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PLX51-PBS

PROFIBUS DP Slave to EtherNet/IP™ or Modbus® Gateway

May 16, 2023

USER MANUAL

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ProSoft Technology, Inc.
+1 (661) 716-5100
+1 (661) 716-5101 (Fax)
www.prosoft-technology.com
support@prosoft-technology.com

PLX51-PBS User Manual
For Public Use.

May 16, 2023

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Contents

Your Feedback Please 2
Content Disclaimer 2
Agency Approvals and Certifications 2

1 Preface 5

1.1 Introduction 5
1.2 Features 5
1.3 Additional Information 6
1.4 Support 6

2 Installation 7

2.1 Module Layout 7
2.2 Module Mounting 9
2.3 PROFIBUS DP Port (RS485) 10

3 Setup 11

3.1 Installing the Configuration Software 11
3.2 Network Parameters 11
3.3 GSD File Management 15
3.4 Creating a New Project 17
3.5 PLX51-PBS Parameters 19
3.5.1 General 19
3.5.2 Modbus 20
3.5.3 Modbus Addressing 21
3.5.4 PROFIBUS Slave Configuration 22
3.5.5 Logix 23
3.5.6 Advanced 24
3.5.7 EtherNet/IP Devices 25
3.5.8 EtherNet/IP Map 27
3.6 Adding PROFIBUS DP Devices 29
3.6.1 General 30
3.6.2 PROFIBUS Configuration 31
3.6.3 DPV1 33
3.6.4 User Parameters 35
3.6.5 Slot Configuration 36
3.6.6 Start-up Parameters 44
3.6.7 DPV1 Objects 45
3.6.8 DPV1 Alarms 47
3.7 Module Download 48
3.8 Logix Configuration 49
3.8.1 EDS AOP (Logix V21+) 49
3.8.2 Generic Module Profile (Logix Pre-V21) 52
3.8.3 Multi-Connection 55
3.9 Logix Mapping 56

4 SD Card 60

4.1 Firmware 61
4.2 Configuration 62
4.2.1 Manual Copy 63
4.2.2 PLX50 Configuration Utility 64

5 Operation 65

5.1 Logix Operation 65
5.1.1 PROFIBUS DP - Slave 65
5.2 Modbus Operation 73
5.2.1 PROFIBUS DP - Slave 73
5.3 EtherNet/IP Explicit Messaging Operation 79
5.4 Firmware Upgrade 80

6 Diagnostics 82

6.1 LEDs 82
6.2 Module Status Monitoring 83
6.2.1 PLX51-PBS 83
6.2.2 Device Status 91
6.3 PROFIBUS Packet Capture 95
6.4 Modbus Packet Capture 97
6.5 Module Event Log 99
6.6 Web Server 100

7 Technical Specifications 101

7.1 Dimensions 101
7.2 Electrical 102
7.3 Ethernet 102
7.4 Modbus TCP/IP 102
7.5 PROFIBUS DP 103
7.6 Agency Approvals and Certifications 103

8 PROFIBUS DP 104

8.1 Introduction 104
8.1.1 PROFIBUS DP 104
8.1.2 PROFIBUS PA 104
8.1.3 PROFIBUS FMS 105
8.2 PROFIBUS Master and Slave 105
8.3 PROFIBUS Master Class 1 (DPM1) or Class 2 (DPM2) 105
8.3.1 PROFIBUS DP Master Class 1 (DPM1) 105
8.3.2 PROFIBUS DP Master Class 2 (DPM2) 105
8.4 Cyclic Communication 105
8.5 Acyclic Communication 106
8.6 Topology of PROFIBUS DP 106
8.7 PROFIBUS DP Cable Description 107
8.8 PROFIBUS DP Connector Description 107

9 Support, Service & Warranty 108

9.1 Contacting Technical Support 108
9.2 Warranty Information 108

1 Preface

1.1 Introduction

This user manual describes the installation, operation, and diagnostics of the PROFIBUS DP Slave to EtherNet/IP™ or Modbus Gateway module. The module will hereafter be collectively referred to as PLX51-PBS.

The PLX51-PBS can operate only as one or more (emulates up to 10) PROFIBUS DPV0/DPV1 Slaves. This allows EtherNet/IP or Modbus devices to exchange process, alarming, and diagnostic data with other PROFIBUS DP Master(s).

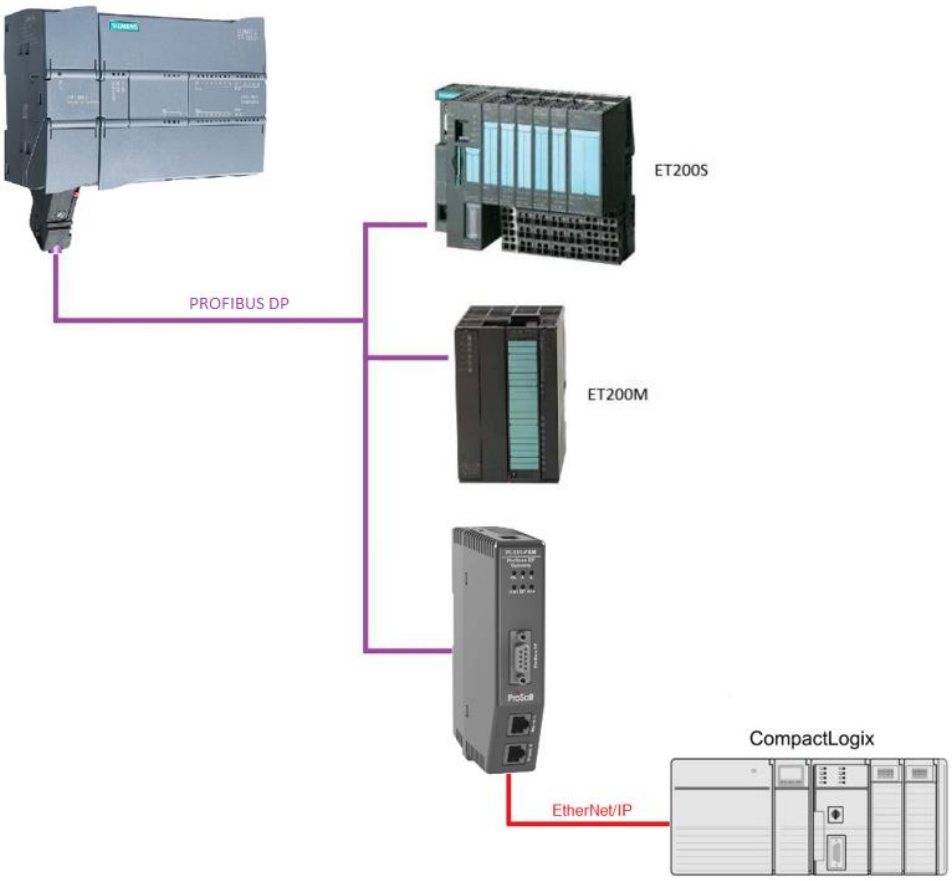


Figure 1.1 – Typical PLX51-PBS PROFIBUS Slave Architecture

1.2 Features

The PLX51-PBS has two Ethernet ports allowing for either a Linear or Ring (Device Level Ring – DLR) Ethernet topology. The Ethernet ports can also be set up for port mirroring allowing for better fault analysis.

The PLX51-PBS can synchronize to an NTP Server, allowing for automatic time synchronization. The PLX51-PBS also supports an onboard non-volatile event log for improved fault finding.

PROFIBUS Slave

The PLX51-PBS can emulate up to 10 PROFIBUS slave devices, providing up to 1536 bytes of Input and Output Cyclic I/O data between EtherNet/IP or Modbus devices and a PROFIBUS DP master. Each slave device emulated by the PLX51-PBS can be configured to provide DPV0 data exchange with a PROFIBUS Master on the network.

The data is formatted into the engineering units for use in a Logix platform by using the automatically generated mapping imports for Logix User Defined Data Types (UDTs).

Each emulated slave can also be configured to exchange DPV1 Class 1 data by mapping Logix tags for the relevant DPV1 data exchange. Each emulated slave is able to provide DPV1 alarming for the PROFIBUS Master.

The PLX51-PBS provides a range of statistics and tools to provide a detailed diagnostic overview of each emulated slave which speeds up fault finding. The PLX50 Configuration Utility allows you to perform a PROFIBUS DP packet capture of the running Fieldbus which can be used to analyze the bus behaviour and packets received. The PLX51-PBS also provides global and device specific statistics.

1.3 Additional Information

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

Table 1.1 - Additional Information

Resource	Link
PLX50 Configuration Utility Installation	www.prosoft-technology.com
PLX51-PBS User Manual PLX51-PBS Datasheet	www.prosoft-technology.com

1.4 Support

Technical support is provided via the Web (in the form of user manuals, FAQ, datasheets etc.) to assist with installation, operation, and diagnostics.

For additional support, use either of the following:

Table 1.2 – Support Details

Resource	Link
Contact Us link	www.prosoft-technology.com
Support email	support@prosoft-technology.com

2 Installation

2.1 Module Layout

The PLX51-PBS has one RS485 PROFIBUS DP port as well as two Ethernet ports. The Ethernet cable must be wired according to industry standards, which can be found in the Additional Information section of this document.

The module provides six diagnostic LEDs, as shown in the front view figure below. These LEDs are used to provide information regarding the module system operation, the Ethernet interface, and the PROFIBUS network status.

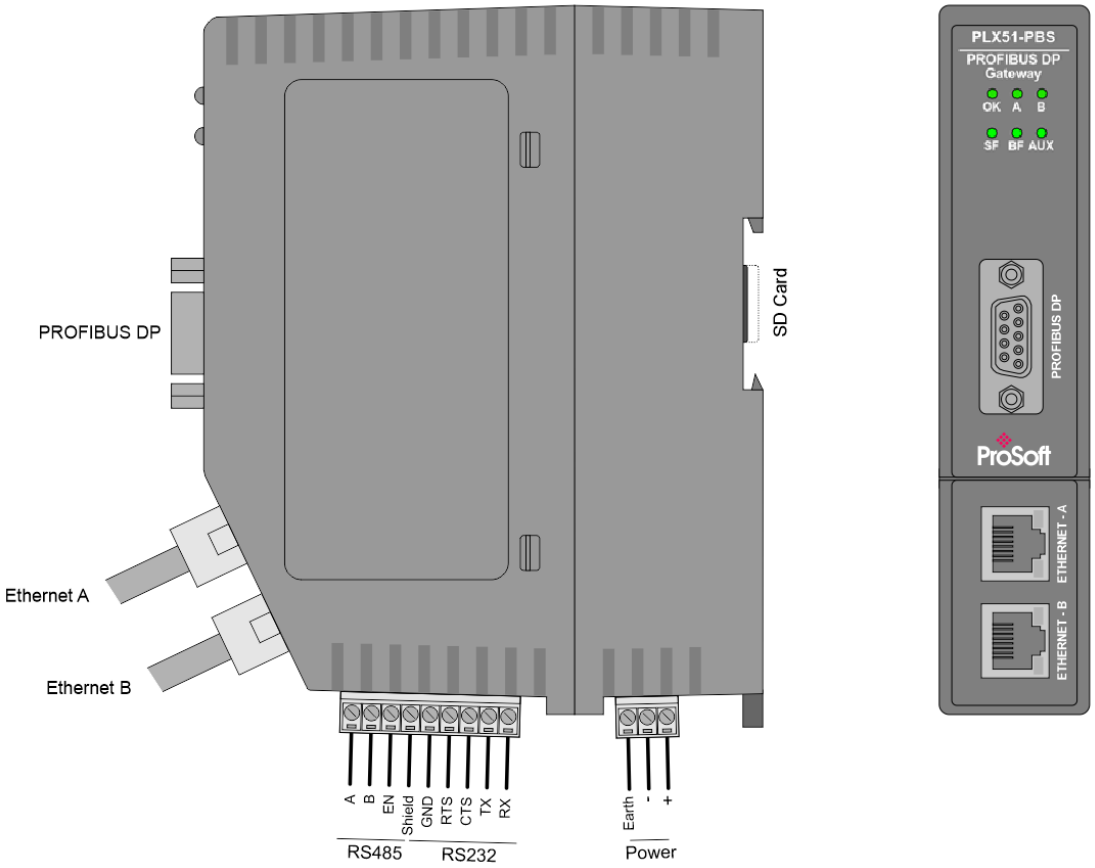


Figure 2.1 – PLX51-PBS Side and Front view

At the bottom of the module, there is one 3-way power connector.

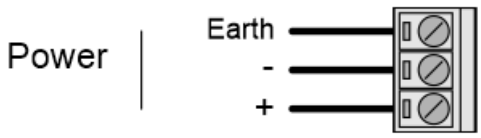


Figure 2.2 – PLX51-PBS Power connector

The PLX51-PBS has an input voltage range of 10 to 36 VDC, applied to the module via the power connector. The power connector also provides an Earth connection for the PLX51-PBS.

IMPORTANT: It is recommended to always have a good clean earth connected to the module via the Earth connector on the power connector.

At the back of the module, there is slot for a SD memory card. The module provides four DIP switches at the top of the enclosure as shown in the top view figure below.

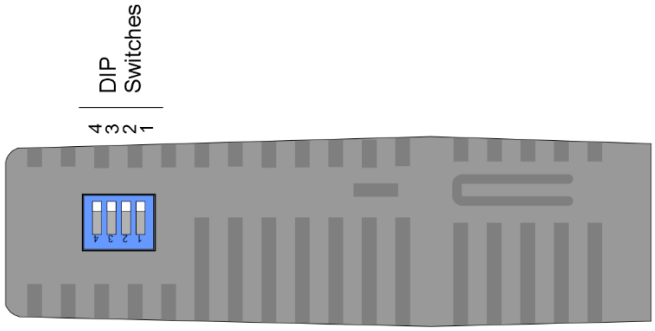


Figure 2.3 – PLX51-PBS Top view

Table 2.1. - DIP Switch Settings

DIP Switch	Description
DIP 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 2	This forces the module into DHCP mode which is useful when you have forgotten the IP address of the module.
DIP 3	This is used to lock the configuration from being overwritten by the PLX50 Configuration Utility. When set, the PLX50 Configuration Utility will not be able to download to the PLX51-PBS module.
DIP 4	When this is set, a module reboot will set the module Ethernet IP address to 192.168.1.100 and network mask 255.255.255.0. You can then switch the DIP switch off and assign the module a static IP address if needed.

2.2 Module Mounting

The PLX51-PBS provides a DIN rail clip to mount onto a 35mm DIN rail.

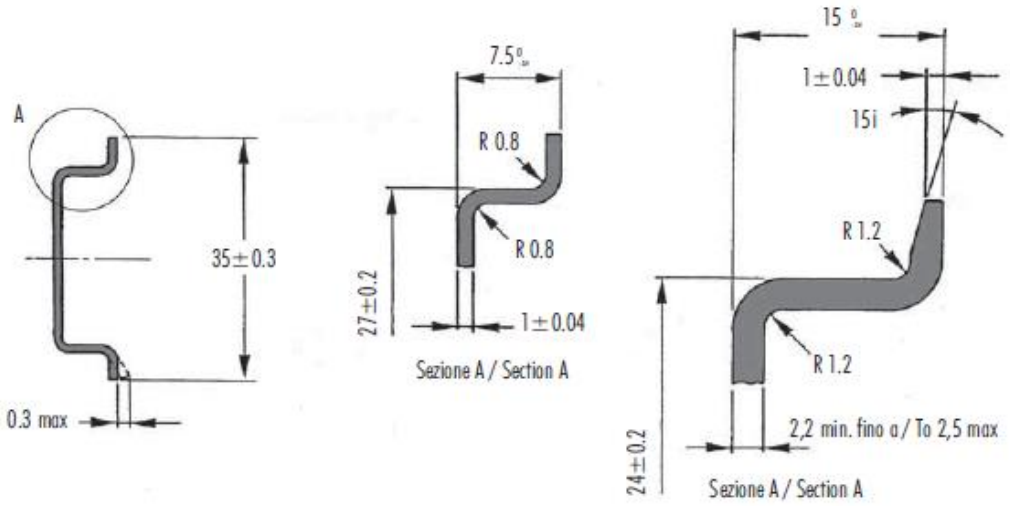


Figure 2.4 - DIN rail specification

The DIN rail clip is mounted at the back of the module as shown in the figure below. Use a flat screw driver to pull the clip downward. Once the module is mounted onto the DIN rail, the clip must be pushed upward to lock the module onto the DIN rail.

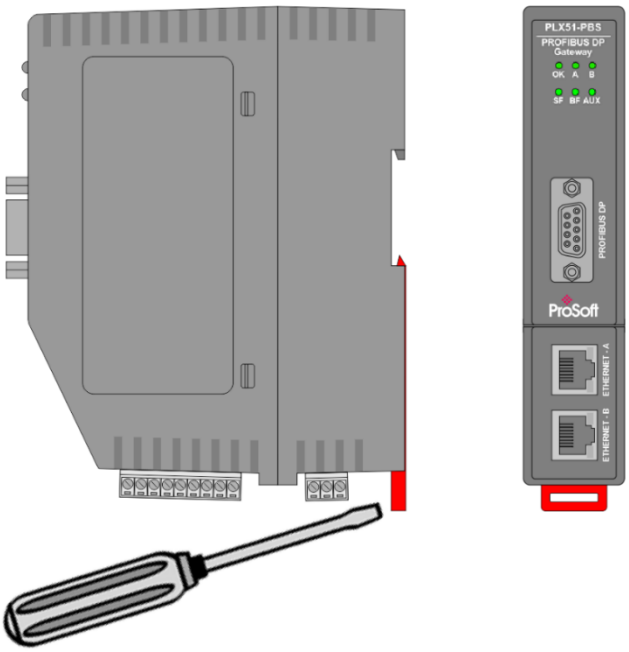


Figure 2.5 - DIN rail mouting

2.3 PROFIBUS DP Port (RS485)

The PROFIBUS DP port uses a female DB9 connector. This provides connection for the communication conductors, cable shielding, and +5Vdc output power.

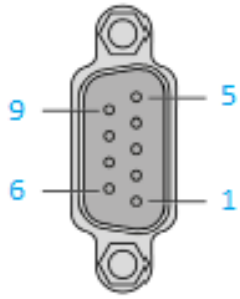


Figure 2.6 – PLX51-PBS PROFIBUS DP (RS485) DB9 connector

Table 2.2 – DB 9 Connector layout

Pin	Signal	Description
1	-	Not connected
2	-	Not connected
3	RxD/TxD-P	Data received and transmit (+)
4	CNTR-P	Control signal to repeater (+)
5	DGND	Reference potential for +5Vdc
6	VP	+5Vdc for terminating resistors (active termination)
7	-	Not connected
8	RxD/TxD-N	Data received and transmit (-)
9	-	Not connected

3 Setup

3.1 Installing the Configuration Software

All PLX51-PBS network setup and configuration is done in the ProSoft PLX50 Configuration Utility. This software can be downloaded from: www.prosoft-technology.com

Figure 3.1. - ProSoft PLX50 Configuration Utility Environment

3.2 Network Parameters

The PLX51-PBS has DHCP (Dynamic Host Configuration Protocol) enabled as factory default. Thus, a DHCP server must be used to provide the module with the required network parameters (IP address, subnet mask, etc.). There are a number of DHCP utilities available, however it is recommended that the DHCP server in the PLX50 Configuration Utility is used.

Within the PLX50 Configuration Utility environment, the DHCP server can be found under the *Tools* menu.

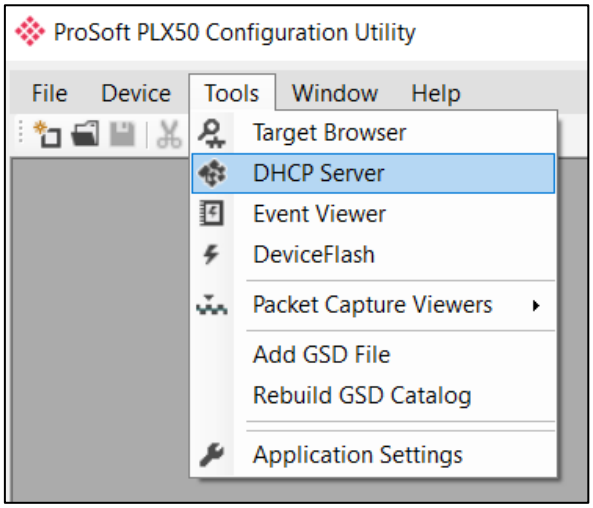


Figure 3.2. - Selecting DHCP Server

Once opened, the DHCP server listens on all available network adapters for DHCP requests and display their corresponding MAC addresses.

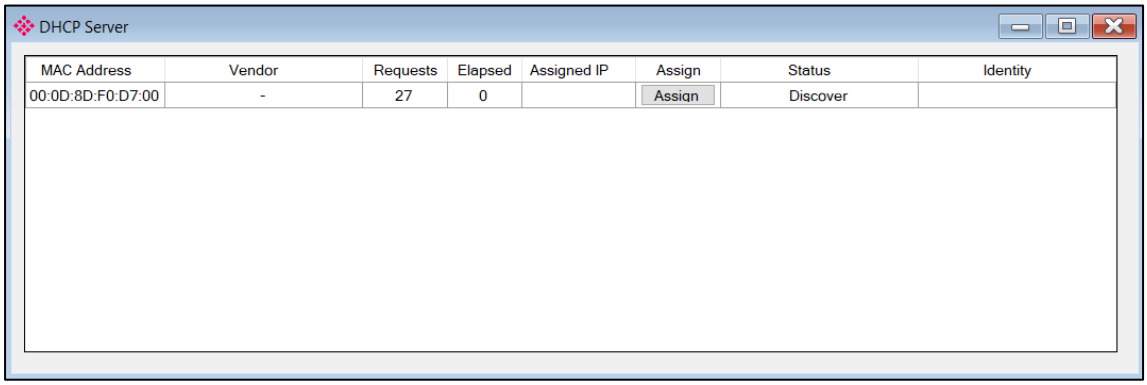


Figure 3.3. - DHCP Server

NOTE: If the DHCP requests are not displayed in the DHCP Server, it may be due to the local PC's firewall. During installation, the necessary firewall rules are automatically created for the Windows firewall. Another possibility is that another DHCP Server is operational on the network and it has assigned the IP address.

To assign an IP address, click on the corresponding **ASSIGN** button. The *Assign IP Address for MAC* window opens.

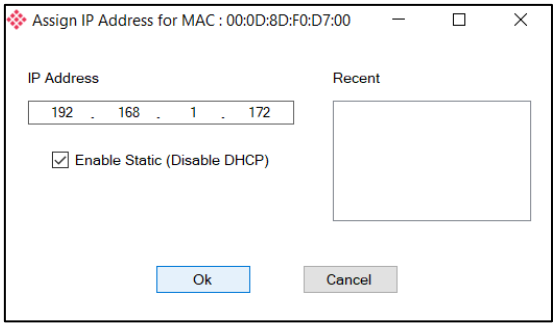


Figure 3.4. - Assigning IP Address for MAC

The required IP address can be either entered, or a recently used IP address can be selected by clicking on an item in the *Recent* list.

If the *Enable Static* checkbox is checked, the IP address will be set to static after the IP assignment, thereby disabling future DHCP requests.

Once you click **OK**, the DHCP server will automatically assign the IP address to the module and then read the Identity object product name from the device.

The successful assignment of the IP address by the device is indicated by the green background of the associated row.

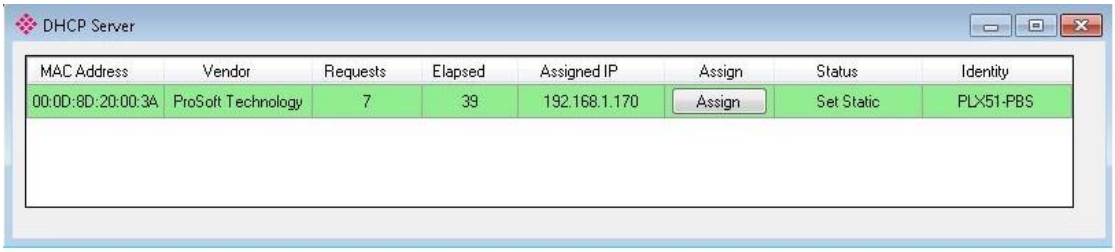


Figure 3.5. - Successful IP address assignment

It is possible to force the PLX51-PBS back into DHCP mode by powering up the device with DIP switch 2 set to the **On** position.

A new IP address can then be assigned by repeating the previous steps.

IMPORTANT: It is important to return DIP switch 2 back to **Off** position, to avoid the module returning to a DHCP mode after the power is cycled again.

In addition to the setting the IP address, a number of other network parameters can be set during the DHCP process. These settings can be viewed and edited in the PLX50 Configuration Utility *Application Settings*, in the *DHCP Server* tab.

Once the DHCP process is complete, the network settings can be set using the *Ethernet Port Configuration* via the *Target Browser*.

The *Target Browser* can be accessed under the *Tools* menu.

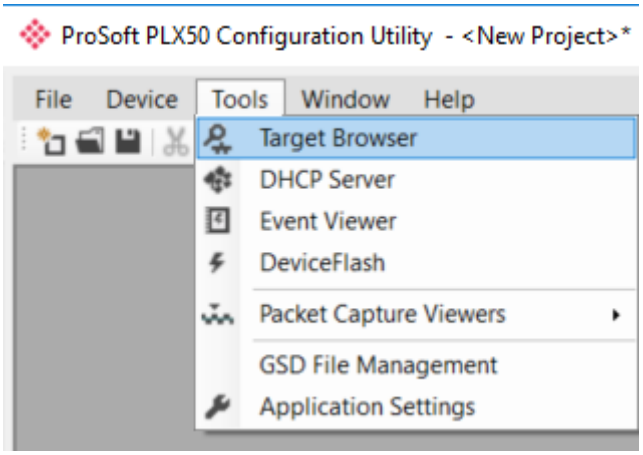


Figure 3.6. - Selecting the Target Browser

The *Target Browser* automatically scans the Ethernet network for EtherNet/IP devices.

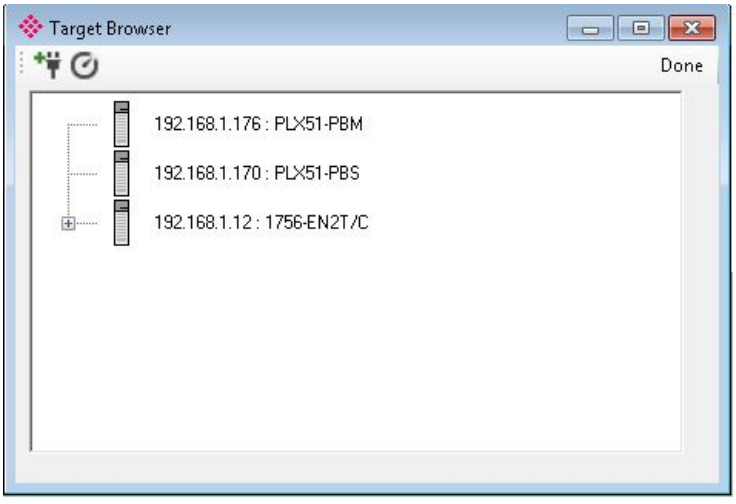


Figure 3.7. - Target Browser

Right-clicking on a device, reveals the context menu, including the *Port Configuration* option.

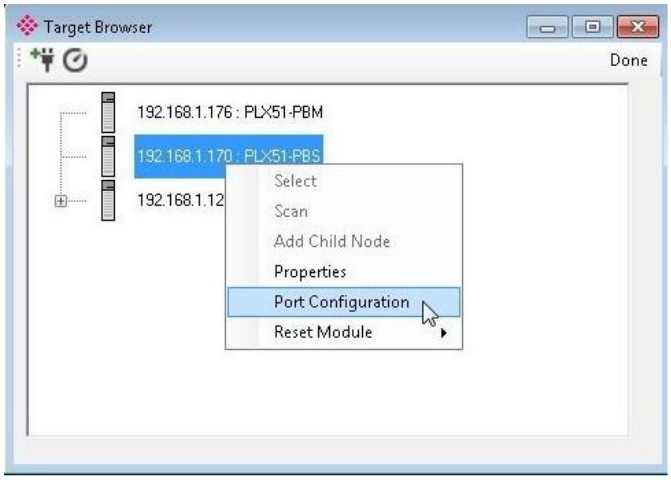


Figure 3.8. - Selecting Port Configuration

The Ethernet port configuration parameters can be modified using the *Ethernet Port Configuration* window.

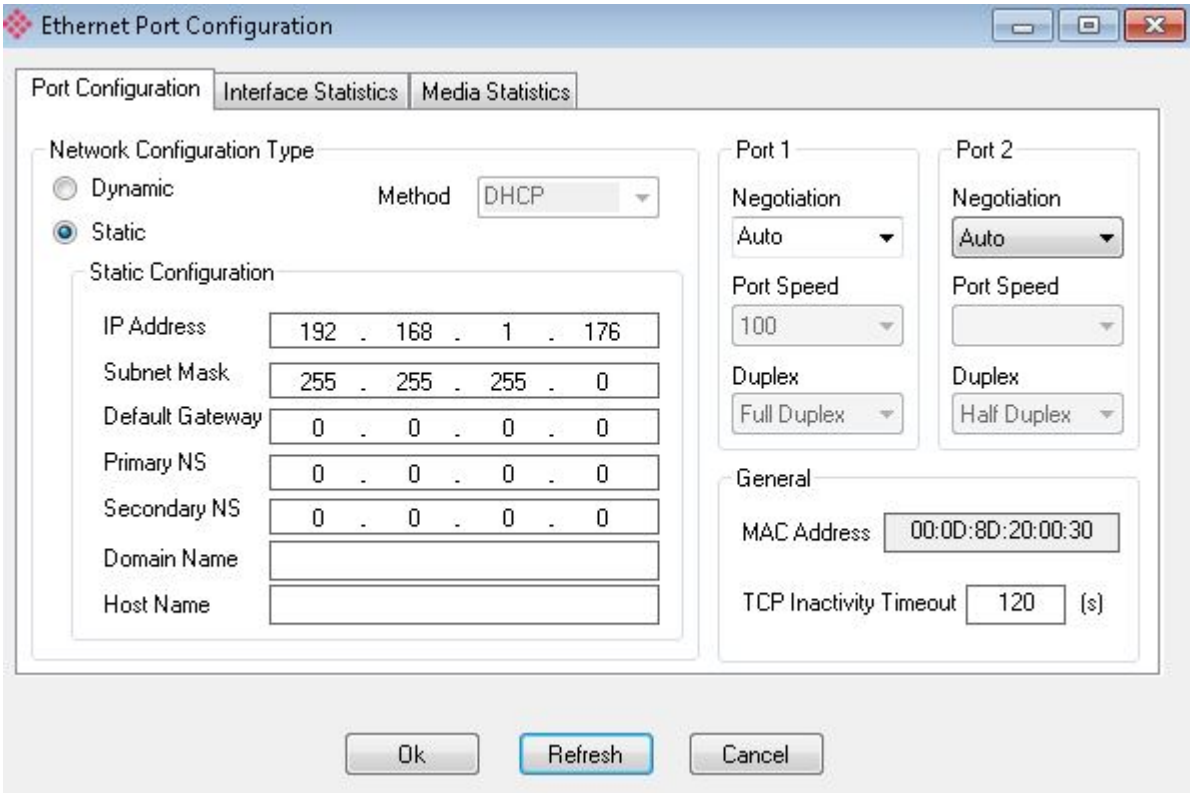


Figure 3.9. - Port Configuration

Alternatively, these parameters can be modified using Rockwell Automation's RSLinx software.

3.3 GSD File Management

Each PROFIBUS device has a GSD file that is required to provide information needed to configure the device for data exchange. The PLX50 Configuration Utility manages the GSD library which is used for adding devices to the PLX51-PBS.

1 The GSD File Management Tool is opened by selecting *GSD File Management* under the *Tool* menu in the configuration utility.

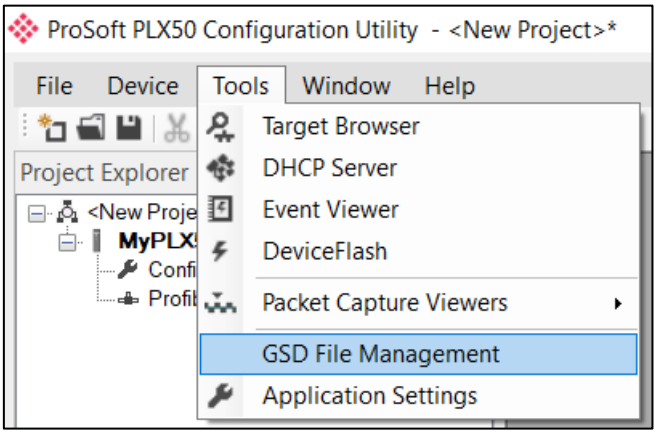
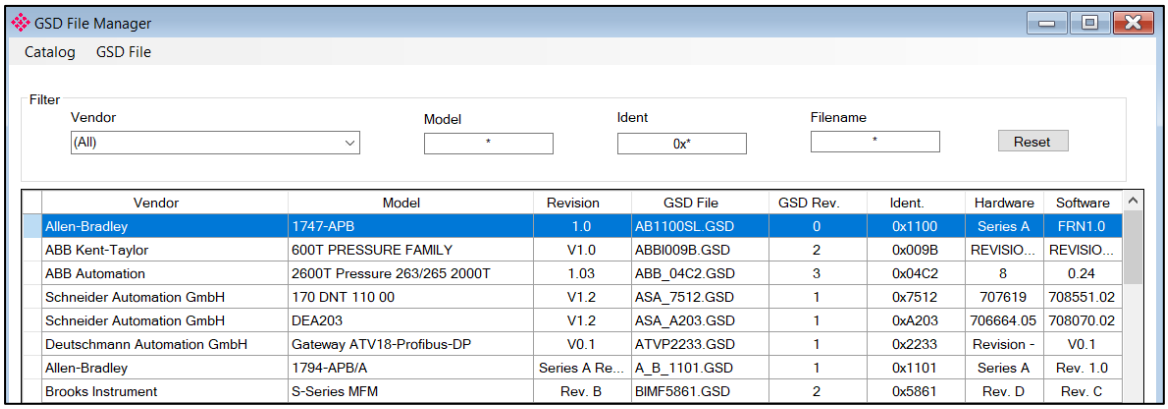


Figure 3.10 – Launching the GSD File Management Tool

2 Once the tool opens, a list of registered slave devices are displayed, using their GSD files.



Vendor	Model	Revision	GSD File	GSD Rev.	Ident.	Hardware	Software
Allen-Bradley	1747-APB	1.0	AB1100SL.GSD	0	0x1100	Series A	FRN1.0
ABB Kent-Taylor	600T PRESSURE FAMILY	V1.0	ABBI009B.GSD	2	0x009B	REVISIO...	REVISIO...
ABB Automation	2600T Pressure 263/265 2000T	1.03	ABB_04C2.GSD	3	0x04C2	8	0.24
Schneider Automation GmbH	170 DNT 110 00	V1.2	ASA_7512.GSD	1	0x7512	707619	708551.02
Schneider Automation GmbH	DEA203	V1.2	ASA_A203.GSD	1	0xA203	706664.05	708070.02
Deutschmann Automation GmbH	Gateway ATV18-Profibus-DP	V0.1	ATVP2233.GSD	1	0x2233	Revision -	V0.1
Allen-Bradley	1794-APB/A	Series A Re...	A_B_1101.GSD	1	0x1101	Series A	Rev. 1.0
Brooks Instrument	S-Series MFM	Rev. B	BIMF5861.GSD	2	0x5861	Rev. D	Rev. C

Figure 3.11 – GSD File Management Tool

3 To add a GSD file, select the *Add* option under the *GSD File* menu.

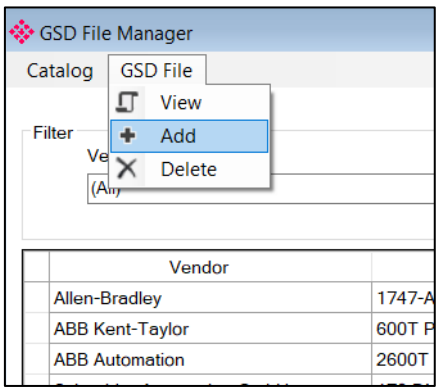


Figure 3.12 – GSD File Adding

4 Select the required GSD file and click **OPEN.**

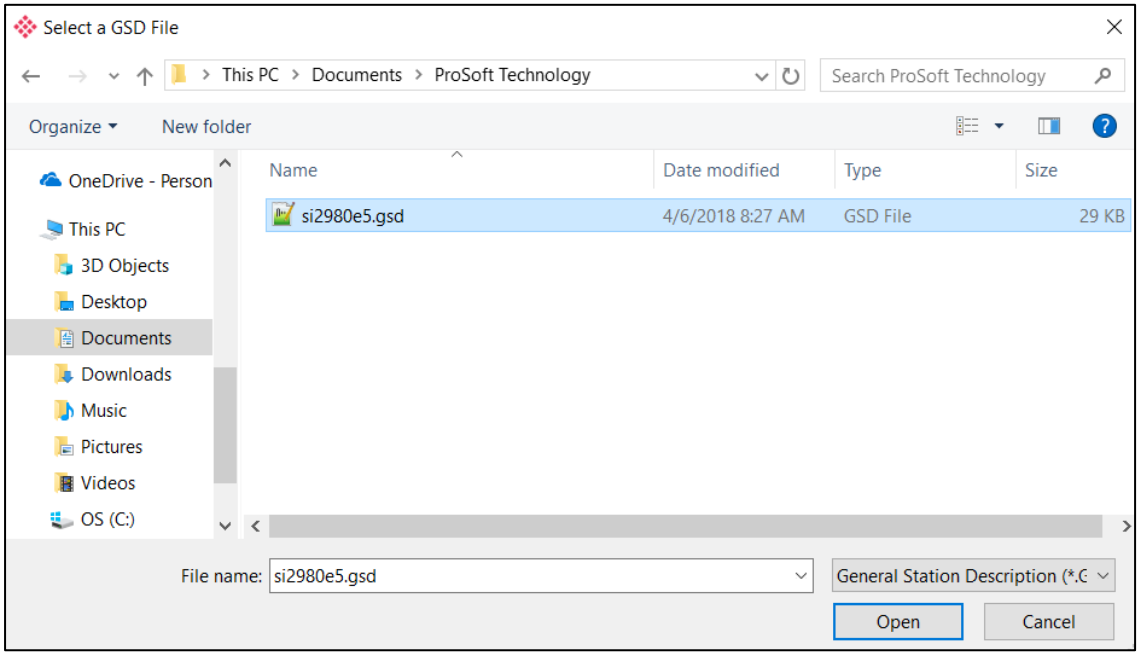


Figure 3.13 – Adding GSD File

5 Once the file has been selected, the GSD File Management tool adds the slave device to the device list and recompile the GSD catalog.

A GSD catalog can be exported from another PLX50 Configuration Utility by exporting the GSD catalog from one PLX50 Configuration Utility, and importing it in another. This is done by selecting either *Import* or *Export* under the *Catalog* menu as shown below:

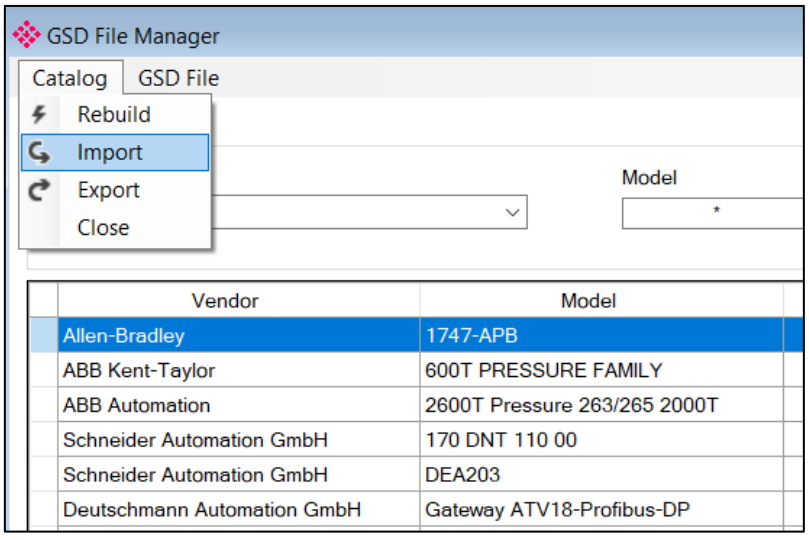


Figure 3.14 – GSD Catalog import/export

3.4 Creating a New Project

1 Before you configure the module, a new PLX50 Configuration Utility project must be created. Under the *File* menu, select **New.**

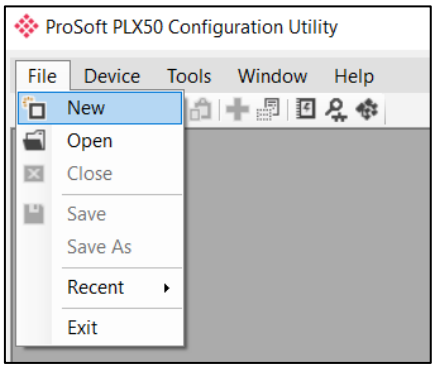


Figure 3.15 - Creating a new project

2 A PLX50 Configuration Utility Design Tool project is created, showing the *Project Explorer* tree view. To save the project use the **Save** option under the *File* menu.

3 A new device can now be added by selecting **Add** under the *Device* menu.

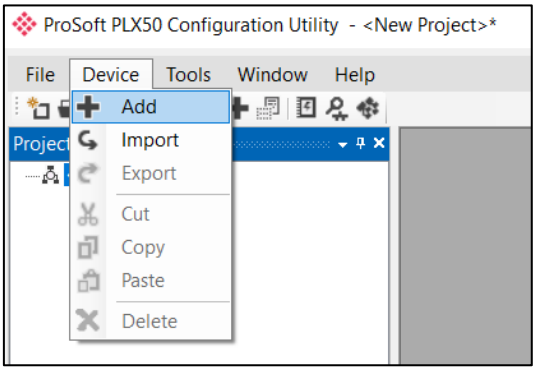


Figure 3.16 - Adding a new device

4 In the *Add New Device* window, the PLX51-PBS and click the **OK** button.

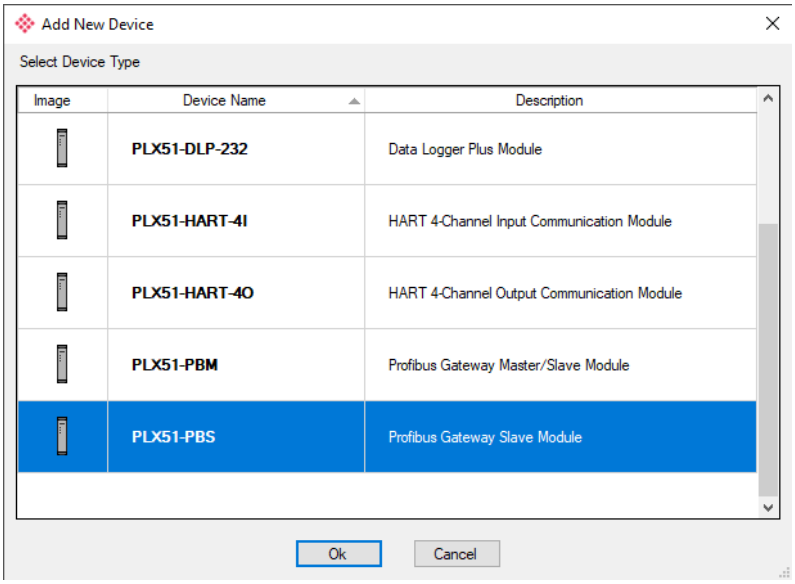


Figure 3.17 – PLX51-PBS

5 The device appears in the *Project Explorer* tree and its configuration window opened.

The device configuration can be reopened by double-clicking the module in the *Project Explorer* tree, or right-clicking the module and selecting *Configuration*.

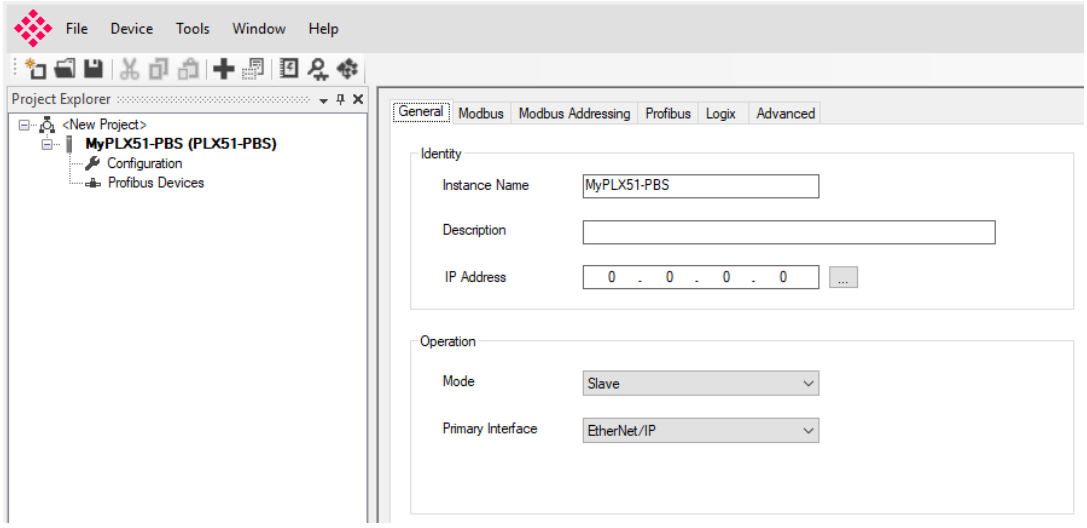


Figure 3.18 – PLX51-PBS configuration

3.5 PLX51-PBS Parameters

The PLX51-PBS parameters are configured by the PLX50 Configuration Utility.

3.5.1 General

The PLX51-PBS General configuration is opened by either double-clicking on the module in the tree, or right-clicking the module and selecting *Configuration*.

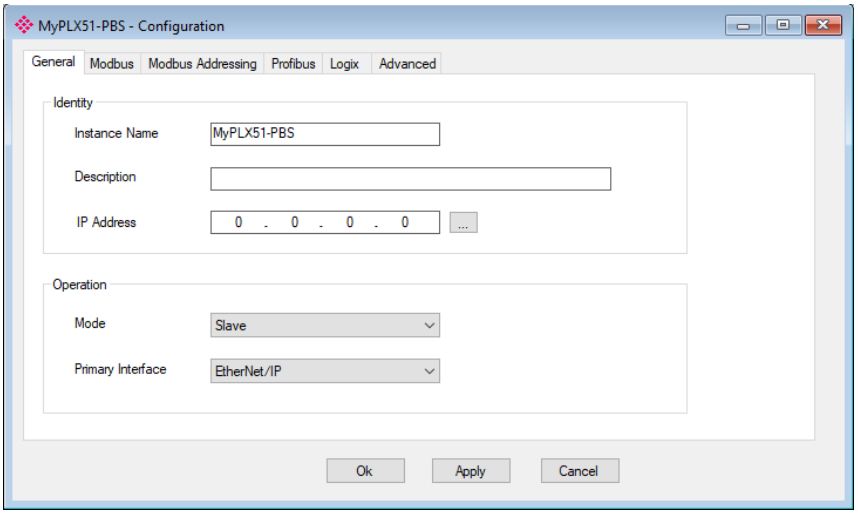


Figure 3.19 – PLX51-PBS General configuration

The General configuration consists of the following parameters:

Table 3.1 - General configuration parameters

Parameter	Description
Instance Name	User defined name to identify between various PLX51-PBS modules.
Description	Used to provide a more detailed description of the application for the module.
IP Address	The IP address of the module.
Mode	The PLX51-PBS can operate in one of two modes: **Quiet -** Connects the PLX51-PBS to an active bus and runs a DP packet capture. The PLX51-PBS will not communicate on the DP Bus, but rather only listen. **Slave -** In this mode, the PLX51-PBS will emulate multiple PROFIBUS Slave devices.
Primary Interface	This is the network the PLX51-PBS will interface the PROFIBUS network. ▪ EtherNet/IP (Logix) ▪ Modbus TCP Master ▪ Modbus RTU Master – RS232 ▪ Modbus RTU Master – RS485 ▪ Modbus TCP Slave ▪ Modbus RTU Slave – RS232 ▪ Modbus RTU Slave – RS485 ▪ EtherNet/IP Explicit Messaging

3.5.2 Modbus

The Modbus configuration is shown in the figure below.

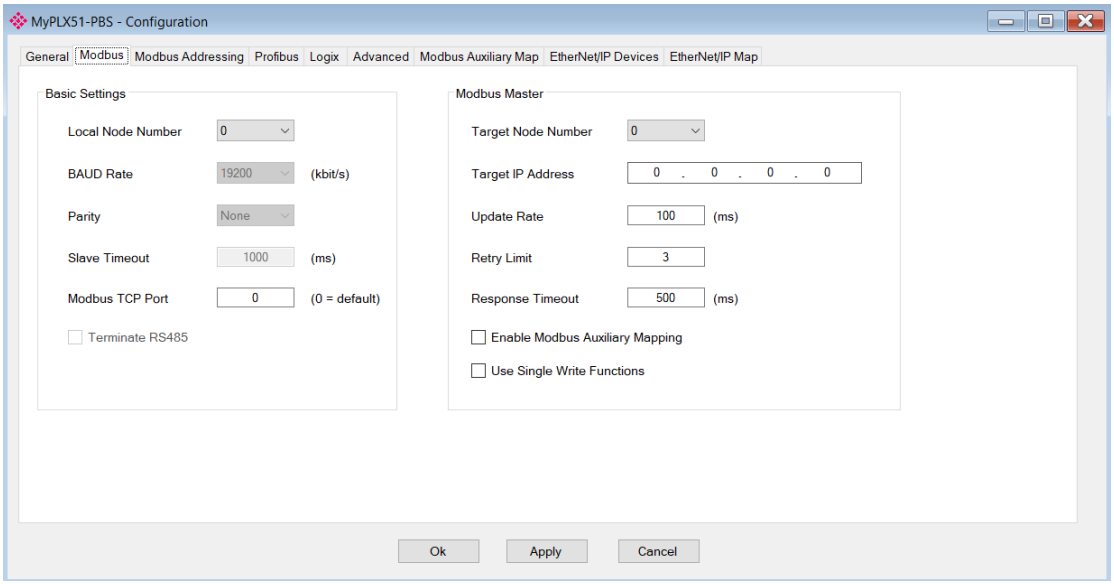


Figure 3.20 – PLX51-PBS Modbus configuration

The Modbus configuration consists of the following parameters:

Table 3.2 - Modbus configuration parameters

Parameter	Description
Local Node Number	The Modbus Node Number used when the PLX51-PBS is in Modbus Slave mode.
BAUD Rate	For Modbus RTU, this setting is the BAUD Rate over the serial communication.
Parity	For Modbus RTU, this setting is the Parity over the serial communication.
Slave Timeout	The slave timeout time in milliseconds.
Modbus TCP Port	The TCP port to be used for the Modbus communication can be configured. If a zero is entered, the module will use the standard TCP port 502.
Terminate RS485	Enables the on-board 124Ω RS485 terminating resistor.
Modbus Master	
Target Node Number	The remote Modbus node to poll. (Modbus Master only)
Target IP Address	The remote Modbus IP Address to poll. (Modbus TCP Master only)
Update Rate (ms)	The period between master requests to the Modbus slave. (Modbus Master only)
Retry Limit	The number of successive Modbus request retries (Modbus Master only)
Response Timeout (ms)	The time the module will wait for a Modbus response (Modbus Master only)
Enable Modbus Auxiliary Mapping	When enabled, the PLX51-PBS will be able to read from, and write to, multiple Modbus Slaves by using the Modbus Auxiliary Map tab. **NOTE:** When enabled, the automatic polling of referenced Modbus registers is disabled. It is the user's responsibility to ensure that all the required PROFIBUS control and data registers are collected from the appropriate remote Modbus slave devices.
Use Single Write Functions	When operating as a Modbus Master, the PLX51-PBM will use Modbus Single Write functions in the Modbus Auxiliary Map when this option has been selected and the write function has an element count of 1.

3.5.3 Modbus Addressing

The Modbus Addressing configuration is shown in the figure below.

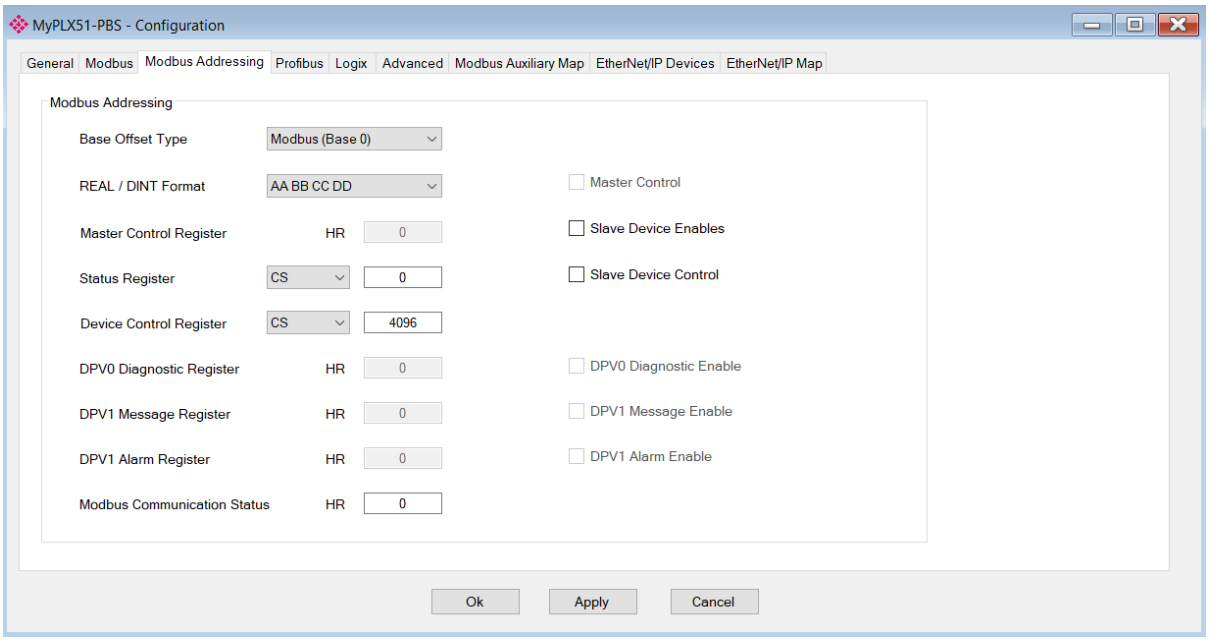


Figure 3.21 – PLX51-PBS Modbus Addressing configuration

The Modbus configuration consists of the following parameters:

Table 3.3 - Modbus Addressing configuration parameters

Parameter	Description
Base Offset Type	Base Address Offset Type Modbus (Base 0) – Conventional Modbus addressing where the first address is 0. PLC (Base 1) – PLC addressing, where the first address is 1.
Real Format	For a Real (single floating point) number this setting shows the format of the data will be presented when using a Modbus Primary Interface. The format (byte re-ordering) options are as follows: AA BB CC DD BB AA DD CC DD CC BB AA CC DD AA BB
Master Control Register	N/A. PROFIBUS Master mode only.
Status Register	The Modbus Coil or Holding Register address starting offset for the Module status.
Device Control Register	The Modbus Coil or Holding Register address starting offset for the Slave Device Control bits.
Slave Device Enables	Enables the individual Slave Device Enable bits. When Enabled, the module can enable/disable each slave device through the use of the Device Control Register. When Disabled, all slave devices are enabled.
Slave Device Control	Enables the Slave Device Control (Alarm Triggers). When Enabled, the module can generate Alarms for each slave device through the use of the Device Control Register. When disabled, no slave device alarming is possible.
DPV0 Diagnostic Enable	N/A. PROFIBUS Master mode only.

DPV1 Message Enable	N/A. PROFIBUS Master mode only.
DPV1 Alarm Enable	N/A. PROFIBUS Master mode only.
Modbus Communication Status	The Modbus Holding Register address starting offset for Modbus Communication Status (when operating as a Modbus Master or Modbus Slave). This can be mapped to DPV0 data which can be used by the Profibus DP Master to take action when the Modbus communication is down or has faulted. See the *Modbus Operation* section for details regarding the Modbus data for the Modbus Communication Status.

IMPORTANT: The range of configured Modbus registers for each register type may not exceed 10,000.

3.5.4 PROFIBUS Slave Configuration

The PLX51-PBS PROFIBUS slave configuration is opened by either double-clicking on the module in the tree, or right-clicking the module and selecting *Configuration*. Then select the **PROFIBUS** tab.

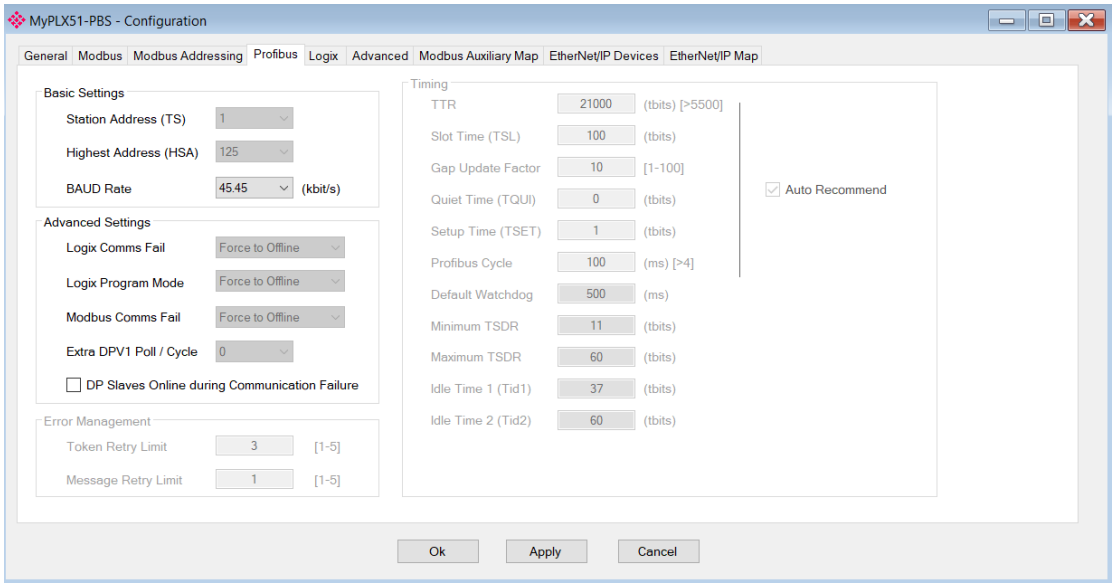


Figure 3.22 – PLX51-PBS PROFIBUS slave configuration

The PLX51-PBS PROFIBUS slave configuration consists of the following parameters:

Table 3.4 – PROFIBUS slave configuration parameters

Parameter	Description
BAUD Rate	Baud Rate (in Kbps) of the PROFIBUS network: 9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000 or 12000 Kbps. The baud rate should be selected depending on the cable length, see chapter “PROFIBUS DP”
DP Slaves Online during Communication Failure	This parameter will allow the DP DPV0 communication to continue when communication it lost on either Modbus (Master or Slave) or EtherNet/IP Explicit Messaging. When this is not set, the DP DPV0 communication will be stopped when the communication to the previously mentioned interfaces is lost.

3.5.5 Logix

This section is used when the *Primary Interface* in the **General** tab is set to *EtherNet/IP*. The PLX51-PBS Logix configuration is opened by either double-clicking on the module in the tree, or right-clicking the module and selecting *Configuration*. Then select the **Logix** tab.

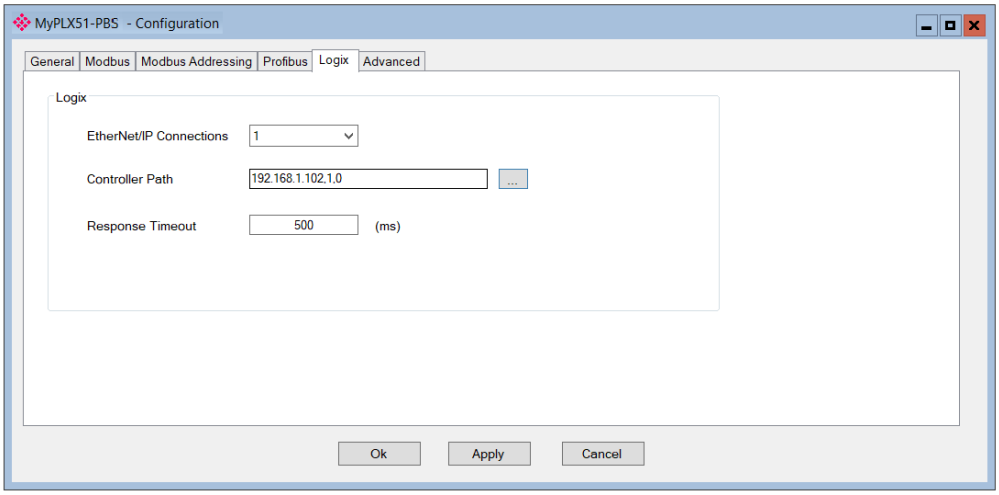


Figure 3.23 – PLX51-PBS Logix configuration

The Logix configuration consists of the following parameters:

Table 3.5 – Logix configuration parameters

Parameter	Description
EtherNet/IP Connections	The number of EtherNet/IP (CIP) Connections to be used in the exchange with Logix (1 to 4). Note, this value must match that configured in the Logix IO tree.
Controller Path	This is the CIP path to the Logix controller. This path is used for the Class 3 data exchanges for DPV1 objects and alarms. **Note:** This path can be entered manually or configured using the *Target Browser*.
Response Timeout	The maximum time (ms) allowed for a Class 3 response from the Logix controller. Default: 5000 ms

To browse to a controller path, select the **BROWSE…** button to open the *Target Browser*. Then select a Logix controller and click **Ok**. The path updates automatically.

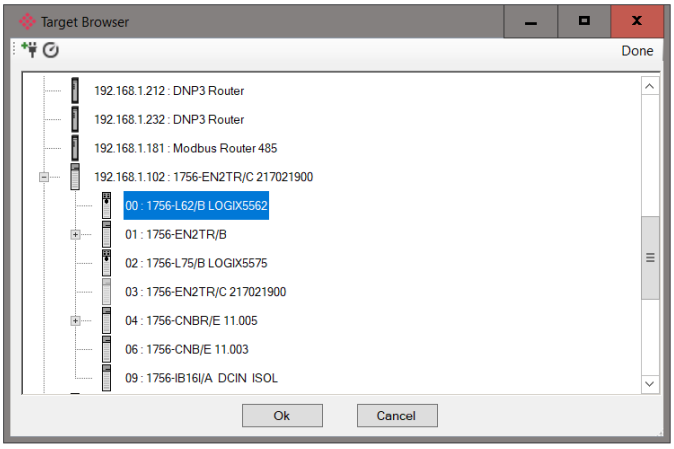


Figure 3.24 – Target Browser – Selecting Logix controller

3.5.6 Advanced

The PLX51-PBS Advanced configuration is opened by either double-clicking on the module in the tree, or right-clicking the module and selecting *Configuration*. Then select the **Advanced** tab.

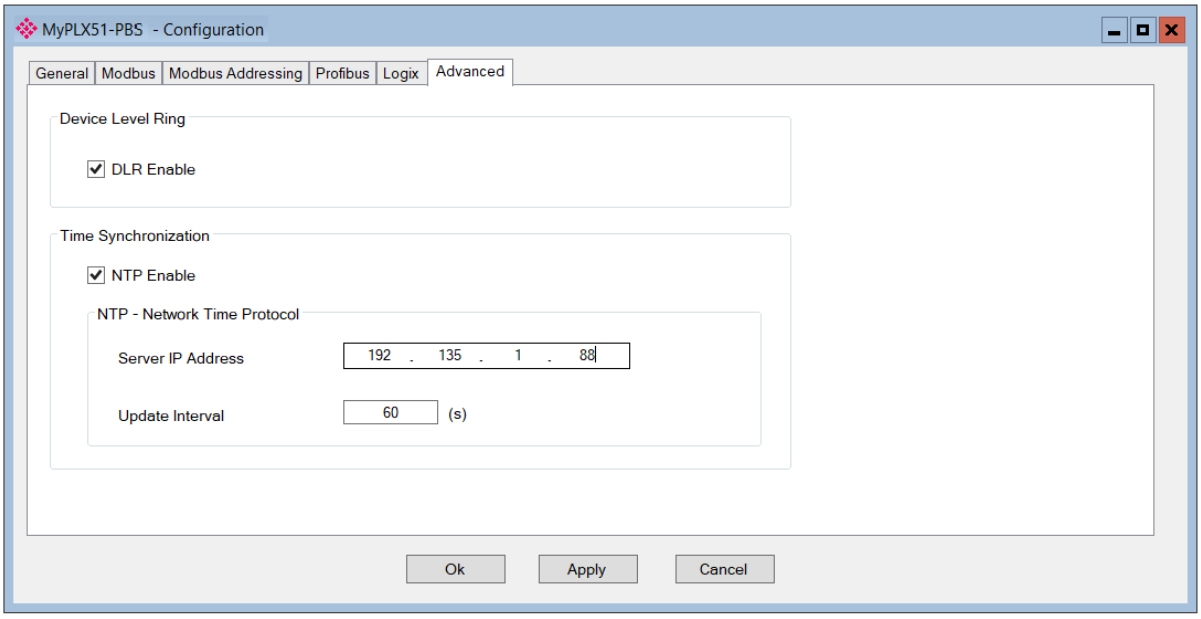


Figure 3.25 – PLX51-PBS Advanced configuration

The Advanced configuration consists of the following parameters:

Table 3.6 - Advanced configuration parameters

Parameter	Description
DLR Enable	This must be set to enable *Device Level Ring* operation when the PLX51-PBS is operating in an Ethernet DLR.
NTP Enable	The PLX51-PBS can synchronize its onboard clock to an NTP Server by enabling NTP.
NTP – Server IP Address	This setting is the IP address of the NTP Server which will be used as a time source.
NTP – Update Interval	This setting is the updated interval (in seconds) that the PLX51-PBS will request time from the NTP Server.

3.5.7 EtherNet/IP Devices

This tab is enabled when the Primary Interface selected is EtherNet/IP Explicit Messaging.

IMPORTANT: EtherNet/IP Explicit Messaging is only allowed when the PLX51-PBS is operating as a Profibus Slave.

The EtherNet/IP Devices configuration is shown in the figure below. Up to 5 EtherNet/IP devices can be configured with up to 50 EtherNet/IP mapped items allowing for either explicit EtherNet/IP Class 3 or Unconnected Messaging (UCMM) to any of the 5 configured devices. The data from each EtherNet/IP device is written to or read from a data table with a size of 10Kbytes. See the *Explicit EtherNet/IP Messaging Operation* section for more details.

The PLX51-PBS EtherNet/IP Devices configuration window is opened by either double clicking on the module in the tree or right-clicking the module and selecting *Configuration*.

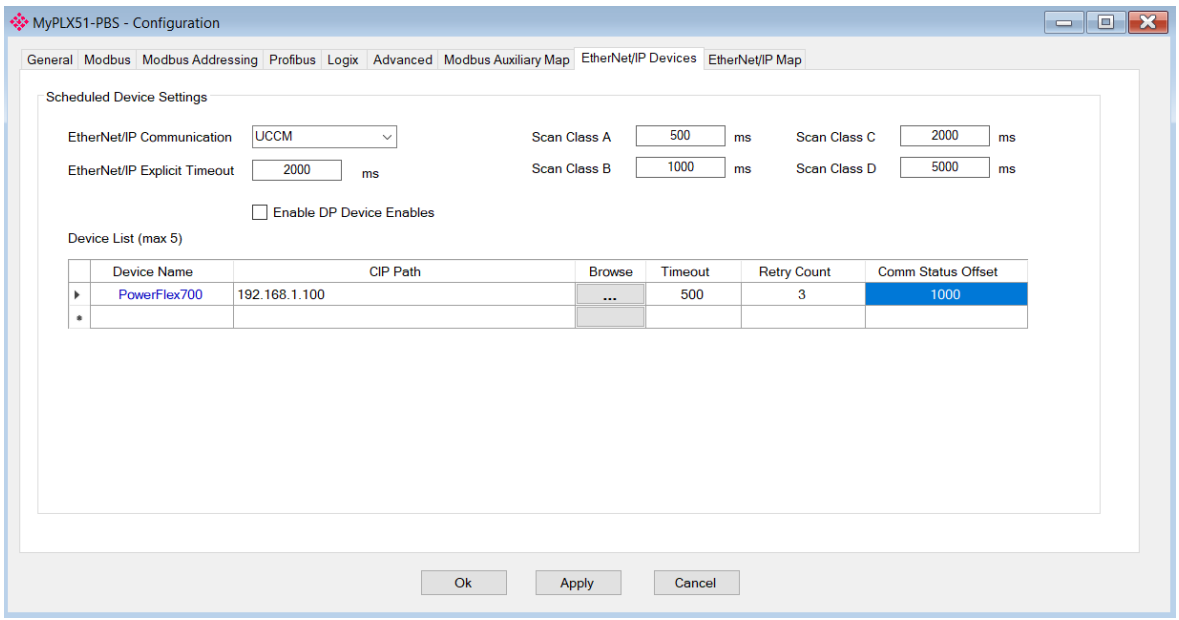


Figure 3.26 – PLX51-PBS EtherNet/IP Devices configuration

The EtherNet/IP Devices configuration consists of the following parameters:

Table 3.7 – EtherNet/IP Devices configuration parameters

Parameter	Description
EtherNet/IP Communication	The module can use either ***Class 3*** or ***Unconnected Messaging*** when communicating to the target EtherNet/IP device.
EtherNet/IP Explicit Timeout	The amount of time with no successful EtherNet/IP responses before the module sets the EtherNet/IP interface in fault. If *DP Slaves Online during Communication Failure* has not been set, then all DP slaves being emulated will go offline on the Profibus DP network.
Scan Class A, B, C, D	The configurable update rates for each mapped item in the EtherNet/IP Map.
Device List (per device)	
Device Name	The user assigned name for the specific device.
CIP Path	The CIP Path to the target device. It can either be entered manually or the user can browse to them by clicking the **BROWSE** button. The Target Browser will open and automatically scan for all available EtherNet/IP devices. If the Ethernet/IP module is a bridge module, it can be expanded by right-clicking on the module and selecting the **SCAN** option. The required EtherNet/IP device can then be chosen by selecting it and clicking the **OK** button, or by double-clicking on the target module.
Timeout	The amount of time the PLX51-PBS module will wait for a response from the target EtherNet/IP device.
Retry Count	The number of retires before the target EtherNet/IP device is considered offline.
Comm Status Offset	This is the offset in the data table (used to map EtherNet/IP device data) which provides the communication status of each EtherNet/IP device. The Communication Status is as shown below: Bit 0 - (1) Device online / (0) Device offline. Bit 1 to 7 – Reserved.

3.5.8 EtherNet/IP Map

This tab is enabled when the Primary Interface selected is EtherNet/IP Explicit Messaging.

IMPORTANT: EtherNet/IP Explicit Messaging is only allowed when the PLX51-PBS is operating as a Profibus Slave.

The EtherNet/IP Map configuration is shown in the figure below. Up to 5 EtherNet/IP devices can be configured with up to 50 EtherNet/IP mapped items allowing for either explicit EtherNet/IP Class 3 or Unconnected Messaging (UCMM) to any of the 5 configured devices. The data from each EtherNet/IP device is written to or read from a data table with a size of 10Kbytes. See the *Explicit EtherNet/IP Messaging Operation* section for more details.

The PLX51-PBS EtherNet/IP Map configuration window is opened by either double clicking on the module in the tree or right-clicking the module and selecting *Configuration*.

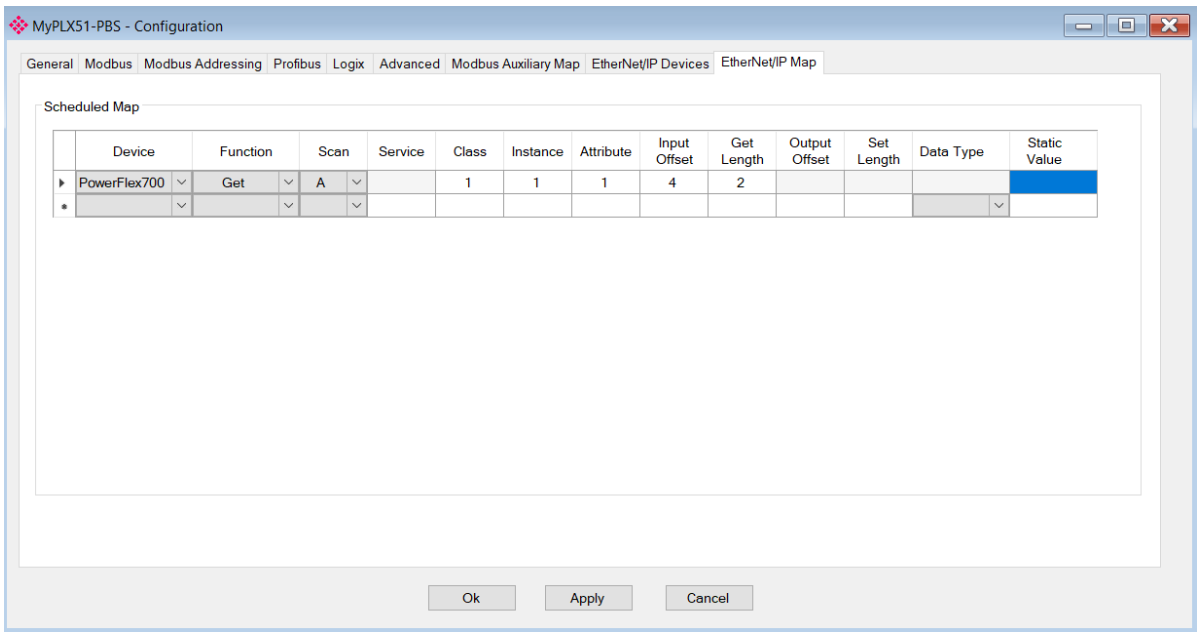


Figure 3.27 – PLX51-PBS EtherNet/IP Map configuration

The EtherNet/IP Map configuration consists of the following parameters:

Table 3.8 – EtherNet/IP Map configuration parameters

Parameter	Description
Device	The device name configured in the previous EtherNet/IP Devices tab. The selected device will be used for executing the communication function.
Function	The user can select one of four functions. **Get** The module will read data from the target EtherNet/IP device by using the Get Single Attribute CIP function. The received data will be placed into the Data Table at the ***Input Offset*** location configured in this tab. **Set** The module will write data to the target EtherNet/IP device by using the Set Single Attribute CIP function. The data to be written will be retrieved from the Data Table at the ***Output Offset*** location configured in this tab. **Set Static** Similar to the Set function above, but the data to be written will be fixed (equal to the *Static Value*) parameter in this configuration window. This function will typically be used with the single Scan class which means the PLX51-PBS can be setup to write the fixed value only once when the target device communication has been established. **Custom** This function allows the user to use a custom Service and write and read data in the same transaction. The user will need to see which custom services that target device supports in that device's user manual.
Scan	The user can select Scan Class **A**, **B**, **C** or **D** (which was configured in the EtherNet/IP Devices tab). The specific mapped item will then be executed at that configured scan class rate. The user can also select the **S** class which means that the mapped item will only execute once when communication to the target device is established. If the target device goes offline, then the mapped items with this class will be re-armed.
Service	The custom CIP service/function which is only available when the ***Custom*** function has been selected.
Class, Instance, Attribute	The CIP class, instance, and attribute of the request message to be sent.
CN In Offset	The location in the Data Table where the received data will be written. This will only be available for ***Get*** and ***Custom*** functions.
Get Length	The length of the data to be received. If the number of bytes received is more than the Get Length, then the data will **not** be written to the Data Table. This will only be available for ***Get*** and ***Custom*** functions.
CN Out Offset	The location in the Data Table where the data to be written to the target device will be read from. This will only be available for ***Set*** and ***Custom*** functions.
Set Length	The length of the data to be written. This will only be available for ***Set*** and ***Custom*** functions.
Data Type	The data type of the Static Value. This will only be available for ***Set Static*** function.
Static Value	The value to be written to the target device when the ***Set Static*** function has been selected.

3.6 Adding PROFIBUS DP Devices

The user will need to add each PROFIBUS device to the PLX51-PBS. Each device can then be individually configured. This is done by right-clicking on ***PROFIBUS Devices*** in the tree and selecting ***Add PROFIBUS Device***.

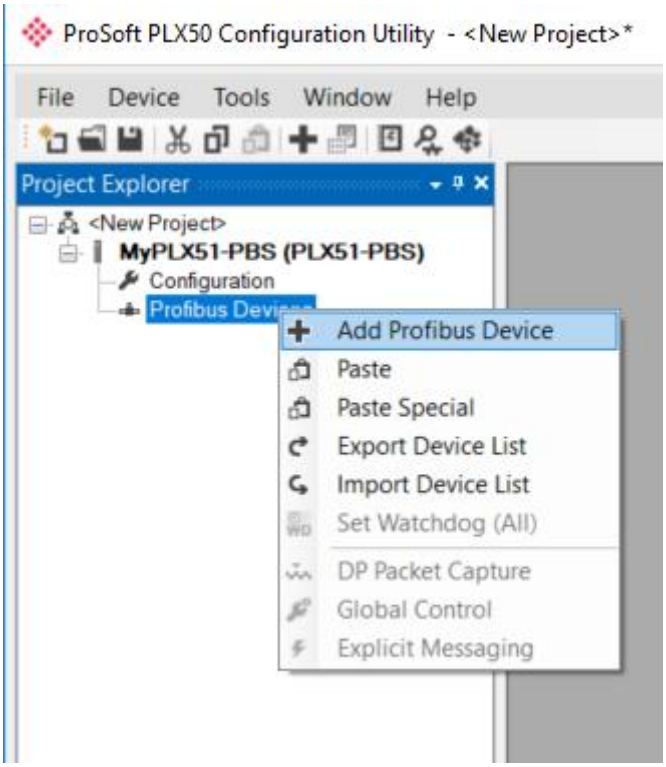


Figure 3.28 – Adding a PROFIBUS Field Device

When adding a PROFIBUS Device, a static GSD file based on the PLX51 module, will be automatically applied.

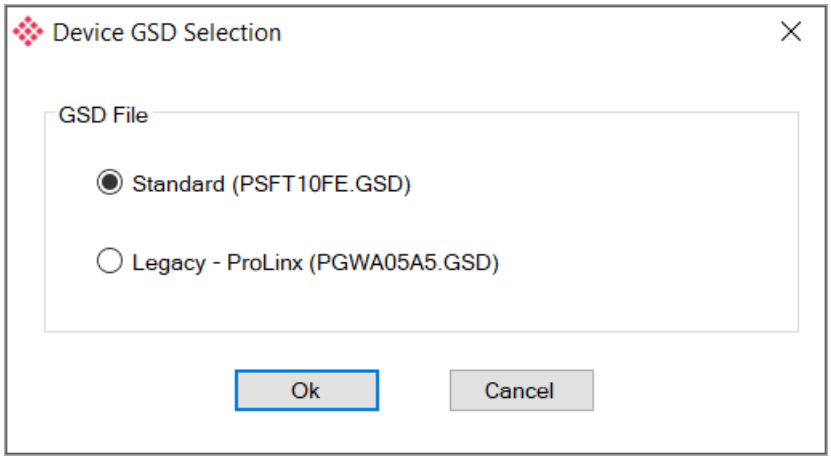


Figure 3.29 – Selecting a PROFIBUS Field Device

Table 3.9 – Slave GSD File

Module	GSD Filename
PLX51-PBS	PSFT10FF.GSD
ProLinx	PGWA05A5.GSD

3.6.1 General

The *General* tab is shown in the following figure:

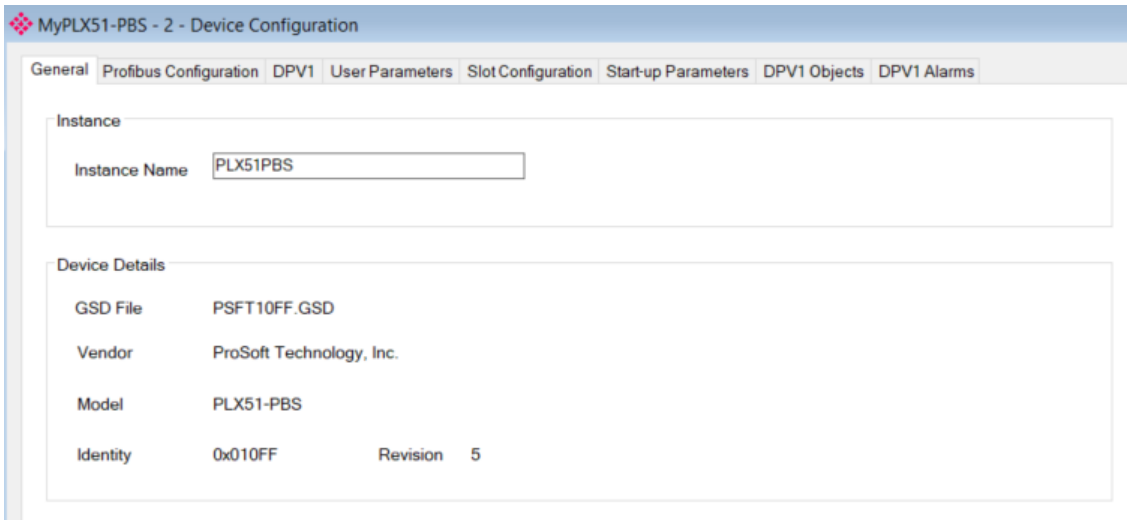


Figure 3.30 – General configuration parameters

The General configuration consists of the following parameters:

Table 3.10 – General configuration parameters

Parameter	Description
Instance Name	The device instance name which will be used to create the Tag names and UDTs in Logix.

When the module is emulating a legacy device, the PLX51-PBS General Configuration parameters will appear as follows:

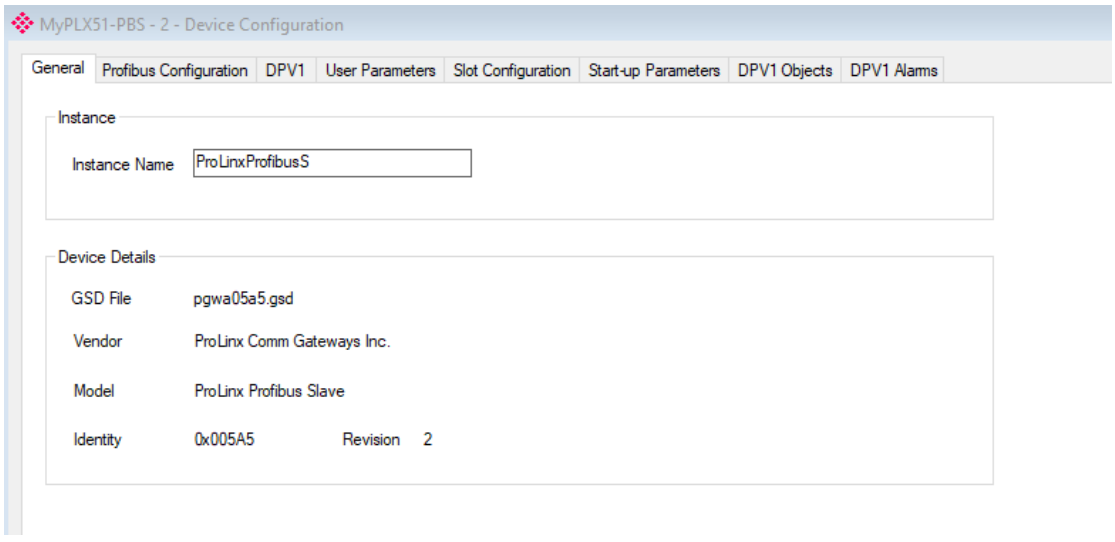


Figure 3.31 – General configuration parameters (legacy device)

3.6.2 PROFIBUS Configuration

The PROFIBUS Configuration tab is shown in the following figure:

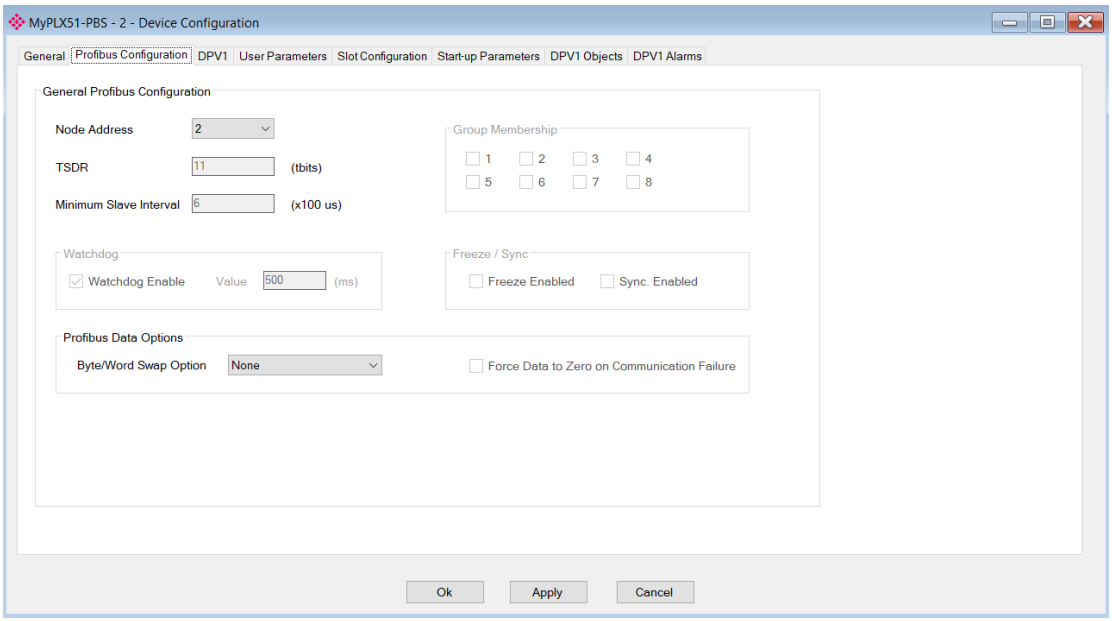


Figure 3.32 – PROFIBUS Configuration parameters

When the module is emulating a legacy device, the PLX51-PBS Profibus Configuration parameters will appear as follows:

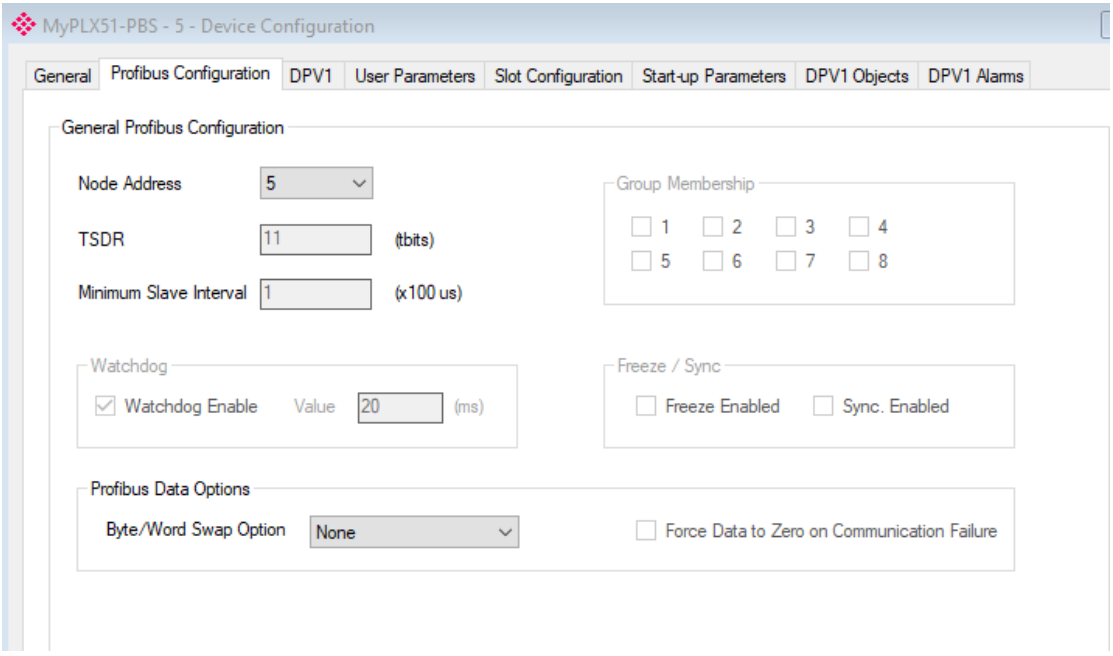


Figure 3.33 – PROFIBUS Configuration parameters (legacy device)

The PROFIBUS configuration consists of the following parameters:

Table 3.11 – Field Device PROFIBUS Configuration parameters

Parameter	Description
Node Address	This is the station address configured for the added device. This is the address the PROFIBUS Master will use to look for and configure the device for Data Exchange.
TSDR	N/A
Minimum Slave Interval	N/A
Watchdog Enable	N/A
Watchdog Value	N/A
Group Membership	N/A
Byte/Word Swap Option	This parameter will reformat the input and output Profibus DPV0 communication data. Below are the reformat options if the normal data format is AA BB CC DD: **None** **BB AA** **DD CC BB AA** **CC DD AA BB**

3.6.3 DPV1

The DPV1 configuration tab is shown in the following figure:

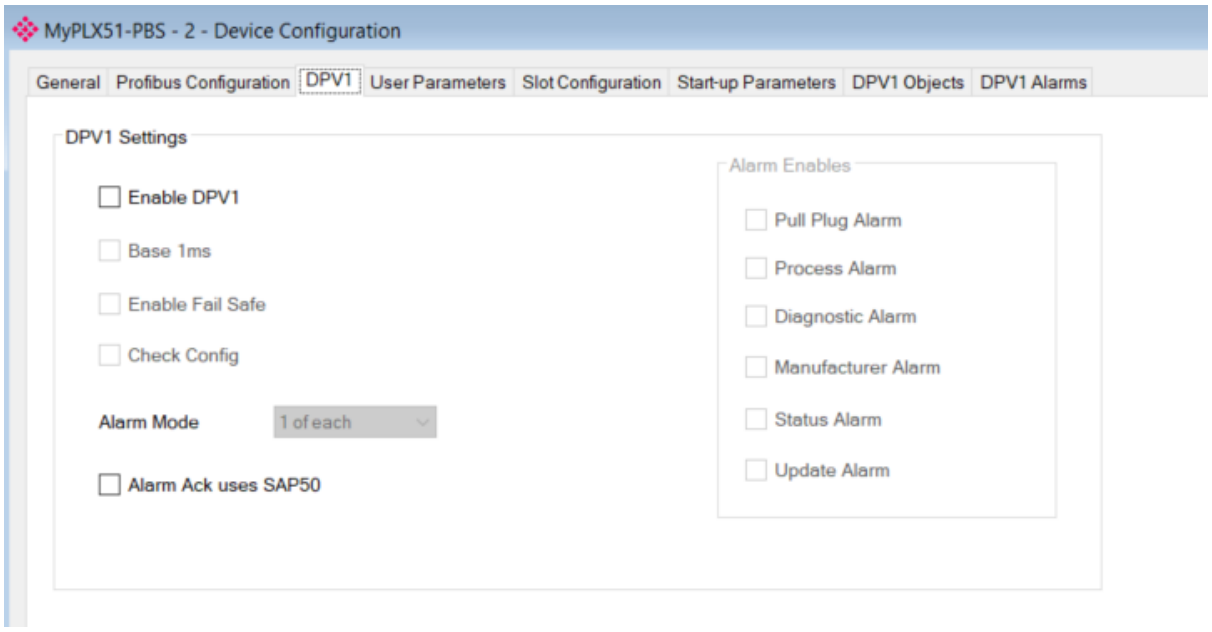


Figure 3.34 – DPV1 configuration parameters

When the module is emulating a legacy device, the DPV1 configuration parameters will appear as follows:

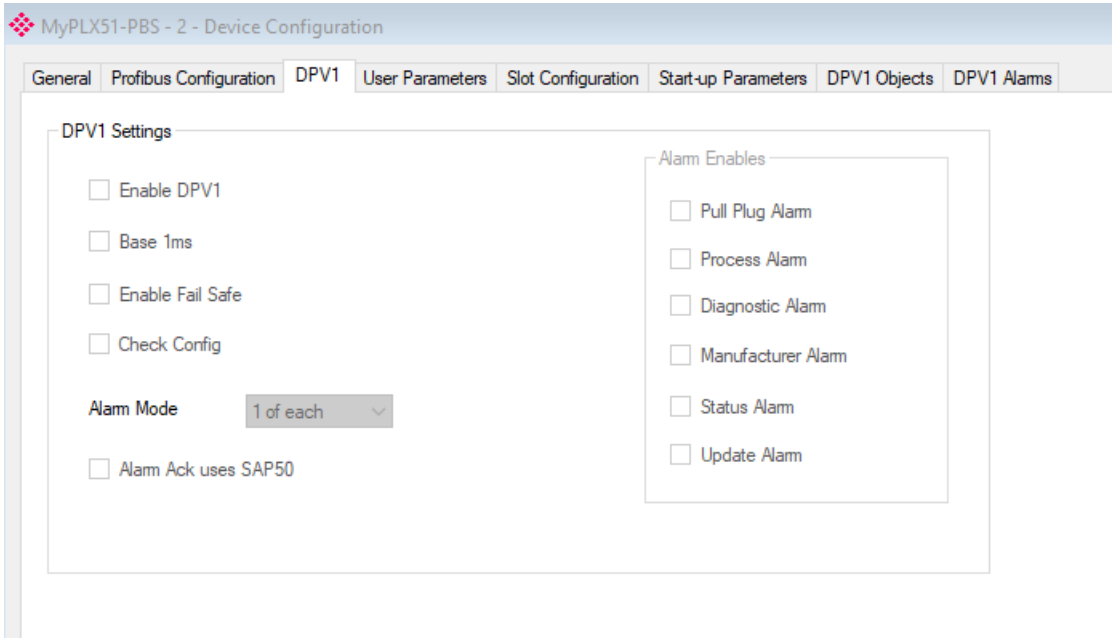


Figure 3.35 – DPV1 configuration parameters (legacy device)

The DPV1 configuration consists of the following parameters:

Table 3.12 – DPV1 configuration parameters

Parameter	Description
Enable DPV1	Enables the DPV1 capabilities of the PLX51-PBS.
Base 1ms	N/A
Enable Fail Safe	N/A
Check Config	N/A
Alarm Mode	N/A
Alarm Ack uses SAP50	This will force the PROFIBUS DP Master to use Service Access Point (SAP) 50 to acknowledge alarms.
Alarm Enables	N/A

3.6.4 User Parameters

Note: You must configure the slave device's user parameters in the settings of the PROFIBUS DP Master.

The User Parameters for the device are shown in the figure below. The User Parameter information is extracted from the device GSD file.

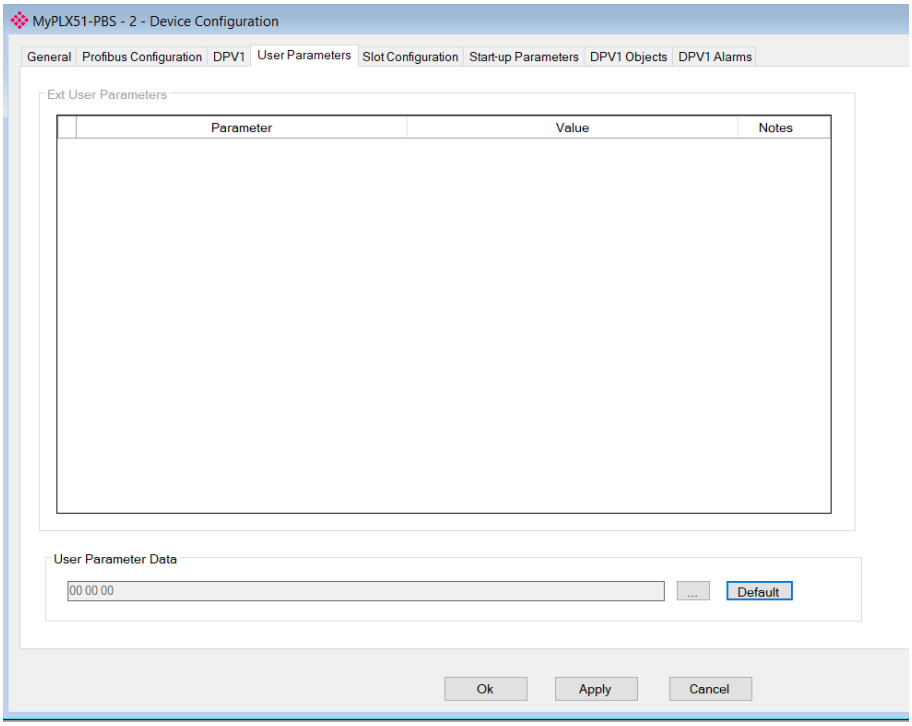


Figure 3.36 – User parameters

When the module is emulating a legacy device, the User Parameters will appear as follows:

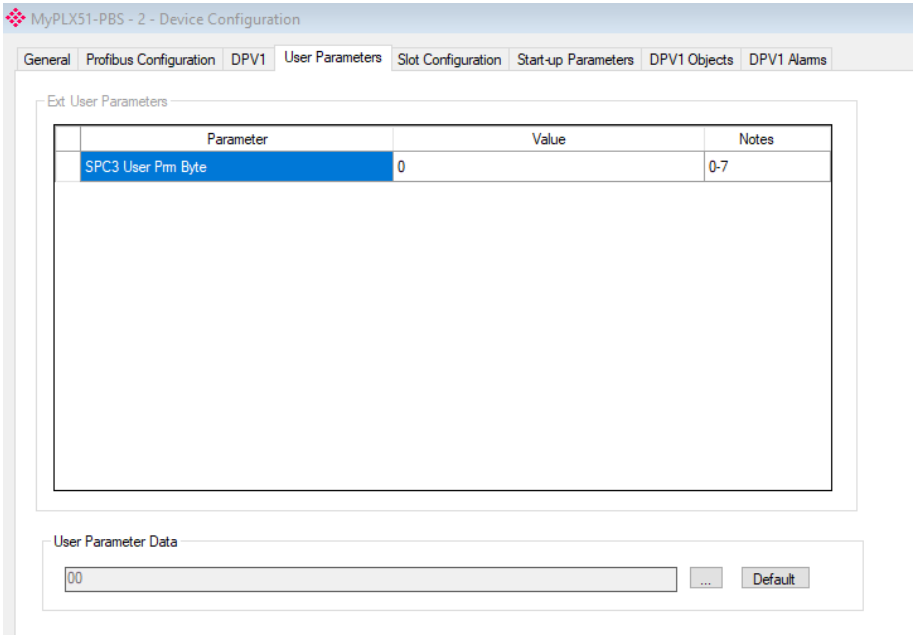


Figure 3.37 – User parameters (legacy device)

3.6.5 Slot Configuration

Each slave device can have multiple slots that can be configured. A slot can be a place holder for a process variable or a placeholder for a specific piece of hardware.

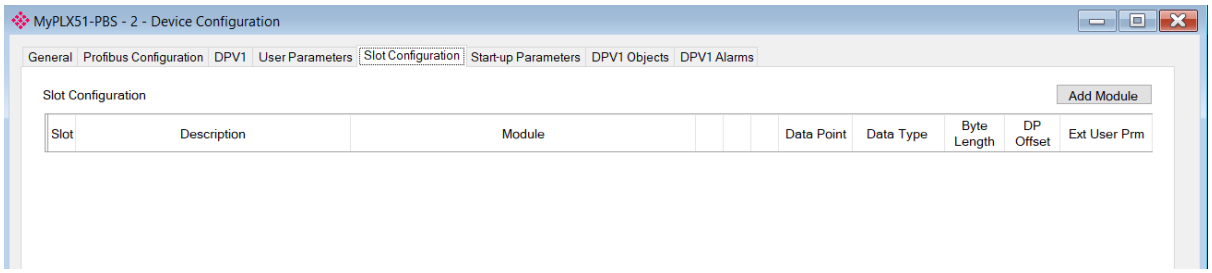


Figure 3.38 – Field Device Slot configuration start

To add a module, select the ***Add Module*** button. The module selection form will appear listing all the available modules from the GSD file.

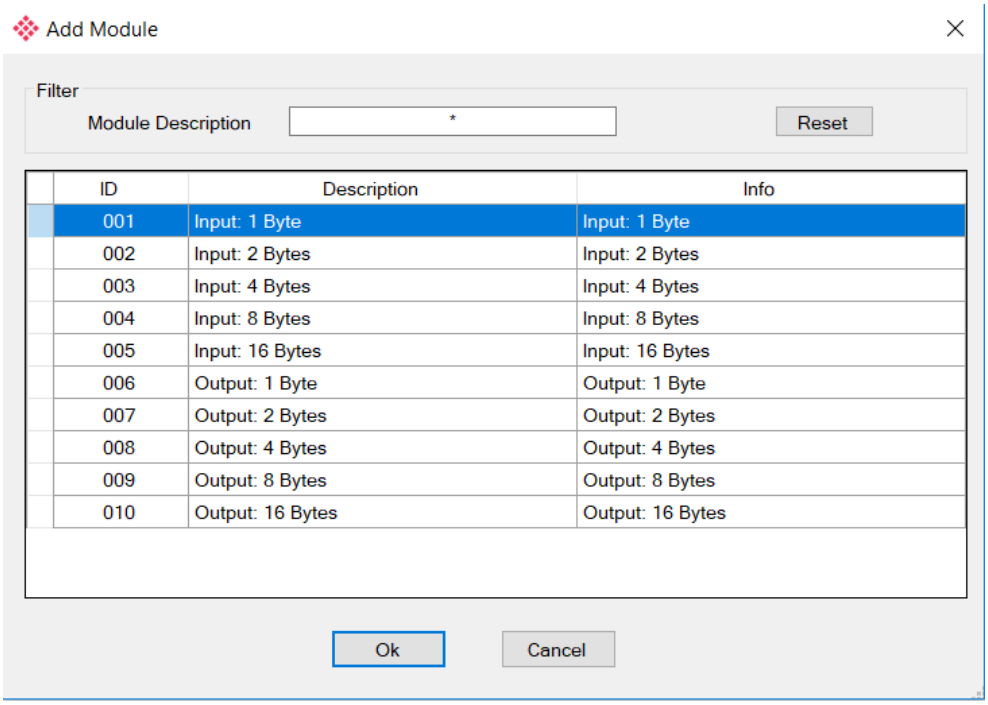


Figure 3.39 – Module Selection

When the module is emulating a legacy device, the Module Selection will appear as follows:

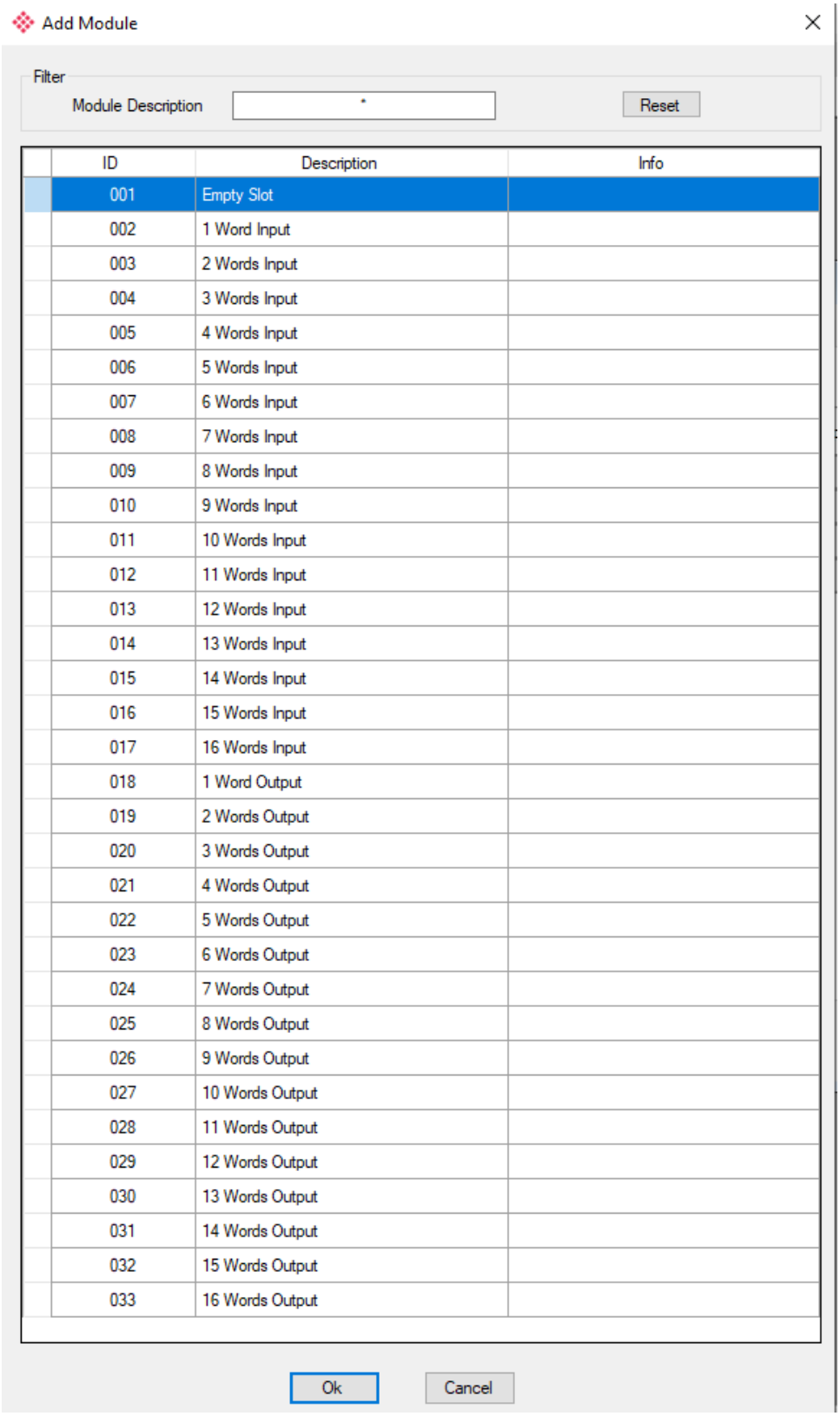


Figure 3.40 – Module Selection (legacy device)

The ***Module Description*** filter can be used in conjunction with the wildcard character ("*****") to easily locate the required module. Once the required module has been selected press the ***Ok*** button.

The module will be added to the Slot configuration. The layout of the slot configuration differs slightly depending on whether Logix or Modbus has been selected as the Primary Interface.

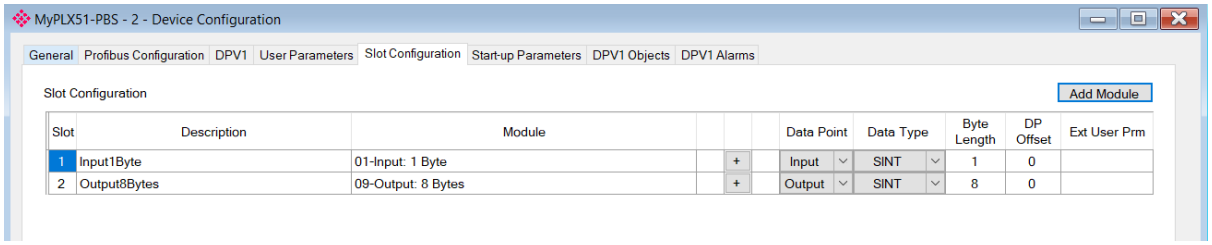


Figure 3.41 – Slot configuration – (Logix)

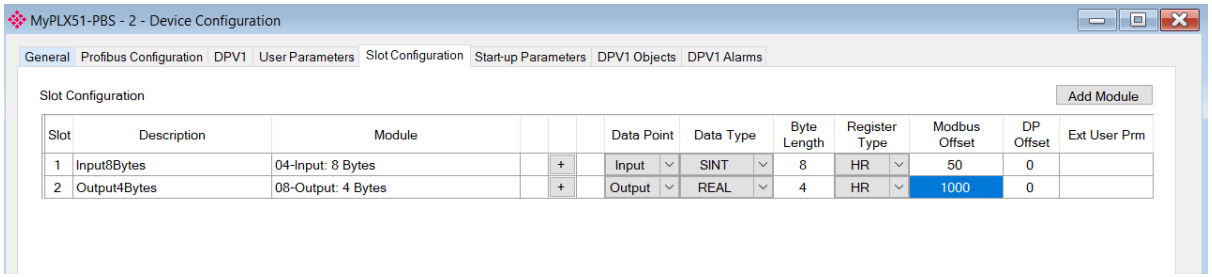


Figure 3.42 – Slot configuration – (Modbus)

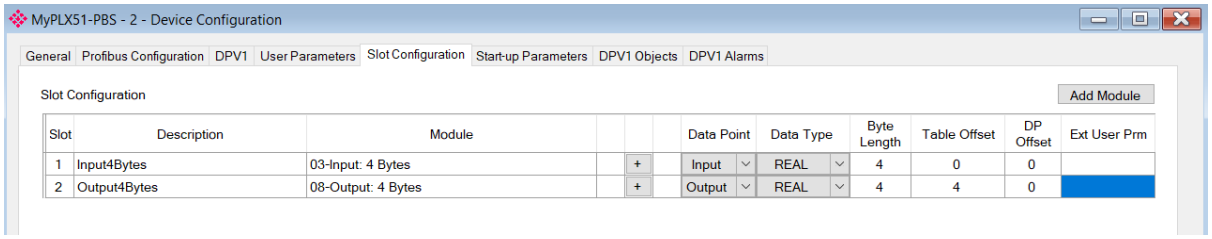


Figure 3.43 – Slot configuration – (Explicit EtherNet/IP)

When the module is emulating a legacy device, the slot configuration for Logix, Modbus, and Explicit EtherNet/IP will appear as follows:

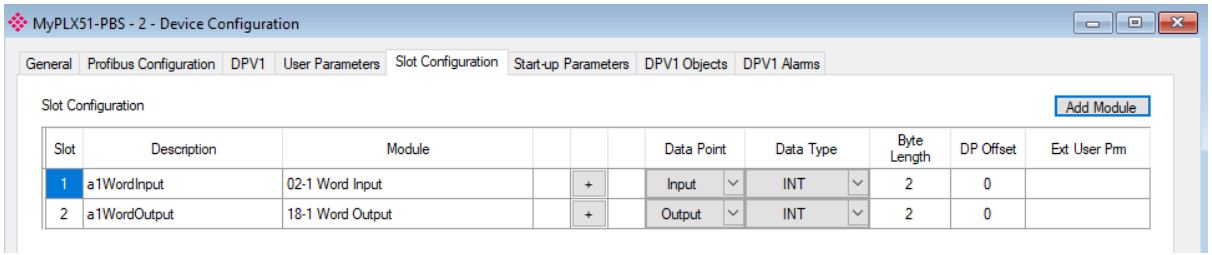


Figure 3.44 – Slot configuration – (Logix) (legacy device)

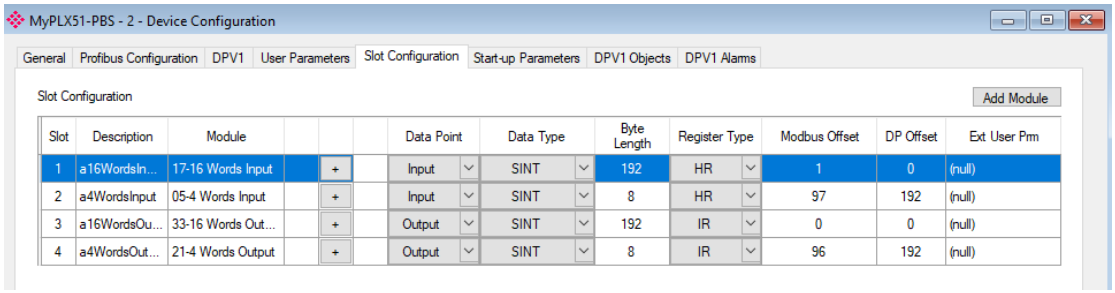


Figure 3.45 – Slot configuration – (Modbus) (legacy device)

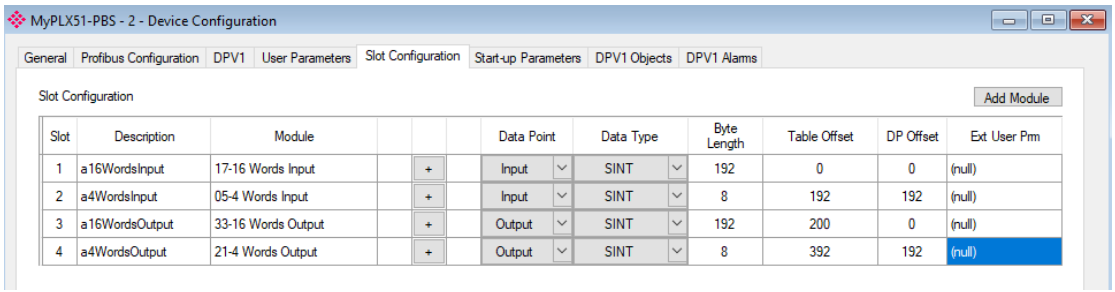


Figure 3.46 – Slot configuration – (Explicit EtherNet/IP) (legacy device)

Slot Configuration - General

Each module added can consist of one or more Data Points. In the example below the module has two Data Points, one Input and one Output.

The description of each is based on the module name (from GSD file) but can be edited by the user. When using Logix this Description is used to create the member of the device-specific UDTs and thus no illegal Logix characters are permitted. It is also important that these descriptions are unique within a device.

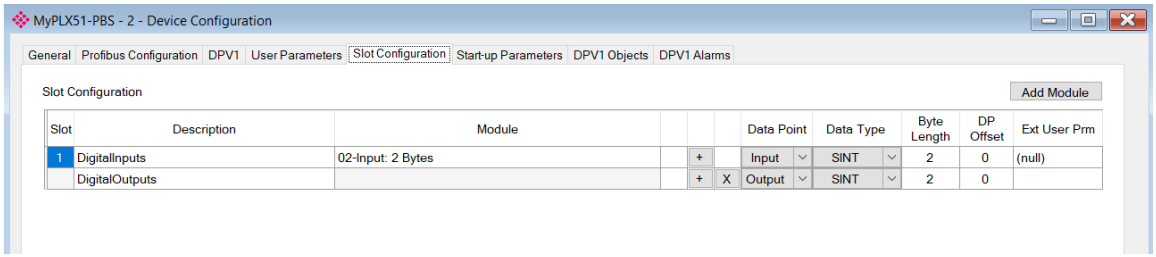


Figure 3.47 – Slot descriptions

When adding a slot, the data format and size will default to that of the selected module in the GSD file.

Formatting the module's data can be achieved by a combination of adding or removing Data Points and changing the Data Type of each.

Data Points can be added by either right-clicking on the module and selecting ***Add Data Point*** or by clicking on the "**+**" button.

Data Points can be removed by either right-clicking on the module and selecting ***Delete Data Point*** or by clicking on the "**X**" button.

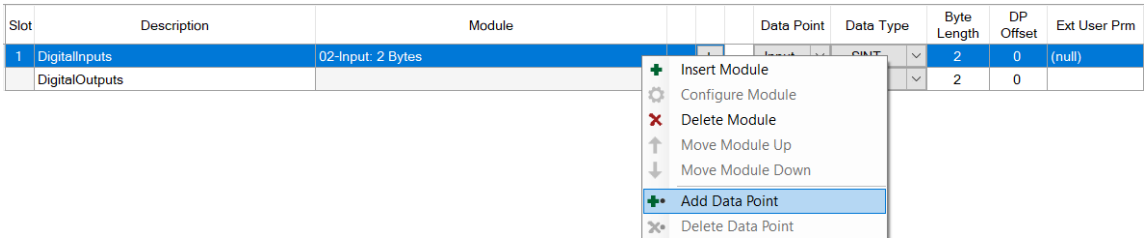


Figure 3.48 – Adding / Removing Data Points

NOTE: Each module must contain at least one Data Point.

After adding a new Data Point, the following should be configured:

- Description
- Data Point Type (Input, Output, None)
- Data Type
- Byte Length

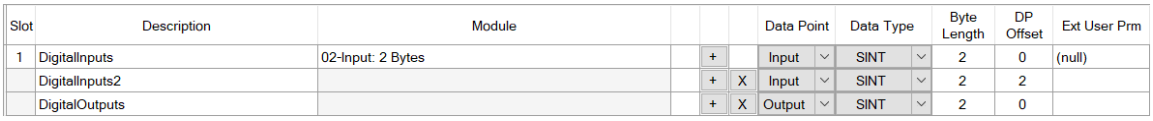


Figure 3.49 – Configuring Data Points

After updating the Data Type, the Byte Length will be set to match the selected Data Type. By modifying the Byte Length thereafter, an array of that Data Type can be configured. It is however important that the Byte Length is always a multiple of the base Data Length.

Table 3.13 – Data Type – Byte Length Restrictions

Data Type	Byte Length MUST be a multiple of:
BOOL	1
SINT	1
INT	2
DINT	4
REAL	4

IMPORTANT: It is critical that the configured Byte Length be a multiple of the base Data Type.

IMPORTANT: It is critical that the total sum of input and output bytes (of all the Data Points) match that required by the slave device. Not adhering to this could cause unexpected results.

NOTE: The DP (Byte) Offset for each the Data Point will be automatically calculated.

Slot Configuration – Logix Specific

When using Logix as the Primary Interface, the PROFIBUS Data Points will be packed and padded to match a device specific UDT. All the Inputs will be collated together and then all the Outputs.

IMPORTANT: It is important that the Data Point Descriptions do not contain any illegal characters and are not duplicated within a device. Failing to do so will create errors when generating and importing the mapping L5X into Studio 5000.

Slot	Description	Module				Data Point	Data Type	Byte Length	DP Offset	Ext User Prm
1	DigitalInputs	02-Input: 2 Bytes		+		Input	SINT	2	0	(null)
	DigitalInputs2			+	X	Input	SINT	2	2	
	DigitalOutputs			+	X	Output	SINT	2	0	

Figure 3.50 – Slot configuration – Logix Example

Slot Configuration – Modbus Specific

When using Modbus as the Primary Interface, it is important to configure the Modbus Register Type and Modbus Offset correctly to ensure that multiple Data Points are not mapped to the same Modbus data area.

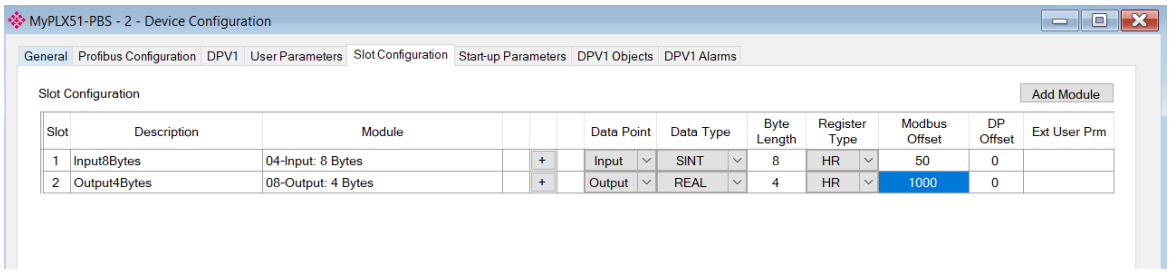


Figure 3.51 – Slot configuration – Modbus Example

IMPORTANT: It is important that the Data Point Register Type and Modbus Offset does not result in multiple Data Points overlapping. Such conflicts will cause unexpected results.

IMPORTANT: It is important that the Data Point Register Type is appropriate for the Data Type, Type (Input/Output) and Modbus interface type (Master/Slave).

IMPORTANT: The range of configured Modbus registers for each register type may not exceed 10,000.

To simplify the Modbus register assignment process, the user can select the ***Assign Modbus from Here*** option, after right-clicking on a particular mapped item. Once the assignment process is complete, all the mapped items below, and including, the selected item will be updated.

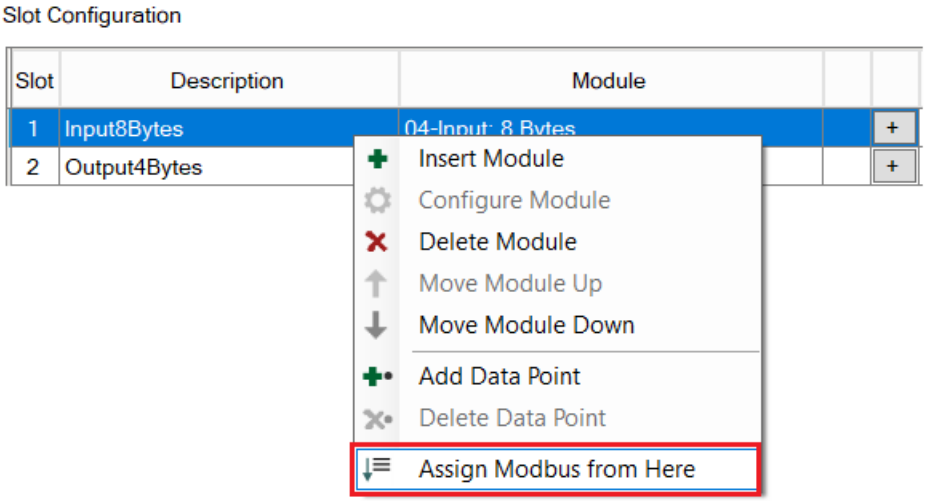


Figure 3.52 – Slot configuration – Selecting Assign Modbus from Here option

After selecting this option, the ***Modbus Assignment*** form will open.

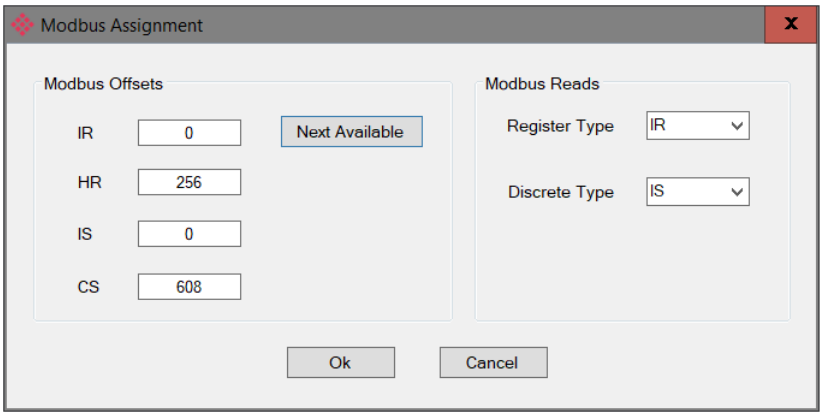


Figure 3.53 – Modbus Assignment

The ***Modbus Offsets*** for each Modbus data type will default to the next available register after the last one referenced. These offsets will be used as the starting registers for the auto-assignment, and can be modified by the user as required.

The ***Next Available*** button, will return the offsets to their default values.

The automatic assignment of registers will take into account the data type of each data point. In the case of Modbus reads, the assigned type could be either an Input Register (IR) or Holding Register (HR) for non-Booleans and either a Digital Input (IS) or Coil (CS) for Booleans.

The user can specify their preference using the ***Register Type*** and ***Discrete Type*** combo box options in the ***Modbus Reads*** section.

Once the ***Ok*** button has been clicked, the Modbus ***Register Type*** and ***Modbus Offset*** for the selected, and subsequent items, will be updated.

Slot Configuration – Explicit EtherNet/IP Specific

When using Explicit EtherNet/IP as the Primary Interface, it is important to configure the Table Offset correctly to ensure that multiple Data Points are not mapped to the same Data Table area.

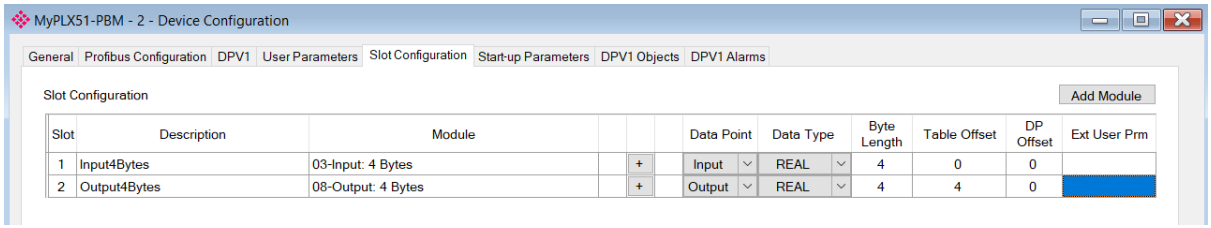
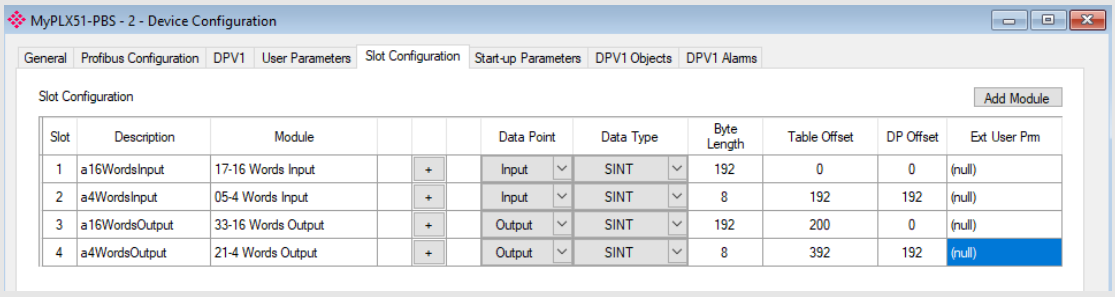


Figure 3.54 – Slot configuration – Explicit EtherNet/IP Example

NOTE: It is important that the Data Point Register Type and Data Table Offset do not result in multiple Data Points overlapping. Such conflicts will cause unexpected results.

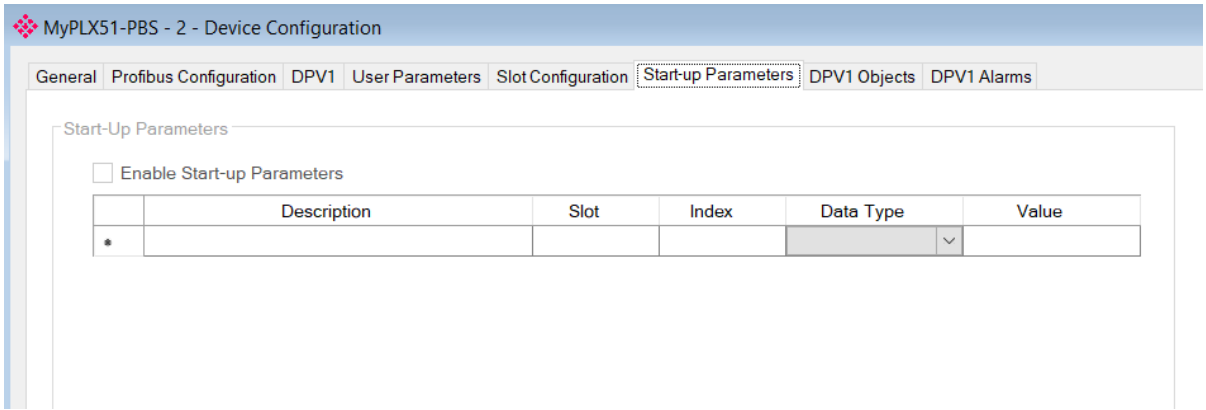
NOTE: The range of configured Data Table Offsets for each register type may not exceed 10,000.

NOTE: In the former xxx, the *Slot Configuration (Modbus)* tab appeared as follows:



3.6.6 Start-up Parameters

PLX51-PBM Master mode only. The device start-up parameter information is shown in the figure below.



3.6.7 DPV1 Objects

The DPV1 Objects configuration tab is shown in the following figure:

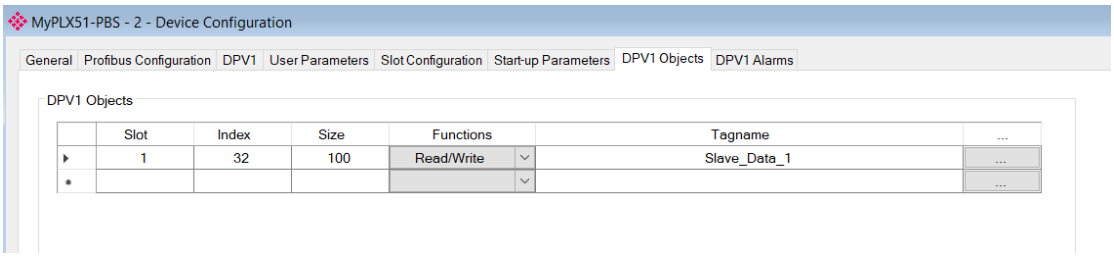


Figure 3.55 – DPV1 Objects configuration parameters – Logix

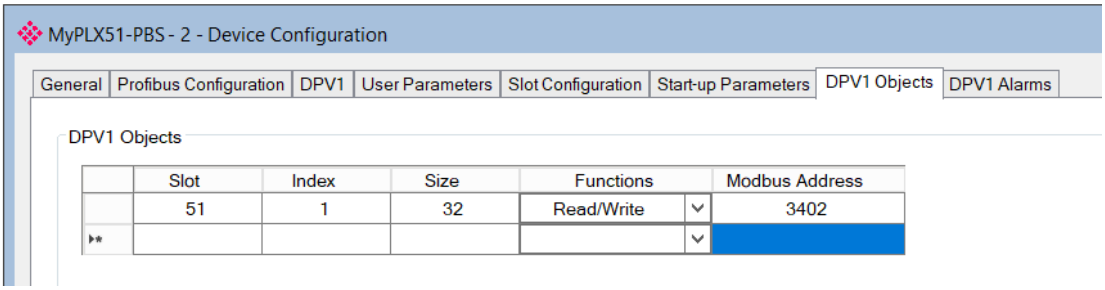


Figure 3.56 – DPV1 Objects configuration parameters – Modbus

The DPV1 configuration consists of the following parameters:

Table 3.14 – DPV1 Objects configuration parameters

Parameter	Description
Slot	The Slot number to which the PROFIBUS DP transaction will be directed.
Index	The Index number to which the PROFIBUS DP transaction will be directed.
Size	The size (bytes) of the transaction.
Functions	The Functions supported by the Slave device for this object: ▪ Read ▪ Write ▪ Read/Write
Tagname	The Logix Tagname where the data will be read / written. (Logix Only)
Modbus Address	The Modbus Holding Register Address where the data will be read / written. (Modbus Only)

The Logix Tagname can be either entered manually or selected using the Logix Tag Browser. The Tag Browser can be launched by clicking on the Browse button (…) adjacent to the Tagname.

NOTE: The logix controller path must be correctly set for the tags to show up in the browser.

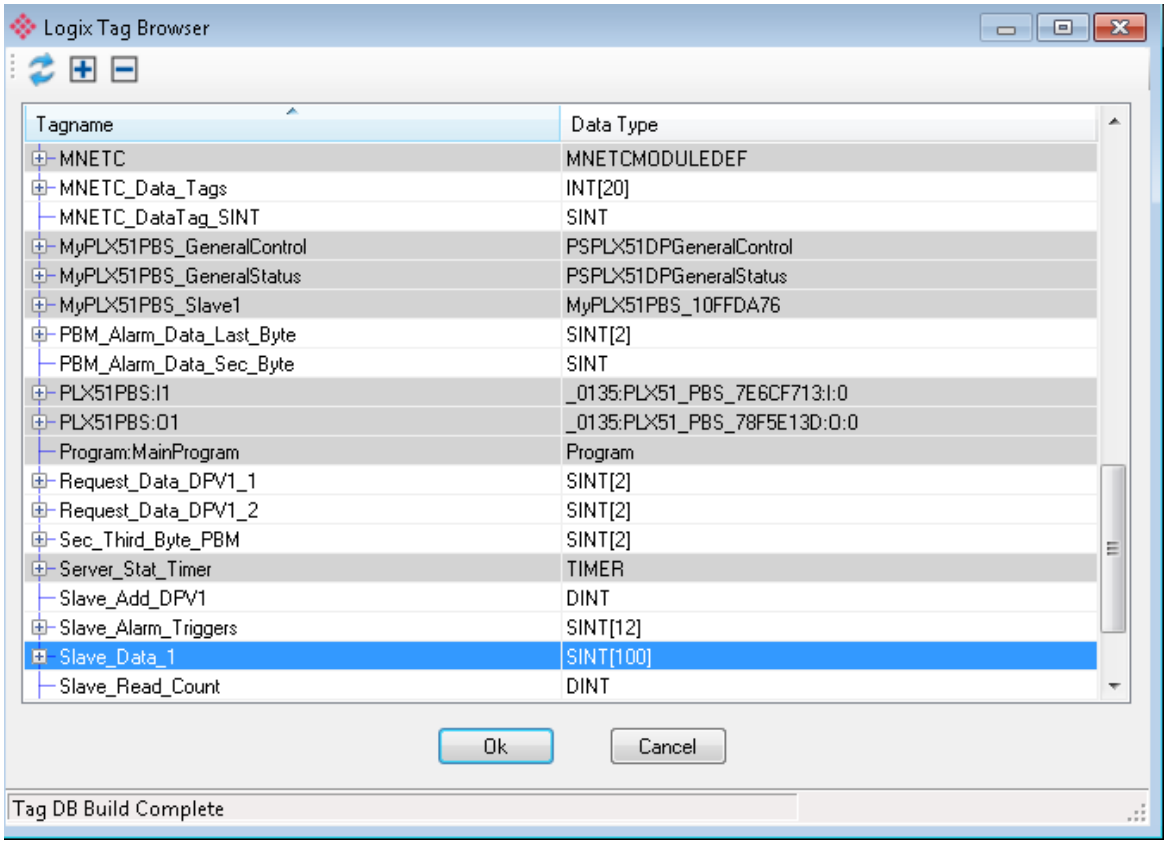


Figure 3.57 – DPV1 Objects Tag Browsing

3.6.8 DPV1 Alarms

The DPV1 Alarms configuration tab is shown in the following figure:

IMPORTANT: The Size of the DPV1 Alarm **must** be greater than 4 or the alarm triggering will not execute.

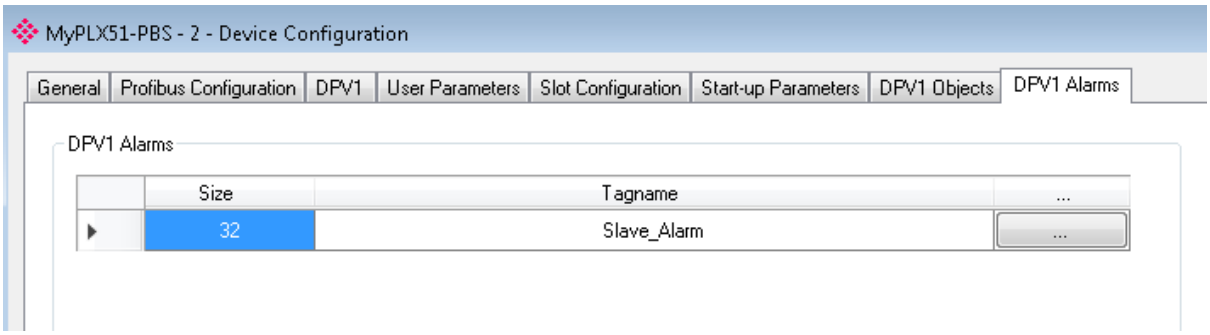


Figure 3.58 – DPV1 Alarms configuration parameters (Logix)

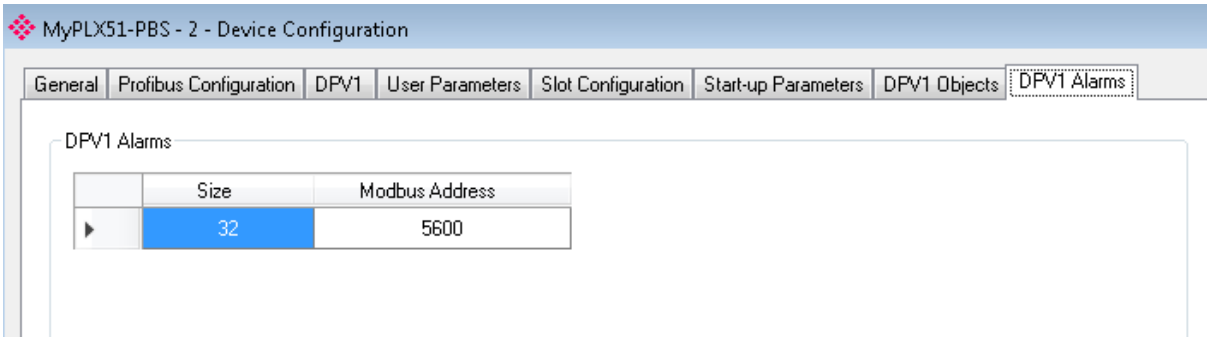


Figure 3.59 – DPV1 Alarms configuration parameters (Modbus)

The DPV1 configuration consists of the following parameters:

Table 3.15 – Device DPV1 Alarms configuration parameters

Parameter	Description
Size	The size (bytes) of the Alarm object.
Tagname	The Logix Tagname from where the alarm data will be read. (Logix Only)
Modbus Address	The Modbus Holding Register Address from where the alarm data will be read. (Modbus Only)

NOTE: The PROFIBUS DP Master connected to the PLX51-PBS will be able to configure the following alarms: Diagnostic Alarm, Process Alarm, Pull Plug Alarm, Status Alarm, Update Alarm, Manufacturer Specific Alarm.

3.7 Module Download

Once the PLX51-PBS configuration is complete, it must be downloaded to the module. The configured IP address of the module is used to connect to the module.

1 To initiate the download, right-click on the module and select the **Download** option.

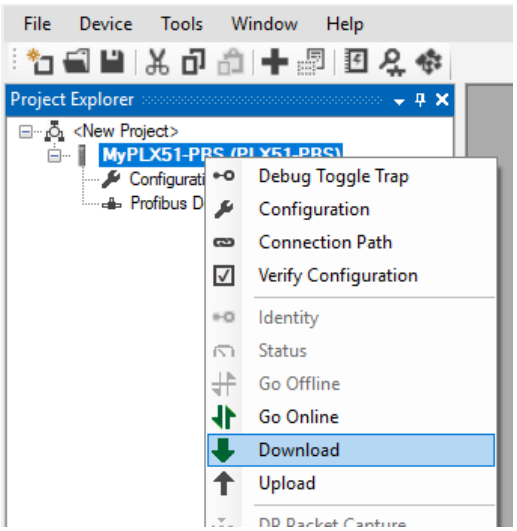


Figure 3.60 - Selecting Download

2 Once complete, you will be notified that the download was successful.

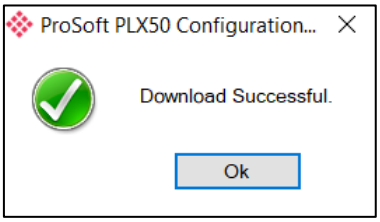


Figure 3.61 - Successful download

3 Within the PLX50 Configuration Utility environment, the module will be in the *Online* state, indicated by the green circle around the module icon. The module is now configured and will start operating immediately.

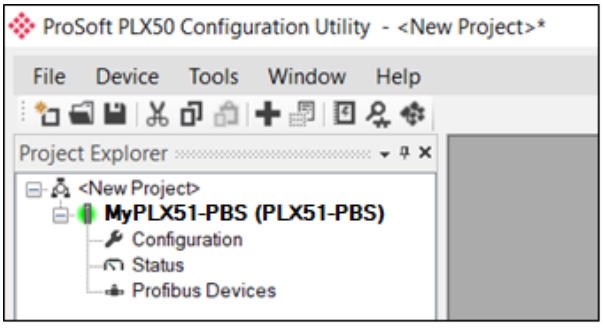


Figure 3.62 - Module online

3.8 Logix Configuration

The PLX51-PBS can be easily integrated with Allen-Bradley Logix family of controllers. Integration with the Logix family in Studio5000 makes use of the EDS Add-On-Profile (AOP) or a Generic Module Profile.

3.8.1 EDS AOP (Logix V21+)

Before the module can be added to the tree the module's EDS file must be registered.

Using RSLinx, the EDS file can be uploaded from the device after which the EDS Hardware Installation tool will be invoked to complete the registration.

Alternatively, the EDS file can be downloaded from the product webpage at www.prosoft-technology.com and registered manually using the EDS Hardware Installation Tool shortcut under the Tools menu in Studio 5000.

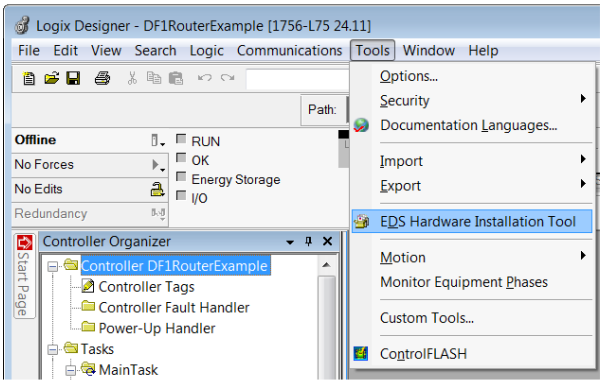


Figure 3.63 - EDS Hardware Installation Utility

After the EDS file has been registered, the module can be added to the Logix IO tree in Studio 5000. Under a suitable Ethernet bridge module in the tree, select the Ethernet network, right-click and select the New Module option.

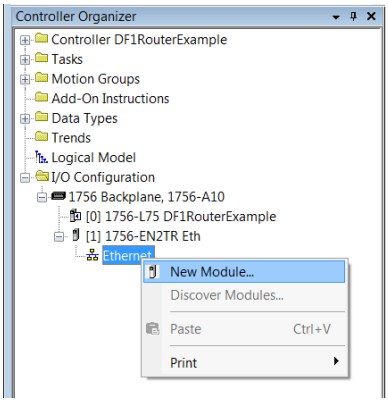


Figure 3.64 – Adding a module

The module selection dialog will open. To find the module more easily, use the Vendor filter to select only the ProSoft Technology modules as shown in the figure below.

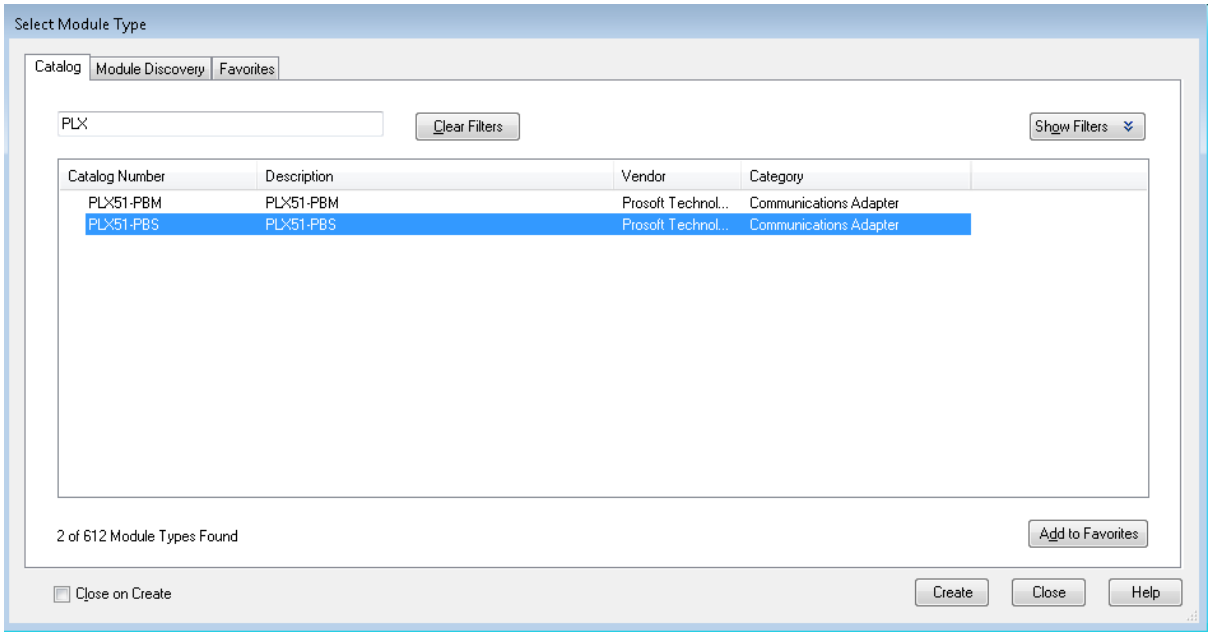


Figure 3.65 – Selecting a module type

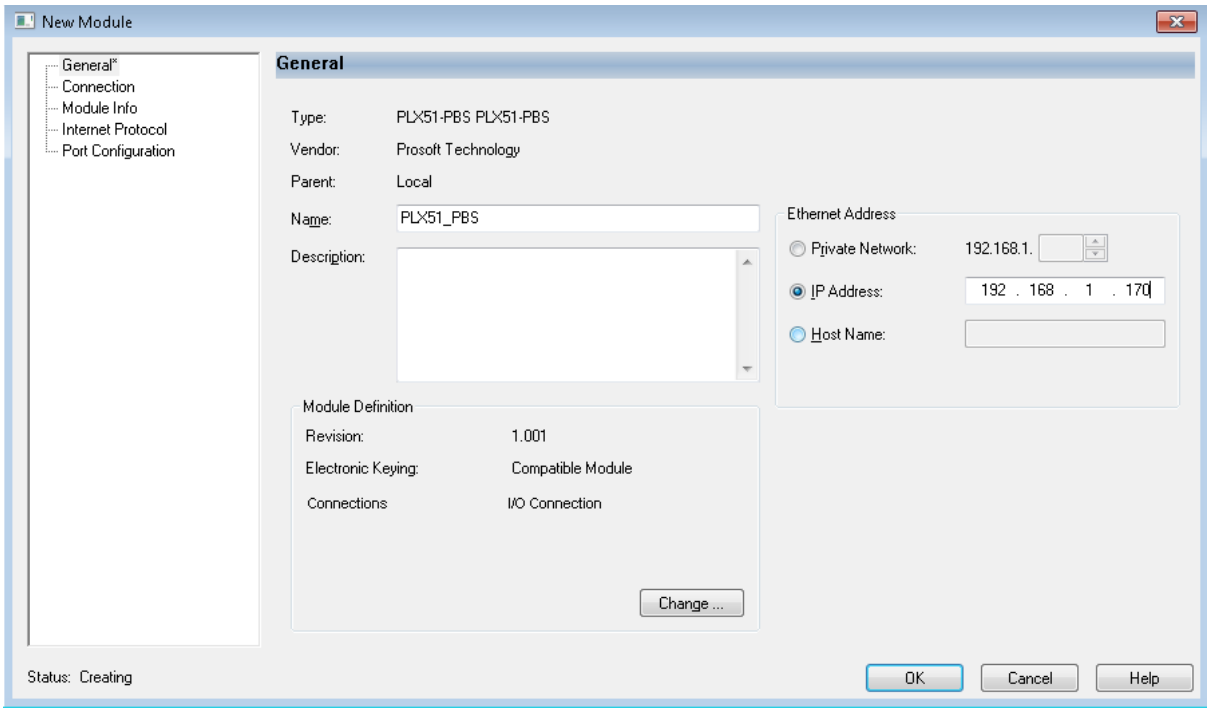


Figure 3.66 – Selecting the module

Locate and select the PLX51-PBS module and select the ***Create*** option. The module configuration dialog will open, where the user must specify the Name and IP address as a minimum to complete the instantiation.

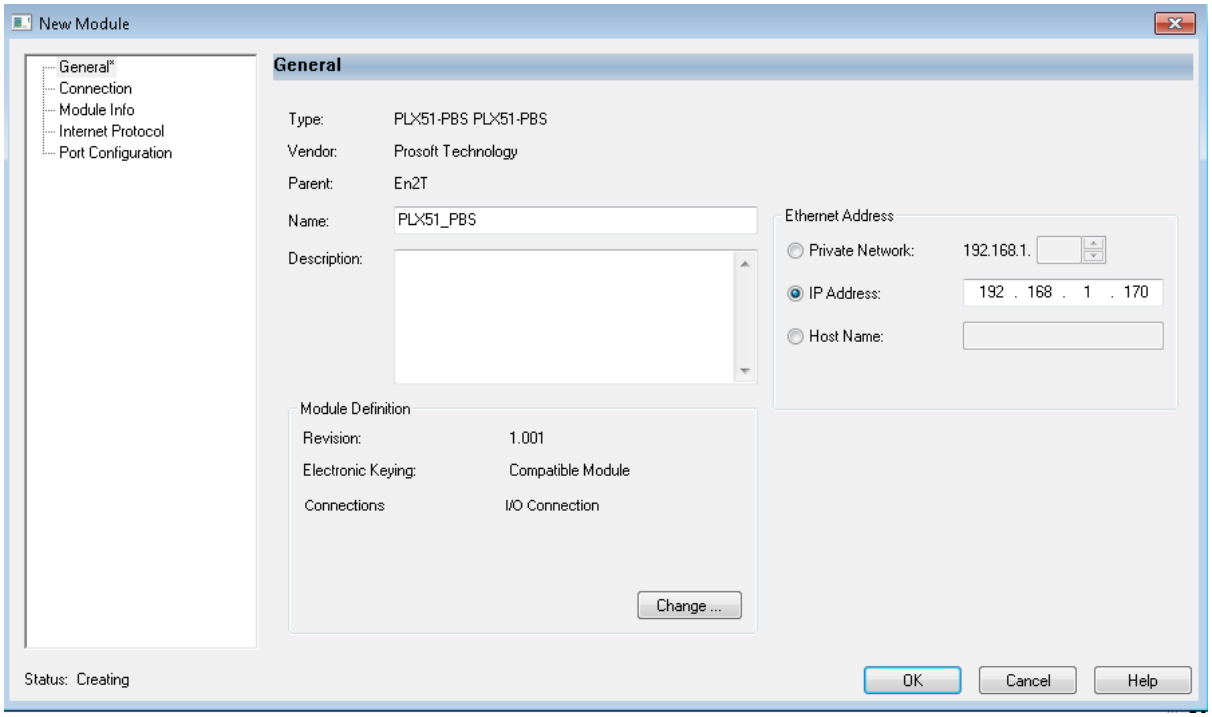


Figure 3.67 – Module instantiation

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

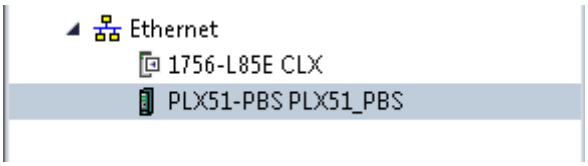


Figure 3.68 – Logix IO tree

The Module Defined Data Types will automatically be created during the instantiation process. These data types provide meaningful structures to the module data. An excerpt of the Input Image is shown in the following figure.

PLX51_PBS:I1	{...}	{.	_0135:PLX51_PBS_7E6CF713:...	
PLX51_PBS:O1	{...}	{.	_0135:PLX51_PBS_78F5E13D:...	
MyPLX51PBS_GeneralControl	{...}	{.	PSPLX51DPGeneralControl	
MyPLX51PBS_GeneralStatus	{...}	{.	PSPLX51DPGeneralStatus	
MyPLX51PBS_Slave1	{...}	{.	MyPLX51PBS_10FFDA76	

Figure 3.69 – Module Defined Data Type

3.8.2 Generic Module Profile (Logix Pre-V21)

IMPORTANT: When using a Generic Module Profile, the user will need to modify the code generated by the PLX50CU to match the single connection profile. To do this the user must remove the connection number from the source and destination tag in the copy blocks (as shown in the example below).

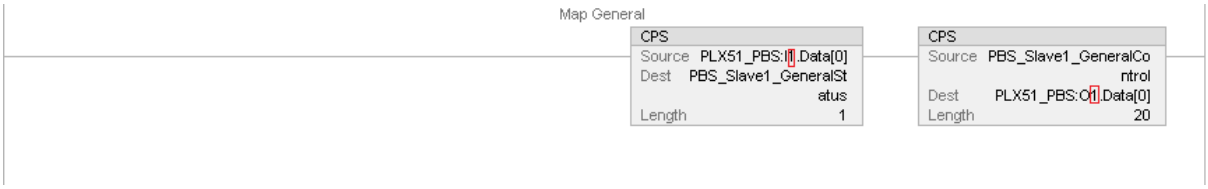


Figure 3.70 – Generated Logix Routine from PLX50CU (highlight connection number)

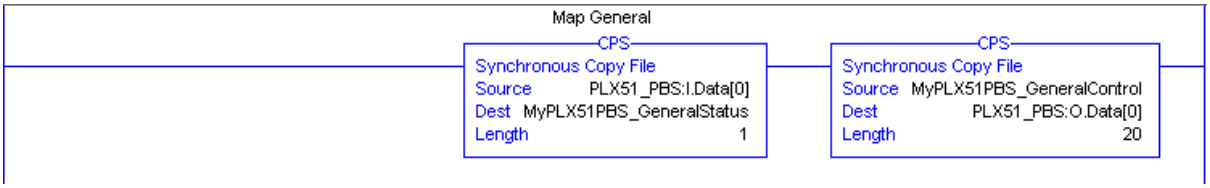


Figure 3.71 – Modified Logix Routine from PLX50CU for Generic Module Profile

When using Logix versions prior to version 21, then the PLX51-PBS module must be added to the RSLogix 5000 I/O tree as a generic Ethernet module. This is achieved by right clicking on the Ethernet Bridge in the RSLogix 5000 and selecting *New Module* after which the *ETHERNET-MODULE* is selected to be added as shown in the figure below.

NOTE: See the next section for importing the configuration (L5X).

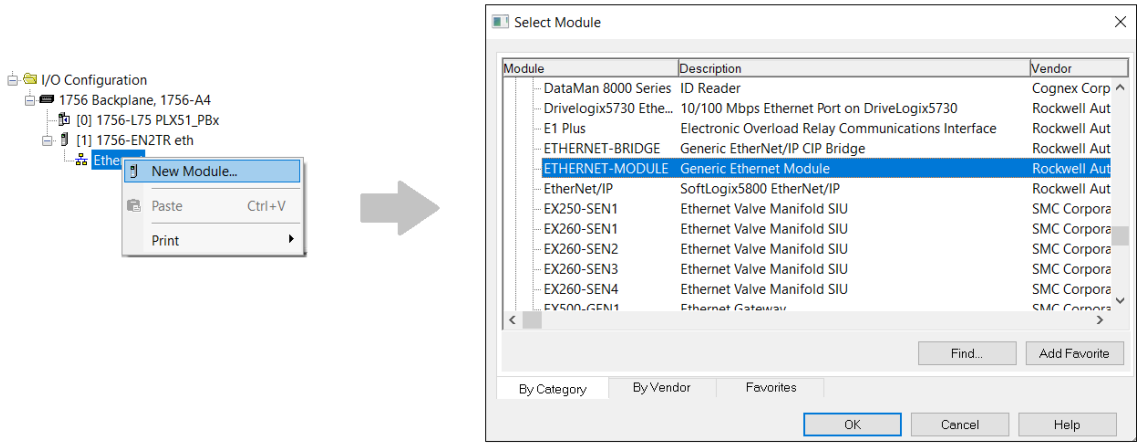


Figure 3.72 - Add a Generic Ethernet Module in RSLogix 5000

The user must enter the IP address of the PLX51-PBS module that will be used. The assembly instance and size must also be added for the input, output, and configuration in the connection parameters section.

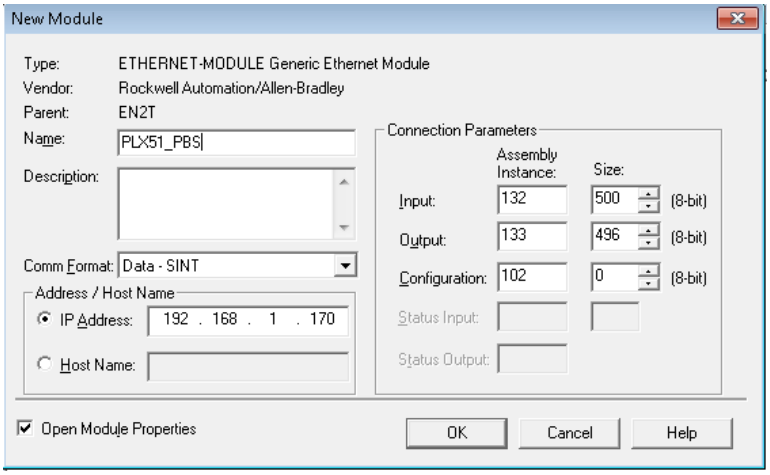


Figure 3.73 - RSLogix 5000 New Module parameters for PLX51-PBS module

The required connection parameters for the PLX51-PBS module are shown below:

Table 3.16 - RSLogix class 1 connection parameters for the PLX51-PBS module

Connection Parameter	Assembly Instance	Size
Input	132	500 (8-bit)
Output	133	496 (8-bit)
Configuration	102	0 (8-bit)

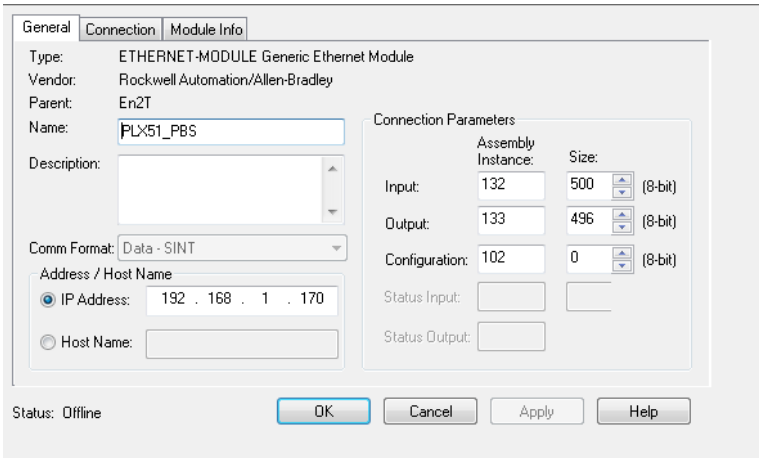


Figure 3.74 - RSLogix 5000 General module properties for PLX51-PBS module

IMPORTANT: The user will need to enter the exact connection parameters before the module will establish a class 1 connection with the Logix controller.

Next, the user needs to add the connection requested packet interval (RPI). This is the rate at which the input and output assemblies are exchanged. Refer to the technical specification section in this document for further details on the limits of the RPI.

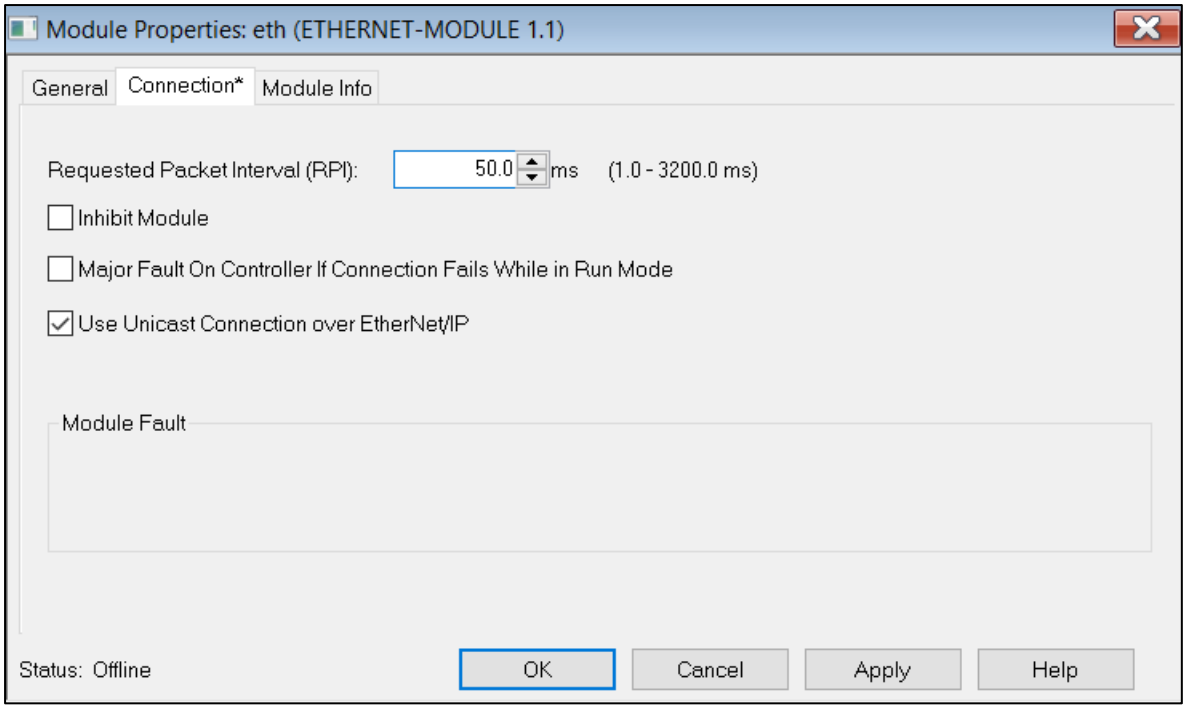


Figure 3.75 - Connection module properties in RSLogix 5000

Once the module has been added to the RSLogix 5000 I/O tree the Logix controller will be ready to connect to the PLX51-PBS with a Class 1 connection.

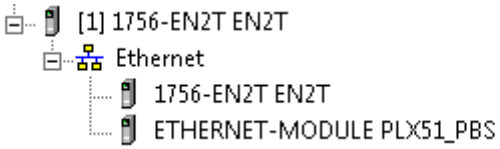


Figure 3.76 – RSLogix 5000 I/O module tree

3.8.3 Multi-Connection

The PLX51-PBS supports up to four Class 1 (cyclic data exchange) connections. This will allow the user to have more field devices per PLX51-PBS because more data can be exchanged between the Logix controller and the PLX51-PBS.

IMPORTANT: This only applies when the user has implemented the PLX51-PBS into Logix using an EDS AOP. When using a Generic Module Profile in Logix (pre-Logix v21) the user will only be able to use 1 Logix Connection.

When the user verifies the PLX50 Configuration Utility project (this is done by right-clicking on the device and selecting *Verify Configuration*), the software will indicate if all the current configuration will fit into the selected EtherNet/IP Connection count. If not, the user will need to increase the connection count.

In the PLX50 Configuration Utility the user can set the number of EtherNet/IP Connections in the Logix tab of the configuration window (as shown below):

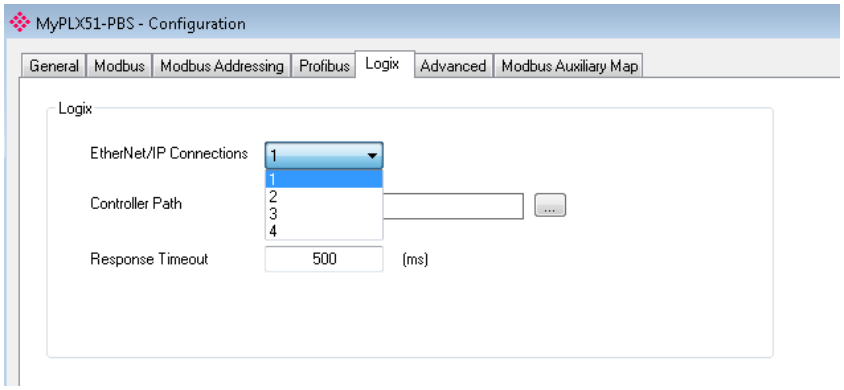


Figure 3.77 – PLX50CU EtherNet/IP Connection Count

In Logix, the user can increase/decrease the connection count using the EDS AOP:

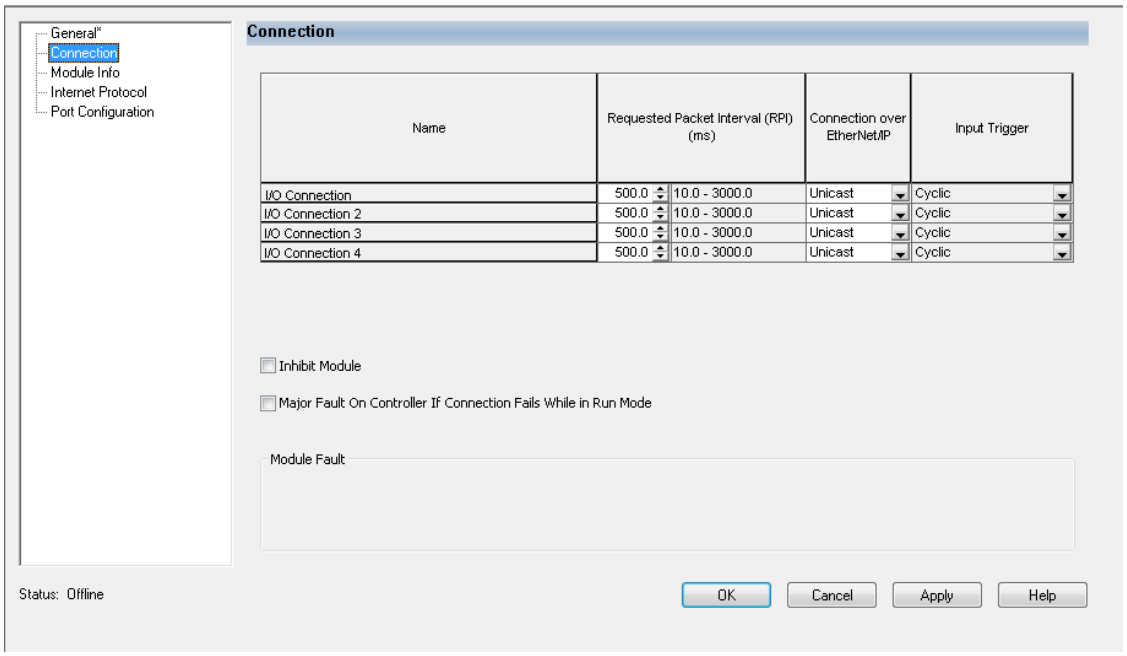


Figure 3.78 – Logix EtherNet/IP Connection Count

3.9 Logix Mapping

The PLX50 Configuration Utility will generate the required UDTs and Routines (based on the PLX51-PBS configuration) to map the required PROFIBUS Slave 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.

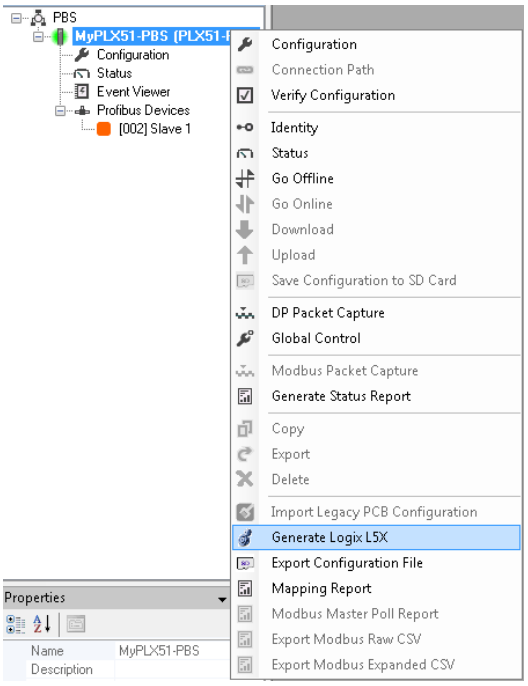


Figure 3.79 – Selecting Generate Logix L5X

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

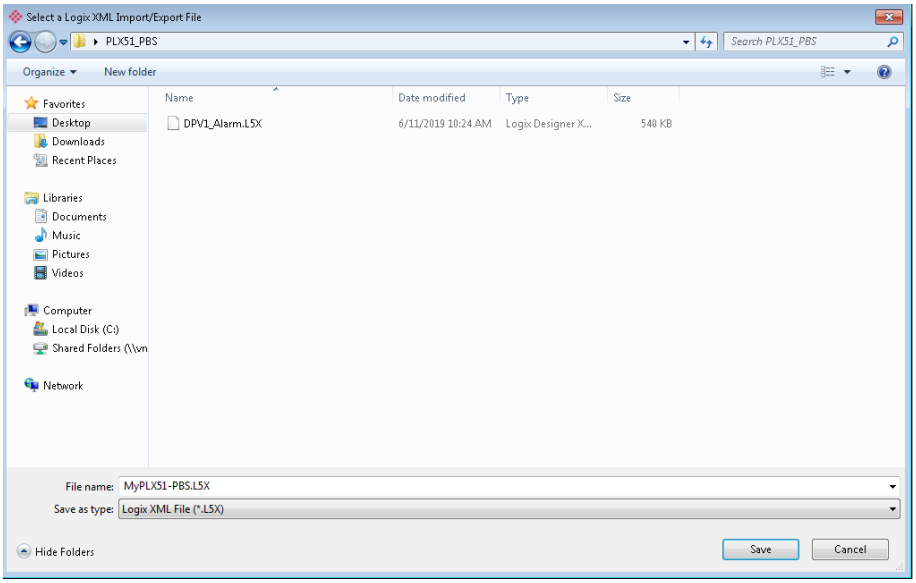


Figure 3.80 – Selecting the Logix L5X file name

This L5X file can now be imported in to the Studio 5000 project by right-clicking on a suitable ***Program*** and selecting ***Add***, and then ***Import Routine***.

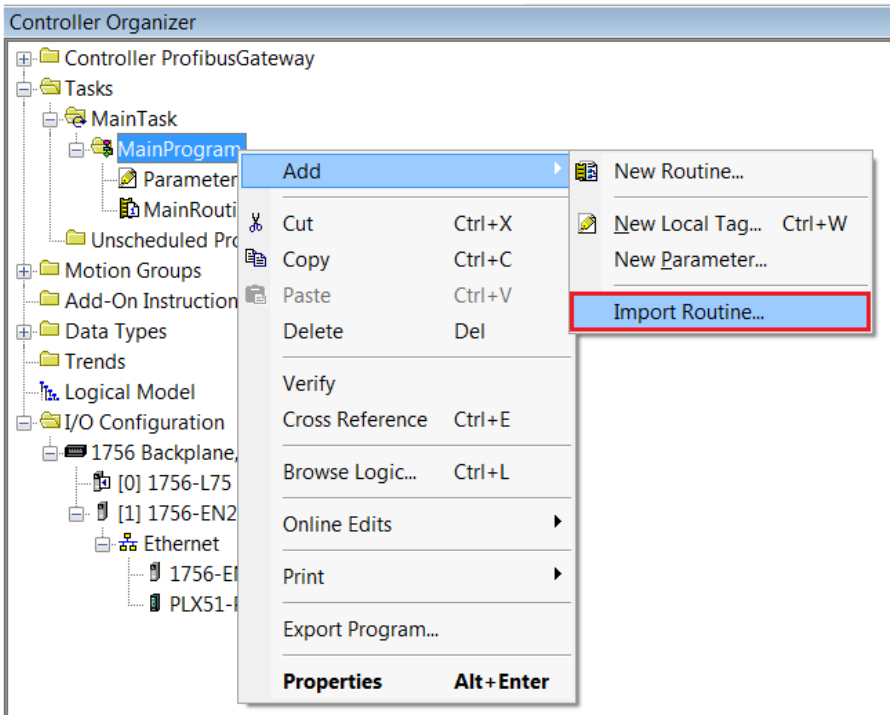


Figure 3.81 – Importing the L5X file into Studio 5000

In the file open dialog select the previously created L5X file and accept the import by pressing **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 3.82 – Calling the mapping routine

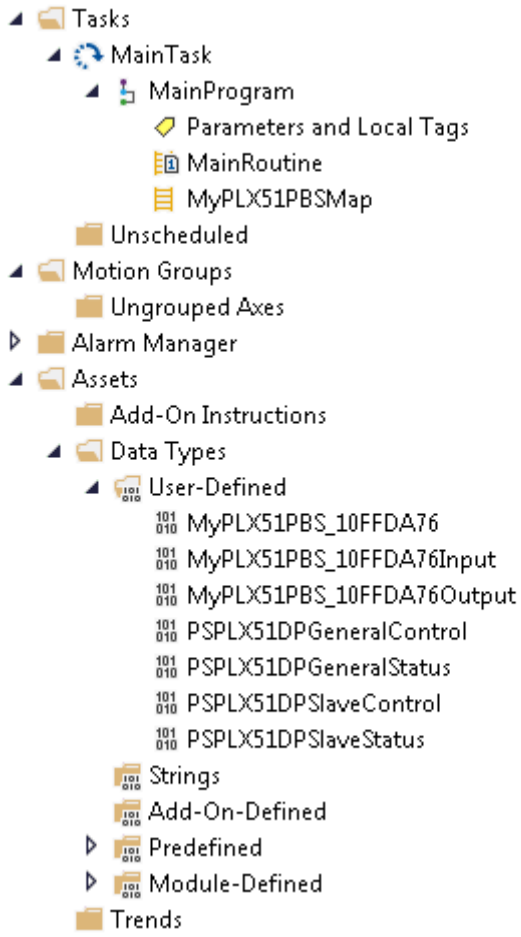


Figure 3.83 – Imported Logix Objects

A number of PLX51 specific (UDT) tags are created.

The General Control tag is used to enable the individual slave devices. The Master Control and Redundancy Control tags are not utilized.

MyPLX51PBS_GeneralControl	{...}	{.		PSPLX51DPGeneralControl
MyPLX51PBS_GeneralControl.MasterControl	0		Decimal	SINT
MyPLX51PBS_GeneralControl.RedundancyControl	0		Decimal	SINT
MyPLX51PBS_GeneralControl.DeviceEnable	{...}	{.	Decimal	BOOL[128]
MyPLX51PBS_GeneralControl.DeviceEnable[0]	0		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[1]	0		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[2]	1		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[3]	0		Decimal	BOOL

Figure 3.84 – General Control tag

The General Status tag displays the status of the PROFIBUS Slave, including arrays to show the LiveList, Data Exchange Active, Alarm and Diagnostic pending status of each slave device.

◢ MyPLX51PBS_GeneralStatus	{...}	{.		PSPLX51DPGeneralStatus
MyPLX51PBS_GeneralStatus.ConfigValid	1		Decimal	BOOL
MyPLX51PBS_GeneralStatus.Owned	1		Decimal	BOOL
MyPLX51PBS_GeneralStatus.DuplicateDPStation	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusFieldbusError	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusDeviceError	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusOffline	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusStopped	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusClear	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusOperational	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.SlaveMode	1		Decimal	BOOL
MyPLX51PBS_GeneralStatus.PLCRun	0		Decimal	BOOL
▷ MyPLX51PBS_GeneralStatus.ConfigCRC	16#647c		Hex	INT
▷ MyPLX51PBS_GeneralStatus.ActiveNodeCount	1		Decimal	SINT
▷ MyPLX51PBS_GeneralStatus.DeviceLiveList	{...}	{.	Decimal	BOOL[128]
▷ MyPLX51PBS_GeneralStatus.DeviceDataExchangeActive	{...}	{.	Decimal	BOOL[128]
▷ MyPLX51PBS_GeneralStatus.DeviceAlarmPendingFlags	{...}	{.	Decimal	BOOL[128]
▷ MyPLX51PBS_GeneralStatus.DeviceDiagnosticPendingFlags	{...}	{.	Decimal	BOOL[128]

Figure 3.85 – General Status tag

There is also a tag created for each configured slave device. The structure of which comprises the following:

- Input Status - Status related to slave device
- Input Data – As specified in the Input Data Points in the Slot configuration
- Output Control – Used to trigger alarms
- Output Data – As specified in the Output Data Points in the Slot configuration

◢ MyPLX51PBS_Slave1.Input	{...}	{.		MyPLX51PBS_10FFDA76Input
◢ MyPLX51PBS_Slave1.Input.Status	{...}	{.		PSPLX51DPSlaveStatus
MyPLX51PBS_Slave1.Input.Status.Online	1		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.DataExchangeActive	1		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.IdentMismatch	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.DisabledByOutputAsse...	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.DeviceError	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.AlarmPending	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.DiagnosticsPending	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.OutputAssemblyNode...	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.MappingCRCMismatch	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.SlaveClearOpMode	0		Decimal	BOOL
MyPLX51PBS_Slave1.Input.Status.SlaveAlarmAck	0		Decimal	BOOL
▷ MyPLX51PBS_Slave1.Input.Status.StationNumber	2		Decimal	SINT
▷ MyPLX51PBS_Slave1.Input.Status.DeviceMappingCRC	16#647c		Hex	INT
▷ MyPLX51PBS_Slave1.Input.Output1Byte	0		Decimal	SINT
◢ MyPLX51PBS_Slave1.Output	{...}	{.		MyPLX51PBS_10FFDA76Output
◢ MyPLX51PBS_Slave1.Output.Control	{...}	{.		PSPLX51DPSlaveControl
▷ MyPLX51PBS_Slave1.Output.Control.StationNumber	2		Decimal	SINT
MyPLX51PBS_Slave1.Output.Control.AlarmTrigger	0		Decimal	BOOL
▷ MyPLX51PBS_Slave1.Output.Control.DeviceMappingCRC	16#647c		Hex	INT

Figure 3.86 – Slave Device-Specific tag

4 SD Card

The PLX51-PBS supports an SD Card (see below) that can be used for disaster recovery. The SD Card can be pre-loaded with the required firmware and/or application configuration.

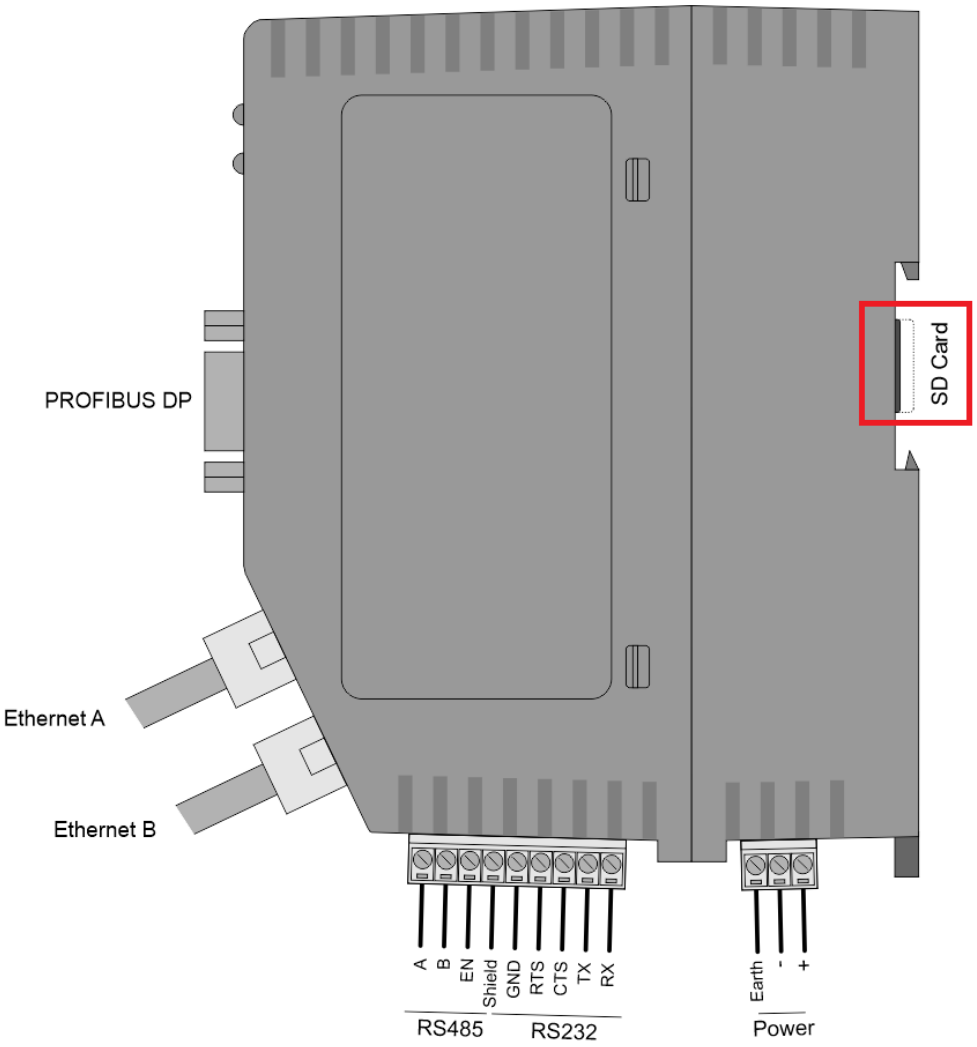


Figure 4.1 – Module Side View – SD Card Slot

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

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

4.1 Firmware

The user can copy the required firmware (which can be downloaded from the ProSoft website) onto the root directory of the SD Card.

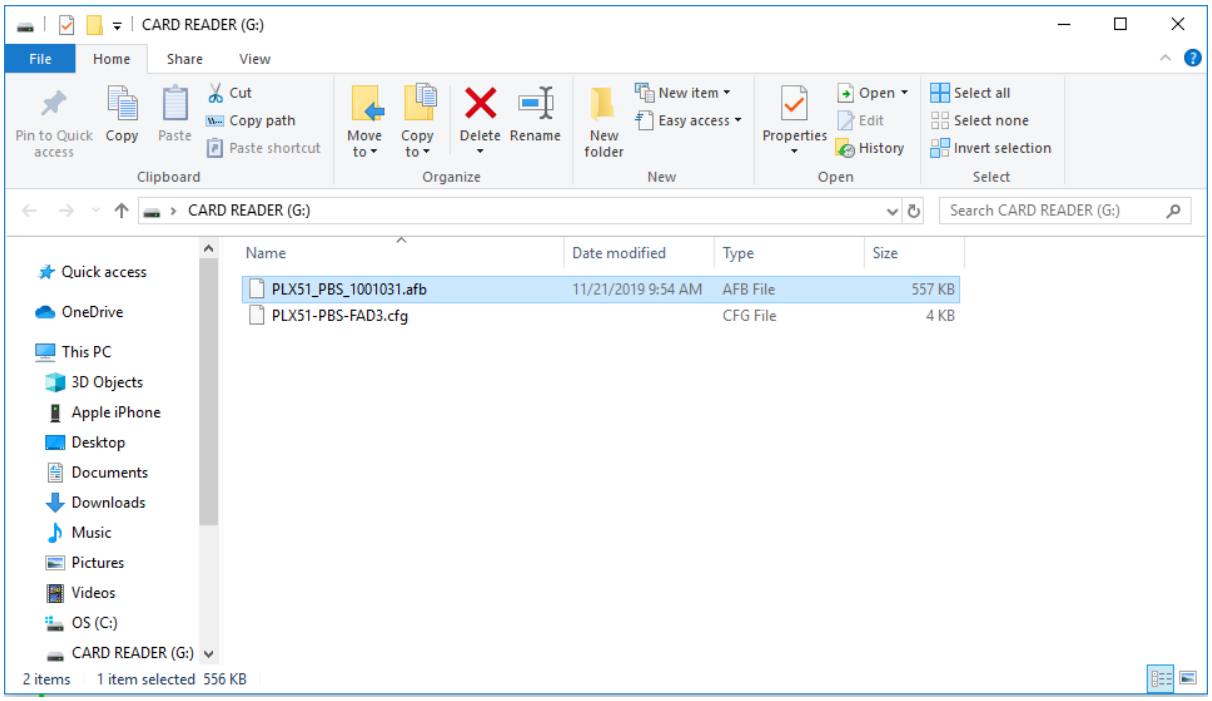


Figure 4.2 – SD Card – Firmware file

IMPORTANT: The filename must not be changed.

IMPORTANT: If more than one firmware file is present on the SD card, with different firmware revisions, it can cause the module to constantly upgrade the firmware.

If a faulty module is replaced, the user can insert the SD Card (containing the firmware file) into the new module. While the module is booting, it detects 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 on the SD Card.

4.2 Configuration

The user can add the configuration file to the SD Card root directory in one of two ways: Manually or PLX50 Configuration Utility.

During boot-up, the module will determine if the configuration on the SD card is different than the module's current configuration (or no configuration). If it is different, the configuration from the SD card will be downloaded into the module's non-volatile memory.

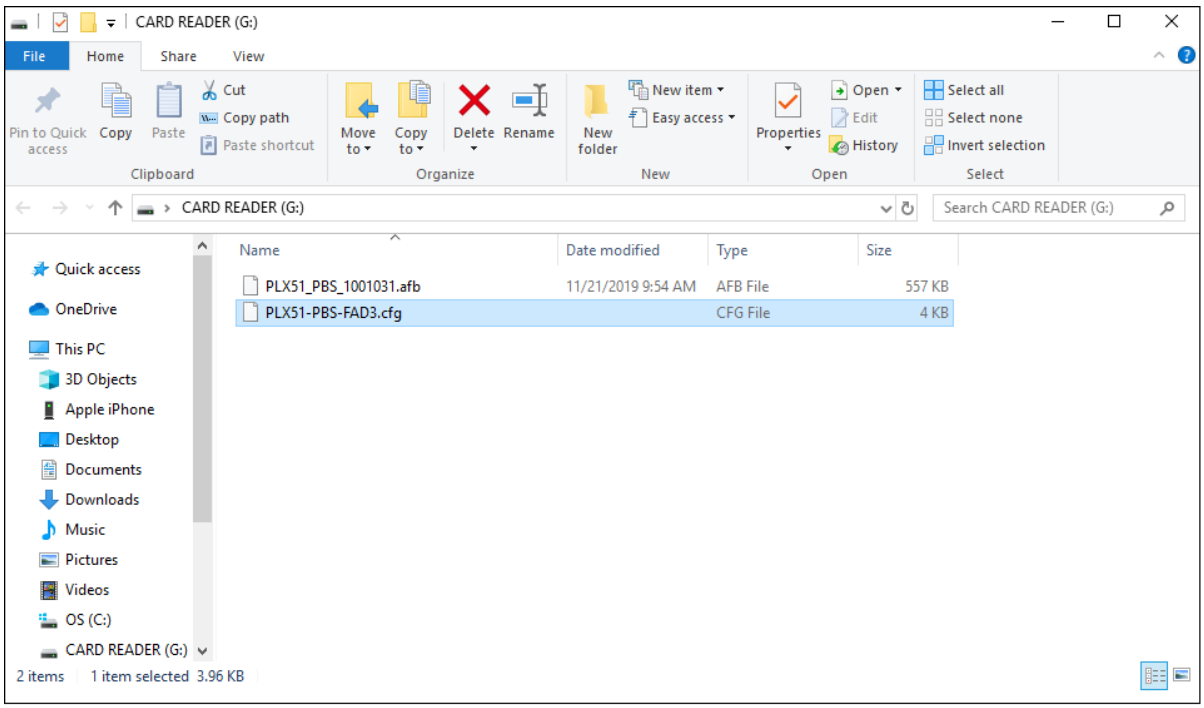


Figure 4.3 – SD Card – Configuration file

4.2.1 Manual Copy

Once the user has configured the application in the PLX50 Configuration Utility, the user can copy this file into the root directory of the SD Card.

Right-Click on the **PLX51-PBS** icon and select **EXPORT CONFIGURATION FILE**.

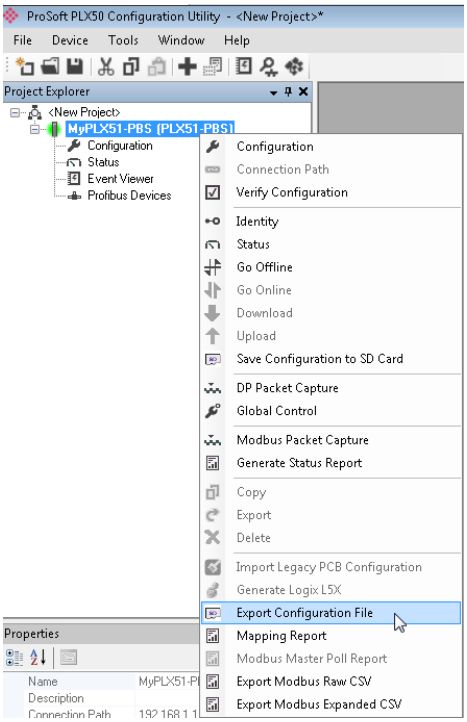


Figure 4.4 – Configuration Export for SD Card

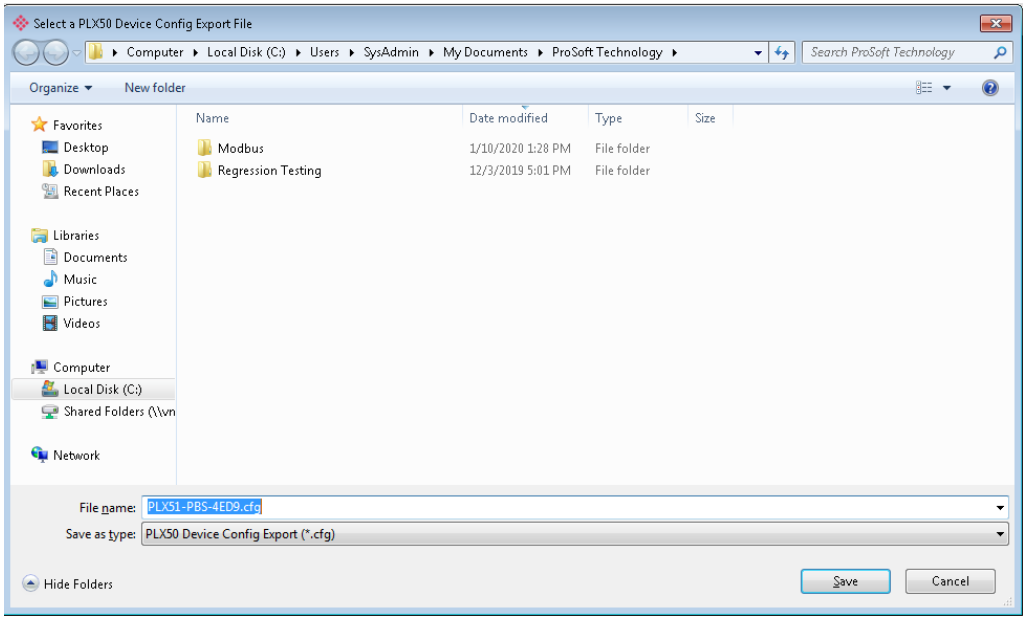


Figure 4.5 – Configuration Export for SD Card

IMPORTANT: The filename of the configuration file must not be changed.

IMPORTANT: If more than one configuration file, with different configuration signatures, is on the SD Card then only the last configuration will be used.

4.2.2 PLX50 Configuration Utility

When the SD Card has been inserted into the module and the user is online in PLX50 Configuration Utility, the user can directly upload the configuration onto the SD Card.

Right-Click on the PLX51-PBS icon and select SAVE CONFIGURATION TO SD CARD.

This copies the configuration from the module directly to the SD Card.

IMPORTANT: All other configuration files in the SD Card root directory will be deleted.

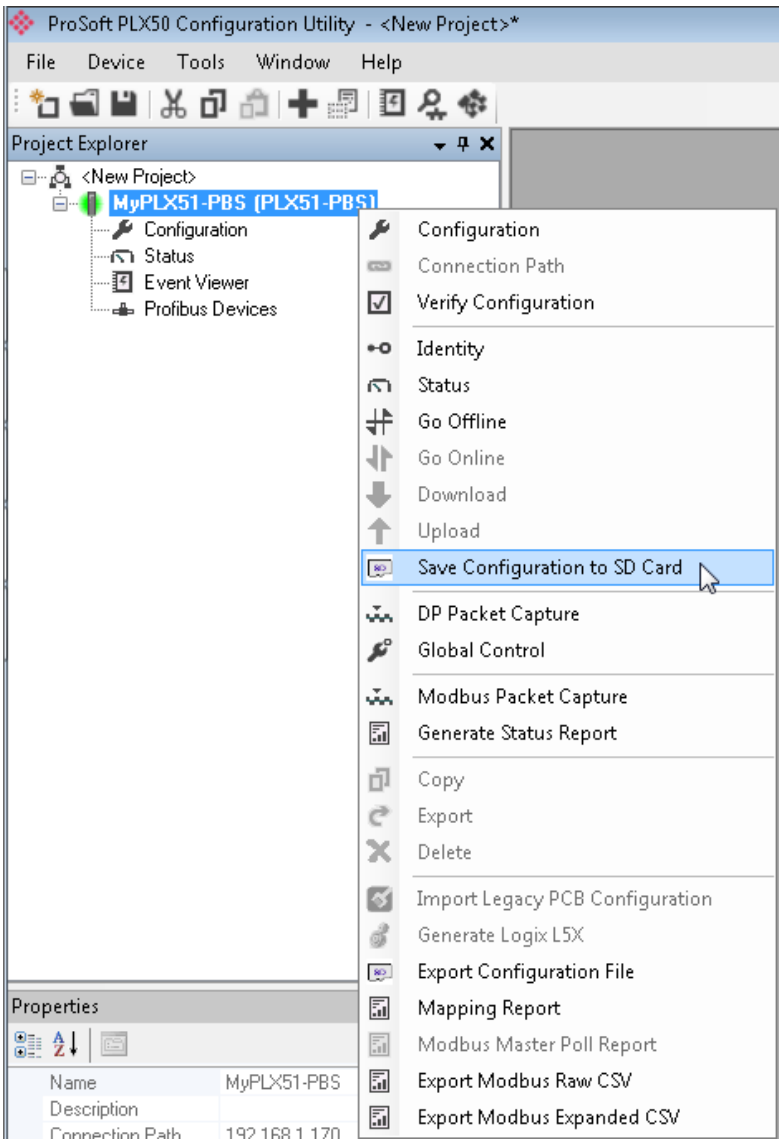


Figure 4.6 – Save Configuration to SD Card

5 Operation

5.1 Logix Operation

The PLX51-PBS can exchange data with a Logix controller by establishing a Class 1 connection.

5.1.1 PROFIBUS DP - Slave

IMPORTANT: The imported Logix routine (generated by the PLX50 Configuration Utility) copies the module's input and output assembly of each connection to the structured input and output assemblies.

General Status

Below are the definitions for the tags in the General Status UDT created by the PLX50CU.

◢ MyPLX51PBS_GeneralStatus	{...}	{.		PSPLX51DPGeneralStatus
MyPLX51PBS_GeneralStatus.ConfigValid	1		Decimal	BOOL
MyPLX51PBS_GeneralStatus.Owned	1		Decimal	BOOL
MyPLX51PBS_GeneralStatus.DuplicateDPStation	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusFieldbusError	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusDeviceError	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusOffline	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusStopped	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusClear	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.ProfibusOperational	0		Decimal	BOOL
MyPLX51PBS_GeneralStatus.SlaveMode	1		Decimal	BOOL
MyPLX51PBS_GeneralStatus.PLCRun	0		Decimal	BOOL
▷ MyPLX51PBS_GeneralStatus.ConfigCRC	16#647c		Hex	INT
▷ MyPLX51PBS_GeneralStatus.ActiveNodeCount	1		Decimal	SINT
▷ MyPLX51PBS_GeneralStatus.DeviceLiveList	{...}	{.	Decimal	BOOL[128]
▷ MyPLX51PBS_GeneralStatus.DeviceDataExchangeActive	{...}	{.	Decimal	BOOL[128]
▷ MyPLX51PBS_GeneralStatus.DeviceAlarmPendingFlags	{...}	{.	Decimal	BOOL[128]
▷ MyPLX51PBS_GeneralStatus.DeviceDiagnosticPendingFlags	{...}	{.	Decimal	BOOL[128]

Figure 5.1 – Logix General Status tags

Table 5.1 – Logix General Status tags

Tag	Description
ConfigValid	Configuration has been downloaded to the PLX51-PBS and is being executed. 1 – PLX51-PBS has been successfully configured. 0 – PLX51-PBS is not configured.
Owned	Indicates if the PLX51-PBS is owned by a Logix Controller with a connection count similar to what has been configured in PLX50CU. 1 – PLX51-PBS is connected. 0 – PLX51-PBS is not connected.
DuplicateDPStation	N/A. PLX51-PBM only.
PROFIBUSFieldbusError	There is a PROFIBUS network issues (e.g. cable unplugged, under/over terminated, etc.).

	1 – Fieldbus error detected. 0 – Normal (No errors detected).
PROFIBUSDeviceError	At least one slave device has a communication issue (e.g. offline, not exchanging process data, etc.) 1 – Device error detected. 0 – Normal (No errors detected).
PROFIBUSOffline	N/A. For PLX51-PBM only.
PROFIBUSStopped	N/A. For PLX51-PBM only.
PROFIBUSClear	N/A. For PLX51-PBM only.
PROFIBUSOperational	N/A. For PLX51-PBM only.
SlaveMode	When in Slave mode the PLX51-PBS will emulate multiple PROFIBUS Slave devices. 1 – The PLX51-PBS is in Slave Mode. 0 – The PLX51-PBS is **not** in Slave Mode.
ConfigCRC	The signature of the configuration currently executing on the module.
DeviceListList	Indicates the nodes that are online on the local PROFIBUS network. Each bit represents a node. When the specific bit is set ‘1’ then the device is online and when the bit is off ‘0’ the device is not on the PROFIBUS network. Bit 0 – Node 0 Online Bit 1 – Node 1 Online Bit 126 – Node 126 Online
DeviceDataExchangeActive	Indicates the nodes that are online and exchanging DPV0 data on the local PROFIBUS network. Each bit represents a node. When the specific bit is set ‘1’ then the device is online and exchanging data and when the bit is off ‘0’ the device is not exchanging data on the PROFIBUS network. Bit 0 – Node 0 Exchanging DPV0 Data Bit 1 – Node 1 Exchanging DPV0 Data Bit 126 – Node 126 Exchanging DPV0 Data
DeviceAlarmPendingFlags	Indicates the nodes that have an alarm pending on the local PROFIBUS network. Each bit represents a node. When the specific bit is set ‘1’ then the device has an alarm pending that must be unloaded and when the bit is off ‘0’ the device does not have an alarm pending. Bit 0 – Node 0 has an alarm pending Bit 1 – Node 1 has an alarm pending Bit 126 – Node 126 has an alarm pending
DeviceDiagnosticPendingFlags	Indicates the nodes that have diagnostics pending on the local PROFIBUS network. Each bit represents a node. When the specific bit is set ‘1’ then the device has diagnostics pending that must be unloaded and when the bit is off ‘0’ the device does not have any diagnostics pending. Bit 0 – Node 0 has diagnostics pending Bit 1 – Node 1 has diagnostics pending Bit 126 – Node 126 has diagnostics pending

General Control

Each configured Slave is enabled by setting the correct enable bit in the Logix output assembly. Once the respective bit has been set in the *DeviceEnable* BOOL array, the PLX51-PBS becomes "alive" on the PROFIBUS network, and will start responding to a PROFIBUS DP Master.

◢ MyPLX51PBS_GeneralControl	{...}	{...}		PSPLX51DPGeneralC...
▷ MyPLX51PBS_GeneralControl.MasterControl	0		Decimal	SINT
▷ MyPLX51PBS_GeneralControl.RedundancyControl	0		Decimal	SINT
◢ MyPLX51PBS_GeneralControl.DeviceEnable	{...}	{...}	Decimal	BOOL[128]
MyPLX51PBS_GeneralControl.DeviceEnable[0]	0		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[1]	0		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[2]	1		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[3]	1		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[4]	1		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[5]	1		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[6]	1		Decimal	BOOL
MyPLX51PBS_GeneralControl.DeviceEnable[7]	1		Decimal	BOOL

Figure 5.2 – General Control tags

Table 5.2 – General Control tags

Tag	Description
MasterControl	N/A (For PLX51-PBM only)
RedundancyControl	Reserved.
DeviceEnable[x]	These bits enable nodes on the PROFIBUS network for data exchange. Each bit represents a node. When the bit is set '1', the device (if configured) will exchange data with the PROFIBUS DP Master. When the bit is set '0', the device does exchange data with the PROFIBUS DP Master. Bit 0 – Node 0 is enabled for data exchange Bit 1 – Node 1 is enabled for data exchange Bit 126 – Node 126 is enabled for data exchange

Monitoring faults (e.g. configured device not found) can be done by viewing the LEDs of the PLX51-PBS (see the *Diagnostics* section for more details), by going online in the PLX50 Configuration Utility and viewing the PLX51-PBS Slave and Device Diagnostics, or by viewing the input assembly of the PLX51-PBS in Logix.

Status and DPV0 Data Exchange

The DPV0 data is exchanged with Logix using the Class 1 EtherNet/IP connection. The device-specific tag contains all the input and output data fields, as well as important control and status information.

◢ MyPLX51PBS	{...}	{...}		MyPLX51PBS_10FFDA...
◢ MyPLX51PBS.Input	{...}	{...}		MyPLX51PBS_10FFDA...
◢ MyPLX51PBS.Input.Status	{...}	{...}		PSPLX51DPSlaveStatus
MyPLX51PBS.Input.Status.Online	1		Decimal	BOOL
MyPLX51PBS.Input.Status.DataExchangeActive	1		Decimal	BOOL
MyPLX51PBS.Input.Status.IdentMismatch	0		Decimal	BOOL
MyPLX51PBS.Input.Status.DisabledByOutputAssembly	0		Decimal	BOOL
MyPLX51PBS.Input.Status.DeviceError	0		Decimal	BOOL
MyPLX51PBS.Input.Status.AlarmPending	0		Decimal	BOOL
MyPLX51PBS.Input.Status.DiagnosticsPending	0		Decimal	BOOL
MyPLX51PBS.Input.Status.OutputAssemblyNodeAddrMismatch	0		Decimal	BOOL
MyPLX51PBS.Input.Status.MappingCRCMismatch	0		Decimal	BOOL
MyPLX51PBS.Input.Status.SlaveClearOpMode	0		Decimal	BOOL
MyPLX51PBS.Input.Status.SlaveAlarmAck	0		Decimal	BOOL
▷ MyPLX51PBS.Input.Status.StationNumber	2		Decimal	SINT
▷ MyPLX51PBS.Input.Status.DeviceMappingCRC	16#63aa		Hex	INT
▷ MyPLX51PBS.Input.Output1Byte	5		Decimal	SINT
◢ MyPLX51PBS.Output	{...}	{...}		MyPLX51PBS_10FFDA...
◢ MyPLX51PBS.Output.Control	{...}	{...}		PSPLX51DPSlaveCont...
▷ MyPLX51PBS.Output.Control.StationNumber	2		Decimal	SINT
MyPLX51PBS.Output.Control.AlarmTrigger	0		Decimal	BOOL
▷ MyPLX51PBS.Output.Control.DeviceMappingCRC	16#63aa		Hex	INT
▷ MyPLX51PBS.Output.Input1Byte	0		Decimal	SINT

Figure 5.3 – PLX51-PBS Slave Device-Specific tag

Table 5.3 – Device Input tags

Tag	Description
PLX51PBS.Input.Status.	
Online	This bit indicates if the device is online on the PROFIBUS network. 1 – Device is online 0 – Device is not online
DataExchangeActive	This bit indicates if the device is configured and exchanging data on the PROFIBUS network. 1 – Device is active and exchanging data 0 – Device is not exchanging data Ensure that all application code making use of slave device data first checks that the ***DataExchangeActive*** bit is 1.
IdentMismatch	The device configured in the PLX50 Configuration Utility and the device at the configured node address do not match because they have different ident numbers. 1 – Online device Ident does not match configured device 0 – Online device and configured device ident match
DisabledByOutputAssembly	This bit indicates if the device has not been enabled for data exchange in the PLX51-PBS device enable control bits. 1 – Device has **not** been enabled for data exchange 0 – Device has been enabled for data exchange
DeviceError	This bit indicates an error with the device. 1 – Device has an error 0 – Device has no error

	The error flag will be set when one of the following conditions occur: If there is an ident mismatch during slave parameterization. When receiving any form of FDL fault (data link layer fault). For example: SAP Not Activated or Resource Not Available. When the data size of the DPV0 data exchange does not match what has been configured in the PLX50 Configuration Utility. This Error flag is transient and will clear once a valid response is received.
AlarmPending	Indicates the device has an alarm pending on the PROFIBUS network. When the bit is set '1', the device has an alarm pending that must be unloaded. When the bit is set '0', the device does not have an alarm pending. 0 – The node has no alarm pending 1 – The node has an alarm pending
DiagnosticsPending	Indicates the device has diagnostics pending on the local PROFIBUS network. When the bit is set '1', the device has diagnostics pending that must be unloaded. When the bit is set '0', the device does not have any diagnostics pending. 0 – The node has no diagnostics pending 1 – The node has diagnostics pending
OutputAssemblyNodeAddrMismatch	Indicates that there is a mismatch between the actual device station address and the expected Logix mapping station address. 0 – Station address matches 1 – Station address mismatch
MappingCRCMismatch	If there is a mismatch in the mapping between Logix and the PLX51-PBS, it can result in data appearing in the incorrect location. This means you 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.
SlaveClearOpMode	When the PLX51-PBS is in **Slave Mode**; this indicates that the respective slave is in fieldbus CLEAR mode (received from the DP Master on the network). 0 – Slave Station is in CLEAR fieldbus mode. 1 – Slave Station is **not** in CLEAR fieldbus mode.
SlaveAlarmAck	When the PLX51-PBS is in **Slave Mode**; this indicates that the respective emulated slave has received an acknowledgement for the pending alarm. 0 – Slave Station has received an Alarm Acknowledgement for last pending alarm. 1 – No Alarm Acknowledgement have been received for a pending alarm or there is no alarm pending.
StationNumber	The station number of the specific slave device.
DeviceMappingCRC	The checksum of the Mapping for the specific slave device.
DeviceSpecificInputDataFields	The tags created for the input data will be slave specific.

Table 5.4 – Device Output tags

Tag	Description
PLX51PBS.Output.Control.	
StationNumber	The station number entered by the Logix mapping code of the specific slave device.
AlarmTrigger	When the PLX51-PBS is in **Slave** Mode; when this bit changes from 0 to 1, it will trigger an alarm notification to the DP Master.
DeviceMappingCRC	The checksum of the mapping that was applied by the generated Logix code used to verify if the mapping being used is valid.

DPV1 Class 1 Messaging (MS1)

The PLX51-PBS Slave feature supports DPV1 Class 1 (MS1) messaging. See the *DPV1 Objects* in the PLX50 Configuration Utility *Device Configuration* section for more information regarding the configuration of the DPV1 Objects. You can configure several slot and index combinations for DPV1 Class 1 communication (for each added PROFIBUS Slave device).

When the PROFIBUS Master sends a DPV1 read/write command for the configured slot and index, the PLX51-PBS accesses the configured Logix tag to provide the required data. The data to be written or read is extracted from the Logix SINT array. This array was configured in the DPV1 objects of the device configuration window. Below is an example of the DPV1 operation when the PLX51-PBS has been configured as a PROFIBUS Slave.

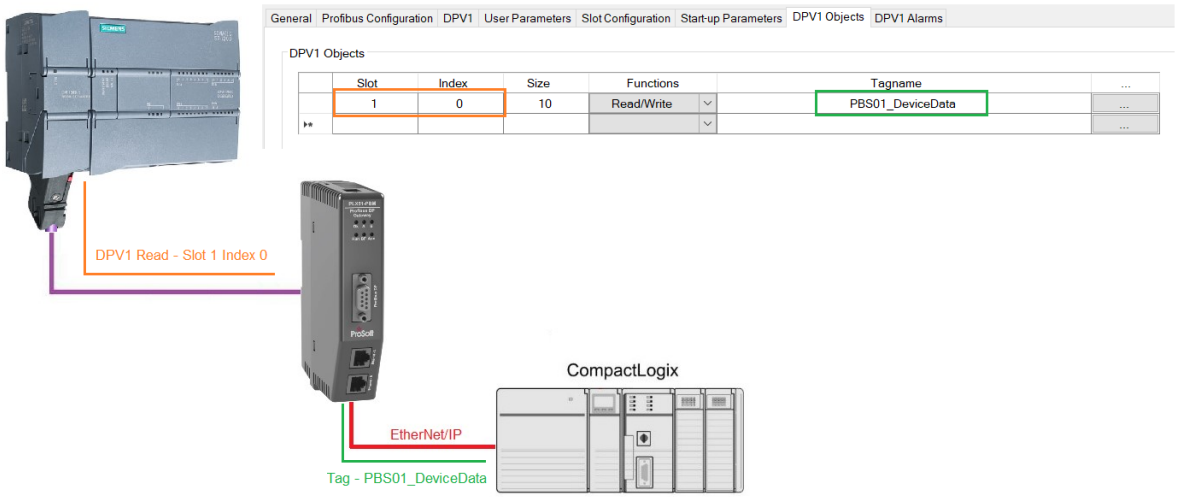


Figure 5.4 – PLX51-PBS DPV1 Object exchange

Alarming

The PLX51-PBS slave feature supports DPV1 Alarming. You can trigger an alarm from the Logix device output assembly, which will notify the PROFIBUS Master that a new alarm has been generated. When the PROFIBUS Master sends a DPV1 alarm read command, the PLX51-PBS accesses the configured Logix tag to provide the required data for the specific alarm.

NOTE: The PLX51-PBS allows only one alarm to be triggered at a time.

1 To trigger an alarm notification for the PROFIBUS Master, toggle (from 0 to 1) the *AlarmTrigger* tag in the field device output assembly as shown below:

⊟ PBS01_PLX51PBS.Output	{...}		PBS01_10FF3E83Output
⊟ PBS01_PLX51PBS.Output.Control	{...}		PSPLX51DPSlaveControl
⊞ PBS01_PLX51PBS.Output.Control.StationNumber	2	Decimal	SINT
PBS01_PLX51PBS.Output.Control.AlarmTrigger	0	Decimal	BOOL
⊞ PBS01_PLX51PBS.Output.Control.DeviceMappingCRC	-27247	Decimal	INT
⊞ PBS01_PLX51PBS.Output.Input1Byte	33	Decimal	SINT

Figure 5.5 – PLX51-PBS Slave Alarm Trigger

2 Once the alarm has been triggered, the PLX51-PBS reads the alarm data from the configured Logix tag and add it to the PROFIBUS diagnostics (which will then be read by the PROFIBUS Master).

3 When the PROFIBUS Master acknowledges the alarm, the *SlaveAlarmAck* bit in the field device input assembly is set, indicating to the Logix controller that the next alarm can be triggered.

⊟ PBS01_PLX51PBS.Input	{...}		PBS01_10FF3E83Input
⊟ PBS01_PLX51PBS.Input.Status	{...}		PSPLX51DPSlaveStatus
PBS01_PLX51PBS.Input.Status.Online	1	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.DataExchangeActive	1	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.IdentMismatch	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.DisabledByOutputAssembly	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.DeviceError	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.AlarmPending	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.DiagnosticsPending	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.OutputAssemblyNodeAddrMi...	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.MappingCRCMismatch	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.SlaveClearOpMode	0	Decimal	BOOL
PBS01_PLX51PBS.Input.Status.SlaveAlarmAck	0	Decimal	BOOL
⊞ PBS01_PLX51PBS.Input.Status.StationNumber	0	Decimal	SINT
⊞ PBS01_PLX51PBS.Input.Status.DeviceMappingCRC	0	Decimal	INT

Figure 5.6 – PLX51-PBS Alarm Acknowledge

The format of the DPV1 Alarm data in the Logix SINT array is shown below:

Table 5.5 – Slave Alarm Data Format

Alarm Parameter	Byte Offset	Byte Size	Description
Alarm Length	0	1	Length of the Alarm data at the bottom of the table.
Alarm Type	1	1	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics Examples: 1 – Diagnosis Alarm 2 – Process Alarm 3 – Pull Alarm 4 – Plug Alarm 5 – Status Alarm 6 – Update Alarm
Alarm Slot	2	1	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics.
Alarm Specifier	3	1	Bit 0 to 1. Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics Examples: 0 - no further differentiation 1 - Incident appeared 2 - Incident disappeared and slot is ok 3 - One incident disappeared, others remain
Alarm data	4	Alarm Length	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics.

An example of the Alarm Data is shown below:

Name	Value	Style	Data Type	Description
◢ DPV1Alarm	{...}	Hex	SINT[40]	
▷ DPV1Alarm[0]	16#05	Hex	SINT	Alarm Data Length
▷ DPV1Alarm[1]	16#01	Hex	SINT	Alarm Type
▷ DPV1Alarm[2]	16#03	Hex	SINT	Alarm Slot
▷ DPV1Alarm[3]	16#01	Hex	SINT	Alarm Specifier
▷ DPV1Alarm[4]	16#11	Hex	SINT	Alarm Data ...
▷ DPV1Alarm[5]	16#22	Hex	SINT	
▷ DPV1Alarm[6]	16#33	Hex	SINT	
▷ DPV1Alarm[7]	16#44	Hex	SINT	
▷ DPV1Alarm[8]	16#55	Hex	SINT	
▷ DPV1Alarm[9]	16#00	Hex	SINT	

Figure 5.7 –DPV1 Alarm Data Example

5.2 Modbus Operation

When the PLX51-PBS has been setup for Modbus communication it will exchange data with a remote Modbus device. Depending on the Primary Interface selection, the PLX51-PBS will either function as a Modbus Master or Modbus Slave.

NOTE: When configured as a Modbus Slave the Modbus Master device will need to read and write all required data from the configured Modbus address ranges. When configured as a Modbus Master the PLX51-PBS will automatically update the required Modbus registers in the configured remote target.

5.2.1 PROFIBUS DP - Slave

Each configured Slave will be enabled by setting the correct enable bit in the Device Control Coil Status bits. Once the respective bit has been set in the Device Control Coil Status bits the PLX51-PBS will become “alive” on the PROFIBUS network and will start responding to a PROFIBUS DP Master.

Slave Device Status

The Slave Status is populated in either Coil (CS) or Holding (HR) registers starting at the **Status Register Offset.**

Table 5.6 – Modbus Master and Device Status

CS Offset	Description
Slave Status	
0	Configuration Valid
1	Owned
2	Duplicate DP Station
3	PROFIBUS Fieldbus Error
4	PROFIBUS Device Error
5	PROFIBUS OFFLINE
6	PROFIBUS STOPPED
7	PROFIBUS CLEAR
8	PROFIBUS OPERATIONAL
9	Master/Slave Mode (1 = Slave Mode)
32 - 158	Live List Flags (Station Address 0 - 126)
160 - 286	Data Exchange Flags (Station Address 0 - 126)
288 - 414	Alarm Pending Flags (Station Address 0 - 126)
416 - 542	Diagnostic Pending Flags (Station Address 0 - 126)
544 + (16 x [Station Address])	Online
545 + (16 x [Station Address])	Data Exchange Active
546 + (16 x [Station Address])	Ident Mismatch
547 + (16 x [Station Address])	Disabled by Output Assembly
548 + (16 x [Station Address])	Device Error
549 + (16 x [Station Address])	Alarm Pending
550 + (16 x [Station Address])	Diagnostics Pending
551 + (16 x [Station Address])	Output Assembly Station Address Mismatch
552 + (16 x [Station Address])	Mapping CRC Mismatch

553 + (16 x [Station Address])	Slave Clear Op Mode
554 + (16 x [Station Address])	Slave Alarm Ack

The Slave Device Enable and (Alarm) Control is located in either Coil (CS) or Holding (HR) Registers starting at the Device Control Register offset.

Table 5.7 – Modbus Slave Device Control

CS Offset	Description
Device Enable	
0 + [Station Address]	Device Enable (Station Address 0 - 126)
Device Control	
128 + (8 x [Station Address])	DPV1 Alarm Trigger

The Modbus Communication Status is located in Holding (HR) registers starting at the *Modbus Communication Status offset* configured in the *Modbus Addressing* tab.

Table 5.8 – Modbus Communication Status

HR Offset	Description
Modbus Communication Status when operating as a **Modbus Slave**	
0	Bit 0 – PLX51-PBS Modbus Slave Communication Status 1 – Modbus Communication Ok 0 – Modbus Communication Failed
Modbus Communication Status when operating as a **Modbus Master**	
0	Bit 0 – Modbus Node 0 Communication Status 1 – Modbus Communication Ok 0 – Modbus Communication Failed
1	Bit 0 – Modbus Node 1 Communication Status 1 – Modbus Communication Ok 0 – Modbus Communication Failed
..	..
253	Bit 0 – Modbus Node 253 Communication Status 1 – Modbus Communication Ok 0 – Modbus Communication Failed
254	Bit 0 – Modbus Node 254 Communication Status 1 – Modbus Communication Ok 0 – Modbus Communication Failed

DPV0 Data Exchange

The DPV0 data exchange for each slave device is configured in the slot configuration.

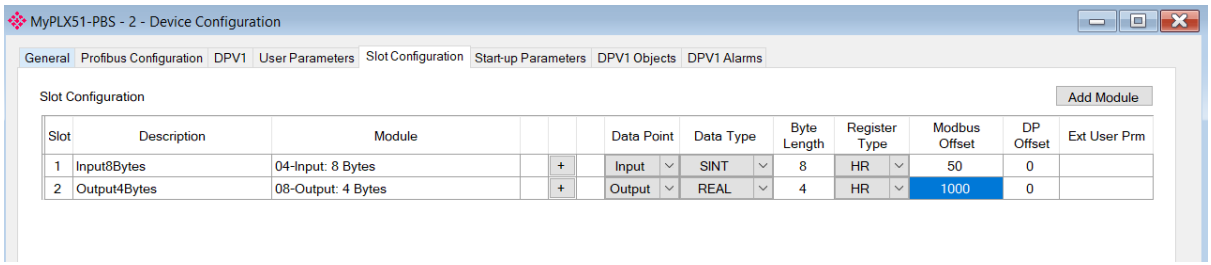


Figure 5.8 – Slave Device Slot configuration – Modbus

DPV1 Class 1 Messaging (MS1)

The user can exchange DPV1 Class 1 data with a configured field device using the configured Modbus Registers. The user will need to assign Slot and Index combinations to Modbus Holding Register Addresses (see below).

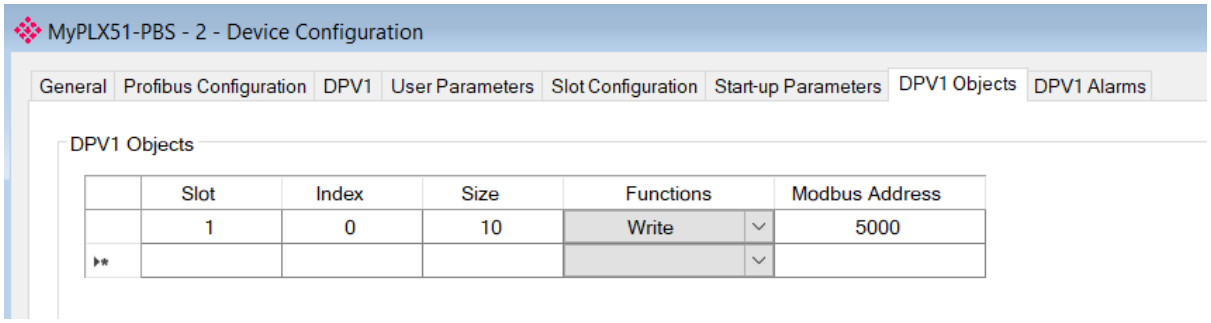


Figure 5.9 – DPV1 Objects Holding Register address

Once the PROFIBUS Master reads or writes to a DPV1 Class 1 Slot/Index, the PLX51-PBS will use the data located at the configured Modbus Address.

NOTE: If the PLX51-PBS has been setup as a Modbus Master then the data will be read or written to the specific Modbus HR address in the target device when the DPV1 Message request is received on the PROFIBUS network.

Alarming

The PLX51-PBS supports DPV1 Alarming when operating as a PROFIBUS Slave. The user can trigger an alarm from the Modbus Device Control Register offset which will notify the PROFIBUS Master that a new alarm has been generated. When the PROFIBUS Master sends a DPV1 alarm read command, the PLX51-PBS will access the configured Modbus Holding address to provide the data for the specific alarm.

NOTE: The PLX51-PBS can only allow one alarm to be triggered at a time.

To trigger an alarm notification for the PROFIBUS Master, toggle (from 0 to 1) the AlarmTrigger tag in the Device Control Alarm Trigger as shown below:

Table 5.9 – Modbus Slave Device Control

CS Offset	Description
Device Control	
128 + (8 x [Station Address])	DPV1 Alarm Trigger

Once the alarm has been triggered the PLX51-PBS will read the alarm data from the configured Modbus Holding Register address range and add it to the PROFIBUS diagnostics (which will then be read by the PROFIBUS Master) as shown below.

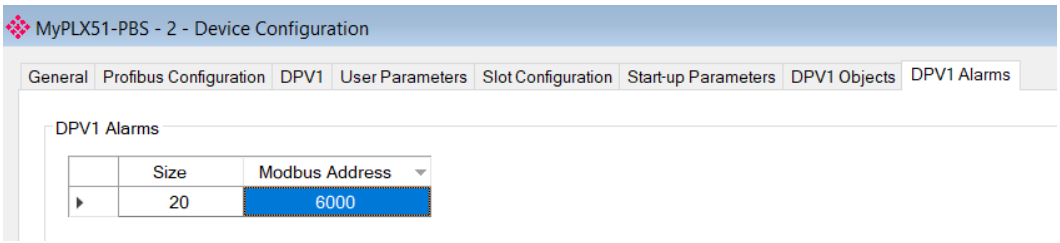


Figure 5.10 – DPV1 Alarm Holding Register address

When the PROFIBUS Master acknowledges the alarm, the SlaveAlarmAck bit in the Slave Device Status Register offset for the field device will be set indicating that the next alarm can be triggered.

Table 5.10 – Modbus Device Status

CS Offset	Description
Slave Device Status	
544 + (16 x [Station Address])	Online
545 + (16 x [Station Address])	Data Exchange Active
546 + (16 x [Station Address])	Ident Mismatch
547 + (16 x [Station Address])	Disabled by Output Assembly
548 + (16 x [Station Address])	Device Error
549 + (16 x [Station Address])	Alarm Pending
550 + (16 x [Station Address])	Diagnostics Pending
551 + (16 x [Station Address])	Output Assembly Station Address Mismatch
552 + (16 x [Station Address])	Mapping CRC Mismatch
553 + (16 x [Station Address])	Slave Clear Op Mode
554 + (16 x [Station Address])	Slave Alarm Ack

NOTE: An alarm will only be triggered when the AlarmTrigger tag is toggled from 0 to 1.

The format of the DPV1 Alarm data in the configured Modbus Holding Register array is shown below:

Table 5.11 – Slave Alarm Data Format

Alarm Parameter	Holding Register Offset	Byte Size	Description
Alarm Length	0 – low byte	1	This is the length of the Alarm Data shown below.
Alarm Type	0 – hi byte	1	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics. Below are some examples: 1 - Diagnosis_Alarm 3 - Pull_Alarm 4 - Plug_Alarm
Alarm Slot	1 – low byte	1	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics.
Alarm Specifier	1 – high byte	1	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics. Below are some examples: 0 - no further differentiation 1 – Incident appeared 2 – Incident disappeared and slot is ok 3 - One incident disappeared, others remain
Alarm data	2	Alarm Length	Refer to the PROFIBUS Specification EN 50170 for information regarding the diagnostics.

Modbus Auxiliary Map

The Modbus Auxiliary Map configuration is enabled when *Enable Modbus Auxiliary Mapping* has been enabled in the Modbus tab, and configured for Modbus Master. This will allow the user to read and/or write any internal PLX51-PBS Modbus Register to any Modbus Slave. Up to 20 Modbus Slaves can be connected and up to 200 mapped items can be configured.

IMPORTANT: When Modbus Auxiliary Mapping is enabled, the automatic polling of referenced Modbus registers is disabled. It is the user's responsibility to ensure that all the required PROFIBUS control and data registers are collected from the appropriate remote Modbus slave devices.

The PLX51-PBS Modbus Auxiliary Map configuration window is opened by either double clicking on the module in the tree, or right-clicking the module and selecting *Configuration*.

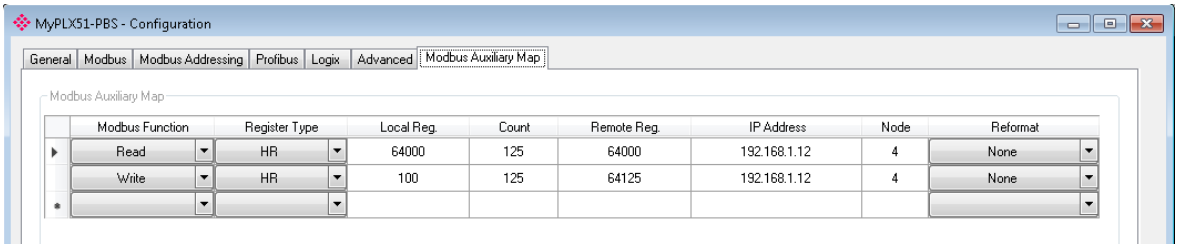


Figure 5.11 – PLX51-PBS Modbus Auxiliary Map configuration

The Modbus Auxiliary Map configuration consists of the following parameters:

Table 5.12 - Modbus Auxiliary Map configuration parameters

Parameter	Description
Modbus Function	This is the Modbus function is the used with the Modbus Slave. Read – Read a Modbus Register (eg. HR, IR, CS, or IS) from a Modbus Slave. Write – Write a Modbus Register (eg. HR, IR, CS, or IS) to a Modbus Slave.
Register Type	Modbus Register Type: CS – Coil Status IS – Input Status IR – Input Register HR – Holding Register
Local Reg.	The local PLX51-PBS Modbus address.
Count	The number of Modbus elements to read or write.
Remote Reg.	The remote slave Modbus address.
IP Address	The IP address of the remote Modbus TCP slave.
Node	The Modbus Node address of the remote Modbus slave.
Reformat	How the data is formatted before reading or writing from/to the Modbus slave. None – No reformatting will be done. BB AA – 16bit Byte swap BB AA DD CC – 32bit Byte Swap CC DD AA BB – Word Swap DD CC BB AA – Word and Byte Swap

5.3 EtherNet/IP Explicit Messaging Operation

When the PLX51-PBS has been setup for EtherNet/IP Explicit Messaging communication it will exchange data with remote EtherNet/IP devices using either connected Class 3 messaging or Unconnected Messaging (UCMM). This will allow the user to exchange data between a EtherNet/IP device and a Profibus DP Master.

The user can map up to 10Kbytes of EtherNet/IP data to the PLX51-PBS module which can then be mapped to DPV0 communication data for any of the configured DP Slaves.

Each EtherNet/IP device configured can also provide communication status which can be mapped to DPV0 data to inform the DP Master that the PLX51-PBS has lost communication with a specific EtherNet/IP device. The user will need to enter the location in the Data Table where the communication status for the device can be found (as shown below).

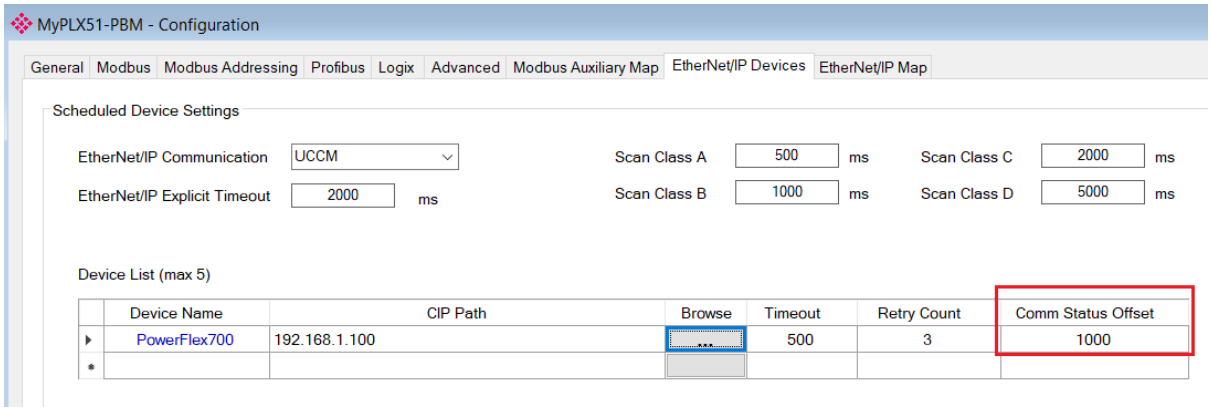


Figure 5.12 – EtherNet/IP Explicit Messaging Communication Status

Communication Status per EtherNet/IP device

Bit 0 - (1) Device online / (0) Device offline.

Bit 1 to 7 – Reserved.

5.4 Firmware Upgrade

Using the PLX50 Configuration Utility, you can upgrade the PLX51-PBS firmware in the field.

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

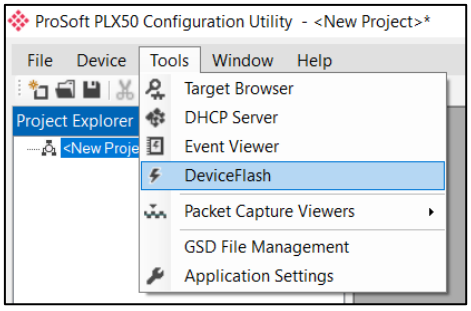


Figure 5.13 - DeviceFlash Tool

2 In the *Select a Device Flash File* window, select the appropriate AFB binary file and click **OPEN**.

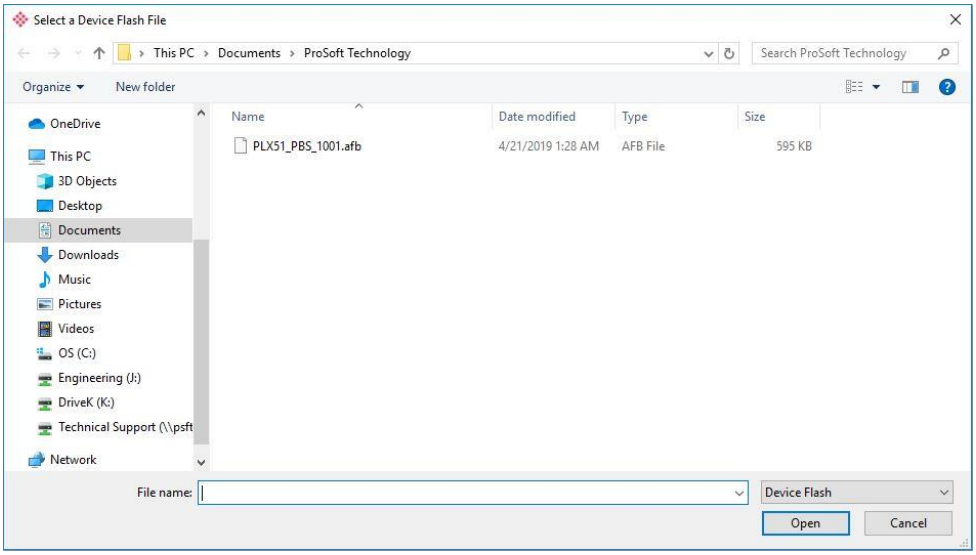


Figure 5.14 - Select the AFB binary

3 In the *Target Browser* window, select the PLX51-PBS's IP address and click **OK**.

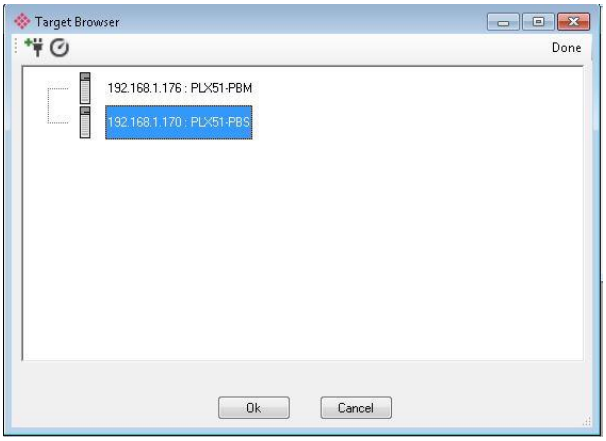


Figure 5.15 - Select the PLX51-PBS module

4 Once the firmware update is complete, the *DeviceFlash* option provides the details of the updated module.

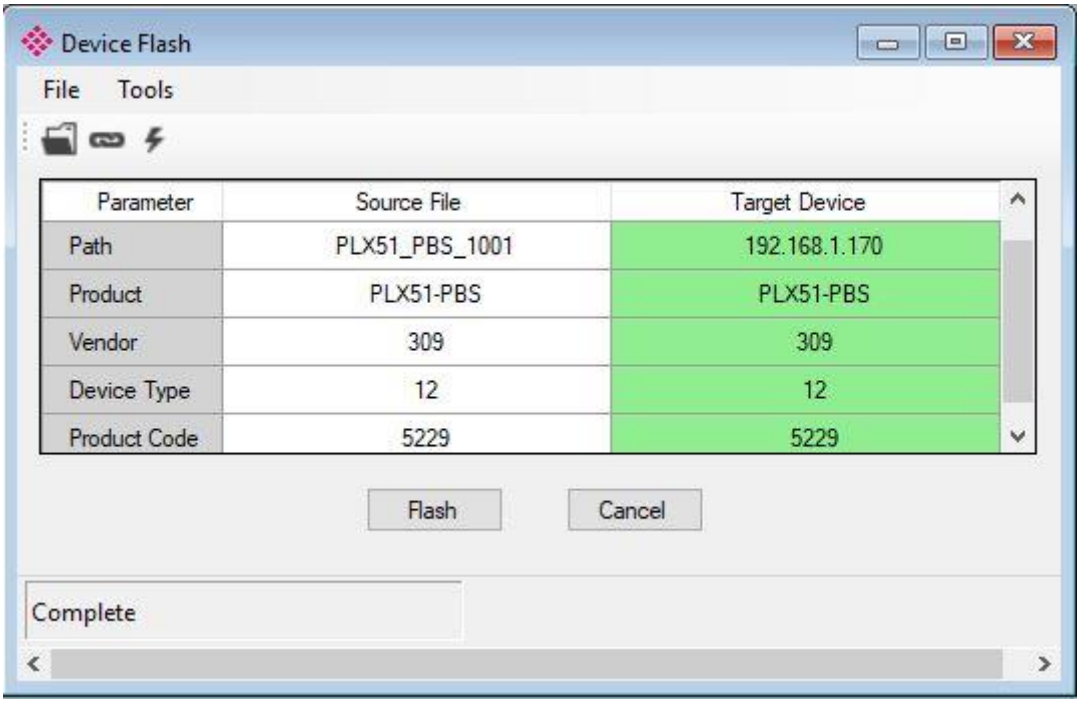


Figure 5.16 – PLX51-PBS successfully updated.

IMPORTANT: The PLX51-PBS firmware is digitally signed so you will only be able to flash the PLX51-PBS with authorized firmware.

6 Diagnostics

6.1 LEDs

The module provides six LEDs for diagnostics purposes as shown below.

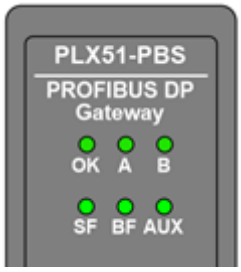


Figure 6.1 - PLX51-PBS LEDs

Table 6.1 - Module LED operation

LED	Description
Ok	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. Solid Red – The module is not operating correctly. For example, if the module application firmware has been corrupted or there is a hardware fault.
A / B	This module has two Ethernet ports; A and B. Each LED represents each specific port. The Ethernet LED lights up when an Ethernet link has been detected (by plugging in a connected Ethernet cable). The LED flashes every time traffic is detected.
SF	Off – This LED is N/A.
BF	This LED indicates the status of the configured field devices. Solid Red – There are bus communication errors present (if no valid packet has been received by any configured slave for more than 1 second). Flashing Red – There are slave errors present (at least one slave has not been configured properly and is not exchanging DPV0 data). Flashing Green – All slaves are successfully exchanging DPV0 data and the DP network operational state is clear. Solid Green – All slaves are successfully exchanging DPV0 data and the DP network operational state is operate.
AUX	This LED is used for the activity on the Primary Interface (e.g. EtherNet/IP, Modbus RTU, or Modbus TCP). Flashing Green – A valid packet is received from the Primary Interface. Flashing Red – A corrupted packet was received (e.g. failed checksum when using RS232 or RS485).

6.2 Module Status Monitoring

The PLX51-PBS provides a range of statistics that can assist with module operation, maintenance, and fault finding. The statistics can be accessed by the PLX50 Configuration Utility or using the web server in the module.

To view the module's status in the PLX50 Configuration Utility environment, the PLX51-PBS 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.

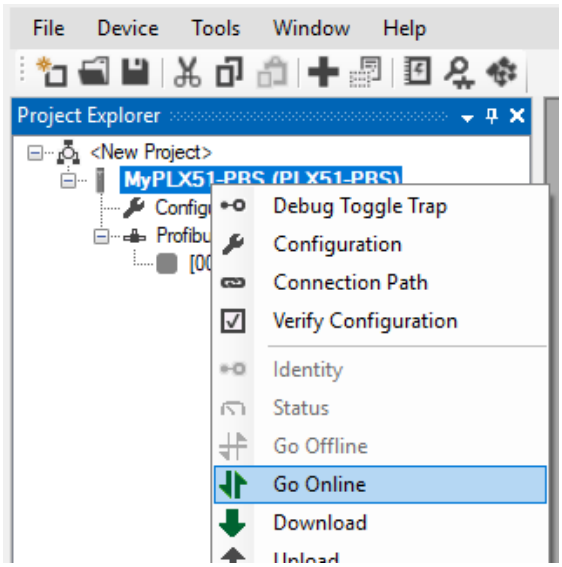


Figure 6.2 - Selecting to Go Online

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

6.2.1 PLX51-PBS

The PLX51-PBS Status window is opened by either double-clicking on the *Status* item in the Project Explorer tree, or by right-clicking on the module and selecting *Status*.

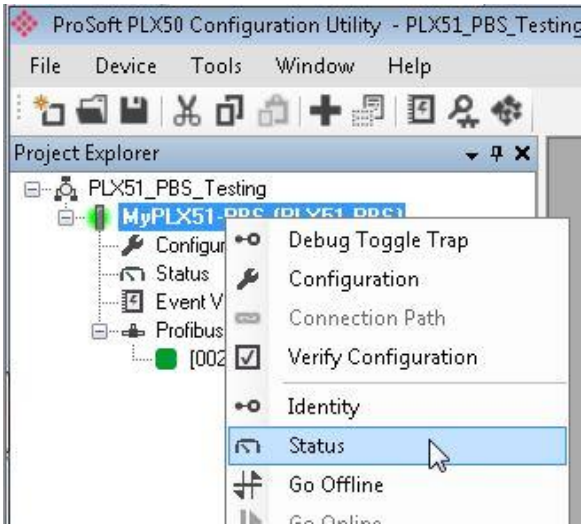


Figure 6.3 - Selecting PLX51-PBS online Status

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

General

The *General* tab displays the following general parameters:

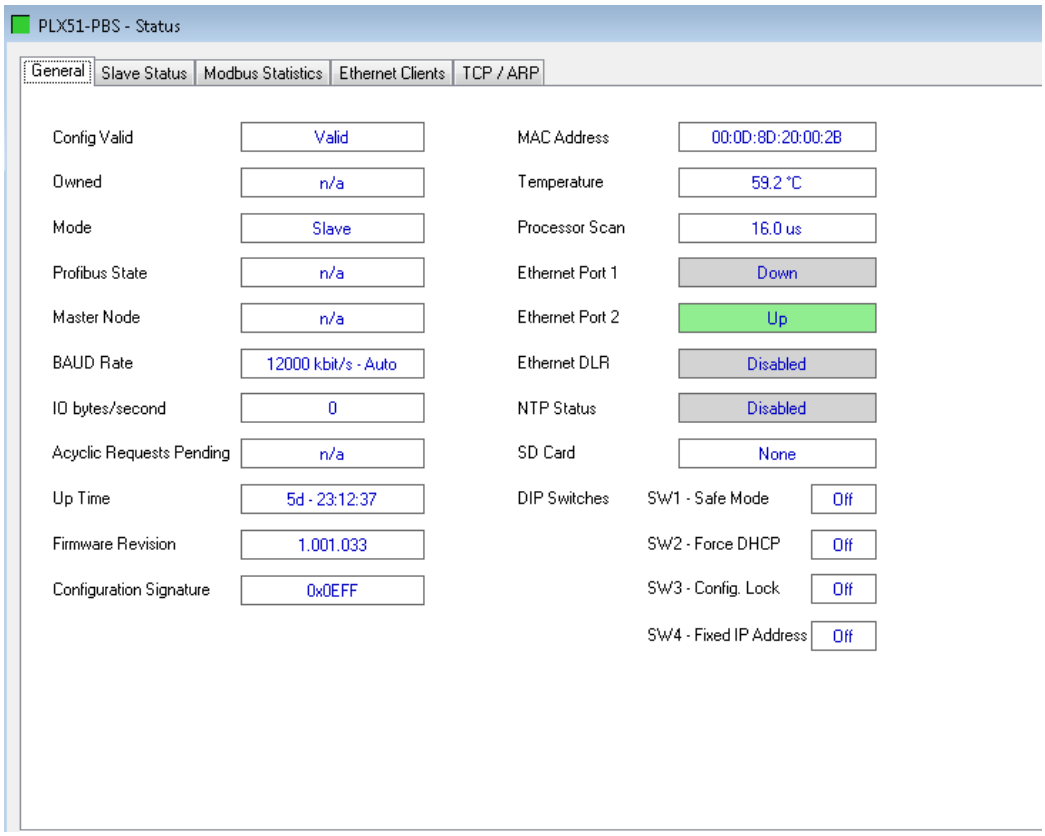


Figure 6.4 – PLX51-PBS Status monitoring - General

Table 6.2 - Parameters displayed in the Status Monitoring – General Tab

Parameter	Description
Config Valid	Indicates if the downloaded configuration is valid and executing.
Owned	Indicates whether or not the module is currently owned (Class 1) by a Logix Controller. (Ethernet/IP mode only)
Mode	Mode of operation of the module. The following states can be returned: **Quiet** This mode allows you to connect the PLX51-PBS to an active bus and run a DP packet capture. In this mode, the PLX51-PBS will not communicate on the DP Bus, but rather only listen. **Slave** In this mode, the PLX51-PBS will emulate multiple PROFIBUS Slave devices.
PROFIBUS State	N/A. For PLX51-PBM only.
Master Node	N/A. For PLX51-PBM only.
BAUD Rate	The BAUD Rate of the PROFIBUS network.
IO bytes/second	The number of process variable bytes being exchanged between the PLX51-PBS and slave devices every second.
Acyclic Requests Pending	N/A. For PLX51-PBM only.
Up Time	Indicates the elapsed time since the module was powered-up.
Firmware Revision	The current PLX51-PBS application firmware revision.

Configuration Signature	The current PLX51-PBS signature of the configuration.
MAC Address	Displays the module's unique Ethernet MAC address.
Temperature	The internal temperature of the module.
Processor Scan	The amount of time (microseconds) taken by the module's processor in the last scan.
Ethernet Port 1/2	The status of each Ethernet port. **Down** The Ethernet connector has **not been** successfully connected to an Ethernet network. **Up** The Ethernet connector has successfully connected to an Ethernet network. **Mirror Enabled** The Ethernet port is mirroring the traffic on the other Ethernet port.
Ethernet DLR (Device Level Ring)	The status of the Ethernet DLR. **Disabled** The DLR functionality has been disabled. **Linear** The DLR functionality has been enabled and the Ethernet network architecture is linear. **Ring – Fault** The DLR functionality has been enabled and the Ethernet network architecture is ring, but there is a fault with the network. **Ring – Ok** The DLR functionality has been enabled and the Ethernet network architecture is ring and is operating.
NTP Status	The status of the local NTP Client. **Disabled** The NTP time synchronization has been disabled. **Locked** NTP time synchronization has been enabled and the PLX51-PBS has locked onto the target time server. **Not Locked** NTP time synchronization has been enabled and the PLX51-PBS has not locked onto the target time server.
DIP Switch Position	The status of the DIP switches when the module booted.

Slave Status

The *Slave Status* tab displays the following parameters:

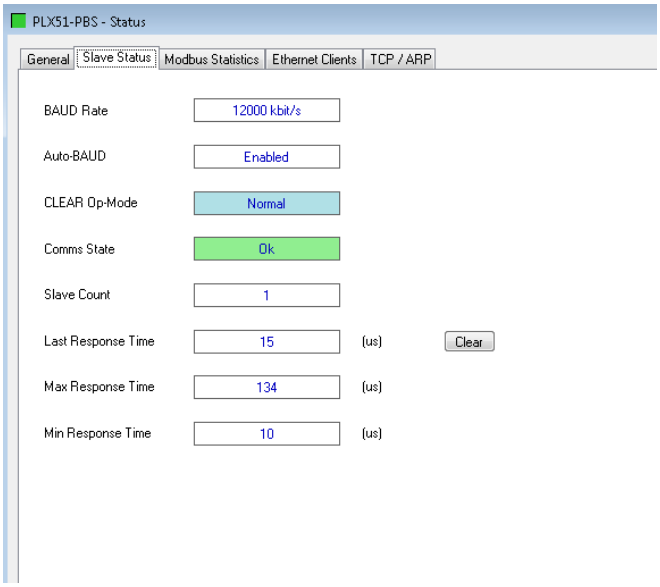


Figure 6.5 – PLX51-PBS Status monitoring – Slave Status

Table 6.3 - Parameters displayed in the Status Monitoring – Slave Status Tab

Parameter	Description
BAUD Rate	Current BAUD rate of the PROFIBUS Network.
Auto-BAUD	If the BAUD rate for the PROFIBUS Network will be automatically detected.
CLEAR Op-Mode	If the operational state of the PROFIBUS Network is CLEAR.
Comms State	**OK** All configured slaves are operating correctly. **Failure** At least one of the configured devices are not operating correctly.
Slave Count	Number of slaves configured.
Last Response Time	The time it took (in microseconds) to respond to the last request from a DP Master.
Max Response Time	The maximum time it took (in microseconds) to respond to a request from a DP Master.
Min Response Time	The minimum time it took (in microseconds) to respond to a request from a DP Master.

Modbus Statistics

The Modbus Statistics tab displays the statistics associated with the Modbus communication and mapping.

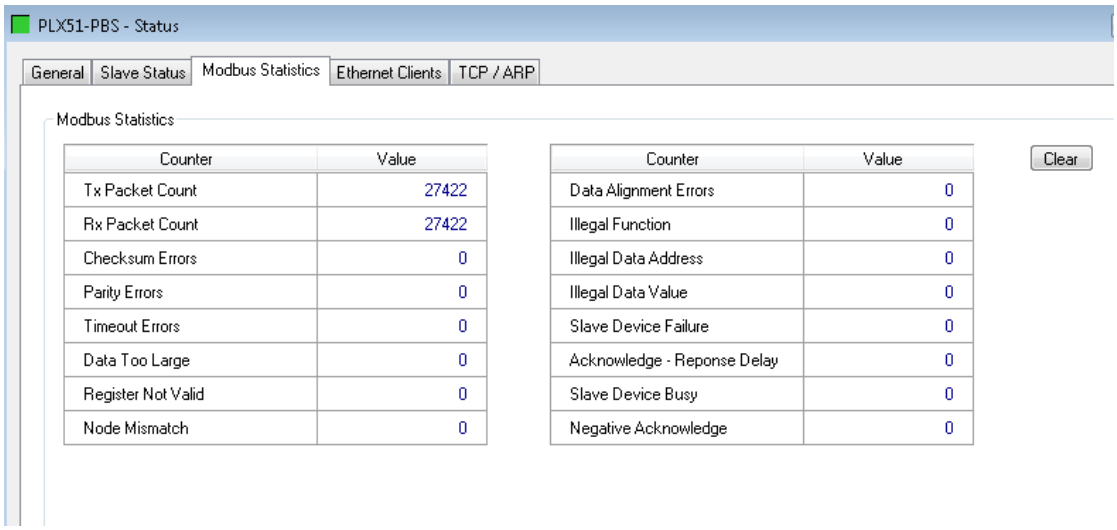


Figure 6.6 – PLX51-PBS Status monitoring – Modbus Statistics

Table 6.4 – Modbus statistics

Statistic	Description
Tx Packet Count	The number of Modbus packets sent by the module.
Rx Packet Count	The number of Modbus packets received by the module.
Checksum errors	The number of corrupted Modbus packets received by the module.
Parity errors	The number of bytes with parity errors received by the module.
Timeout Errors	The number of message response timeouts the module has encountered.
Data Too Large	The number of Modbus requests/responses where the data was too large.
Register Not Valid	The number of Modbus requests containing an invalid register.
Node Mismatch	The received Modbus request did not match the module's Modbus node address.
Data Alignment Errors	The Modbus request and associated mapped item is not byte aligned with the destination Logix tag.
Illegal Function	The number of Illegal Function exceptions returned by the Modbus device.
Illegal Data Address	The number of Illegal Data Address exceptions returned by the Modbus device.
Illegal Data Value	The number of Illegal Data Value exceptions returned by the Modbus device.
Slave Device Failure	The number of Device Failure exceptions returned by the Modbus device.
Acknowledge – Response Delay	The number of Acknowledge exceptions returned by the Modbus device.
Slave Device Busy	The number of Slave Busy exceptions returned by the Modbus device.
Negative Acknowledge	The number of Negative Acknowledge exceptions returned by the Modbus device.

Modbus Devices

The Modbus Devices tab displays the active Modbus Client/Server devices the module is communicating with.

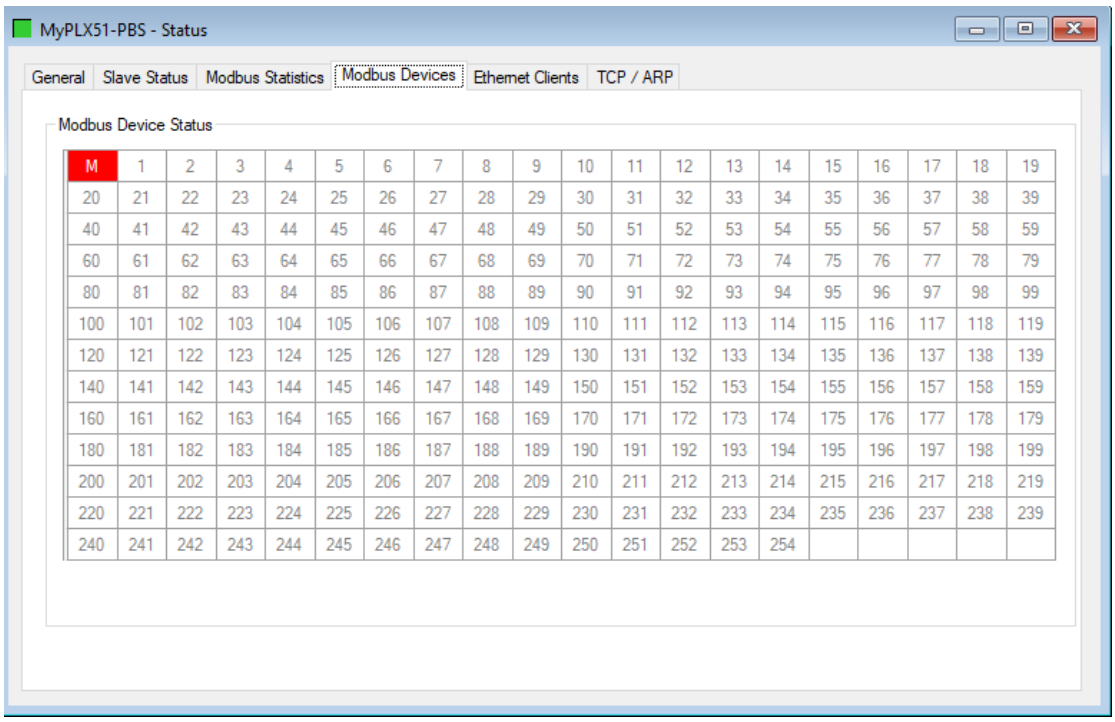


Figure 6.7 – PLX51-PBS Status monitoring – Modbus Devices

EtherNet/IP Explicit Statistics

The EtherNet/IP Explicit Statistics tab displays the statistics for the combined EtherNet/IP target devices when the *Primary Interface* has been set to *EtherNet/IP Explicit Messaging*.

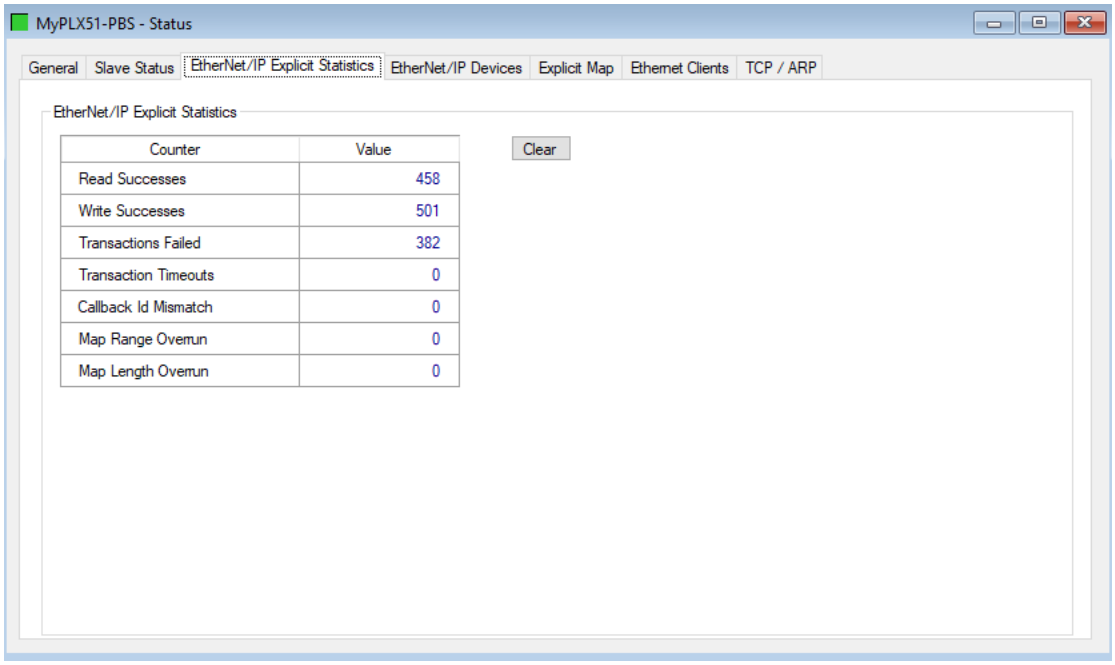


Figure 6.8 – PLX51-PBS Slave mode status monitoring – EtherNet/IP Explicit Statistics

Table 6.5 - Parameters displayed in the Status Monitoring – EtherNet/IP Explicit Statistics

Parameter	Description
Read Successes	The number of successful Explicit EtherNet/IP read message transactions.
Write Successes	The number of successful Explicit EtherNet/IP write message transactions.
Transactions Failed	The number of failed Explicit EtherNet/IP message transactions. For example, if the target EtherNet/IP device responded with an error.
Transaction Timeouts	The number of times the target EtherNet/IP device did not respond within the configured timeout time.
Callback Id Mismatch	The received response from the EtherNet/IP device does not match the request sent.
Map Range Overrun	The response is larger than the upper limit of the Data Table.
Map Length Overrun	The response is larger than the configured expected response size.

EtherNet/IP Devices

This shows all the configured EtherNet/IP devices used for Explicit EtherNet/IP Messaging and the current communication status. **Green** being online and exchanging data, **Red** indicating that the target device is offline.

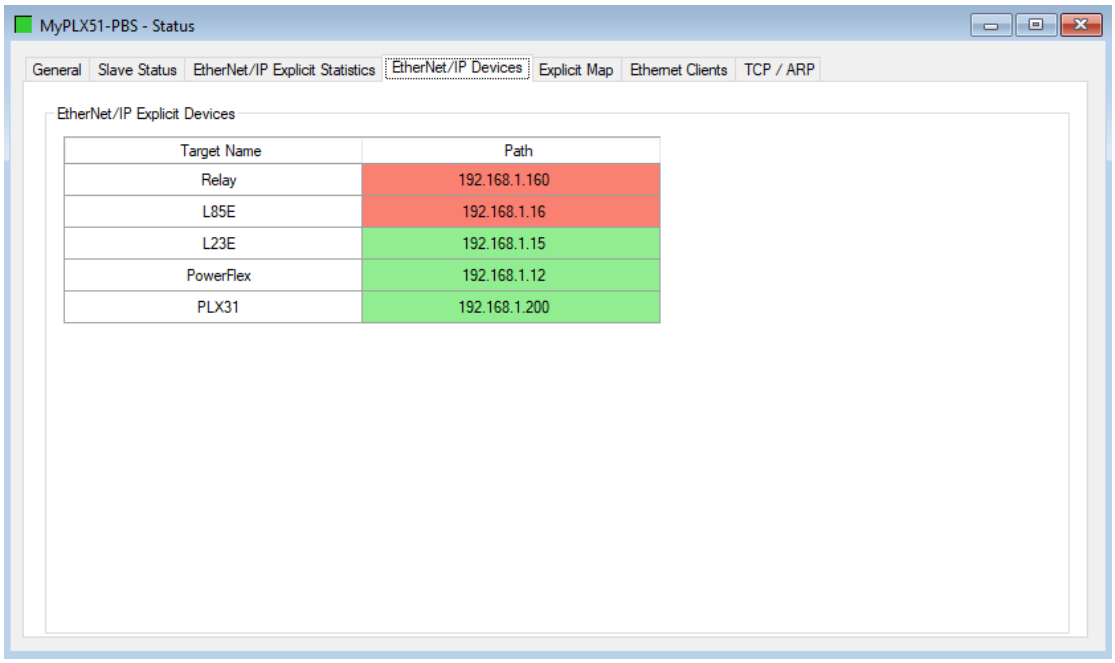
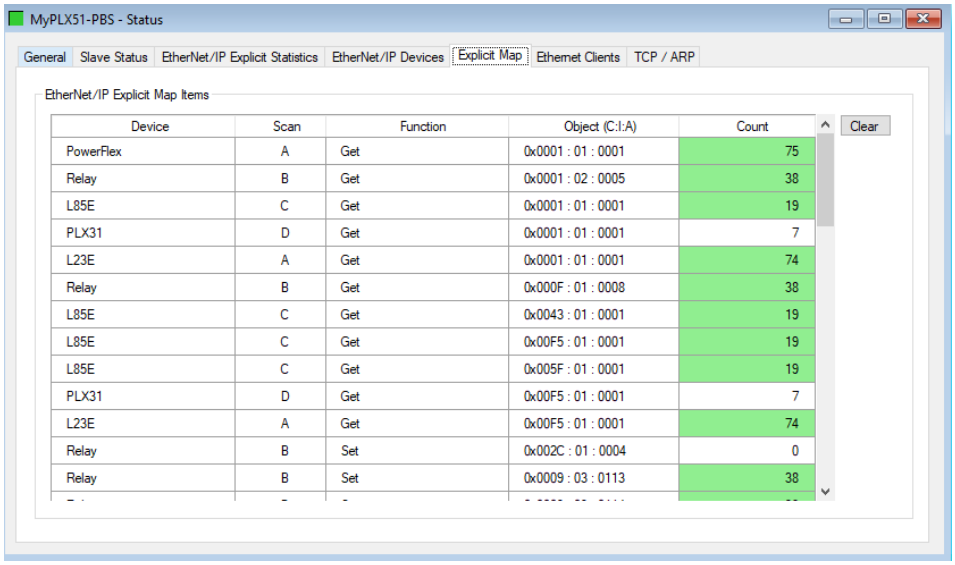


Figure 6.9 – PLX51-PBS Slave mode status monitoring – EtherNet/IP Devices

Explicit Map

This shows all the mapped EtherNet/IP explicit messaged used for Explicit EtherNet/IP Messaging. Each time there is a successful transaction the *Count* will increase and the item will briefly go green.

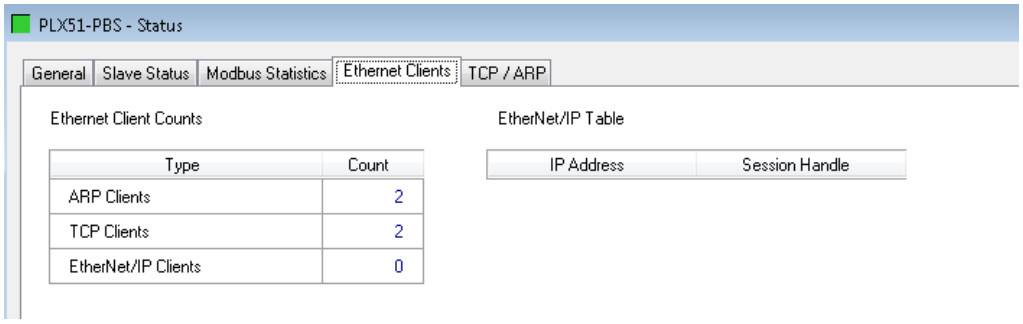


Device	Scan	Function	Object (C:I:A)	Count
PowerFlex	A	Get	0x0001 : 01 : 0001	75
Relay	B	Get	0x0001 : 02 : 0005	38
L85E	C	Get	0x0001 : 01 : 0001	19
PLX31	D	Get	0x0001 : 01 : 0001	7
L23E	A	Get	0x0001 : 01 : 0001	74
Relay	B	Get	0x000F : 01 : 0008	38
L85E	C	Get	0x0043 : 01 : 0001	19
L85E	C	Get	0x00F5 : 01 : 0001	19
L85E	C	Get	0x005F : 01 : 0001	19
PLX31	D	Get	0x00F5 : 01 : 0001	7
L23E	A	Get	0x00F5 : 01 : 0001	74
Relay	B	Set	0x002C : 01 : 0004	0
Relay	B	Set	0x0009 : 03 : 0113	38

Figure 6.10 – PLX51-PBS Slave mode status monitoring – Explicit Map

Ethernet Clients

The *Ethernet Clients* tab displays the details of the Ethernet and EtherNet/IP clients connected to the PLX51-PBS.



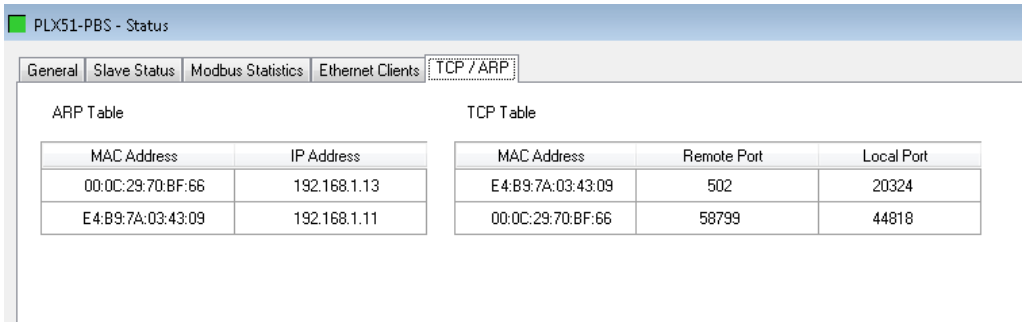
Type	Count
ARP Clients	2
TCP Clients	2
EtherNet/IP Clients	0

IP Address	Session Handle

Figure 6.11 – PLX51-PBS Status monitoring – Ethernet Client Statistics

TCP/ARP

The *TCP/ARP* tab displays details of the internal Ethernet ARP and TCP lists of the PLX51-PBS.



MAC Address	IP Address
00:0C:29:70:BF:66	192.168.1.13
E4:B9:7A:03:43:09	192.168.1.11

MAC Address	Remote Port	Local Port
E4:B9:7A:03:43:09	502	20324
00:0C:29:70:BF:66	58799	44818

Figure 6.12 – PLX51-PBS Status monitoring – Ethernet TCP / ARP Statistics

6.2.2 Device Status

The *Device Status* window of each PROFIBUS slave device connected to the PLX51-PBS is opened by right-clicking on the specific slave device icon in the PLX50 Configuration Utility tree, and selecting **STATUS**.

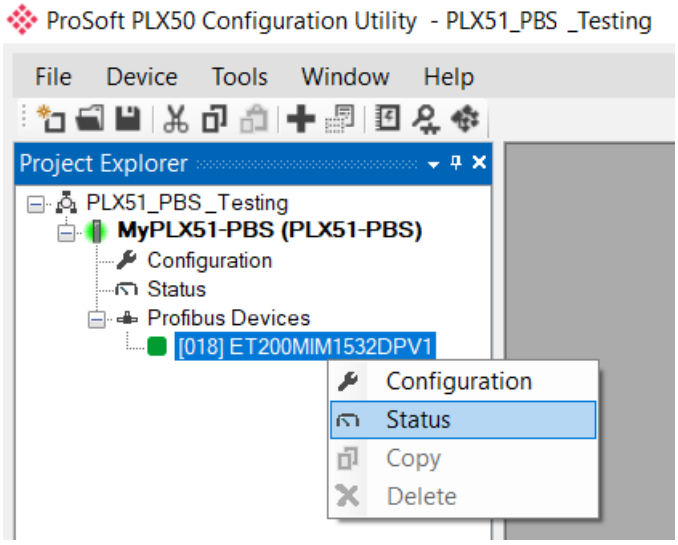


Figure 6.13 - Selecting slave status

The device status window contains multiple tabs to display the status of the specific slave device.

General – Slave Mode

The *General* tab displays the following general parameters:

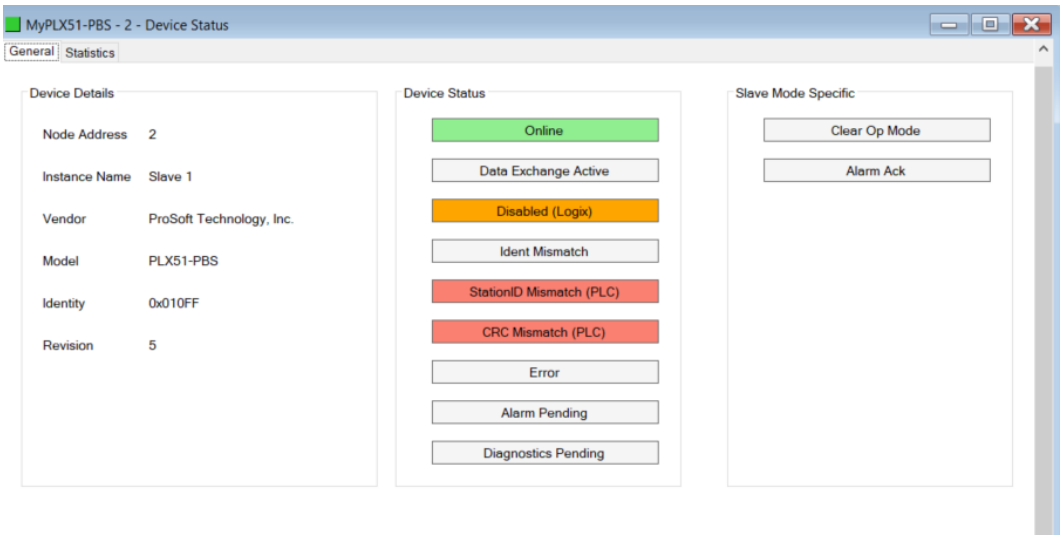


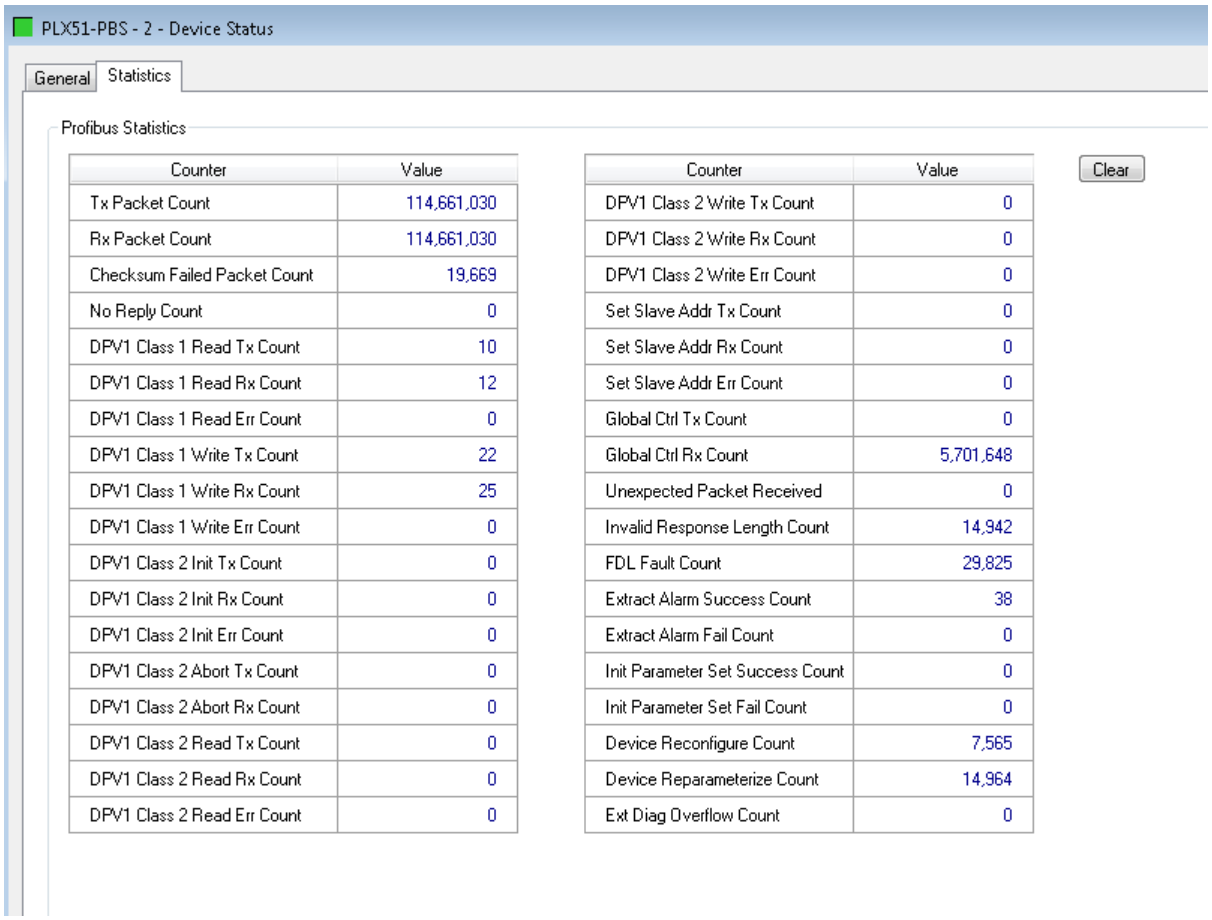
Figure 6.14 – Device Status monitoring - General

Table 6.6 - Device Status Monitoring – General Tab

Parameter	Description
Node Address	The selected slave device station address.
Instance Name	The configured instance name of the device.
Vendor	The device Vendor name.
Model	The device Model name.
Identity	The device PNO identity.
Revision	The device revision.
Device Status	The current status of the device: **Online** The slave device is online. **Data Exchange Active** The slave device is exchanging DPV0 process data with the PROFIBUS DP Master. **Enabled/Disabled (Logix)** The slave device has been enabled/disabled from DPV0 data exchange from the Logix controller using the PLX51-PBS output assembly. **Identity Mismatch** The device configured in the PLX50 Configuration Utility and the device online at the specific station address do not match. **StationID Mismatch (PLC)** The station address entered from the Logix controller using the PLX51-PBS output assembly does not match the station address of the configured slave device. **CRC Mismatch (PLC)** Indicates the mapping from the Logix controller does not match the configured mapping. **Error** Device Error flag. **Alarm Pending** An alarm is pending in the specific slave device. **Diagnostics Pending** There is new diagnostics pending in the slave device.

Statistics

The *Statistics* tab displays the following general parameters:



Counter	Value
Tx Packet Count	114,661,030
Rx Packet Count	114,661,030
Checksum Failed Packet Count	19,669
No Reply Count	0
DPV1 Class 1 Read Tx Count	10
DPV1 Class 1 Read Rx Count	12
DPV1 Class 1 Read Err Count	0
DPV1 Class 1 Write Tx Count	22
DPV1 Class 1 Write Rx Count	25
DPV1 Class 1 Write Err Count	0
DPV1 Class 2 Init Tx Count	0
DPV1 Class 2 Init Rx Count	0
DPV1 Class 2 Init Err Count	0
DPV1 Class 2 Abort Tx Count	0
DPV1 Class 2 Abort Rx Count	0
DPV1 Class 2 Read Tx Count	0
DPV1 Class 2 Read Rx Count	0
DPV1 Class 2 Read Err Count	0

Counter	Value
DPV1 Class 2 Write Tx Count	0
DPV1 Class 2 Write Rx Count	0
DPV1 Class 2 Write Err Count	0
Set Slave Addr Tx Count	0
Set Slave Addr Rx Count	0
Set Slave Addr Err Count	0
Global Ctrl Tx Count	0
Global Ctrl Rx Count	5,701,648
Unexpected Packet Received	0
Invalid Response Length Count	14,942
FDL Fault Count	29,825
Extract Alarm Success Count	38
Extract Alarm Fail Count	0
Init Parameter Set Success Count	0
Init Parameter Set Fail Count	0
Device Reconfigure Count	7,565
Device Reparameterize Count	14,964
Ext Diag Overflow Count	0

Figure 6.15 – Device Status monitoring - Statistics

Table 6.7 - Device Status Monitoring – Statistics Tab

Parameter	Description
Tx Packet Count	The number of PROFIBUS packets transmitted.
Rx Packet Count	The number of PROFIBUS packets received.
Checksum Failed Packet Count	The number of PROFIBUS packets that had a failed checksum.
No Reply Count	The number of PROFIBUS requests from the PLX51-PBS where the station did not respond.
DPV1 Class 1 Read Tx Count	The number of PROFIBUS DPV1 Class 1 Read responses sent from the specific device to the PROFIBUS DP Master.
DPV1 Class 1 Read Rx Count	The number of successful PROFIBUS DPV1 Class 1 Read requests received by the specific device.
DPV1 Class 1 Read Err Count	N/A
DPV1 Class 1 Write Tx Count	The number of PROFIBUS DPV1 Class 1 Write responses sent from the specific device to the PROFIBUS DP Master.
DPV1 Class 1 Write Rx Count	The number of successful PROFIBUS DPV1 Class 1 Write requests received by the specific device.
DPV1 Class 1 Write Err Count	N/A
DPV1 Class 2 Init Tx Count	N/A
DPV1 Class 2 Init Rx Count	The number of PROFIBUS DPV1 Class 2 Initialize requests received by the specific device.

DPV1 Class 2 Init Err Count	N/A
DPV1 Class 2 Abort Tx Count	N/A
DPV1 Class 2 Abort Rx Count	The number of PROFIBUS DPV1 Class 2 Abort requests received by the specific device.
DPV1 Class 2 Read Tx Count	N/A
DPV1 Class 2 Read Rx Count	The number of PROFIBUS DPV1 Class 2 Read requests received by the specific device.
DPV1 Class 2 Read Err Count	N/A
DPV1 Class 2 Write Tx Count	N/A
DPV1 Class 2 Write Rx Count	The number of PROFIBUS DPV1 Class 2 requests received by the specific device.
DPV1 Class 2 Write Err Count	N/A
Set Slave Addr Tx Count	N/A
Set Slave Addr Rx Count	The number of PROFIBUS Set Slave requests received by the specific device.
Set Slave Addr Err Count	N/A
Global Ctrl Tx Count	The number of PROFIBUS Global Control responses sent by the specific slave device.
Global Ctrl Rx Count	The number of PROFIBUS Global Control requests received by the specific slave device.
Unexpected Packet Received	The number of times a response is received from the device that was not expected (e.g. incorrect response, response from a different node, etc.).
Invalid Response Length Count	The number of times a response is received from the device where the length is not correct (For example, if the device is configured to provide 10 bytes of process data and only 5 bytes are returned during data exchange).
FDL Fault Count	The number of Data Link Layer function code faults received from the specific device.
Extract Alarm Success Count	The number of alarms that have successfully been extracted from the specific device.
Extract Alarm Fail Count	N/A
Initialize Parameter Set Success Count	The number of parameters that have successfully been set after the device has been configured for data exchange for the specific device.
Initialize Parameter Set Fail Count	The number of parameters that have failed to set after the device has been configured for DPV0 data exchange for the specific device.
Device Reconfigure Count	The number of times the device has been (re)configured for DPV0 data exchange.
Device Reparameterize Count	The number of times the device has been (re)parameterized for DPV0 data exchange.
Ext Diag Overflow Count	The number of times the device has returned diagnostics data that could not fit into a single PROFIBUS frame.

6.3 PROFIBUS Packet Capture

The PLX51-PBS allows you to capture the PROFIBUS traffic for analysis.

1 To invoke the capture of the module, right-click on the *PLX51-PBS* icon and double-click on the **DP PACKET CAPTURE** item in the Project Explorer tree.

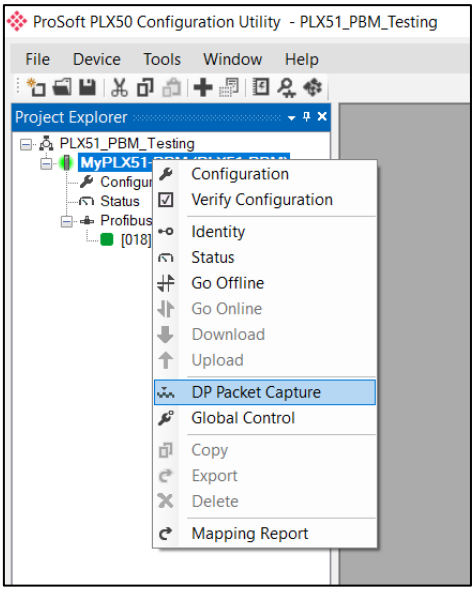


Figure 6.16 - Selecting PROFIBUS Packet Capture

2 The *DP Packet Capture* window opens and automatically starts capturing all PROFIBUS packets.

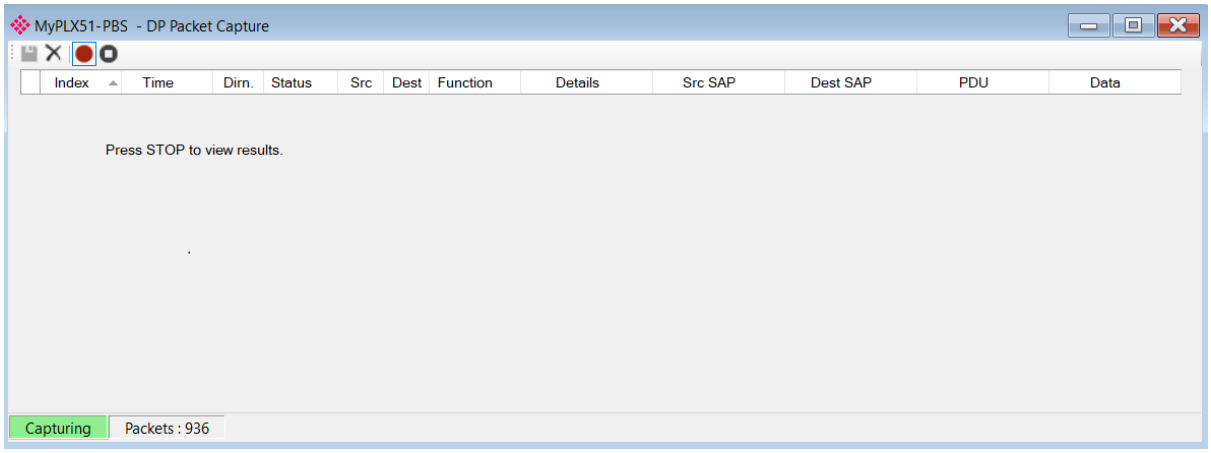
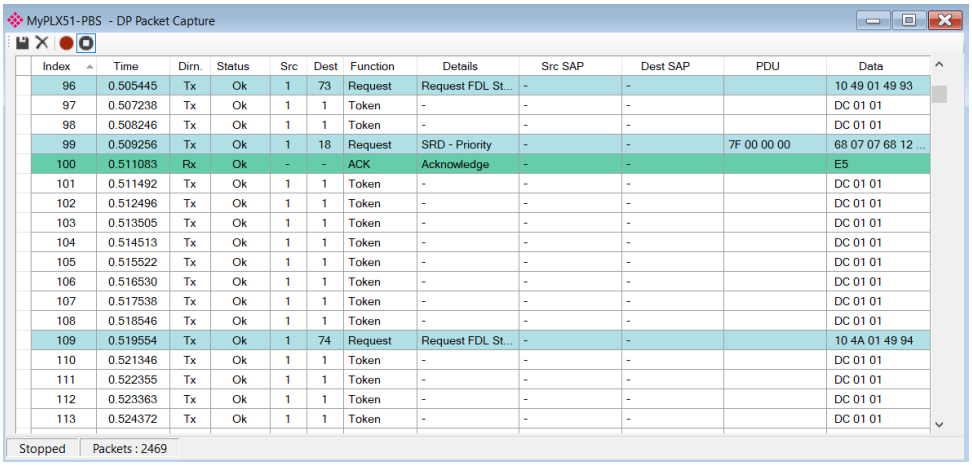


Figure 6.17 - PROFIBUS packet capture

NOTE: The module captures packets until you press the **STOP** button or when 10,000 DP packets have been reached.

3 When the capture process is stopped, the PROFIBUS capture is displayed.



Index	Time	Dirn.	Status	Src	Dest	Function	Details	Src SAP	Dest SAP	PDU	Data
96	0.505445	Tx	Ok	1	73	Request	Request FDL St...	-	-		10 49 01 49 93
97	0.507238	Tx	Ok	1	1	Token	-	-	-		DC 01 01
98	0.508246	Tx	Ok	1	1	Token	-	-	-		DC 01 01
99	0.509256	Tx	Ok	1	18	Request	SRD - Priority	-	-	7F 00 00 00	68 07 07 68 12 ...
100	0.511083	Rx	Ok	-	-	ACK	Acknowledge	-	-		E5
101	0.511492	Tx	Ok	1	1	Token	-	-	-		DC 01 01
102	0.512496	Tx	Ok	1	1	Token	-	-	-		DC 01 01
103	0.513505	Tx	Ok	1	1	Token	-	-	-		DC 01 01
104	0.514513	Tx	Ok	1	1	Token	-	-	-		DC 01 01
105	0.515522	Tx	Ok	1	1	Token	-	-	-		DC 01 01
106	0.516530	Tx	Ok	1	1	Token	-	-	-		DC 01 01
107	0.517538	Tx	Ok	1	1	Token	-	-	-		DC 01 01
108	0.518546	Tx	Ok	1	1	Token	-	-	-		DC 01 01
109	0.519554	Tx	Ok	1	74	Request	Request FDL St...	-	-		10 4A 01 49 94
110	0.521346	Tx	Ok	1	1	Token	-	-	-		DC 01 01
111	0.522355	Tx	Ok	1	1	Token	-	-	-		DC 01 01
112	0.523363	Tx	Ok	1	1	Token	-	-	-		DC 01 01
113	0.524372	Tx	Ok	1	1	Token	-	-	-		DC 01 01

Figure 6.18 - PROFIBUS Packet Capture complete

The captured PROFIBUS packets are tabulated as follows:

Table 6.8 - PROFIBUS Packet Capture fields

Statistic	Description
Index	The packet index incremented for each packet sent or received.
Time	The time is measured in microseconds (us) and is started at a fraction of a second and continued until the packet capture is done.
Dirn.	The direction of the packet, either transmitted (Tx) or received (Rx).
Status	The status of the packet. Received packets are checked for valid PROFIBUS constructs and valid checksums.
Src	PROFIBUS node address of the message source.
Dest	PROFIBUS node address of the message destination.
Function	The PROFIBUS function (e.g. Token, Request, etc.).
Details	Additional details associated with the PROFIBUS command/function.
Src SAP	The source Service Access Point (SAP), when used.
Dest SAP	The destination Service Access Point (SAP), when used.
PDU	The PROFIBUS packet payload.
Data	The packet's raw data displayed in space delimited hex.

4 The packet capture can be saved to a file for further analysis by selecting the **SAVE** button on the toolbar.

5 Previously saved PROFIBUS Packet Capture files can be viewed by selecting the **PROFIBUS PACKET CAPTURE VIEWER** option in the *Tools* menu.

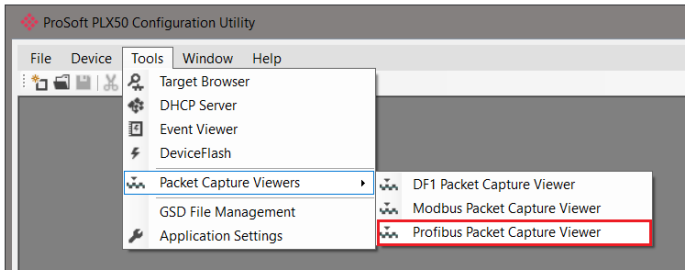


Figure 6.19 - Selecting the PROFIBUS Packet Capture Viewer

6.4 Modbus Packet Capture

The PLX51-PBS allows you to capture the Modbus traffic for analysis.

1 To invoke the capture of the module, right-click on the *PLX51-PBS* icon and double-click on the **MODBUS PACKET CAPTURE** item in the Project Explorer tree.

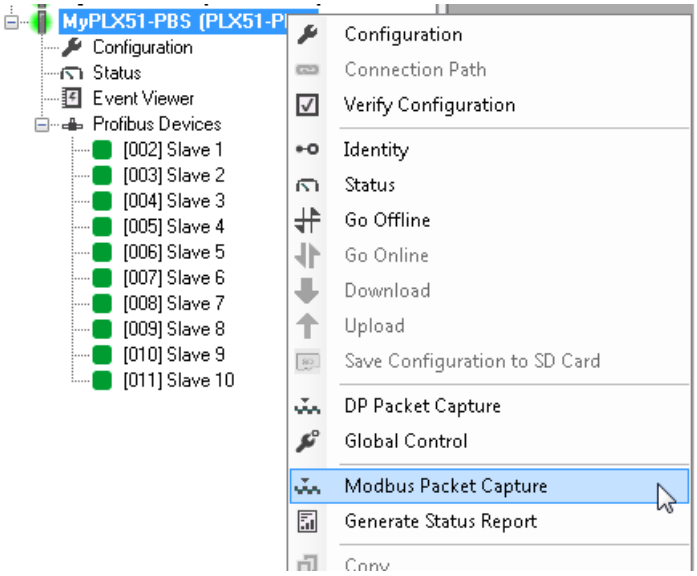


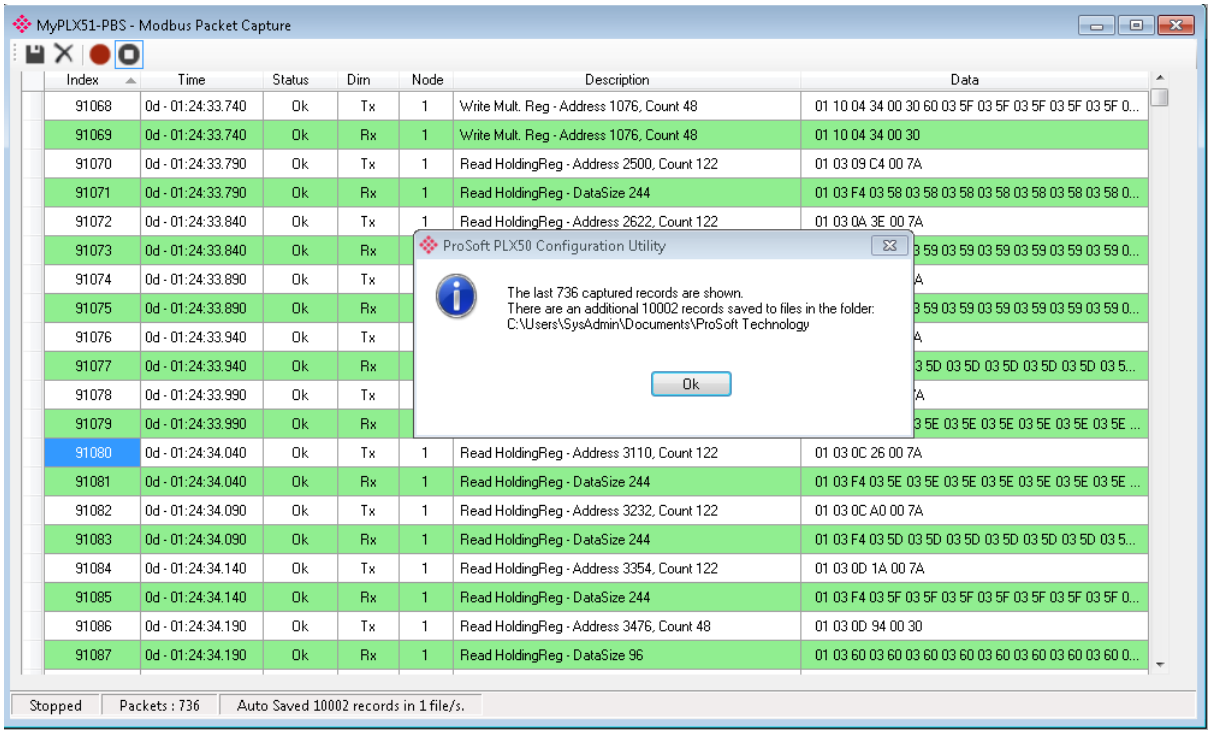
Figure 6.20 - Selecting Modbus Packet Capture

2 The *DP Packet Capture* window opens and automatically starts capturing all Modbus packets.

Figure 6.21 - Modbus packet capture

NOTE: The module captures packets until you press the **STOP** button**.** If the packet capture reaches ~10,000 packets, it will automatically store the capture into a file, and will keep doing so for every 10,000 packets.

3 When the capture process is stopped, the Modbus capture is presented as shown below. It will keep capturing until you press **STOP**.



Index	Time	Status	Dirn	Node	Description	Data
91068	0d - 01:24:33.740	Ok	Tx	1	Write Mult. Reg - Address 1076, Count 48	01 10 04 34 00 30 60 03 5F 03 5F 03 5F 03 5F 0...
91069	0d - 01:24:33.740	Ok	Rx	1	Write Mult. Reg - Address 1076, Count 48	01 10 04 34 00 30
91070	0d - 01:24:33.790	Ok	Tx	1	Read HoldingReg - Address 2500, Count 122	01 03 09 C4 00 7A
91071	0d - 01:24:33.790	Ok	Rx	1	Read HoldingReg - DataSize 244	01 03 F4 03 58 03 58 03 58 03 58 03 58 03 58 0...
91072	0d - 01:24:33.840	Ok	Tx	1	Read HoldingReg - Address 2622, Count 122	01 03 0A 3E 00 7A
91073	0d - 01:24:33.840	Ok	Rx			3 59 03 59 03 59 03 59 03 59 03 59 0...
91074	0d - 01:24:33.890	Ok	Tx			A
91075	0d - 01:24:33.890	Ok	Rx			3 59 03 59 03 59 03 59 03 59 03 59 0...
91076	0d - 01:24:33.940	Ok	Tx			A
91077	0d - 01:24:33.940	Ok	Rx			3 5D 03 5D 03 5D 03 5D 03 5D 03 5...
91078	0d - 01:24:33.990	Ok	Tx			A
91079	0d - 01:24:33.990	Ok	Rx			3 5E 03 5E 03 5E 03 5E 03 5E 03 5E ...
91080	0d - 01:24:34.040	Ok	Tx	1	Read HoldingReg - Address 3110, Count 122	01 03 0C 26 00 7A
91081	0d - 01:24:34.040	Ok	Rx	1	Read HoldingReg - DataSize 244	01 03 F4 03 5E 03 5E 03 5E 03 5E 03 5E 03 5E ...
91082	0d - 01:24:34.090	Ok	Tx	1	Read HoldingReg - Address 3232, Count 122	01 03 0C A0 00 7A
91083	0d - 01:24:34.090	Ok	Rx	1	Read HoldingReg - DataSize 244	01 03 F4 03 5D 03 5D 03 5D 03 5D 03 5D 03 5D 03 5...
91084	0d - 01:24:34.140	Ok	Tx	1	Read HoldingReg - Address 3354, Count 122	01 03 0D 1A 00 7A
91085	0d - 01:24:34.140	Ok	Rx	1	Read HoldingReg - DataSize 244	01 03 F4 03 5F 03 5F 03 5F 03 5F 03 5F 03 5F 0...
91086	0d - 01:24:34.190	Ok	Tx	1	Read HoldingReg - Address 3476, Count 48	01 03 0D 94 00 30
91087	0d - 01:24:34.190	Ok	Rx	1	Read HoldingReg - DataSize 96	01 03 60 03 60 03 60 03 60 03 60 03 60 03 60 0...

Figure 6.22 - Modbus Packet Capture complete

The captured Modbus values are tabulated as follows:

Table 6.9 – Captured Modbus values

Statistic	Description
Index	The packet index incremented for each packet sent or received.
Time	The time is started at a fraction of a second and continued until the packet capture is done. Time is based off the Up Time of the module.
Status	The status of the packet. Packets are checked for valid Modbus constructs and valid checksums.
Dirn.	The direction of the packet, either transmitted (Tx) or received (Rx).
Node	Modbus Slave ID
Description	Modbus Function Code, Database starting address, Count
Data	Modbus message construction, in HEX format.

6.5 Module Event Log

The PLX51-PBS 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 or via the web interface. To view them in the PLX50 Configuration Utility, select the **EVENT VIEWER** option in the Project Explorer tree.

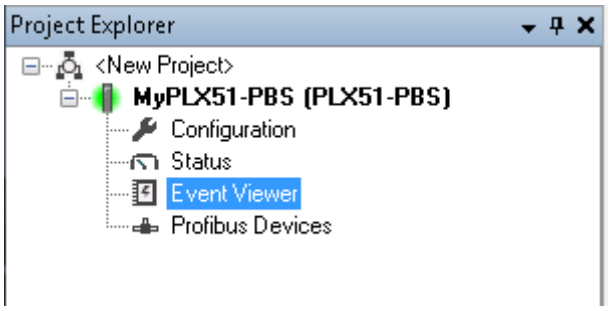
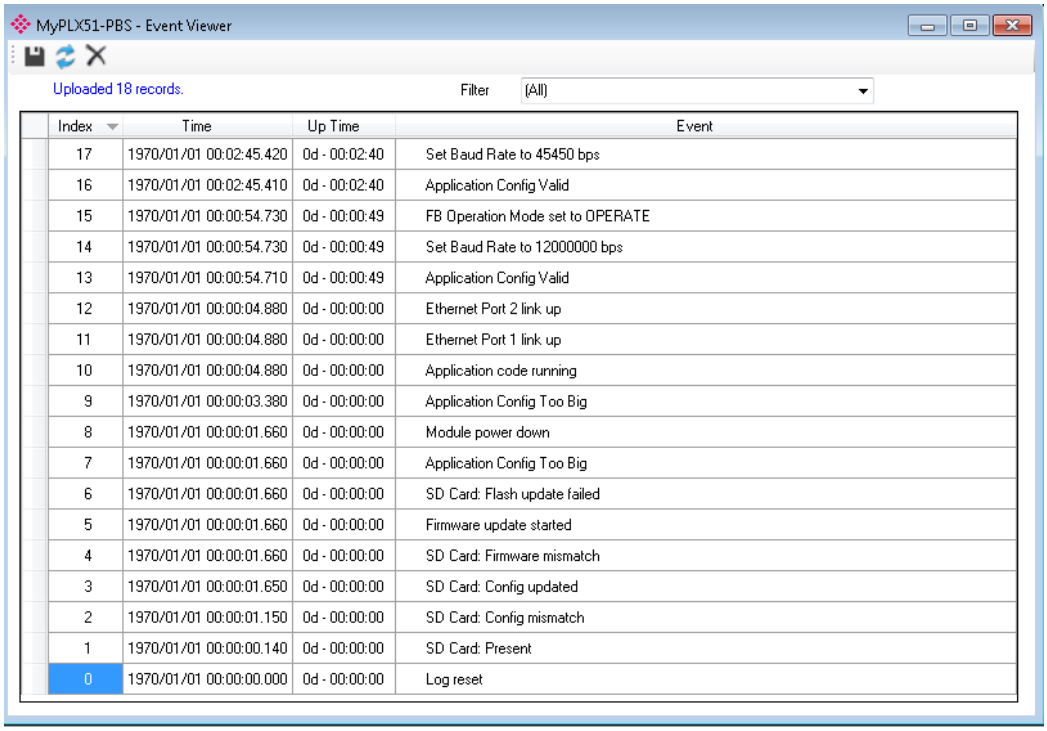


Figure 6.23. - Selecting the module Event Log

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.



Index	Time	Up Time	Event
17	1970/01/01 00:02:45.420	0d - 00:02:40	Set Baud Rate to 45450 bps
16	1970/01/01 00:02:45.410	0d - 00:02:40	Application Config Valid
15	1970/01/01 00:00:54.730	0d - 00:00:49	FB Operation Mode set to OPERATE
14	1970/01/01 00:00:54.730	0d - 00:00:49	Set Baud Rate to 12000000 bps
13	1970/01/01 00:00:54.710	0d - 00:00:49	Application Config Valid
12	1970/01/01 00:00:04.880	0d - 00:00:00	Ethernet Port 2 link up
11	1970/01/01 00:00:04.880	0d - 00:00:00	Ethernet Port 1 link up
10	1970/01/01 00:00:04.880	0d - 00:00:00	Application code running
9	1970/01/01 00:00:03.380	0d - 00:00:00	Application Config Too Big
8	1970/01/01 00:00:01.660	0d - 00:00:00	Module power down
7	1970/01/01 00:00:01.660	0d - 00:00:00	Application Config Too Big
6	1970/01/01 00:00:01.660	0d - 00:00:00	SD Card: Flash update failed
5	1970/01/01 00:00:01.660	0d - 00:00:00	Firmware update started
4	1970/01/01 00:00:01.660	0d - 00:00:00	SD Card: Firmware mismatch
3	1970/01/01 00:00:01.650	0d - 00:00:00	SD Card: Config updated
2	1970/01/01 00:00:01.150	0d - 00:00:00	SD Card: Config mismatch
1	1970/01/01 00:00:00.140	0d - 00:00:00	SD Card: Present
0	1970/01/01 00:00:00.000	0d - 00:00:00	Log reset

Figure 6.24. – Module Event Log

The log can also be stored to a file for future analysis, by selecting the **SAVE** button in the tool menu.

To view previously saved files, use the **EVENT LOG VIEWER** option under the Tools menu.

6.6 Web Server

The PLX51-PBS provides a web server for diagnostics. This allows for connectivity to the module without the use of the PLX50 Configuration Utility, Logix, or Modbus device to view various the diagnostics of the module.

NOTE: The web server is read-only and thus no parameters or configuration can be altered from the web interface.

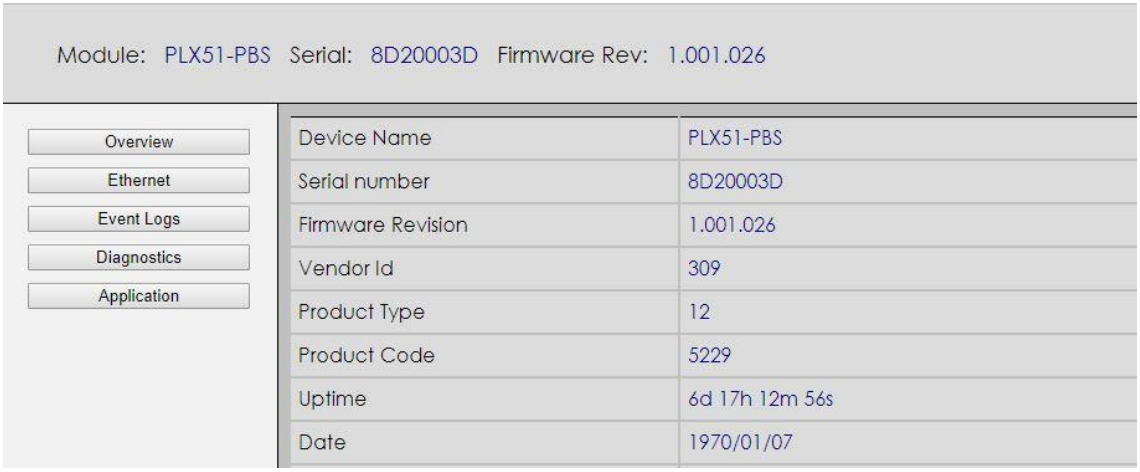


Figure 6.25 - Web interface

NOTE: The PLX51-PBS parameters and diagnostics in the web server will match those in the PLX50 Configuration Utility status.

7 Technical Specifications

7.1 Dimensions

Below are the enclosure dimensions. All dimensions are in millimeters.

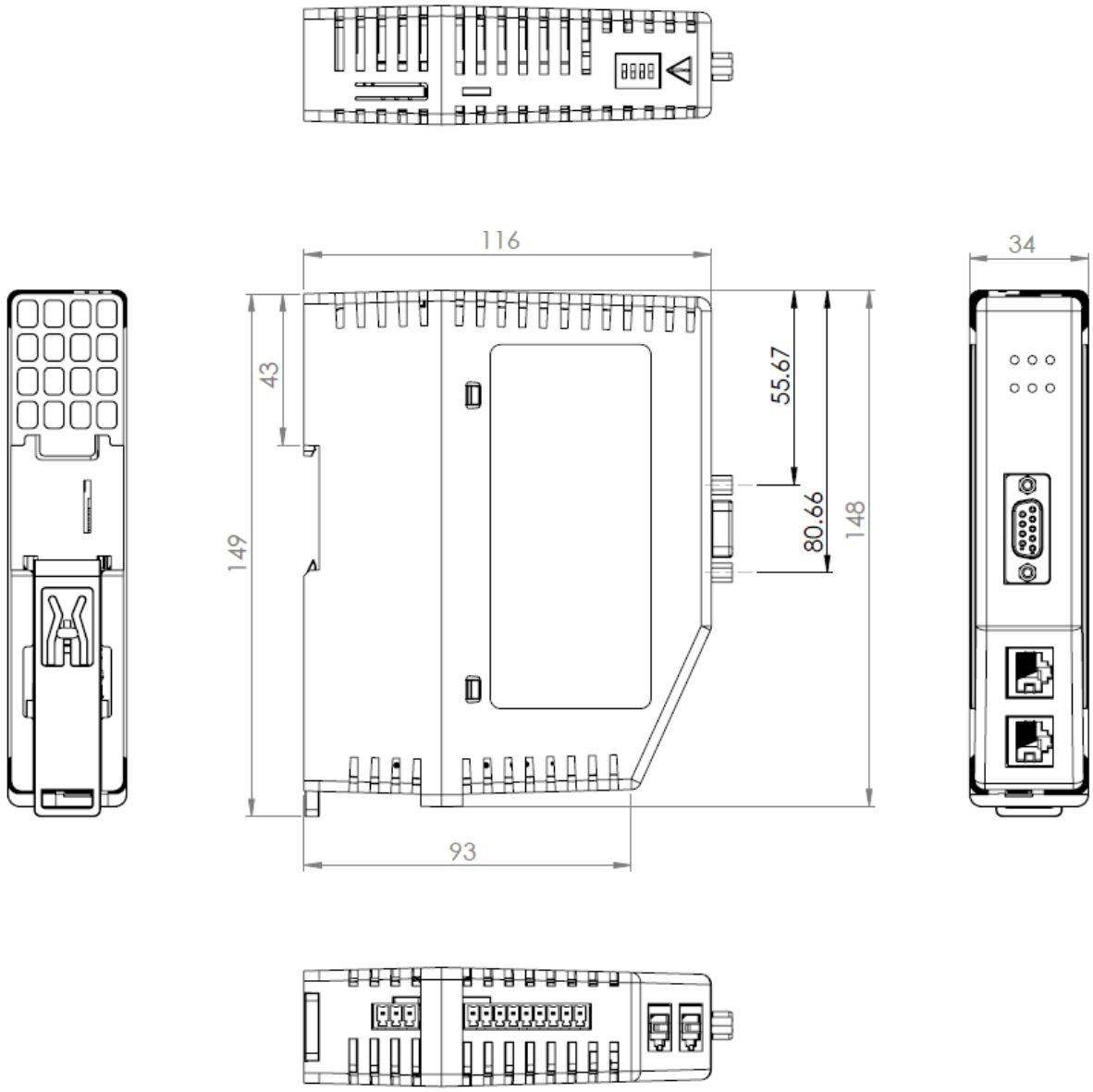


Figure 7.1 – PLX51-PBS enclosure dimensions

7.2 Electrical

Table 7.1 - Electrical specification

Specification	Rating
Power requirements	Input: 10 to 36V DC
Power consumption	Maximum: 85mA @ 24V => 2.04W
Connector	3-way terminal
Conductors	24 to 18 AWG
Enclosure rating	IP20, NEMA/UL Open Type
Temperature	-20 to 70 °C
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

7.3 Ethernet

Table 7.2 - Ethernet specification

Specification	Rating
Connector	RJ45
Conductors	CAT5 STP/UTP
ARP connections	Max 40
TCP connections	Max 40
CIP connections	Max 10
Communication rate	10/100Mbps
Duplex mode	Full/Half
Auto-MDIX support	Yes
Embedded switch	Yes, 2 x Ethernet ports

7.4 Modbus TCP/IP

Table 7.3 – Modbus TCP/IP specification

Specification	Rating
Mode	Client or Server
Connector	RJ45
Conductors	CAT5 STP/UTP
ARP connections	Max 40: 20 Client, 20 Server
Communication rate	10/100Mbps
Duplex mode	Full / Half / Auto Negotiate
Auto-MDIX support	Yes

7.5 PROFIBUS DP

Table 7.4 – PROFIBUS DP specification

Specification	Rating
Connector	Female DB9 connector
Conductor	See *PROFIBUS DP* Section.
DP Slave Mode Support	DPV0 Data Exchange DPV1 Class 1 Messaging DPV1 Alarming
Isolated	Yes
BAUD Rate supported	9.6 kbps 19.2 kbps 45.45 kbps 93.75 kbps 187.5 kbps 500 kbps 1.5 Mbps 3 Mbps 6 Mbps 12 Mbps

7.6 Agency Approvals and Certifications

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

8 PROFIBUS DP

8.1 Introduction

PROFIBUS is a vendor-independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Vendor independence and openness are guaranteed by the PROFIBUS standard EN 50 170. With PROFIBUS, devices of different manufacturers can communicate without special interface adjustments. PROFIBUS can be used for both high-speed time critical data transmission and extensive complex communication tasks. The PROFIBUS family consists of three compatible versions.

8.1.1 PROFIBUS DP

Optimized for high speed and inexpensive hookup, this PROFIBUS version is designed especially for communication between automation control systems and distributed I/O at the device level. PROFIBUS-DP can be used to replace parallel signal transmission with 24 V or 4-20 mA.

Table 8.1 – PROFIBUS Protocol (OSI model)

OSI Layer		PROFIBUS		
7	Application	DPV0	DPV1	DPV2
6	Presentation			
5	Session			
4	Transport			
3	Network			
2	Data Link	FDL		
1	Physical	EIA-485	Optical	MBP

To utilize these functions, various service levels of the DP protocol were defined:

- DP-V0 provides the basic functionality of DP, including:
  - cyclic data exchange,
  - station, module and channel-specific diagnostics
- DP-V1 contains enhancements geared towards process automation, in particular:
  - acyclic data communication for parameter assignment
  - alarm handling
- DP-V2 for isochronous mode and data exchange broadcast (slave-to-slave communication)

8.1.2 PROFIBUS PA

PROFIBUS PA is designed especially for process automation. It permits sensors and actuators to be connected on one common bus line through a dedicated DP/PA gateway or link between the PROFIBUS DP and PROFIBUS PA networks, even in intrinsically-safe areas. PROFIBUS PA permits data communication and power over the bus using a 2-wire technology according to the international standard IEC 1158-2.

8.1.3 PROFIBUS FMS

PROFIBUS FMS is the general-purpose solution for communication tasks at the cell level. Powerful FMS services open up a wide range of applications and provide great flexibility. PROFIBUS FMS can also be used for extensive and complex communication tasks. This protocol is the first developed for PROFIBUS, but it is no longer currently used.

PROFIBUS specifies the technical and functional characteristics of a serial fieldbus system with which decentralized digital controllers can be networked together from the field level to the cell level.

8.2 PROFIBUS Master and Slave

PROFIBUS distinguishes between master devices and slave devices.

Master devices determine the data communication on the bus. A master can send messages without an external request when it holds the bus access rights (the token). Masters are also called '**active stations**' in the PROFIBUS protocol.

Slave devices are peripheral devices. Typical slave devices include input/output devices, valves, drives and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the master when requested to do so. Slaves are also called '**passive stations**'.

8.3 PROFIBUS Master Class 1 (DPM1) or Class 2 (DPM2)

8.3.1 PROFIBUS DP Master Class 1 (DPM1)

A class 1 master handles the normal communication or exchange of data with the slaves assigned to it. This is typically a PLC.

It uses **cyclic communication** to exchange process data with its associated slaves. The class 1 master sets the baud rate and the slave's auto-detect this rate. Each slave device is assigned to one master and only that master may write output data to that slave. Other masters may read information from any slave but can only write output data to their own assigned slaves.

8.3.2 PROFIBUS DP Master Class 2 (DPM2)

A class 2 master is a special device primarily used for commissioning slaves and for diagnostic purposes. This is typically a Supervisor. It uses **acyclic communication** over what is known as the **MS2 channel**. A DPM2 does not have to be permanently connected to the bus system.

8.4 Cyclic Communication

The DP master class 1 cyclically exchanges data with all of the slaves assigned to it. This service is configured. During the configuration process, master and slave addresses are assigned, the bus parameters are defined, the types and numbers of modules (in the case of modular slaves) are specified, user-selectable parameter choices are made, etc.

Before data exchange can take place, the master will send parameterization and configuration telegrams to all of its assigned slaves. These parameters and configuration data are checked by the slaves. If both are valid, the master will initiate cyclic I/O data communication with the slave devices.

8.5 Acyclic Communication

In addition to the cyclic data exchange, the PROFIBUS protocol has the option of acyclic communication. This service is not configured. There are 2 different communication channels possible between the requested master and the slave:

- **MS1 channel** (MS1 connection): can only be established if cyclic data exchange is taking place between that master (DPM1) and the slave
- **MS2 channel** (MS2 connection): is possible with several masters simultaneously, but the connection must be established explicitly by the master.

Acyclic reading and writing of data requires an established MS1 or MS2 connection.

For the MS1 channel, 3 conditions must be satisfied:

- The slave device must support the MS1 channel (key *C1_Read_Write_supp* at 1 in the GSD file)
- The DPV1_enable bit must be set during the parameter assignment
- Data exchange is taking place

For the MS2 channel, the connection must be explicitly initiated by the master. The maximum number of possible MS2 connections to the slave must not be reached. The connection can be closed by either the master or the slave device.

8.6 Topology of PROFIBUS DP

PROFIBUS devices are connected in a bus structure. Up to 32 stations (master or slaves) can be connected in one segment. The bus is terminated by an active bus terminator at the beginning and end of each segment. Both bus terminations must always be powered. When more than 32 stations are used, repeaters (line amplifiers) must be used to connect the individual bus segments.

8.7 PROFIBUS DP Cable Description

Only one type of cable can be used for PROFIBUS network:

Table 8.2 – PROFIBUS DP network cable

Parameter	Type A
Surge Impedance	135 to 165Ω (3 to 20 MHz)
Capacity	< 30 pF/m
Loop Resistance	< 110 Ω/km
Wire gauge	> 0.64 mm
Conductor area	> 0.34 mm²

The maximum cable length depends on the transmission speed and cable type. The specified cable length can be increased using the repeaters. The use of more than 3 repeaters in series is not recommended.

Table 8.3 – PROFIBUS DP cable length

Baudrate (kbps)	9.6	19.2	93.75	187.5	500	1500	3000 to 12000
Length A (m)	1200	1200	1200	1000	400	200	100

8.8 PROFIBUS DP Connector Description

Table 8.4 – PROFIBUS DP connector

DB9 Pin Description	DB9 Pin#	DB9 Termination with PLX51-PBS
Chassis ground	1	
Reserved	2	
Data+ / B	3	In case of termination, connect this pin to Pin 8 (Data - / A) with 220 ohm resistor
Tx enable	4	
Isolated ground	5	Connect this pin to Pin 8 (Data - / A) with 390 ohm resistor
Voltage plus	6	Connect this pin to Pin 3 (Data + / B) with 390 ohm resistor
Reserved	7	
Data- / A	8	
Reserved	9	

9 Support, Service & Warranty

9.1 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:

- Product Version Number
- System architecture
- Network details

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

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

NOTE: For technical support calls within the United States, ProSoft Technology's 24/7 after-hours phone support is available for urgent plant-down issues.

North America (Corporate Location)	**Europe / Middle East / Africa Regional Office**
Phone: +1.661.716.5100 info@prosoft-technology.com Languages spoken: English, Spanish REGIONAL TECH SUPPORT support@prosoft-technology.com	Phone: +33.(0)5.34.36.87.20 france@prosoft-technology.com Languages spoken: French, English REGIONAL TECH SUPPORT support.emea@prosoft-technology.com
Latin America Regional Office	**Asia Pacific Regional Office**
Phone: +52.222.264.1814 latinam@prosoft-technology.com Languages spoken: Spanish, English REGIONAL TECH SUPPORT support.la@prosoft-technology.com	Phone: +60.3.2247.1898 asiapc@prosoft-technology.com Languages spoken: Bahasa, Chinese, English, Japanese, Korean REGIONAL TECH SUPPORT support.ap@prosoft-technology.com

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9.2 Warranty Information

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