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PLX51-PBS

PROFIBUS DP Slave to EtherNet/IP™ Gateway

August 29, 2019
v1.0

USER MANUAL

CONTENTS

1. PREFACE

1.1. INTRODUCTION

This manual describes the installation, operation, and diagnostics of the PROFIBUS DP Slave to EtherNet/IP™ 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 devices to exchange process, alarming, and diagnostic data with other PROFIBUS DP Master(s).
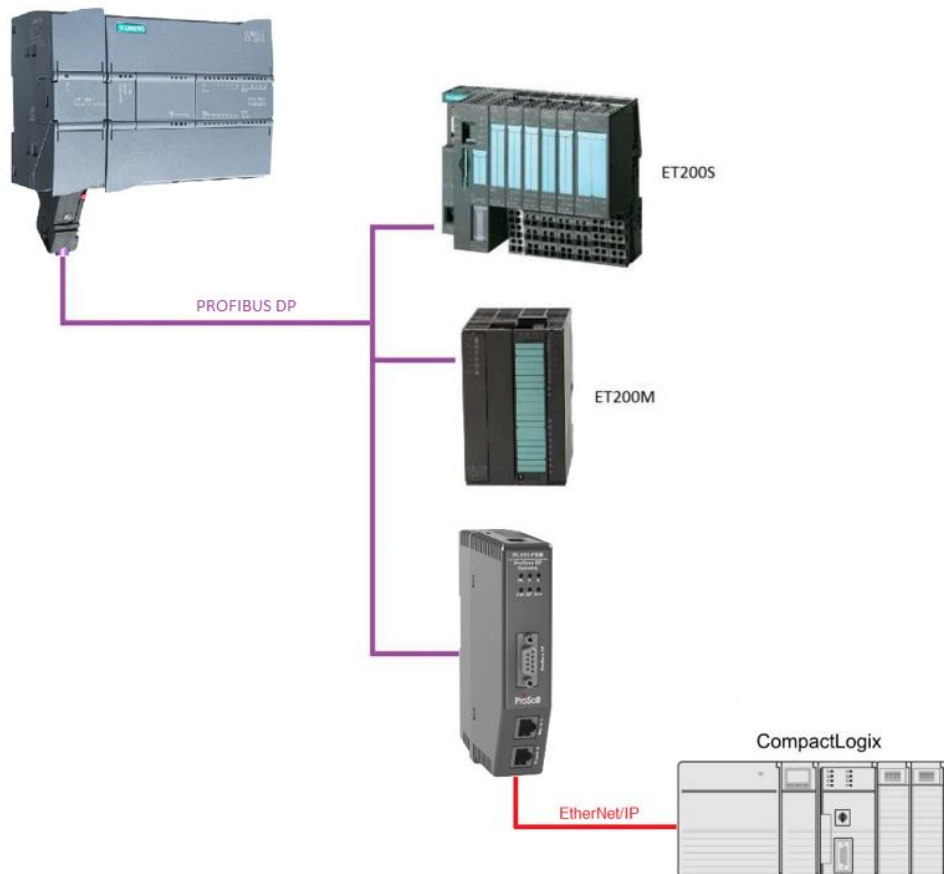

Figure 1.1 – Typical PLX51-PBS PROFIBUS Slave Architecture

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 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.

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

Table 1.1 - Additional Information

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:

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

Table 1.2 – Support Details

2. INSTALLATION

2.1. MODULE LAYOUT

The PLX51-PBS has one RS485 PROFIBUS DP port as well as two Ethernet. 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.
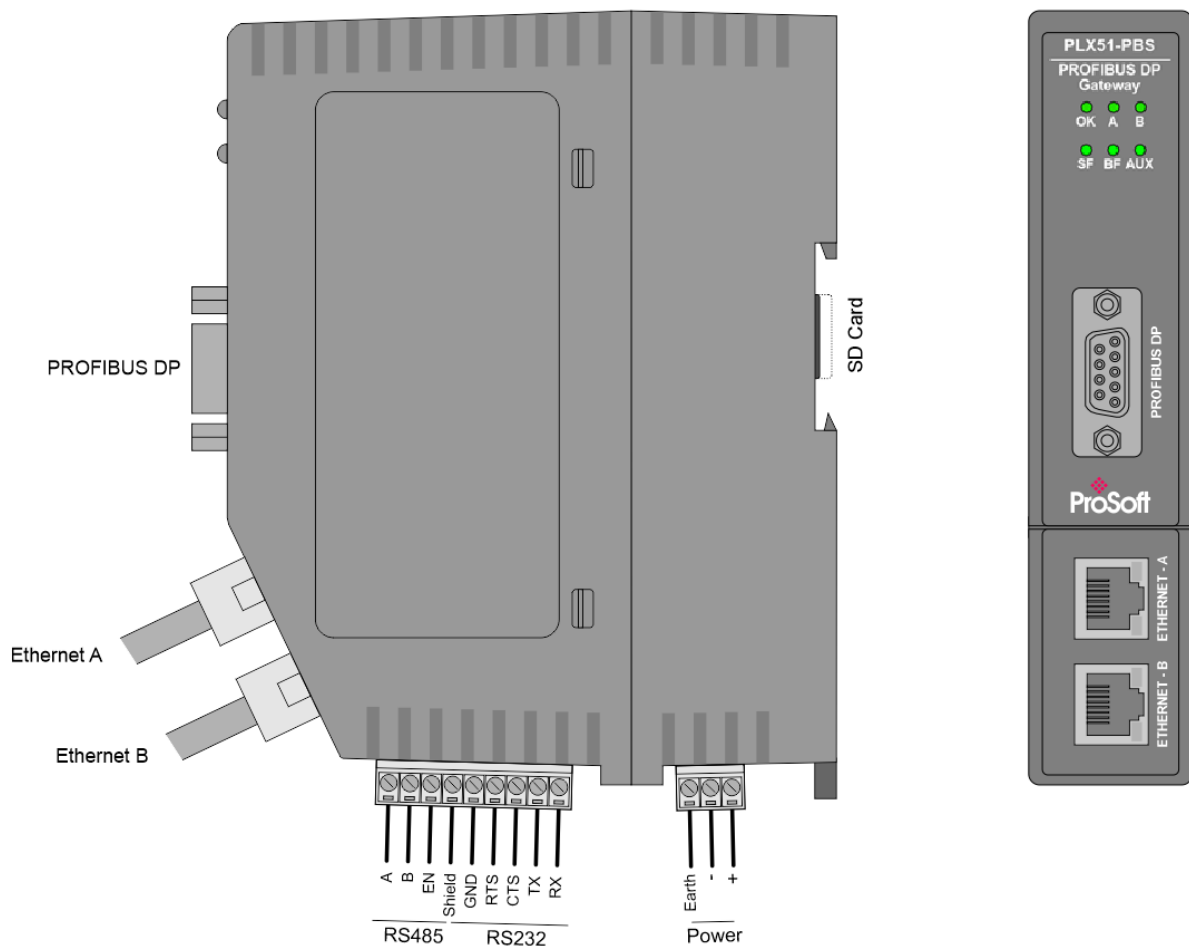

Figure 2.1 – PLX51-PBS Side and Front view

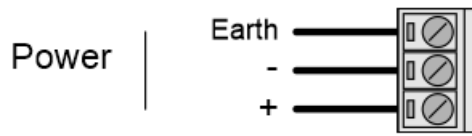At the bottom of the module, there is one 3-way power connector.

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.

NOTE: 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

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.

Table 2.1. - DIP Switch Settings

2.2. MODULE MOUNTING

The PLX51-PBS provides a DIN rail clip to mount onto a 35mm DIN rail.
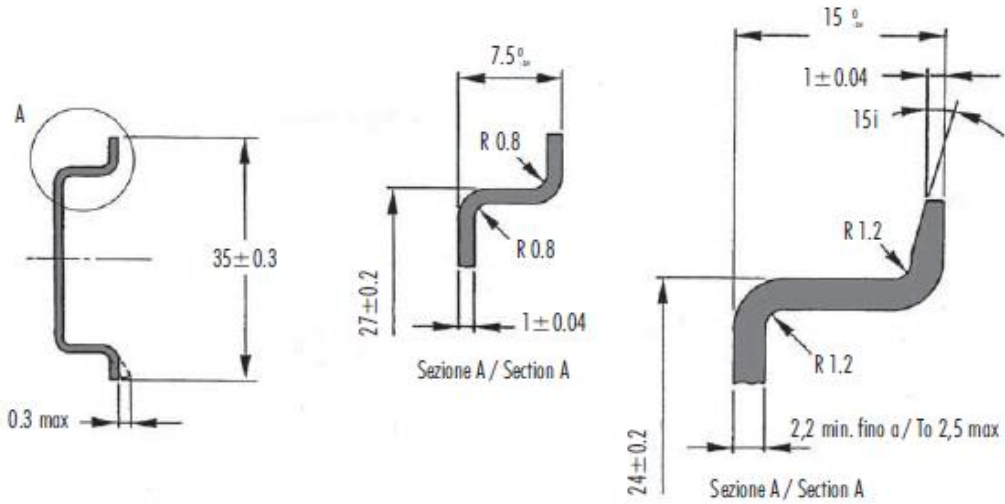
Figure 2.4 - DIN rail specification

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 upwards to lock the module onto the DIN rail.
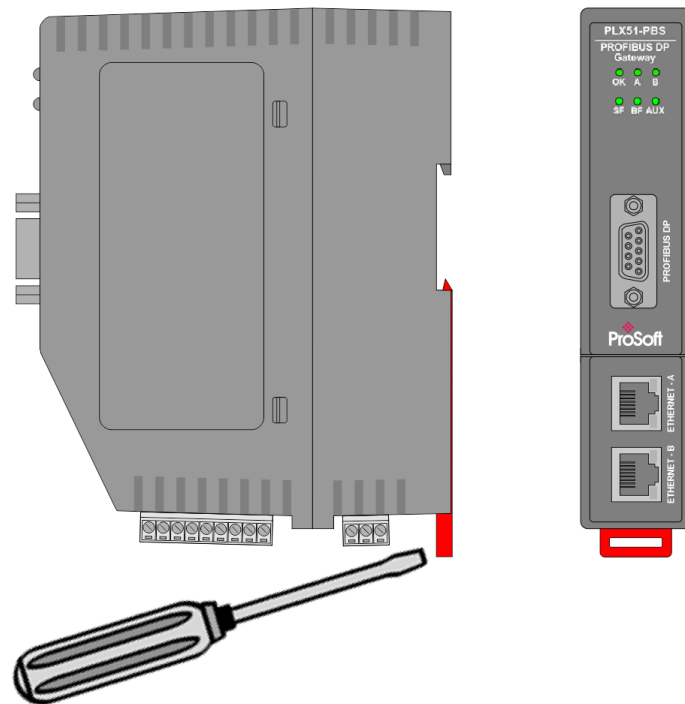
Figure 2.5 - DIN rail mouting

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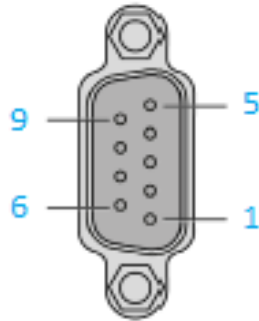
Figure 2.6 – PLX51-PBS PROFIBUS DP (RS485) DB9 connector

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

Table 2.2 – DB 9 Connector layout

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.
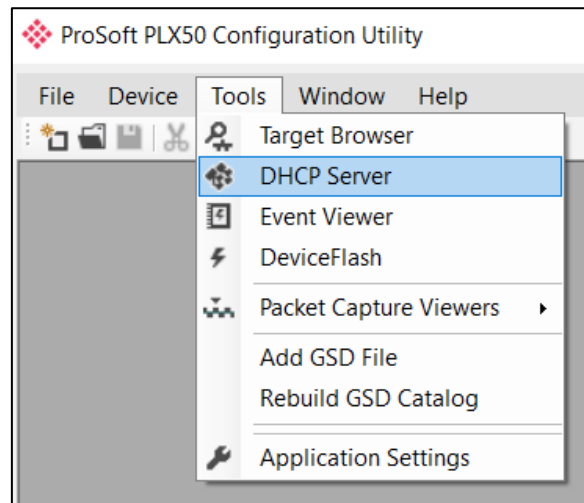
Figure 3.2. - Selecting DHCP Server

Once opened, the DHCP server listens on all available network adapters for DHCP requests and display their corresponding MAC addresses.
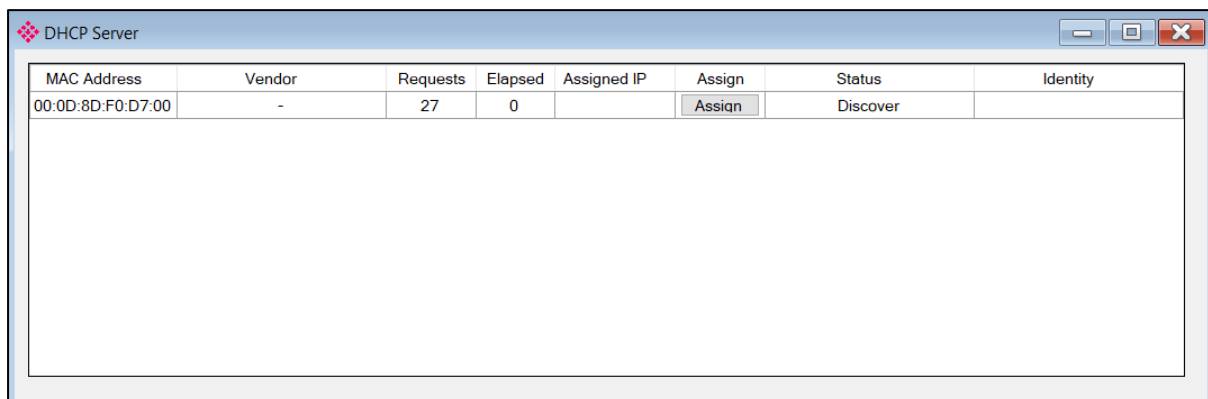
Figure 3.3. - DHCP Server

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.
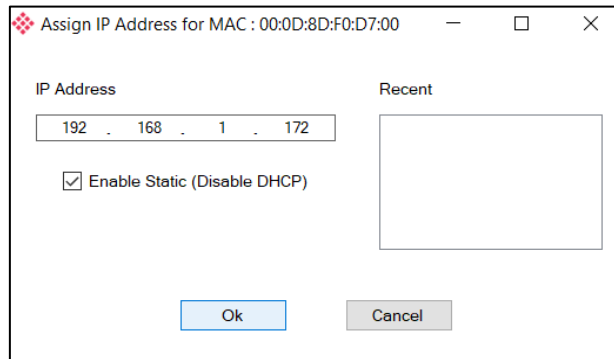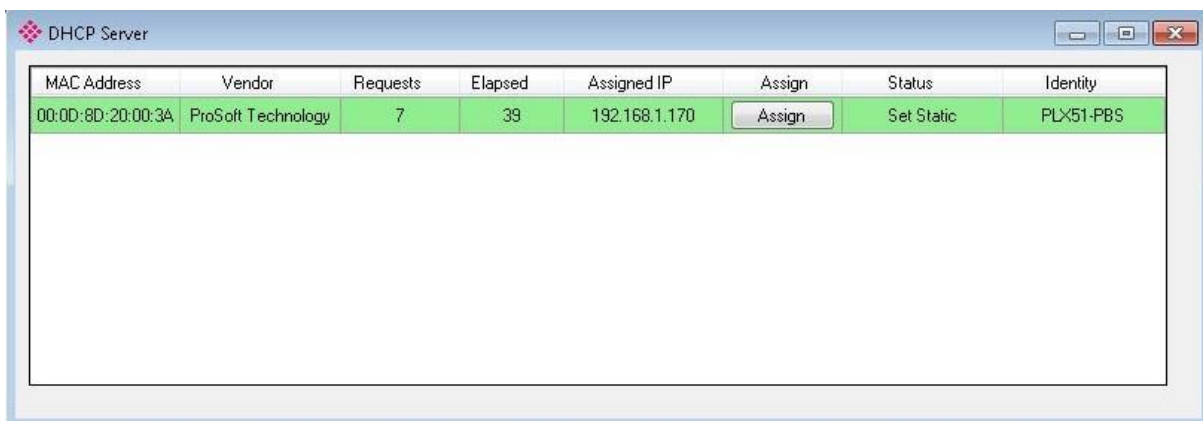
Figure 3.4. - Assigning IP Address for MAC

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.

⚠️ **NOTE:** 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.
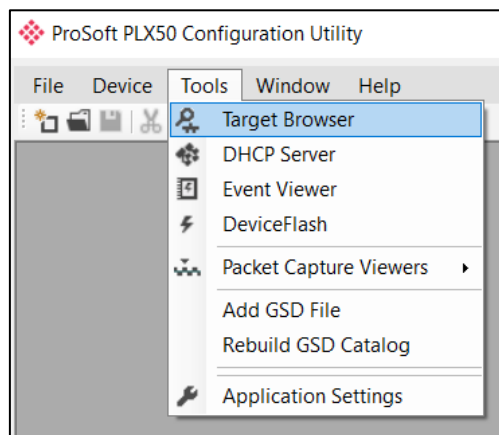
Figure 3.6. - Selecting the Target Browser

The *Target Browser* automatically scans the Ethernet network for EtherNet/IP devices.
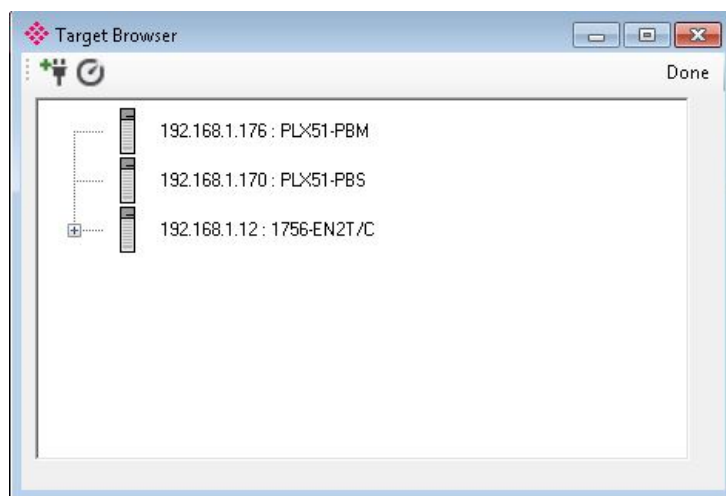
Figure 3.7. - Target Browser

Right-clicking on a device, reveals the context menu, including the *Port Configuration* option.
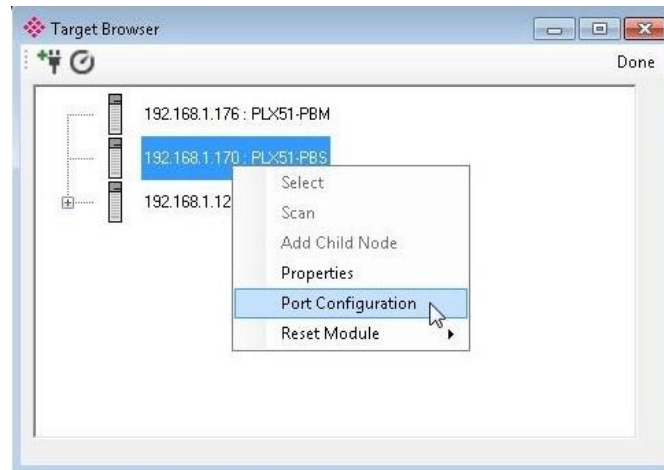
Figure 3.8. - Selecting Port Configuration

The Ethernet port configuration parameters can be modified using the *Ethernet Port Configuration* window.
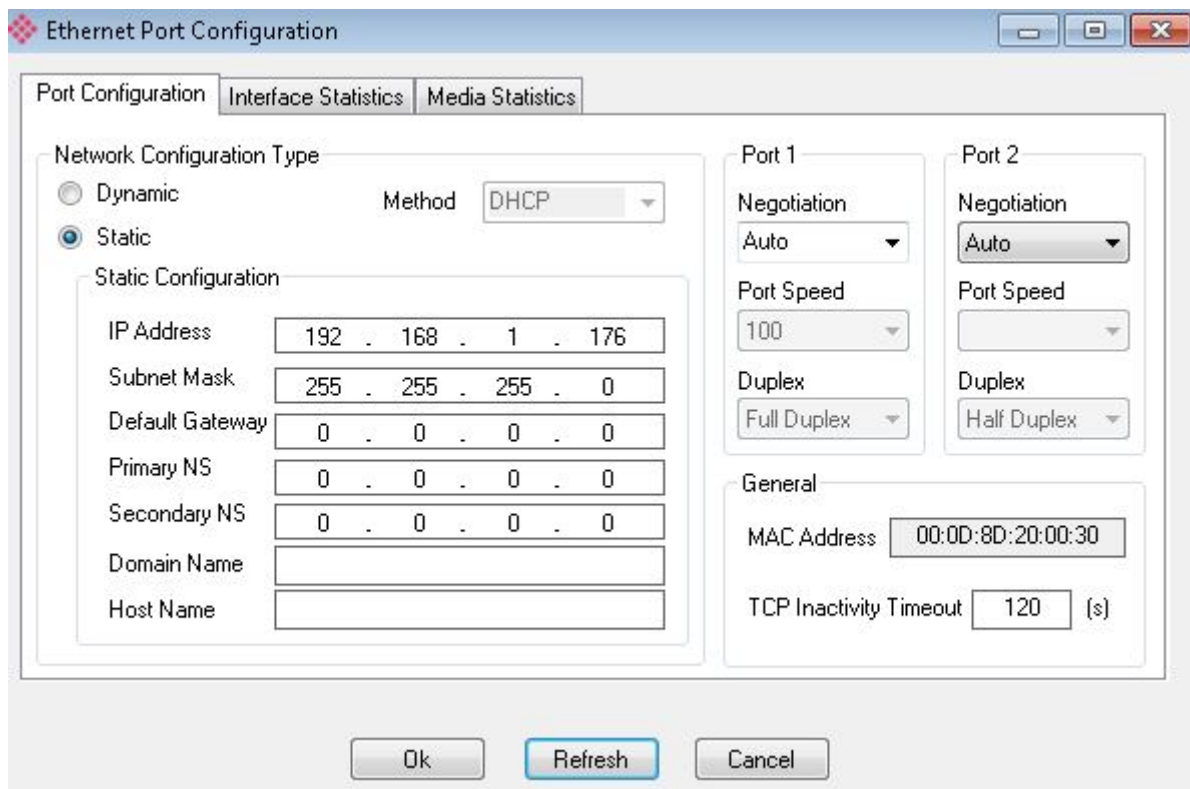
Figure 3.9. - Port Configuration

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.
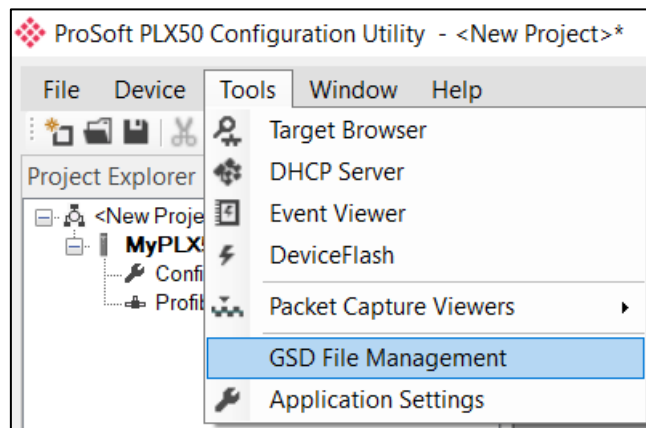
Figure 3.10 – Launching the GSD File Management Tool

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

Figure 3.11 – GSD File Management Tool

3 To add a GSD file, select the *Add* option under the *GSD File* menu.
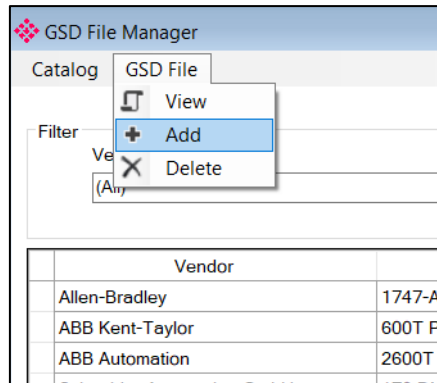
Figure 3.12 – GSD File Adding

4 Select the required GSD file and click **OPEN.**
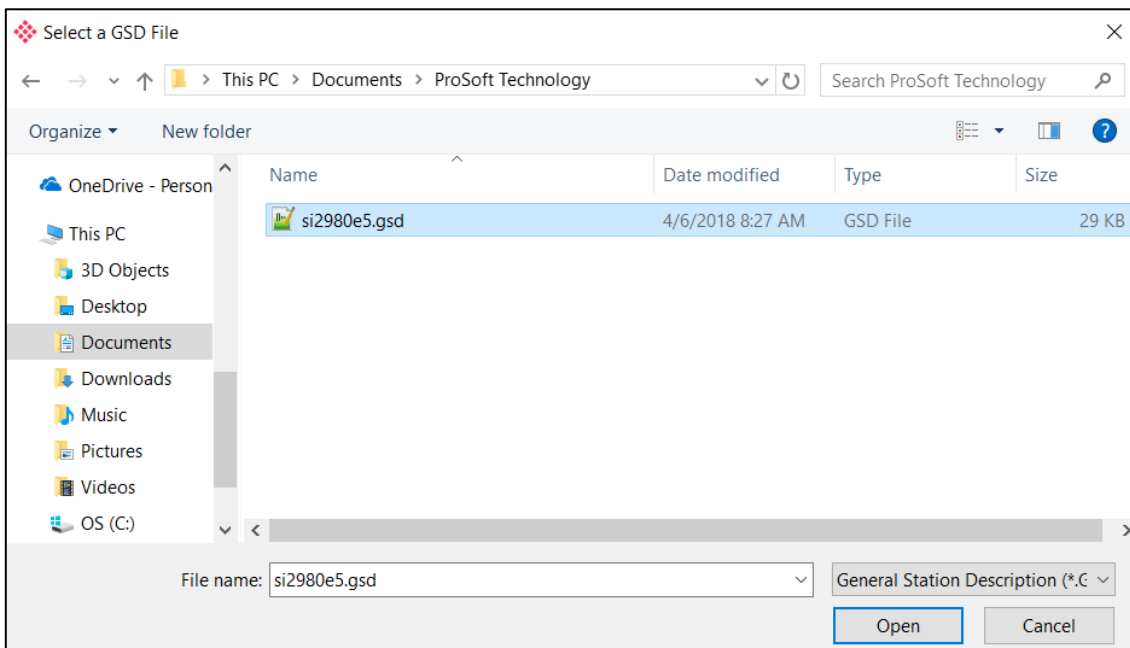
Figure 3.13 – Adding GSD File

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:
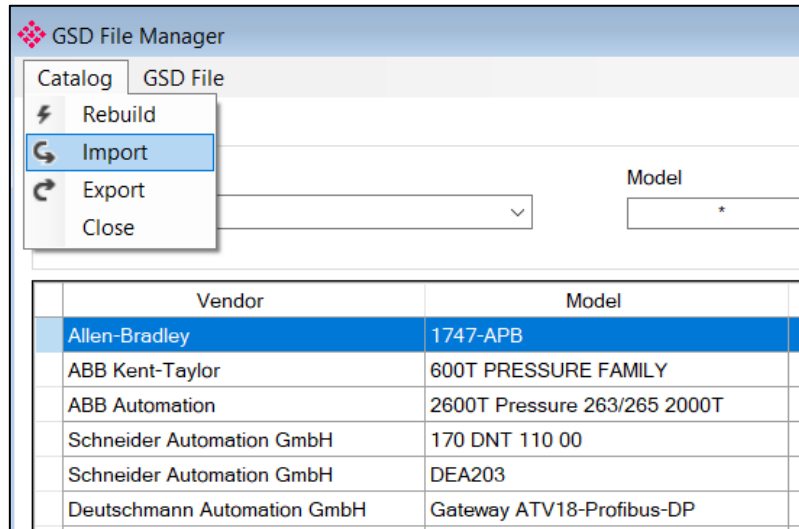
Figure 3.14 – GSD Catalog import/export

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.**
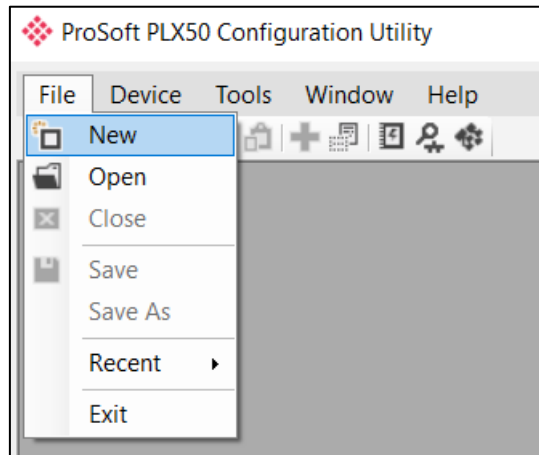
Figure 3.15 - Creating a new project

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.
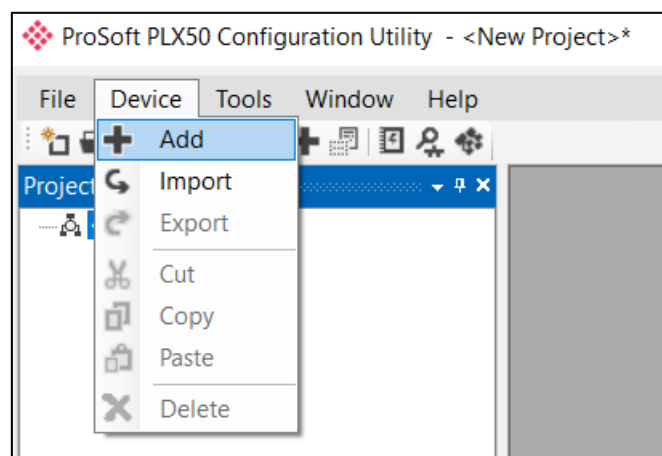
Figure 3.16 - Adding a new device

4 In the *Add New Device* window, the PLX51-PBS and click the **Oĸ** button.
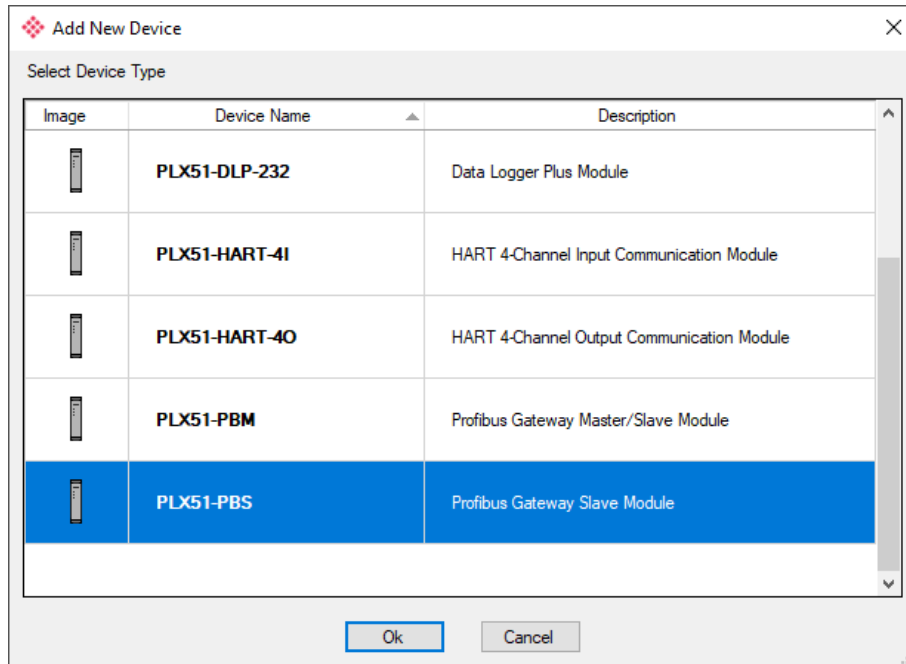
Figure 3.17 – PLX51-PBS

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*.
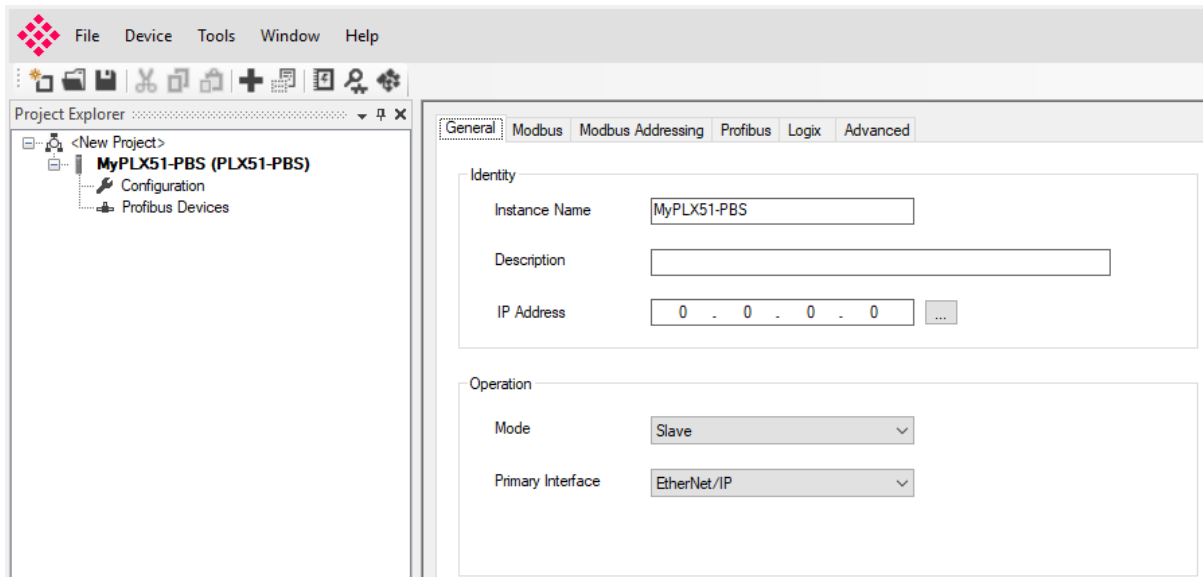
Figure 3.18 – PLX51-PBS configuration

3.5. PLX51-PBS PARAMETERS

The PLX51-PBS parameters are configured by the PLX50 Configuration Utility. Refer to the Additional Information section for documentation and installation links for ProSoft's 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*.
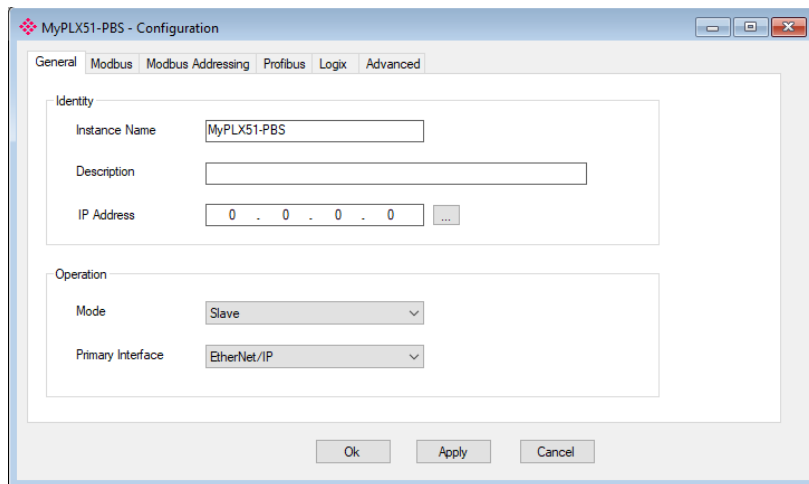
Figure 3.19 – PLX51-PBS General configuration

The General configuration consists of the following parameters:

Parameter	Description
Instance Name	This parameter is a user defined name to identify between various PLX51-PBS modules.
Description	This parameter is 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 three modes: **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.
Primary Interface	This is the network the PLX51-PBS will interface the PROFIBUS network. • EtherNet/IP (Logix)

Table 3.1 - General configuration parameters

3.5.2. 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.
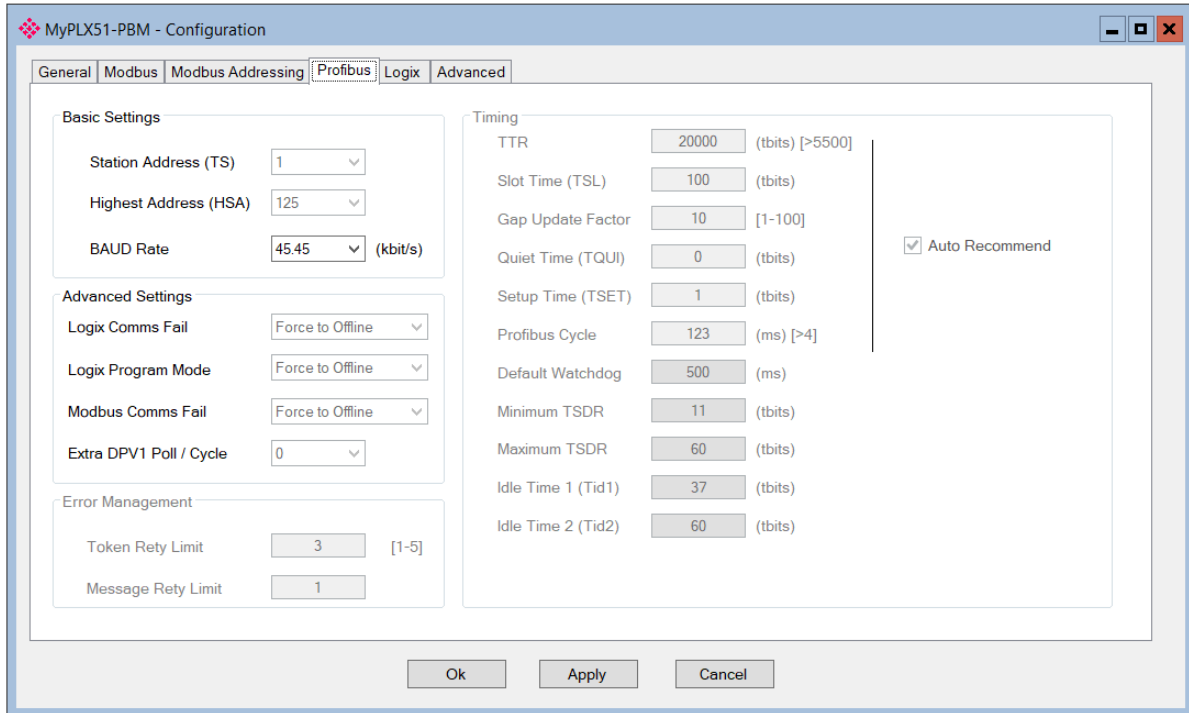
Figure 3.20 – PLX51-PBS PROFIBUS slave configuration

The PLX51-PBS PROFIBUS slave configuration consists of the following 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**"

Table 3.2 – PROFIBUS slave configuration parameters

3.5.3. 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.
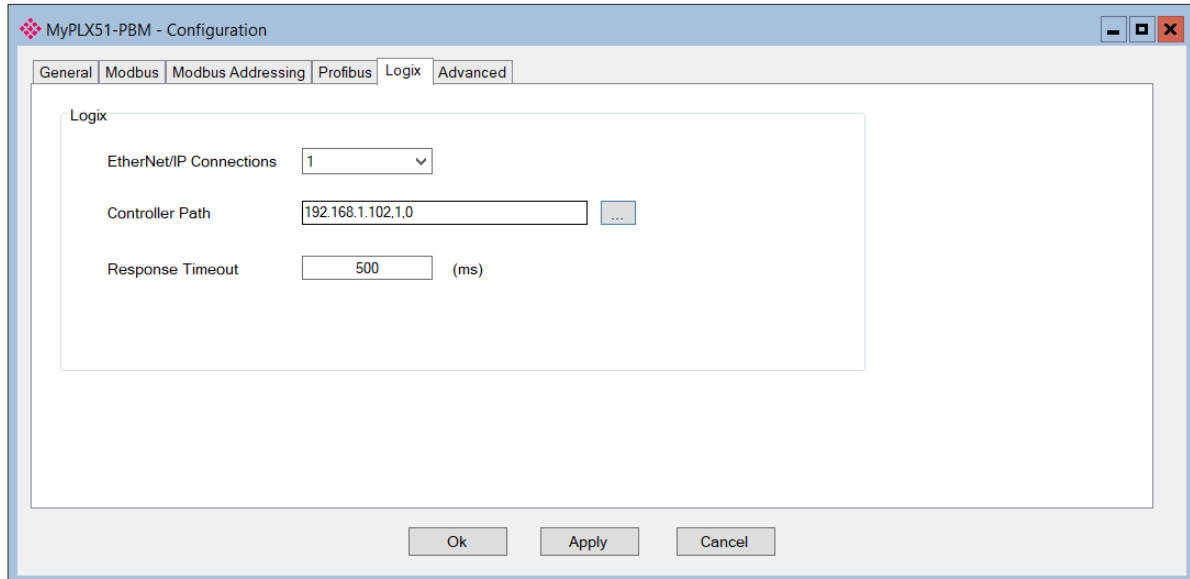
Figure 3.21 – PLX51-PBS Logix configuration

The Logix configuration consists of the following 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 either 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

Table 3.3 - Logix configuration parameters

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.
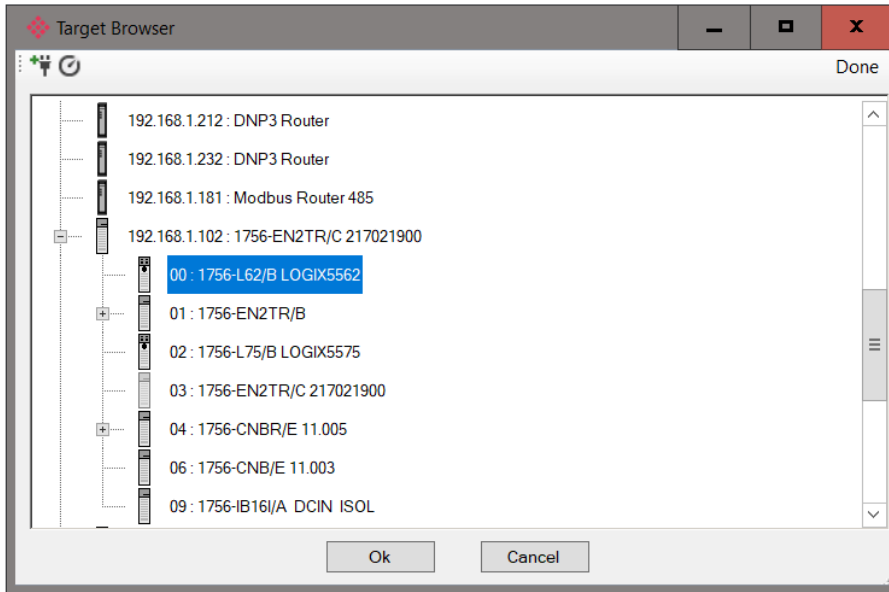
Figure 3.22 – Target Browser – Selecting Logix controller

3.5.4. 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.
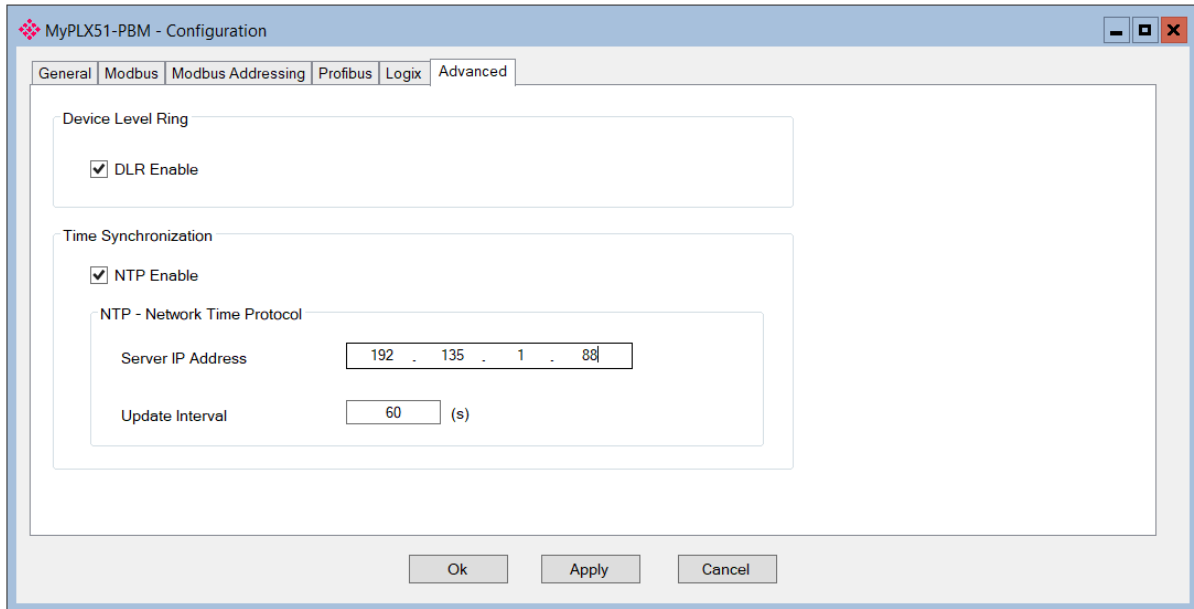

Figure 3.23 – PLX51-PBS Advanced configuration

The Advanced configuration consists of the following 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.

Table 3.4 - Advanced configuration parameters

3.6. 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.
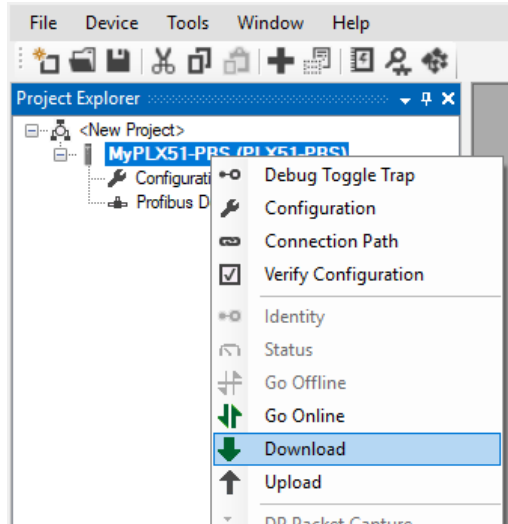
Figure 3.24 - Selecting Download

2 Once complete, you will be notified that the download was successful.
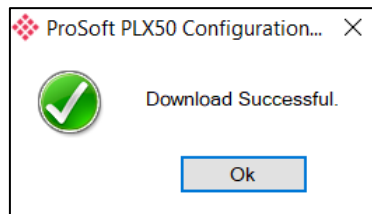
Figure 3.25 - Successful download

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.
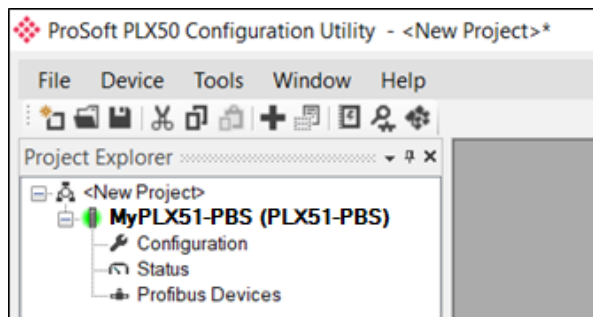
Figure 3.26 - Module online

4. OPERATION

4.1. LOGIX OPERATION

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

4.1.1. PROFIBUS DP - SLAVE

NOTE: 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 of the General Status UDT's created by the PLX50 Configuration Utility.

⊟ PBM01_MasterStatus	{...}		PSPLX51DPMasterStatus
PBM01_MasterStatus.ConfigValid	1	Decimal	BOOL
PBM01_MasterStatus.Owned	1	Decimal	BOOL
PBM01_MasterStatus.DuplicateDPStation	0	Decimal	BOOL
PBM01_MasterStatus.ProfibusFieldbusError	0	Decimal	BOOL
PBM01_MasterStatus.ProfibusDeviceError	1	Decimal	BOOL
PBM01_MasterStatus.ProfibusOffline	0	Decimal	BOOL
PBM01_MasterStatus.ProfibusStopped	0	Decimal	BOOL
PBM01_MasterStatus.ProfibusClear	0	Decimal	BOOL
PBM01_MasterStatus.ProfibusOperational	1	Decimal	BOOL
PBM01_MasterStatus.SlaveMode	0	Decimal	BOOL
⊞ PBM01_MasterStatus.ConfigCRC	−3271	Decimal	INT
⊞ PBM01_MasterStatus.DeviceLiveList	{...}	Decimal	BOOL[128]
⊞ PBM01_MasterStatus.DeviceDataExchangeActive	{...}	Decimal	BOOL[128]
⊞ PBM01_MasterStatus.DeviceAlarmPendingFlags	{...}	Decimal	BOOL[128]
⊞ PBM01_MasterStatus.DeviceDiagnosticPendingFlags	{...}	Decimal	BOOL[128]

Figure 4.1 – 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 the PLX50 Configuration Utility. 1 – PLX51-PBS is connected. 0 – PLX51-PBS is not connected.

DuplicateDPStation	Indicates that the PLX51-PBS has detected another PROFIBUS DP station with the same station address as itself and has entered a temporary Back-off mode. 1 – Duplicate detected (Back-off mode active). 0 – Normal (No duplicate detected). **NOTE**: In this condition, the PLX51-PBS will not communicate on the PROFIBUS DP network. Although the back-off time is approximately 5 seconds, should the conflicting DP master remain active on the PROFIBUS network, the PLX51-PBS will continuously re-enter back-off mode.
PROFIBUSFieldbusError	There is a PROFIBUS network issue (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	The PROFIBUS network is offline and the PLX51-PBS will not communicate with the DP Master on the network. 1 – PROFIBUS fieldbus state is OFFLINE. 0 – PROFIBUS fieldbus state is **not** OFFLINE.
PROFIBUSStopped	The PROFIBUS network is running and the PLX51-PBS is communicating on the network, but it will not exchange any process data with the DP Master. 1 – PROFIBUS fieldbus state is STOPPED. 0 – PROFIBUS fieldbus state is **not** STOPPED.
PROFIBUSClear	The PROFIBUS network is running and the PLX51-PBS is communicating on the network, however, the DP Master is only able to read input data. 1 – PROFIBUS fieldbus state is CLEAR. 0 – PROFIBUS fieldbus state is **not** CLEAR.
PROFIBUSOperational	The PROFIBUS network is running and the PLX51-PBS is communicating with the DP Master. 1 – PROFIBUS fieldbus state is operational. 0 – PROFIBUS fieldbus state is **not** operational.
SlaveMode	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.
DeviceLiveList	Indicates the nodes that are online on the local PROFIBUS network. Each bit represents a node. When the bit is set '1', the device is online. When the bit is set '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 bit is set '1', the device is online and exchanging data. When the bit is set '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 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. 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 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. Bit 0 – Node 0 has diagnostics pending Bit 1 – Node 1 has diagnostics pending ………. Bit 126 – Node 126 has diagnostics pending

Table 4.1 – Logix General Status tags

GENERAL CONTROL

The PLX51-PBS Slave feature operates similar to Master mode, but 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 4.2 – General Control tags

Tag	Description
MasterControl	For PLX51-PBM only.
RedundancyControl	Reserved.
DeviceEnable	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 PLX51-PBS.
	When the bit is set '0', the device does exchange data with the PLX51-PBS.
	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

Table 4.2 – General Control tags

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.

PBS01_PLX51PBS	{...}		PBS01_10FF3E83
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
PBS01_PLX51PBS.Input.Output1Byte	0	Decimal	SINT
PBS01_PLX51PBS.Input.Output2Bytes	{...}	Decimal	SINT[2]
PBS01_PLX51PBS.Input.Output4Bytes	0.0	Float	REAL
PBS01_PLX51PBS.Input.Output8Bytes	{...}	Decimal	SINT[8]
PBS01_PLX51PBS.Input.Output16Bytes	{...}	Decimal	SINT[16]
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
PBS01_PLX51PBS.Output.Input2Bytes	{...}	Decimal	SINT[2]
PBS01_PLX51PBS.Output.Input4Bytes	0.0	Float	REAL

Figure 4.3 – PLX51-PBS Slave Device-Specific tag

Tag	Description
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 4.3 – Device Input tags

Tag	Description
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.
DeviceSpecificOutputDataFields	The tags created for the output data will be slave specific.

Table 4.4 – Device Output tags

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.
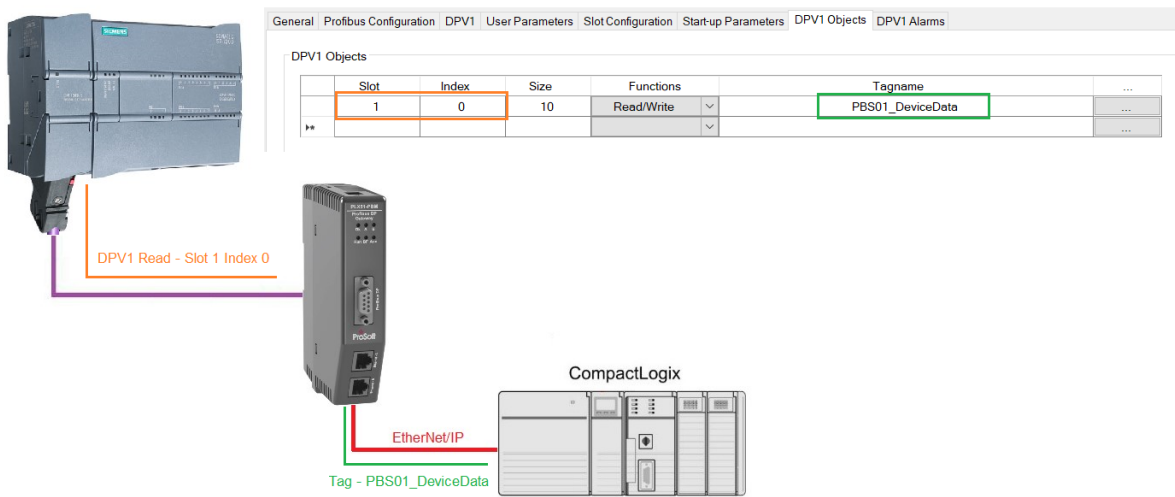

Figure 4.4 – PLX51-PBS DPV1 Object exchange

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 4.5 – 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 4.6 – PLX51-PBS Alarm Acknowledge

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

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 3 - Pull_Alarm 4 - Plug_Alarm
Alarm Slot	2	1	Refer to the *PROFIBUS Specification EN 50170* for information regarding the diagnostics.
Alarm Specifier	3	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.

Table 4.5 – Slave Alarm Data Format

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 4.7 –DPV1 Alarm Data Example

4.2. FIRMWARE UPGRADING

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.
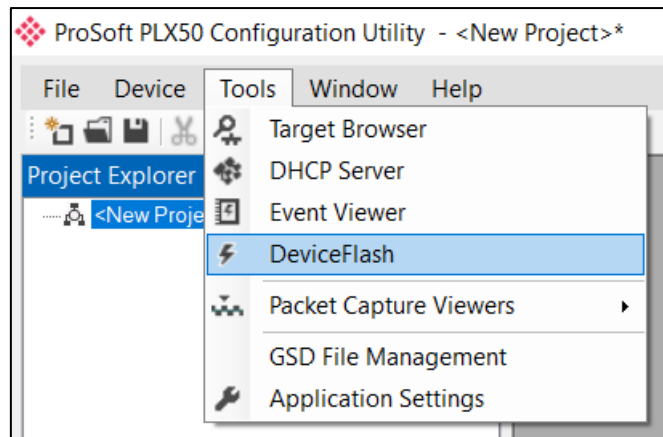
Figure 4.8 - DeviceFlash Tool

2 In the *Select a Device Flash File* window, select the appropriate AFB binary file and click OPEN.
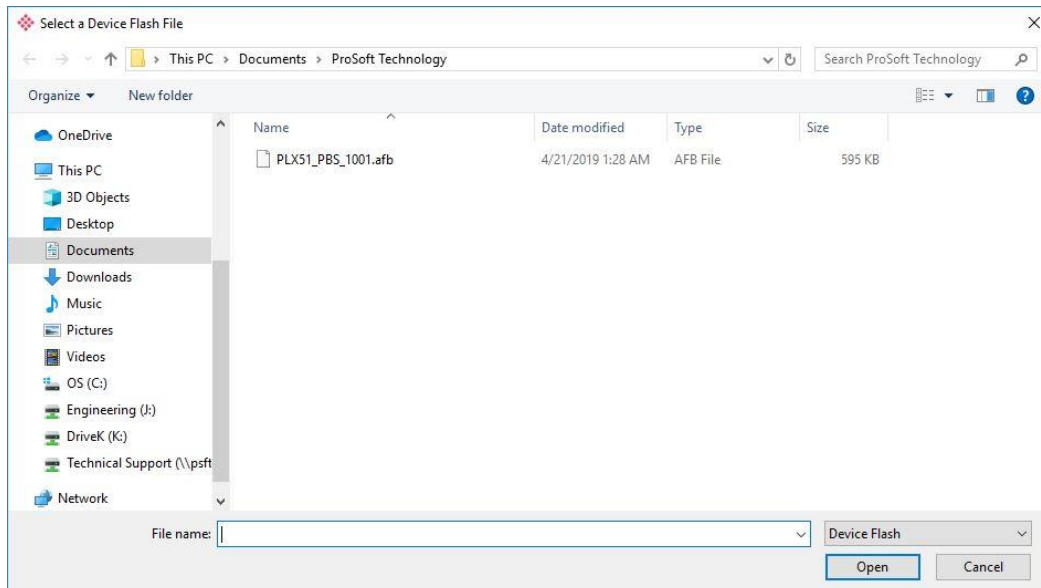
Figure 4.9 - Select the AFB binary

3 In the *Target Browser* window, select the PLX51-PBS's IP address and click OK.
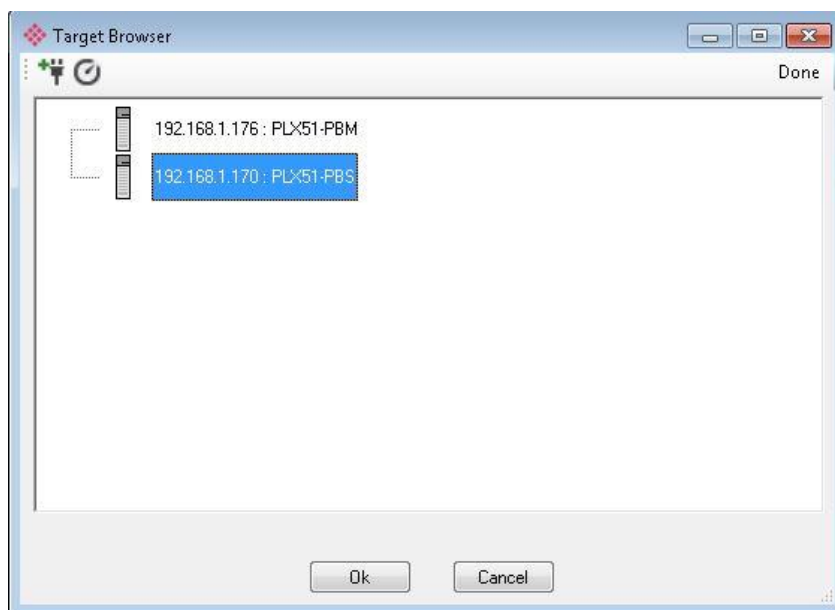
Figure 4.10 - Select the PLX51-PBS module

4 Once the firmware update is complete, the *DeviceFlash* option provides the details of the updated module.
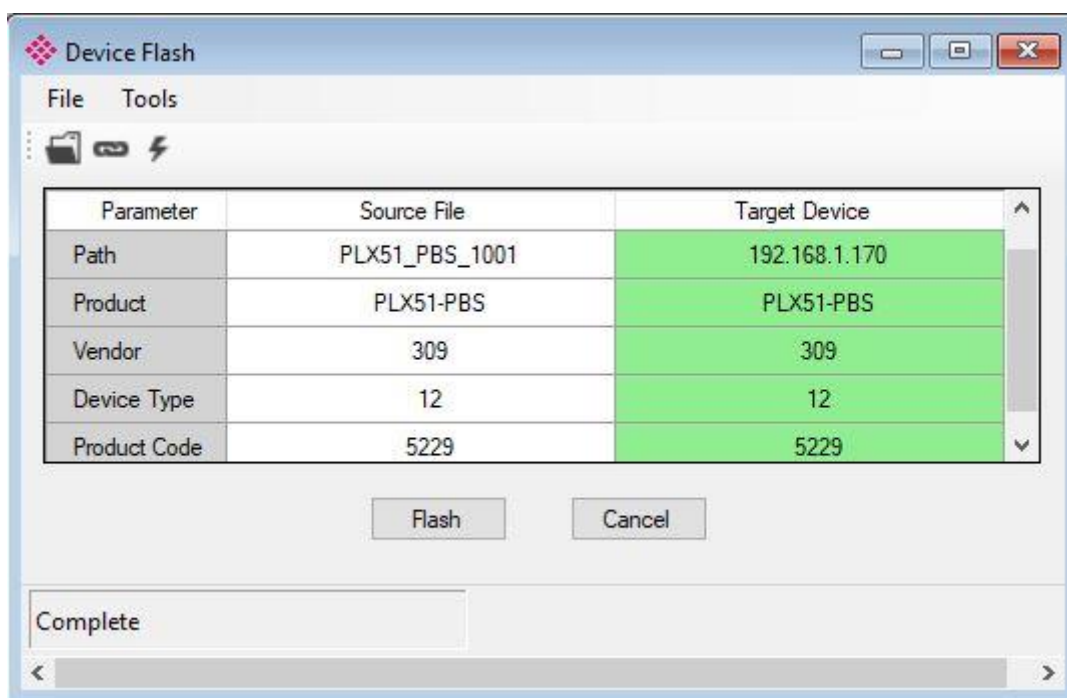
Figure 4.11 – PLX51-PBS successfully updated.

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

5. DIAGNOSTICS

5.1. LEDS

The module provides six LEDs for diagnostics purposes as shown below. 1

Figure 5.1 - PLX51-PBS LEDs

LED	Description
Ok	<u>Flashing Green</u> – The module has booted and is running correctly **without** any application configuration loaded. <u>Solid Green</u> – The module has booted and is running correctly **with** application configuration loaded. <u>Solid Red</u> – 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	<u>Off</u> – This LED is N/A.

BF	This LED indicates the status of the configured field devices.
	<u>Solid Red</u> – There are bus communication errors present (if no valid packet has been received by any configured slave for more than 1 second).
	<u>Flashing Red</u> – There are slave errors present (at least one slave has not been configured properly and is not exchanging DPV0 data).
	<u>Flashing Green</u> – All slaves are successfully exchanging DPV0 data and the DP network operational state is **clear**.
	<u>Solid Green</u> – 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).
	<u>Flashing Green</u> – A valid packet is received from the Primary Interface.
	<u>Flashing Red</u> – A corrupted packet was received (e.g. failed checksum when using RS232 or RS485).

Table 5.1 - Module LED operation

5.2. 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.
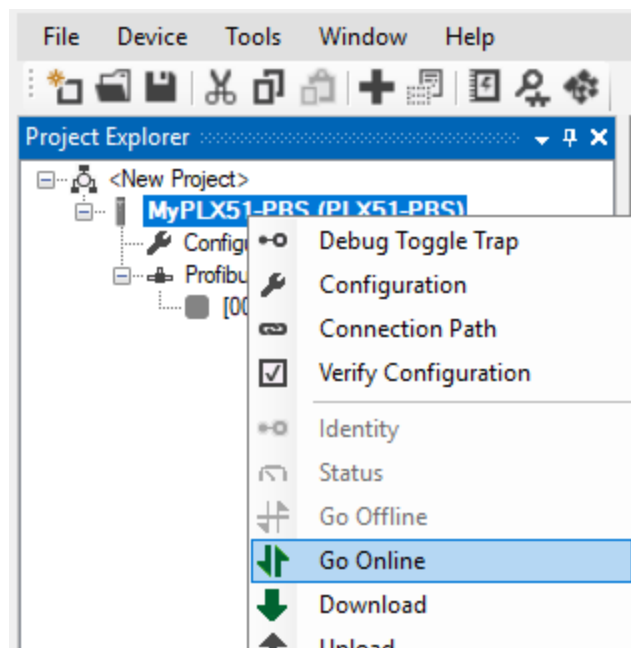
Figure 5.2 - Selecting to Go Online

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

5.2.1. 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*.
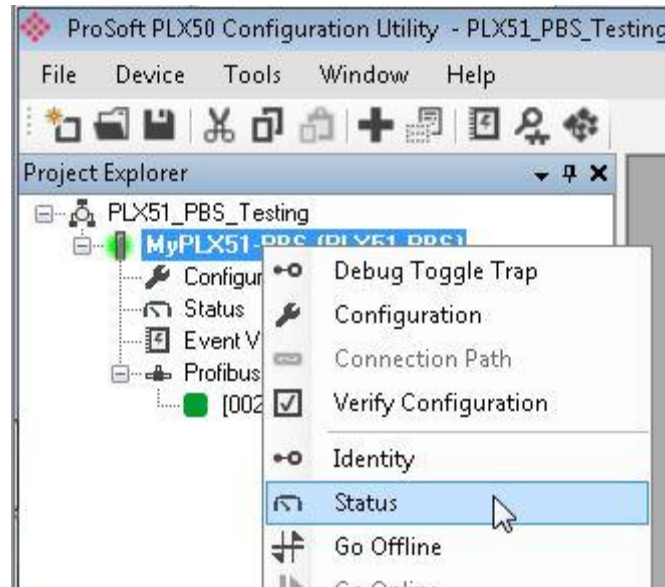
Figure 5.3 - Selecting PLX51-PBS online Status

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

GENERAL

The *General* tab displays the following general parameters:
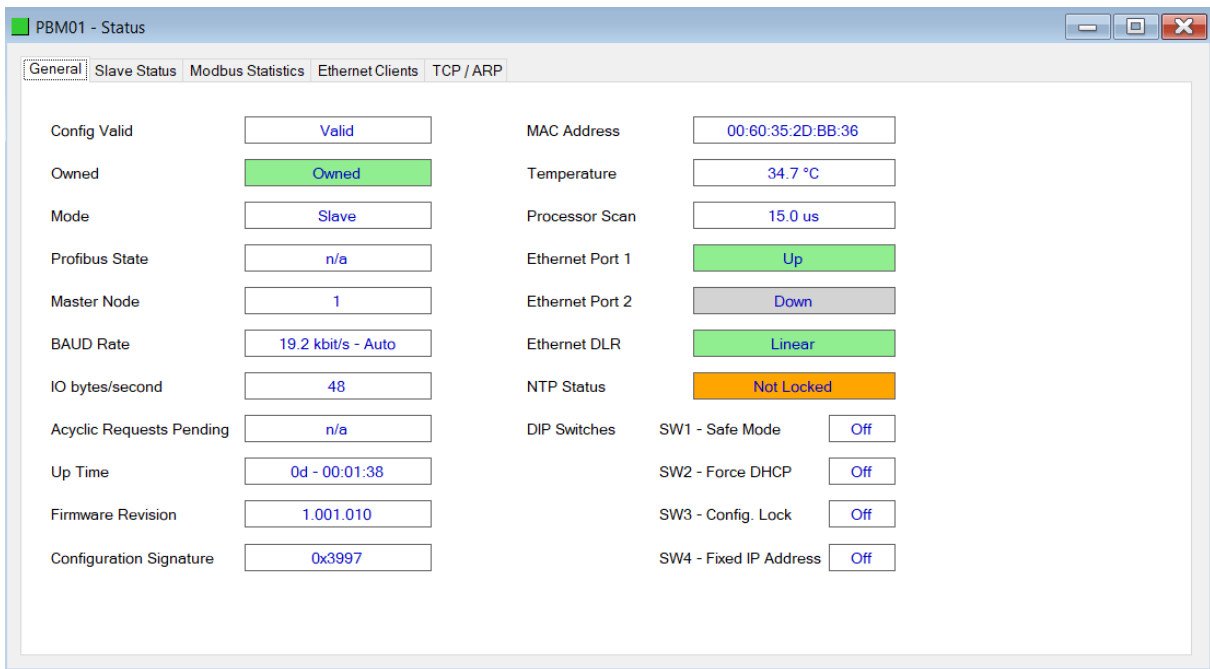
Figure 5.4 – PLX51-PBS Status monitoring - General

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.
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. **Standalone** In this mode, the PLX51-PBS is the DP Master on the PROFIBUS network. **Slave** In this mode, the PLX51-PBS will emulate multiple PROFIBUS Slave devices.
PROFIBUS State (Master mode only)	This is the operational state of the PROFIBUS network. The following states can be returned: **OFFLINE**

	The PROFIBUS network is offline and the PLX51-PBS will not communicate on the network.
	STOP
	The PROFIBUS network is running and the PLX51-PBS is communicating on the network, but it will not exchange any process data with any slave device.
	OPERATE
	The PROFIBUS network is running and the PLX51-PBS is communicating with all slave devices on the network, and if configured in the PLX51-PBS, the module will configure and exchange process data with each slave device.
	CLEAR
	The PROFIBUS network is running and the PLX51-PBS is communicating with all slave devices on the network, and if configured in the PLX51-PBS, the module will configure and exchange process data with each slave device.
	Note: In CLEAR mode, the PLX51-PBS will not send any output data to any slave device.
Master Node (Master mode only)	The PROFIBUS Node address of the local PLX51-PBS when in Master mode.
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	The number of acyclic requests (DPV1 Class 1 and Class 2 requests) pending.
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.

Table 5.2 - Parameters displayed in the Status Monitoring – General Tab

SLAVE STATUS

The *Slave Status* tab displays the following parameters:

Figure 5.5 – PLX51-PBS Status monitoring – Slave Status

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.

Table 5.3 - Parameters displayed in the Status Monitoring – Slave Status Tab

GENERAL STATISTICS

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

Figure 5.6 – PLX51-PBS Status monitoring – General Statistics

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.
Set Slave Addr Tx Count	The number of PROFIBUS Set Slave Address requests sent from the PLX51-PBS.
Set Slave Addr Rx Count	The number of successful PROFIBUS Set Slave Address responses received from the specific slave device.
Set Slave Addr Err Count	The number of failed PROFIBUS Set Slave Address responses received from the specific slave device.
Global Ctrl Tx Count	The number of PROFIBUS Global Control requests sent from the PLX51-PBS.
Global Ctrl Rx Count	The number of PROFIBUS Global Control requests received by the PLX51-PBS.
Last PROFIBUS Cycle Time	The time (in microseconds) the last PROFIBUS Cycle took to complete.

Max PROFIBUS Cycle Time	The maximum time (in microseconds) the PROFIBUS Cycle took to complete.
Min PROFIBUS Cycle Time	The minimum time (in microseconds) the PROFIBUS Cycle took to complete.
Last Token Hold Time	The time (in microseconds) the PLX51-PBS held the token in the last token rotation.
Max Token Hold Time	The maximum time (in microseconds) the PLX51-PBS held the token.
Min Token Hold Time	The minimum time (in microseconds) the PLX51-PBS held the token.
Last Response Time	In a Multi DP Master system, this is the time it took (in microseconds) to respond to the last token passed from another DP Master.
Max Response Time	In a Multi DP Master system, this is the maximum time it took (in microseconds) to respond to a token passed from another DP Master.
Min Response Time	In a Multi DP Master system, this is the minimum time it took (in microseconds) to respond to a token passed from another DP Master.
FB Fault Count	The number of fieldbus faults that have occurred (e.g. devices going offline, corrupted packets, etc.)
Device Fault Count	The number of slave device faults that have occurred (e.g. device stops communicating during data exchange).
Acyclic Request Client Count Overrun	The number of times more than 10 acyclic requests needed to be buffered in which case the PLX51-PBS will reject the 11th request.
Token Pass Retry Count	In a Multi DP Master system, this is the number of times the token pass from the PLX51-PBS had to be retransmitted because the receiving DP Master did not respond in time.
Token Pass Fail Count	When the number of consecutive Token Pass Retries reaches the configured token pass retry count after which that DP Master will be assumed as offline.
Unexpected Packet Received	The number of times a response is received from a slave device that was not expected (e.g. incorrect response, response from a different node, etc.).
FB Inactivity Count	The number of times the PLX51-PBS has determined that there are no other DP Masters on the PROFIBUS network.
Duplicate Station Detect Count	The number of times the PLX51-PBS has detected that there is another station on the network with the same station address as the local PLX51-PBS.
Invalid Response Length Count	The number of times a response is received from a slave device where the length is not correct (for example if the slave 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.

	This occurs when the remote PROFIBUS device rejects a function request, e.g. if the device is not in the correct state, or if it does not support that function.
	A list of FDL errors is tabulated in chapter 9.
Extract Alarm Success Count	The number of alarms that have successfully been extracted from slave devices.
Extract Alarm Fail Count	The number of alarms that have **not** successfully been extracted from slave devices.
Initialize Parameter Set Success Count	The number of parameters that have successfully been set after the device has been configured for data exchange.
Initialize Parameter Set Fail Count	The number of parameters that have failed to set after the device has been configured for DPV0 data exchange.
Device Reconfigure Count	The number of times a slave device has been (re)configured for DPV0 data exchange.
Device Reparameterize Count	The number of times a slave device has been (re)parameterized for DPV0 data exchange.
Ext Diag Overflow Count	The number of times a slave device has returned diagnostics data that could not fit into a single PROFIBUS frame.

Table 5.4 - Parameters displayed in the Status Monitoring – General Statistics Tab

DPV1 STATISTICS

The *DPV1 Statistics* tab displays the following general parameters:

Figure 5.7 – PLX51-PBS Status monitoring – DPV1 Statistics

Parameter	Description
DPV1 Class 1 Read Tx Count	The number of PROFIBUS DPV1 Class 1 Read requests sent from the PLX51-PBS.
DPV1 Class 1 Read Rx Count	The number of successful PROFIBUS DPV1 Class 1 Read responses received by the PLX51-PBS.
DPV1 Class 1 Read Err Count	The number of failed PROFIBUS DPV1 Class 1 Read responses received by the PLX51-PBS.
DPV1 Class 1 Write Tx Count	The number of PROFIBUS DPV1 Class 1 Write requests sent from the PLX51-PBS.
DPV1 Class 1 Write Rx Count	The number of successful PROFIBUS DPV1 Class 1 Write responses received by the PLX51-PBS.
DPV1 Class 1 Write Err Count	The number of failed PROFIBUS DPV1 Class 1 Write responses received by the PLX51-PBS.
DPV1 Class 2 Init Tx Count	The number of PROFIBUS DPV1 Class 2 Initialize requests sent from the PLX51-PBS.
DPV1 Class 2 Init Rx Count	The number of successful PROFIBUS DPV1 Class 2 Initialize responses by the PLX51-PBS.
DPV1 Class 2 Init Err Count	The number of failed PROFIBUS DPV1 Class 2 Initialize responses received by the PLX51-PBS.

DPV1 Class 2 Abort Tx Count	The number of PROFIBUS DPV1 Class 2 Abort requests sent from the PLX51-PBS.
DPV1 Class 2 Abort Rx Count	The number of PROFIBUS DPV1 Class 2 Abort messages received by the PLX51-PBS.
DPV1 Class 2 Read Tx Count	The number of PROFIBUS DPV1 Class 2 Read requests sent from the PLX51-PBS.
DPV1 Class 2 Read Rx Count	The number of successful PROFIBUS DPV1 Class 2 Read responses received by the PLX51-PBS
DPV1 Class 2 Read Err Count	The number of failed PROFIBUS DPV1 Class 2 Read responses received by the PLX51-PBS.
DPV1 Class 2 Write Tx Count	The number of PROFIBUS DPV1 Class 2 Write requests sent from the PLX51-PBS.
DPV1 Class 2 Write Rx Count	The number of successful PROFIBUS DPV1 Class 2 Write responses received by the PLX51-PBS.
DPV1 Class 2 Write Err Count	The number of failed PROFIBUS DPV1 Class 2 Write responses received by the PLX51-PBS.

Table 5.5 - Parameters displayed in the Status Monitoring – DPV1 Statistics Tab

LIVE LIST

The *Live List* tab provides an overview of all slave devices and DP masters connected to the PROFIBUS network. Each station will be in one of six states.
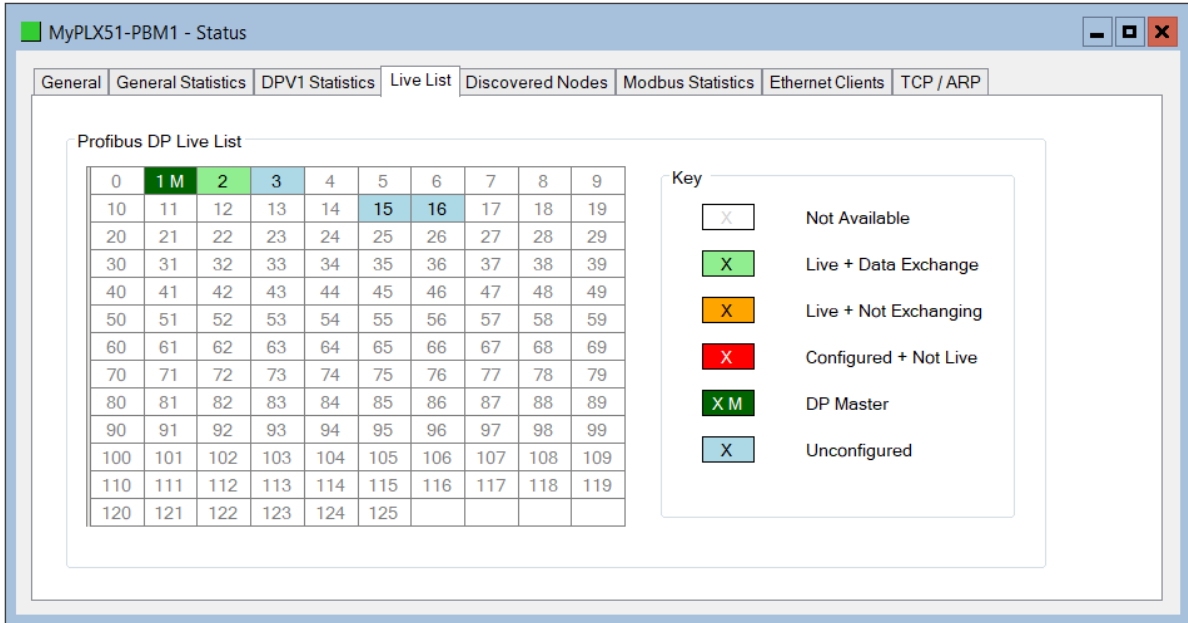
Figure 5.8 – PLX51-PBS Status monitoring – Live List

DISCOVERED NODES

The *Discovered Nodes* tab provides more detail regarding each station on the PROFIBUS network (when compared to the *Live List*). You can scan the PROFIBUS network to extract further details from each device. From here, you can add the slave device or change the slave device station address. See the *Device Discovery* section.
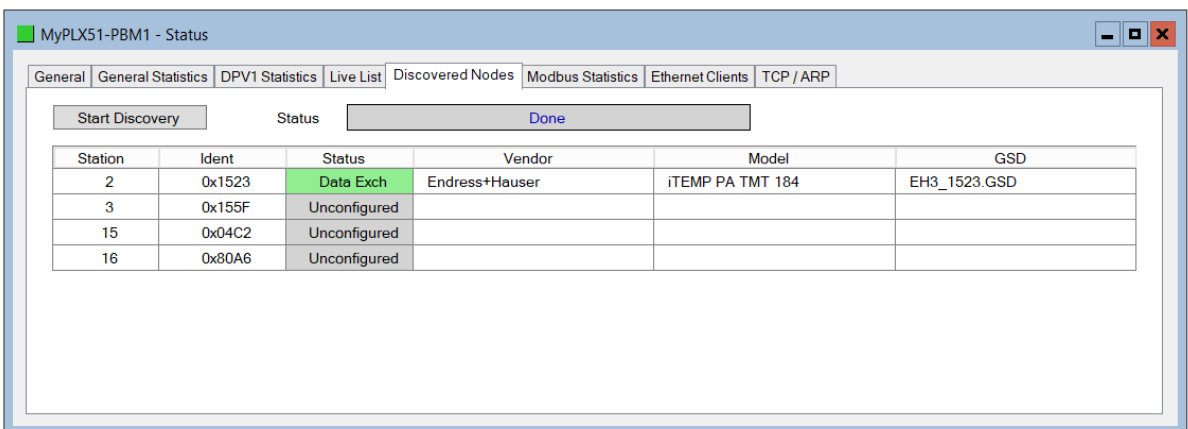
Figure 5.9 – PLX51-PBS Status monitoring – Discovered Nodes

ETHERNET CLIENTS

The *Ethernet Clients* tab displays the details of the Ethernet and EtherNet/IP clients connected to the PLX51-PBS.
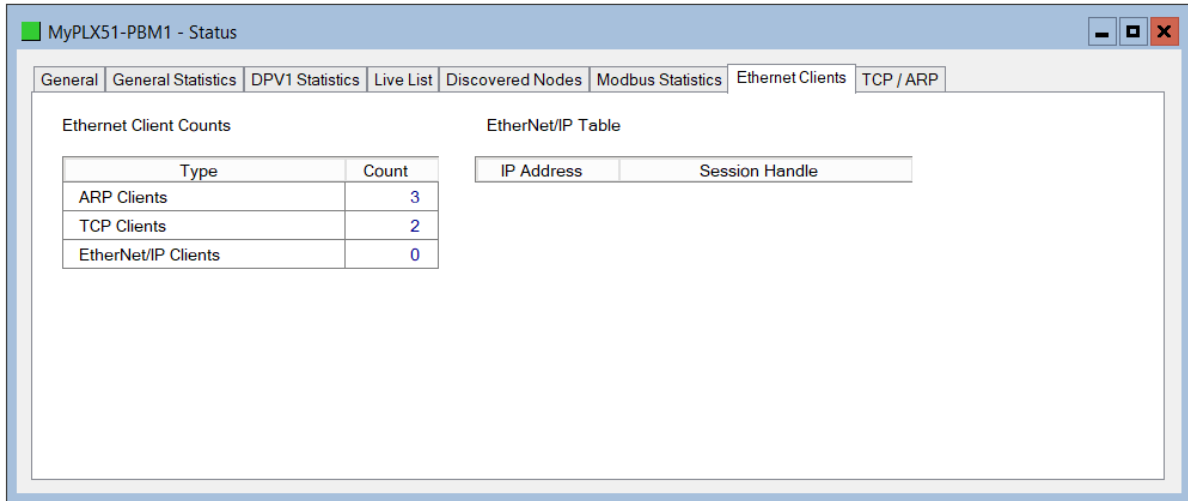
Figure 5.10 – PLX51-PBS Status monitoring – Ethernet Client Statistics

TCP/ARP

The *TCP/ARP* tab displays details of the internal Ethernet ARP and TCP lists of the PLX51-PBS.
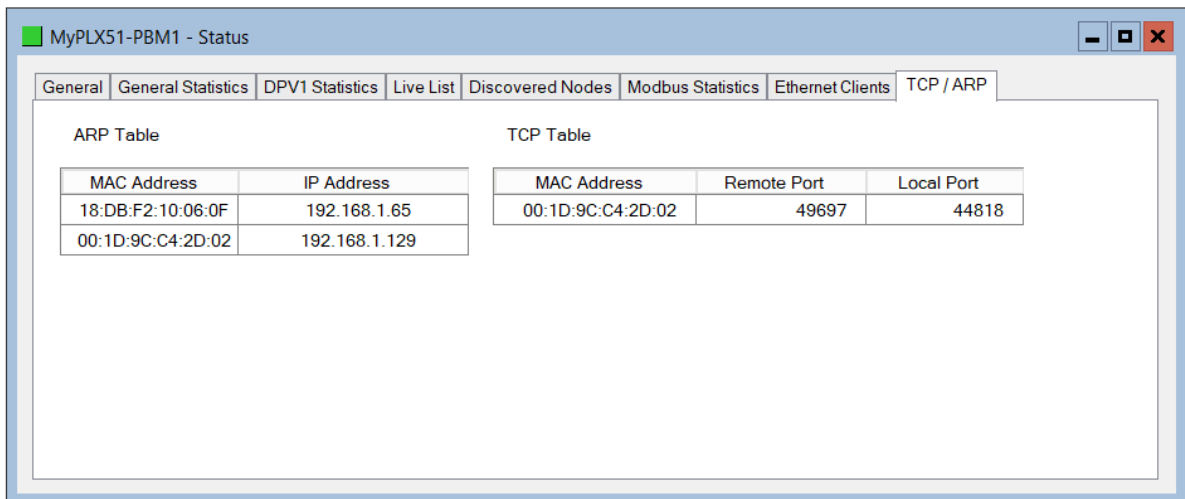
Figure 5.11 – PLX51-PBS Status monitoring – Ethernet TCP / ARP Statistics

5.2.2. 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**.
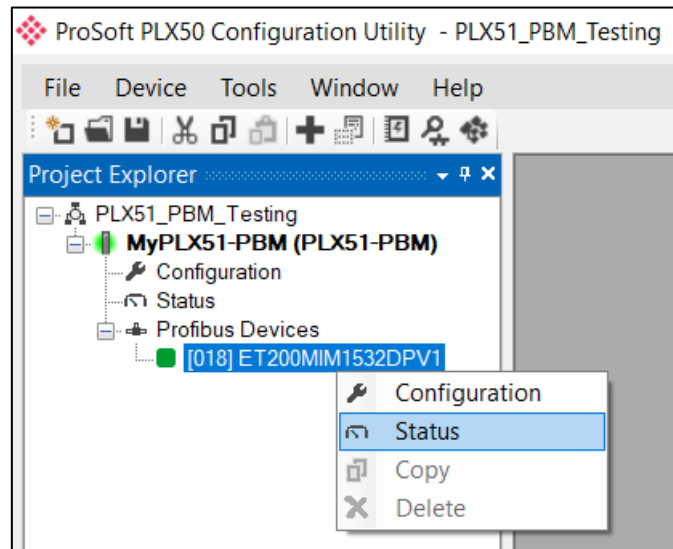
Figure 5.12 - Selecting slave status

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

GENERAL – MASTER MODE

The *General* tab displays the following general parameters:
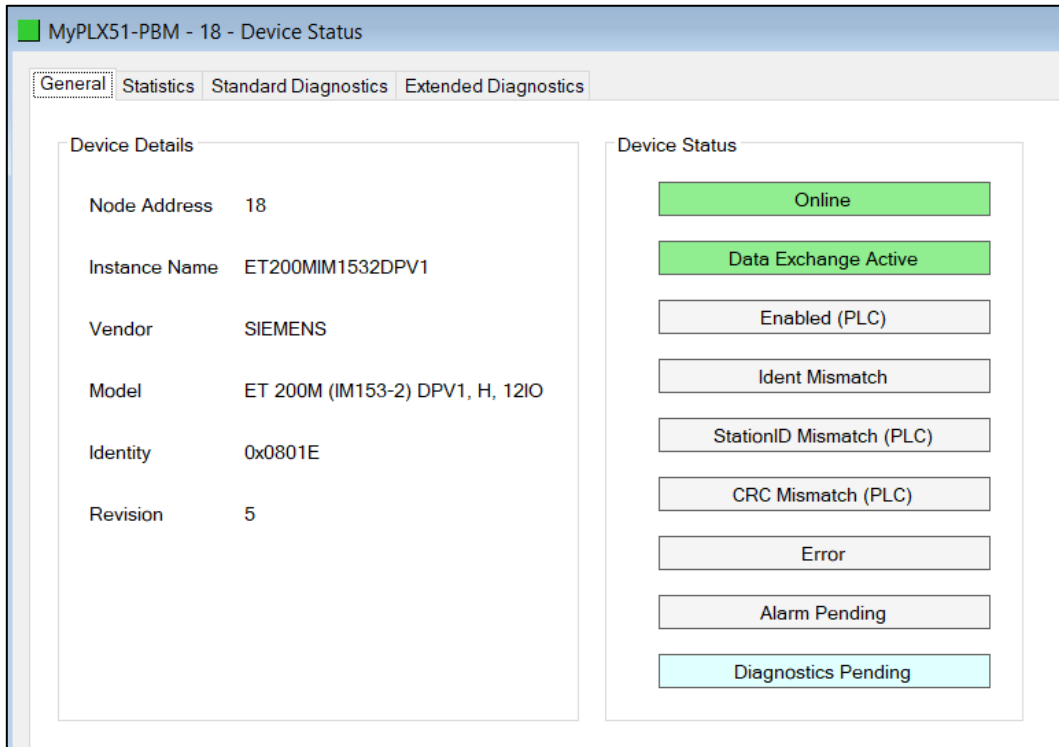
Figure 5.13 – Device Status monitoring - General

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 PLX51-PBS. **Disabled (PLC)** The slave device has been 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.

Table 5.6 - Device Status Monitoring – General Tab

STATISTICS

The *Statistics* tab displays the following general parameters:

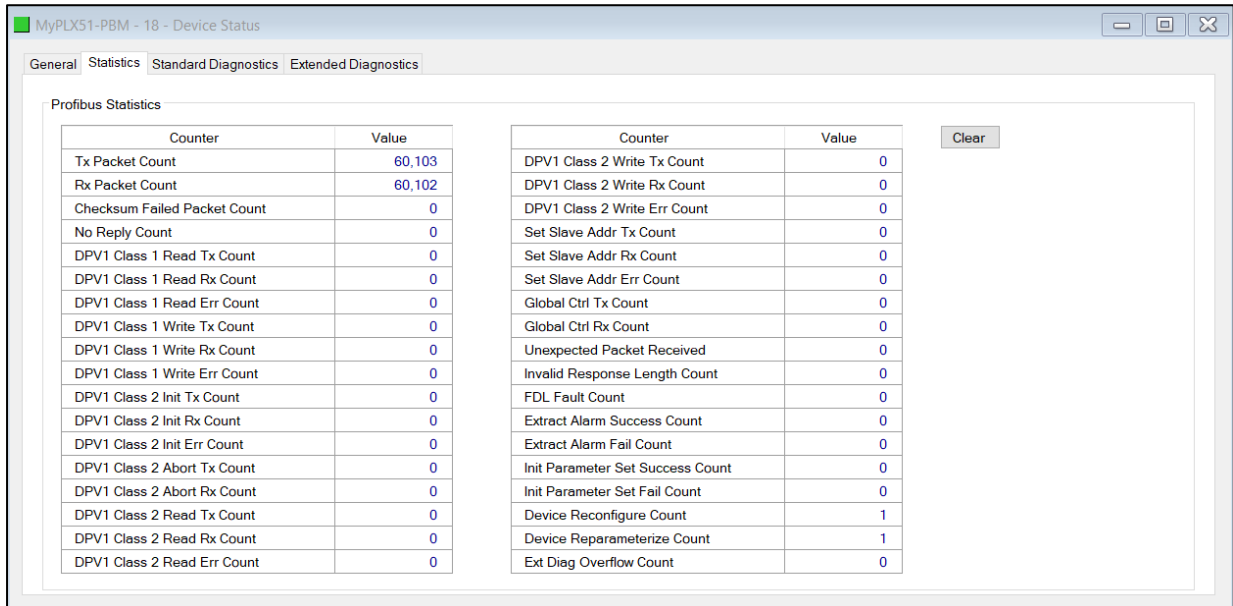| Counter	Value		Counter	Value
Tx Packet Count	60,103		DPV1 Class 2 Write Tx Count	0
Rx Packet Count	60,102		DPV1 Class 2 Write Rx Count	0
Checksum Failed Packet Count	0		DPV1 Class 2 Write Err Count	0
No Reply Count	0		Set Slave Addr Tx Count	0
DPV1 Class 1 Read Tx Count	0		Set Slave Addr Rx Count	0
DPV1 Class 1 Read Rx Count	0		Set Slave Addr Err Count	0
DPV1 Class 1 Read Err Count	0		Global Ctrl Tx Count	0
DPV1 Class 1 Write Tx Count	0		Global Ctrl Rx Count	0
DPV1 Class 1 Write Rx Count	0		Unexpected Packet Received	0
DPV1 Class 1 Write Err Count	0		Invalid Response Length Count	0
DPV1 Class 2 Init Tx Count	0		FDL Fault Count	0
DPV1 Class 2 Init Rx Count	0		Extract Alarm Success Count	0
DPV1 Class 2 Init Err Count	0		Extract Alarm Fail Count	0
DPV1 Class 2 Abort Tx Count	0		Init Parameter Set Success Count	0
DPV1 Class 2 Abort Rx Count	0		Init Parameter Set Fail Count	0
DPV1 Class 2 Read Tx Count	0		Device Reconfigure Count	1
DPV1 Class 2 Read Rx Count	0		Device Reparameterize Count	1
DPV1 Class 2 Read Err Count	0		Ext Diag Overflow Count	0

Figure 5.14 – Device Status monitoring - Statistics

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 requests sent from the PLX51-PBS to the specific device.
DPV1 Class 1 Read Rx Count	The number of successful PROFIBUS DPV1 Class 1 Read responses received from the specific device.
DPV1 Class 1 Read Err Count	The number of failed PROFIBUS DPV1 Class 1 Read responses received from the specific device.
DPV1 Class 1 Write Tx Count	The number of PROFIBUS DPV1 Class 1 Write requests sent from the PLX51-PBS to the specific device.
DPV1 Class 1 Write Rx Count	The number of successful PROFIBUS DPV1 Class 1 Write responses received from the specific device.
DPV1 Class 1 Write Err Count	The number of failed PROFIBUS DPV1 Class 1 Write responses received from the specific device.
DPV1 Class 2 Init Tx Count	The number of PROFIBUS DPV1 Class 2 Initialize requests sent from the PLX51-PBS to the specific device.
DPV1 Class 2 Init Rx Count	The number of successful PROFIBUS DPV1 Class 2 Initialize responses received from the specific device.
DPV1 Class 2 Init Err Count	The number of failed PROFIBUS DPV1 Class 2 Initialize responses received from the specific device.
DPV1 Class 2 Abort Tx Count	The number of PROFIBUS DPV1 Class 2 Abort requests sent from the PLX51-PBS to the specific device.
DPV1 Class 2 Abort Rx Count	The number of PROFIBUS DPV1 Class 2 Abort messages received from the specific device.
DPV1 Class 2 Read Tx Count	The number of PROFIBUS DPV1 Class 2 Read requests sent from the PLX51-PBS to the specific device.
DPV1 Class 2 Read Rx Count	The number of successful PROFIBUS DPV1 Class 2 Read responses received from the specific device.
DPV1 Class 2 Read Err Count	The number of failed PROFIBUS DPV1 Class 2 Read responses received from the specific device.
DPV1 Class 2 Write Tx Count	The number of PROFIBUS DPV1 Class 2 Write requests sent from the PLX51-PBS to the specific device.
DPV1 Class 2 Write Rx Count	The number of successful PROFIBUS DPV1 Class 2 Write responses received from the specific device.
DPV1 Class 2 Write Err Count	The number of failed PROFIBUS DPV1 Class 2 Write responses received from the specific device.

Set Slave Addr Tx Count	The number of PROFIBUS Set Slave Address requests sent from the PLX51-PBS to the specific device.
Set Slave Addr Rx Count	The number of successful PROFIBUS Set Slave Address responses received from the specific device.
Set Slave Addr Err Count	The number of failed PROFIBUS Set Slave Address responses received from the specific device.
Global Ctrl Tx Count	The number of PROFIBUS Global Control requests sent from the PLX51-PBS to the specific device.
Global Ctrl Rx Count	The number of PROFIBUS Global Control requests received by the PLX51-PBS from the specific 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	The number of alarms that have **not** successfully been extracted from the specific device.
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.

Table 5.7 - Device Status Monitoring – Statistics Tab

STANDARD DIAGNOSTICS

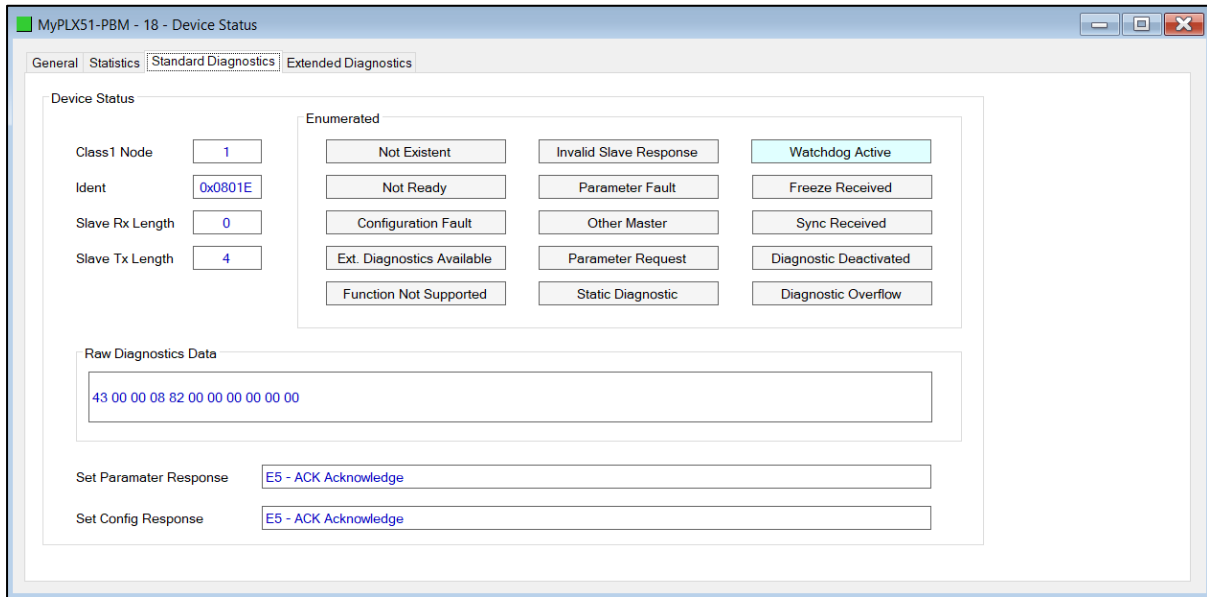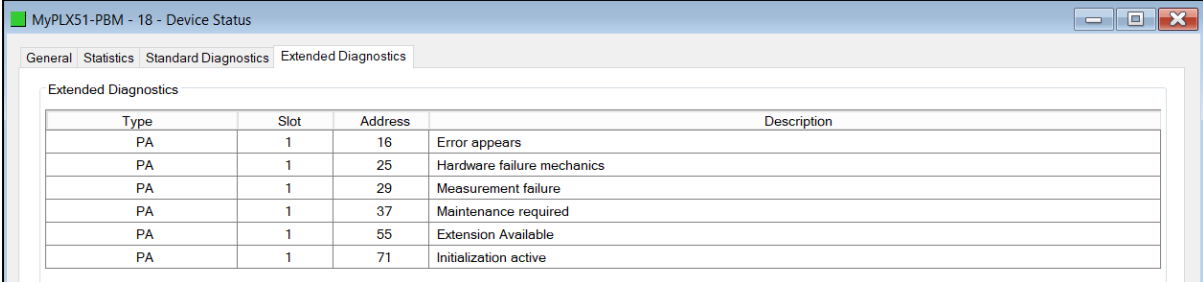The *Standard Diagnostics* tab displays the following general parameters:

Figure 5.15 – Device Status monitoring – Standard Diagnostics

Parameter	Description
Class 1 Node	The station address of the DP Master that configured the specific device for DPV0 communication.
Ident	The PNO Identification number of the device on the PROFIBUS network.
Slave Rx Length	The number of process data (DPV0) bytes expected from the device.
Slave Tx Length	The number of process data (DPV0) bytes that will be sent to the device.
Enumerated	Refer to the *PROFIBUS Specification EN 50170* for information regarding the diagnostics.
Raw Diagnostics Data	The raw diagnostics in a hexadecimal data string.
Set Parameter Response	The last response from the specific field device to the last set parameter telegram.
Set Config Response	The last response from the specific field device to the last check config telegram.

Table 5.8 - Device Status Monitoring – Standard Diagnostics Tab

EXTENDED DIAGNOSTICS

The *Extended Diagnostics* are decoded and displayed in a table form. The diagnostics are decoded using the pre-configured GSD file.

Figure 5.16 – Device Status monitoring – Extended Diagnostics

5.3. 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.
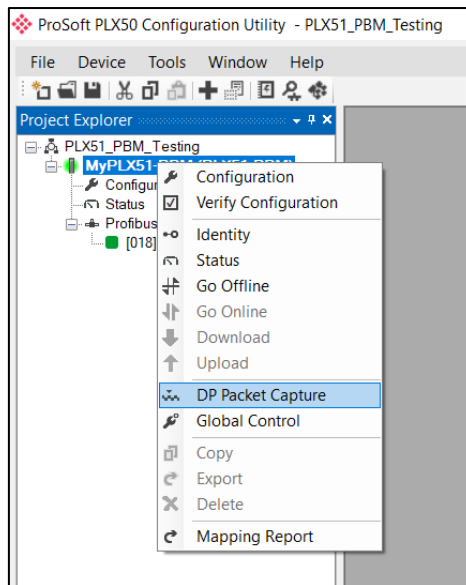

Figure 5.17 - Selecting PROFIBUS Packet Capture

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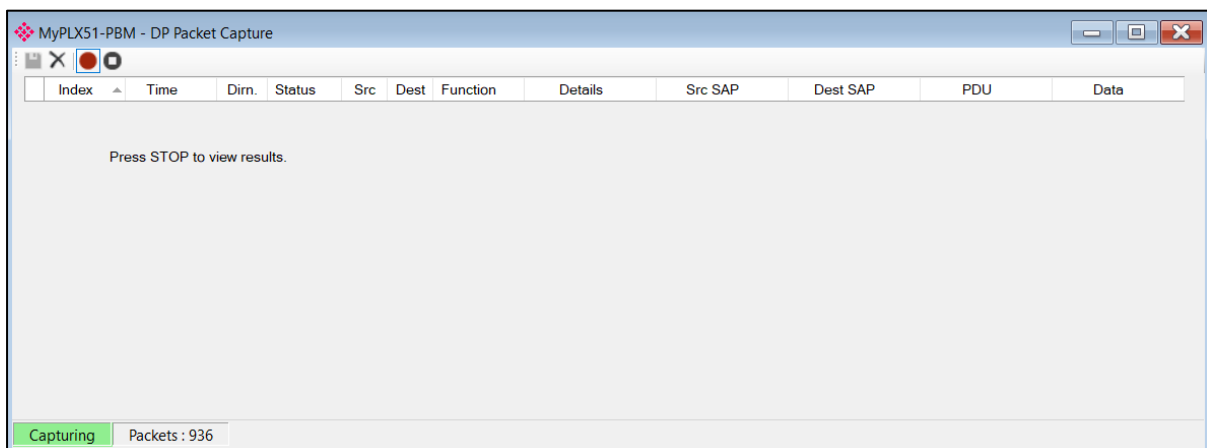

Figure 5.18 - PROFIBUS packet capture

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 presented as shown below.

Figure 5.19 - PROFIBUS Packet Capture complete

The captured PROFIBUS packets are tabulated as follows:

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.

Table 5.9 - PROFIBUS Packet Capture fields

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.
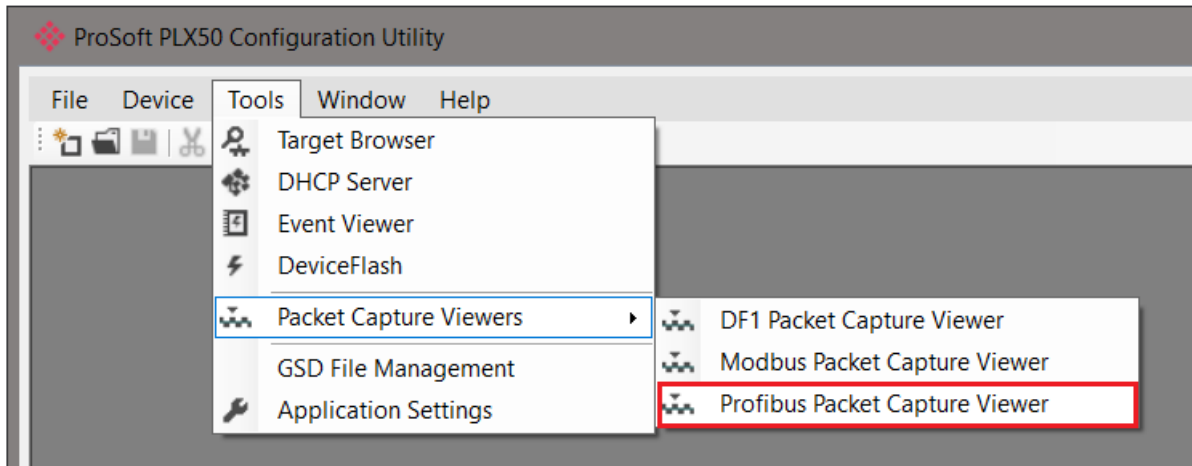
Figure 5.20 - Selecting the PROFIBUS Packet Capture Viewer

5.4. 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 or Logix.

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

Figure 5.21 - Web interface

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

6. TECHNICAL SPECIFICATIONS

6.1. DIMENSIONS

Below are the enclosure dimensions. All dimensions are in millimeters.
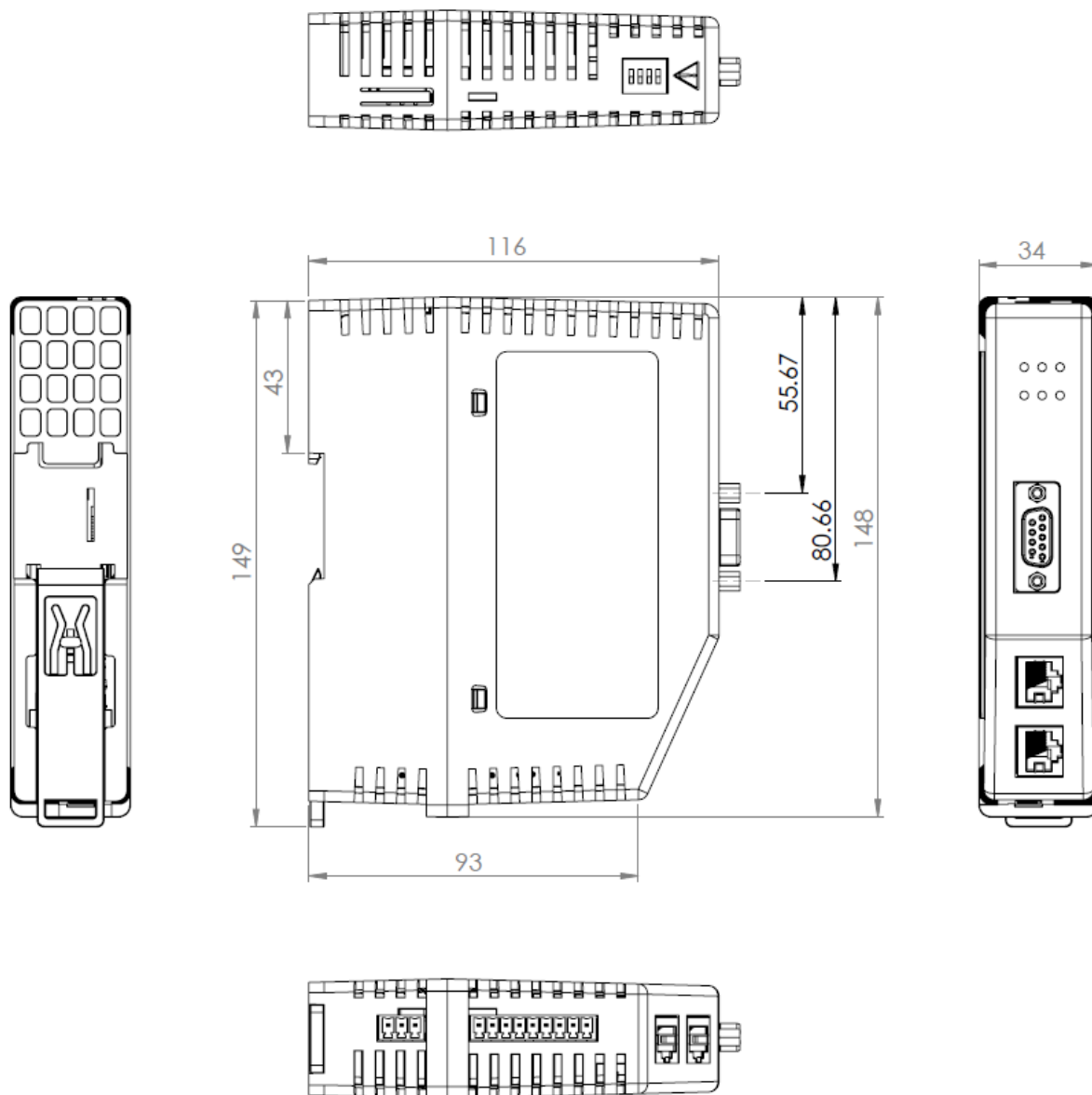
Figure 6.1 – PLX51-PBS enclosure dimensions

6.2. ELECTRICAL

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

Table 6.1 - Electrical specification

6.3. ETHERNET

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

Table 6.2 - Ethernet specification

6.4. PROFIBUS DP

Specification	Rating
Connector	Female DB9 connector
Conductor	See *PROFIBUS DP* Section.
DP Master Mode Support	DPV0 Data Exchange DPV1 Class 1 Messaging DPV1 Class 2 Messaging DPV1 Alarming
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

Table 6.3 – PROFIBUS DP specification

6.5. AGENCY APPROVALS AND CERTIFICATIONS

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

7. PROFIBUS DP

7.1. 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.

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.

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

Table 9.1 – PROFIBUS Protocol (OSI model)

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)

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.

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.

7.2. 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**'.

7.3. PROFIBUS MASTER CLASS 1 (DPM1) OR CLASS 2 (DPM2)

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.

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.

7.4. 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.

7.5. 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:

- o **MS1 channel** (MS1 connection): can only be established if cyclic data exchange is taking place between that master (DPM1) and the slave
- o **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:

- o The slave device must support the MS1 channel (key *C1_Read_Write_supp* at 1 in the GSD file)
- o The DPV1_enable bit must be set during the parameter assignment
- o 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.

7.6. 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.

7.7. PROFIBUS DP CABLE DESCRIPTION

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

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

Table 9.2 – PROFIBUS DP network cable

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.

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

Table 9.3 – PROFIBUS DP cable length

7.8. PROFIBUS DP CONNECTOR DESCRIPTION

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	

Table 9.4 – PROFIBUS DP connector

10. SUPPORT, SERVICE & WARRANTY

10.1. CONTACTING TECHNICAL SUPPORT

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

1 Product Version Number

2 System architecture

3 Network details

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

1 Module configuration and associated ladder files, if any.

2 Module operation and any unusual behavior

3 Configuration/Debug status information

4 LED patterns

5 Details about the serial, Ethernet or Fieldbus devices interfaced to the module, if any.

Note: *For technical support calls within the United States, ProSoft's 24/7 after-hours phone support is available for urgent plant-down issues. Detailed contact information for all our worldwide locations is available on the following page.*

Asia Pacific	Europe / Middle East / Africa
Regional Office Phone: +60.3.2247.1898 asiapc@prosoft-technology.com Languages spoken: Bahasa, Chinese, English, Japanese, Korean REGIONAL TECH SUPPORT support.ap@prosoft-technology.com **North Asia (China, Hong Kong)** Phone: +86.21.5187.7337 china@prosoft-technology.com Languages spoken: Chinese, English REGIONAL TECH SUPPORT support.ap@prosoft-technology.com **Southwest Asia (India, Pakistan)** Phone: +91.98.1063.7873 india@prosoft-technology.com Languages spoken: English, Hindi, Urdu **Australasia (Australia, New Zealand)** Phone: +60.3.7941.2888 pacific@prosoft-technology.com Language spoken: English **Southeast Asia (Singapore, Indonesia, Philippines)** Phone: +60.3.7941.2888 seasia@prosoft-technology.com Languages spoken: English, Bahasa, Tamil **Northeast & Southeast Asia** **(Japan, Taiwan, Thailand, Vietnam, Malaysia)** Phone: +60.3.7941.2888 neasia@prosoft-technology.com Languages spoken: English, Chinese, Japanese **Korea** Phone: +60.3.7941.2888 korea@prosoft-technology.com Languages spoken: English, Korean	Regional Office Phone: +33.(0)5.34.36.87.20 europe@prosoft-technology.com Languages spoken: French, English REGIONAL TECH SUPPORT support.emea@prosoft-technology.com **Middle East & Africa** Phone: +971.4.214.6911 mea@prosoft-technology.com Languages spoken: Hindi, English REGIONAL TECH SUPPORT support.emea@prosoft-technology.com **North Western Europe (UK, IE, IS, DK, NO, SE)** Phone: +44.(0)7415.864.902 nweurope@prosoft-technology.com Language spoken: English **Central & Eastern Europe, Finland** Phone: +48.22.250.2546 centraleurope@prosoft-technology.com Languages spoken: Polish, English **Russia & CIS** Phone: +7.499.704.53.46 russia@prosoft-technology.com Language spoken: Russian, English **Austria, Germany, Switzerland** Phone: +49.(0)1511.465.4200 germany@prosoft-technology.com Language spoken: German, English **BeNeLux, France, North Africa** Phone: +33(0)5.34.36.87.20 france@prosoft-technology.com Languages spoken: French, English **Mediterranean Countries** Phone: +39.342.8651.595 italy@prosoft-technology.com Languages spoken: Italian, English, Spanish

Latin and South America	North America
Brazil, Argentina, Uruguay Phone: +55.11.5084.5178 brasil@prosoft-technology.com Languages spoken: Portuguese, Spanish, English REGIONAL TECH SUPPORT support.la@prosoft-technology.com **Mexico** Phone: +52.222.264.1814 mexico@prosoft-technology.com Languages spoken: Spanish, English REGIONAL TECH SUPPORT support.la@prosoft-technology.com **Andean Countries, Central America, Caribbean, Chile, Bolivia, Paraguay** Phone: +507.6427.48.38 andean@prosoft-technology.com Languages spoken: Spanish, English REGIONAL TECH SUPPORT support.la@prosoft-technology.com	Regional Office Phone: +1.661.716.5100 info@prosoft-technology.com Languages spoken: English, Spanish REGIONAL TECH SUPPORT support@prosoft-technology.com

10.2.   WARRANTY INFORMATION

For complete details regarding ProSoft Technology's TERMS & CONDITIONS OF SALE, WARRANTY, SUPPORT, SERVICE AND RETURN MATERIAL AUTHORIZATION INSTRUCTIONS, please see the documents at: www.prosoft-technology.com/legal

Documentation is subject to change without notice.

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