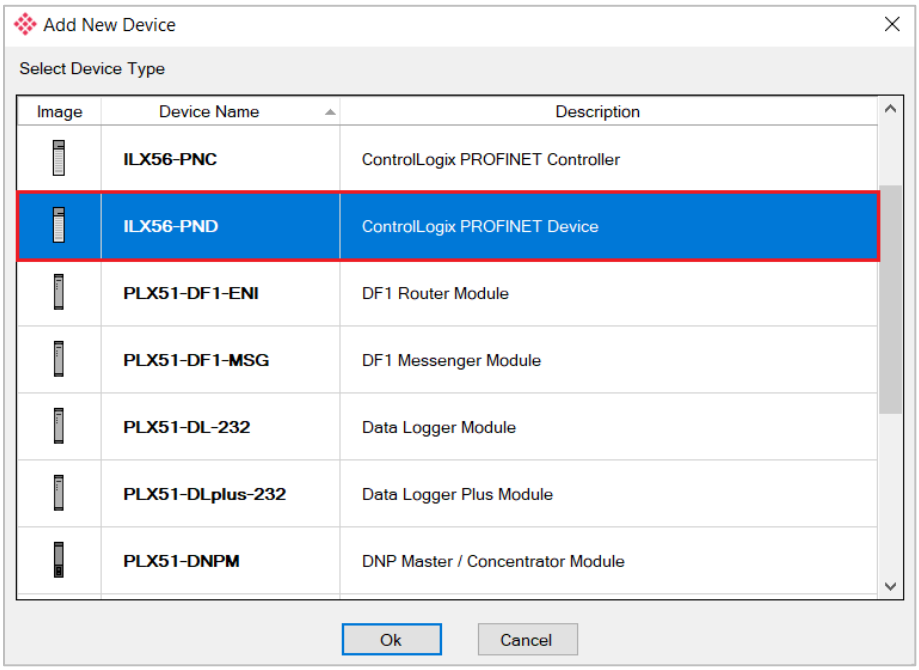


Figure 3.4 – Select ILX56-PND

4 The ILX56-PND Configuration window opens. The device configuration window can be reopened by either double-clicking the module in the *Project Explorer* tree or right-clicking on the module and selecting **CONFIGURATION**.

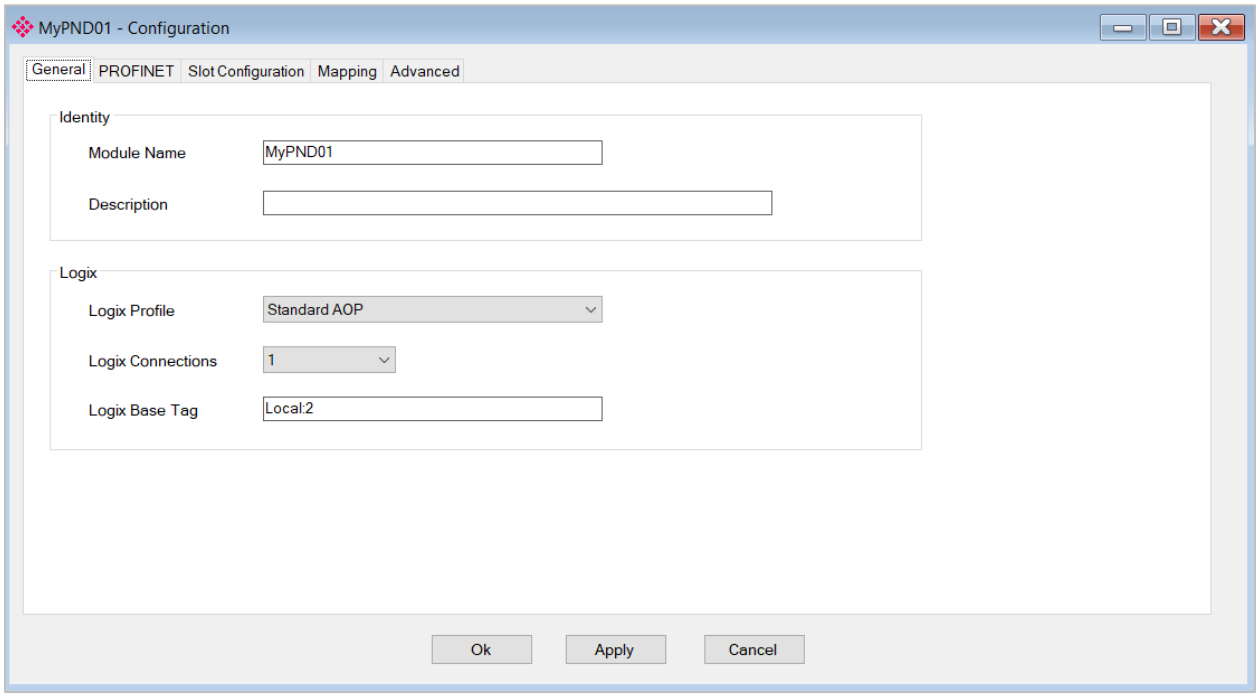


Figure 3.5 – ILX56-PND Configuration

3.3 ILX56-PND Configuration

The ILX56-PND configuration takes place within the PLX50 Configuration Utility environment.

Note: Refer to section *1.4 Additional Information* for documentation and installation links for the ProSoft PLX50 Configuration Utility.

3.3.1 General

The *General* tab of the ILX56-PND Configuration window is opened by either double-clicking on the module in the tree, or right-clicking the module and selecting **CONFIGURATION**.

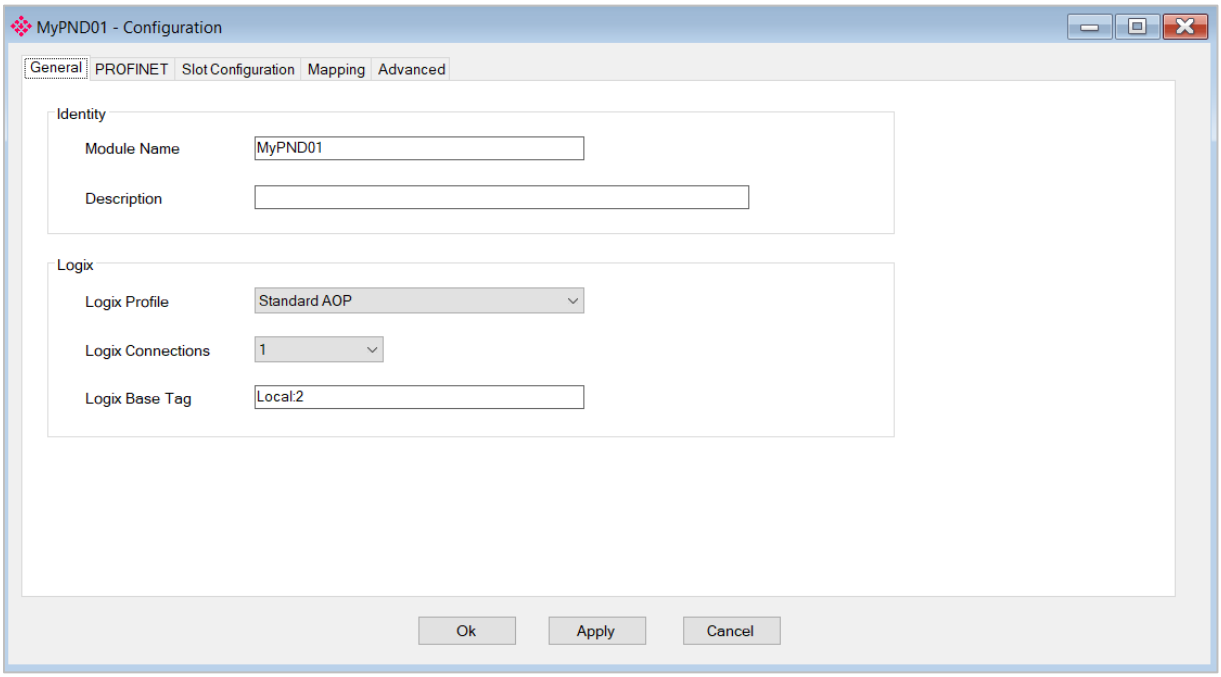


Figure 3.6 – ILX56-PND General configuration

The General configuration consists of the following parameters:

Parameter	Description
Identity	
Module Name	User-defined name to identify the ILX56-PND module. **Note**: This name must match the instance name assigned to the module in the Studio 5000 IO tree.
Description	Provides a detailed description of the application for the module.
Logix	
Profile	The Studio 5000 profile used to instantiate the ILX56-PND module. **Standard AOP** The preferred profile to allow the user to configure between 1 and 11 connections. **Generic Profile** Provides a single connection and is required for older versions of Logix.
Connection Count	The number of class 1 CIP connections established between the ControlLogix CPU and the module. (1 to 11). **Note:** This value must match that configured in the Logix IO tree.
Logix Base Tag	The tagname of the ILX56-PND used for the input and output assembly. For example, if the module is in the local slot connected to a Logix controller the base tag will be **Local:x** (where **x** is the slot number). The base tagname is used when generating the Logix L5X file to automatically map the required data.

Table 3.1 - General configuration parameters

3.3.2 PROFINET

The *PROFINET* tab in the Configuration window is opened by either double-clicking on the module icon in the tree, or by right-clicking on the module icon and selecting **CONFIGURATION**.

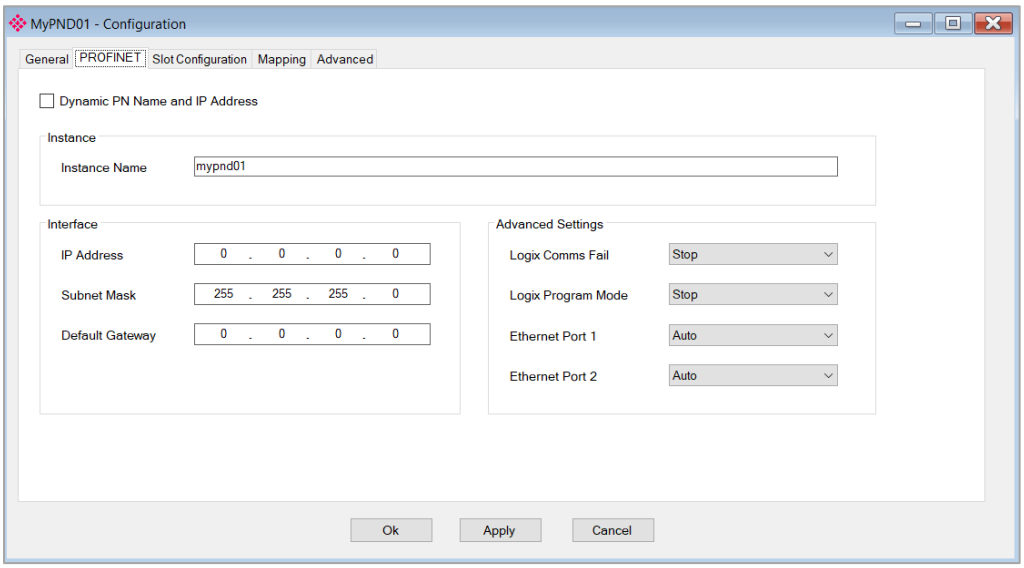
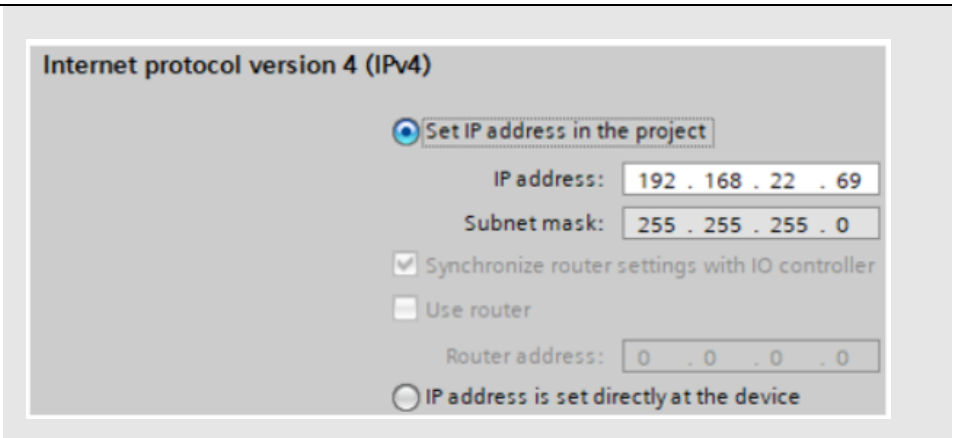


Figure 3.7 – ILX56-PND PROFINET configuration

The PROFINET configuration consists of the following parameters:

Parameter	Description
Dynamic PN Name and IP Address	When selected, the ILX56-PND Device Name and Network settings (e.g., IP Address) are set by the PROFINET Controller connected to the ILX56-PND. The name and IP address set by the PROFINET Controller is non-volatile. When the option is not selected, the ILX56-PND PROFINET Device Name and Network settings are set to the values in this configuration page. The PROFINET Controller connected to the ILX56-PND is not able to change the Name or Network settings. **Note:** For TIA Portal utility users: When this parameter is enabled, TIA portal must have the **Set IP address in the project** option selected. When this parameter is not enabled, TIA portal must have the **IP address is set directly at the device** option selected.



Instance	**Note:** Relevant when *Dynamic PN Name and IP Address* has **not** been selected.
Instance Name	The name used to identify the device on the PROFINET network.
Interface	**Note:** Relevant when *Dynamic PN Name and IP Address* has **not** been selected.
IP Address	The IP Address of the module on the PROFINET network.
Subnet Mask	The subnet mask to be used by the module/s on the PROFINET network.
Default Gateway	The IP Address of the Default Gateway to be used by the module/s on the PROFINET network. The gateway allows the module to communicate with PROFINET devices that are not on the same subnet.
Advanced Settings	
Logix Comms Fail	Specifies the PROFINET Device behavior when communication with Logix is lost. **Stop** or **Continue**
Logix Program Mode	Specifies the PROFINET Device behavior when the Logix controller is placed in PROGRAM mode. **Stop** or **Continue**
Ethernet Port 1 / 2	The Ethernet port speed selection. **Auto** – The Ethernet port speed will be auto-negotiated (100M or 1G). **Fixed 100 Mbps FD** – The Ethernet port speed will be fixed at 100Mbps. **Fixed 1 Gbps FD** – The Ethernet port speed will be fixed at 1 Gbps.

Table 3.2 - PROFINET configuration parameters

3.4 Slot Configuration

The *Slot Config* tab contains the module and sub-module slot configuration. The Slot Configuration allows the ILX56-PND to provide the implemented Slots to the PROFINET Controller, such that they can be added in the Connection Request from the PROFINET Controller.

Note: At least one Slot must be configured before the PLX50CU will allow the configuration to be downloaded to a ILX56-PND module.

3.4.1 Add Module

To add a module, either click on the **ADD MODULE** button in the *Slot Config* tab, or right-click and select the **ADD MODULE** context menu option.

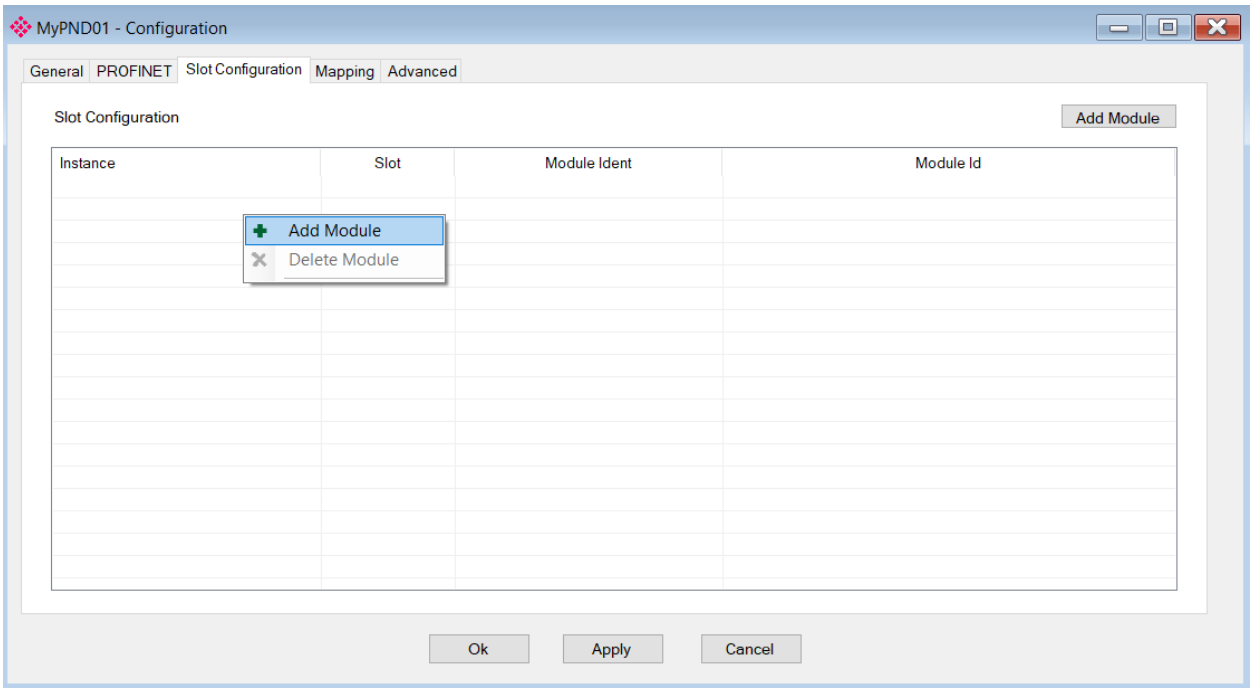


Figure 3.8 – Slot Configuration

The *Add Module* window opens and lists all the available modules for the selected *Slot Number* for the ILX56-PND.

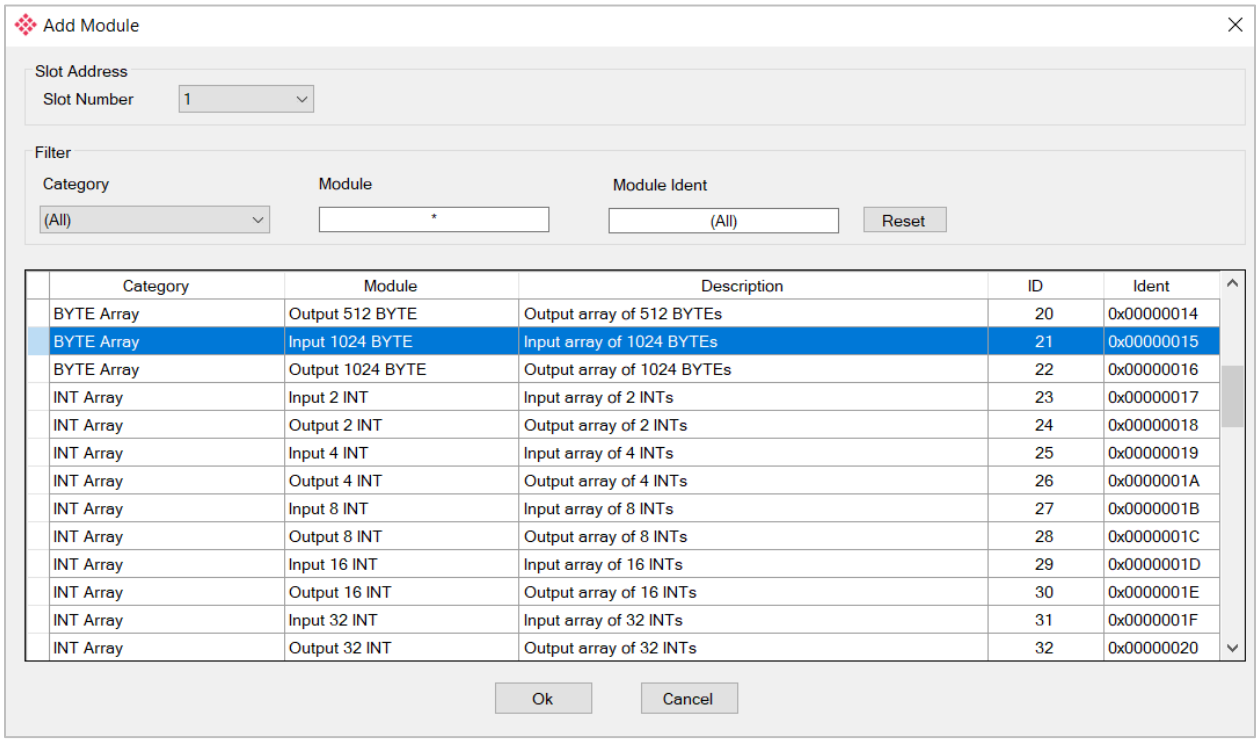


Figure 3.9 – Module Selection

The module selection can be narrowed by entering filter criteria for one or more of the following attributes: *Category*, *Module*, *Order Number*, and *Module Ident*

Note: The entered criteria can be removed by clicking on the **RESET** button.

Note: When entering filter criteria, it is recommended to use the wildcard character " * ", before and after the criteria text. Example: ***321 DI4***

Once the required module has been selected, click the **OK** button. The selected module will be added to the Slot configuration.

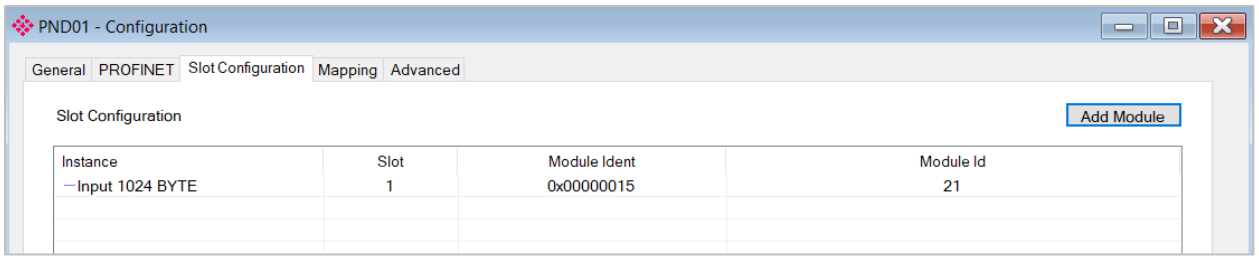


Figure 3.10 – Slot configuration

3.4.2 Delete Module

To delete a module, right-click on the module and select **DELETE MODULE**.

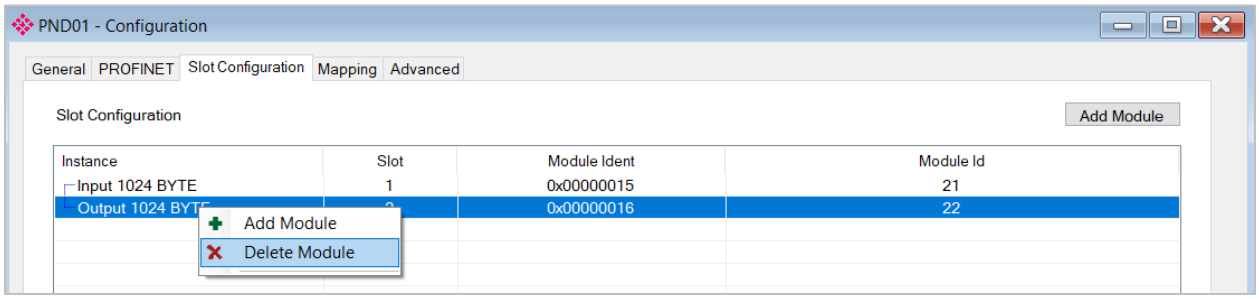


Figure 3.11 – Delete Module

3.5 Mapping

The *Mapping* tab displays the relationship between the PROFINET device's input and output data and the resulting UDT tag structure in Logix.

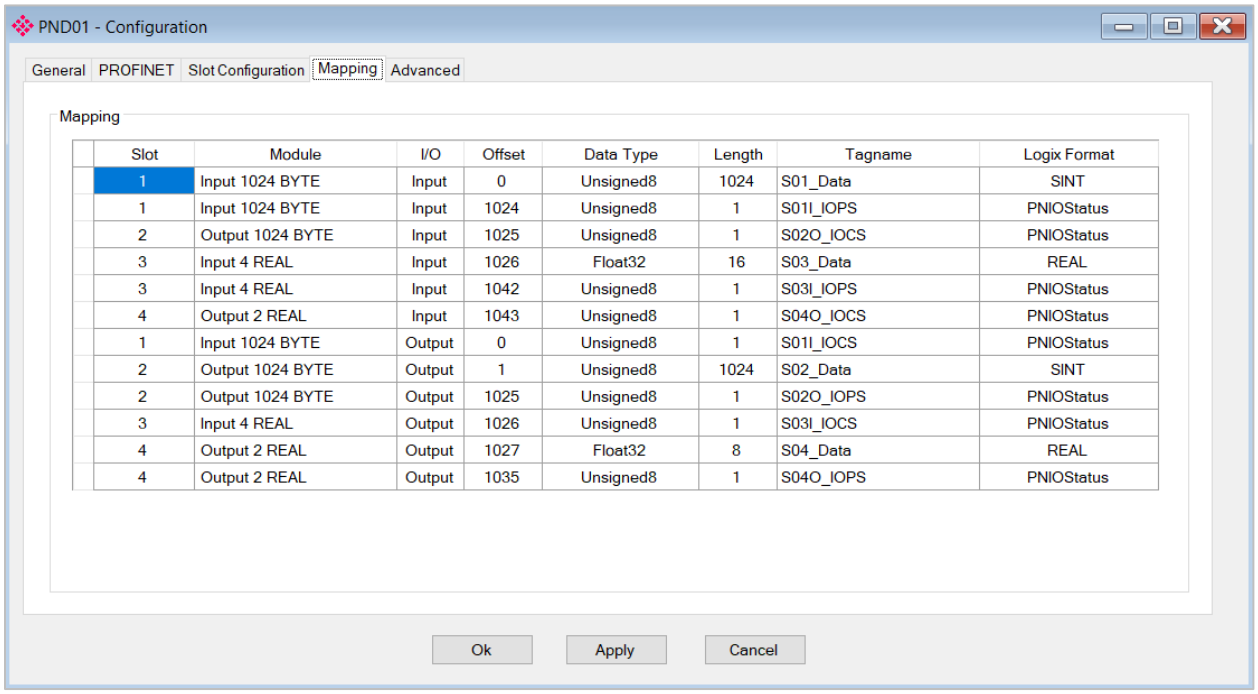


Figure 3.12 – Device Mapping configuration

The items listed in the *Mapping* configuration table are automatically added and removed when a module/submodule is added or removed.

The *Mapping* table contains the following:

Column	Description
Slot	The slot or sub-slot position of the module or submodule. (Read only)
Module	The name of the module or submodule. (Read only)
I/O	The direction of the data flow. (Read only) **Input**: From device to controller **Output**: From controller to device.
Offset	The byte offset in the PROFINET device data structure (Read only)
Data Type	The PROFINET data type. (Read only)
Length	The data length in bytes. (Read only)
Tagname	The user configurable Tagname for the data point. This Tagname is used to generate the device specific UDT (user-defined data type) to be imported into Logix. **Note:** The Tagname must conform to the requirements of Logix tagnames / UDT member names. (No spaces or extended characters.) **Note:** Each Tagname must be unique across the entire PROFINET device.

Logix Format	The data format to be used for the Logix device specific UDT.
	Depending on the corresponding PROFINET data type, the following options are available:
	• None (The item is excluded from the Logix structure.)
	• BOOL
	• SINT
	• INT
	• DINT
	• LINT
	• REAL
	• LREAL
	• SINTArray
	• PNIOStatus - A specific UDT to describe the:
	  ○ IOPS – Input Output Object Provider Status
	  ○ IOCS – Input Output Object Consumer Status

Table 3.3 – Device Mapping configuration columns

3.6 Advanced

The *Advanced* tab contains the language, CRC, and assembly parameters.

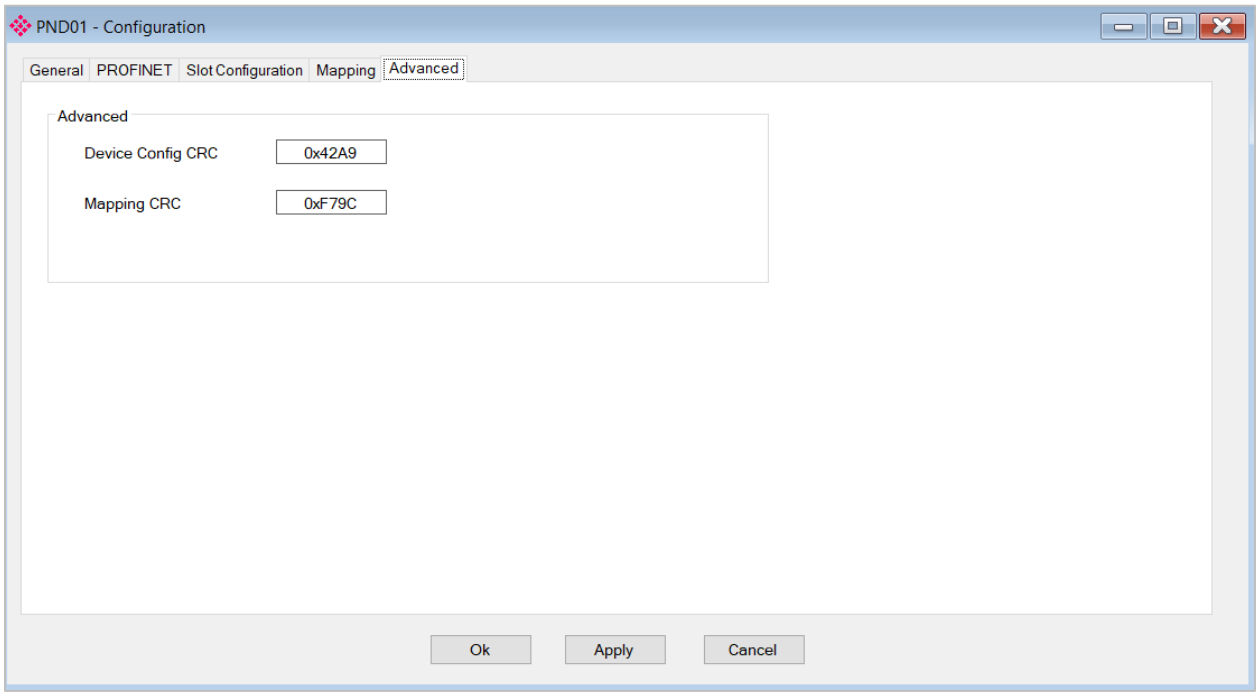


Figure 3.13 – Device Advanced configuration

The *Advanced* tab contains the following parameters:

Parameter	Description
Device Config CRC	A checksum calculated on the entire device's configuration.
Mapping CRC	A checksum of the device configuration associated with data mapping.

Table 3.4 – Device Advanced configuration parameters

3.7 Module Download

Once the ILX56-PND configuration is complete, it must be downloaded to the module. The *Connection Path* of the module must be configured before downloading.

1 Right-click on the module and select the **CONNECTION PATH** option.

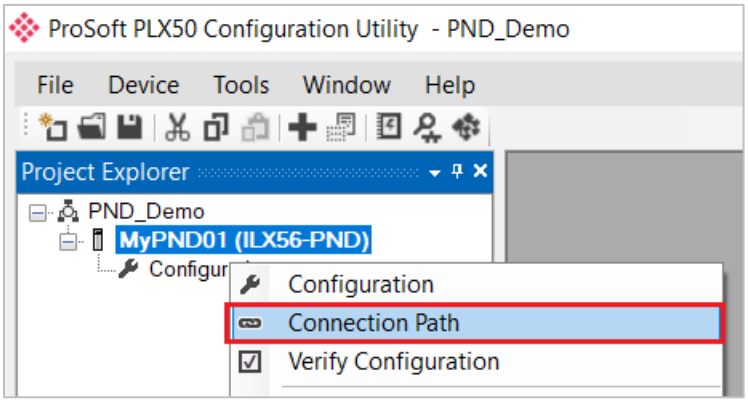


Figure 3.14 – Select Connection Path

2 The current *Connection Path* will be displayed. The new connection path can be entered manually or selected by using the *Target Browser*. To use the latter, select the **BROWSE** button.

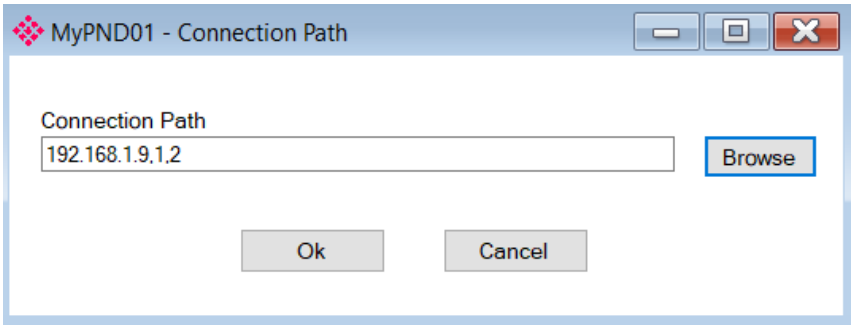


Figure 3.15 – Enter Connection Path

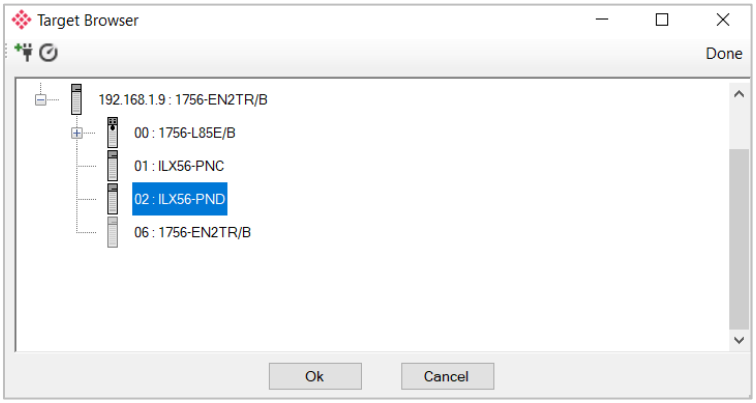


Figure 3.16 – Target Browser

3 Click **OK**. The configured path will be used to connect to the module.

4 To initiate the download, right-click on the module and select the **DOWNLOAD** option.

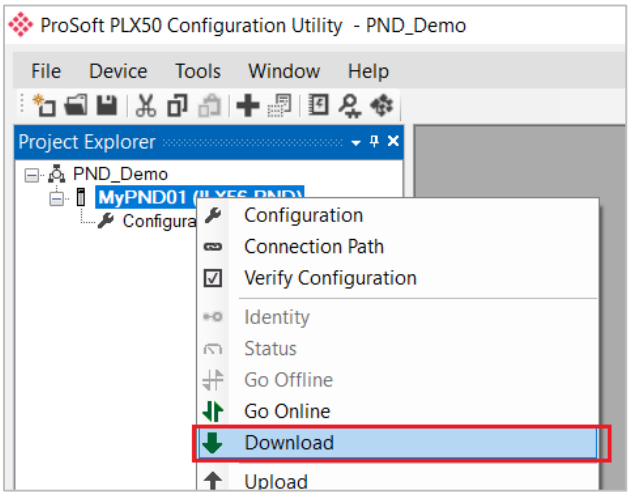


Figure 3.17 - Selecting Download

5 Once complete, the user will be notified that the download was successful.

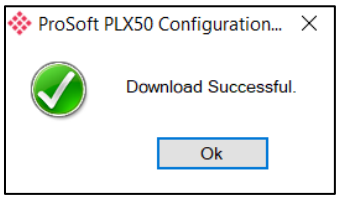


Figure 3.18 - Successful download

6 The PLX50 Configuration Utility will indicate the module will be in the *Online* state. The module's icon will have a green circle. The module is now configured and operational.

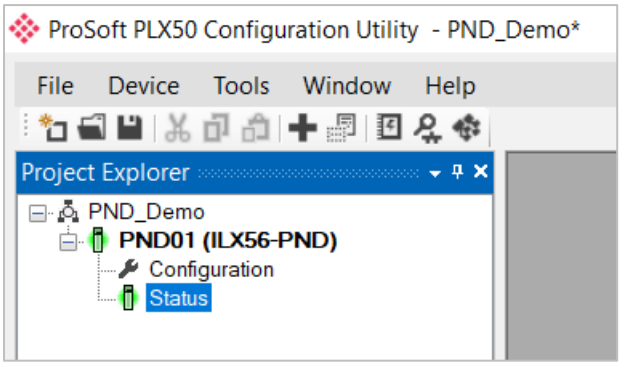


Figure 3.19 - Module online

3.8 Studio 5000 Configuration

There are two profile options for integrating the ILX56-PND into Logix:

- Standard (ILX56-PND) Add-On-Profile (AOP)
- Generic Profile (1756-Module)

Note: The minimum Studio 5000 version that can be used is V16. The preferred implementation makes use of an Add-On Profile (AOP) for the 1756 Backplane, which requires V30 and newer. Versions prior to V30 require the use of a Generic Profile.

Note: The choice of profile selected in Studio 5000 / RSLogix 5000 must match that configured in the PLX50 Configuration Utility.

3.8.1 Standard Add-On Profile

3.8.1.1 Installing the Add-On Profile (AOP)

Before the ILX56-PND module AOP can be added into the Logix I/O tree, it must first be installed on that system. The user will need to download the AOP from **www.prosoft-technology.com**. Once downloaded, extract the zip file, run the *MPSetup.exe* file, and follow the on-screen instructions.

3.8.1.2 Add Module to I/O Configuration

This sections adds the AOP to the Logix IO Configuration (tree).

1 Right-click on the **1756 BACKPLANE** and select the **NEW MODULE** option.

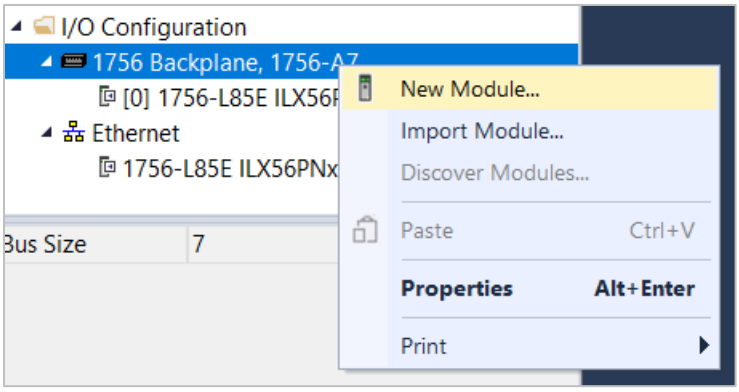


Figure 3.20 – Adding a New Module

2 In the *Select Module Type* dialog, enter the ILX56-PND name into the catalog filter to find the ILX56-PND AOP.

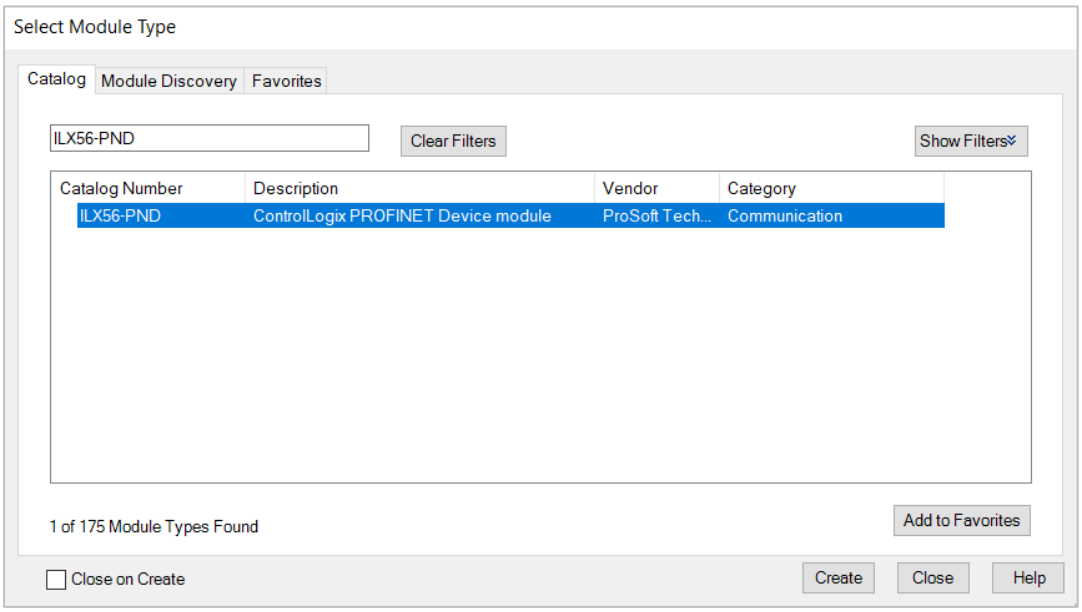


Figure 3.21 – Selecting the module

3 Select the ILX56-PND and click **CREATE**.

4 In the *New Module* dialog configure the module *Name* and *Slot* as a minimum to complete the instantiation.

Note: The module *Name* must match the *Instance Name* configured in the PLX50 Configuration Utility.

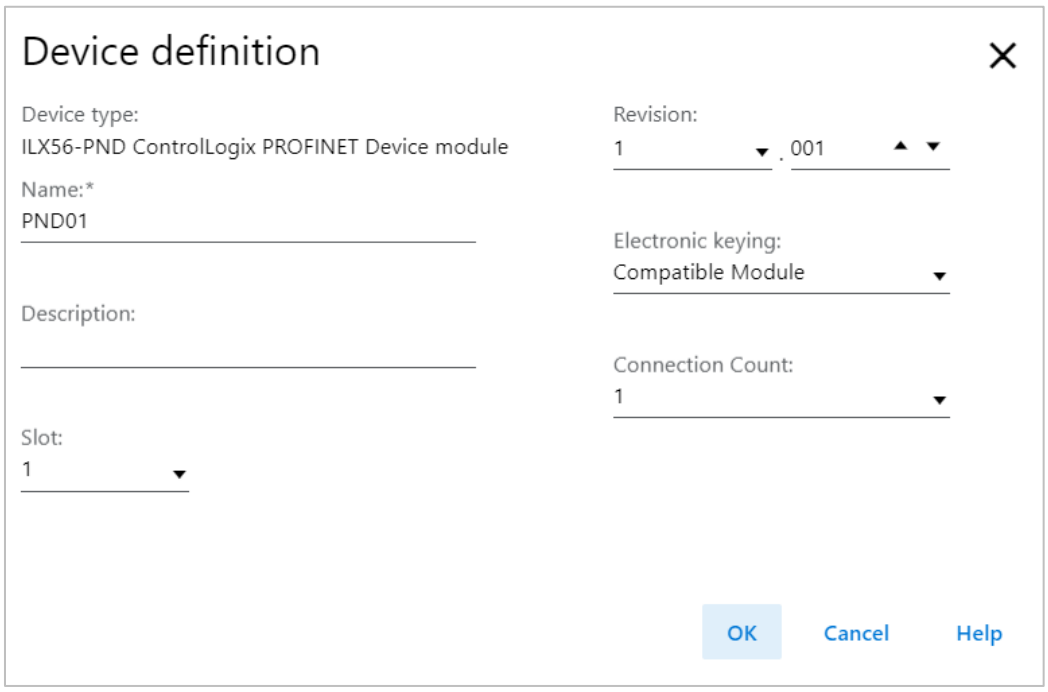


Figure 3.22 – Module instantiation

5 Once the instantiation is complete the module will appear in the Logix IO tree.

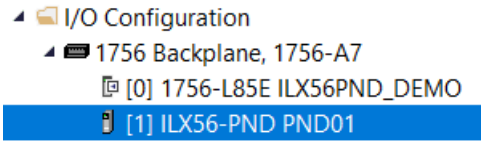


Figure 3.23 – Logix IO tree

6 The *Module Defined Data Types* will be automatically created during the instantiation process.

3.8.1.3 PLX50 Configuration Utility Project File

The ILX56-PND AOP allows the user to save the PLX50 Configuration Utility project file in the AOP as well as launch PLX50 Configuration Utility from the AOP.

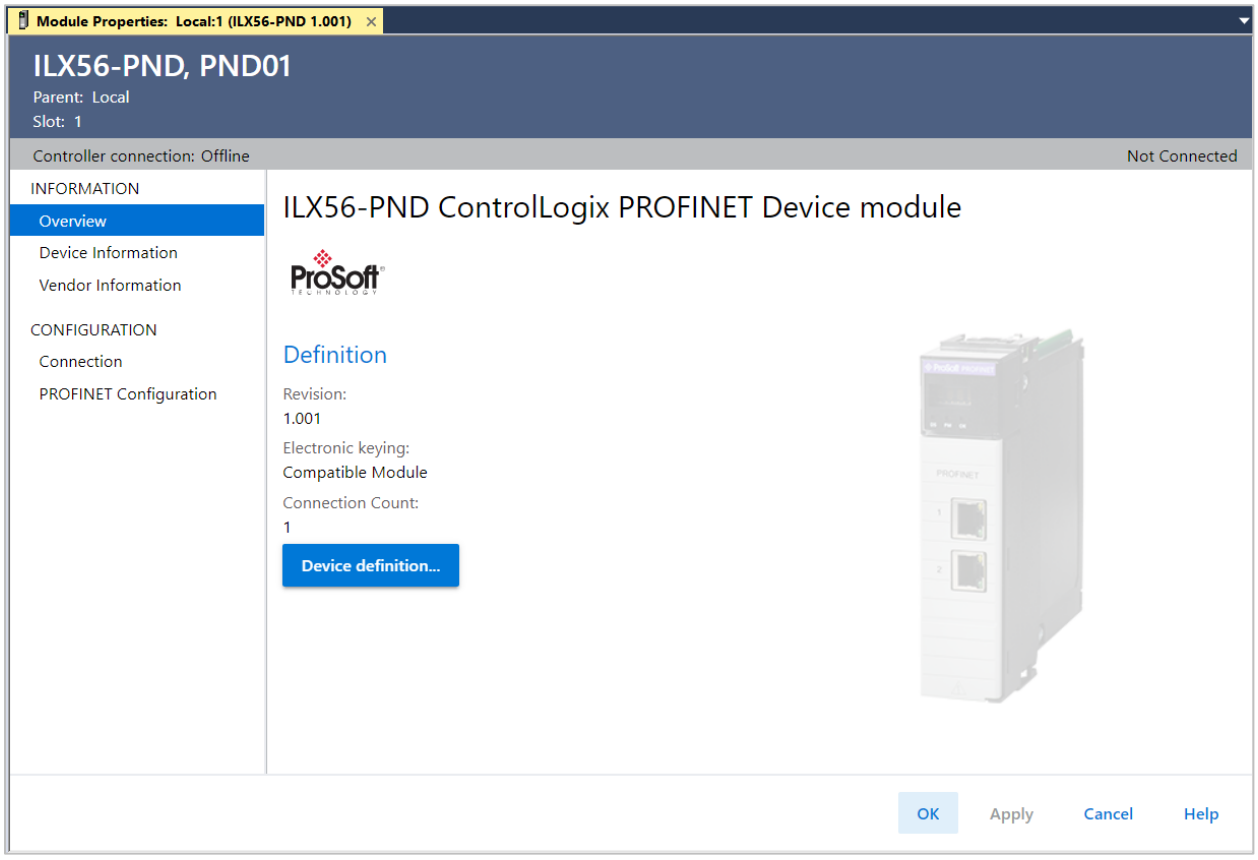


Figure 3.24 – AOP - PLX50 Configuration Utility

When no PLX50 Configuration Utility project has been defined, the user can *Browse* for an existing PLX50 Configuration Utility project. If no PLX50 Configuration Utility project has been created, the user can manually enter in the project file name in the *PLX50 Configuration Utility Project File* textbox and select the **LAUNCH PLX50 CONFIGURATION UTILITY** button.

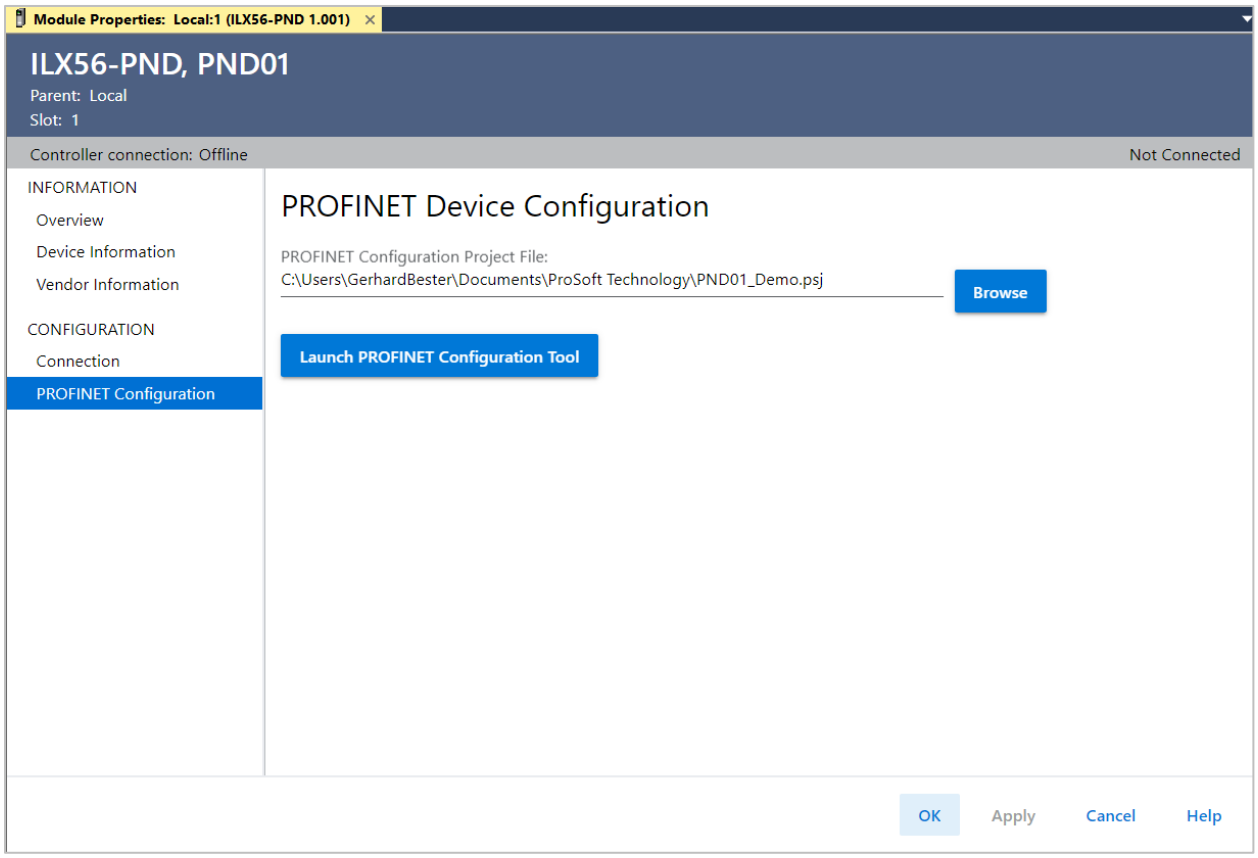


Figure 3.25 – AOP – Launch PLX50 Configuration Utility

Note: Once the file name has been entered, the user will need to click **APPLY** before the **LAUNCH PLX50 CONFIGURATION UTILITY** button will become available.

3.8.2 Generic Profile

For older versions of Studio 5000 / RSLogix 5000, the use of the *Generic Profile* is required.

To add the **Generic 1756-Module** profile in the Logix *IO Configuration* (tree):

1 Right-click **1756 BACKPLANE** and select the **NEW MODULE** option.

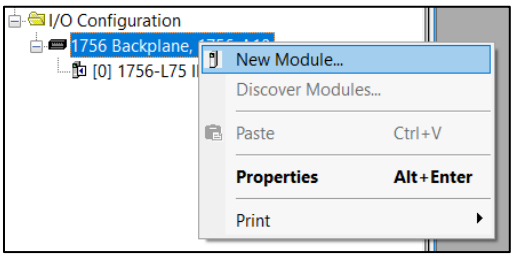


Figure 3.26 – Adding a New Module

2 In the *Select Module Type* dialog, the *Module Type Category Filters* search field can be used search for “Generic” modules as shown in the following figure.

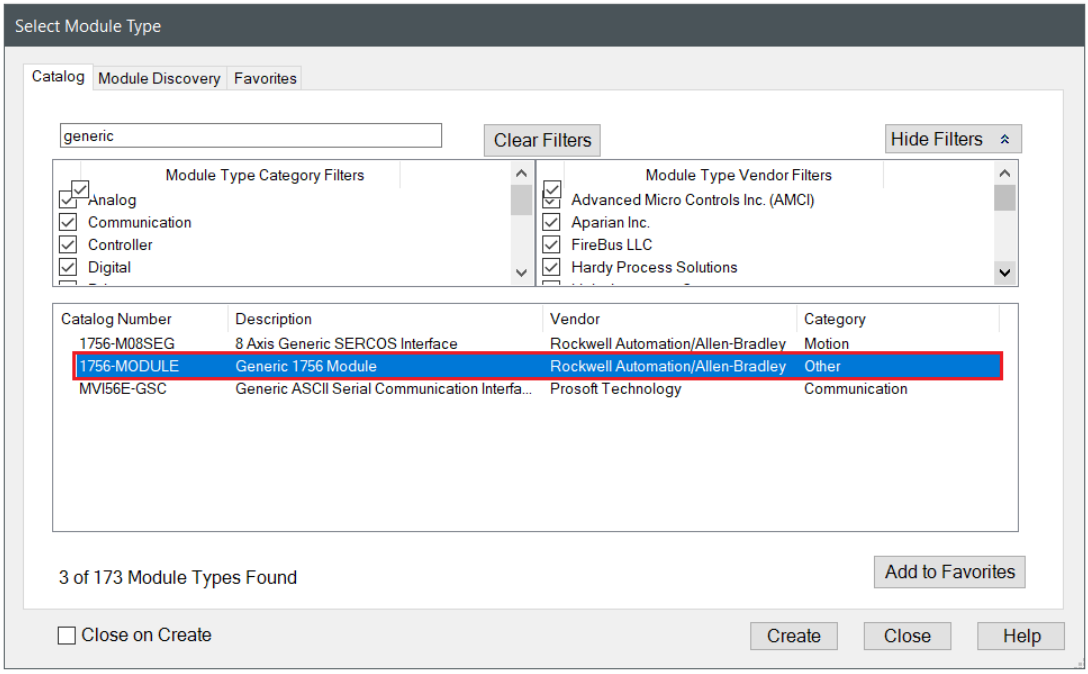


Figure 3.27 – Selecting the Generic module

3 Locate and select the **1756-MODULE** and click the **CREATE** button.

4 In the *New Module* dialog configure the module *Name*, *Slot*, and *Connection Parameters* as a minimum to complete the instantiation.

Note: The module *Name* must match the *Instance Name* configured in the PLX50 Configuration Utility.

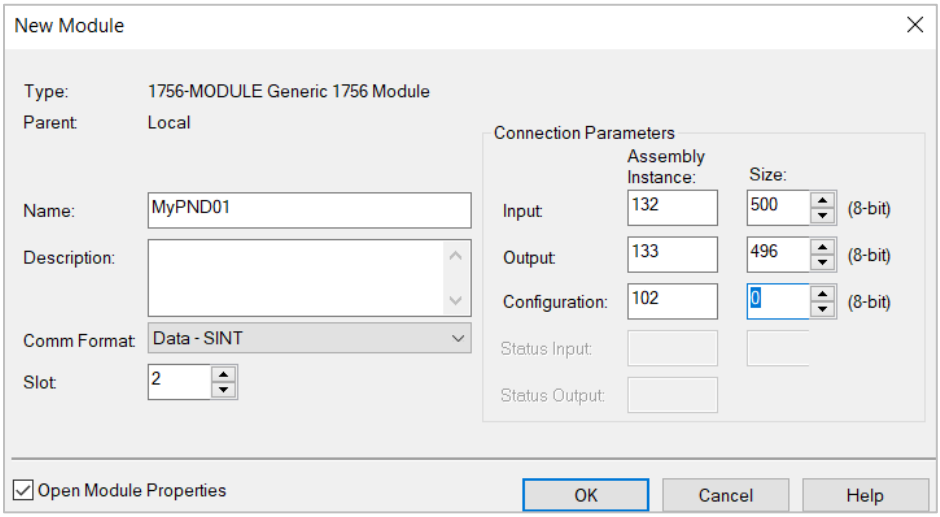


Figure 3.28 – Generic Module instantiation

5 The required *Connection Parameters* are as follows:

Parameter	Description
Input Instance	132
Input Size	500 (bytes)
Output Instance	133
Output Size	496 (bytes)
Configuration Instance	102
Configuration Size	0 (bytes)

Table 3.5 – Generic Connection Parameters

6 Once the instantiation is complete the module will appear in the Logix IO tree.

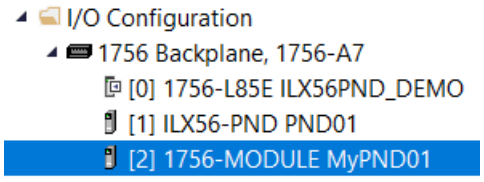


Figure 3.29 – Logix IO tree

3.9 Logix Mapping

The PLX50 Configuration Utility will generate the required UDTs and Routines to map the PROFINET input and output data. The user will need to generate the required Logix and UDTs by right-clicking on the module in the PLX50 Configuration Utility and selecting the **GENERATE LOGIX L5X** option.

Note: The user will need to ensure that the Logix Base Tag is correct for the generated Logix L5X code to work. The base tag will be the tag name for the module input and output assemblies in the Logix controller owning the module.

For example, if the ILX56-PND is in the same local rack as the Logix controller owning it, the Logix Base Tag will be *Local:xx* (where *xx* is the slot number of the module). Below is an example where the ILX56-PND is in slot 1 of the local rack.

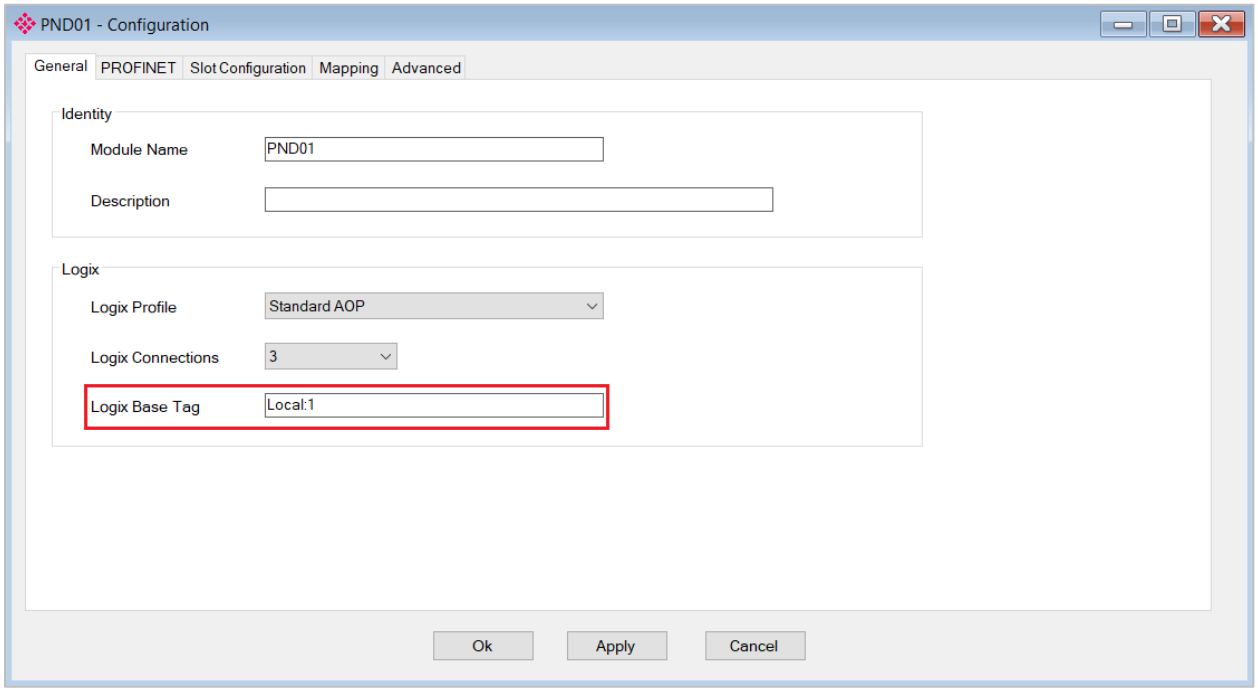


Figure 3.30 – Logix Base tag assignment in PLX50 Configuration Utility

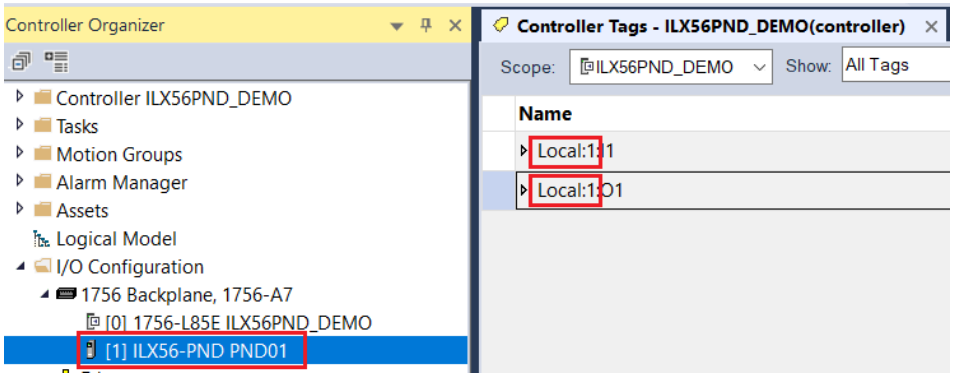


Figure 3.31 – Logix Base tag assignment in Studio 5000

If the module is in a remote rack, the user will need to enter the Logix Base Tag based on the name of the remote rack (see the example below):

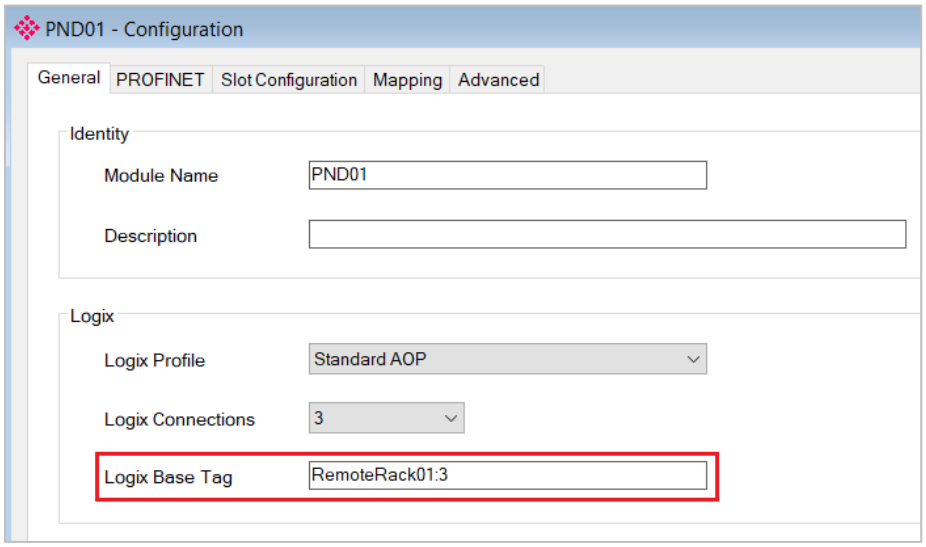


Figure 3.32 – Logix Base tag assignment in PLX50 Configuration Utility

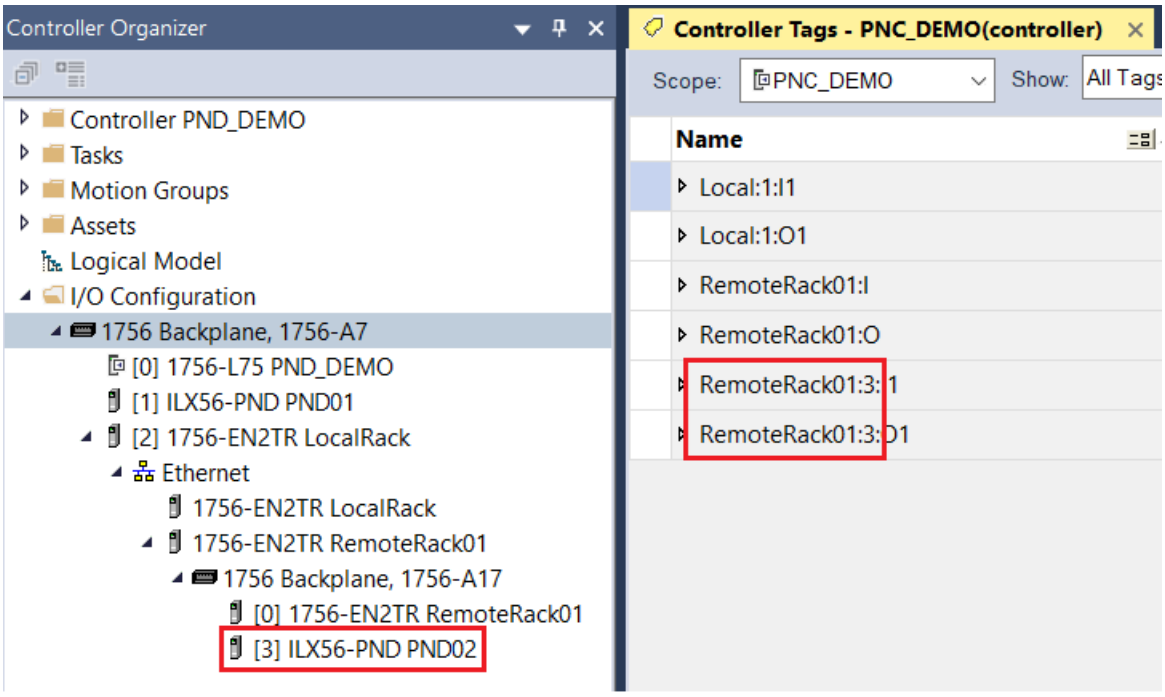


Figure 3.33 – Logix Base tag assignment in Studio 5000

To generate the mapping Logix L5X file, right-click on the ILX56-PND module and select the **GENERATE LOGIX L5X** option.

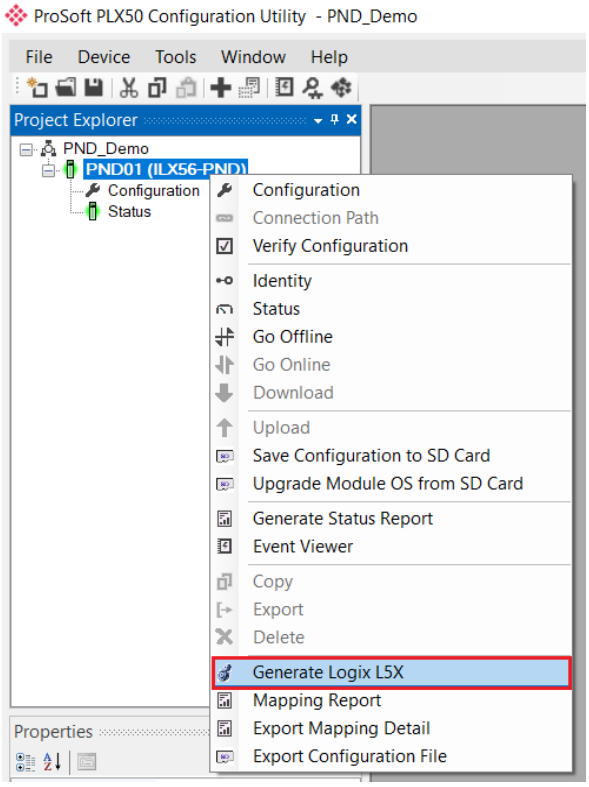


Figure 3.34 – Selecting Generate Logix L5X

The user will then be prompted to select a suitable file name and path for the L5X file.

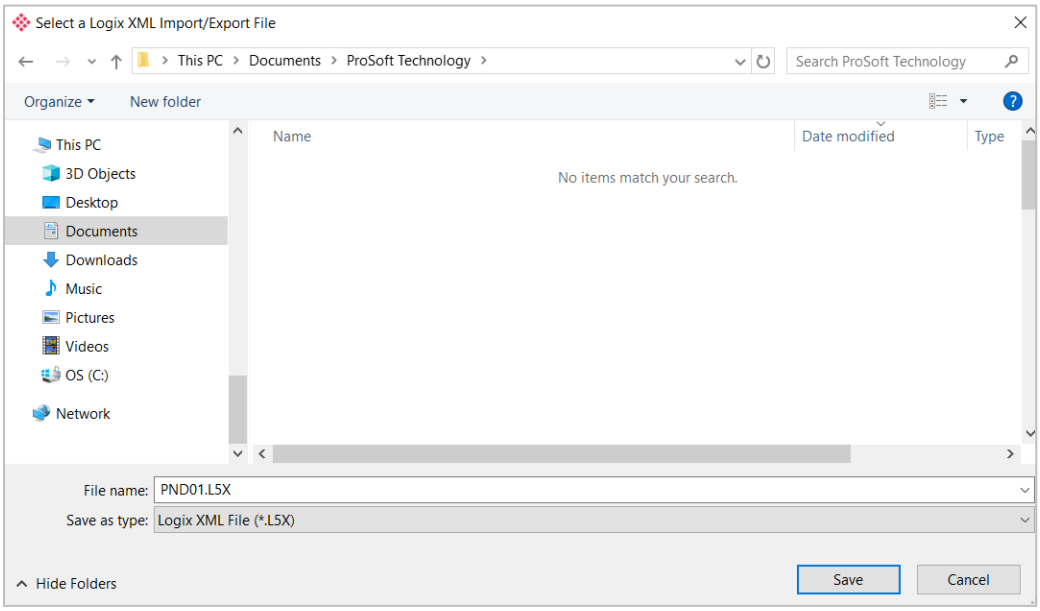


Figure 3.35 – Selecting the Logix L5X file name.

This L5X file can now be imported into the Studio 5000 project by right-clicking on a suitable **PROGRAM**, then click **ADD** > **IMPORT ROUTINE**.

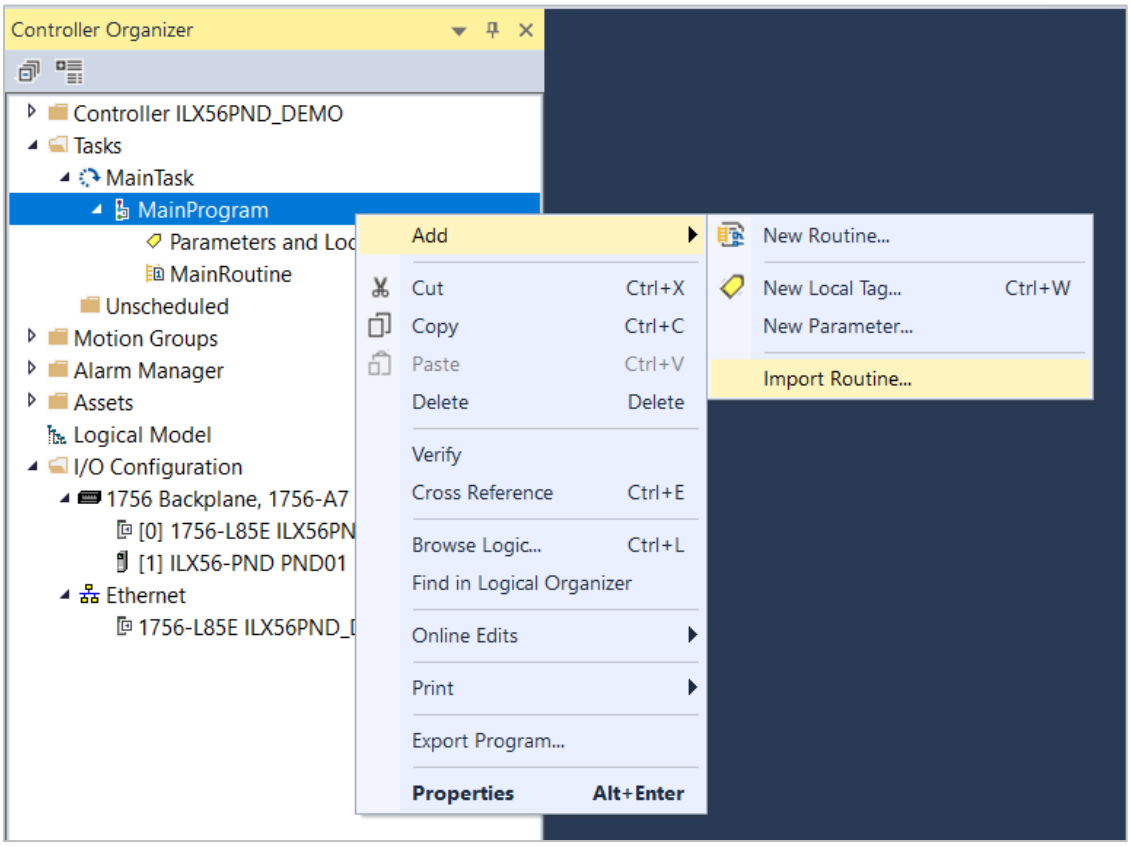


Figure 3.36 – Importing the L5X file into Studio 5000

In the file open dialog, select the previously created L5X file and press **OK**.

The import will create the following:

- Mapping Routine
- Multiple UDT (User-Defined Data Types)
- Multiple Controller Tags

Since the imported mapping routine is not a *Main Routine*, it will need to be called from the current *Main Routine*.

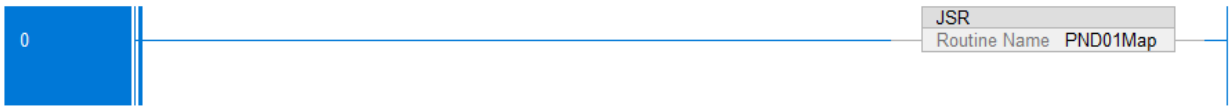


Figure 3.37 – Calling the mapping routine

The following shows an example of the items created by importing the L5X file.

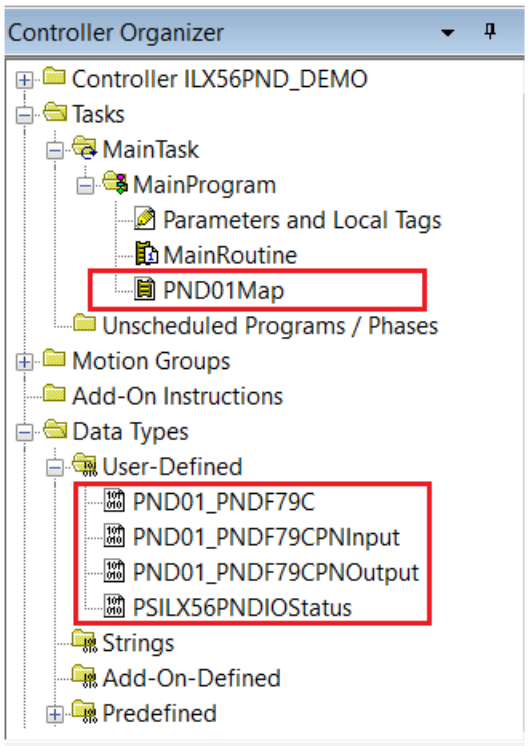


Figure 3.38 – Imported Logix Objects

A number of ILX56 specific (UDT) tags are created for both the ILX56-PND Controller as well as the configured PROFINET devices. These structures are described in the following section.

4 Operation

4.1 Logix Operation

When the ILX56-PND has been configured for Logix communication, it will exchange data with a Logix controller by adding the ILX56-PND in the IO tree and establishing a Class 1 connection. Once the ILX56-PND and Logix controller have been configured, the ILX56-PND will start exchanging data with the PROFINET controllers.

Note: The module input and output assembly of each connection will be an undecorated array of bytes. The imported Logix routine (generated by PLX50 Configuration Utility) will copy this data between the decorated tags (UDT) and the input and output assemblies.

4.1.1 PND Module Status

The controller Status tag displays the status of the PROFINET Device and other ILX56-PND module related diagnostics.

Name	Value	Style	Data Type
◢ Local:1:I1	{...}		PS:ILX56_PND_InStatus:I:0
Local:1:I1.ConnectionFaulted	0	Decimal	BOOL
▷ Local:1:I1.DeviceStatus	119	Decimal	DINT
Local:1:I1.ConfigValid	1	Decimal	BOOL
Local:1:I1.Owned	1	Decimal	BOOL
Local:1:I1.EthernetPort1	1	Decimal	BOOL
Local:1:I1.EthernetPort2	0	Decimal	BOOL
Local:1:I1.ControllerMode	1	Decimal	BOOL
Local:1:I1.SDCard	1	Decimal	BOOL
Local:1:I1.DataExchangeActive	1	Decimal	BOOL
Local:1:I1.DisabledByOutputAssembly	0	Decimal	BOOL
Local:1:I1.DeviceError	0	Decimal	BOOL
Local:1:I1.MappingCRCMismatch	0	Decimal	BOOL
Local:1:I1.ModuleMismatch	0	Decimal	BOOL
Local:1:I1.S2RedundantConnection	0	Decimal	BOOL
▷ Local:1:I1.ConfigCRC	16#cd69	Hex	INT
▷ Local:1:I1.IPAddress	{...}	Decimal	INT[4]
▷ Local:1:I1.MRPState	0	Decimal	SINT
▷ Local:1:I1.DeviceMappingCRC	16#f79c	Hex	INT

Figure 4.1 – Logix Module Status tag

The items contained within the controller status structure are as follows:

Tag	Description
ConnectionFaulted	Indicates if a connection fault has been detected. **1** – Connection fault **0** – No connection fault
DeviceStatus	Indicates the status of the module. It reflects the status on all Bool data types in the following Controller Tags.
ConfigValid	Configuration has been downloaded to the ILX56-PND and is being executed. **1** – ILX56-PND has been successfully configured. **0** – ILX56-PND is not configured.
Owned	Indicates if the ILX56-PND is owned by a Logix Controller with a connection count matching that configured in PLX50 Configuration Utility. **1** – ILX56-PND is connected. **0** – ILX56-PND is not connected.
EthernetPort1	Indicates the link status of the first Ethernet port (Port 0). **1** – Active Ethernet link **0** – No Ethernet link
EthernetPort2	Indicates the link status of the second Ethernet port (Port 1). **1** – Active Ethernet link **0** – No Ethernet link
ControllerMode	Indicates if the connected Logix controller is in RUN mode. **1** – RUN mode **0** – PROGRAM / FAULT mode
SDCard	Indicates if an SD Card is installed. **1** – SD Card detected **0** – No SD Card
DataExchangeActive	Indicates if the device is configured and exchanging data on the PROFINET network. **1** – Device is active and exchanging data **0** – Device is not exchanging data The user must ensure that all application code making use of data from a device first checks that the *DataExchangeActive* bit is 1.
DisabledByOutputAssembly	Indicates that the device has been Disabled for data exchange in the ILX56-PND device disable control bit. **1** – Device has been disabled for data exchange **0** – Device has been enabled for data exchange
DeviceError	Indicates an error with the device. **1** – Device has an error. **0** – Device has no error. **Note:** This Error flag is transient and will clear once the error condition has been rectified.
MappingCRCMismatch	If there is a mismatch in the mapping between Logix and the ILX56-PND, it can result in data appearing in the incorrect location. The user can be sending incorrect data to a device which can have unpredicted results. **0** – The mapping for the output data is correct. **1** – There is a mapping mismatch in the output data.
ModuleMismatch	One or more of the configured PROFINET modules in the ILX56-PND device does not match the configuration or is missing. **0** – Modules Match (Ok) **1** – Mismatch
S2RedundantConnection	Indicates that the Cyclic Connection to the ILX56-PND module is an S2 Redundant Connection. **0** – Normal non-redundant connection active. **1** – S2 connection active.

ConfigCRC	The signature of the configuration currently executing on the module.
ModuleIPAddress	Indicates the IP address of the ILX56-PND module.
MRPState	Indicates the MRP state of the controller: **0** – Disabled **1** – Open Ring **2** – Closed Ring
DeviceMappingCRC	The checksum of the Mapping for the specific device.

Table 4.1 – Logix Controller Status tag

4.1.2 PND Control

The user will need to set the PROFINET Operating mode from the ILX56-PND Logix output assembly in the Logix controller.

Name	Value	Style	Data Type
Local:1:O1	{...}		PS:ILX56_PND_OutControl:O:0
Local:1:O1.PNDControl	0	Decimal	INT
Local:1:O1.DeviceDisable	{...}		PS_ILX56_PND_DeviceList_Struct:IO:0
Local:1:O1.SystemTime	DT#2024-07-04-13:56:35.832_027(UTC+02:00)	Date/Time	LINT
Local:1:O1.DeviceMappingCRC	16#f79c	Hex	INT

Figure 4.2 – Logix Controller Control tag

Tag	Description
PNDControl	This is currently reserved.
DeviceDisable	These bits disable the ILX56-PND device on the PROFINET network for data exchange. Only the first bit is used to enable or disable the PROFINET data exchange. The other bits are reserved. When the first bit is set '**1**' then the device will **not** enter data exchange and when the bit is off '**0**' the device will enter cyclic data exchange. Bit 0 – ILX56-PND device is disabled for data exchange Bit 1 to 63 – Reserved
SystemTime	The system time in UTC.
DeviceMappingCRC	The checksum of the mapping that was applied by the generated Logix code used to verify if the mapping being used is valid.

Table 4.2 – Logix Controller Control tag

The user will be able to see if there are any faults (e.g. configured device not found) by:

- Viewing the LEDs of the ILX56-PND (see section *8.1 LEDs* for more details)
- Going online with the module in the PLX50 Configuration Utility and viewing the ILX56-PND Diagnostics
- Viewing the input assembly of the ILX56-PND in Logix.

4.1.3 IO Data Status (IOPS / IOCS)

Contained within the ILX56-PND module's input and output configuration, there will be a number of IOPS (Input Output Object Provider Status) and IOCS (Input Output Object Consumer Status) objects. There are typically one of these per device module.

- The IOPS provides information on the status of the produced data.
- The IOCS provides information on the status of the consumed data.

Exposing these items to the Logix application code allows the monitoring of the status of input data. It also allows the application to control the status of the data being sent to the output devices.

In a typical data exchange with an **output** device, as shown below, the controller sends the output data and the IOPS. The IOPS can be controlled by the application code, perhaps flagging the data as bad under certain conditions which in turn could cause the output device to a fail-safe condition. The application code can also monitor the IOCS for confirmation that the device received the latest data.

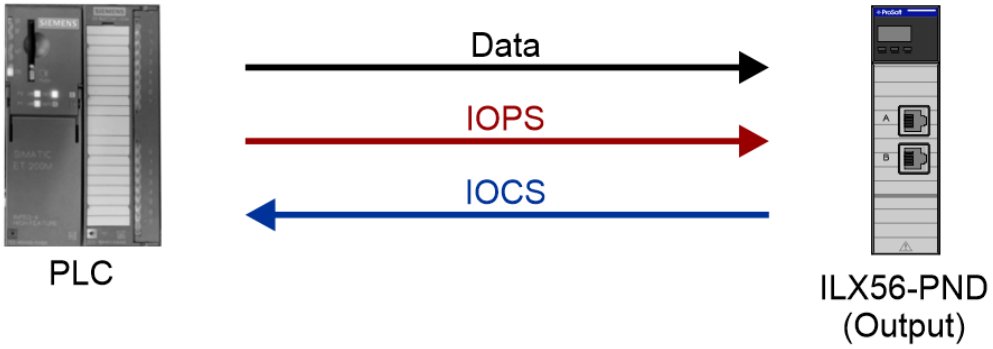


Figure 4.3 – Typical Output Device Data Exchange

In a typical data exchange with an **input** device, as shown below, the device sends the output data and the IOPS to the controller. The application code can use the IOPS to determine the quality of the data provided.

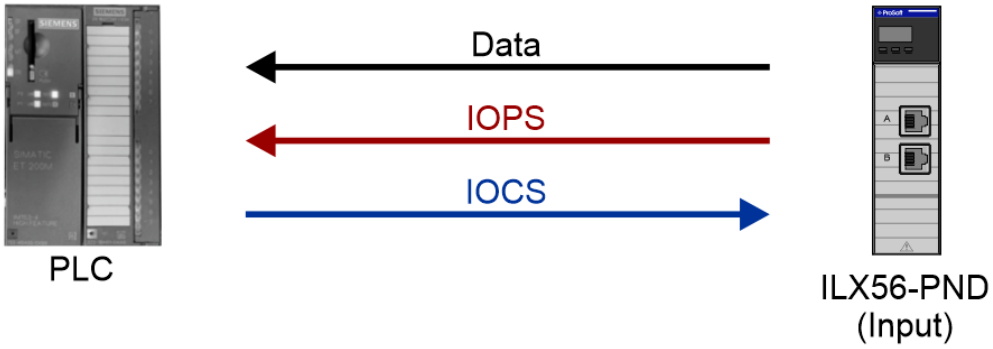


Figure 4.4 – Typical Input Device Data Exchange

Both the IOPS and IOCS are represented in the Logix structures using a common UDT structure, which expands the typically 1 byte status to a more Logix readable structure.

Name	Value	Style	Data Type	Description
PND01_Device.PNInput.S01I_IOPS	{...}		PSILX56PNDIOStatus	
PND01_Device.PNInput.S01I_IOPS.DataBad	0	Decimal	BOOL	Data Bad
PND01_Device.PNInput.S01I_IOPS.BadDetectedBySubslot	0	Decimal	BOOL	Bad Status Detected by SubSlot
PND01_Device.PNInput.S01I_IOPS.BadDetectedBySlot	0	Decimal	BOOL	Bad Status Detected by Slot
PND01_Device.PNInput.S01I_IOPS.BadDetectedByIODevice	0	Decimal	BOOL	Bad Status Detected by IO Device
PND01_Device.PNInput.S01I_IOPS.BadDetectedByIOController	0	Decimal	BOOL	Bad Status Detected by Io Controller

Figure 4.5 – IO Data Status Specific tag

The IO Data Status structure comprises the following:

Parameter	Description
Status	
DataBad	Indicates the Data is bad. **0** – Data is good **1** – Data is bad
BadDetectedBySubslot	Indicates that the bad data is being flagged at the Subslot level.
BadDetectedBySlot	Indicates that the bad data is being flagged at the Slot level.
BadDetectedByIODevice	Indicates that the bad data is being flagged at the IO Device level.
BadDetectedByIOController	Indicates that the bad data is being flagged at the IO Controller level.

Table 4.3 – IO Data Status Specific tag

5 SD Card

The ILX56-PND supports an SD Card for disaster recovery. The SD Card can be pre-loaded with the required firmware and/or application configuration.

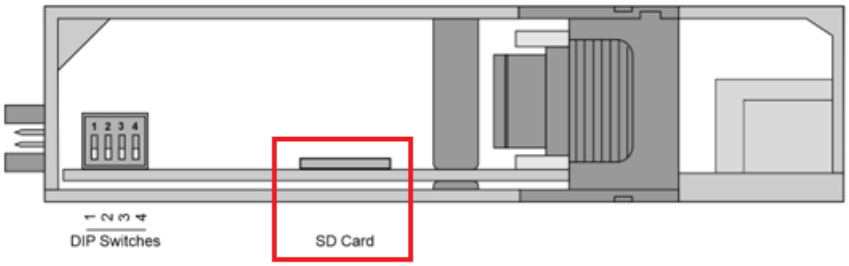


Figure 5.1 – Module Bottom View – SD Card Slot

Note: The user will need to ensure that the SD Card has been formatted for FAT32.

Note: All files must be copied into the root directory of the SD Card. The module will not use files located in folders.

5.1 Firmware

The user can copy the required firmware (which can be downloaded from www.prosoft-technology.com) onto the root directory of the SD Card.

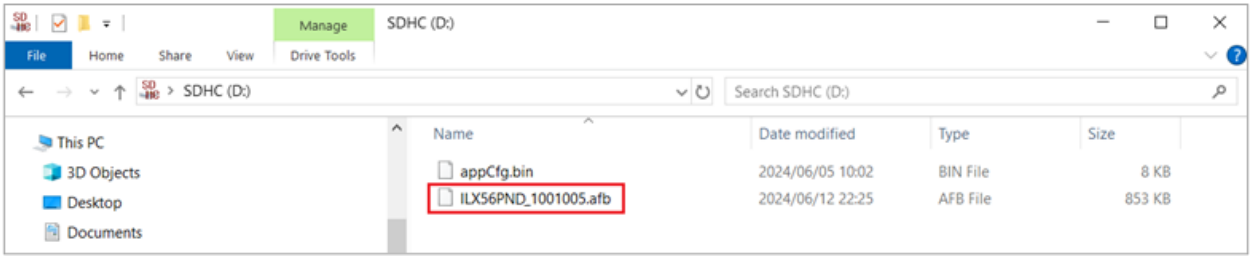


Figure 5.2 – SD Card – Firmware file

Note: The filename of the firmware file must not be changed. The specific module will use only the firmware that is valid (e.g. the ILX56-PND will only use the BIN firmware file).

Note: If more than one firmware file with different firmware revisions of the same product is on the SD Card, it can cause the module to constantly firmware upgrade the module.

If a faulty module is replaced, the user can insert the SD Card with the firmware file into the new module. While the module is booting it can detect if the firmware on the new module is different from that on the SD Card. If yes, the firmware will either be upgraded or downgraded to the firmware revision on the SD Card.

5.2 Configuration

If a faulty module is replaced, the user can insert the SD Card with the configuration file into the new module. The new module will determine if the configuration on the SD Card is different than the currently loaded configuration (even when there is no configuration on the module). If different, the configuration on the SD Card will be downloaded into the module's NV memory before the module starts executing.

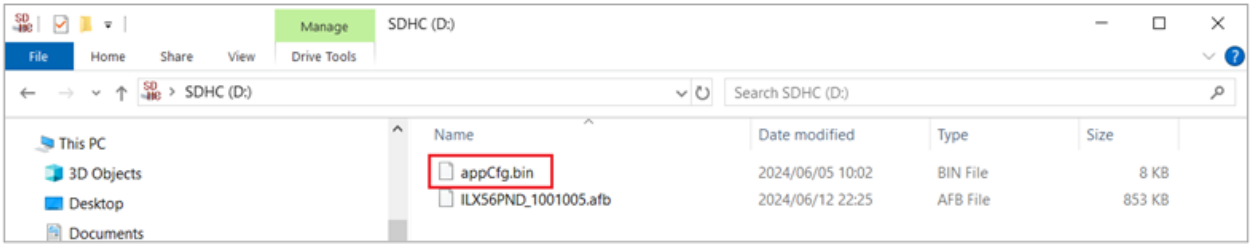


Figure 5.3 – SD Card – Configuration file

Once the user has created the necessary application configuration in the PLX50 Configuration Utility, the configuration can be exported to a file that can be used on the SD Card. The user can copy this exported file into the root directory of the SD Card.

5.2.1 Save Configuration File to SD Card

When the SD Card is inserted into the ILX56-PND module, the **SAVE CONFIGURATION TO SD CARD** option will become available. When this is selected, the current application configuration is saved on to the SD Card.

5.2.2 Exporting the Configuration File

To export the configuration, right-click on the ILX56-PND and select the **EXPORT CONFIGURATION FILE** option.

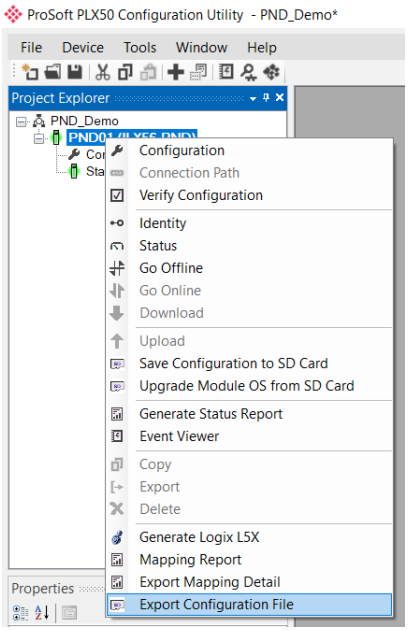


Figure 5.4 – Configuration Export for SD Card

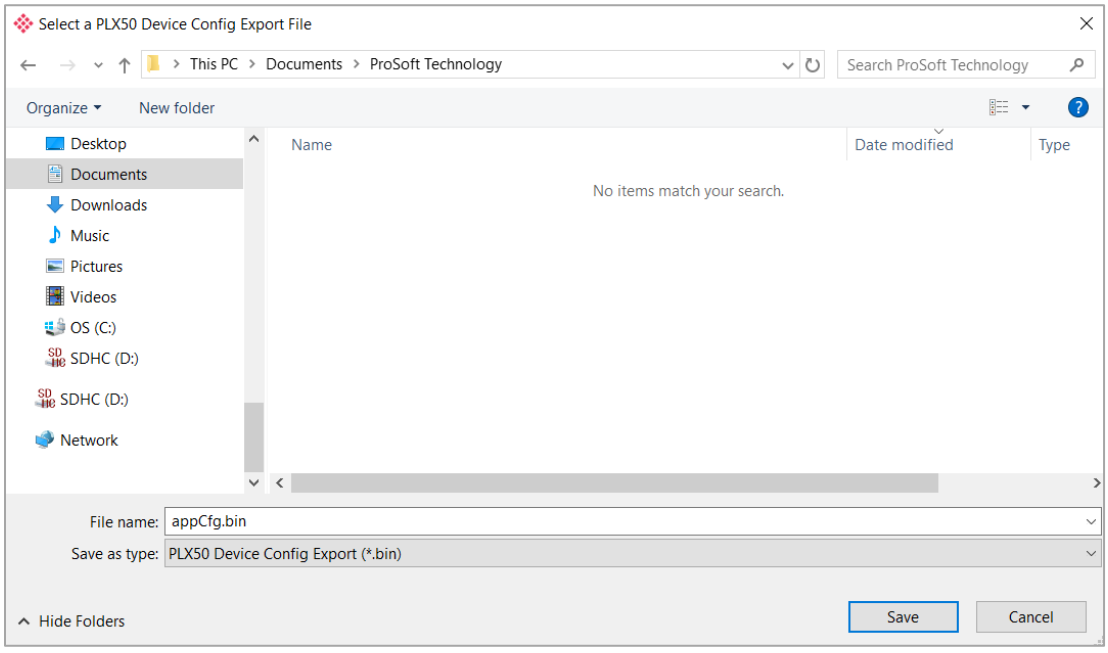


Figure 5.5 – Configuration Export for SD Card

Note: The filename of the configuration file must not be changed. The specific module will use only the configuration that is valid (e.g. the ILX56-PND will only use the BIN configuration file).

6 Firmware upgrade

The ILX56-PND allows the user to upgrade the module firmware in the field by using the PLX50 Configuration Utility.

In the PLX50 Configuration Utility go to the *Tools* menu and select the **DEVICEFLASH** option.

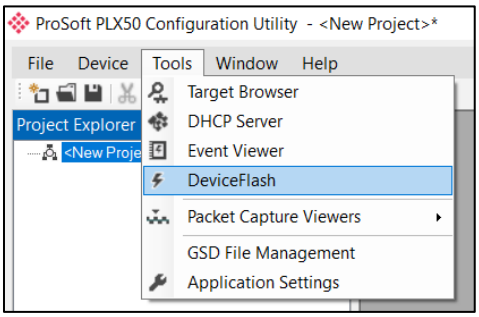


Figure 6.1 - DeviceFlash Tool

The user will need to select the appropriate .AFB binary file to upgrade the ILX56-PND firmware then click **OPEN**.

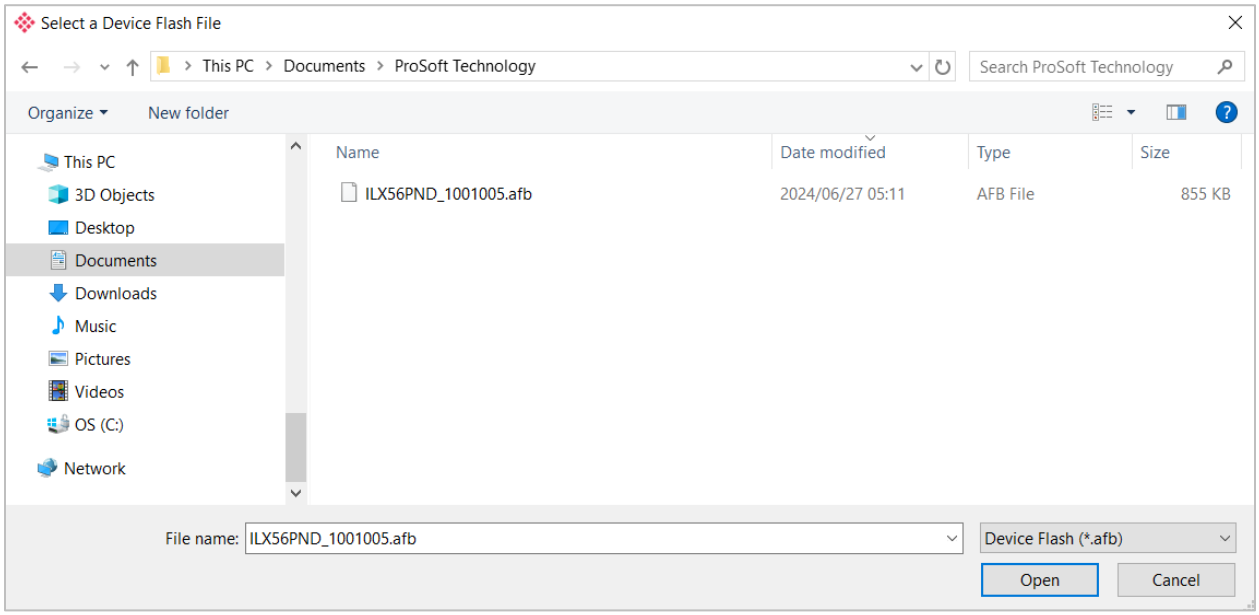


Figure 6.2 - Select the AFB binary

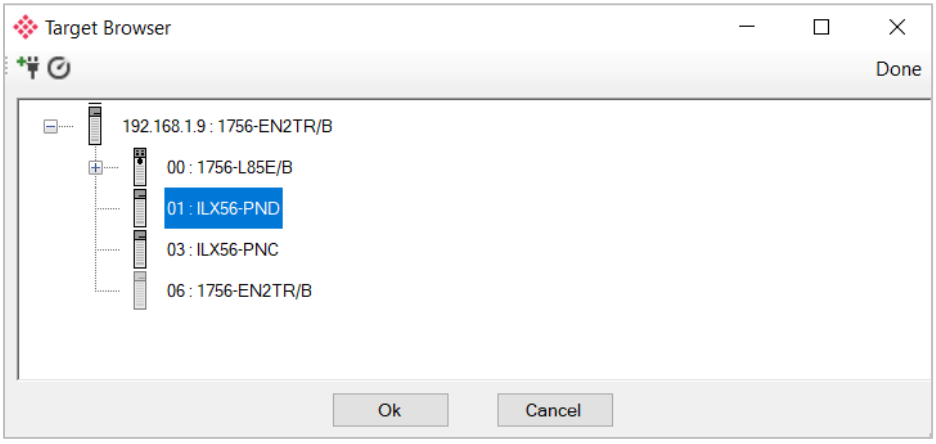


Figure 6.3 - Select the correct ILX56-PND module

Once the firmware upgrade is complete, the *Device Flash* dialog will provide the user with the details of the updated module.

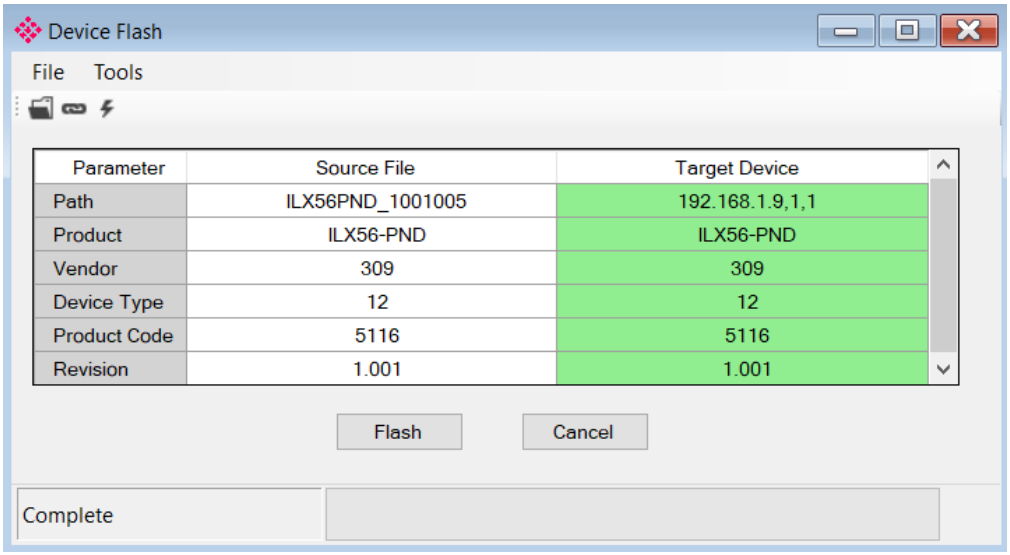


Figure 6.4 – ILX56-PND successfully updated.

Note: The ILX56-PND firmware is digitally signed so the user will only be able to flash the ILX56-PND with authorized firmware.

7 Media Redundancy Protocol (MRP)

Media Redundancy Protocol (MRP) allows PROFINET devices to be connected in an Ethernet ring topology which provides protection against single-cable-fault communication failures.

An MRP ring consists of multiple MRP clients and a single MRP manager. The manager monitors the integrity of the ring by sending Test Frames out one port and expects them to appear on the other port. When the ring is healthy the manager blocks all traffic transfer between its ports.

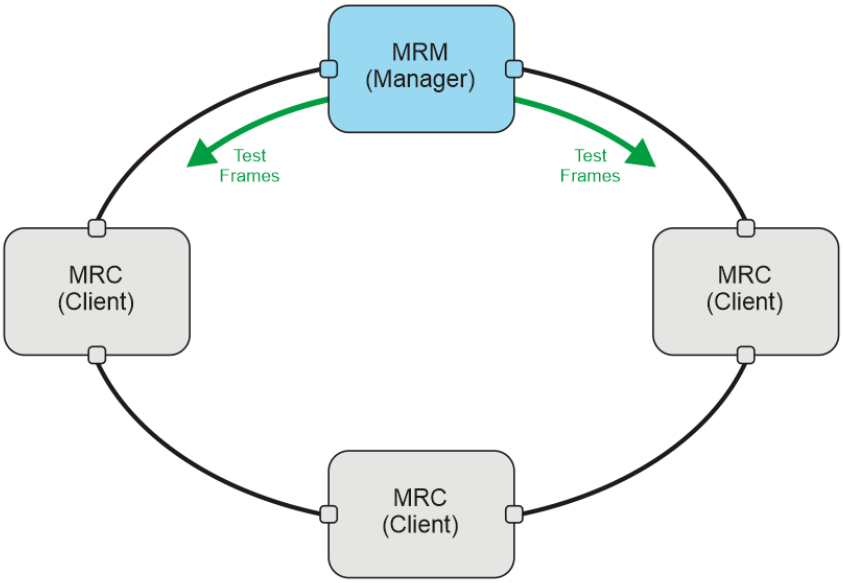


Figure 7.1 – MRP Ring

If the ring is broken (due to a cable failure or disconnection) then the MRP manager must notify the other client devices in the ring that there is a failure and then switch its own ports to a line topology, that is, passing packets between its own ports.

This process typically takes a few milliseconds, without the cyclic data exchange between the controller and devices being adversely affected.

7.1 Basic Rules

All devices in a ring must comply with the following:

1) All devices must support MRP and have MRP enabled.
2) One device must be configured as an MRP Manager (MRM), and all the other devices must be configured as MRP Clients (MRC).
3) All devices must be configured with the same MRP Domain.
4) Devices must be connected to the ring using their two configured ring ports.
5) All partner ports must have the same configuration.

Note: When commissioning an MRP ring ensure that all devices have been correctly configured before closing the ring. Failure to do so may cause a complete network failure and prevent further configuration of some, or all, of the devices.

Note: The IO Update Time and WatchDog Factor for each device must be configured such that the MRP fault recovery will not result in the cyclic connection timing out.

8 Diagnostics

8.1 LEDs

The module provides 3 diagnostic LEDs and a 4-character alpha-numeric LED display for diagnostics purposes as shown below:

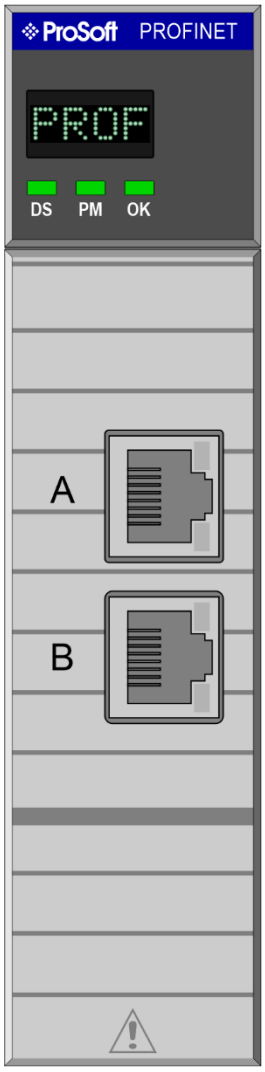


Figure 8.1 – ILX56-PND LEDs

A description of each LED is given in the table below.

LED	Description
DS	Indicates the status of the PROFINET network. **Off** – No communication on the PROFINET network. **Solid Red** – The device is not exchanging cyclic data. **Flashing Green** – The device is exchanging cyclic data with the PROFINET controller, but there are errors. **Solid Green** – The device is exchanging cyclic data with the PROFINET controller without any errors.
PM	This LED is reserved.
OK	Indicates information regarding the system-level operation of the module. **Flashing Red** – The module is not operating correctly. For example, if the module application firmware has been corrupted or there is a hardware fault. **Flashing Green** – The module has booted and is running correctly without any application configuration loaded. **Solid Green** – The module has booted and is running correctly with application configuration loaded.

Table 8.1 – Module LED operation

A description of each alphanumeric display message is given in the table below.

LED Text	Description
TEST	The module is busy testing all hardware during bootup.
OK	The module has successfully booted, and all hardware testing has passed.
No Name Assigned	The module does not have a PROFINET name assigned to it (when the *Dynamically Assign* bit has been set). **Note:** If a name has been assigned then it will be scrolled across the LED display.
IP x.x.x.x	The IP address of the local ILX56-PND module.
No IP Assigned	The module does not have an IP address assigned to it (when the *Dynamically Assign* bit has been set).
No Config Loaded	No configuration has been loaded onto the ILX56-PND.

Table 8.2 – Module LED operation

The module LED will also display the instance name of the module configured in PLX50 Configuration Utility.

8.1 Module Status Monitoring

The ILX56-PND provides a range of statistics that assists with module operation, maintenance, and fault finding. The statistics can be accessed in full by the PLX50 Configuration Utility.

To view the module's status in the PLX50 Configuration Utility environment, the ILX56-PND must be online. If the module is not already Online (following a recent configuration download), then right-click on the module and select the **GO ONLINE** option.

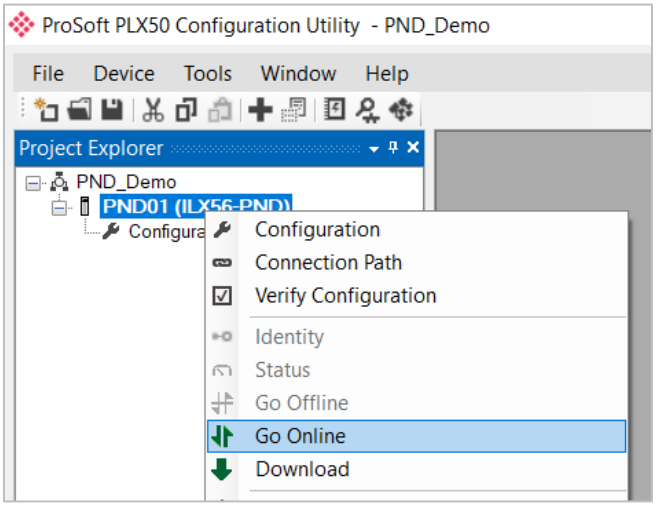


Figure 8.2 – Selecting to Go Online

The Online mode is indicated by the green circle behind the module in the Project Explorer tree.

The Status monitoring window can be opened by either double-clicking on the *Status* item in the Project Explorer tree, or by right-clicking on the module and selecting **STATUS**.

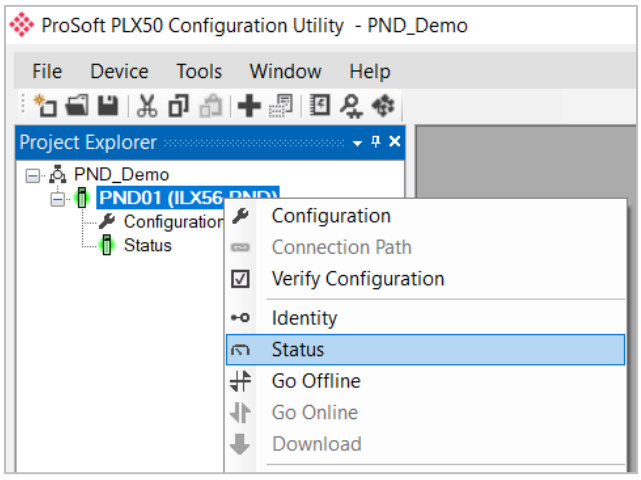


Figure 8.3 – Selecting ILX56-PND Online Status monitoring

The status window contains multiple tabs to display the current status of the module.

8.1.1 General

The *General* tab displays the following general parameters:

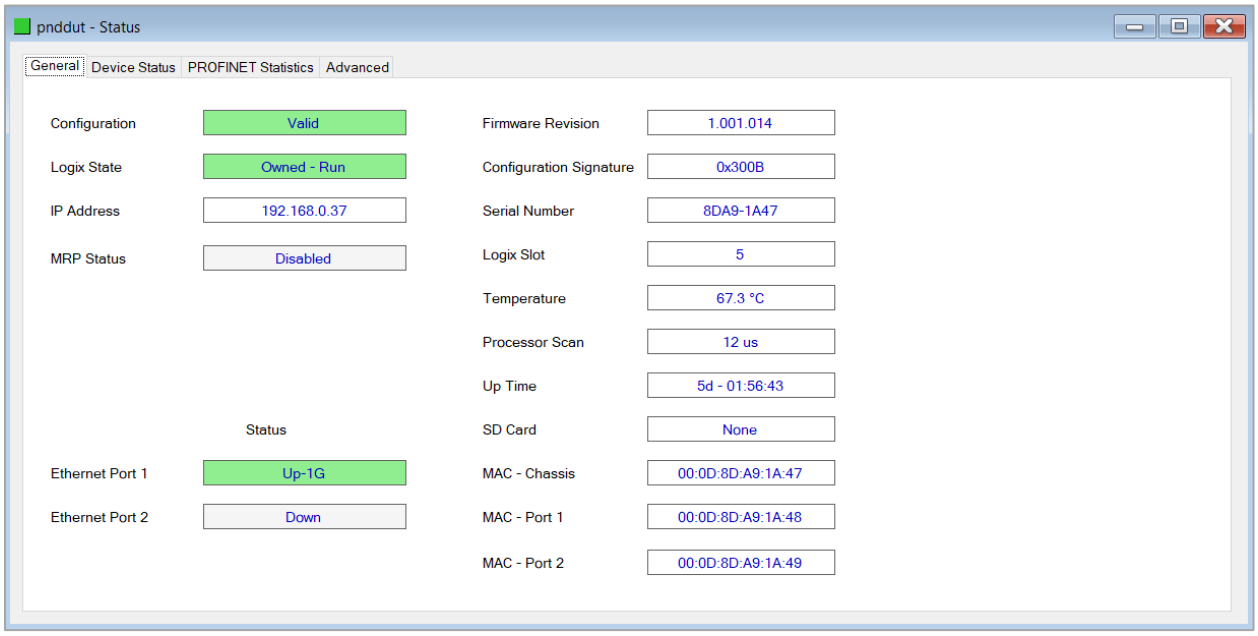


Figure 8.4 – ILX56-PND Status monitoring - General

Parameter	Description
Configuration	Indicates if the downloaded configuration is valid and executing. **Valid** – Configuration is valid. **Not Valid** – Configuration is blank or corrupt.
Logix State	Indicates if the module is currently owned (Class 1) by a Logix controller and the state of the controller: **Not Owned** – Logic controller not connected. **Owned - Run** – Controller is connected and in RUN mode **Owned Program** – Controller is connected and in PROGRAM, FAULT, or TEST mode.
IP Address	The IP address of the ILX56-PND.
MRP Status	The current MRP status: **Disabled** – MRP is disabled. **Open Ring** – The MRP ring is open. **Closed Ring** – The MRP ring is closed.
Firmware Revision	The application firmware revision currently executing.
Configuration Signature	The signature of the configuration currently executing on the module.
Serial Number	Displays the module's serial number.
Logix Slot	The current slot in which the module resides of the ControlLogix rack.
Temperature	The internal temperature of the module.
Processor Scan	The amount of time (microseconds) taken by the module's processor in the last scan.
Up Time	Indicates the elapsed time since the module was powered-up.
SD Card	Indicates if a SD Card has been inserted into the module.
MAC Address Chassis, Port 1, and Port 2	The MAC Addresses assigned to the PROFINET interface.

Ethernet Ports 1 & 2	
Status	The current link status of the Ethernet port: **Up-1G** – Port has an active Ethernet link at 1 Gbps speed. **Up-100M** – Port has an active Ethernet link at 100 Mbps speed. **Down** – Port has no Ethernet link.
MRP Link Down Device	The suspected device at which the MRP ring has been broken. Only applicable when MRP is enabled.

Table 8.3 – Parameters displayed in the Status Monitoring – General Tab

8.1.2 Device Status

The *General* tab displays the following general parameters:

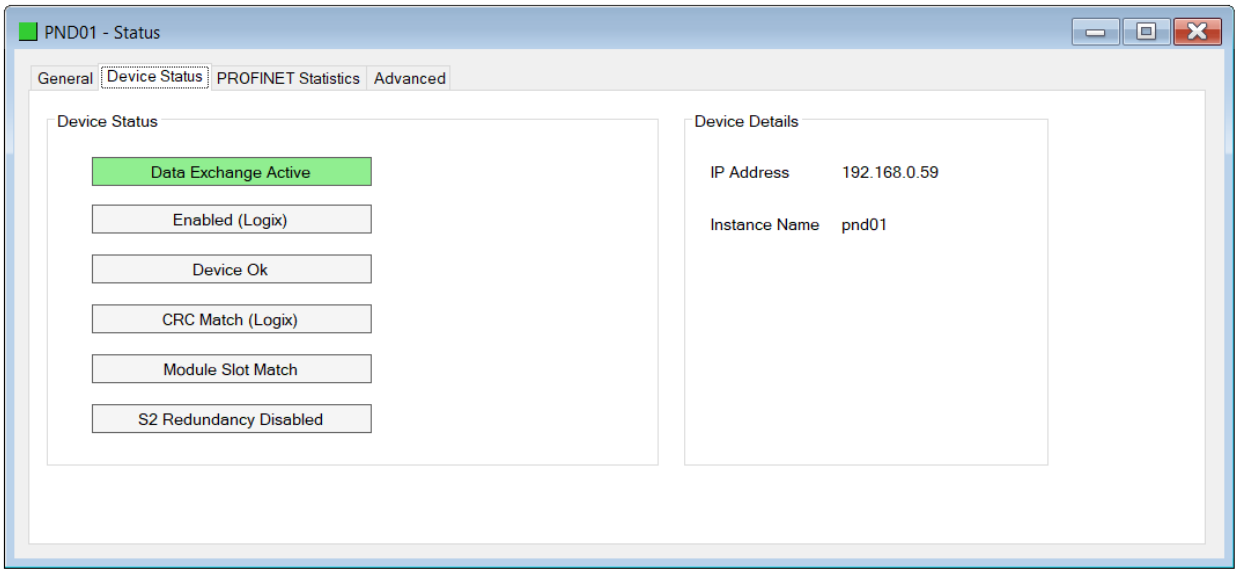


Figure 8.5 – Device Status monitoring - General

Parameter	Description
Device Status	The current status of the device: **Data Exchange Active** – The device is exchanging cyclic data with the ILX56-PND. **Disabled (Logix)** – The device has been disabled for cyclic data exchange by the Logix controller using the ILX56-PND output assembly. **Enabled (Logix)** – The device has been enabled for cyclic data exchange by the Logix controller using the ILX56-PND output assembly. **Device Error** – Device Error flag: Either the controller has disconnected from the device, or the quality of the IOPS (Input Output Object Provider Status) is bad. The latter may be an indication that the PROFINET controller is not in RUN mode. **Device Ok** – No Device Error **CRC Mismatch (Logix)** – Indicates the mapping from the Logix controller does not match the configured mapping in the ILX56-PND.

	CRC Match (Logix) – Indicates the mapping from the Logix controller matches the configured mapping in the ILX56-PND. **Module Slot Mismatch** – In the connection establishment from the PROFINET Controller, the incorrect Slot was sent in the module configuration. **Module Slot Match** – In the connection establishment from the PROFINET Controller, the slots configured in the ILX56-PND matched that expected by the controller. **S2 Redundancy Disabled** – The device connection to the PROFINET Controller is a standard single Controller connection. **S2 Redundancy Enabled** – The device connection to the PROFINET Controller is an S2 Redundant controller.
IP Address	The configured IP address for the device.
Instance Name	The configured instance name for the device.

Table 8.4 – Device Status Monitoring – General Tab

8.1.3 PROFINET Statistics

The *PROFINET Statistics* tab displays the following general parameters:

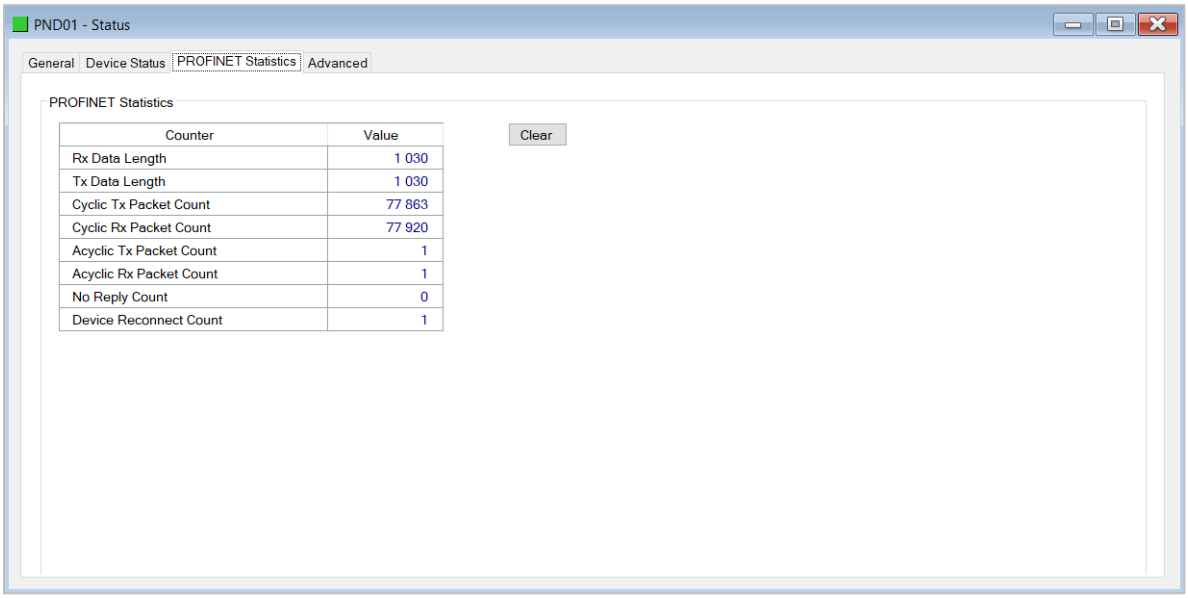


Figure 8.6 – ILX56-PND Status monitoring – PROFINET Statistics

Parameter	Description
Cyclic Tx Packet Count	The number of cyclic PROFINET packets transmitted.
Cyclic Rx Packet Count	The number of cyclic PROFINET packets received.
Acyclic Tx Packet Count	The number of acyclic PROFINET packets transmitted.
Acyclic Rx Packet Count	The number of acyclic PROFINET packets received.
No Reply Count	The number of ILX56-PND PROFINET requests where the device did not respond.
Device Reconnect Count	The number of device connection requests sent.

Table 8.5 – Parameters displayed in the Status Monitoring – General Statistics Tab

8.1.4 Advanced

The *Advanced* tab displays various internal and low-level, diagnostics of the ILX56-PND.

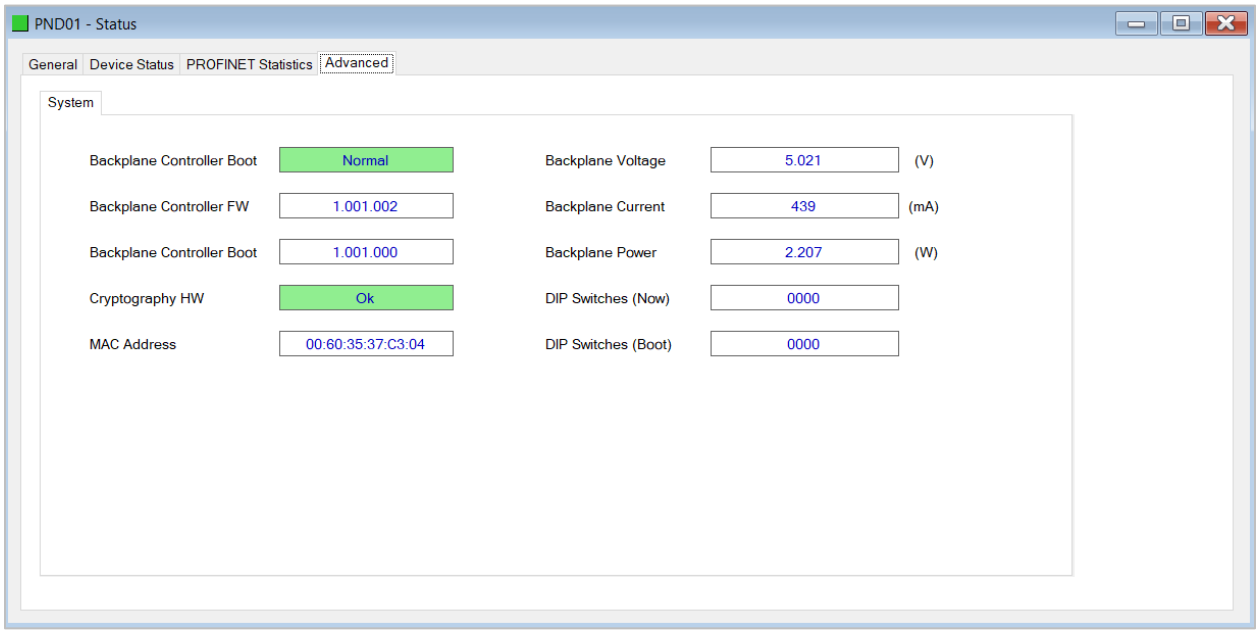


Figure 8.7 – ILX56-PND Status monitoring – Advanced Tab

Parameter	Description
Backplane Controller Boot	The boot-up status of the backplane controller.
Backplane Controller FW	The firmware revision of the backplane controller.
Backplane Controller Boot	The bootloader version of the backplane controller.
Cryptography HW	The communication status to the cryptography processor.
MAC Address	The primary module MAC address.
Backplane Voltage	The measured backplane voltage.
Backplane Current	The measure backplane current in mA.
Backplane Power	The calculated backplane power consumption in W.
DIP Switch (Now)	The current status of the DIP switches.
DIP Switch (Boot)	The status of the DIP switches at Boot-up.

Table 8.6 – Parameters displayed in the Status Monitoring – Advanced Tab

8.2 Module Event Log

The ILX56-PND module logs various diagnostic records to an internal event log. These logs are stored in non-volatile memory and can be displayed using the PLX50 Configuration Utility. To view them in the PLX50 Configuration Utility, select the **EVENT VIEWER** option.

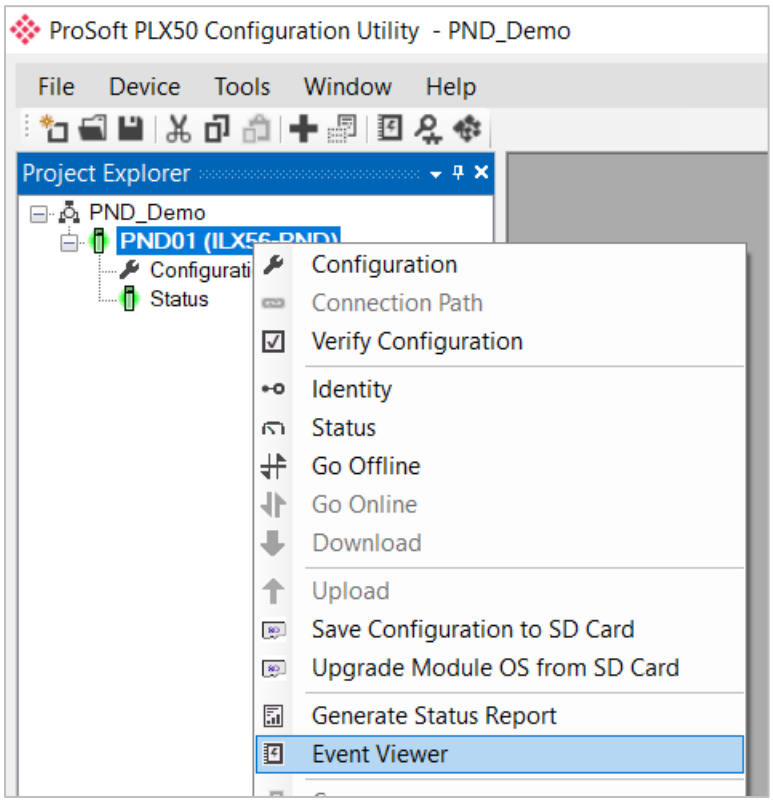


Figure 8.8 - Selecting the module Event Log

The *Event Viewer* window will open and automatically read all the events from the module. The log entries are sorted with the latest record at the top. Custom sorting is achieved by double-clicking on the column headings.

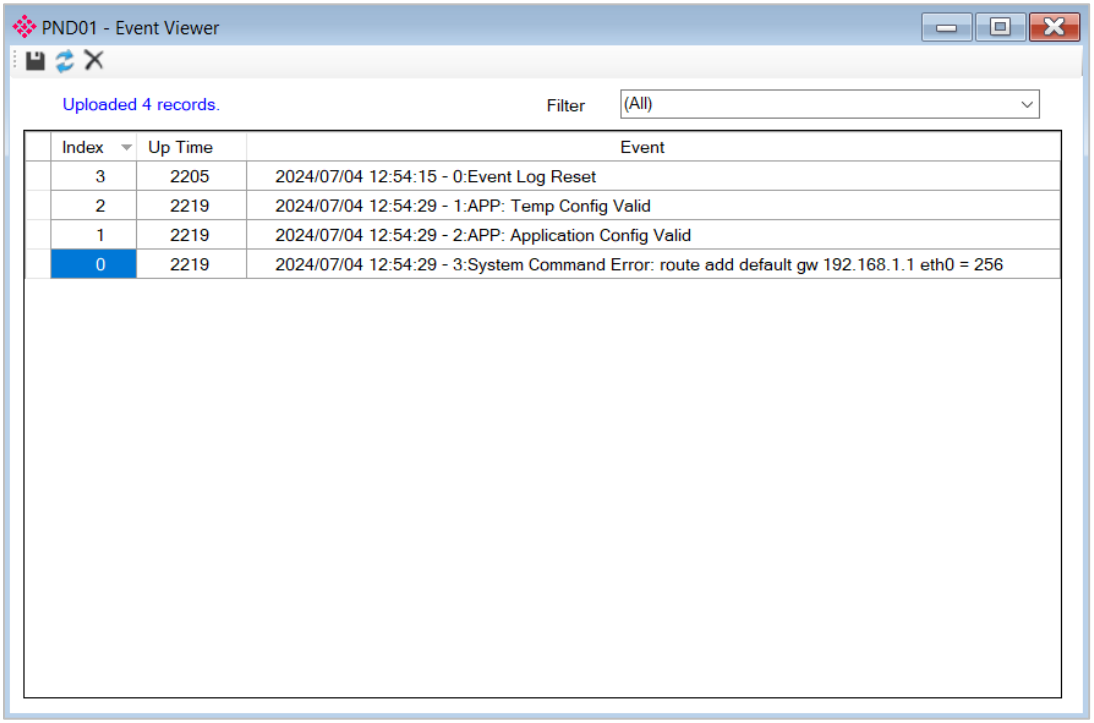


Figure 8.9 – Module Event Log

The log can also be stored to a file for future analysis, by clicking the **SAVE** button in the tool menu. To view previously saved files, use the *Event Log Viewer* option under the *Tools* menu.

9 Technical Specifications

9.1 Electrical

Specification	Description
Backplane Current Load	600 mA @ 5 VDC 2 mA @ 24 VDC
Enclosure rating	IP20, NEMA/UL Open Type
Temperature	0°C to 60°C (32°F to 140°F) ILX56-PND-CC: -20°C to 70°C (-4°F to 158°F)
Earth connection	Yes, terminal based
Emissions	IEC61000-6-4
ESD Immunity	EN 61000-4-2
Radiated RF Immunity	IEC 61000-4-3
EFT/B Immunity	EFT: IEC 61000-4-4
Surge Immunity	Surge: IEC 61000-4-5
Conducted RF Immunity	IEC 61000-4-6

Table 9.1 – Electrical specification

9.2 PROFINET

Specification	Description
PROFINET Device	Supported
Media Redundancy Protocol (MRP)	Client Supported
PROFINET Conformance Level	B
S2 Redundancy	Supported

Table 9.2 – PROFINET specification

9.3 ControlLogix

Specification	Description
Class 1 Connections	Maximum 11 x Class 1 connections supported.
Minimum Requested Packet Interval (RPI)	2ms for connection count <= 4 10ms for connection count > 4
UCMM Acyclic Messaging	Supported
Class 3 Acyclic Messaging	Supported

Table 9.3 – ControlLogix specification

9.4 Certifications

Please visit our website: www.prosoft-technology.com

10 Appendix

10.1 PROFINET Response Error Codes

The response status consists of four error codes:

- *ErrorCode*
- *ErrorDecode*
- *ErrorCode1*
- *ErrorCode2*

The definition of *ErrorCode1* and *ErrorCode2* will depend on the values of *ErrorCode* and *ErrorDecode*.

Note: There are many error code definitions, this section provides details relevant to Explicit Acyclic Messaging.

ErrorCode	ErrorDecode	ErrorCode1	ErrorCode2	Description
0x00	-	-	-	No Error
0x81 (PNIO)	0x80 (PNIORW)	0xA0	-	**Application Error** Read Error
0x81 (PNIO)	0x80 (PNIORW)	0xA1	-	**Application Error** Write Error
0x81 (PNIO)	0x80 (PNIORW)	0xA2	-	**Application Error** Module Failure
0x81 (PNIO)	0x80 (PNIORW)	0xA7	-	**Application Error** Busy
0x81 (PNIO)	0x80 (PNIORW)	0xA8	-	**Application Error** Feature Not Supported
0x81 (PNIO)	0x80 (PNIORW)	0xB0	-	**Access Error** Invalid Index
0x81 (PNIO)	0x80 (PNIORW)	0xB1	-	**Access Error** Write Length Error
0x81 (PNIO)	0x80 (PNIORW)	0xB2	-	**Access Error** Invalid Slot / Subslot
0x81 (PNIO)	0x80 (PNIORW)	0xB3	-	**Access Error** Type Conflict
0x81 (PNIO)	0x80 (PNIORW)	0xB4	-	**Access Error** Invalid Area / API
0x81 (PNIO)	0x80 (PNIORW)	0xB5	-	**Access Error** State Conflict
0x81 (PNIO)	0x80 (PNIORW)	0xB6	-	**Access Error** Access Denied
0x81 (PNIO)	0x80 (PNIORW)	0xB7	-	**Access Error** Invalid Range
0x81 (PNIO)	0x80 (PNIORW)	0xB8	-	**Access Error** Invalid Parameter
0x81 (PNIO)	0x80 (PNIORW)	0xB9	-	**Access Error** Invalid Type
0x81 (PNIO)	0x80 (PNIORW)	0xBA	-	**Access Error** Backup
0x81	0x80	0xC0	-	**Resource Error**

(PNIO)	(PNIORW)			Read Constraint Conflict
0x81 (PNIO)	0x80 (PNIORW)	0xC1	-	**Resource Error** Write Constraint Conflict
0x81 (PNIO)	0x80 (PNIORW)	0xC2	-	**Resource Error** Resource Busy
0x81 (PNIO)	0x80 (PNIORW)	0xC3	-	**Resource Error** Resource Unavailable

Table 10.1 - Error Response codes

11 Support, Service, and Warranty

11.1 Contacting Technical Support

ProSoft Technology, Inc. is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

1. Product Version Number
2. System architecture
3. Network details

If the issue is hardware related, we will also need information regarding:

1. Module configuration and associated ladder files, if any
2. Module operation and any unusual behavior
3. Configuration/Debug status information
4. LED patterns
5. Details about the interfaced serial, Ethernet or Fieldbus devices

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11.2 Warranty Information

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