# *Balluff IO-Link Profinet Setup Guide*

# *PN Configurator/PLC/HMI*

*Version*

2.02


**MEAU – Engineering Group**

# Content

## Document Management Information

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# 1 OVERVIEW

## 1.1 Overview of the Balluff IOL Profinet Setup Guide

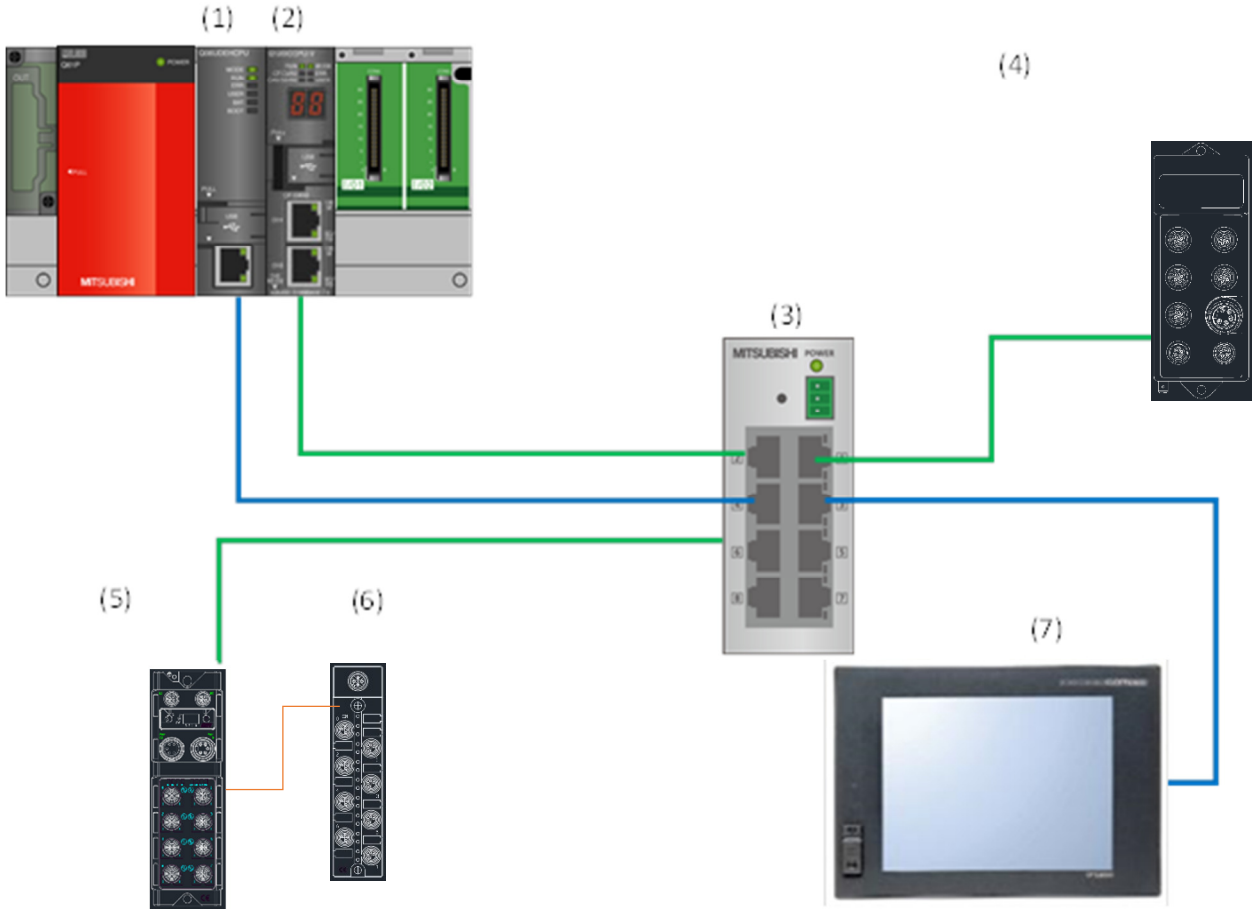
This guide shows a user how to setup the IOLink_Diag_PN Template Project for proper use of Balluff IO-link diagnostics, parameterization of IO-link devices, and formatting of the process data from Balluff IO-link devices.

This guide is divided into four main areas:

1. **Overview:** this section which gives general feeling for the software requirements and software package.
2. **Configurator PN Setup:** For proper ProfiNet/IO-Link configuration/reference of the ProfiNet CPU.
3. **GXWorks2 FB Setup:** For customization of the ProfiNet/IO-Link function blocks (FB) in the GXWorks 2 template project.
4. **GTDesigner3 Elements:** Description of ProfiNet/IO-Link HMI display screens and proper usage and element readouts.

## 1.2 Example of System Configuration

For Q series, the following configuration is used:




| No. | Module | Description |
|---|---|---|
| 1 | Q series programmable controller | Use the base unit, power supply module, and Q series Built-in Ethernet port CPU module. |
| 2 | Q12DCCPU-V | Secondary Network CPU configured for Profinet (ME1PN1FW-Q) |
| 3 | Ethernet Switch | Switch for all Ethernet/Profinet communications (may be separated into multiple switches if needed) |
| 4 | ProfiNet Node Device without IOL | Balluff Profinet Node with NO IOL communication capability |

| | | |
|---|---|---|
| 5 | ProfiNet Node Device with IOL | Balluff Profinet Node with IOL communication capability |
| 6 | IOL Device | Balluff IO-Link Device |
| 7 | GOT 2000 | HMI interface |

## 1.3 Software and Project Requirements

### 1.3.1 Programming Software Requirements

To properly open, configure, edit and save project data for IO-Link diagnostics, the required software with minimum revision level is listed below:

| Software Title | Version | Description |
|---|---|---|
| MELSOFT Navigator | 2.12 | Integrated project for storing and configuring both the PLC and HMI projects. System labels are used to allow common labels between PLC and HMI with this software. IO-Link indicators on the HMI use system labels extensively. |
| GX Works2 | 1.540 | PLC software needed for all PLC-related programming. Used in conjunction with MELSOFT Navigator. Numerous FBs require configuration for IO-Link Diagnostics to work properly. |
| GT Designer3 (GOT 1000 version) | 1.151 | HMI software needed for all GOT-related programming. Used in conjunction with MELSOFT Navigator. IO-Link diagnostics and Parameter read/write screens reside here. |
| GX Configurator PN | 1.03+ | Profinet configuration software to set up all Profinet devices on a network. Used in conjunction with GX Works 2 to map I/O and diagnostic data to/from PLC. Specific IO-Link mapping and Profinet Node master device mapping is needed for proper diagnostics display. |

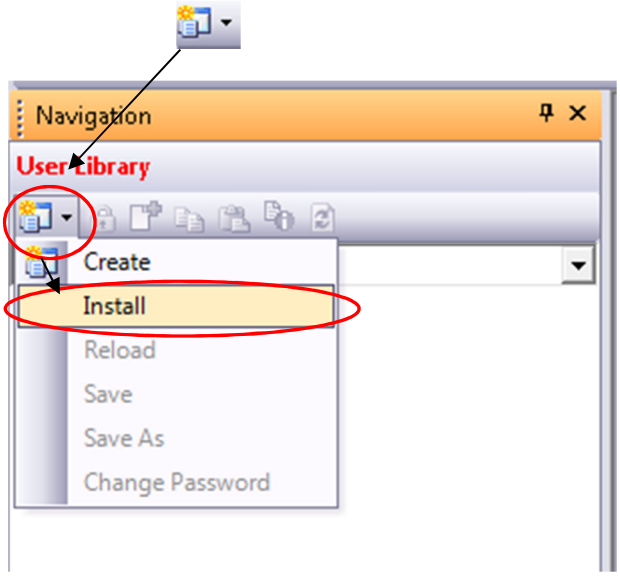
## 1.4 Importing User Libraries

This section explains how to import any User Library into GX Works2.

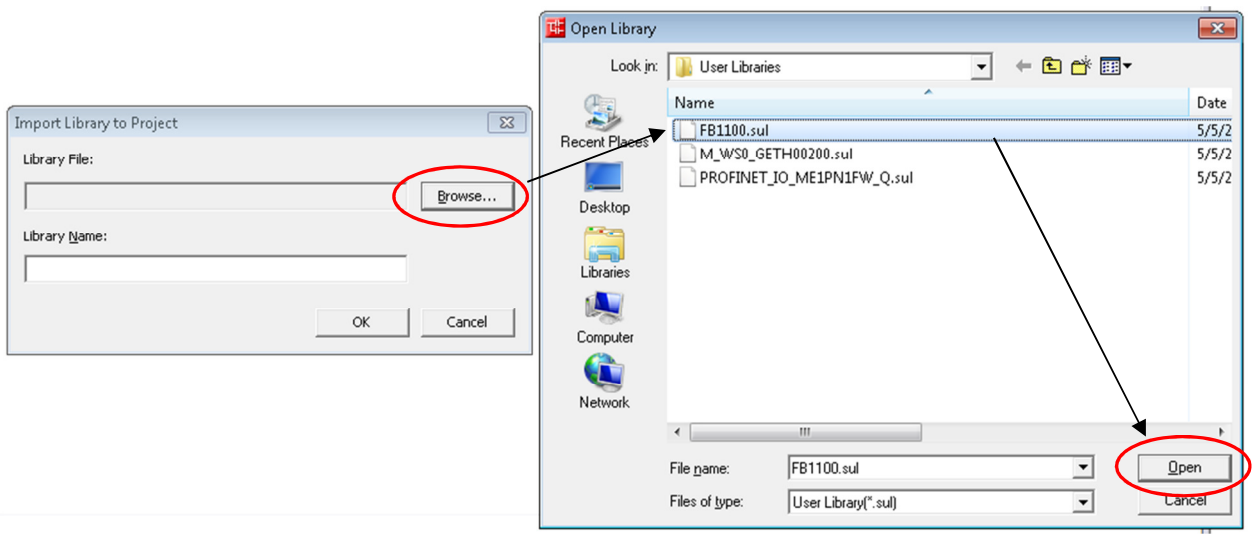
There are six key libraries for this project

1. PN_IOLDiag_v200
    a. This library contains structures and function blocks for IOLink Diagnostics and maintenance
2. Balluff_IOL_CFG_V201
    a. This library contains structures and function blocks related to the configuration of Balluff hardware
3. Balluff_IOL_ProcessData_v202
    a. This library contains structures and function blocks related to utilizing process data for connected IOL Devices
4. RFID_Balluff_BIS_v303
    a. This library contains structure and FB in regards to RFID access for the BIS-M, BIS-V, and Io-link RFID
5. Profinet_IO_ME1PN1FW_Q
    a. This library is necessary and installed by GX Configurator-PN, it maintains data structures of PN controller level data needed by function blocks accessing the Profinet network
6. PN_accessory_v120
    a. This library contains Acyclic Profinet functions and IO Link Device Call

1) Click on the “User Library” tab on the GX Works 2 Navigation Pane.
2) Click the arrow part of this icon, to bring a drop-down menu. Select the “Install” option:

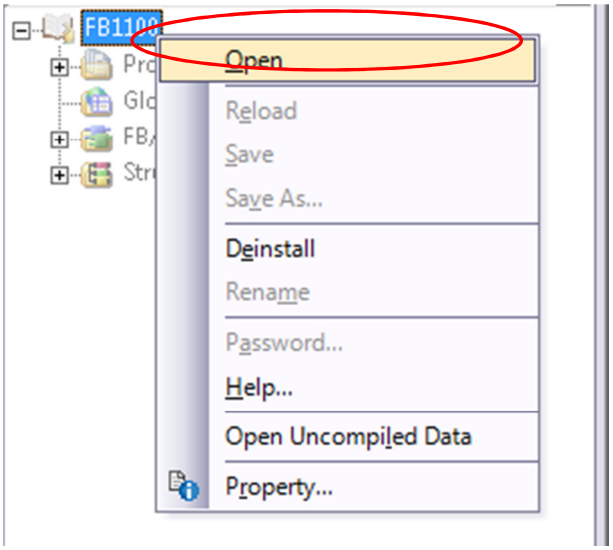


3) From the “Import Library to Project” window, click the Browse button, find the .sul library file, and click Open:



4) Click the “OK” button. Click “OK” again when prompted that the library has been installed.

The library elements will now show up as a directory tree in the Navigation Pane. Right click on the top folder and select “Open” to view/edit the library elements:



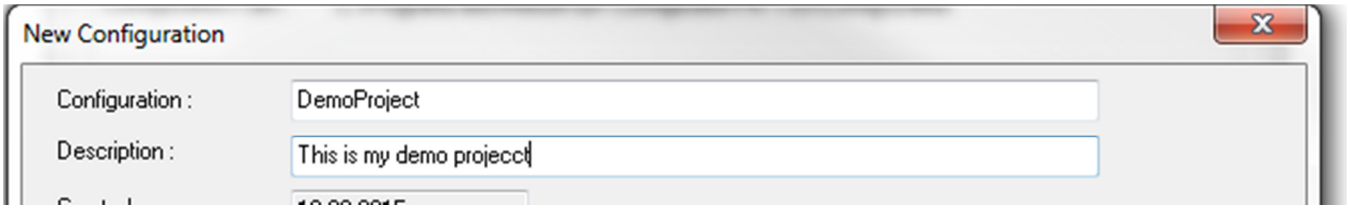
# 2 GX CONFIGURATOR PN PROFINET SETUP

GX Configurator PN is used to set up the Profinet network configuration in the Q12DCCPU-V CPU module. This section will explain how to set up a new configuration and populate the network with one ProfiNet node device with IO-Link capability. It will also show how to configure all the necessary diagnostic and process data needed for each node and IO-Link device.

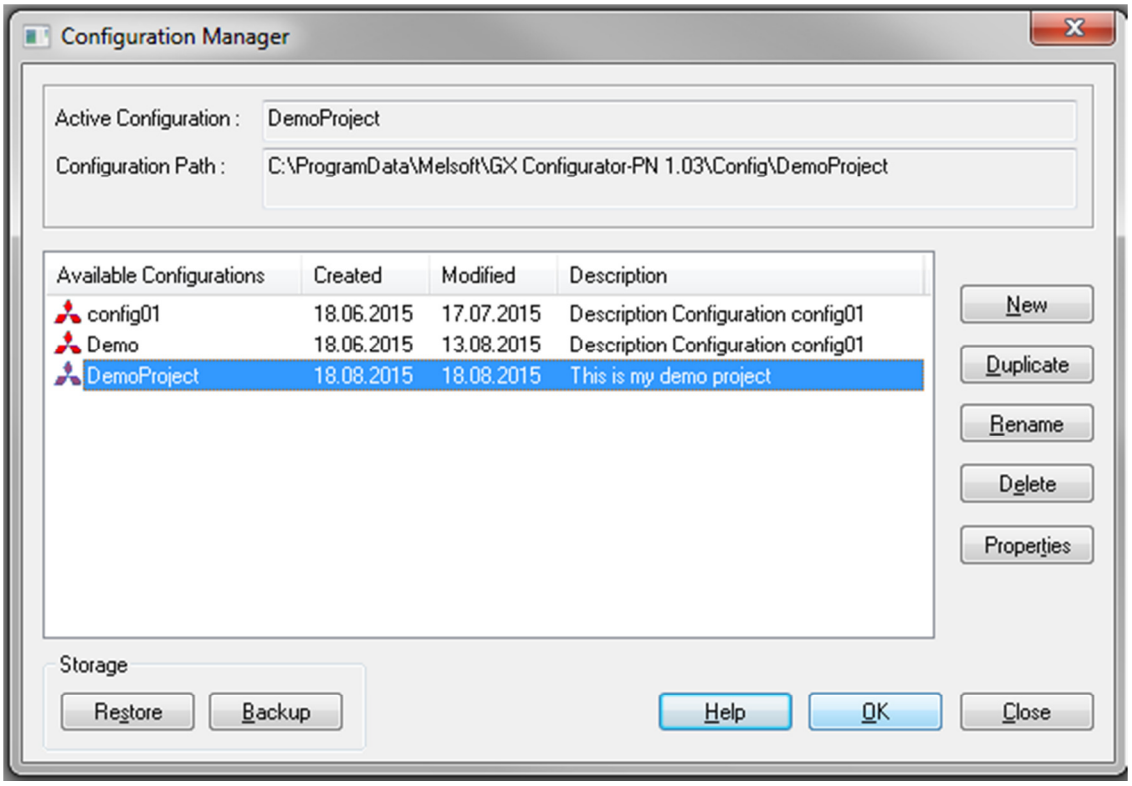
**Important! Before any configuration can be done on a Profinet node device, a GSDML file specific to that device must be imported into the GX Configurator PN software. GSDML files for target Balluff Profinet devices can be found on the Balluff website (http://www.balluff.com)**

## 2.1 Creating a new ProfiNet Configuration

1. Open **GX Configurator PN** and select **File>Configuration Manager** from the top menu. (also the  icon may be pressed on the icon toolbar)
2. From the **Configuration Manager** window, click the **New** button
3. From the **New Configuration** window, Type in a name in the **Configuration:** textbox (optionally, the **Description:** textbox can be also used to further describe the configuration file):




4. Click the **OK** button.
5. Back on the **Configuration Manager** screen, the new project should be listed on the **Available Configurations** table. Be sure the new project is selected and click the **OK** button. (see next page):

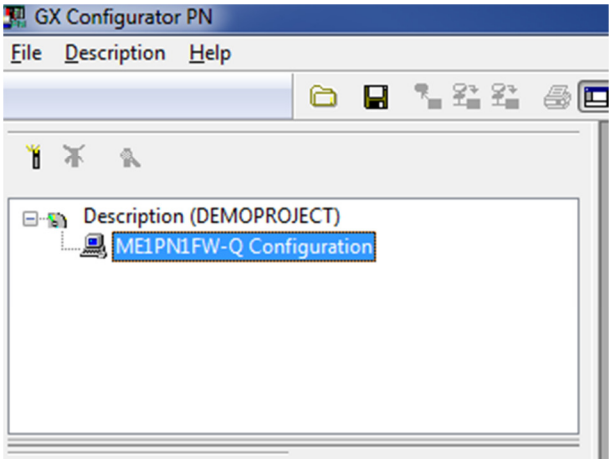



This makes the selected project the active one on the main window

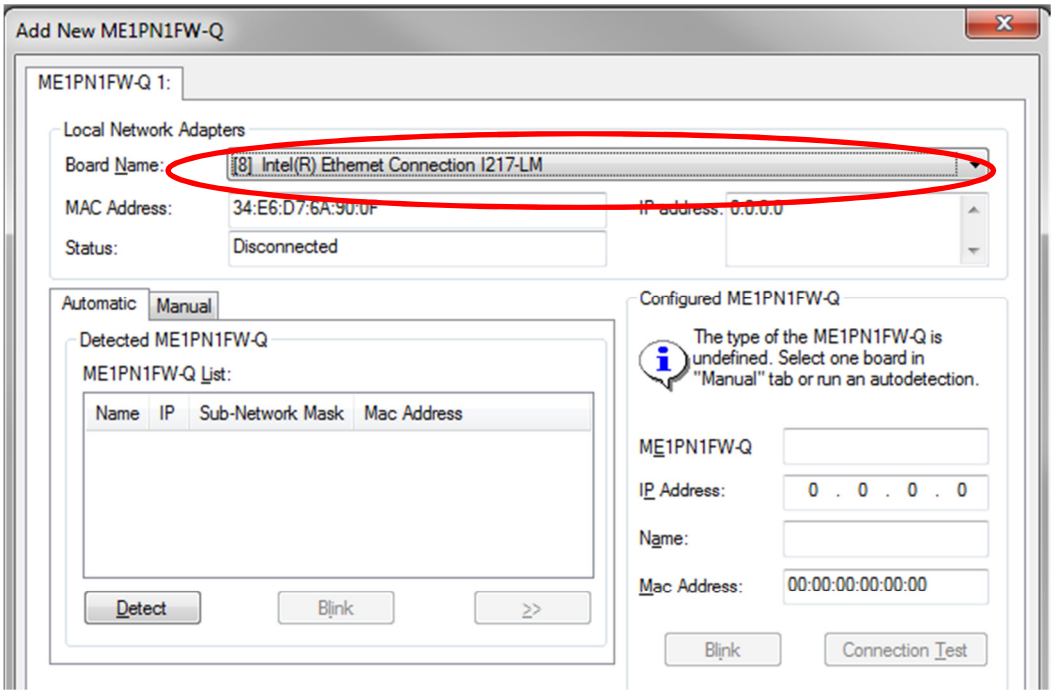
You can also restore an included .mit file for a sample configuration

## 2.2 ProfiNet CPU (ME1PN1FW-Q) Setup

1. From the **Configuration Manager** window, double-click on the **ME1PN1FW-Q Configuration** entry under the **Description** Item:




2. On the **Add New ME1PN1FW-Q** windows, be sure the Automatic tab is selected for **Detected ME1PN1FW-Q** and click the **Detect** button:

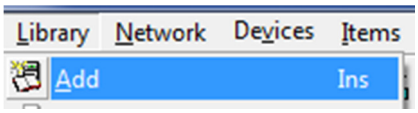



**NOTE:** Be sure the **Board Name:** is the target Network interface on your computer and that it is connected to the same network as the **ME1PN1FW-Q** module. Check Ethernet connections and IP settings if Automatic detection does not work.

3. When the **ME1PN1FW-Q** module is found, click the OK button to close the window.
4. Click the Save button (  )

## 2.3 Importing GSDML file to GX Configurator PN

1. Open **GX Configurator PN** and select Library>Add from the top menu :



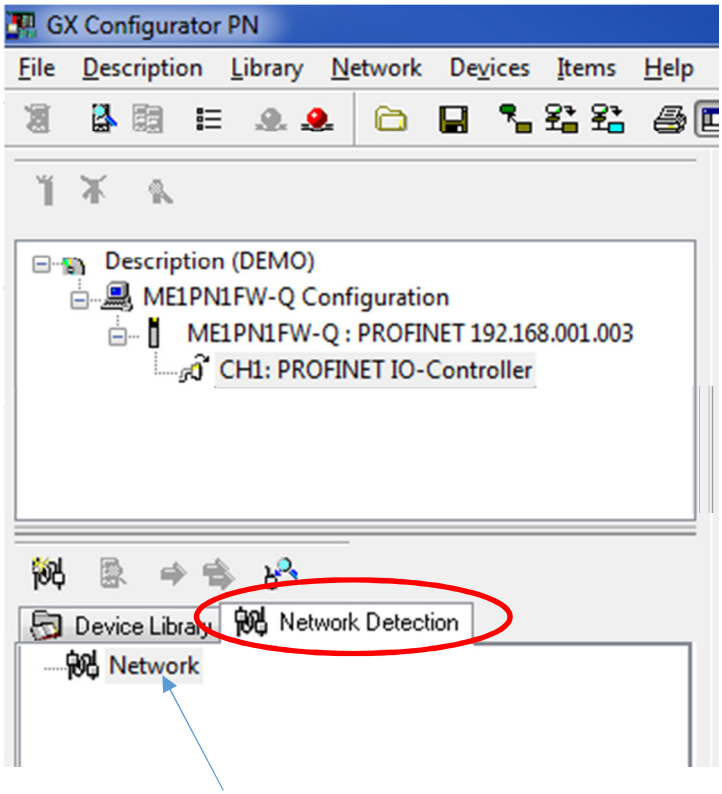

2. From the GSDML Management window, click the **Next >** button
3. The next screens allow either a single GSDML file or a folder with multiple GSDML files to be imported. Choose the appropriate option, and then click the Browse button to locate the file or folder.
4. Click the **Next >** button twice until the Action is Completed window appears.
5. Click the **Finish** button
6. **Target node should now be configurable in the GX Configurator PN software**

## 2.4 ProfiNet Node Initial Device Setup

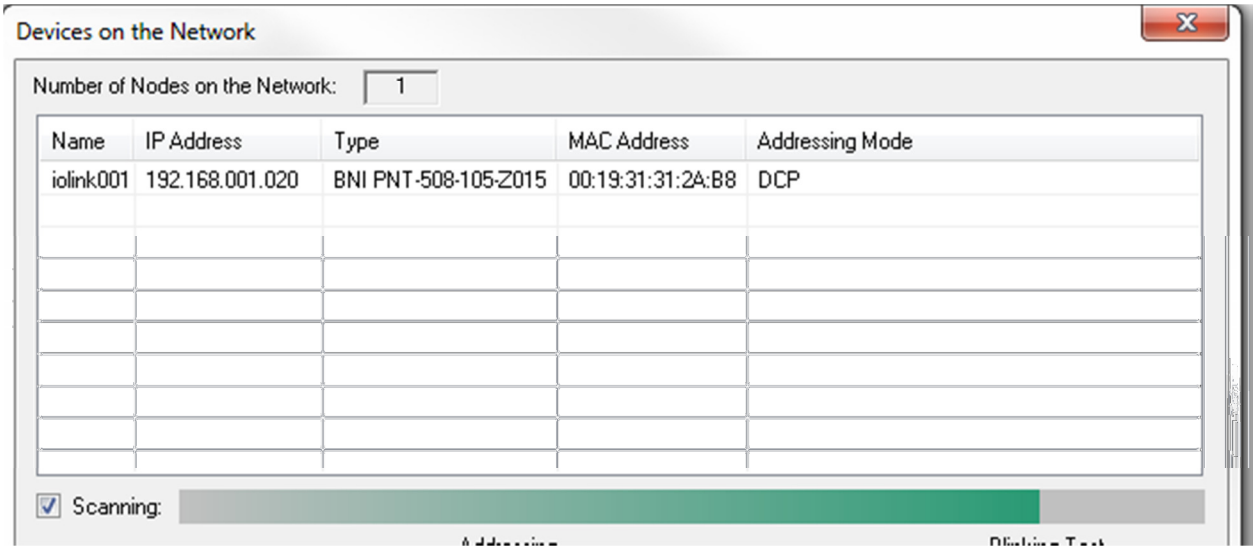
Use this procedure for setting up the newly-added ProfiNet node devices when online with the PN CPU module.

**You must have the target node device connected to the same network as your PC and PN CPU module.**

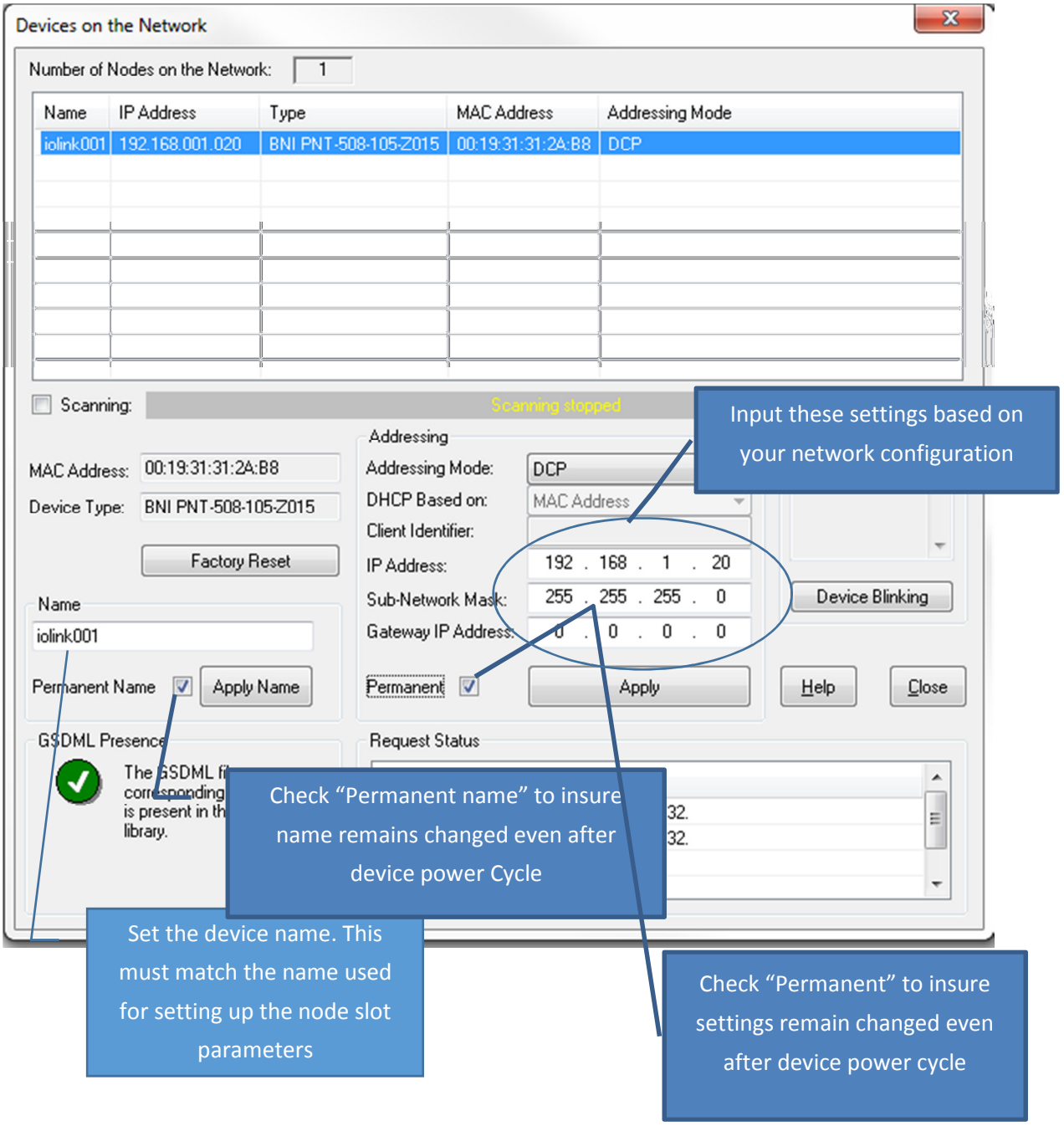
1. From the Main window, select the **Network Detection** tab:




2. Right click on the **Network** item and select **Online Action** or click the **(**  **)** icon.
3. On the **Devices on the Network** window, the software will scan the ProfiNet network and show all found nodes on the network (allow a few scans so devices have a chance to respond):

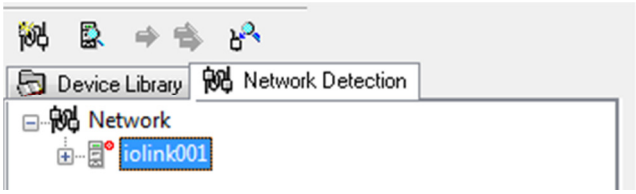



4. Once the target device appears on the list, uncheck the Scanning checkbox. This will allow re-configuration of the target device. Click on the target device from the list.
5. With the target node still selected, adjust settings for Name, IP Address, Sub-Network Mask, and Gateway IP Address as required by your ProfiNet control network. See below for further instructions:




6. After settings are adjusted, be sure to click **Apply** and **Apply Name** button to permanently store the new settings.
7. Click the **Close** button.
8. On the Main window, right click on the **Network** item again and select **Read Network Configuration** or click the ( ) icon.

9. The target node should now appear below the **Network** item (see next page):

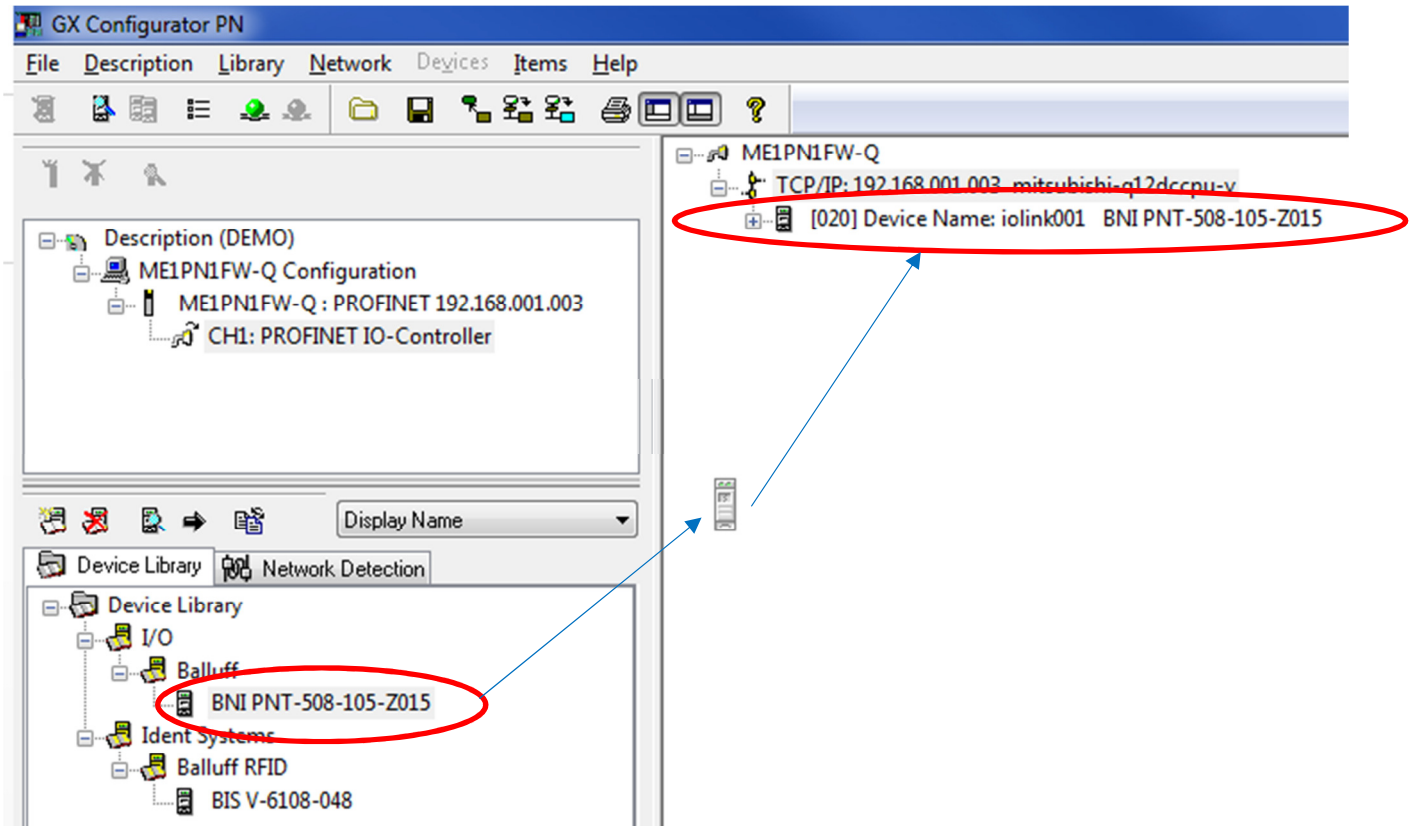



10. Initial device setup is complete

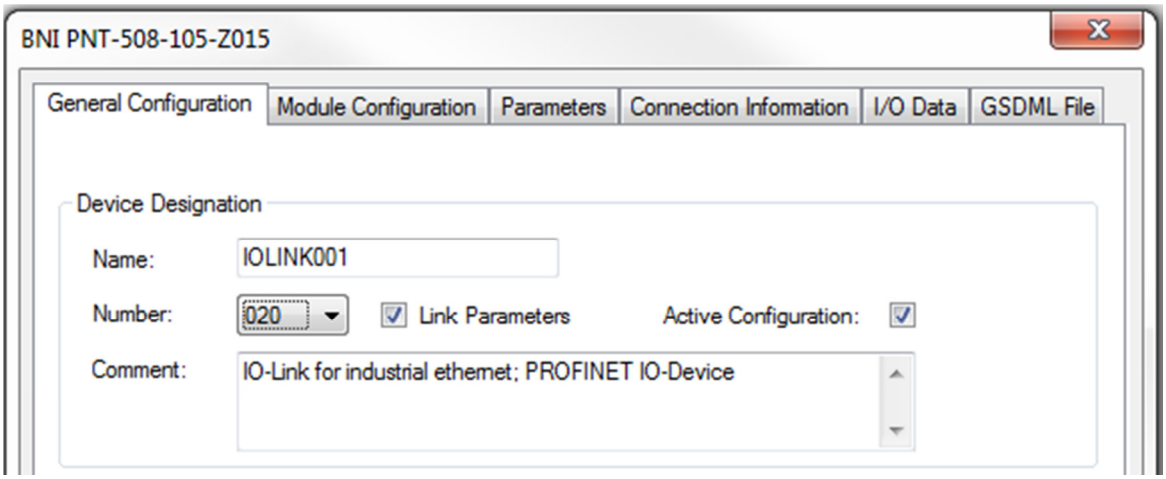
## 2.5 ProfiNet Node Device General Configuration

Use this procedure for setting up the ProfiNet node device's general configuration.

1. From the Main window, locate the target Node device from the Device Library list (if the device is not found refer to the **"Importing GSDML file to GX Configurator PN"** procedure above). Click and drag the target device from the Device Library onto the Main window. When released the device will show inside the TCP/IP:… branch and a window will appear for node configuration (see next page):




2. On the Node Window's **General Configuration**, set the Node number (as set by the Initial Device Config procedure above) and name. **Important! Be sure the Name is the same name as set by the Initial Device Config procedure above (letter case CAN be different)** (see next page):

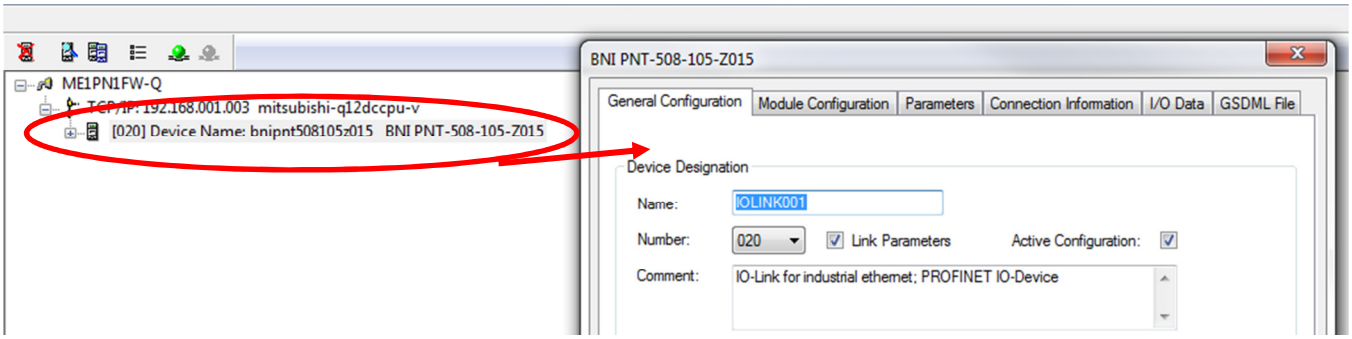



3. Continue to add node devices for each device on the ProfiNet network.

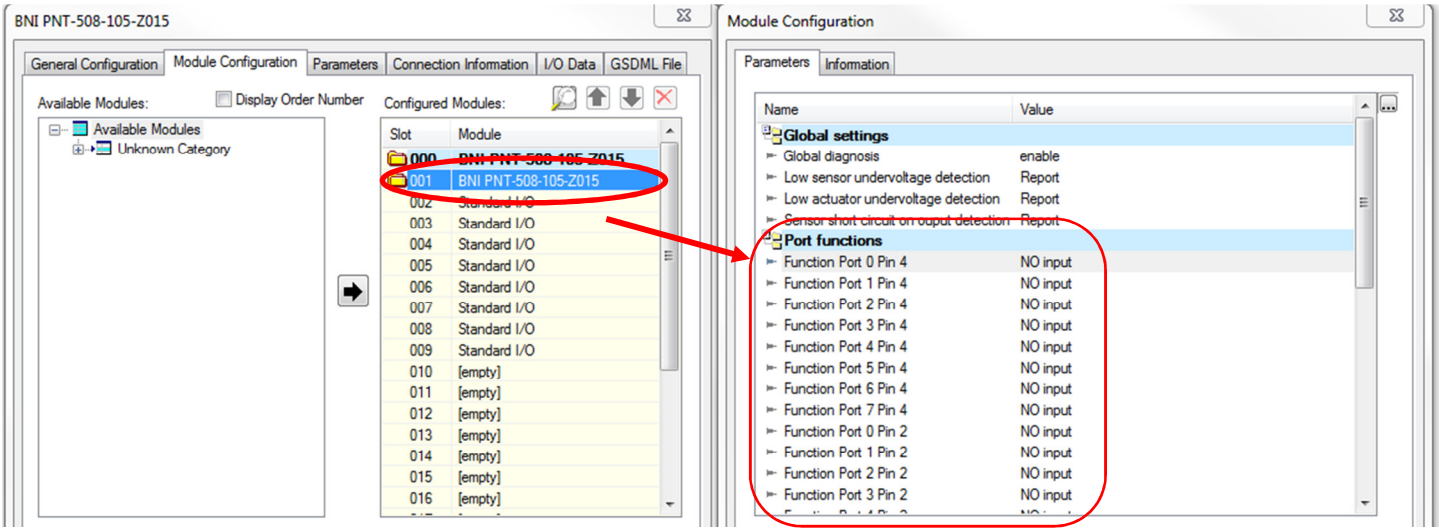
## 2.6 ProfiNet Node Device Module Configuration-Port Functions

There are many items that have to be configured and added to the ProfiNet node device to ensure proper process and diagnostic data functionality. This first module configuration procedure will focus on setting up the Parts of the Profinet node device. In most scenarios the hub device ports can be set up for standard I/O or IO-Link communication. The example below will use the Balluff **BNI005H** node device that can have standard I/O or IO-Link communication on all ports. Other node devices may have more restricted ability for IO-Link configuration. Refer to the node device's user manual for more information.

1. From the Main window, locate the target Node device from the list of node devices listed and double-click it to bring up its configuration page:




2. Click on the **Module Configuration** tab.
3. From the **Configured Modules:** table, double-click on the **Slot 001** folder. Another window will appear to allow port functions to be adjusted (see next page):




The list above shows Port functions for Pin 4 and Pin 2 of standard M12 round micro-connector:


| Pin | Function |
|---|---|
| 1 | +24 V, 200 mA |
| 2 | Input/output |
| 3 | GND |
| 4 | Input/output |
| 5 | FE |

**Standard I/O**

| Pin | Function |
|---|---|
| 1 | +24 V, 1.6 A |
| 2 | Input/output |
| 3 | GND |
| 4 | IO-Link / input / output |
| 5 | n.a. |

**IO-Link Configuration**

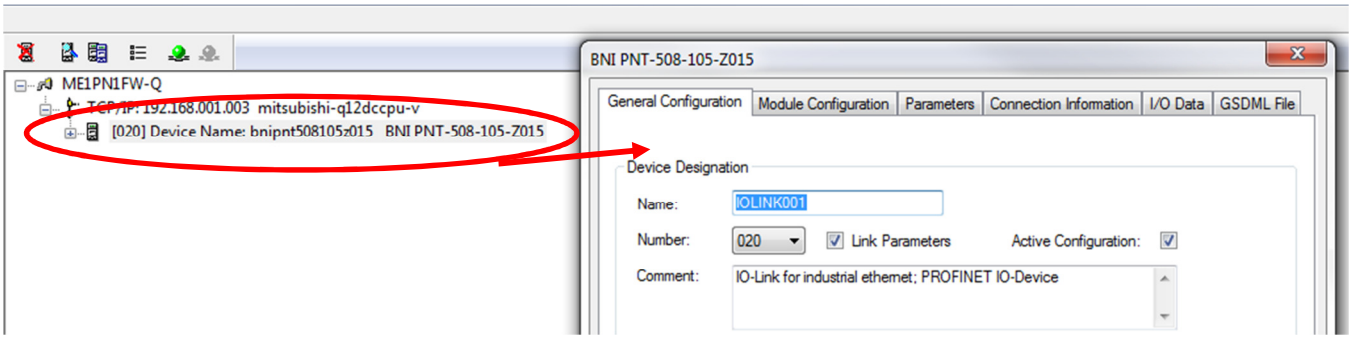
For this node device, the IO-Link is enabled on **Pin 4** of each port. Other node devices may handle IO-Link enabling differently. Refer to the node device's user manual for more information.

4. Click on each Port's Pin 4 setting and select **Normally Open** or **Normally Closed Input** or **Output** for standard I/O or **IO-Link**.
    a. IO-link will not be selectable in GSDML 2.31
    b. To configure a port as IO-link pull the slot configuration for each slow 2-9(BNI005H) 6-9 as an IO-link configuration
5. Click on each Port's Pin 2 to set standard I/O functionality for Non-IO-Link ports.

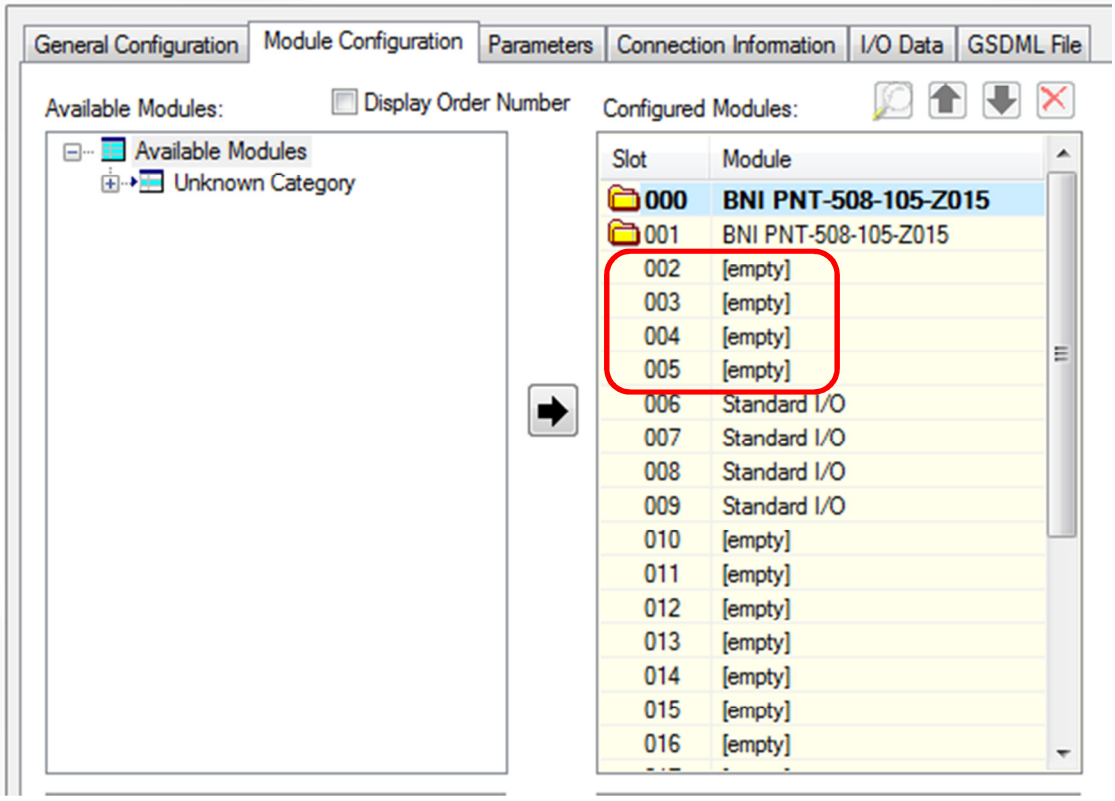
## 2.7 ProfiNet Node Device Module Configuration-IO-Link/Standard I/O Slot Data

After the Profinet Node device's ports and pins have been configured, the IO-Link mapping must be configured for proper IO-Link device functionality. This second module configuration procedure will focus on setting up the "Slots" reserved for IO-Link or Standard I/O. The example below will use the Balluff **BNI005H** node device that can have standard I/O or IO-Link communication on all ports. Other node devices may have more restricted ability for IO-Link configuration. Refer to the node device's user manual for more information.

1. From the Main window, locate the target Node device from the list of node devices listed and double-click it to bring up its configuration page:



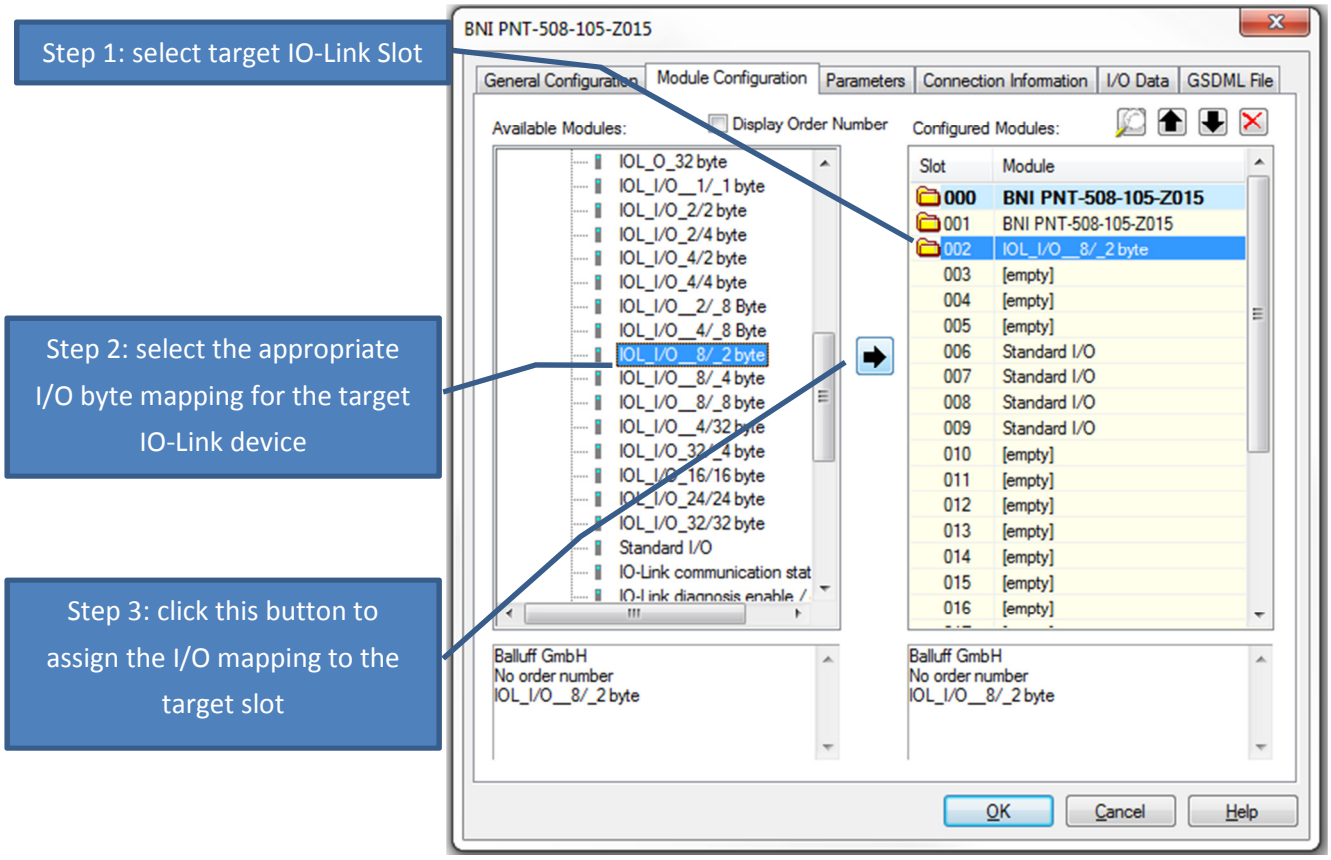

2. Click on the **Module Configuration** tab.
3. From the **Configured Modules:** table, click on the **Slot 002 Standard I/O** folder. Slot 002 = Port 0 of the node device, Slot 003 = Port 1, etc. Starting with Slot 002, delete the module types you will be using for IO-Link by using the (  ) button on the upper right. You should end up with [empty] slots for each port that will be used for IO-Link communication:




4. Click on the + next to the **Unknown Category** sub branch in the **Available Modules** branch. From the list of possible IOL mapping, choose the I and/or O bytes that match the target hub device. Each IO-Link hub device may have different mapping. Refer to the user manual for the Process data length. Below is an excerpt from the **BNI003A 16In/16Out IO-Link hub device** (see next page):

| | |
|---|---|
| Data transmission rate | COM2 (38,4 kBaud) |
| Frame type | 1 |
| Minimal cycle time | 3 ms |
| Process data cycle time | 30 ms, at minimal cycle time |
| Process data length | 8 Bytes input, 2 Bytes output |

Using the example above, click on the target Slot on the right, then select the appropriate IOL byte mapping and click the (  ) button to assign it to that slot. See steps below:




5. When all IO-Link slots have been assigned click the **OK** button.

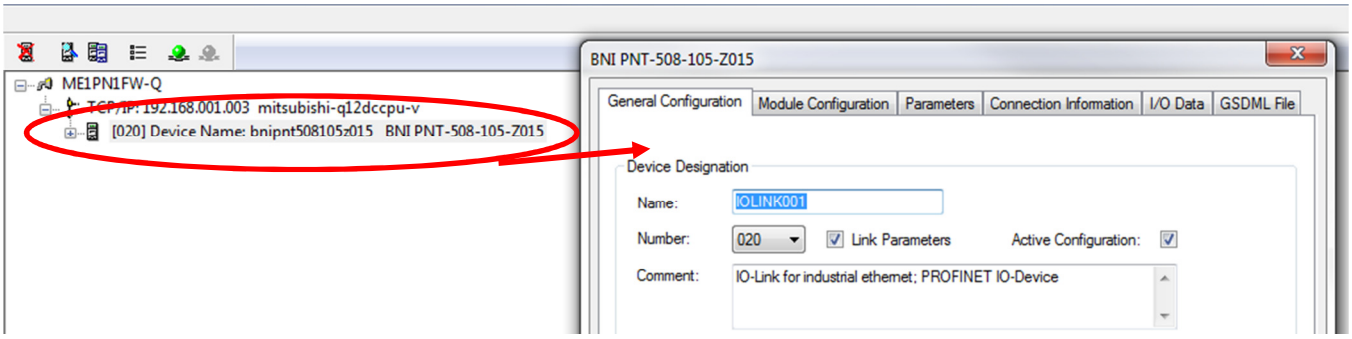
**Important! When using the Balluff BIS013W RFID node device, ALL four slots for RFID antennae MUST be configured regardless of actual hardware!**

**Important! It is recommended to set IO-link ports to 16 IN/16 Out to allow maximum flexibility in configuration.**

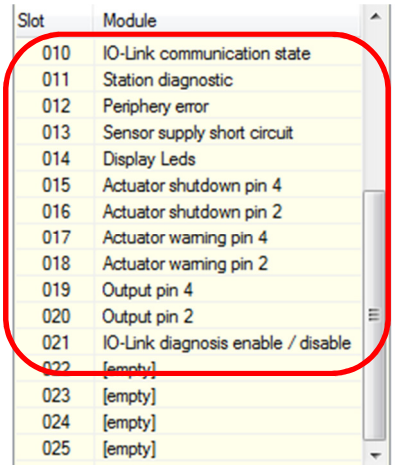
## 2.8 ProfiNet Node Device Module Configuration-Node Diagnostics Slot Data

After the Profinet Node device's IO-Link hubs have been configured, the Profinet node device's diagnostic data must be mapped to enable this functionality. This third module configuration procedure will focus on setting up the "Slots" reserved for Short Circuit, Module Error, IOL Diagnostics Enabled/Disabled, etc. The example below will use the Balluff **BNI005H** node device that can have standard I/O or IO-Link communication on all ports. Other node devices may have more restricted ability for IO-Link configuration. Refer to the node device's user manual for more information.

1. From the Main window, locate the target Node device from the list of node devices listed and double-click it to bring up its configuration page:




2. Click on the **Module Configuration** tab.
3. From the **Configured Modules:** table, click on the **Slot 0010 [empty]** folder.
4. Using the steps show in the previous procedure, **"ProfiNet Node Device Module Configuration-IO-Link/Standard I/O Slot Data",** add ALL of the modules shown below. The order of the slot insertion does NOT need to be identical as long as they are on the list of Configured Modules:

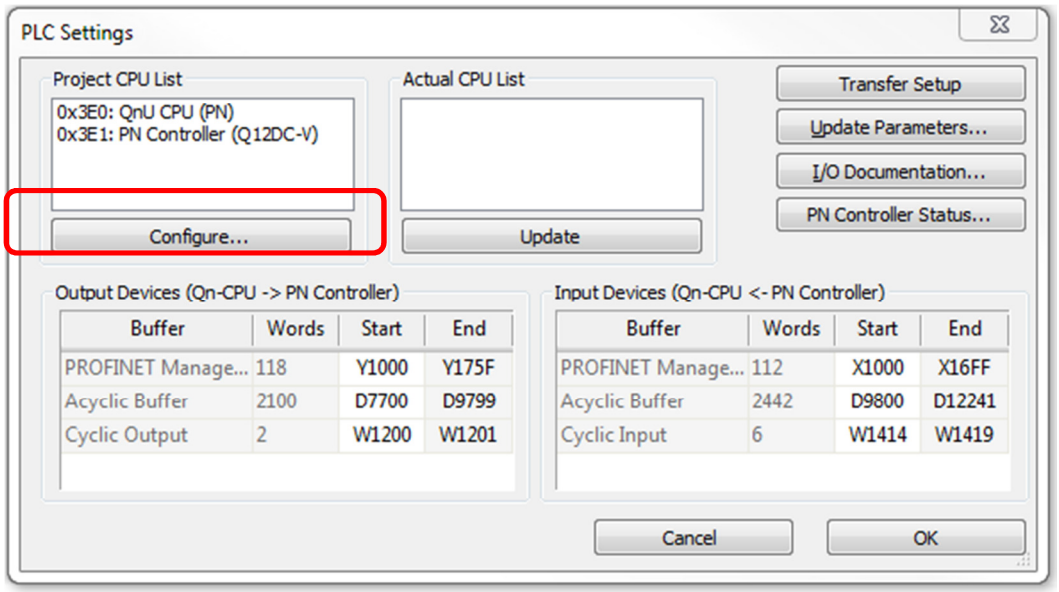



5. When all IO-Link slots have been assigned click the **OK** button.

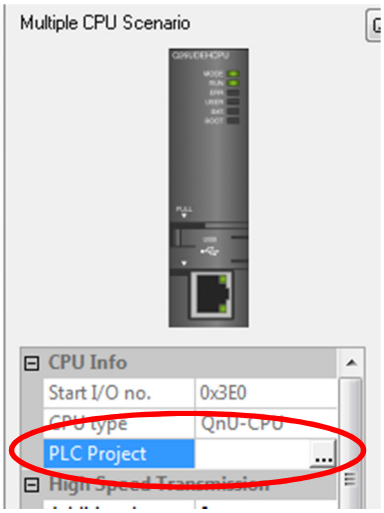
## 2.9 ProfiNet and Main PLC Settings-CPU Project Association and Update Parameters

Before downloading a Profinet configuration project, the PLC project for the main CPU must be assigned in the CPU Configuration of the PN Configurator software. When mapping is added, edited, or deleted, PN configurator needs to update the PLC project's PLC parameters to reflect the new device mapping. Once this is complete, the Parameters can be updated online to the Main CPU and PN Controller and the offline PLC project. This second PLC Settings procedure will show how to set up plc project association and perform an **Update Parameters** operation.

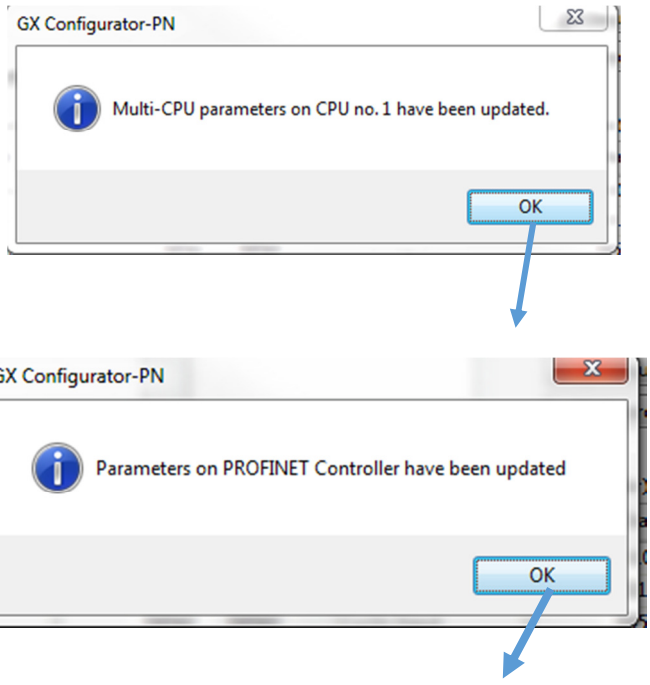
1. From the Main **Menu** window, select **File>PLC Settings** or click the ( ) button.
2. On the PLC Settings window, click on the **Configure** button:

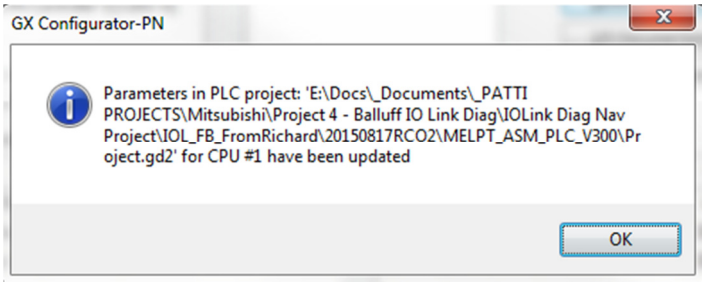



3. On the **CPU Info** list, click on the blank space next to **PLC Project**:




4. Use the ( ) button to select your target project.
5. Once selected, click **OK** to store the new setting.
6. From the **PLC Settings** window, click the **Update Parameters…** button.
7. Be sure both Main and PN controller checkboxes are checked and click OK.
8. Click **Yes**. If parameters successfully update in both CPUs and the PLC the project, you should get three message boxes:






9. Click **OK** three times to clear all message boxes.
10. Click **OK** on the **PLC Settings** to close the window.
11. Click the Save icon ( ) to permanently save new settings.

## 2.10 Saving and Downloading Configuration to PN Controller

After all the preceding steps have been complete:

- New Configurator created
- GSDML files imported
- Main CPU and PN Controller configured
- Node and Hub devices mapped
- Parameters in Main CPU and PN Controller update

Then, the final configuration can be saved and downloaded to the PN controller. Only after these steps are completed with the PN controller reflect the new configuration:

1. From the Main **Menu** window, select **File>Save** or click the (  ) button.
   **NOTE: IF there are any parameters that need to be update to the Main CPU and the PN Controller, the PLC Settings will appear. Perform the "Update Parameters" procedure explained above to complete the file save.**
2. After parameters are updated and file is saved, select **File>Download Configuration** or click the (  ) icon.
3. When the Output Message View on the bottom of the main window says **"The configuration is successfully downloaded."**
4. Reset your Main CPU processor for changes to take effect.

## 2.11Referencing I/O/Diagnostic Data Mapping

When a ProfiNet network configuration is completed, the actual device mapping for each slot of each node and hub can be referenced within the GX Configurator PN software.

Most times, the GXWorks 2 PLC template project will automatically handle all node and hub data for diagnostic and parameter display/manipulation but there may be a need to reference this material for added features.

1. From the Main **Menu** window, select **File>PLC Settings** or click the (  ) button.
2. On the PLC Settings window, click on the **I/O Documentation...** button.
3. Click **OK** if any warnings appear (usually it's just to truncate the name of a slot element).
4. The resulting report will load on your default web browser on your PC.
5. The report is broken up into 2 major areas:
    a. A master slot table of all slave nodes on the ProfiNet network with hyperlink shortcuts to more details
    b. Details tables for each slot configured for each slave node on the ProfiNet network.

**See next page for Header data on this report:**

**Example with two ProfiNet node devices (No 20 and 21)**

**Project: DEMO**

| Slave No. | Name | Model | Modules |
|---|---|---|---|

| Slot | Model | Global Var. In / Global Var. Out |
|---|---|---|
| 0 | BNI PNT-508-105-Z015 | - / - |
| 1 | BNI PNT-508-105-Z015 | - / - |
| 2 | IOL_I/O__8/_2 byte | SLV020SLOT002DataStructIn / SLV020SLOT002DataStructOut |
| 6 | Standard I/O | - / - |
| 7 | Standard I/O | - / - |
| 8 | Standard I/O | - / - |
| 9 | Standard I/O | - / - |
| 10 | IO-Link communication state | SLV020SLOT010DataStructIn / - |
| 11 | IO-Link diagnosis enable / disable | - / SLV020SLOT011DataStructOut |
| 12 | Station diagnostic | SLV020SLOT012DataStructIn / - |
| 13 | Periphery error | SLV020SLOT013DataStructIn / - |
| 14 | Sensor supply short circuit | SLV020SLOT014DataStructIn / - |
| 15 | Actuator shutdown pin 4 | SLV020SLOT015DataStructIn / - |
| 16 | Actuator shutdown pin 2 | SLV020SLOT016DataStructIn / - |
| 17 | Actuator warning pin 4 | SLV020SLOT017DataStructIn / - |
| 18 | Actuator warning pin 2 | SLV020SLOT018DataStructIn / - |
| 19 | Display Leds | - / SLV020SLOT019DataStructOut |

20 | bnipnt508105z015 | BNI PNT-508-105-Z015

| Slot | Model | Global Var. In / Global Var. Out |
|---|---|---|
| 0 | BNI PNT-508-105-Z015 | - / - |
| 1 | BNI PNT-508-105-Z015 | - / - |
| 2 | IOL_I__4 byte | SLV040SLOT002DataStructIn / - |
| 3 | Standard I/O | - / - |
| 4 | Standard I/O | - / - |
| 5 | Standard I/O | - / - |
| 6 | Standard I/O | - / - |
| 7 | Standard I/O | - / - |
| 8 | Standard I/O | - / - |
| 9 | Standard I/O | - / - |
| 10 | IO-Link communication state | SLV040SLOT010DataStructIn / - |
| 11 | IO-Link diagnosis enable / disable | - / SLV040SLOT011DataStructOut |
| 12 | Station diagnostic | SLV040SLOT012DataStructIn / - |
| 13 | Periphery error | SLV040SLOT013DataStructIn / - |
| 14 | Sensor supply short circuit | SLV040SLOT014DataStructIn / - |
| 15 | Actuator shutdown pin 4 | SLV040SLOT015DataStructIn / - |
| 16 | Actuator shutdown pin 2 | SLV040SLOT016DataStructIn / - |
| 17 | Actuator warning pin 4 | SLV040SLOT017DataStructIn / - |
| 18 | Actuator warning pin 2 | SLV040SLOT018DataStructIn / - |
| 19 | Display Leds | - / SLV040SLOT019DataStructOut |

40 | bnipnt508105 | BNI PNT-508-105-Z015

**See next page for Details:**

Basic node device info as configured in the General

Slot Data with clickable hyperlinks as configured in the

**bnipnt508105z015.Module Slot 2 : SLV020SLOT002DataStructIn**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT002_INPUT_2_BYTES | ARRAY [0..63] OF BOOL | Input | W1415.0 |

**bnipnt508105z015.Module Slot 2 : SLV020SLOT002DataStructOut**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT002_OUTPUT_2_BYTES | ARRAY [0..15] OF BOOL | Output | W1201.0 |

**bnipnt508105z015.Module Slot 10 : SLV020SLOT010DataStructIn**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT010_KOMMUNIKATIONSSTATUS | ARRAY [0..7] OF BOOL | Input | W1419.0 |
| SLOT010_BIT_KOMMUNIKATIONSSTATUS | ARRAY [0..7] OF BOOL | Input | W1419.0 |

**bnipnt508105z015.Module Slot 11 : SLV020SLOT011DataStructOut**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT011_DIAGOSIS_ENABLE_DISABLE | ARRAY [0..7] OF BOOL | Output | W1202.0 |
| SLOT011_BIT_DIAGOSIS_ENABLE_DISA | ARRAY [0..7] OF BOOL | Output | W1202.0 |

**bnipnt508105z015.Module Slot 12 : SLV020SLOT012DataStructIn**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT012_STATION_DIAGNOSTIC | ARRAY [0..7] OF BOOL | Input | W141A.0 |
| SLOT012_BIT_STATION_DIAGNOSTIC | ARRAY [0..7] OF BOOL | Input | W141A.0 |

**bnipnt508105z015.Module Slot 13 : SLV020SLOT013DataStructIn**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT013_PERIPHERY_ERROR | ARRAY [0..7] OF BOOL | Input | W141B.0 |
| SLOT013_BIT_PERIPHERY_ERROR | ARRAY [0..7] OF BOOL | Input | W141B.0 |

**bnipnt508105z015.Module Slot 14 : SLV020SLOT014DataStructIn**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT014_SENSOR_SUPPLY_SHORT_CIRC | ARRAY [0..7] OF BOOL | Input | W141C.0 |
| SLOT014_BIT_SENSOR_SUPPLY_SHORT | ARRAY [0..7] OF BOOL | Input | W141C.0 |

Slot Data for the first IO-Link device for node device 20. Actual breakdown of I/O signals and diagnostic indicators can be referenced in that device's User Guide

Slot Data for the node device's diagnostic data

**See next page for more information:**

| Slave No. | Name | Model | Modules | | |
|---|---|---|---|---|---|
| | | | Slot | Model | Global Var. In / Global Var. Out |
| | | | 0 | BNI PNT-508-105-Z015 | - / - |
| | | | 1 | BNI PNT-508-105-Z015 | - / - |
| | | | 2 | IOL_I/O__8/_2 byte | SLV020SLOT002DataStructIn / SLV020SLOT002DataStructOut |
| | | | 6 | Standard I/O | - / - |

Clicking on one of these hyperlinks will navigate to the appropriate details section of the report

**bnipnt508105z015.Module Slot 2 : SLV020SLOT002DataStructIn**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT002_INPUT_2_BYTES | ARRAY [0..63] OF BOOL | Input | W1415.0 |

**bnipnt508105z015.Module Slot 2 : SLV020SLOT002DataStructOut**

| Element Identifier | Element Type | Class | Buffer MIT-Address |
|---|---|---|---|
| SLOT002_OUTPUT_2_BYTES | ARRAY [0..15] OF BOOL | Output | W1201.0 |

Number of bits used in this slot data. Since this is an 8-byte slot, 64 bits are

Starting device address as this slot data as configured in the PLC

# 3 GX WORKS 2 PLC SETUP

From the template project, much of the ProfiNet and IO-Link Diagnostics functionality is configured to allow for dynamic changes to the setup. However, some verification and changes are required for proper ProfiNet operation on a target system.

The template project is designed for a Q06UDV processor, with a MultiCPU rack, with a PN controller in the CPU slot next to the Q06UDV CPU.

In subsequent sections we will cover:

1. PLC Parameters and required programming
2. IO-Link device configuration function blocks
3. IO-Link Master Configuration
4. IO-Link Diagnostics required programming
5. IO-Link Device Process Data function blocks
6. RFID required programming

## 3.1 PLC Parameters and required Programming

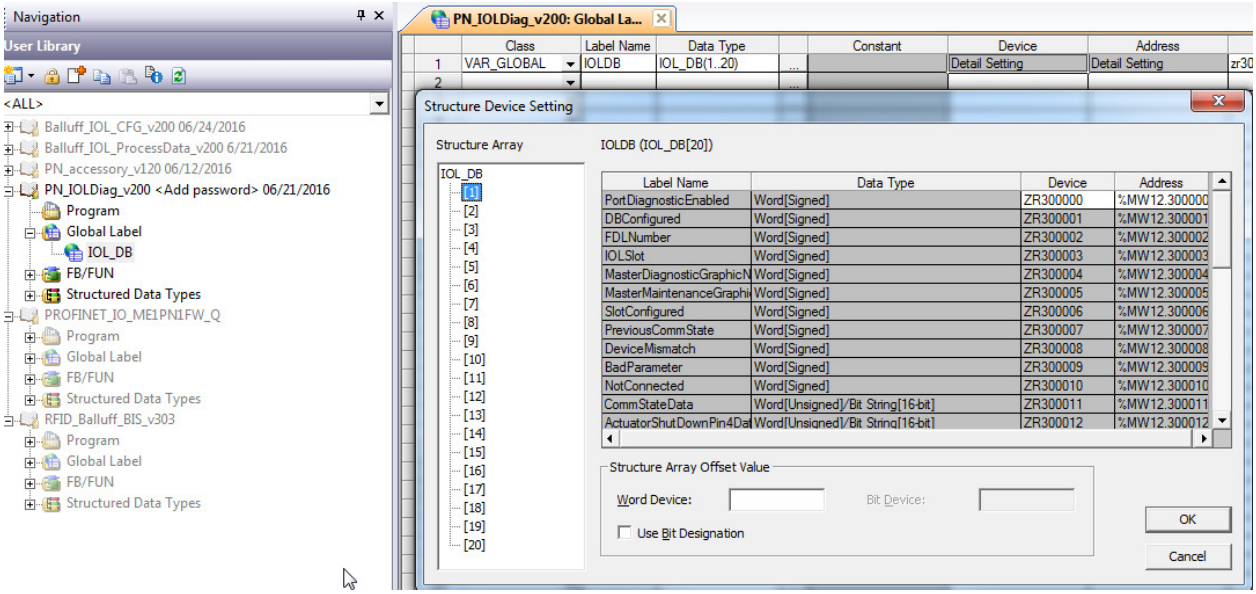
Whether starting with the template project or importing or copy/pasting elements into an existing project, there are common PLC parameters required for correct operation.

PLC file registers are used in our example template, the maximum non-extended size of a Q06UDV, 384 K points is defined.

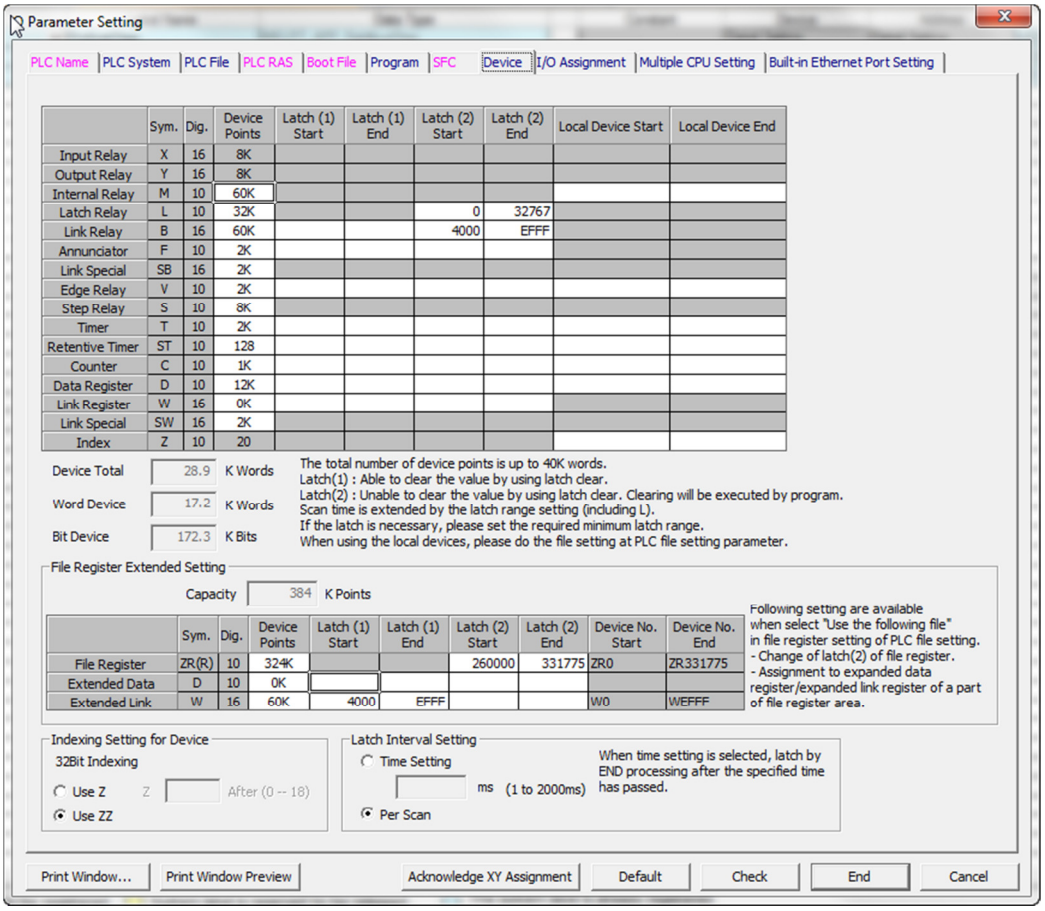
This project uses retentive registers for storing data through a power cycle.

IO-link Data (IOLDB) needs to be stored in retentive word memory consisting of 9340 words. The template project stores this data within ZR300000-ZR309339.

This can be configured from the Global Label settings of the PN_IOLDiag library

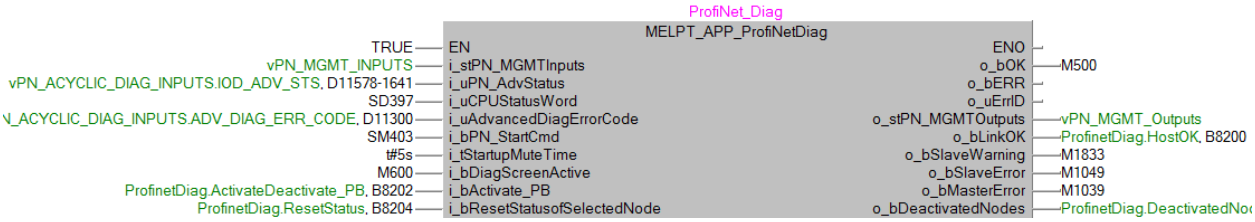



Profinet Diagnostics needs to store the deactivated nodes(128 bits) in retentive bit memory. The template project uses B8200-B82FF and W8200-82FF to store all Profinet Diagnostic Data




Proper operation of IO-Link diagnostics requires the use and operation of the MELPT_APP_ProfinetDiag function block. The template version uses version 3.03.

### 3.1.1 Configuration of MELPT_APP_ProfinetDiag




**Purpose:** Turns on the cyclic communication functionality of the PN controller. Determines Fieldbus Status for individual nodes, allows the ability to reserve/activate a node. Retrieves channel diagnostics. Provides alarm summary bits

**User Configuration:** Profinet controller location, attaching alarm outputs to HMI alarm memory.

This function block is used to monitor overall node health for the fieldbus and provide detailed diagnostics for the selected fieldbus node.

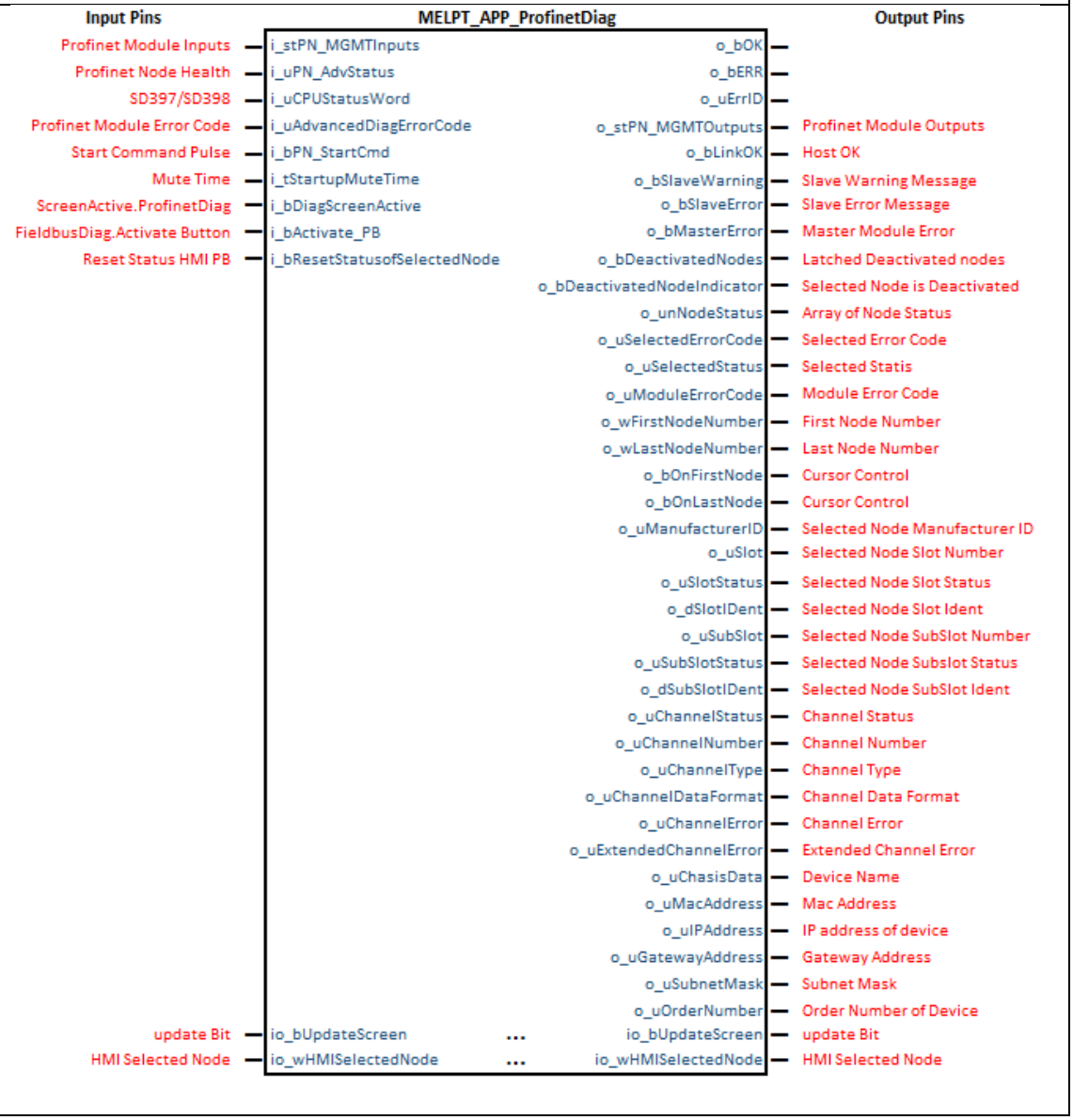
For this function block to operate properly the User library installed by GX Configurator –PN: PROFINET_IO_ME1PN1FW_Q ,must be installed and updated with the correct PLC registers. The installation of Profinet_IO_ME1PN1FW_Q is achieved through configuration of the PN controller from GX Configurator_PN. To install this library please refer to section 2.9 of this document.

During the write process to the PLC , GX Configurator –PN will install the user library and update the labels with the devices listed in PLC Settings of GX Configurator_PN.

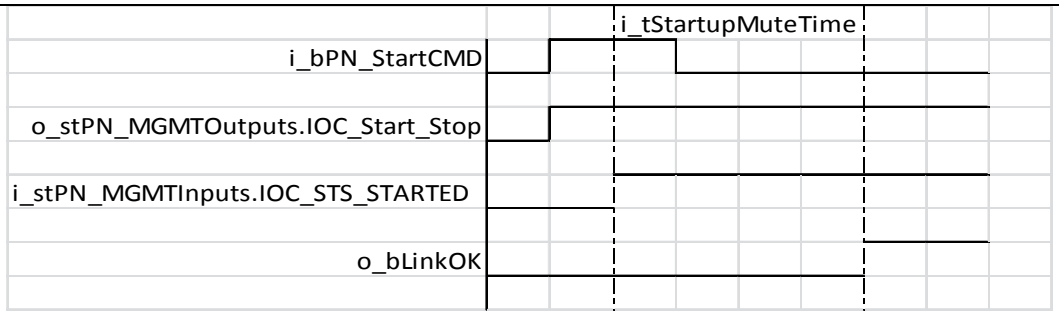
Additionally the user library PN_accessory_v120 needs to be installed, this library contains the acyclic read and write function needed to retrieve channel diagnostics.

**Note: If a diagnostic is occurring when the io-link diagnostic is disabled. An electrical change has to occur once it is enabled for the diagnostic to be reported to the fieldbus diagnostic programming.**

| FB Name |
|---|
| MELPT_APP_ProfinetDiag |

| Item | Description |
|---|---|
| Function overview | This function block monitors Profinet node health, starts the fieldbus, and allows a method to reserve/activate nodes |
| Symbol |  |

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Applicable Hardware</td><td>
<table>
<tr><th>Series</th><th>Model</th><th>Serial Restriction</th></tr>
<tr><td>MELSEC-Q series</td><td>Universal Model PLC</td><td>None</td></tr>
<tr><td>MELSEC-Q series C CPU</td><td>ME1PN1FW-Q</td><td>None</td></tr>
<tr><td>GOT 1000 series</td><td>GT16(800*600) or Higher</td><td>None</td></tr>
</table>
</td></tr>
<tr><td>Applicable Software</td><td>
<table>
<tr><th>Series</th><th>Version</th></tr>
<tr><td>GX Works 2</td><td>1.540</td></tr>
<tr><td>GT Designer 3</td><td>1.136</td></tr>
<tr><td>Configurator-PN</td><td>1.03</td></tr>
</table>
</td></tr>
<tr><td>Programming language</td><td>Structured Ladder/FBD</td></tr>
<tr><td>Number of Ladder Steps</td><td>QnU: 1048 steps<br>*The number of steps of the FB program depends on the CPU Model that is used and input and output definition</td></tr>
<tr><td>Device Memory Used</td><td>1852 bits<br>1426 words<br>2 timer</td></tr>
<tr><td>Compiling method</td><td>Macro type;</td></tr>
<tr><td>Execution type</td><td>Real-time Execution</td></tr>
</table>

| Item | Description |
|---|---|
| Dependences | This FB requires the following SDT from the Profinet Module library:<br>tPN_MGMT_INPUTS,<br>tPN_MGMT_OUTPUTS<br>and the following FB from the PN_accessory library<br>PN_Read_Rec<br>PN_AcyclicBufferCheck |
| Function description | This function block enabled the ProfiNet fieldbus, monitors node health, sets alarms for node issues, and interrogates an individual node for channel diagnostics |
| Restrictions and precautions | This function block uses Z16 |
| Timing chart |  |

| FB Error Code |
|---|

| Error Code | Description |
|---|---|
| 0 | No Error |
| H100 (256) | Not a Profinet Module check i_uCPUStatusWord |
| H101 (257) | Module Error Code Present |

| Error Code | Description |
|---|---|
| H102 (258) | Configuration Error Detected |

| Labels |
|---|

■nput labels

| User Input | Symbol Name | Var_Input name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| | Profinet Module Inputs | i_stPN_MGMTInputs | tPN_MGMT_ INPUTS | | Profinet Controller Management Input SDT |
| | Profinet Node Health | i_uPN_AdvStatus | Word[Unsigned](0..63) | | Advanced Status of 128 nodes |
| X | SD397/SD398 | i_uCPUStatusWord | Word[Unsigned] | SD397 or SD398 | Data for MultiCPU<br>Enter SD397 if CPU2<br>SD398 if CPU3 |
| | Profinet Module Error Code | i_uAdvancedDiagErrorCode | Word[Unsigned] | | Error Code from C-CPU |
| | Start Command Pulse | i_bPN_StartCmd | Bit | | User Defined Start Profinet |
| X | Mute Time | i_tStartupMuteTime | Time | T#1ms – t#32s | Timer for not recovering status of slaves |
| | ScreenActive.ProfinetDiag | i_bDiagScreenActive | Bit | | When Fieldbus Diagnostic Screen is Active |
| | FieldbusDiag.Activate Button | i_bActivate_PB | Bit | | Activate Node |

| User Input | Symbol Name | Var_Input name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| | Reset Status HMI PB | i_bResetStatusofSelectedNode | Bit | | Reset Status |

■nput/Output labels

| User Input | Name | Var_In_Out name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| | update Bit | io_bUpdateScreen | Bit | | Refresh Diag Screen |
| | HMI Selected Node | io_wHMISelectedNode | Word[Signed] | | HMI numeric Input of FDL address |

■Output labels

| Name | Var_Output name | Data Type | Description |
|---|---|---|---|
| FB Execute normal | o_bOK | Bit | When TRUE, indicates processing has completed normally |
| FB Execute abnormally | o_bERR | Bit | When TRUE, indicates an Error has occurred |
| FB Error Code | o_uErrID | Word[Unsigned] | FB Error Code Output |
| Profinet Module Outputs | o_stPN_MGMT Outputs | tPN_MGMT_OUTPUTS | outputs to ProfiNet control |
| Host OK | o_bLinkOK | Bit | Status of Data Link |
| Slave Warning Message | o_bSlaveWarning | Bit | A slave currently has diagnostic message |
| Slave Error Message | o_bSlaveError | Bit | A slave currently is disconnected |

| Name | Var_Output name | Data Type | Description |
|---|---|---|---|
| Master Module Error | o_bMasterError | Bit | A slave currently is disconnected |
| Latched Deactivated nodes | o_bDeactivated Nodes | Bit(0..127) | Temporary Reserved Nodes |
| Selected Node is Deactivated | o_bDeactivated NodeIndicator | Bit | HMI Indicator the selected Node is Deactivated |
| Array of Node Status | o_unNodeStatus | Word[Unsigned](0..127) | Node Status Array |
| Selected Error Code | o_uSelectedErrorCode | Word[Unsigned] | Node Status Array |
| Selected Statis | o_uSelectedStatus | Word[Unsigned] | Selected node Status |
| Module Error Code | o_uModuleErrorCode | Word[Unsigned] | Profibus HMI Module Fault Code |
| First Node Number | o_wFirstNodeNumber | Word[Signed] | First Node Number |
| Last Node Number | o_wLastNodeNumber | Word[Signed] | Last Node Number on Machine |
| Cursor Control | o_bOnFirstNode | Bit | HMI Indicator for Node Selection Control |
| Cursor Control | o_bOnLastNode | Bit | HMI Indicator for Node Selection Control |
| Selected Node Manufacturer ID | o_uManufacturerID | Word[Unsigned] | Manufacturer ID from I&M0 |
| Selected Node Slot Number | o_uSlot | Word[Unsigned] | Slot Number of |

| Name | Var_Output name | Data Type | Description |
|---|---|---|---|
| Selected Node Slot Status | o_uSlotStatus | Word[Unsigned] | Slot Status |
| Selected Node Slot Ident | o_dSlotIDent | Double Word[Unsigned] | Slot Ident Number |
| Selected Node SubSlot Number | o_uSubSlot | Word[Unsigned] | Subslot Number |
| Selected Node Subslot Status | o_uSubSlotStatus | Word[Unsigned] | Subslot Status |
| Selected Node SubSlot Ident | o_dSubSlotIDent | Double Word[Unsigned] | SubSlot Ident |
| Channel Status | o_uChannelStatus | Word[Unsigned] | Channel Status |
| Channel Number | o_uChannelNumber | Word[Unsigned] | Channel Number |
| Channel Type | o_uChannelType | Word[Unsigned] | Channel Type |
| Channel Data Format | o_uChannelDataFormat | Word[Unsigned] | ChannelDataFormat |
| Channel Error | o_uChannelError | Word[Unsigned] | Channel Error Code |
| Extended Channel Error | o_uExtendedChannelError | Word[Unsigned] | Extended Channel Error Code |
| Device Name | o_uChasisData | Word[Unsigned](0..15) | Chassis data |

| Name | Var_Output name | Data Type | Description |
|---|---|---|---|
| Mac Address | o_uMacAddress | Word[Unsigned](0..2) | MAC Address |
| IP address of device | o_uIPAddress | Word[Unsigned](0..1) | IP Address |
| Gateway Address | o_uGatewayAddress | Word[Unsigned](0..1) | Gateway Address |
| Subnet Mask | o_uSubnetMask | Word[Unsigned](0..1) | Subnet Mask |
| Order Number of Device | o_uOrderNumber | Word[Unsigned](0..9) | Order Number |

| FB Version Upgrade History | |
|---|---|
| Version | Description |
| 2.10 | This function block was introduced |
| 3.00 | Modified Format to display channel diagnostics |
| 3.01 | Recode reduces memory usage |
| 3.03 | MC/MCR, recode for memory reduction, correct status issue. |

| SDT Usage |
|---|

tPN_MGMT_Ouptuts

| Global Label: vPN_MGMT_Outputs | | |
|---|---|---|
| Member | Type | Usage |

| Global Label: vPN_MGMT_Outputs | | |
|---|---|---|
| Member | Type | Usage |
| .IOC_Start_Stop | Bit | Starts Profinet Communication, Set by this FB |
| ACYC_HSK_Y_Req1.Execute | Bit | Monitor to see if acyclic buffer in use |
| ACYC_HSK_Y_Req2.Execute | Bit | Monitor to see if acyclic buffer in use |
| .IOD_MGT_Mode | Bit(0..127) | Used to deactivate nodes |
| .IOD_CMD_HSK_Y | Bit(0..127) | Used to deactivate nodes |
| IOD_START_STOP_DEV | Bit(0..127) | |
| IOD_MGT_ALARM | Bit(0..127) | |
| IOD_CONSIST | Bit(0..127) | |
| IOD_INPUT_HSK_Y | Bit(0..127) | |
| IOD_OUTPUT_HSK_Y | Bit(0..127) | |

tPN_MGMT_INPUTS

| Global Label: vPN_MGMT_Inputs | | |
|---|---|---|
| Member | Type | Usage |
| IOC_STS_CONFIG_OK | Bit | Needed to turn on ProfiNet |
| IOC_STS_CONFIG_DOWNLOADING | Bit | |
| IOC_STS_KEYFILE_ERROR | Bit | |
| IOC_STS_STARTED | Bit | Handshake from module that it started |
| IOC_STS_ERROR_DIAG_SET | Bit | |

| Global Label: vPN_MGMT_Inputs | | |
|---|---|---|
| Member | Type | Usage |
| IOC_STS_PLC_WD_ERR | Bit | |
| IOD_CMD_HSK_X | Bit(0..127) | |
| IOD_INPUT_HSK_X | Bit(0..127) | |
| IOD_OUTPUT_HSK_X | Bit(0..127) | |
| ACYC_HSK_X_RES1_COMPLETED | Bit | Monitor to see if acyclic buffer in use |
| ACYC_HSK_X_RES2_COMPLETED | Bit | Monitor to see if acyclic buffer in use |
| ACYC_HSK_X_RES1_ACCEPTED | Bit | Monitor to see if acyclic buffer in use |
| ACYC_HSK_X_RES2_ACCEPTED | Bit | Monitor to see if acyclic buffer in use |
| IOD_ALARM_IND | Bit(0..127) | |
| IOD_CONN_STS | Bit(0..127) | Used to determine status |
| IOD_ERR_STS | Bit(0..127) | Used to determine status |

MELPT_APP_FieldbusDiag

| System Label: ProfinetDiag | | |
|---|---|---|
| Member | Type | Usage |
| HostOK | Bit | Profinet Card Running, set by this FB |
| Update | Bit | Set by HMI, requires refresh of detailed diagnostic data |
| ActivateDeactivate_PB | Bit | HMI PB to change activated status |
| ActiveNode_Ind | Bit | HMI Indicator of activation status |

| System Label: ProfinetDiag | | |
|---|---|---|
| Member | Type | Usage |
| ResetStatus | Bit | Reset Status PB From HMI. Seta Status to zero |
| OnFirstNode | Bit | Set by Function block to limit HMI PB from decrementing too low |
| OnLastNode | Bit | Set by Function block to limit HMI PB from incrementing too high |
| WriteCheck | Bit(0..7) | |
| DeactivatedNodes | Bit(0..127) | Stored Values of Deactivated nodes |
| IMSupported | Bit(0..15) | |
| LocalNetworkNumber | Word[Unsigned] | |
| LocalStationNumber | Word[Unsigned] | |
| FieldbusModuleCommentNumber | Word[Unsigned] | |
| FieldbusModuleFault | Word[Unsigned] | Profinet Module Error |
| FirstConfiguredNode | Word[Signed] | Node Number of first configured node |
| LastConfiguredNode | Word[Signed] | Node Number of Last configured node |
| SelectedNode | Word[Signed] | HMI Selected node, this is FB limited by First and Last Configured Node |
| SelectedStatus | Word[Unsigned] | Status of Selected Node |
| SelectedDeviceDiagnostic | Word[Unsigned] | |
| ManufacturerID | Word[Unsigned] | Retrieved during acyclic requests manufacturer code |
| DeviceID | Word[Unsigned] | |

| System Label: ProfinetDiag | | |
|---|---|---|
| Member | Type | Usage |
| ChannelStatus | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| ChannelNumber | Word[Unsigned] | Retrieved during acyclic requests channel number under error |
| ChannelType | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics channel type |
| ChannelDataFormat | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics data format |
| ChannelError | Word[Unsigned] | Retrieved during acyclic requests channel error |
| ExtendedChannelError | Word[Unsigned] | Retrieved during acyclic requests channel extended channel error |
| Slot | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| SlotStatus | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| SubSlot | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| SubSlotStatus | Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| SlotIDent | Double Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| SubSlotIDent | Double Word[Unsigned] | Retrieved during acyclic requests channel diagnostics |
| ChasisData | Word[Unsigned](0..15) | Retrieved during acyclic requests includes device name |
| MacAddress | Word[Unsigned](0..2) | Retrieved during acyclic requests |

| System Label: ProfinetDiag | | |
|---|---|---|
| Member | Type | Usage |
| IPAddress | Word[Unsigned](0..1) | Retrieved during acyclic requests |
| SubnetMask | Word[Unsigned](0..1) | Retrieved during acyclic requests |
| GatewayAddress | Word[Unsigned](0..1) | Retrieved during acyclic requests |
| OrderNumber | Word[Unsigned](0..9) | Retrieved during acyclic requests |
| PlantID | Word[Unsigned](0..15) | |
| LocationName | Word[Unsigned](0..10) | |
| InstallationDate | Word[Unsigned](0..7) | |
| Description | Word[Unsigned](0..23) | |
| LinkTime | Word[Unsigned](0..2) | |
| NodeStatus | Word[Unsigned](0..127) | Status of all nodes determined by the FB |

### 3.1.2 Necessary System Labels

The HMI project  is common between Profinet and Profibus implementations of this project

ProfinetDiag(for Profinet diagnostics display)

ProfibusDiag(for Profibus diagnostics display)

GOTRFID (for manual RFID interface)

IOLinkDiag (For IO-link diagnostics features)

1 instance of IOlinkPressureSwitch for each pressure switch graphic needed.

A PLC device register is assigned to each system label, this prevents synching issues with the PLC project when additional programming and labels are added to the project.

## 3.2 IO-Link device configuration function blocks

**Purpose:** Provide System information and default parameter values to the PLC so device specific information can be displayed properly, and the device can be parameterized.

**User Configuration:** The function block must be in the initial or active scan, EN must be TRUE, Device Number must be unique and between 1-10, Diagnostic Graphic Number must be between 1 and 32767. A unique device description should be provided.

The Balluff IOL_CFG library contains multiple function blocks containing device information needed for proper program execution. There are function blocks for IOL-link devices for the following families.

Analog

IO Hubs

Positioning

Pressure

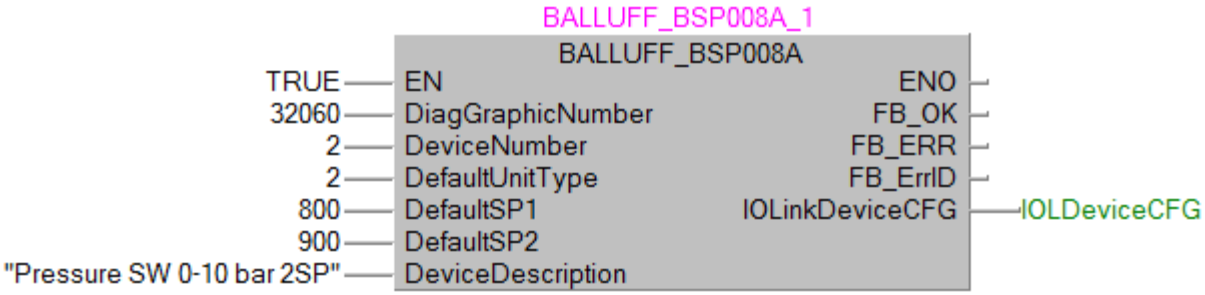
RFID FB

SmartLights

Valve Interface

Up to 10 devices total can be selected and placed into the initial scan of the PLC. These function blocks only have to be executed once the data contained within the function block is transferred to the data structure array IOLCFG

Configuration function block setup



### 3.2.1 FB Inputs

The EN pin must be set to true for the information to be available, set to false if the configuration is not desired.

DiagGraphicNumber

The HMI window number for this device, this is a value between 1 and 32767 corresponding to the diagnostic window displayed on the HMI for the specific device.

DeviceNumber

A value 1-10 that corresponds to the array element within IOLDeviceCFG, where this data will be stored. This number needs to be unique between all the configuration function blocks.

DefaultUnitType

This element only exists for Pressure Switches

Enter one of the following values:

0=bar

1=mbar

2=PSI

3=MPa

Default SP1 & Default SP2

The default set points when first configuring the device, this value is a raw device value

Device Description

This is the text that will be displayed on the HMI Maintenance Screen. There is a 24 character maximum.

### 3.2.2 FB Outputs

When the device number is outside the range of 1-10 FB_ERR is true
The ERRID will be 256(H100)

When the graphic number is outside the allowable range of 1 to 32767. FB_ERR is True.
The ERRID will be 257(H101)

For Pressure Switches an additional FB_ERR can occur when the value of DefaultUnitType is less than zero, or greater than three.
The ERRID will be 258(H102)

When ERRID is non-zero FB_ERR is TRUE.
When ERRID is zero FB_OK is TRUE.

The output of all CFG function blocks is IOLDeviceCFG which is array of CFG structures. Each individual block stores data in 1 element of this structure array.

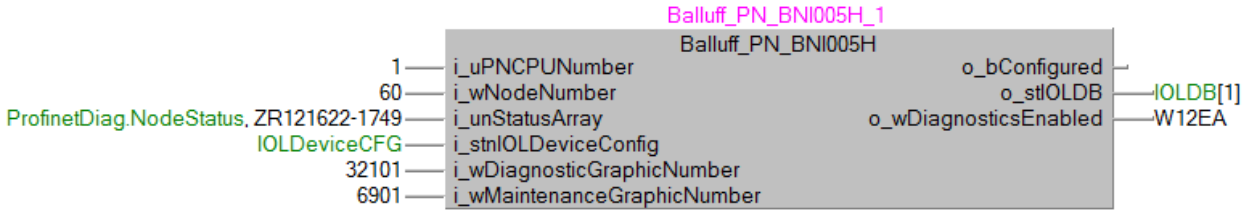
## 3.3 IO-Link Master Configuration

Three function blocks exist within the Balluff IOL_CFG library, an instance for each IO-link master on your PLC needs to be added to the scan, the maximum number of IO-Link Masters is twenty.

The three function blocks included are:

- Balluff_PN_BIS013W
- Balluff_PN_BNI004U
- Balluff_PN_BNI005H

- **Purpose:** this function block determines how a master is configured, retrieves and organizes diagnostic data for the master also retrieves process data for any IO-link devices and stores appropriately.
- **User Configuration:** The user must properly populate the following pins:
  - PNCPUNumber
  - NodeNumber
  - DiagnosticGraphic Number
  - Maintenance Graphic Number
  - IOLDB element number
  - Diagnostics Enabled auto-refresh address



### 3.3.1 FB Inputs

PNCPUNumber

1: When the PN Controller is next to the PLC CPU

2: When the PN controller is one slot away from the PLC CPU

NodeNumber

This is a value between 0 and 127 and corresponds to the value set to the specific node in GX configurator PN

StatusArray

This is the node status word array that is output from MELPT_APP_ProfinetDiag

DiagnosticGraphicNumber

This is the HMI Window Number that displays the master diagnostics

Maintenance Graphic Number

This is the HMI window Number that displays the maintenance data

### 3.3.2 FB Outputs

Configured

This value is True after the slot configuration of the node is retrieved

IOLDB

Attach the IOLDB element where you want to store the settings for this master. The element number must be unique and a value between 1 and 20.

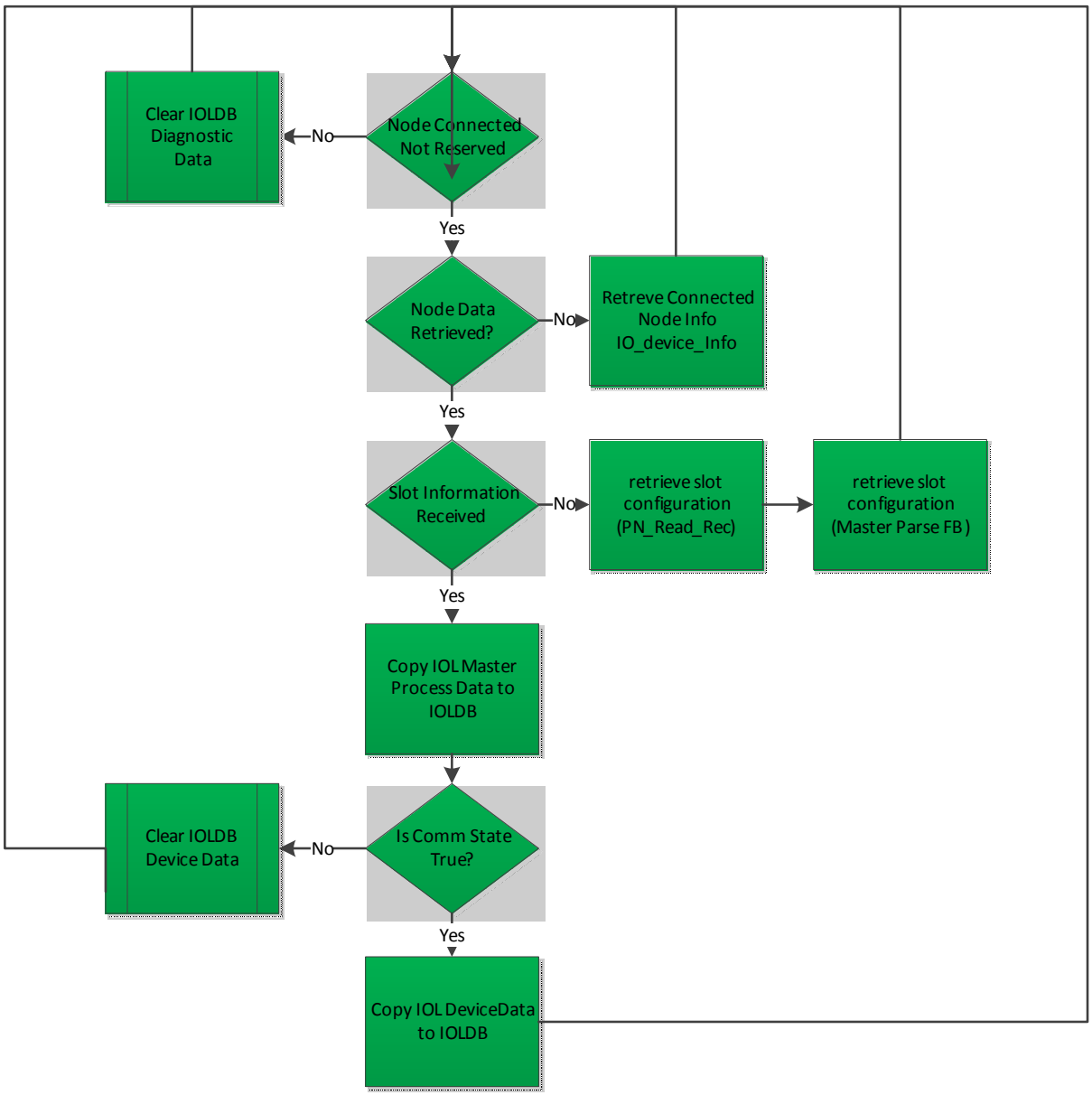
DiagnosticsEnabled

This is the output from IOLDB to the IO-link Master. This signal can be used to mask channel diagnostics on the fieldbus related to IO-link.

**Note: If a diagnostic is occurring when the io-link diagnostic is disabled. An electrical change has to occur once it is enabled for the diagnostic to be reported to the fieldbus diagnostic programming.**

The Auto refresh address of the fieldbus must be attached to this pin. The auto refresh register can be obtained by following the instructions in 2.11

### 3.3.3 Program Flow



## 3.4 IO-Link Diagnostics required programming

Two function blocks are required to provide the functionality of this project that are not Device related.

### 3.4.1 IOLDiag_PN_module_Lookup

**Purpose:** Interrogates all elements of IOLDB, determines when a new IO-link connection is made, sends the stored parameters to the IO-Link Device.

**User Configuration:** Make sure the FB is scanned and required libraries are installed.

This function block is in charge of acyclic communication with an IO-Link device, and the writing of parameters to the device.

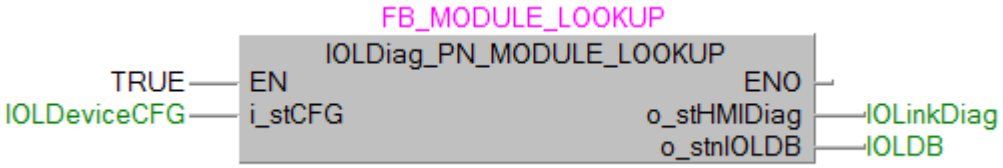
This function block will check the comm state for every IO-Link port. If communication has not been established the Manufacturer and Device ID are retrieved and compared to the available configurations if a match is made, then the configuration is checked for the same type. If a second match is made, parameters are written to the device if the configuration has them.

This function block requires the libraries:

PN_accessory_v120

And

Profinet_IO_ME1PN1FW_Q.




#### *3.4.1.1 Inputs*

Set the EN pin to TRUE

The configuration data IOLDeviceCFG is connected to i_stCFg, this structure was populated in section 3.2 by the initial scan sequence

### *3.4.1.2 Outputs*

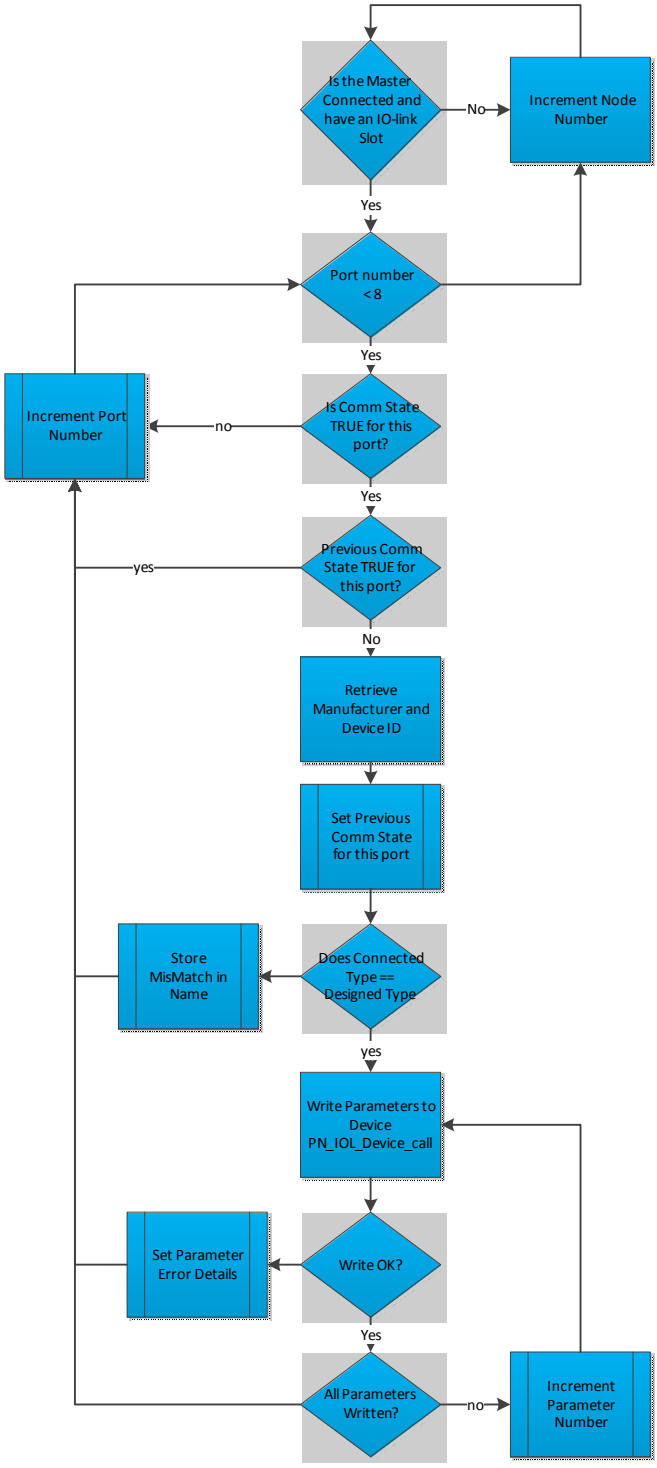
HMI Diag

The HMI System variables are retrieved and compared to the Label IOLinkDiag needs to be connected to the output HMI Diag

IOLDB

The Global Label IOLDB is attached to the output IOLDB

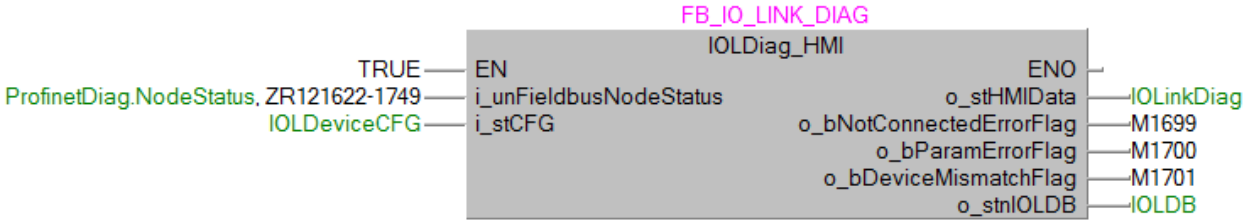
### *3.4.1.3 IOLDiag_PN_Module_Lookup FlowChart*



### 3.4.2 IOLDiag_HMI

**Purpose:** This function blocks takes all the stored data from the master function blocks, determines error status and presents selected information to the HMI. In addition it accepts input from the HMI to modify the data structures.

**User Configuration:** Attach Flag Output Pins to the Alarming System of the HMI




#### *3.4.2.1 FB Inputs*

Set the EN pin to TRUE

CFG

The configuration data IOLDeviceCFG is connected to i_stCFg, this structure was populated in section 3.2 by the initial scan sequence

FieldbusNodeStatus

This is the node status word array that is output from MELPT_APP_ProfinetDiag

#### *3.4.2.2 FB Outputs*

HMIData

The data formatted to and from the HMI. IOLinkData.

IOLDB

The Global Label IOLDB is attached to the output IOLDB. This is a collection of all configured masters and if they are connected the diagnostic process data associated with them.

NotConnectedErrorFlag

This Boolean is connected to the HMI monitoring area for alarm messages to be displayed by the HMI alarm banner; It is true when a port is enabled, and configured but a device is not connected

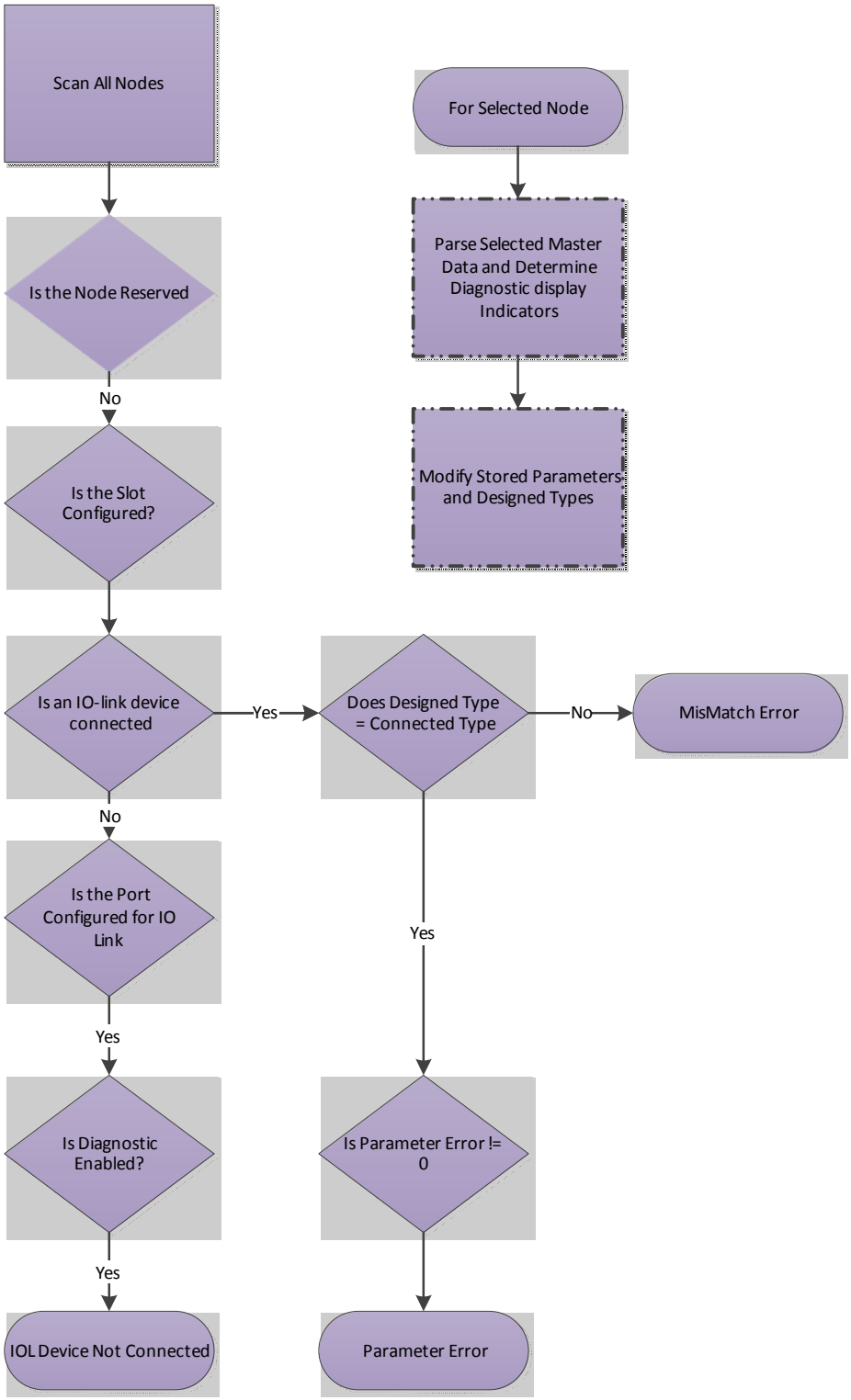
ParamErrorFlag

This Boolean is connected to the HMI monitoring area for alarm messages to be displayed by the HMI alarm banner;  It is true when a port has an error message

DeviceMisMatchFlag

This Boolean is connected to the HMI monitoring area for alarm messages to be displayed by the HMI alarm banner.  It is true when a connected device did not match the manufacturer and device ID configured on the HMI for that port.

### *3.4.2.3 IOLDiag_HMI FlowChart*



## 3.5 IO-Link Device Process Data Function Blocks

There are eleven different types of process data function blocks available within the Balluff_IOL_Processdata

This section goes over how each type is used, and how to configure within your project.

### 3.5.1 Balluff Pressure Switch: Balluff_PSW_Processdata

**Purpose:** For each Balluff pressure switch used in a configuration, one instance of the **Balluff_PSW_Processdata** FB is recommended. For each instance of this FB, a new system label is required for each instance.

**User Configuration:**

Adding a new System label for each pressure switch that will be configured (Note: the target project must be part of a Melsoft Navigator project for the system label to function properly)

Setting the correct Port Number

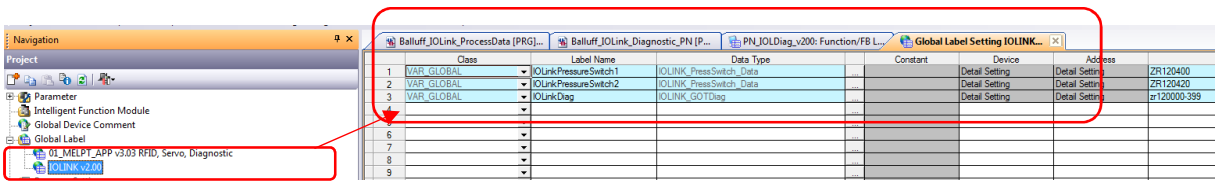
Setting the correct MasterData(IOLDB) Instance

Setting the warning percentage range

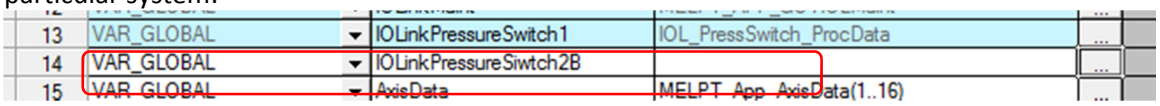
Tying flag outputs to the HMI alarming section

#### *3.5.1.1 System Label*

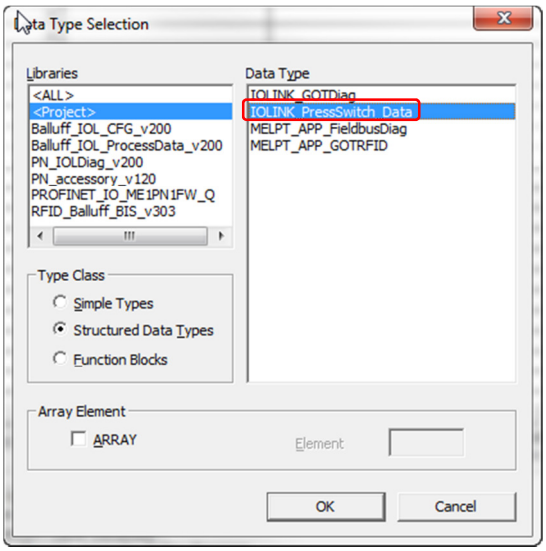
1. Open the **IOLink** label group in the **Global Label** section of the target project:




2. On a blank row create a new tag with a **Class** of **VAR_GLOBAL** and any **Label Name** that fits your particular system:

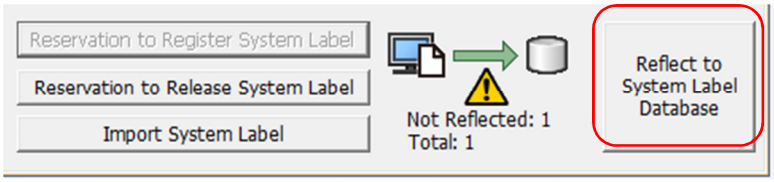



3. For the **Data Type**, click the **Ellipse** Button. On the **Data Type Selection** screen, switch the **Type Class** to **Structured Data Types** and select **IOLink_PressSwitch_Data** as the **Data Type**:

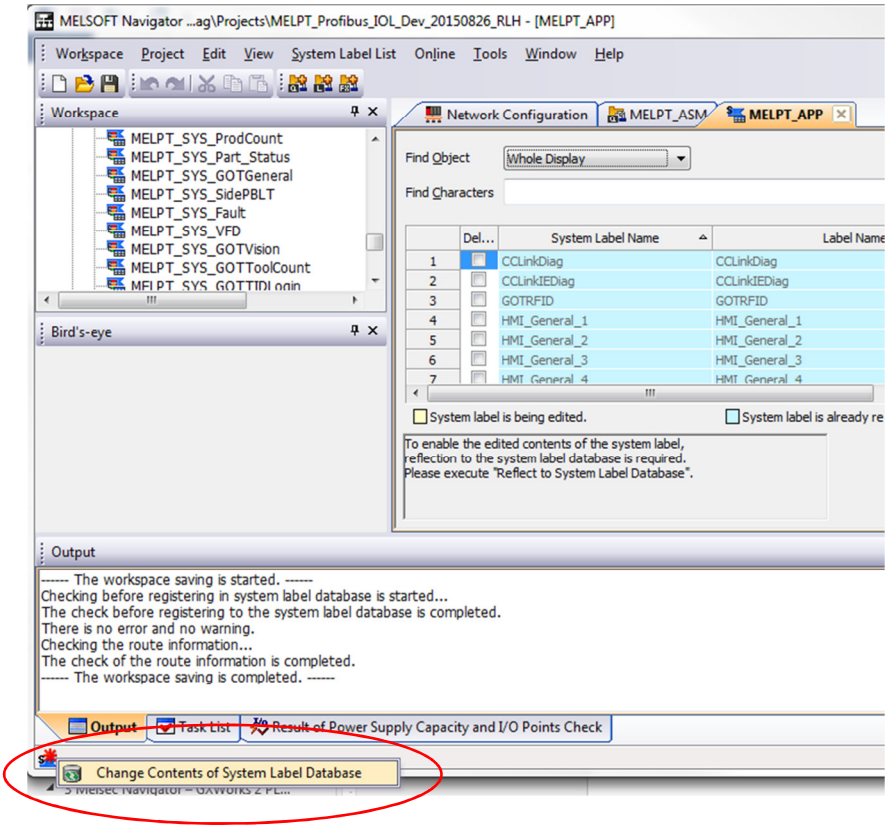



4. Click **OK**.
5. On the lower right of the Global Label list window, click the **Reservation to Register System Label** button:


6. The **Reflect to System Label Database** will enable. Click it to register the label to Melsoft navigator:



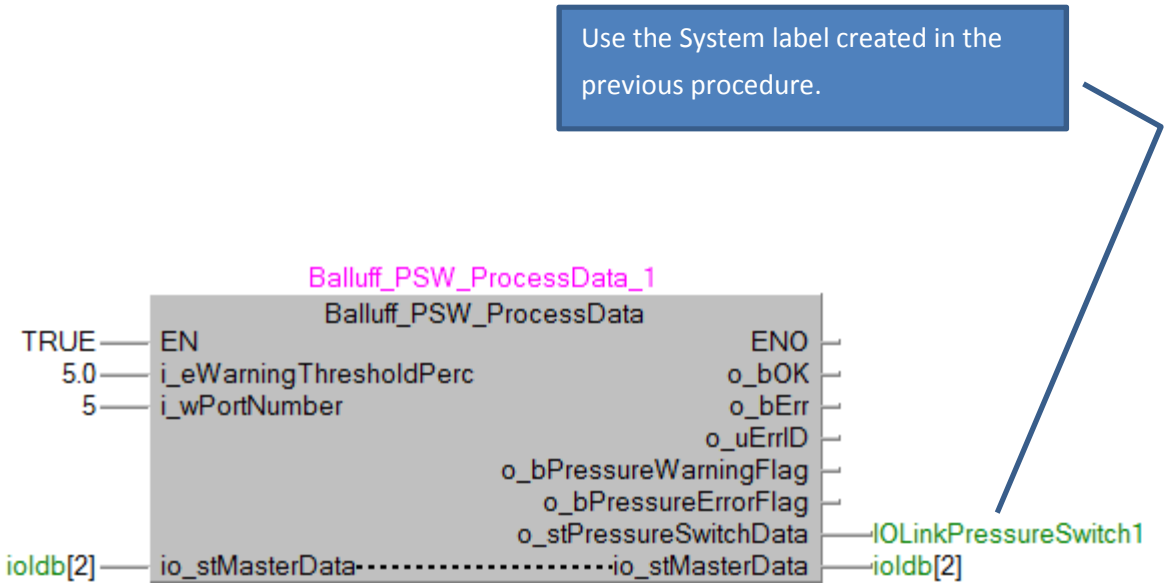

7. Click **Yes** when prompted.
8. Click the **Register** button on the **Check before registering in system label database** window
9. Open the Melsoft Navigator project for this PLC project.
10. On the lower left of the Navigator window, an icon will be flashing red.
11. Right click it and click the **Change Contents of System Label Database** that appears:




12. Click the **Import** button on the **Change Contents of System Label Database** window.
13. Open the GT Designer HMI project associate with this Navigator project.
14. Repeat steps 10-12 listed above in the HMI project.
15. Download the updated GT Designer 3 project to the HMI.

**Adding a new Function Block for a pressure switch device:**

1. Add an instance of the **Balluff_PSW_ProcessData** FB to the SCAN program. Configure these Input parameters and Output for **each** instance of the function block (see next page):




### *3.5.1.2 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **i_eWarningThresholdPerc** | Setpoint 1 is subtracted from Setpoint 2. This value is multiplied by the input percentage. The result is added to Set point 1, this creates the lower warning range. The result is also subtracted from setpoint2, this creates the upper warning range. |
| **I_wPortNumber** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **io_stMasterData** | The data block for the master where this particular device is connected. This function block adjusts the return point parameters to one less than the set points |

### *3.5.1.3 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |

| | |
|---|---|
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Invalid Device Type Detected<br>258(0x102) Device MisMatch<br>259(0x103) Device Not Connected |
| **o_bPressureWarningFlag** | When the Actual Value is within one of the warning ranges this output is true. It should be tied to the HMI alarming |
| **o_bPressureErrorFlag** | When the Actual Value is below Setpoint 1, or above SetPoint 2, this output is true. It should be tied to the HMI alarming. |
| **o_stPressureSwitchData** | This data structure contains all data for the HMI pertaining to this device |

### 3.5.2 Balluff_Smartlight_ProcessData

**Purpose:** For each SmartLight used in a configuration, one instance of the **Balluff_SmartLight_Processdata** FB is recommended. For each instance of this FB, a new control label structure instance will be needed.

**User Configuration:**

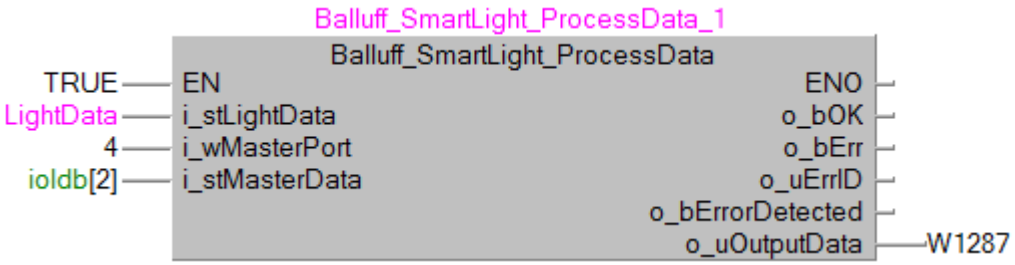
Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance

Controlling the Data for the LightData Structure

Tying the Error Output to the HMI alarming system.

Tying the Output Data to the correct auto-refresh register.




#### *3.5.2.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **i_stLightData** | Data Structure used to control the output to the light |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **i_stMasterData** | The data block for the master where this particular device is connected. |

#### *3.5.2.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |

| | |
|---|---|
| **o_bErr** | This is True when the function block aborted execution due to error |
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Invalid Device Type Detected<br>258(0x102) Invalid Mode Selected (more than one mode or no mode is selected) |
| **o_bErrorDetected** | The input data has an error code. |
| **o_uOutputData** | This is the starting register for the output telegram to the smartlight. |

### *3.5.2.3 IOL_SmartLight_Data*

1. IOL_SmartLight_Data

| Label: LightData | | |
|---|---|---|
| Member | Type | Usage |
| SegmentMode_Enabled | BOOL | True to Enable Segment Mode |
| SegMode_Segment1Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| SegMode_Segment1Blink | BOOL | TRUE=Blink |
| SegMode_Segment1Blink50 | BOOL | When Blink ON Blink 50% |

| Label: LightData | | |
|---|---|---|
| Member | Type | Usage |
| SegMode_Segment2Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| SegMode_Segment2Blink | BOOL | TRUE=Blink |
| SegMode_Segment2Blink50 | BOOL | When Blink ON Blink 50% |
| SegMode_Segment3Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| SegMode_Segment3Blink | BOOL | TRUE=Blink |
| SegMode_Segment3Blink50 | BOOL | When Blink ON Blink 50% |
| SegMode_Segment4Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |

| Label: LightData | | |
|---|---|---|
| Member | Type | Usage |
| SegMode_Segment4Blink | BOOL | TRUE=Blink |
| SegMode_Segment4Blink50 | BOOL | When Blink ON Blink 50% |
| SegMode_Segment5Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| SegMode_Segment5Blink | BOOL | TRUE=Blink |
| SegMode_Segment5Blink50 | BOOL | When Blink ON Blink 50% |
| SegMode_NumberOfSegments | WORD | Number of Segments |
| SegMode_BlinkingFrequency | WORD | 1=0.5hz<br>2=1hz<br>3=2HZ<br>4=5hz<br>5=10hz |
| LevelMode_Enabled | BOOL | True to Enable Level Mode |

| Label: LightData | | |
|---|---|---|
| Member | Type | Usage |
| LvlMode_Segment1Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| LvlMode_Segment1Dominance | BOOL | When true lower segments take this color |
| LvlMode_Segment2Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| LvlMode_Segment2Dominance | BOOL | When true lower segments take this color |
| LvlMode_Segment3Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |

| Label: LightData | | |
|---|---|---|
| Member | Type | Usage |
| LvlMode_Segment3Dominance | BOOL | When true lower segments take this color |
| LvlMode_Segment4Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| LvlMode_Segment4Dominance | BOOL | When true lower segments take this color |
| LvlMode_Segment5Color | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| LvlMode_Segment5Dominance | BOOL | When true lower segments take this color |
| LvlMode_LevelType | BOOL | True = Top Down |
| LvlMode_LevelValue | WORD | Value between 0-255 |
| RunLight_Enabled | BOOL | TRue to Enable Run Light Mode |

| Label: LightData | | |
|---|---|---|
| Member | Type | Usage |
| RunLghtMode_BackGroundColor | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| RunLghtMode_RunningColor | WORD | 0=off<br>1=green<br>2=red<br>3=yellow<br>4=blue<br>5=orange<br>6=user defined by parameter<br>7=white |
| RunLghtMode_NumberOfSegments | WORD | Value 1-5 |
| RunLghtMode_RunningSpeed | WORD | Value 1-5 |
| BuzzerState | BOOL | Buzzer On |
| BuzzerType | WORD | 0=Continous<br>1 1hz chopped<br>5 hz chopped<br>3=3 short beep with 2 sec pause |

### 3.5.3 Balluff_BNI0041_ProcessData

**Purpose:**

This function block scales the input from the device and will output a value 4.0ms-20ma

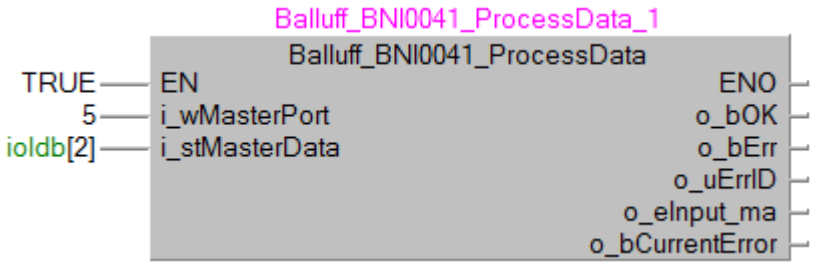
For each Balluff Analog current input(BNI0041) used in a configuration, one instance of the **Balluff_BNI0041_Processdata** FB is recommended.

**User Configuration:**

Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance

Tying Current Error outputs to the HMI alarm monitoring




#### *3.5.3.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **i_stMasterData** | The data block for the master where this particular device is connected. |

#### *3.5.3.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |

| | |
|---|---|
| **o_bErr** | This is True when the function block aborted execution due to error |
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch<br>258(0x102) Device Not Connected |
| **o_bErrorDetected** | If the input to the device is below 4ma, the device will set an error output, that bool is reported here. |
| **o_eInput_ma** | The input data is scaled, a Value of 0.0 to 20.0 is output from this function block, if an error is occurring the output is 0.0 |

### 3.5.4 Balluff_BNI0042_ProcessData

**Purpose:**

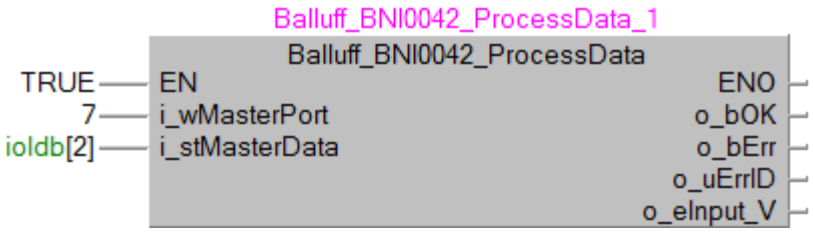
This function block scales the input from the device and will output a value 4.0ms-20ma

For each Balluff Analog Voltage input used in a configuration, one instance of the **Balluff_BNI0042_Processdata** FB is recommended.

**User Configuration:**

Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance




#### *3.5.4.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **i_stMasterData** | The data block for the master where this particular device is connected. |

#### *3.5.4.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |

| | |
|---|---|
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch<br>258(0x102) Device Not Connected |
| **o_eInput_V** | The input value is scaled and the function block will output a value between 0.0 and 10.0V |

### 3.5.5 Balluff_AnalogOut_ProcessData

**Purpose:**

This function block receives a user input between 0.0 and 100.0 the value is scaled and output to the device where the voltage or current is output.

For each Balluff Analog Output BNI004C or BNI004E used in a configuration, one instance of the **Balluff_AnalogOut_Processdata** FB is recommended.

**User Configuration:**

Setting the correct Port Number

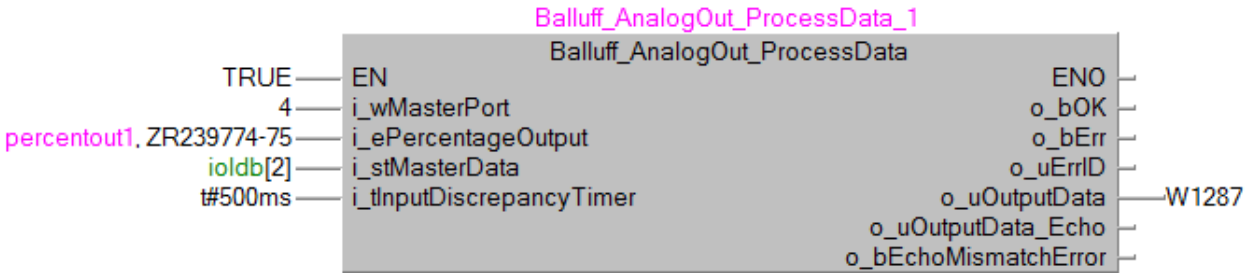
Setting the correct MasterData(IOLDB) Instance

Set a discrepancy timer value

Control the Percentage Output Value

Tie the auto-refresh register to the outputData

Tie the EchoMismatchError to the HMI alarming




#### *3.5.5.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **I_ePercentageOutput** | A value between 0.0 and 100.0 corresponding to the percentage to be output. |

| | |
|---|---|
| **I_stMasterData** | The data block for the master where this particular device is connected. |
| **I_tInputDiscrepencyTimer** | The device echo's the value being output, internally the two are compared, if they do not match for the time input length, the echo mismatch error is TRUE |

### *3.5.5.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch<br>258(0x102) Device Not Connected |
| **o_uOutputData** | The percentage scaled and formatted for the device. Connect the auto-refresh register to this pin |
| **o_uOutputDataEcho** | The Data returned from the device |
| **o_bEchoMisMatchError** | When the Echo does not match the output data for the input discrepancy time. |

### 3.5.6 Balluff_Ultrasonic_ProcessData

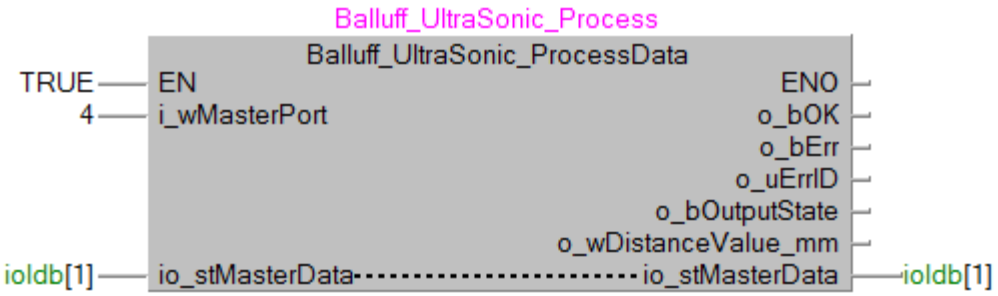
**Purpose:**

For each Balluff ultrasonic used in a configuration, one instance of the **Balluff_UltraSonic_Processdata** FB is recommended.

**User Configuration:**

Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance




#### *3.5.6.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **io_stMasterData** | The data block for the master where this particular device is connected. This function block will adjust the parameters to be within certain limits of the set points. |

#### *3.5.6.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |

| | |
|---|---|
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch<br>258(0x102) Device Not Connected |
| **o_bOutputState** | The Boolean State of the Switched Output |
| **o_wDistanceValue_mm** | The Data returned from the device scaled to mm |

### 3.5.7 Balluff_BAW002F_ProcessData

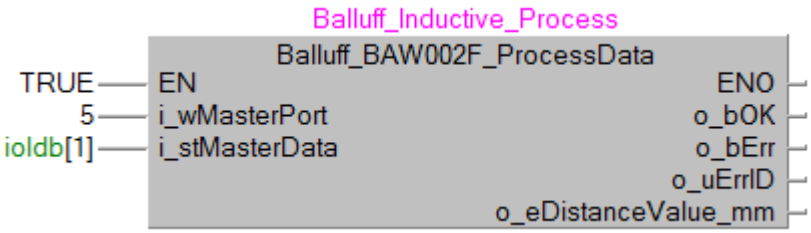
**Purpose:**

For each Balluff BAW002F sensor used in a configuration, one instance of the **Balluff_BAW002F_Processdata** FB is recommended.

**User Configuration:**

Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance




#### *3.5.7.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **i_stMasterData** | The data block for the master where this particular device is connected. This function block will adjust the parameters to be within certain limits of the set points. |

#### *3.5.7.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |

| | |
|---|---|
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch |
| **o_eDistanceValue_mm** | The Data returned from the device scaled between 1.0 and 5.0 mm |

### 3.5.8 Balluff_BIP0004_ProcessData

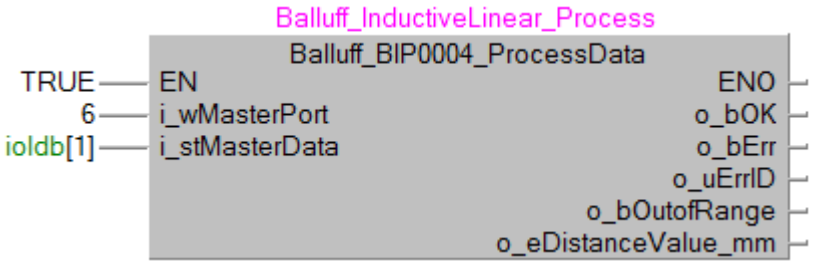
**Purpose:**

For each Balluff BIP0004 sensor used in a configuration, one instance of the **Balluff_BIP0004_Processdata** FB is recommended.

**User Configuration:**

Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance




#### *3.5.8.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **i_stMasterData** | The data block for the master where this particular device is connected. This function block will adjust the parameters to be within certain limits of the set points. |

#### *3.5.8.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |

| | |
|---|---|
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch |
| **o_eDistanceValue_mm** | The Data returned from the device scaled between 0.0 and 40.0 mm |

### 3.5.9 Balluff_BOD0012_ProcessData

**Purpose:**

For each Balluff BOD0012 sensor used in a configuration, one instance of the **Balluff_BOD0012_Processdata** FB is recommended.

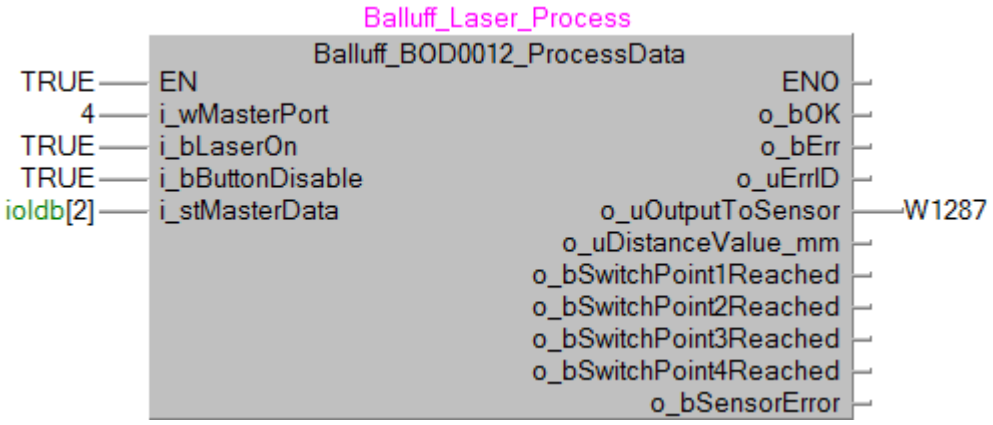
**User Configuration:**

Setting the correct Port Number

Setting the correct MasterData(IOLDB) Instance

Setting the output to sensor auto-refresh register

Turn in on the Laser to retrieve result




#### *3.5.9.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **EN** | Must be True for the function block to be executed |
| **I_wMasterPort** | This is a number 0-7 corresponding to the port the IO-link device is connected to on the master. |
| **I_bLaserOn** | Turns on Measurement |
| **I_bButtonDisable** | Disables user modification via sensor pushbutton |

| | |
|---|---|
| **i_stMasterData** | The data block for the master where this particular device is connected. This function block will adjust the parameters to be within certain limits of the set points. |

### *3.5.9.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **o_bOK** | This is True when the function block executes normally |
| **o_bErr** | This is True when the function block aborted execution due to error |
| **o_uErrID** | This is the Error code, when the function block aborted execution<br>256(0x100) Invalid Port Number<br>257(0x101) Device MisMatch |
| **O_uOutputToSensor** | This is the output to the auto refresh register of the io-link device |
| **o_uDistanceValue_mm** | The Data returned from the device scaled between 0 and 6000 |
| **o_bSwitchPoint1Reached** | Output when the distance exceeds switch point 1 parameter |
| **o_bSwitchPoint2Reached** | Output when the distance exceeds switch point 2 parameter |
| **o_bSwitchPoint3Reached** | Output when the distance exceeds switch point 3 parameter |
| **o_bSwitchPoint4Reached** | Output when the distance exceeds switch point 4 parameter |
| **o_bSensorError** | Output when the sensor reports error |

## 3.5.10 Balluff_Valve16_ProcessData

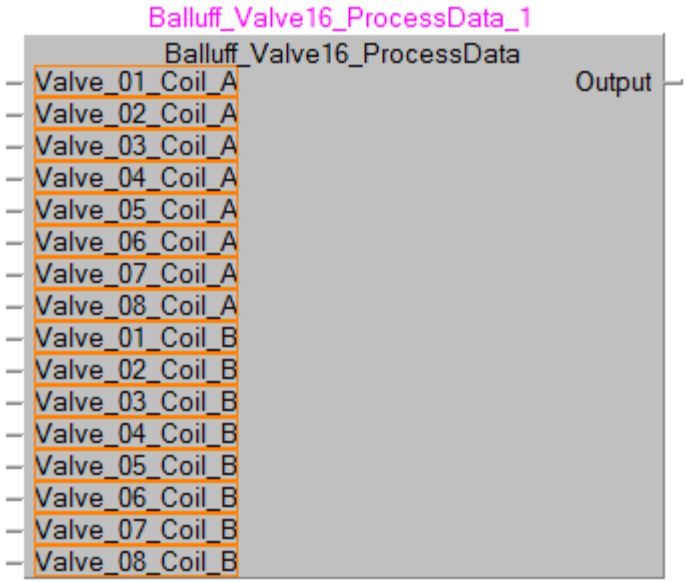
**Purpose:**

For each 16 Valve Interface used in a configuration, one instance of the **Balluff_Valve16_Processdata** FB is recommended.

**User Configuration:**

Setting the output to valve interface auto-refresh register

Setting control bits for the individual valves




### *3.5.10.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **Valve_XX_Coil_A/B** | Boolean Condition to output to an individual valve |

### *3.5.10.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **Output** | This is the output to the auto refresh register of the io-link device |

## 3.5.11Balluff_Valve24_ProcessData

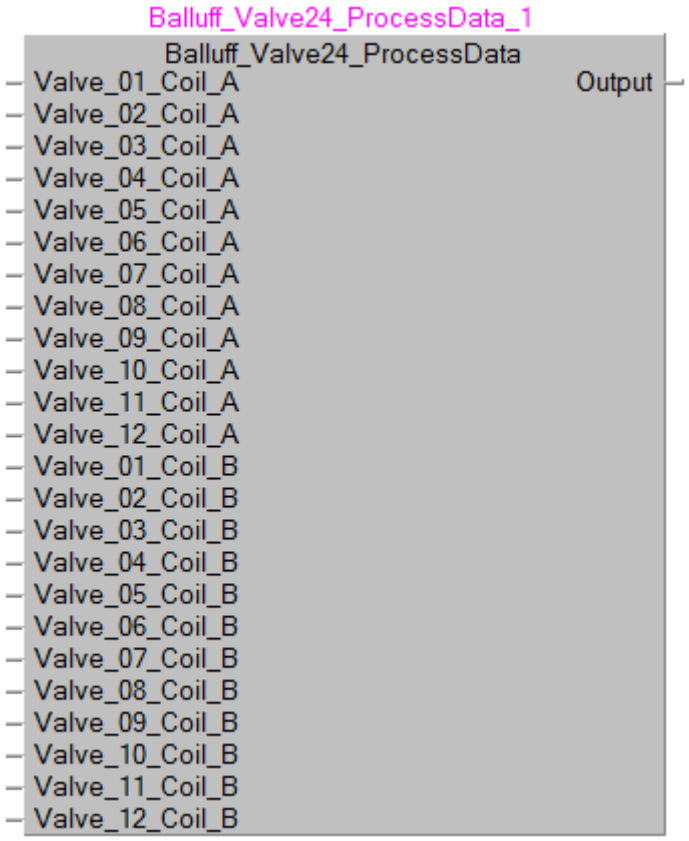
**Purpose:**

For each 24 Valve Interface used in a configuration, one instance of the **Balluff_Valve24_Processdata** FB is recommended.

**User Configuration:**

Setting the output to valve interface auto-refresh register

Setting control bits for the individual valves




### *3.5.11.1 Inputs*

| Input Name | Input Parameter Setting |
|---|---|
| **Valve_XX_Coil_A/B** | Boolean Condition to output to an individual valve |

### *3.5.11.2 Outputs*

| Output Name | Output Description/Setting |
|---|---|
| **Output** | This is the output to the auto refresh register of the io-link device |

## 3.6 RFIDIF_Balluff_IOLink_256b / RFIDIF_BalluffBIS_V_M_2K

**Purpose:**

IO-link antennas can be used with the RFIDIF_Balluff_IOLink_256b function block. This function block allows for a continuous read/write of up to 256 bytes for one antenna.

When using the Balluff BIS-V or –M system.

You use the following function blocks:

RFIDIF_BalluffBIS_V_M_2K

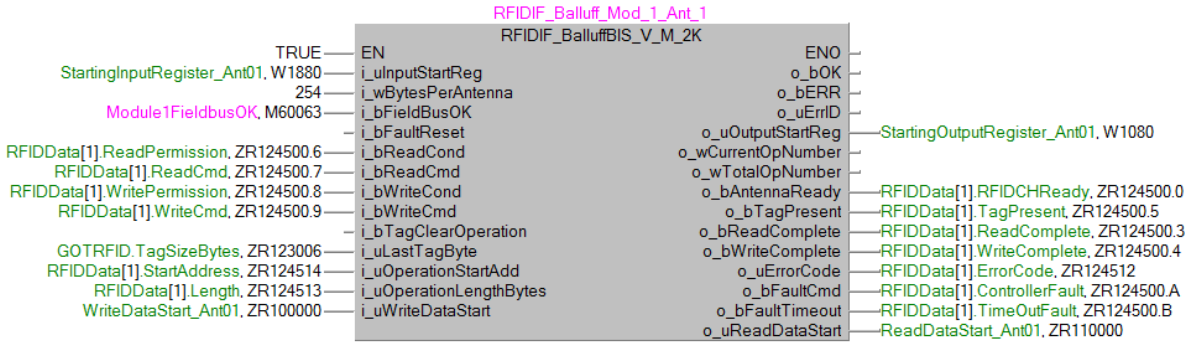
This function block allows for a continuous read/write of up to 2048 bytes for one antenna.

**User Configuration:**

The user must place the correct Starting Input and Output auto-refresh registers

The user must configure the proper number of bytes per antenna (10 or 32 for IO-Link) Slot limited for BIS-V/M

RFID data is placed into a data structure with up to 16 elements. There is also a GOT RFID FB that control manual signals for this function block.

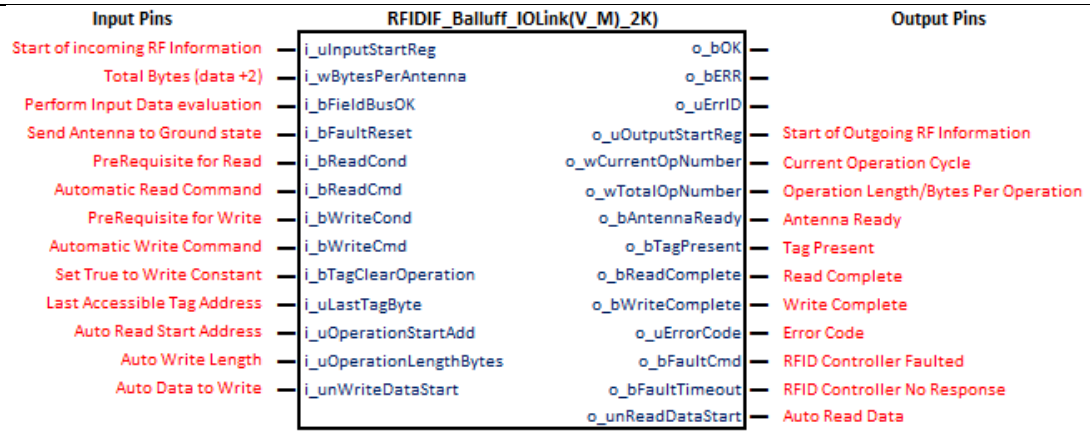



The RFID_Balluff User library contains programs, function blocks and SDT for use with the Balluff BIS-V, Balluff BIS-M, or Balluff IO-link RFID

If you are using the Balluff BIS-M RFID system the maximum size of an operation is 2000 bytes.

If you are using an IO-link antenna RFIDIF_Balluff_IOLink_256b must be used.

| FB Name |
|---|
| RFIDIF_BalluffBIS_V_M_2K |

| Item | Description |
|---|---|
| Function overview | This Function block handles manual and automatic RFID functions for 1 antenna of the system. Commands supported are: Read, Write, and Write Constant Value. |
| Symbol |  |

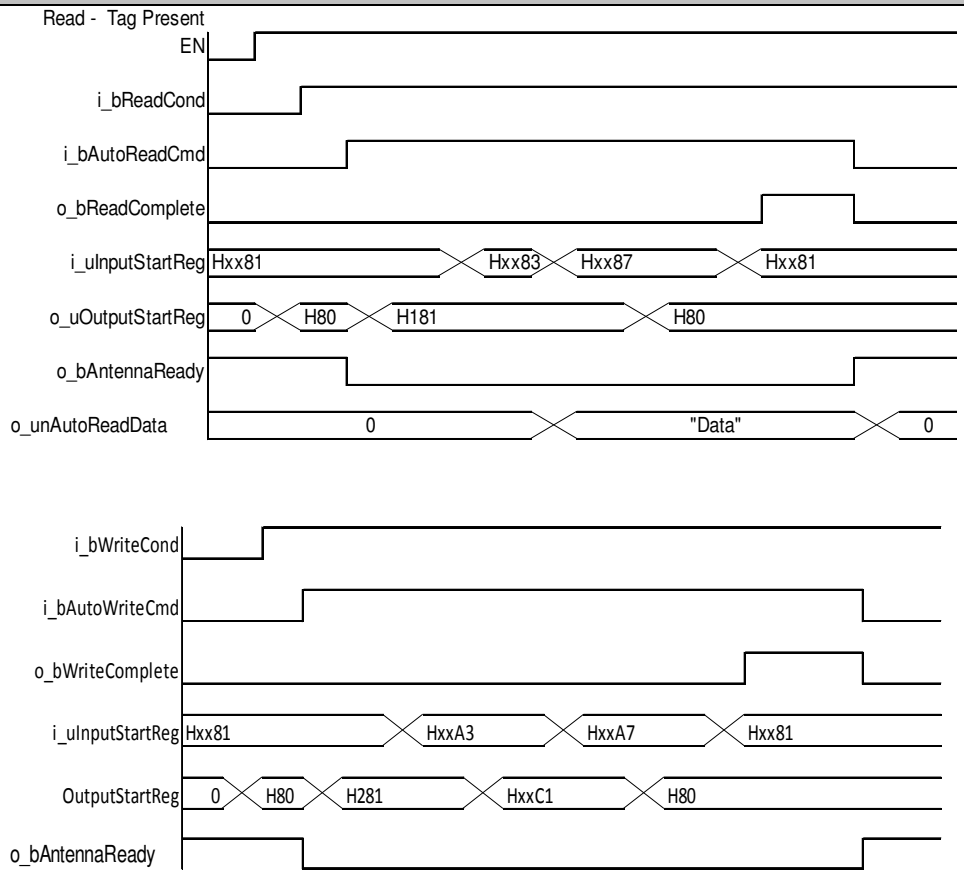


Applicable Hardware

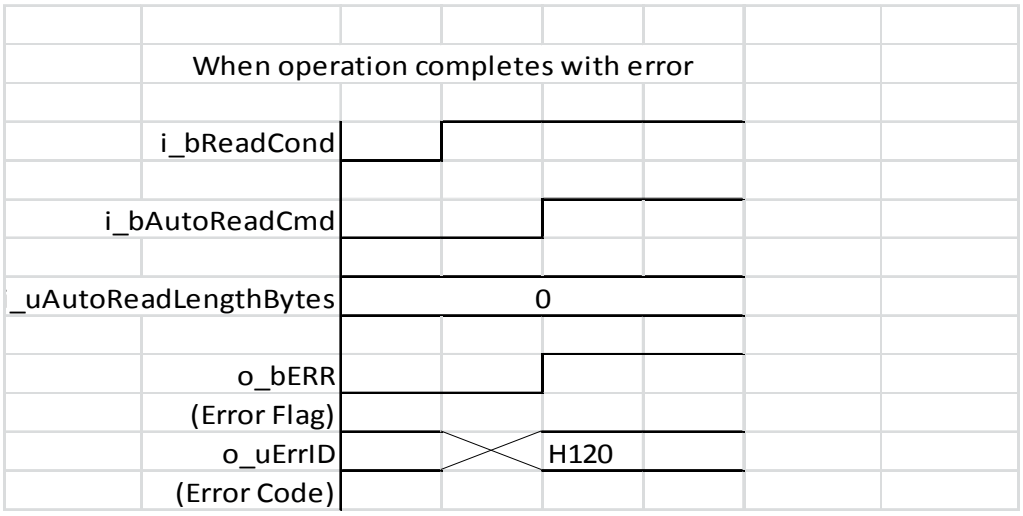
| Series | Model | Serial Restriction |
|---|---|---|
| MELSEC-Q series | Universal Model PLC | None |
| GOT 1000 series | GT16(800*600) or Higher | None |
| Melsec Q Series | Applicable Fieldbus Module | |
| Balluff BIS-V RF Controller | BIS012E, BIS013W | |
| Balluff BIS-M RF Controller | BIS00L7, BIS00EW | |
| IO-link Antenna | BIS00LH | FW 1.8 |

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Applicable<br>Software</td><td>
<table>
<tr><th>Series</th><th>Version</th></tr>
<tr><td>GX Works 2</td><td>1.540</td></tr>
<tr><td>GT Designer 3</td><td>1.136</td></tr>
<tr><td>Fieldbus Configurator</td><td></td></tr>
</table>
</td></tr>
<tr><td>Programming language</td><td>Structured Ladder/FBD</td></tr>
<tr><td>Number of Ladder Steps</td><td>QnU:  582 steps BIS_V_M<br><br>QnU: 691 steps: IO-link<br><br>*The number of steps of the FB program depends on the CPU Model that is used and input and output definition</td></tr>
<tr><td>Device Memory Used</td><td></td></tr>
<tr><td>Compiling method</td><td>Macro type;</td></tr>
<tr><td>Execution type</td><td>Real-time Execution</td></tr>
<tr><td>Dependences</td><td>The RFID controller needs to have 2-byte headers enabled;  BIS-M must have synchronization enabled.</td></tr>
<tr><td>Function description</td><td>This function blocks separates status data from the antenna interrogated and places into HMI labels.<br><br>It also moves HMI input data to the manual related members of the RFID data structure of the selected antenna.</td></tr>
</table>

| Item | Description |
| --- | --- |
| Restrictions and precautions | |

| Item | Description |
|---|---|
| Timing chart |  |





| Item | Description |
|---|---|
| | |

| FB Error Code |
|---|

| Error Code | Description |
|---|---|
| 0 | No Error. |
| H100(256) | Bytes Per Antenna is less than 2 |
| H101(257) | Bytes per antenna > 1024/2048 |
| H110(272) | Manual Length = 0 |
| H111(273) | Manual Length Greater than 16 |
| H112(274) | Manual Operation Exceeds Tag Capacity |
| H120(288) | Auto Read Length = 0 |
| H121(289) | Auto Read Length >1024/2048 |
| H122(290) | Read Operation Exceeds Tag Capacity |
| H130(304) | Auto Write Length = 0 |
| H131(305) | Auto Write Length >1024/2048 |
| H132(306) | Write Operation Exceeds Tag Capacity |
| H140(320) | Fieldbus OK not true |

| Labels |
|---|

■nput labels

| User Input | Symbol Name | Var_Input name | Data Type | Setting range | Description |
|---|---|---|---|---|---|

| User Input | Symbol Name | Var_Input name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| X | Start of incoming RF Information | i_uInputStartReg | Word[Unsigned] | | Input from Fieldbus |
| X | Total Bytes (data +2) | i_wBytesPerAntenna | Word[Signed] | 1 to 1024/2048 | to fieldbus maximum |
| X | Perform Input Data evaluation | i_bFieldBusOK | Bit | | Fieldbus Ok signal |
| | Send Antenna to Ground state | i_bFaultReset | Bit | | Fault Reset Signal |
| X | Prerequisite for Read | i_bReadCond | Bit | | Input Conditions for Read |
| X | Read Command | i_bReadCmd | Bit | | Read Request |
| X | Prerequisite for Write | i_bWriteCond | Bit | | Input Conditions for Write |
| X | Write Command | i_bWriteCmd | Bit | | Write Begin |
| X | Set True to Write Constant | i_bTagClearOperation | Bit | | If this is true the next write will be a tag clear operation |
| | Last Accessible Tag Address | i_uLastTagByte | Word[Unsigned] | | Tag Size |
| X | Operation Start Address | i_uOperationStartAdd | Word[Unsigned] | 0 to i_uTagByteCapacity | Starting tag Address |

| User Input | Symbol Name | Var_Input name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| X | Operation Length | i_uOperationLengthBytes | Word[Unsigned] | 1 to 2048/2000/256 | Length in Bytes |
| X | Data to Write | i_uWriteDataStart | Word[Unsigned] | | Packed Data for Writing to the Tag |

■Output labels

| User Output | Symbol Name | Var_Output name | Data Type | Description |
|---|---|---|---|---|
| | FB Executed Normally | o_bOK | Bit | When TRUE, indicates processing has completed normally |
| | FB Execution Aborted | o_bERR | Bit | When TRUE, indicates an Error has occurred |
| | FB Error Code | o_uErrID | Word[Unsigned] | FB Error Code Output |
| X | Start of Outgoing RF Information | o_uOutputStartReg | Word[Unsigned] | Output to fieldbus |
| | Current Operation Cycle | o_wCurrentOpNumber | Word[Signed] | Current Operation Number |
| | Operation Length/Bytes Per Operation | o_wTotalOpNumber | Word[Signed] | Total Operations to Complete |
| | Antenna Ready | o_bAntennaReady | Bit | RFID Ready For new Command Signal |
| | Tag Present | o_bTagPresent | Bit | Tag Presence Signal |

| User Output | Symbol Name | Var_Output name | Data Type | Description |
|---|---|---|---|---|
| | Read Complete | o_bReadComplete | Bit | Read Complete signal |
| | Write Complete | o_bWriteComplete | Bit | Write Complete signal |
| | Error Code | o_uErrorCode | Word[Unsigned] | Error Code |
| | RFID Controller Faulted | o_bFaultCmd | Bit | On When Controller Error Bit TRUE |
| | RFID Controller No Response | o_bFaultTimeout | Bit | Command execution time > 20 seconds |
| X | Read Data | o_uReadDataStart | Word[Unsigned] | Received Data(available at Read Complete |

| FB Version Upgrade History | |
|---|---|
| Version | Description |
| 1.01 | Initial Release |
| 1.02 | Clear Manual Read memory on status Change |
| 1.12 | Changed the Manual Read Structure<br>Modified FB variables to use the standard specified in BCN-89000-0823-D |
| 1.13 | Added Clear Tag Function |
| 1.20 | Added FB Status Outputs |
| 2.00A | Adopted BCN-89000-0969; Corrected Issue with Tag Clear WTOB; Removed 5 Read Write Option, added ob_suRFIDReady; Move to flexible sized input and output |
| 2.10 | Continuous Read/write supported |
| 3.00 | Tag Clear is integrated into Write |

| | |
|---|---|
| 3.01 | Label Name Updates |
| 3.02 | Removed Fault Timer Input |
| 3.03 | Added 256 byte function limit added to packet offset; Introduced IO-link version |

| SDT Usage |
|---|

RFIDData

| Global Label: RFIDData | | |
|---|---|---|
| Member | Type | Usage |
| RFIDCHReady | Bit | Populated by this FB when a new command can be accepted |
| ManualReadCondTrue | Bit | Populated by associated program code to allow a manual read command |
| ManualWriteCondTrue | Bit | Populated by associated program code to allow a manual write command |
| ReadComplete | Bit | Populated by this FB when done and held true until input condition is released |
| WriteComplete | Bit | Populated by this FB when done and held true until input condition is released |
| TagPresent | Bit | Populated by this FB |
| ReadPermission | Bit | User Populated needed by this function block to know when to accept A Read Command |
| ReadCmd | Bit | User Populated to execute an automatic Read Command; Associated code will populate for HMI driven |

| Global Label: RFIDData | | |
|---|---|---|
| Member | Type | Usage |
| WritePermission | Bit | User Populated needed by this function block to know when to accept A Write Command |
| WriteCmd | Bit | User Populated to execute an automatic Read Command; Associated program code will populate for HMI driven |
| ControllerFault | Bit | Attached to FB output pins Command Fault |
| TimeOutFault | Bit | Attached to FB output pins for Timeout or no response |
| ErrorCode | Word[Unsigned] | Error Code received from RF controller |
| Length | Word[Unsigned] | User Populated for automatic control, Associated program code will populate for HMI driven |
| StartAddress | Word[Unsigned] | User Populated for automatic control, Associated program code will populate for HMI driven |

MELPT_APP_GOTRFID

| System Label: GOTRFID | | |
|---|---|---|
| Member | Type | Usage |
| StationDataRequest_PB | Bit | |
| StationDataRequestPre_PB | Bit | |
| ManualRead_PB | Bit | |
| ManualWrite1_PB | Bit | |
| ManualWrite16_PB | Bit | |
| OnLastAntenna | Bit | |

| System Label: GOTRFID | | |
|---|---|---|
| Member | Type | Usage |
| OnLastAddress | Bit | |
| TagPresent | Bit | |
| CHReady | Bit | |
| ReadCondTrue | Bit | |
| WriteCondTrue | Bit | |
| ManualReadRequest | Bit(1..16) | Antenna Element used to Trigger Manual Read |
| ManualWriteRequest | Bit(1..16) | Antenna Element used to Trigger Manual Write |
| SelectedAntennaNumber | Word[Signed] | |
| SelectedStatus | Word[Unsigned] | |
| TagSizeBytes | Word[Unsigned] | Used as input check to prevent operation over the limits of the tag |
| RFIDErrorCommentNumber | Word[Unsigned] | |
| ErrorCodes | Word[Unsigned](1..16) | |
| WriteData1Byte | Word[Unsigned] | |
| StartAddress | Word[Unsigned] | |
| WriteStartAddress | Word[Unsigned] | |
| HMIData | Word[Unsigned](0..15) | |

## Application Example

To utilize this function block the following inputs and outputs need to be adapted to the application:

I_uInputStartReg

This is the starting register for the fieldbus input for this antenna. You can find this information in the auto-refresh range for the fieldbus used.

For example we are to configure antenna #1 on Profinet this is slot 1 on the device the starting register is W2001

I_wBytesPerAntenna

This is the length of the fieldbus input, this variable is symmetrical. If you define 254 bytes for input it will also output 254 bytes, this information is contained within the fieldbus setup of the node.

I_bFaultReset

Turning this bit to true will send an output from the PLC to the antenna to drive the antenna to ground state.

I_bReadCond

Conditions to allow Read operation, must be true to allow read operation

I_bWriteCond

Conditions to allow Write operation, must be true to allow Write or Tag Clear operation

I_bTagClearOperation

Set to TRUE to make your write operation a tag clear operation, the data used to clear the tag is the first byte of i_unAutoWriteData

O_uOutputStartReg

This is the starting register for the PLC output to this antenna. You can find this information in the auto-

refresh range for the fieldbus used.

For example we are to configure antenna #1 on Profinet this is slot 1 on the device the starting register is W1001. The function block outputs data for the number of bytes list on i_wBytesPerAntenna

O_bFaultCMD

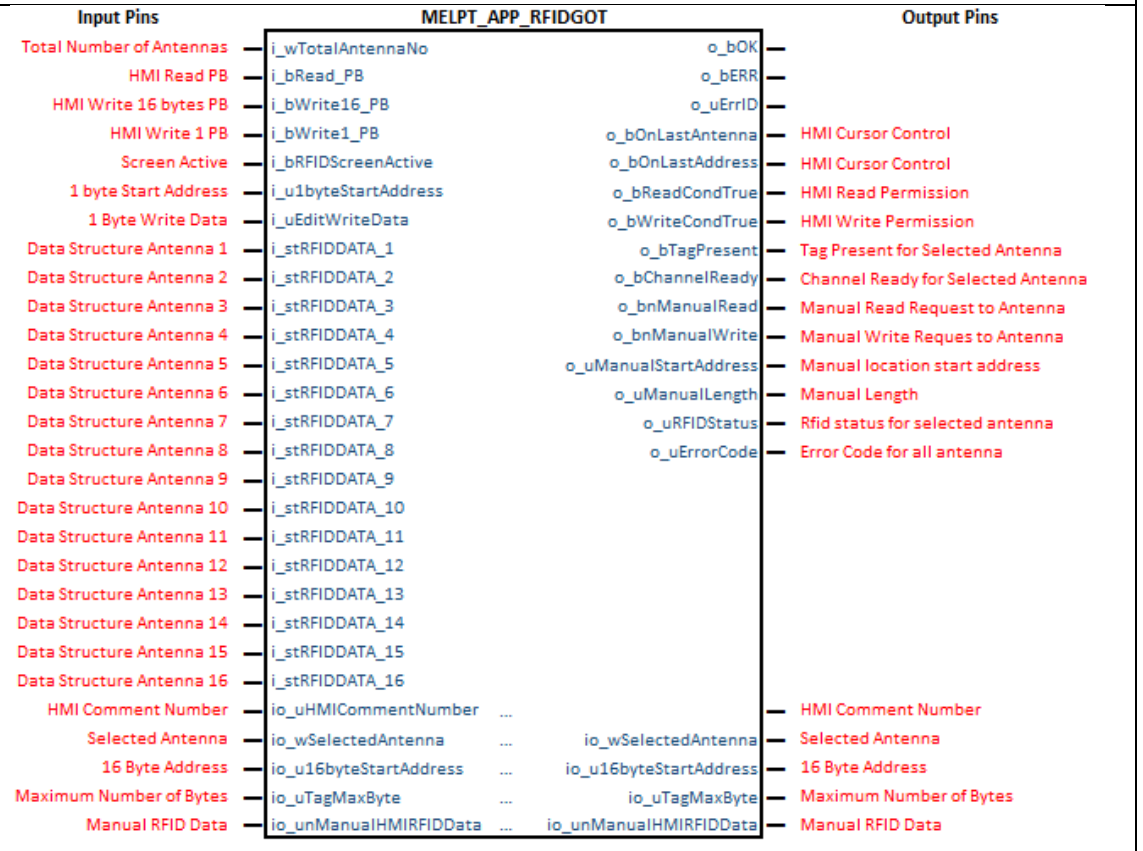
This is true when the controller has returned an error code investigate o_uErrorCode for ErrorCode

O_bFaultTimeout

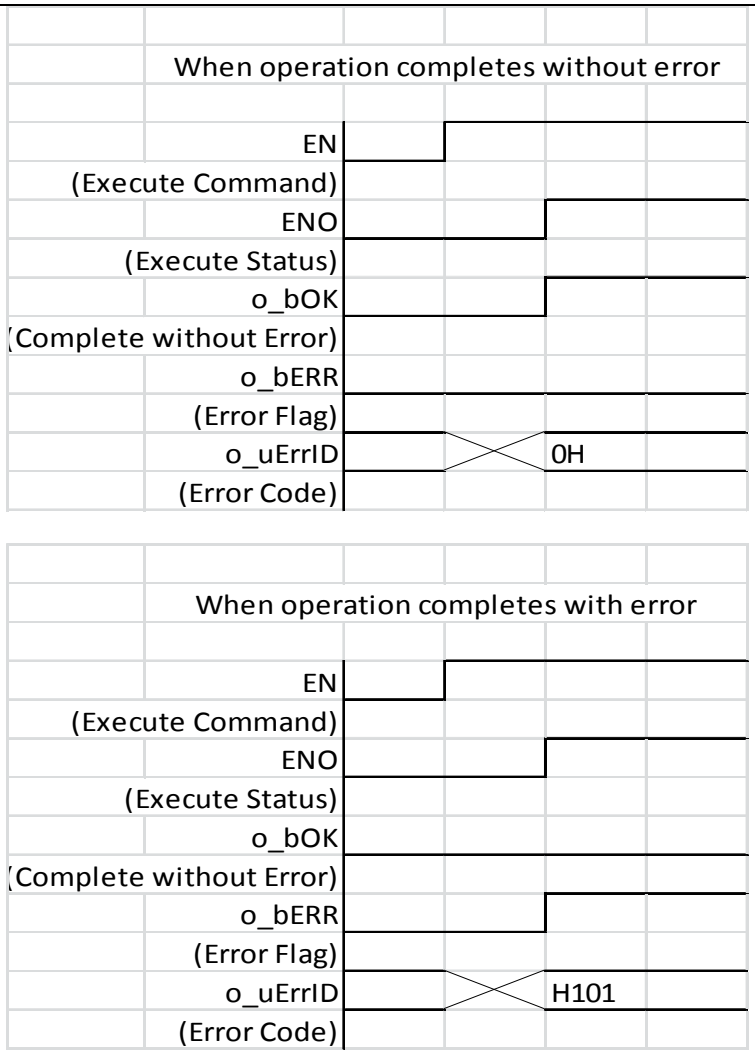
### 3.6.1 MELPT_APP_RFIDGOT

This program calls the function block MELPT_APP_RFIDGOT_1KB, _2KB, or _256b. Only one of these programs is designed to be in the scan at any one time and is intended to be used with the data structures needed by the RFID system in use

| FB Name |
|---|
| MELPT_APP_RFIDGOT |

| Item | Description |
|---|---|
| Function overview | This function block interfaces GOT related RFID functions to the selected RFID IF FB. 1 instance per GOT screen, this function block can interface with up to 16 antenna data structures. |
| Symbol |  |

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Applicable Hardware</td><td>
<table>
<tr><th>Series</th><th>Model</th><th>Serial Restriction</th></tr>
<tr><td>MELSEC-Q series</td><td>Universal Model PLC</td><td>None</td></tr>
<tr><td>GOT 1000 series</td><td>GT16(800*600) or Higher</td><td>None</td></tr>
</table>
</td></tr>
<tr><td>Applicable Software</td><td>
<table>
<tr><th>Series</th><th>Version</th></tr>
<tr><td>GX Works 2</td><td>1.536</td></tr>
<tr><td>GT Designer 3</td><td>1.136</td></tr>
</table>
</td></tr>
<tr><td>Programming language</td><td>Structured Ladder/FBD</td></tr>
<tr><td>Number of Ladder Steps</td><td>QnU: 1286 steps<br>*The number of steps of the FB program depends on the CPU Model that is used and input and output definition</td></tr>
<tr><td>Device Memory Used</td><td>MELPT_APP_RFIDGOT<br><br>61 bits<br><br>98 words</td></tr>
<tr><td>Compiling method</td><td>Macro type;</td></tr>
<tr><td>Execution type</td><td>Real-time Execution</td></tr>
<tr><td>Dependences</td><td></td></tr>
<tr><td>Function description</td><td>This function block multiplexes up to 16 antenna worth of information for display on the HMI. The status of the selected antenna is determined, and Manual RFID Read and Write Requests are generated from this FB.</td></tr>
</table>

| Item | Description |
|---|---|
| Restrictions and precautions | |
| Timing chart |  |



## FB Error Code

| Error Code | Description |
|---|---|

| Error Code | Description |
|---|---|
| 0 | No Error. |
| H101(257) | Tag Max Byte is equal to zero |
| H102(258) | Total Antenna Number is greater than 16 |
| H103(259) | Total Antenna number is less than or equal to zero |

## Labels

■ Input labels

| User Input | Symbol Name | Var_Input name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| X | Total Number of Antennas | i_wTotalAntennaNo | Word[Signed] | 1 to 16 | No. of Antennas used |
| | HMI Read PB | i_bRead_PB | Bit | | HMI PB to read tag |
| | HMI Write 16 bytes PB | i_bWrite16_PB | Bit | | HMI PB to write to tag 16 bytes |
| | HMI Write 1 PB | i_bWrite1_PB | Bit | | HMI PB to write to tag 1 byte |
| | Screen Active | i_bRFIDScreenActive | Bit | | Screen Active Bit |
| | RFID IF Data Structure | i_stRFIDData_X | RFIDData_1KB<br>RFIDData_2KB<br>RFIDData_256b | | RFID Data for one antenna |
| | 1 byte Start Address | i_u1byteStartAddress | Word[Unsigned] | | 1 Byte Write Start Address |
| | 1 Byte Write Data | i_uEditWriteData | Word[Unsigned] | | The data to be written to the tag for 1-byte write |

■ Input/Output labels

| User Input | Name | Var_In_Out name | Data Type | Setting range | Description |
|---|---|---|---|---|---|

| User Input | Name | Var_In_Out name | Data Type | Setting range | Description |
|---|---|---|---|---|---|
| x | HMI Comment Number | Io_uHMICommentNumber | Word[Unsigned] | 1-255 | Comment File for the Advanced user Alarm. |
| | Selected Antenna | io_wSelectedAntenna | Word[Signed] | | Selected Antenna |
| | 16 Byte Address | io_u16byteStartAddress | Word[Unsigned] | | 16 Byte Start Address |
| X | Maximum Number of Bytes | io_uTagMaxByte | Word[Unsigned] | 0-32k | Tag Size in Bytes |
| | Manual RFID Data | io_unManualHMIRFIDData | Word[Unsigned](0..15) | | 16-byte write data or data read from tag |

■ Output labels

| Name | Var_Output name | Data Type | Description |
|---|---|---|---|
| FB Executed Normal | o_bOK | Bit | When TRUE, indicates processing has completed normally |
| FB Execution abnormal | o_bERR | Bit | When TRUE, indicates an Error has occurred |
| FB Error Code | o_uErrID | Word[Unsigned] | FB Error Code Output |
| HMI Cursor Control | o_bOnLastAntenna | Bit | HMI Indicator for PB Control |
| HMI Cursor Control | o_bOnLastAddress | Bit | HMI Indicator for PB Control |
| HMI Read Permission | o_bReadCondTrue | Bit | HMI Indicator for PB Control |
| HMI Write Permission | o_bWriteCondTrue | Bit | HMI Indicator for PB Control |
| Tag Present for Selected Antenna | o_bTagPresent | Bit | Tag present Ind. On HMI |
| Channel Ready for Selected Antenna | o_bChannelReady | Bit | Selected Antenna can accept new command |
| Manual Read Request to Antenna | o_bnManualRead | Bit(1..16) | Manual Read to RFID FB |

| Name | Var_Output name | Data Type | Description |
|---|---|---|---|
| Manual Write Request to Antenna | o_bnManualWrite | Bit(1..16) | Manual Write to RFID FB |
| Manual location start address | o_uManualStartAddress | Word[Unsigned] | Manual Start Address |
| Manual Length | o_uManualLength | Word[Unsigned] | Manual Operation Length |
| RFID status for selected antenna | o_uRFIDStatus | Word[Unsigned] | Status of RFID HMI Ind. |
| Error Code for all antenna | o_uErrorCode | Word[Unsigned](1..16) | Array of Error Codes to Display on HMI |

## FB Version Upgrade History

| Version | Description |
|---|---|
| 1.10 | Initial Release |
| 1.12 | Label Update |
| 1.20 | FB Status Outputs added |
| 2.00A | Adopted BCN-89000-0969 added intelligent module check, changes made to screen display and use of Superimpose Offset; Issue with Detailed Diagnostic Output corrected |
| 2.10 | Start address changed to double word |
| 3.00 | Modified for version 3.00 structures, start address back to single word |
| 3.03 | Modified for 16 independent inputs instead of array of structures; memory improvement |

## SDT Usage

1. RFIDData

| Global Label: RFIDData | | |
|---|---|---|
| Member | Type | Usage |
| RFIDCHReady | Bit | Selected Antenna Data forwarded to HMI structure |
| ManualReadCondTrue | Bit | Selected Antenna Data forwarded to HMI structure |
| ManualWriteCondTrue | Bit | Selected Antenna Data forwarded to HMI structure |
| ReadComplete | Bit | Selected Antenna Data forwarded to HMI structure |
| WriteComplete | Bit | Selected Antenna Data forwarded to HMI structure |
| TagPresent | Bit | Selected Antenna Data forwarded to HMI structure |
| ReadPermission | Bit | Selected Antenna Data forwarded to HMI structure |
| ReadCmd | Bit | |
| WritePermission | Bit | Selected Antenna Data forwarded to HMI structure |
| WriteCmd | Bit | |
| ErrorCode | Word[Unsigned] | All Data forwarded to HMI |
| Length | Word[Unsigned] | Modified by this FB and sent to individual RF function block |
| StartAddress | Word[Unsigned] | Modified by this FB and sent to individual RF function block |

2. MELPT_APP_GOTRFID

| System Label: GOTRFID | | |
|---|---|---|
| Member | Type | Usage |
| StationDataRequest_PB | Bit | |
| StationDataRequestPre_PB | Bit | |
| ManualRead_PB | Bit | GOT Screen Manual Read |
| ManualWrite1_PB | Bit | GOT Screen Manual Write 1 byte |
| ManualWrite16_PB | Bit | GOT Screen Manual Write 16byte |

| System Label: GOTRFID | | |
|---|---|---|
| Member | Type | Usage |
| OnLastAntenna | Bit | True when on Last Antenna |
| OnLastAddress | Bit | True When on Last Address |
| TagPresent | Bit | Tag Present Ind. |
| CHReady | Bit | Antenna Ready Indicator |
| ReadCondTrue | Bit | Read Cond True allow Manual Read Push Button |
| WriteCondTrue | Bit | Write Cond True FB will accept Manual Write PB if pressed |
| ManualReadRequest | Bit(1..16) | Manual Read Pulse for Each Antenna, this function block pulses the selected antenna bit |
| ManualWriteRequest | Bit(1..16) | Manual Write Pulse for Each Antenna, this function block pulses the selected antenna biut |
| SelectedAntennaNumber | Word[Signed] | Antenna Selection number hmi controlled |
| SelectedStatus | Word[Unsigned] | Determined by this FB |
| TagSizeBytes | Word[Unsigned] | This is the last editable byte number of the tag, used for input checking |
| RFIDErrorCommentNumber | Word[Unsigned] | Populate as part of the RFID driver you are using: |
| ErrorCodes | Word[Unsigned](1..16) | Error Codes for RFID alarming |
| WriteData1Byte | Word[Unsigned] | 1 Byte of Write Data |
| StartAddress | Word[Unsigned] | Manual Read and 16 Write Start Add. |
| WriteStartAddress | Word[Unsigned] | 1 byte Write Start Address |

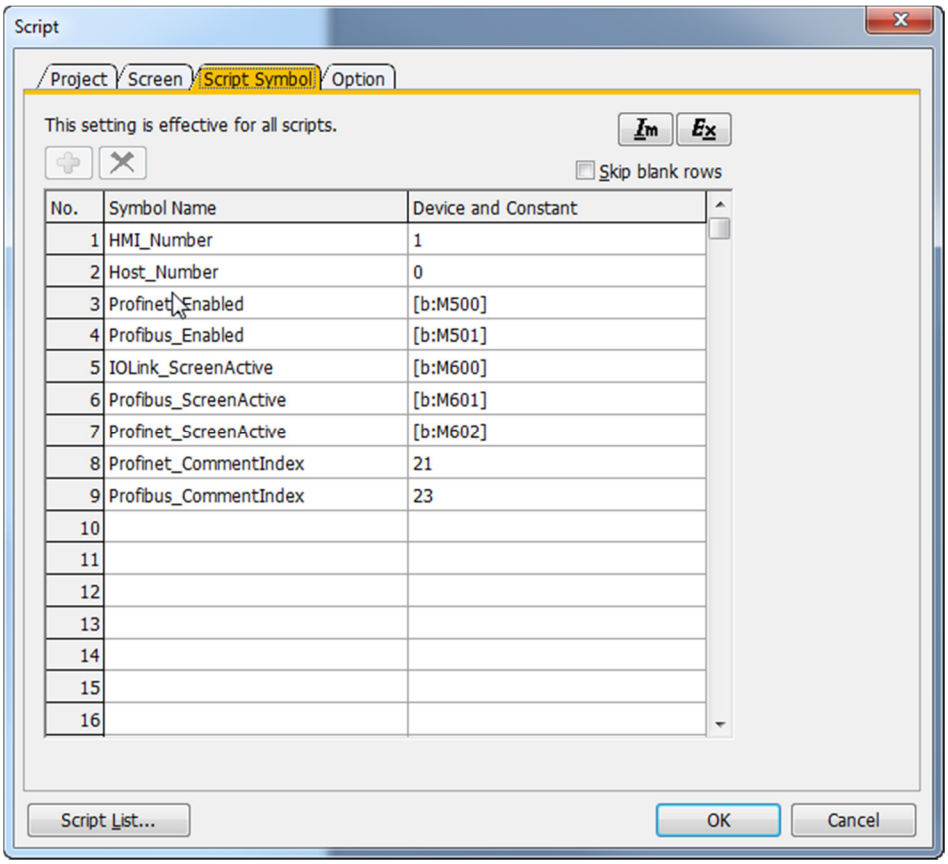
| System Label: GOTRFID | | |
|---|---|---|
| Member | Type | Usage |
| HMIData | Word[Unsigned](0..15) | Manual Data I/O 16bytes of read/write data |
| OperationAddress | Word[Unsigned] | The Tag Start Address for HMI requests |
| OperationLength | Word[Unsigned] | The Length in bytes for HMI requests |

# 4 GTDESIGNER 3 HMI ELEMENTS

Much of the ProfiNet and IO-Link Diagnostics HMI functionality is pre-configured to allow diagnostics of ProfiNet and IO-Link Devices and Parameter Read/Write on the Maintenance section. However, some extra configuration of certain screen elements may be required based on network requirements.

The first section will show the ProfiNet Diagnostics
The second section will cover the IO-Link Diagnostics screens.
The third section will show the Maintenance parameter screens for initial IO-Link device parameter setup and subsequent adjustment of parameters.
The fourth section will cover what is needed to add the pressure switch graphics to an HMI screen.
The fifth section regards the Manual Edit Screen for RFID.

Script Symbols are used, the proper devices on the PLC must be assigned to the Script Symbol



### 4.1.1 ProfiNet Diagnostic Displays

Fieldbus Diagnostics will determine fieldbus node health.

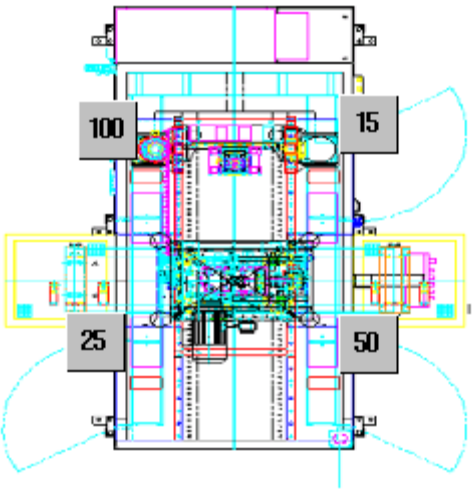
The associated function block will determine node health and categorize the node number into one of the following categories

ProfinetDiag.Nodestatus[0..127]

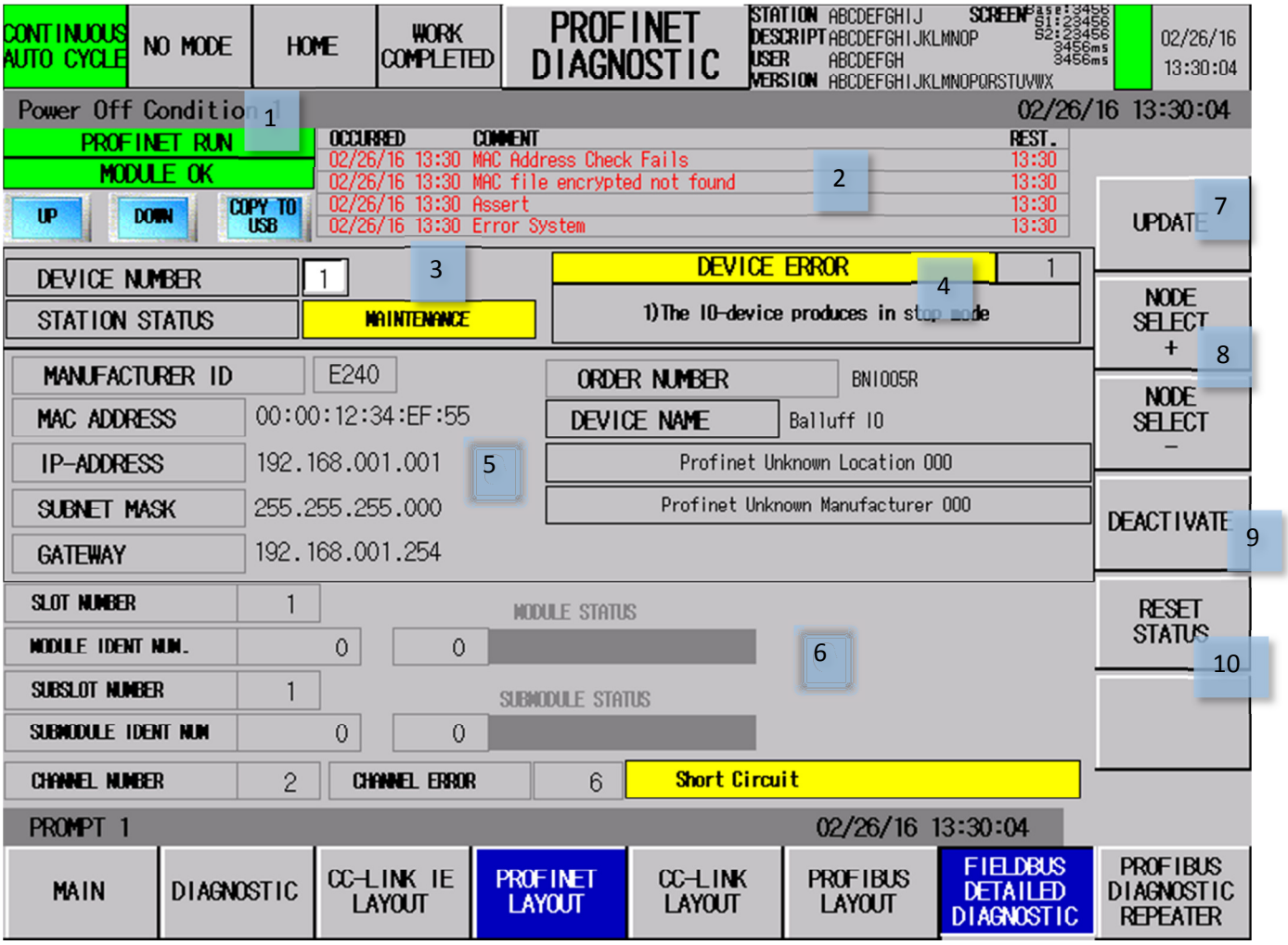
| State | Decimal Value | Graphic |
|---|---|---|
| Not Configured | 0 |   |
| Normal | 1 |   |
| Maintenance | 34 |   |
| Ok Was Maintained | 33 |   |
| Defective | 68 |   |
| Ok Was Defective | 65 |   |
| Disconnected | 136 |   |
| Ok Was Disconnected | 129 |   |
| Deactivated | 272 |   |
| Ok Was Deactivated | 257 |   |

Each Fieldbus Diagnostic Screen can be broken into a layout and detailed diagnostic screen.

The layout is intended to give the operator a general view of machine operation, and where the fieldbus nodes are located.



The detailed diagnostic is intended to provide detailed information about one node.




Screen script #300 monitors the screen you are on and when you are on a specific fieldbus diagnostic screen the specific labels associated with the screen are loaded into the general HMI registers for display.

Each Indicator on the Overview screen is layered with a hidden multifunction switch.

The switch accomplishes 3 tasks

Sets bit GB65111, when this bit is set the screen navigates to the appropriate detailed diagnostic screen

Sets the node number

When on the detailed diagnostic screen the information displayed is for this node number

Sets the particular fieldbus.update signal

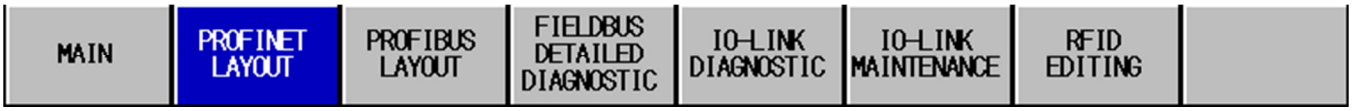
This signal is used by the associated FB to know to retrieve information for the node selected

On each layout screen indicators and switches are provided for the maximum allowed nodes per fieldbus, it is recommended that not configured indicators be moved to another window inside the project for future use.

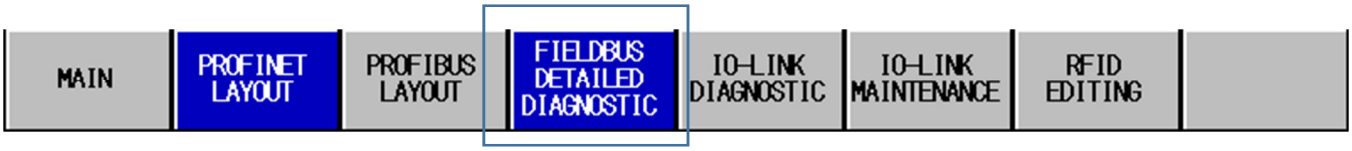
Navigation

The navigation bar has two options for each fieldbus

Layout



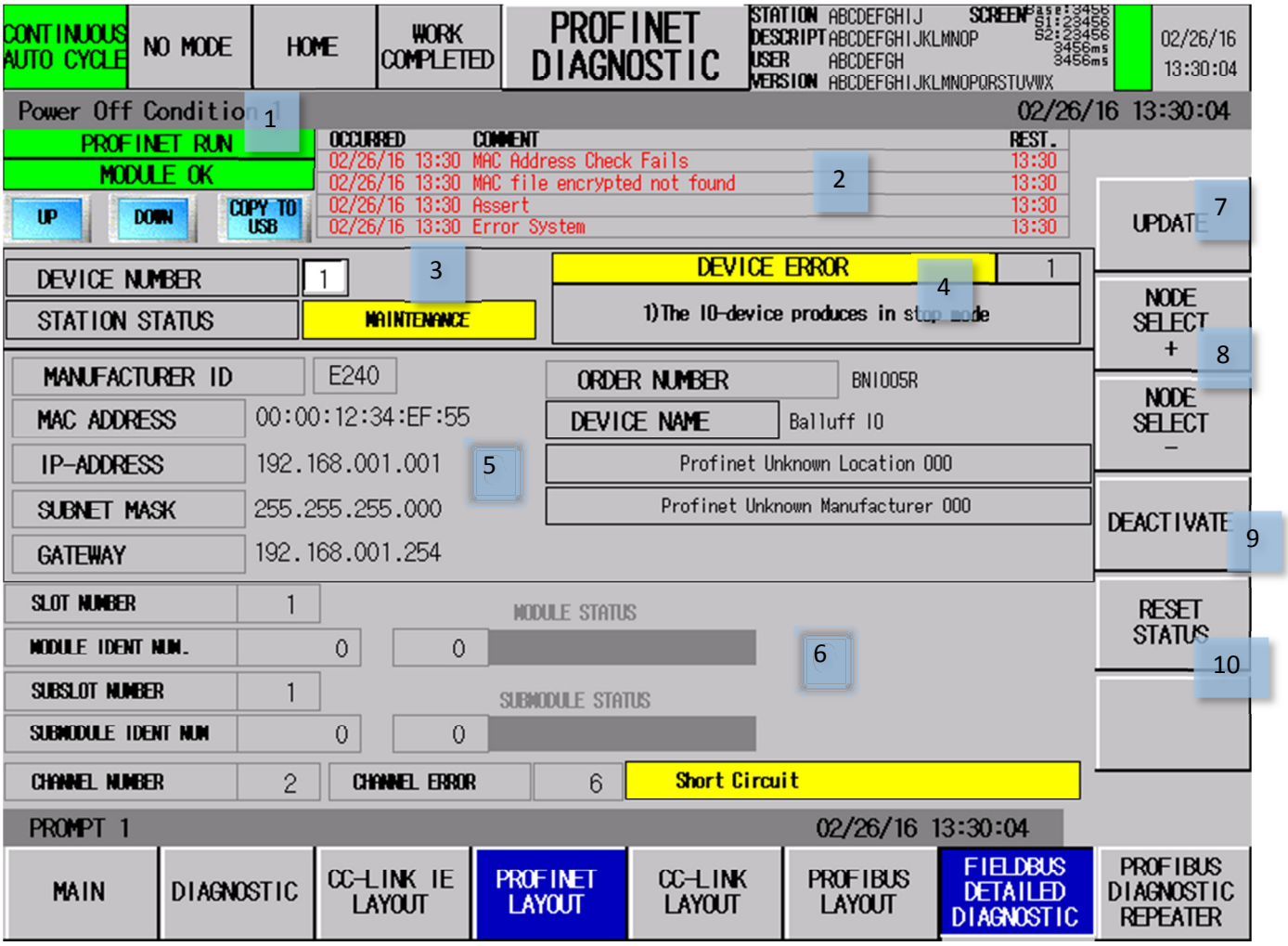

Detailed Diagnostic




The fieldbus detailed diagnostic button is a toggle switch to switch between the layout and detailed diagnostic for the selected Fieldbus

HMI-Profinet Detailed Diagnostics

This screen provides detailed information for the selected node of the Profinet Fieldbus




| Item # | Description | Object | Details |
|---|---|---|---|
| 1 | Host Status | Bit Lamp: ProfinetDiag.HostOK | Off: PROFINET NOT RUNNING<br>On: PROFINET RUN |

| Item # | Description | Object | Details |
|---|---|---|---|
| | Module Faulted Indicator | Bit Lamp: ProfinetDiag.FieldbusModuleFault | Off   On   |
| 2 | Alarm Area | User Alarm Display(21) | COPY to USB button Executes Screen script that will copy alarms to E:\backup\Profinet.CSV |
| 3 | Selected Node | Numeric Input ProfinetDiag.SelectedNode | Numeric Input limited by the first and last node number detected by FB; Sets ProfinetDiag.Update when a new value is entered |

<table>
<tr><th>Item #</th><th>Description</th><th>Object</th><th>Details</th></tr>
<tr><td>3</td><td>Selected Status</td><td>Word Lamp:<br>ProfinetDiag.SelectedStatus</td><td>
<table>
<tr><th>State</th><th>Value</th><th>Graphic</th></tr>
<tr><td>Not Configured</td><td>0</td><td>NOT CONFIGURED</td></tr>
<tr><td>Ok</td><td>1</td><td>OK</td></tr>
<tr><td>Ok Was Maintained</td><td>33</td><td>OK, WAS MAINTAINED</td></tr>
<tr><td>Maintenance</td><td>34</td><td>MAINTENANCE</td></tr>
<tr><td>Ok Was Defective</td><td>65</td><td>OK, WAS DEFECTIVE</td></tr>
<tr><td>Defective</td><td>68</td><td>DEFECTIVE</td></tr>
<tr><td>Ok Was Disconnected</td><td>129</td><td>OK, WAS DISCONNECT</td></tr>
<tr><td>Disconnected</td><td>136</td><td>DISCONNECTED</td></tr>
<tr><td>Ok Was Deactivated</td><td>257</td><td>OK, WAS DEACTIVATE</td></tr>
<tr><td>Deactivated</td><td>272</td><td>DEACTIVATED</td></tr>
</table>
</td></tr>
</table>

| Item # | Description | Object | Details | |
|---|---|---|---|---|
| 4 | Device Error Code | Word Comment Display:<br>Numeric Display:<br>ProfinetDiag.SelectedDevice Diagnostic | Comment File #21<br>Device Error Text Turns yellow when not equal to zero<br>  | |
| 5 | Device Details | Information retrieved from device via acyclic means when the Profinet.update is triggered | Manufacturer ID | Retrieved by I&m0<br>ProfinetDiag.ManufacturerID |
| | | | Mac Address | Response to index F841<br>ProfinetDiag.MacAddress[0..2] |
| | | | IP Address | Response to index F841<br>ProfinetDiag.IPAddress[0..2] |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Subnet Mask | | | Response to index F841<br>ProfinetDiag.SubnetMask[0..2] | |
| | | | Gateway | | | Response to index F841<br>ProfinetDiag.GatewayAddress[0..2] | |
| | | | Order Number | | | Retrieved by I&m0 | |
| | | | Device Name | | | Response to index F841<br>ProfinetDiag.ChasisData[0..15] | |
| 5 | Location | Word Comment Display:<br>ProfinetDiag.SelectedNode | Comment File #21<br>$$ + 10000 | | | | |
| | Manufacturer | Word Comment Display:<br>ProfinetDiag.SelectedNode | Comment File #21<br>20000 + $$ | | | | |
| 6 | Channel Diagnostics | Information retrieved from device via acyclic means when the Profinet.update is triggered | Slot Number | Numeric Display | ProfinetDiag.Slot | | |
| | | | Module Ident Number | Numeric Display | ProfinetDiag.SlotIDent | | |
| | | | Module Status | ProfinetDiag.SlotStatus | 0 | No Module | |
| | | | | | 1 | Wrong Module | |
| | | | | | 2 | Right Module | |
| | | | | | 3 | Substitute Module | |
| | | | SubSlot Number | Numeric Display | ProfinetDiag.SubSlot | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | Submodule Ident Number | Numeric Display | ProfinetDiag.SubSlotIDent | |
| | | | Submodule Status | ProfinetDiag.SubSlotStatus | 0 | No submodule |
| | | | | | 1 | Wrong Submodule |
| | | | | | 2 | Locked by IO Controller |
| | | | | | 4 | Application Ready Pending |
| | | | | | 7 | Substitute |
| | | | | | Hex 8000-8007 | Take Over Not Allowed |
| | | | | | Hex 8020-8040 | Maintenance Required |
| | | | | | Hex 8040-8080 | Maintenance Demanded |
| | | | | | Hex 8080-8100 | Diagnosis Data |
| | | | | | Hex 8100-8110 | Application ready Pending |

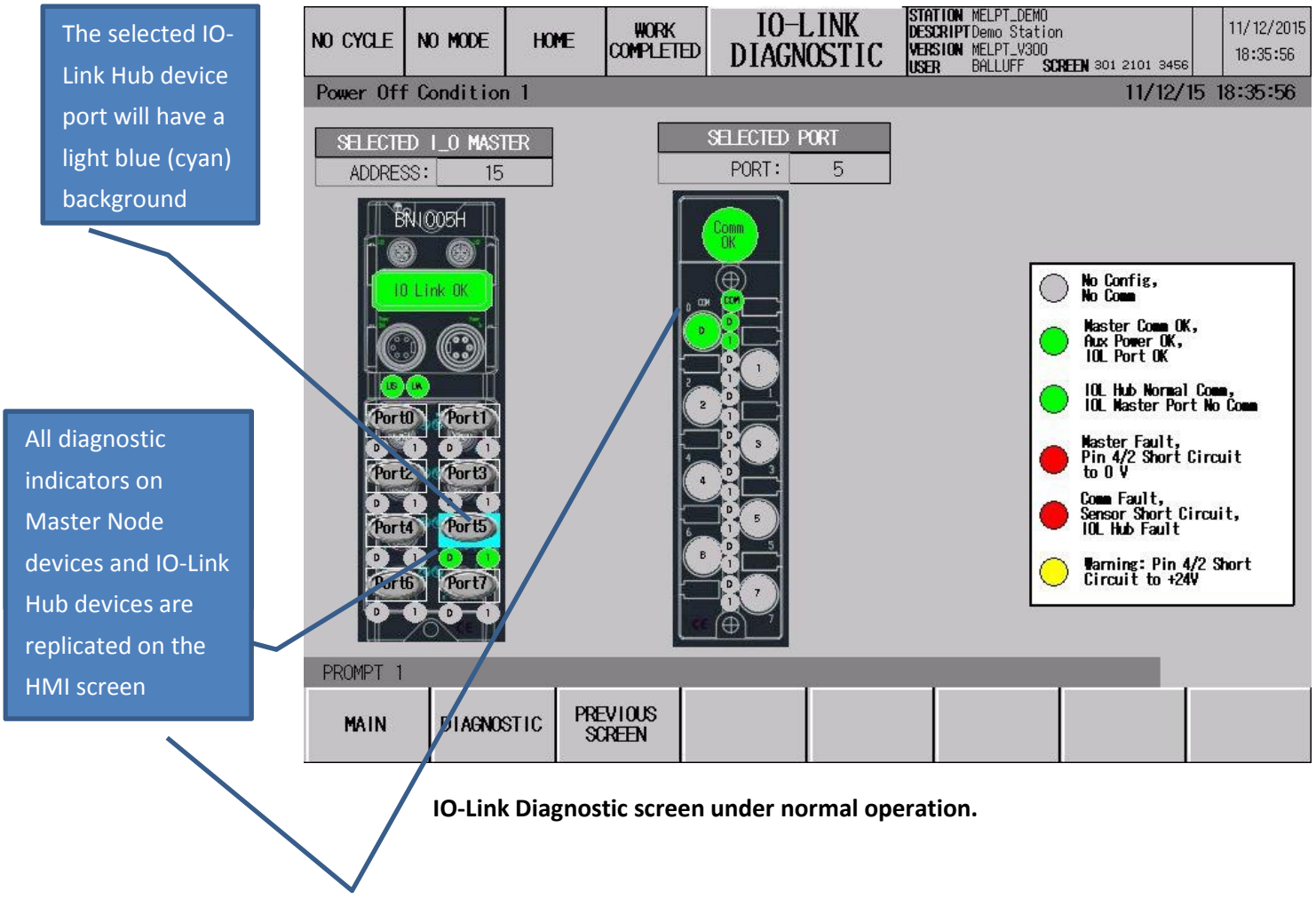
| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Hex 8110-8200 | SUPERORDINATED LOCKED |
| | | | | | Hex 8000 | OKAY |
| | | | | | Hex 9000-9880 | Substitute |
| | | | | | Hex 9800-9A00 | wrong |
| | | | | | Hex A000-FFFF | No submodule |
| | | | Channel Number | Numeric display | ProfinetDiag.ChannelNumber | |
| | | | Channel Error | ProfinetDiag.ChannelError | 1 | Short Circuit |
| | | | | | 2 | Under voltage |
| | | | | | 3 | Overvoltage |
| | | | | | 4 | Overload |
| | | | | | 5 | Over temperature |
| | | | | | 6 | Line Break |
| | | | | | 7 | Upper Limit Value Exceeded |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | 8 | Lower Limit Value Exceeded |
| | | | | | 9 | Error |
| | | | | | 16 | Parametrization Fault |
| | | | | | 17 | Power Supply Fault |
| | | | | | 18 | Fuse Blown / Open |
| | | | | | 19 | Communication Error |
| | | | | | 20 | Ground Fault |
| | | | | | 21 | Reference Point Lost |
| | | | | | 22 | Process Event Lost |
| | | | | | 23 | Threshold Warning |
| | | | | | 24 | Output Disabled |
| | | | | | 25 | Safety Event |
| | | | | | 26 | External Fault |
| | | | | | 27 | Sensor has incorrect Configuration |
| | | | | | 28 | Manufacturer Specific |
| | | | | | 29 | Primary Variable out of limits |
| | | | | | 30 | Non-primary Variable out of limits |
| | | | | | 31 | The Channel Needs Parameters |
| | | | | | 32 | Reserved |
| | | | | | 33 | Sensor Supply Short Circuit |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | 34 | Ground fault |
| 7 | Update Button | Bit Momentary Switch ProfinetDiag.Update | Refreshed all acyclic retrieved data and channel diagnostics. | | | |
| 8 | Node Select Buttons | Word Switch: ProfinetDiag.SelectedNode | Increment or decrements by 1 the Selected Node | | | |
| 9 | Deactivate /Activate PB | Bit Momentary Switch: ProfinetDiag.ActivateDeactivate_PB ProfinetDiag.ActiveNode_Ind | Toggles the Deactivated State of the Selected Node, this occurs while the system continues to run. | | | |
| 10 | Reset Status | Bit Momentary Switch: ProfinetDiag.ResetStatus | Places zero into ProfinetDiag.NodeStatus[SelectedNode] | | | |

### 4.1.2 IO-Link Diagnostics

The IO-link Diagnostics Screen shows the ProfiNet Master Node device (on left) and the selected port's IO-Link connected io-link device on the right. See graphic below for more details:

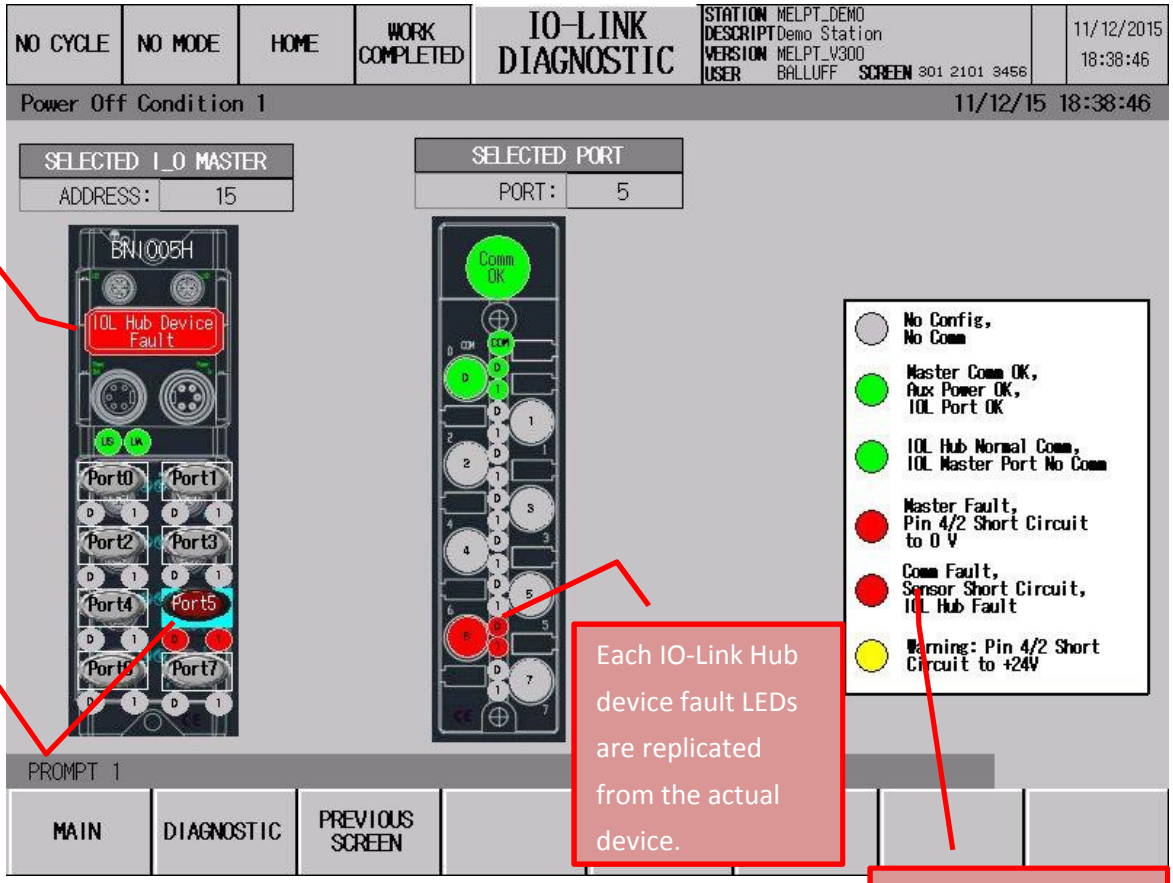



**IO-Link Diagnostic screen under normal operation.**

**See next page for IOL Diagnostic Faulted example.**

Errors/Warnings from the Master Node device will have a solid red indicator. IO-Link Hub-related errors/warnings will be blinking

Any IO-Link hub faults will show a blinking red indicator on the Port button. Pressing this will show the faulted device on the right




Each IO-Link Hub device fault LEDs are replicated from the actual device.

This legend can be used to determine the error or warning to aid in troubleshooting

**IO-Link Diagnostic screen with IO-Link Hub Fault.**

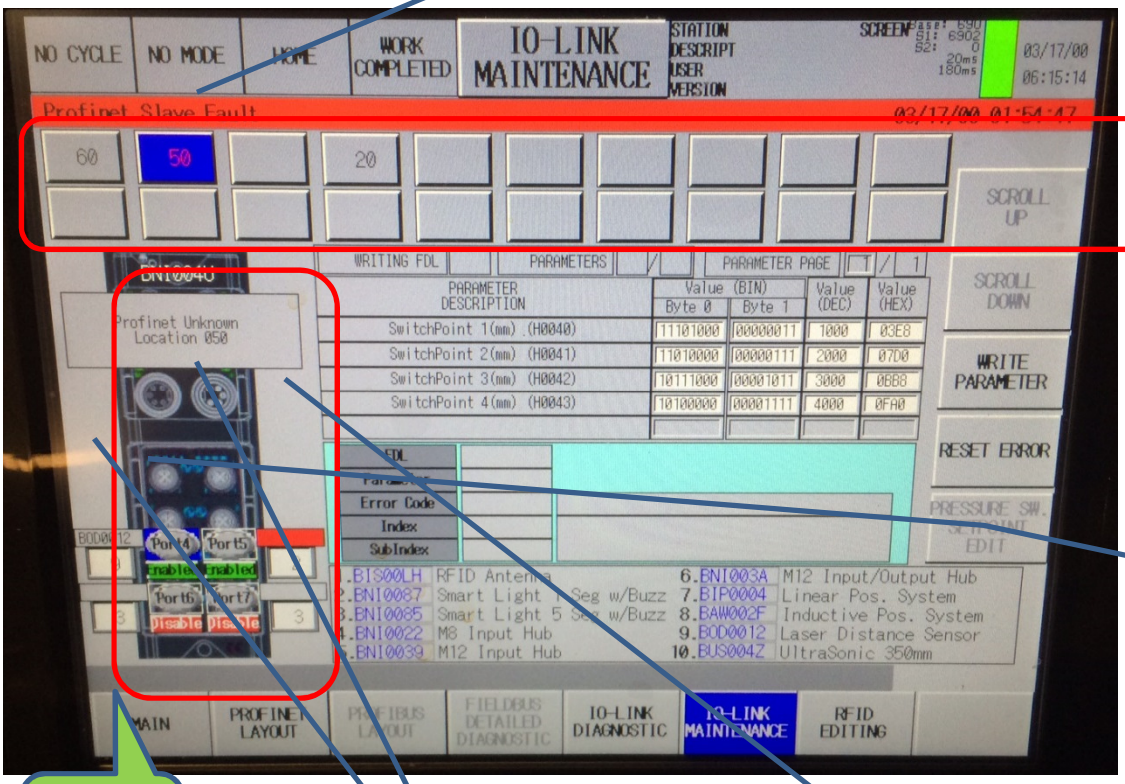
### 4.1.3 IO-Link Maintenance – Device Parameters Setup Display

In the Maintenance section of the HMI, there is an IO-Link Maintenance screen which allows reading/writing of Parameters of All IO-Link Hubs of all IO-Link-enabled Node devices on a ProfiNet network.

The parameters for all the configured IOL hubs are stored in permanent memory in the PLC. Whenever a node is disconnected and reconnected or someone performs a Write Parameters function, data stored from that PLC memory location is written to the parameters of the target IO-Link hub device.

For initial commissioning of the ProfiNet network, all configured IO-Link devices must have Device Type assigned. This is accomplished by placing the device CFG function block in the initial scan. This will allow a check to be performed and annunciate a possible wrong device replacement/installation.

See below for more details:



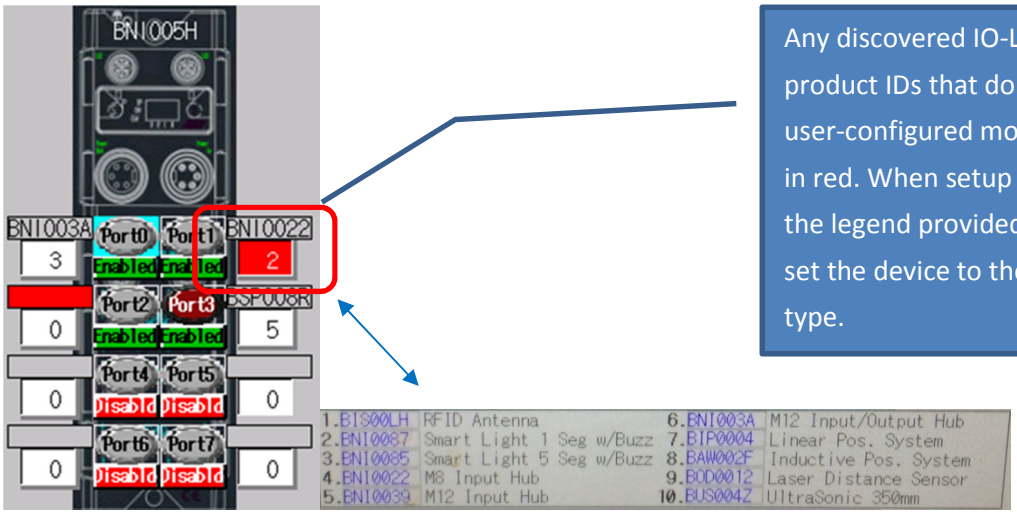

All possible nodes on the ProfiNet network will have an enabled button here. Red-colored buttons represent some error on that node. Pressing the node button will load the node

Selected Port will highlight in blue . Enable/Disable is for IO-Link Diagnostics. Disabling for a port will prevent Errors/Warnings on the IO-Link device from registering as ProfiNet faults

Any port with a connected device type will show the device type name in this box. If communication is lost, the indicator will blink red.

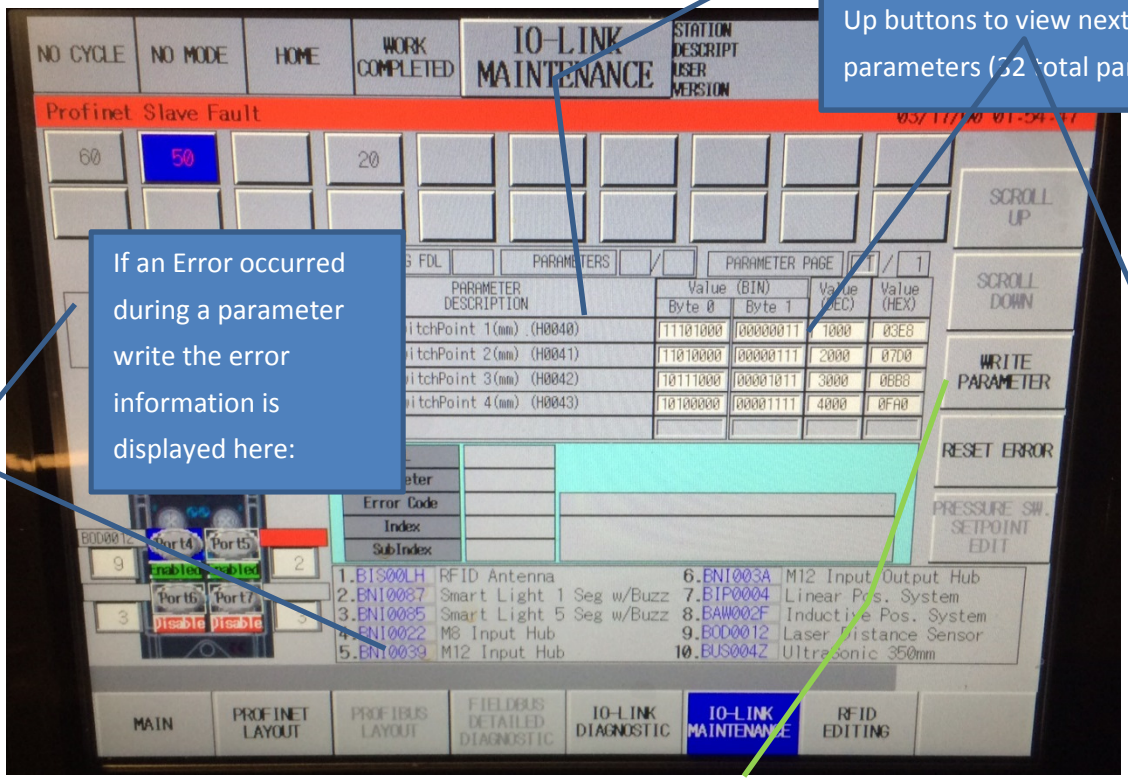
IOL Parameter write error(s) will make the target node button blink red, pressing the button will load up error details to the right of the module graphic

Device mismatches will turn this indicator background red. White=device match.




Any discovered IO-Link device product IDs that do not match the user-configured model type will show in red. When setup is first done, use the legend provided on the screen to set the device to the proper model type.

Actual parameter settings for IO-Link device are listed here. Use the Scroll Down and Scroll Up buttons to view next 5 or previous 5 parameters (32 total parameters possible).




If an Error occurred during a parameter write the error information is displayed here:

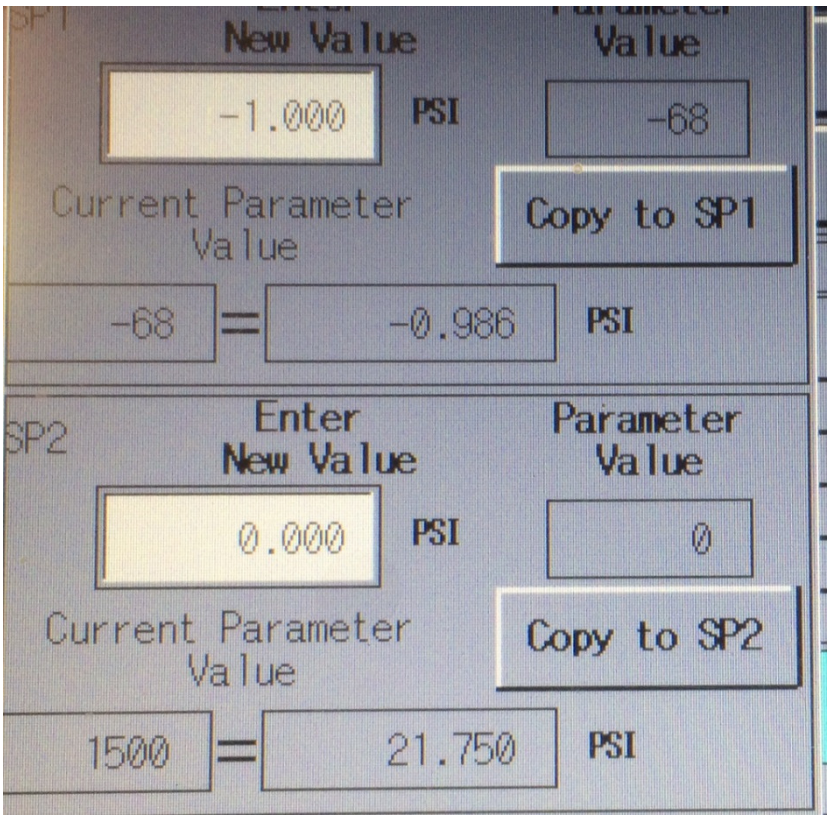
Press Either the Decimal (DEC) value or Hexadecimal (HEX) value for each parameter to input new values, Clicking Enter on the number display when complete.

When the Enter key is pressed for numeric entry the parameters are saved to the PLC. If it is connected, a 10 second timer begins additional edits can be made, to reset the timer. Parameters are written to the device when the timer expires, the device is navigated away from, or the write Parameters Push Button is pressed.

### 4.1.4 IO-Link Pressure Switch Devices

#### *4.1.4.1 Modifying Set points*

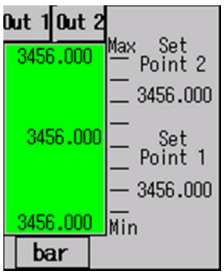
When modifying the setpoint of a Balluff pressure switch, the pressure switch accepts the parameter in bar, with a device multiplier. The operator may not know the conversion to the unit type commonly used. On the maintenance screen when a pressure switch device is selected the Pressure Sw. Setpoint Edit button is available.


This window converts the current parameter value into the current unit type. When a change is to be made the operator will place a new value in the input box, the parameter value is calculated in the display box. Transferring from the window to the parameter list is done with the copy to push button.

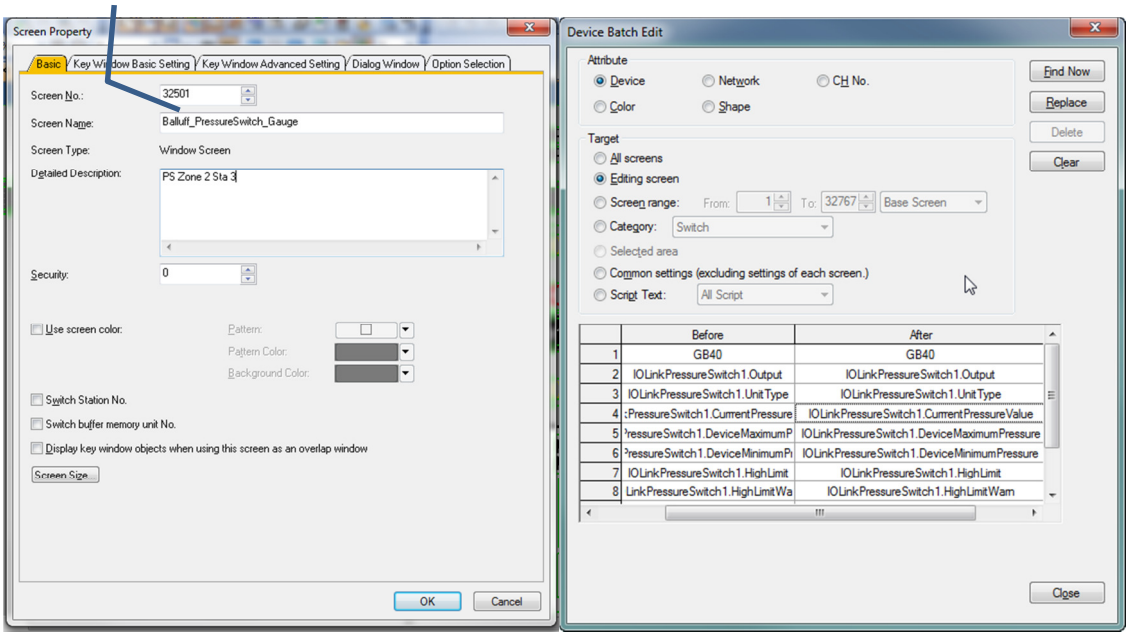
### *4.1.4.2 Graphics Display*

The Balluff pressure switch IO-Link device has a gauge window that can be added as an overlay window on any base HMI screen. For each pressure switch used on the system, a new duplicated gauge window must be created.

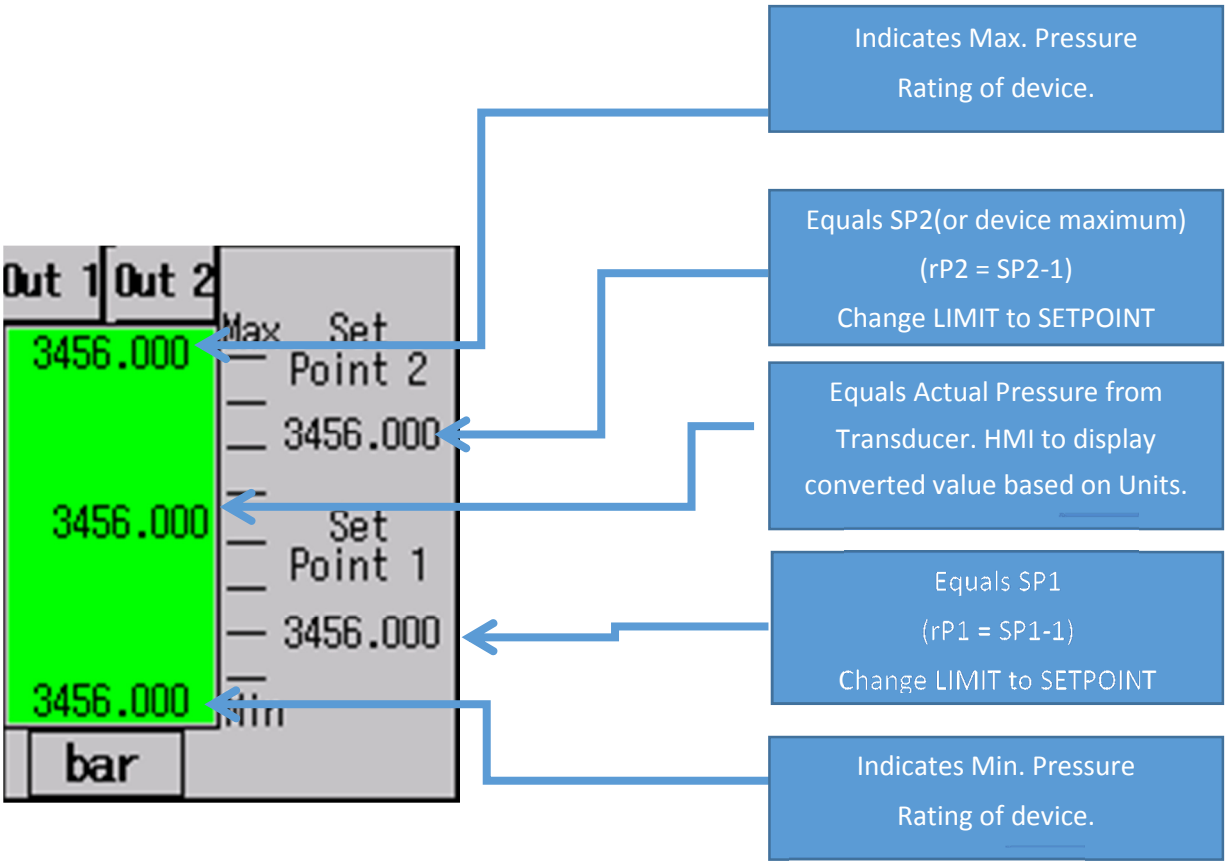



For each new pressure switch gauge needed, window screen 32500 can be copied and pasted to new window screens (see next page):

After the copy/paste of the 32500 window screen, a new window dialog box appears. Adjust the Screen No. to any unused screen number and click OK. The




After Copying the Pressure Device window, use the Device Batch Edit top change HMI variables to the new system label.




BAR Color designations:

RED: Less than SP1

YELLOW: Between SP1 and (((SP2-SP1)x.05)+SP1)

GREEN: Between and (((SP2-SP1)x.05)+SP1) (SP2-((SP2-SP1)x.05))

YELLOW: Between (SP2-((SP2-SP1)x.05)) and SP2

RED: Greater than SP2

### 4.1.5 RFID Editing Screen

The RFID screen provides a manual interface to the RFID system installed

RFID systems are installed as a user library, the user library contains a program and function block for reading and writing to multiple antennas on a RFID controller.

The HMI Interface is a standard screen with HMI Interface function block. The program included in the user library already interfaces the HMI driven manual components with the standard RFID function block

Up to 16 antennas can be managed by the screen, function block and labels provided with MELPT

Writing to the RF tag is a password protected function

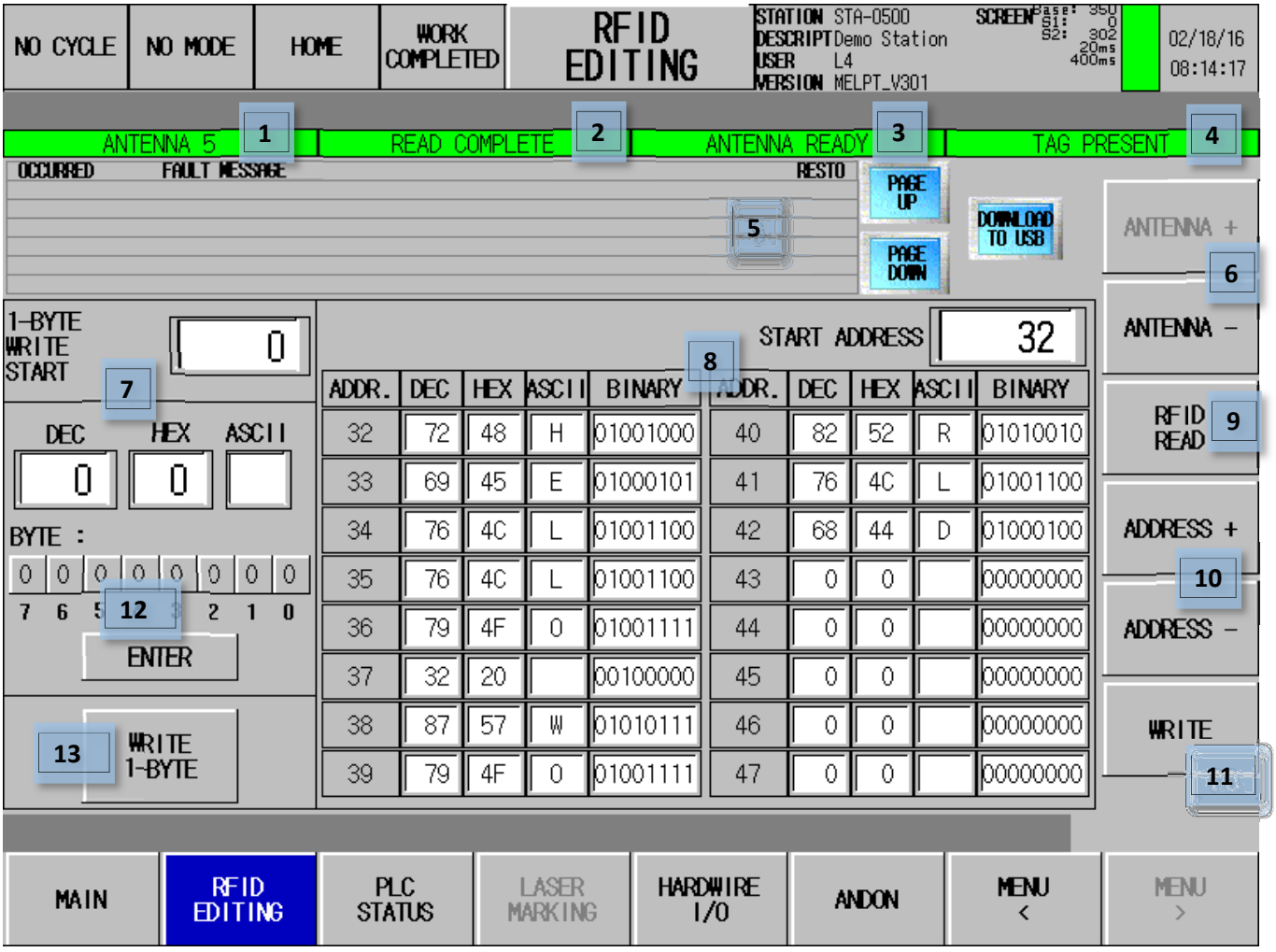



Figure-RFID Editing Screen

<table>
<tr><th>#</th><th>Description</th><th>Object</th><th>Details</th></tr>
<tr><td>1</td><td>Antenna<br>Number</td><td>Word Comment Display:<br>GOTRFID.SelectedAntennaNumber<br>Comment Displayed is $$+50<br>Comment File:125</td><td>1-16</td></tr>
<tr><td>2</td><td>Operation<br>Status<br>Indicator</td><td>Word Comment Display:<br>GOTRFID.SelectedStatus</td><td>
<table>
<tr><th>Value</th><th>Graphic</th></tr>
<tr><td>None</td><td>INVALID DATA</td></tr>
<tr><td>1</td><td>FAULTED</td></tr>
<tr><td>2</td><td>READ IN PROGRES</td></tr>
<tr><td>3</td><td>READ COMPLETE</td></tr>
<tr><td>4</td><td>WRITE IS PROGRE</td></tr>
<tr><td>5</td><td>WRITE COMPLETE</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Antenna<br>Status</td><td>Bit Lamp:<br>GOTRFID.CHReady</td><td>
<table>
<tr><th>State</th><th>Graphic</th></tr>
<tr><td>Off</td><td>ANTENNA NOT READY</td></tr>
<tr><td>On</td><td>ANTENNA READY</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Tag<br>Present</td><td>Word Lamp:<br>31 == GOTRFID.RFIDErrorCommentNumber<br>GOTRFID.TagPresent</td><td>
<table>
<tr><th>State</th><th>Graphic</th></tr>
<tr><td>None</td><td>TAG NOT PRESENT</td></tr>
<tr><td>31 == GOTRFID.RFIDError CommentNumber</td><td></td></tr>
<tr><td>GOTRFID.TagPresen t==0</td><td>TAG NOT PRESENT</td></tr>
<tr><td>GOTRFID.TagPresen t==1</td><td>TAG PRESENT</td></tr>
</table>
</td></tr>
</table>

| # | Description | Object | Details |
|---|---|---|---|
| 5 | RFID<br>Alarming | Advanced User Alarm Display(GOTRFID.RFIDErrorCommentNumber) | COPY to USB button Executes Screen script that will copy alarms to<br>E:\backup\Balluff.CSV<br>Or<br>E:\backup\OMRON.CSV<br>Based off value contained within<br>PLC logic needs to place a value in<br>GOTRFID.RFIDErrorCommentNumber |
| 6 | Antenna Selection PB | Word Switch: | Numeric Input limited to the maximum number of antenna |
| 7 | One Byte<br>Write<br>Address<br>And Data | Accessible when GB65101 and GOTRFID.WriteCondTrue are TRUE<br>Address: Numeric Input<br>GOTRFID.WriteStartAddress<br>Limited to 0<=$W<=GOTRFID.TagSizeBytes | |
| 8 | 16 Byte<br>Start<br>Address<br>And Data | Numeric Input:<br>GOTRFID.StartAddress<br>Limited to 0<=$W<=GOTRFID.TagSizeBytes | |
| 9 | RFID Read PB | Bit Momentary:<br>GOTRFID.ManualRead_PB | GOTRFID.ReadCondTrue must be TRUE |

| # | Description | Object | Details |
|---|---|---|---|
| 10 | Address Change<br>PB | Word Switch:<br>GOTRFID.StartAddress | Adds or Subtracts 16 to the Starting Address |
| 11 | RFID Write PB | Bit Momentary:<br>GOTRFID.ManualWrite16_PB | GOTRFID.WriteCondTrue and GB65101 must be TRUE |
| 12 | Bit Enter | Byte:<br>Bit Alternate<br>GD64510.bit number<br>Enter:<br>Bit Set:<br>GB64511 | 8 individual switched alternate the bits of a byte.<br>Pressing the Enter Key executes a script that loads the value into GOTRFID.WriteData1Byte |
| 13 | Write 1-byte<br>PB | Bit Momentary:<br>GOTRFID.ManualWrite1_PB | |

# 5 APPENIDX-CHANGE HISTORY

**Beta Review:**

Review Date:8/4/2015

First Demo, basic concept explained. Reading of parameters determined unnecessary

- Profinet V1.01

Review Date 9/30/2015

Modification from 5 devices to configurable 10 devices per PLC.

Profibus Version created from this version.

Pressure transducer Process FB introduced

- Profinet V1.02

Review Date 10/30/2015

Additional logic for fault detection and annunciation.

General bug fixes, added device configured logic, so data is not lost at power down.

Removal of the Initial device file, replaced by master functions.

Device Configured determination moved to GSDML function block

Pressure Transducer FB reworked

- Profinet V1.03

    a. Device Access Lock Parameter added to pressure transducer parameter list and placed 1st
    b. Default Parameter property introduced when device is configured default parameters are introduced
    c. Lowering Rp1/Rp2, before setting SP additional parameters to the sequence
    d. Added HMI Edit Inhibit boelean and scripting to disallow editing of certain parameters
    e. Memory map modified to accomadate for 4-254 byte antennas
    f. Added dual setpoint pressure transducer BSP008A
    g. Increased font size and improved legend for diagnostics
    h. General bug fixes
        i. Number of Pages calculation or parameters

- Profinet V1.04

Modified Pressure Transducer function block,

- Profinet V2.00

CFG library is shared with Profinet release

Process library is shared with Profinet release

Added Configuration function blocks for all project book devices.

Created initial program to place configuration into data array.

Created Process Data function blocks for:

BIP0004

Analog

Valve

BAW002F

BOD0012

Smartlights

Revised network maintenance function blocks into single function block per master.

Revised HMI and parameter write function blocks for efficiency.

Standardized HMI FB between packages

HMI package migrated to GOT 2000

- Profinet V2.01 (7/26/2016)

Ultrasonic sensors were using an incorrect device type value. They are now type 8(.b3)

- Profinet V2.02 (8/10/2016)

- BNI0041 process data function block was improperly scaled
- RFID FB had not antenna faulted added to antenna ready status