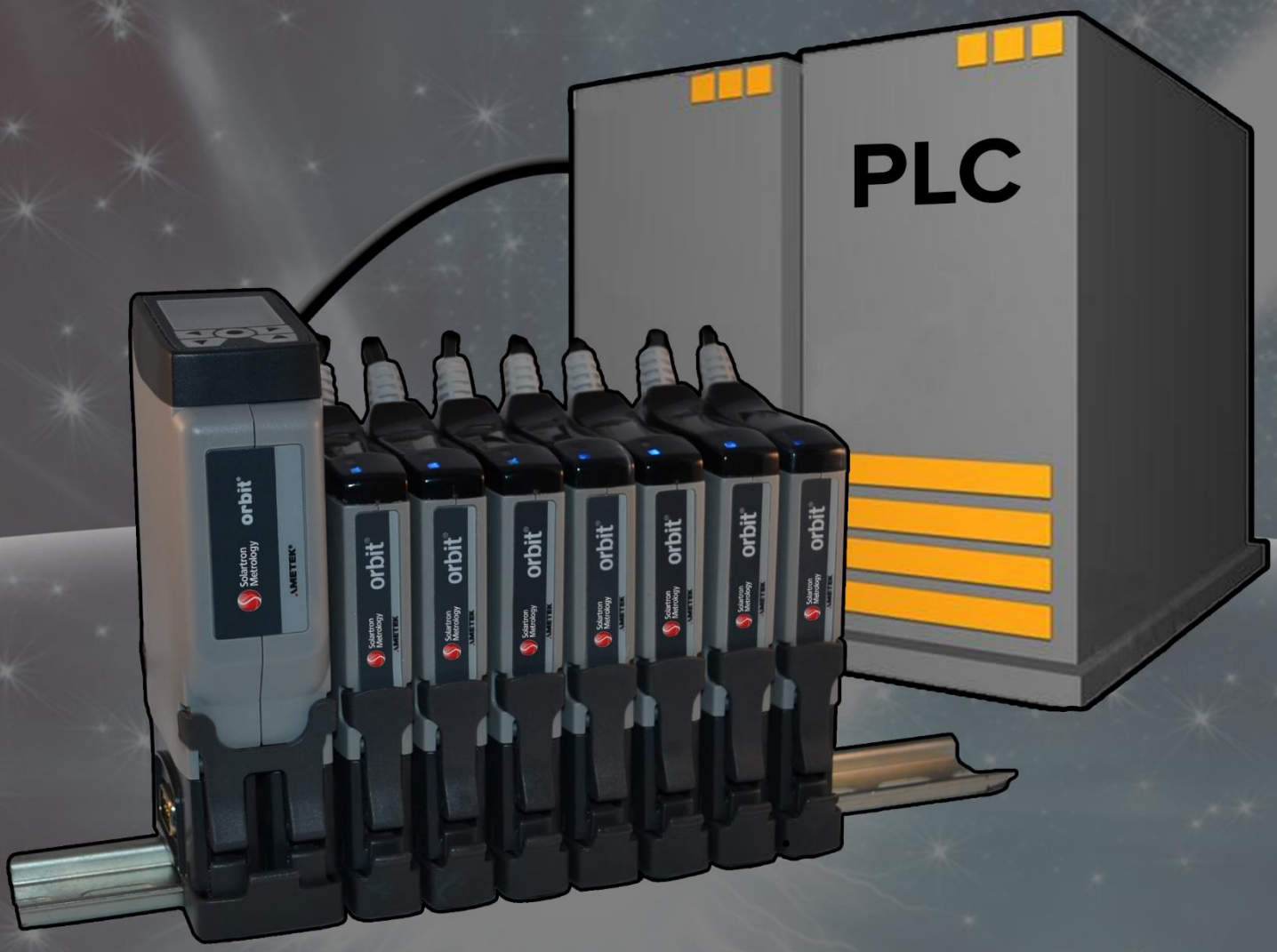
Solartron Metrology

PIM User Manual



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ULTRA PRECISION TECHNOLOGIES

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1. Introduction

This manual specifically caters for the PIM (Protocol Interface Module) products.
The Orbit® PIM system provides products specifically designed to simplify the communications between an Orbit® network of instruments and a standard industrial communications protocol.

Each module contains an integral LCD screen and keypad for monitoring network information and status as well as real-time Orbit® Module Readings.

The Orbit PIM Product has several variants, one for each of the communication protocols supported.

Please see the specific section for the protocol you require. These sections provide the network specific information for settings, as well as accessing the information from the Orbit Network of modules (parameter addresses etc) via the specific network communications.

The PIM product range supports the following industrial communications protocols:

- EtherNet/IP
- PROFINET
- Modbus TCP
- EtherCAT
- CC-Link

2. Navigate this Document

Hyperlinks are included to aid navigation.

To return to the point where you have jumped from, most pdf readers have a ‘Previous Page View’ button, alternatively use the keyboard shortcut 'ALT' + left arrow key.

3. Safety Summary

WARNING statements identify conditions or practices that could result in personal injury or loss of life. **CAUTION** statements identify conditions or practices that could result in damage to the equipment or other property **Symbols in this manual**  Indicates cautionary or other information	**Warnings and Cautions** **Warning**: Do not operate in an explosive atmosphere. **Warning**: This equipment is not intended for safety critical applications **Warning**: Do not exceed maximum ratings as specified in this document under individual modules. **Caution: Low Voltage** This equipment operates below the SELV and is therefore outside the scope of the Low Voltage Directive **Service and Repair**  CAUTION: This equipment contains no user serviceable parts. Return to supplier for all service and repair

All of the Products are CE marked and comply with EN61000-6-3 Electrical Emissions and EN61000-6-2 Electrical Immunity and EN61326-1.

For general safety advice, see user leaflet.

4. Trademarks and Copyrights

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EtherNet/IP is a trademark of ODVA Inc.

5. Contact Information

For updated information, troubleshooting guide and to see our full range of products, visit our website: www.solartronmetrology.com

6. Documentation cross reference

503286	PIM User Leaflet
520439	Orbit3 Support pack for Windows: *Contains both software and manuals for the Orbit system.*
502990	Orbit3 System manual: *Contains Orbit 3 system hardware information*
502914	Orbit3 Module manual: *Contains Orbit 3 WCM information*
	EthernetIP 977152-3 ADI_Map.csv *A csv file describing all parameters available through Explicit Messaging for Ethernet IP for part number 977152-3 (and part number 977037-3)*
	EthernetIP 977152-3 CyclicRead.csv: *A csv file describing all cyclic parameters available through Implicit 'Read' messaging for EthernetIP part number 977152-3 (and part number 977037-3)*
	EthernetIP 977152-3 CyclicWrite.csv: *A csv file describing all cyclic parameters available through Implicit 'Write' messaging for EthernetIP part number 977152-3 (and part number 977037-3)*
	ModbusTCP 977150-3 ADI_Map.csv: *A csv file describing all parameters available through Explicit Messaging for ModbusTCP for part number 977150-3*
	ModbusTCP 977150-3 CyclicRead.csv: *A csv file describing all cyclic parameters available through Implicit 'Read' messaging for ModbusTCP part number 977150-3*
	ModbusTCP 977150-3 CyclicWrite.csv: *A csv file describing all cyclic parameters available through Implicit 'Write' messaging for ModbusTCP part number 977150-3*
	PROFINET 977038-3 ADI_Map.csv: *A csv file describing all parameters available through Explicit Messaging for PROFINET for part number 977038-3*
	PROFINET 977038-3 CyclicRead.csv: *A csv file describing all cyclic parameters available through Implicit 'Read' messaging for PROFINET part number 977038-3*
	PROFINET 977038-3 CyclicWrite.csv: *A csv file describing all cyclic parameters available through Implicit 'Write' messaging for PROFINET part number 977038-3*
	ETHERCAT 977149-3 ADI_Map.csv: *A csv file describing all parameters available through Explicit Messaging for ETHERCAT for part number 977149-3*
	ETHERCAT 977149-3 CyclicRead.csv: *A csv file describing all cyclic parameters available through Implicit 'Read' messaging for ETHERCAT part number 977149-3*
	ETHERCAT 977149-3 CyclicWrite.csv: *A csv file describing all cyclic parameters available through Implicit 'Write' messaging for ETHERCAT part number 977149-3*

7. Glossary

Terms used in this manual

Display	The Liquid Crystal Display on the top of the module providing displayed information
Keypad	The five way keypad on the top of the module allowing display navigation
USB Interface	The PIM includes a Mini-USB socket used for connecting to a PC for configuration, monitoring & firmware updates
Digital Probe	A standard Solartron product that can be connected to the PIM to form a multi-channel measurement system
Connection Unit	Base Module to allow the unit to be mounted on a DIN rail or screwed down to a mounting plate as well as providing connections to digital probes (known as a TCON on the Solartron Orbit system)
Anybus Interface	The interface from the PIM to the specific Industrial Network in use

8. Installation

Note. The PIM Series of products are not sealed instruments and care should be taken when installing in environments where contamination can come into contact with the unit.

8.1. PC System Requirements

8.1.1. PC Hardware Requirements

- Personal computer with a processor running at 1GHz or faster with 2GB or more RAM.
- An available USB port.

8.1.2. PC Software Requirements

- Microsoft Windows® operating system (Windows® 7, or later)
- Solartron Orbit3 Support Pack for Windows.

8.2. Installing the Orbit3 Support Pack for Windows® software

Important! *Please ensure that you have Administrative access rights for installing this software.*
Before you can use the PIM, you must have the Orbit3 Support Pack for Windows® software installed on your computer; this is freely available from the Solartron website (http://www.solartronmetrology.com).

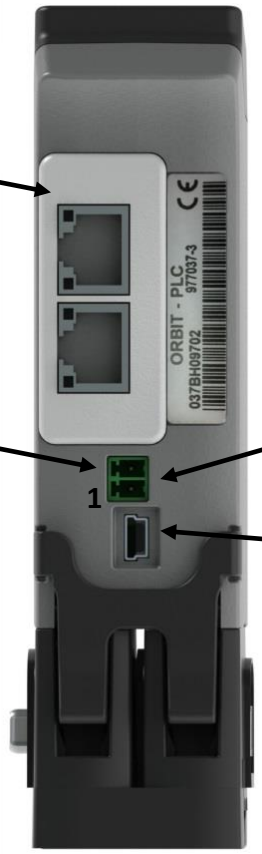
This will install the latest version of this manual, the PIM configuration application and Orbit3 Updater that are required for using PIM products.

8.3. Connections

This section describes how to connect the unit.

Protocol Connections
See Status Indicators & Protocol Connections

Input Connections
2 0V Power
1 18-32V DC Power
(see below for supplied Power supply connections)



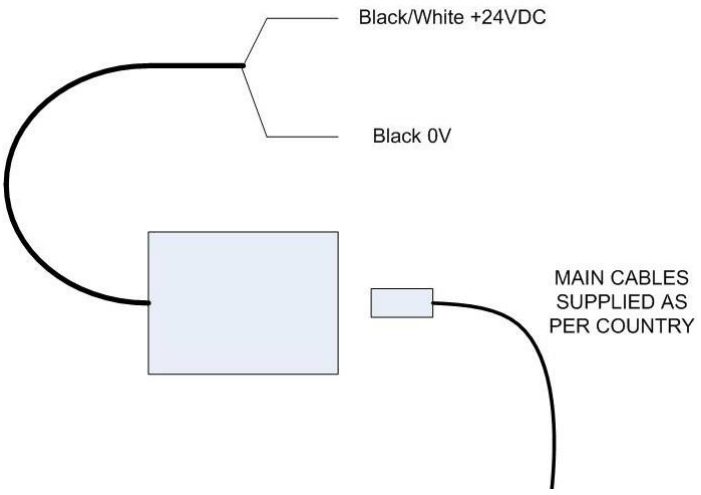
A mating connector is supplied with each unit
(This can be removed for wiring)
Additional connectors can be purchased from Solartron Metrology or Camden Part No. CTB93HD/2 or IMO Part No. 21.155 MH/2

Mini USB,
For configuration, monitoring & firmware updates

Operating Currents (mA) (nominal)		
Input Voltage	**PIM**	**PIM + 2DP**
18 V DC	120	150
24 V DC	100	120
32 V DC	80	100

DO NOT CONNECT ANY POWER SOURCES TO THE 9 WAY D-TYPE OF THE PIM

8.4. Mains to +24V DC Power Block (supplied)



8.5. Power Supply Details

- The PIM works with up to 150 Orbit modules (although the specific external Industrial Network may have further constraints).
- Provides Orbit power for up to 10 Orbit Modules.
    - To calculate exactly how many modules, see the “Orbit3 Network Power Calculator” spreadsheet, installed as part of the Orbit3 Support pack for Windows.
        - This power calculator will also highlight whether additional power supply modules (PSIMs) are required.
- Provides Auxiliary power for up to 4 Orbit Laser modules.

For more power supply configuration details see the ‘Electrical Installation’ section of the Orbit3 System manual.

8.6. Grounding, cables and power supplies

It is advisable to provide a good ground point for the PIM.

The PIM can be connected to a network of Solartron Digital probes via its 9 way D-type connector. If both the PIM and the Digital probes are mounted on a DIN rail, additional grounding may be performed using the mounting bracket (see diagram).

Note. The Orbit bus is a multi-drop RS485 network, therefore it is recommended that the provided Orbit Terminator is fitted to the end of the bus.

8.7. Noisy Electrical Environments

This section discusses the type of installation required, depending on the electrical environment.
Typically, this will be an industrial environment where there is equipment likely to produce high levels of electrical interference, such as welders, machine tools, cutting and stamping machines.

Connections should be made using screened cable. Braided or foil screened cables may be used. The cable screen should be connected to the Orbit PIM unit at the 0V connection.

In some particularly noisy environments it may be necessary to add ferrite filter components on power and/or data cables.

When selecting the type of wire or cable to be used, consider the following parameters:

- Screening
- Conductor size (resistance)
- Mechanical aspects such as flexibility and robustness

This is not a complete list. Installations may require other special cable characteristics.

8.8. Status Indication

The PIM provides operational status information on its built in display. See Displays
Also, PLC network protocol specific status is provided on the built in Anybus module, located at the rear of the PIM. See the relevant PLC Network Protocols section of this manual for further details.
Attached Digital probes have two indication LEDs.

- The blue Led is on when the PIM and Digital probes are communicating.
- For error conditions, the red Led will flash or be permanently on. See the 'Diagnostics' section of the Orbit System manual for error status details.

8.8.1. Displays

There are three main screens which are navigated using the buttons on the user interface.

Note: the display does not operate while USB is connected to a PC and will show "External Monitor".

8.9. External Network Information

The first page shown on the display provides Network information for the External Industrial Network (for example, the EtherNet/IP version of the PIM shows DHCP enable / disable, IP Address, Subnet Mask and Default Gateway settings).
See the relevant PLC Network Protocols section of this manual for further details.

8.10. Orbit Network Information

The second page available on the display provides basic information about the Orbit Network of Modules – Number of modules and Network Error State.

8.11. Orbit Module Readings

The third page available on the display provides a reading value and bar-chart for two modules. Which two modules are displayed can be indexed through the buttons, allowing the reading for any module on the Orbit network to be displayed in real-time.

Note: The display will also show basic status information in place of the reading when the status is not 'Ok', this includes "OverRange", "UnderRange" or "Error".

9. PIM Configuration / Windows Application

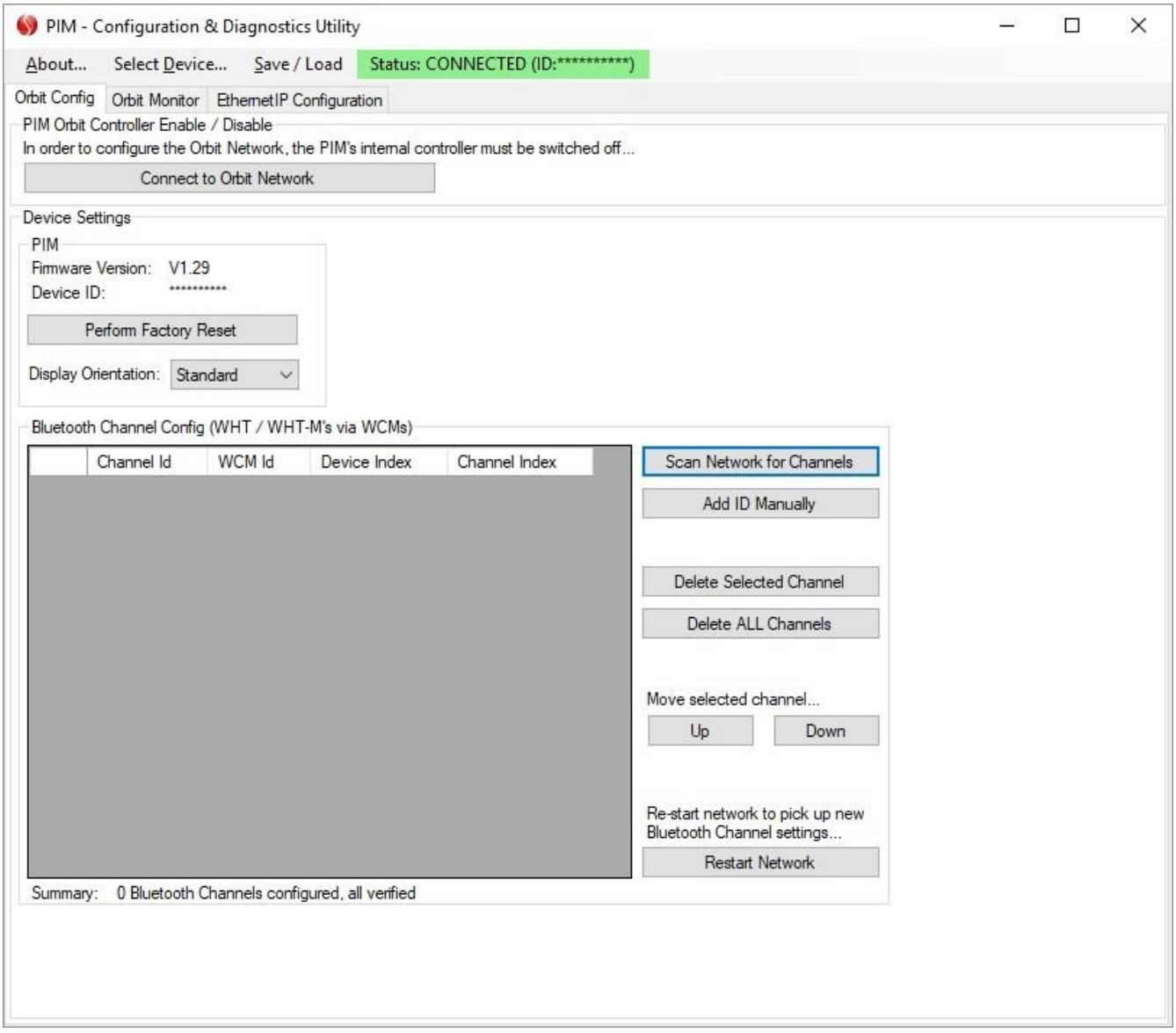
For easy setup of the PIM, a configuration application for Windows based PCs is available, included with the Orbit3 Support Pack for Windows.

The PIM unit must be connected to the PC via the USB mini B Port on the rear of the unit and then powered in the normal way (the PIM cannot be powered via the USB lead).

The application allows the user to configure (and monitor) the Orbit Network of Modules connected to the PIM, as well as configure (and monitor) the external Industrial Network.

When the application is first run, the “Select Device” menu item should be used to identify and connect to the required PIM device.

Once connected the application provides multiple ‘tabs’ (see below). The first two are for configuring and monitoring the Orbit Network of Modules, while the remainder are for configuration and monitoring of the External Industrial Network.



The following sections describe the Orbit Configuration and Monitoring tab usage. The External Network Configuration and Monitoring tabs are specific to the particular network in use. See the relevant PLC Network Protocols section of this manual for further details. regarding the specific network setup.

9.1. Orbit Configuration Tab

9.1.1. Background

The PIM includes within it an Orbit Network Controller - which performs all the communications with the local Orbit Network of Modules. In order to configure the Orbit Network, the configuration application needs to 'take-over' control of the network. Therefore, the Orbit configuration can only be accessed by 'Switching off' the PIMs internal Orbit Controller and allowing the application to take over control of the Orbit Network.

As well as configuring the Orbit network, Wireless Handtool 'Channels' can be configured on this screen. For more information, please see WCM / WHT Support section (section 9.1.4). **Note.** The legacy version of the Ethernet IP product (part no. 977037-3) does not support the WCM.

9.1.2. Usage

Once the Orbit Config tab is selected: -

1. **Click the 'Connect to Orbit Network' button.**
   a. *The application will take a few seconds to disable the PIM controller and connect via Orbit.*

2. **Once connected to Orbit, use the 'Find ALL Modules' button to identify all the Orbit modules available on the Orbit network connected to the PIM.**
   a. *Modules can also be added by ID, or using 'Notify' (move probe tip to add).*
   b. *Modules can be deleted from the network or the entire network cleared using the buttons provided.*
   c. *Specific setup for certain modules types can also be performed here (such as laser configuration). The "Setup Selected Module" button will become available when a module is selected that has these extra settings.*

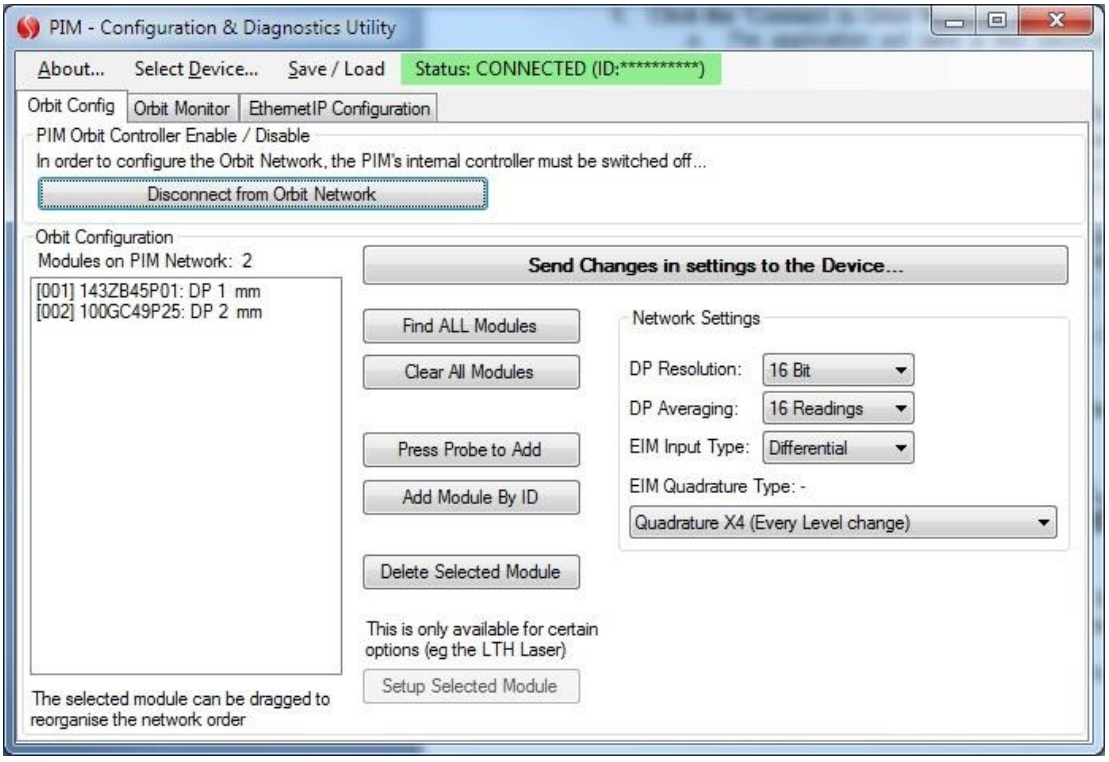
3. **Modules can be moved within the network display using the mouse to drag them to the required network position.**

4. **Additional network settings such as resolution and averaging are also configured on this tab.**

IMPORTANT: Once the network settings are configured you MUST click the "Send changes in Settings to Device" button to update the PIM.

1. **Once finished, click the "Disconnect from Orbit Network" button to revert control of the Orbit network back to the PIMs internal controller.**

The diagram below shows the Orbit Network Configuration tab and its controls.


PIM - Configuration & Diagnostics Utility
About...
Select Device...
Save / Load
Status: CONNECTED (ID:**********)
Orbit Config
Orbit Monitor
EthernetIP Configuration
PIM Orbit Controller Enable / Disable
In order to configure the Orbit Network, the PIM's internal controller must be switched off...
Disconnect from Orbit Network
Orbit Configuration
Modules on PIM Network: 2
[001] 143ZB45P01: DP 1 mm
[002] 100GC49P25: DP 2 mm
The selected module can be dragged to reorganise the network order
Send Changes in settings to the Device...
Find ALL Modules
Clear All Modules
Press Probe to Add
Add Module By ID
Delete Selected Module
This is only available for certain options (eg the LTH Laser)
Setup Selected Module
Network Settings
DP Resolution: 16 Bit
DP Averaging: 16 Readings
EIM Input Type: Differential
EIM Quadrature Type: -
Quadrature X4 (Every Level change)

9.1.3. Measurement Resolution, Averaging and Bandwidth

The Orbit PIM has the ability to set the probes into three resolution options, 14 bit, 16 bit (default factory setting) and 18 bit. The table below shows the best resolution (1 bit that is theoretically possible) with different probe measurement ranges.

Range mm	0.5	1	2	5	10	20
Resolution µm (18 bit)	0.00	0.00	0.01	0.02	0.04	0.08
Resolution µm (16 bit)	0.01	0.02	0.03	0.08	0.15	0.31
Resolution µm (14 bit)	0.03	0.06	0.12	0.31	0.61	1.22

Averaging improves the signal to noise ratio, but reduces the measurement bandwidth. Generally, using a higher resolution requires more averaging. The averaging is expressed in terms of the number of base reading cycles for the probe where a reading cycle corresponds to 256uS. The update rate of the Orbit PIM depends upon the size of the network.

9.1.3.1.Parameter scaling

Parameters are provided externally within the parameter map for each modules Reading, Max, Min and UOM (Units Of Measure). The Reading, Max and Min parameters are all 32 bit integers with an implied number of decimal places which in turn depends on the UOM used by the module.

The UOM Parameter is enumerated and the table below provides enumeration value, Units Of Measure and the number of implied decimal places in the Reading / Max / Min parameters for the module.

UOM Parameter eNum Value	Units Of Measure	Implied Decimal Places
0	NA / Unknown	0
1	mm	7
2	mA	7
3	V	7
4	DegC	7
5	g	7
6	inch	7
7	kPa	7
8	psi	7
9	mVpV (mV/V)	7
10	mil	7

9.1.4. WCM / WHT Channel Configuration and usage

The WCM module is an interface to Solartron WHTs (Wireless Handtools - both single and multi-channel variants), and the PIM supports the WCM modules within its network.

For more information regarding the WCM and WHT’s themselves, please see the Orbit Module manual (WCM section) and the wireless device’s manual.

This section of this document aims to describe the implementation, configuration and usage of the WHT Bluetooth “Channel’s” within a PIM network.

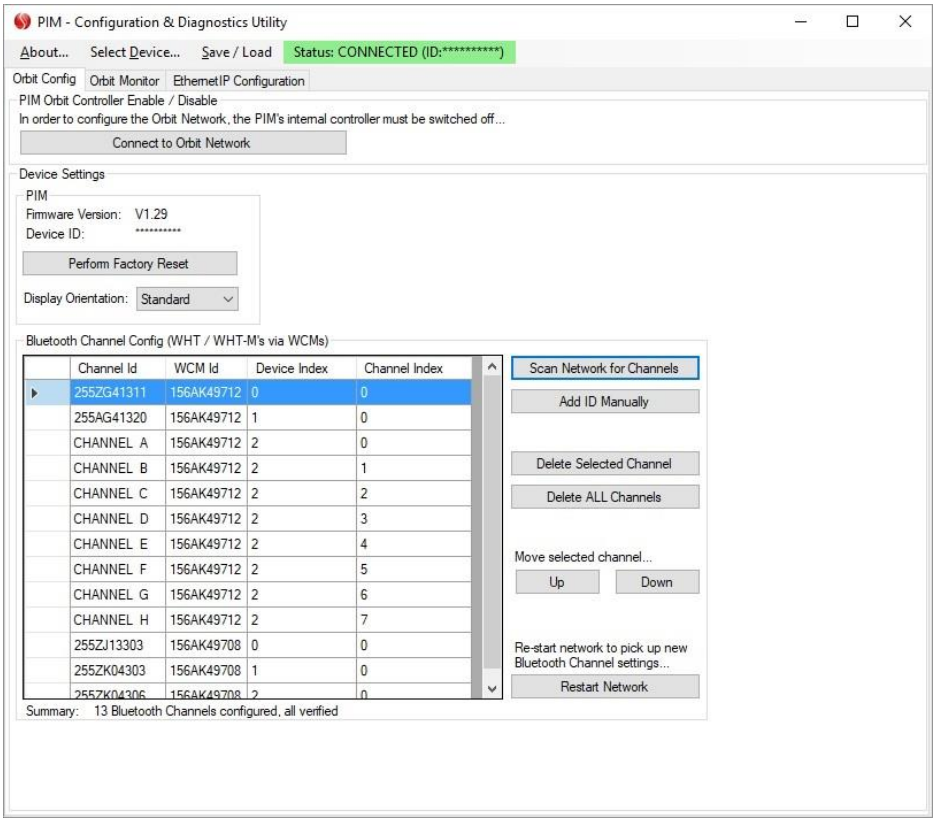
The following steps must be carried out to setup a Wireless device for operation with a PIM via WCM modules:

- Configure the WCM to connect to the specific wireless device's ID. Use the WCM_Configurator application to do this (part of the Orbit Support Pack for Windows). Please see the Orbit Module manual (WCM section) for details. Note: choose the appropriate PIM <*ID*> "Orbit network" from the combo box on the Orbit tab.
- If not already, power on the wireless device. The WCM will automatically connect to the wireless device. If the WCM fails to connect to the wireless device, it may require a power-on reset to successfully scan.
- Start the PIM Utility application and add the WCM to the PIM's module list via the Orbit Configuration Tab
- In the "Orbit Config" tab of the PIM Utility (see screenshot), click "Scan Network for Channels". Once scanned, all available channels are shown within the "Bluetooth Channel Config" table provided.
    - Note that the channel order can easily be altered using the available control buttons.

Below shows an example of a PIM configured with WCM's and showing all available Bluetooth channel.
In this example. 2x WCMs are configured, each with three wireless devices

- WCM1 (156AK49712)
    - Wireless Device 0 (1 channel - 255ZG41311) = WHT
    - Wireless Device 1 (1 channel - 255ZG41320) = WHT
    - Wireless Device 2 (8 channels) = WHT-M
- WCM2 (156AK49708)
    - Wireless Device 0 (1 channel - 255ZJ13303) = WHT
    - Wireless Device 1 (1 channel - 255ZK04302) = WHT
    - Wireless Device 2 (1 channel - 255ZK04306) = WHT

= 13 channels in total.

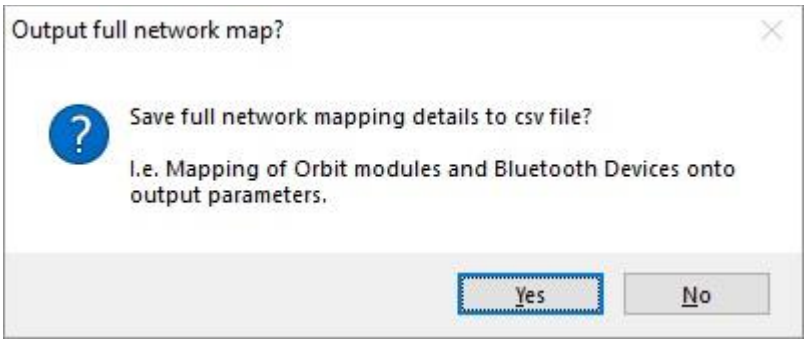


As well as automatically scanning for known Bluetooth devices and their channel information (extracted from WCM modules), it is also possible to add a Bluetooth 'Channel' purely using its ID (Add ID Manually button) – this helps when configuring a system while the WHT's are not physical available. In this instance, once the WHT devices are found by the WCMs, they will be automatically included at the relevant position within parameter mapping (see section 9.1.4.1).
Note that the manually entered channel ID **must** match the actual channel ID for this to work.

Note: When scanning or adding manually, the Device Index and Channel Index columns can only be populated if the WCM device has actually connected to the Bluetooth WHT since the last power up.

9.1.4.1.Module and Channel Parameter Mapping

As the Orbit module data is mapped into the external protocol parameter map sequentially, any Bluetooth channels are therefore appended to the end of the list of physical Orbit modules. Once scanning for Bluetooth channels is completed, a prompt is provided to output the entire external parameter mapping to a CSV file…



Selecting yes will provide a CSV file describing the external parameter mapping onto modules and Bluetooth channels, an example is shown below: -

	A	B	C	D	E	F	G	H	I	J	K
1	Parameter mapping for PIM Id: **********										
2	Note: Output parameter details here show 'Orb_ChX' which refers to the source for Orb_ChX_Reading _Status _MAX _MIN & _UOM for that output 'number' (X).										
3											
4	Orbit Modules...										
5	Output Number	OrbitId	ModuleType	Stroke							
6	Orb_Ch1	110AJ38P03	DP	10							
7	Orb_Ch2	156AK49712	WCM	0							
8	Orb_Ch3	169AE38504	AIM	2							
9	Orb_Ch4	156AK49708	WCM	0							
10											
11	Bluetooth Channels...										
12	Output Number	SourceID	WCMId	WCMDeviceIndex	WCMDeviceChannelIndex						
13	Orb_Ch5	255ZG41311	156AK49712	0	0						
14	Orb_Ch6	255AG41320	156AK49712	1	0						
15	Orb_Ch7	CHANNEL A	156AK49712	2	0						
16	Orb_Ch8	CHANNEL B	156AK49712	2	1						
17	Orb_Ch9	CHANNEL C	156AK49712	2	2						
18	Orb_Ch10	CHANNEL D	156AK49712	2	3						
19	Orb_Ch11	CHANNEL E	156AK49712	2	4						
20	Orb_Ch12	CHANNEL F	156AK49712	2	5						
21	Orb_Ch13	CHANNEL G	156AK49712	2	6						
22	Orb_Ch14	CHANNEL H	156AK49712	2	7						
23	Orb_Ch15	255ZJ13303	156AK49708	0	0						
24	Orb_Ch16	255ZK04303	156AK49708	1	0						
25	Orb_Ch17	255ZK04306	156AK49708	2	0						
26											

The above example shows four Orbit modules (two of which are WCM's with Bluetooth WHTs configured), together with 13 Bluetooth Channels of data. All these parameters are mapped onto the external network at the parameter locations indicated. I.e. Bluetooth channels start at Orbit Channel 5.

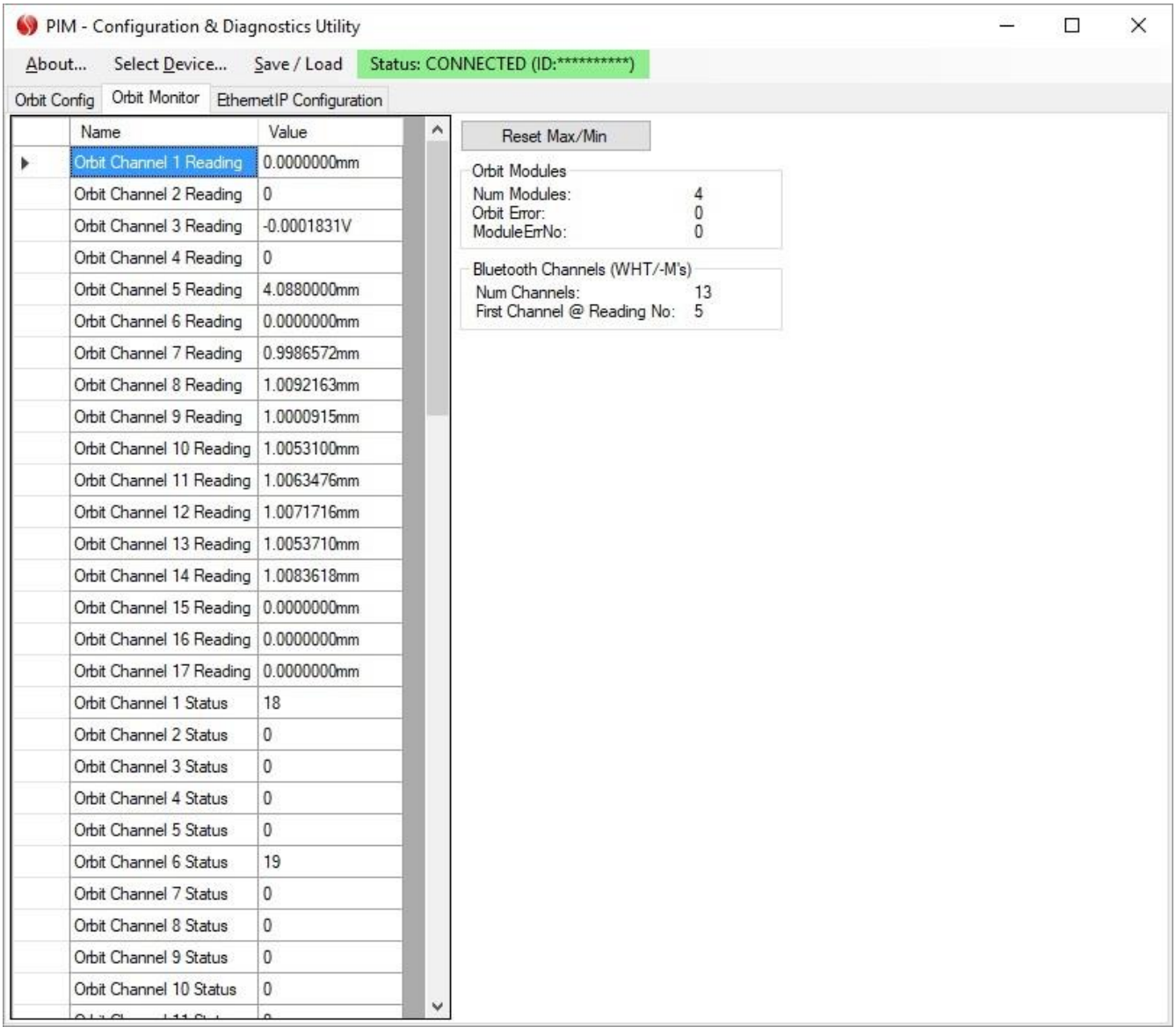
9.2. Orbit Monitoring Tab

Selecting the "Orbit Monitor" tab provides a view of the Orbit Network Information, including the Reading, Max, Min and Status of each module (or Bluetooth channel) on the network.

This tab also provides the Orbit Network Error Status and number of modules as well as a button for resetting Max / Min for all modules.

As well as the above, the monitor tab also shows a brief summary of which readings are from physical Orbit Modules and which readings are from Bluetooth Channels via WCMs.

The diagram below shows the Orbit Monitoring tab and its controls. Note the PIM has four Orbit modules configured (two of which are WCM's) on the Orbit Network as well as 13 Bluetooth channel readings, with the Bluetooth channel readings starting at Orbit reading number 5 on the external network.



9.3. Saving / Loading configuration

The Saving / Loading of configuration within the PIM is segregated into three sections: -

- Orbit Network Settings and Setup.
- External Protocol Settings
- Bluetooth Channel Configuration Settings (via WCM type modules).

9.3.1. Saving PIM configuration to a file.

To save the complete setup / configuration of a PIM module, select the “Save / Load” menu, then “Save”.

A file save dialog will be provided to allow selection of file name / location to save.

Notes: -

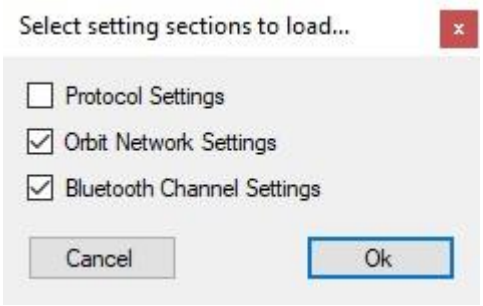
- The Save / Load menu item is disabled if no PIM module is connected.
- When saving, all sections of settings are saved to file.
- If Orbit Modules are not present at the time of saving, the network restoration section of the save file will be incomplete.
    - This will not be a problem if the physical network is setup independently and subsequently connected to the PIM.
- The Saving and Loading process require multiple communications interface re-configuration steps and does take a significant amount of time.
- All PIM settings files have the extension *.pim.

9.3.2. Loading PIM configuration from a saved file.

To Load settings from a previously saved file, select the “Save / Load” menu, then “Load”.

A file selector dialog will be provided allowing selection of the relevant settings file.

Once the settings file is selected, the user in then prompted with a form to select which areas of settings should be configured from the file – allowing the user to ‘cherry-pick’ which settings they wish to employ from the file. The section selection form is shown below: -



Check the appropriate boxes for desired loading sections and click Ok to perform the ‘Load’.

Notes: -

- ‘Protocol’ settings are ‘un-checked’ by default, whereas other sections are ‘checked’ by default.

- Loading Orbit Network Settings will also perform initialisation of the physical Orbit Network if it present.
    - Any failure to re-configure the attached network to that which was saved will be indicated with a warning message.

- The Saving and Loading process require multiple communications interface re-configuration steps and does take a significant amount of time.

- All PIM settings files have the extension *.pim.

9.4. Module Status Codes

Modules can report many status codes however the more common are shown below: -

Module Status Code	Orbit Error	PIM Error	Description
0			All Ok
18	✓		Under Range
19	✓		Over Range
10	✓		Bluetooth channel reading not available
256		✓	No Module Configured
512		✓	unsupported module type
768		✓	Timeout occurred on reading module

The display on the PIM will show a reading, UnderRange, OverRange or Error for all other error codes. The actual error number can be read from parameters.
For a full list of Orbit error, please refer to the Orbit Software Manual (Orbit Errors section)
To decode an Orbit error code:

- Add 8448 (0x2100) to the Module Status Code (Step1).
    - E.g. for Module Status Code 19, this works out as 8467
- Run the “Orbit Library Test” utility (part of the 'Orbit3 Support Pack for Windows'. This can be downloaded from the Solartron Metrology website).
- In the Help menu, select “Decode Orbit Error” and type in the number from step1
    - A textual description of the error should be displayed.
    - E.g. for 8467 (for Module Status Code 19), this reports: “Over Range”.

10. Miscellaneous

10.1. Firmware Upgrades

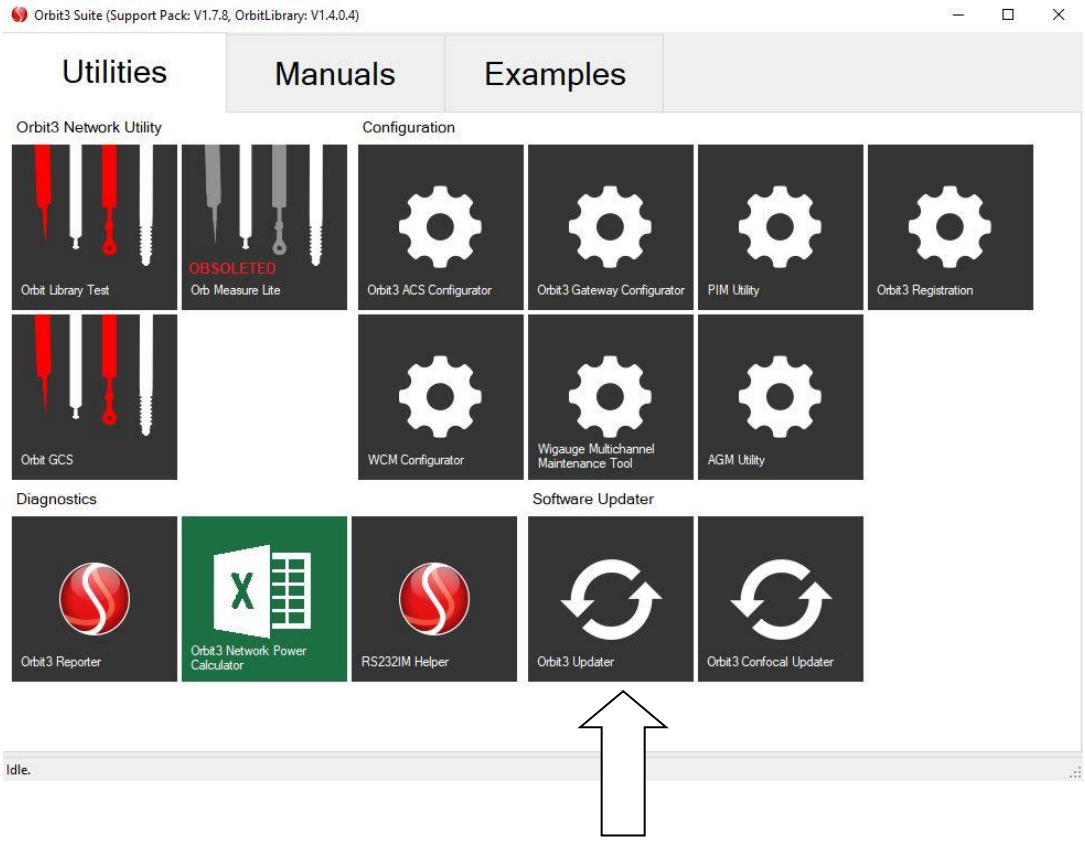
From time to time, enhancements may become available for the Orbit range, including the PIM itself as well as the connected Orbit Modules.

These product firmware upgrades can be implemented using the Orbit3 Updater utility, via the USB Mini B port on the rear of the unit. The PIM itself and the connected orbit modules can all be updated using this mechanism.

The unit must be powered in the normal way, as it is not powered via the USB lead. Note that the PIM must **not** be connected via the PIM Utility application.

The Orbit Updater utility is part of the 'Orbit3 Support Pack for Windows'. It can be downloaded from the Solartron Metrology website.

Once installed, it is located via the Orbit Suite: -



Follow the on screen instructions for the Updater.

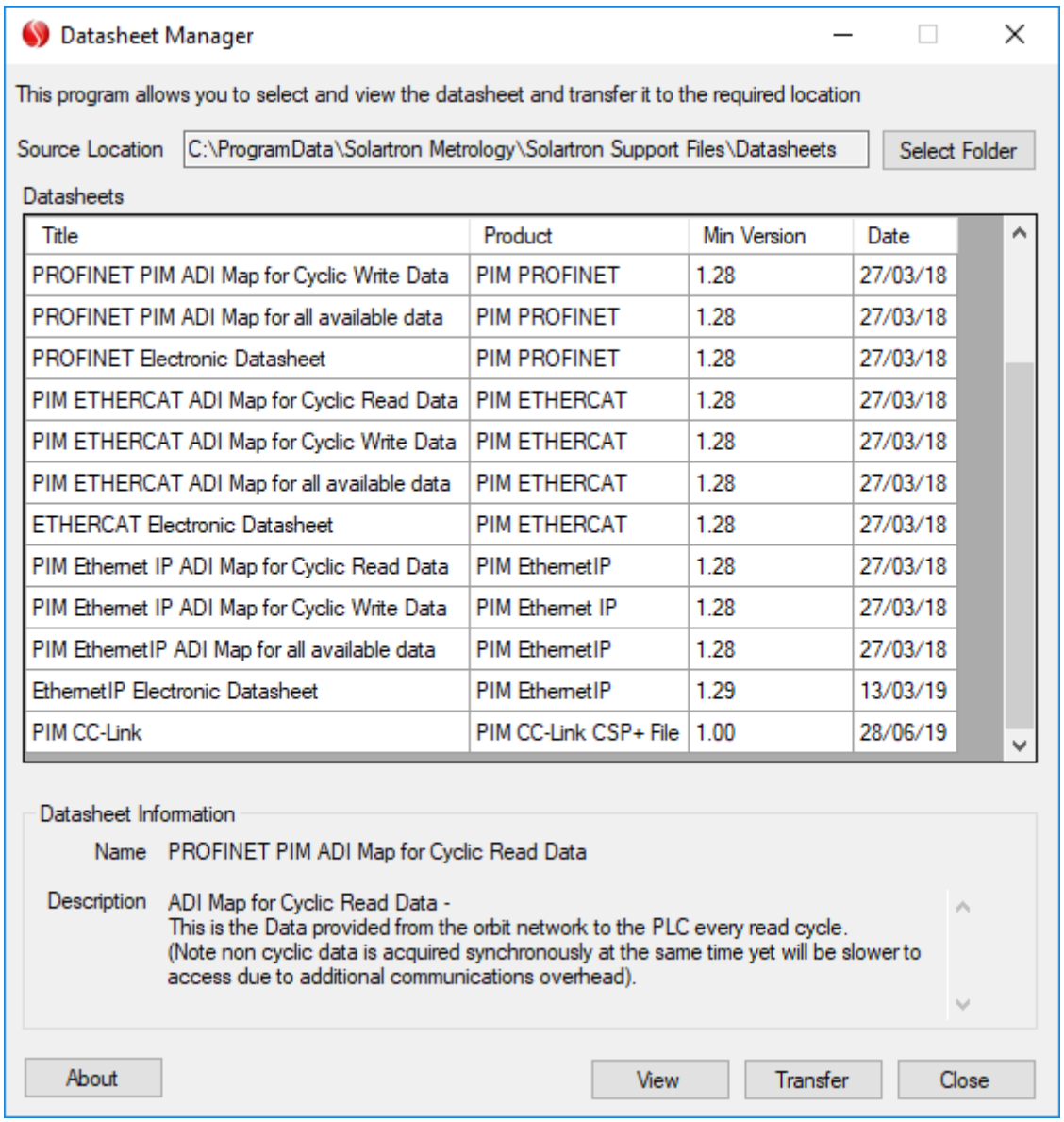
Note. After running the firmware upgrade it is advisable to power cycle the Orbit PIM and its Orbit Network to allow the changes to fully take effect.

11. PLC Network Protocols

There are a number of variants of PIM (Ethernet/IP, Profinet, ModbusTCP, ETHERCAT and CC-Link), each with their own ADI(Register) maps and settings, these settings have been grouped together in the setup application where possible, also where possible the register map and cyclic data has been kept as similar as possible; however register details should be checked in the provided ADI csv files.

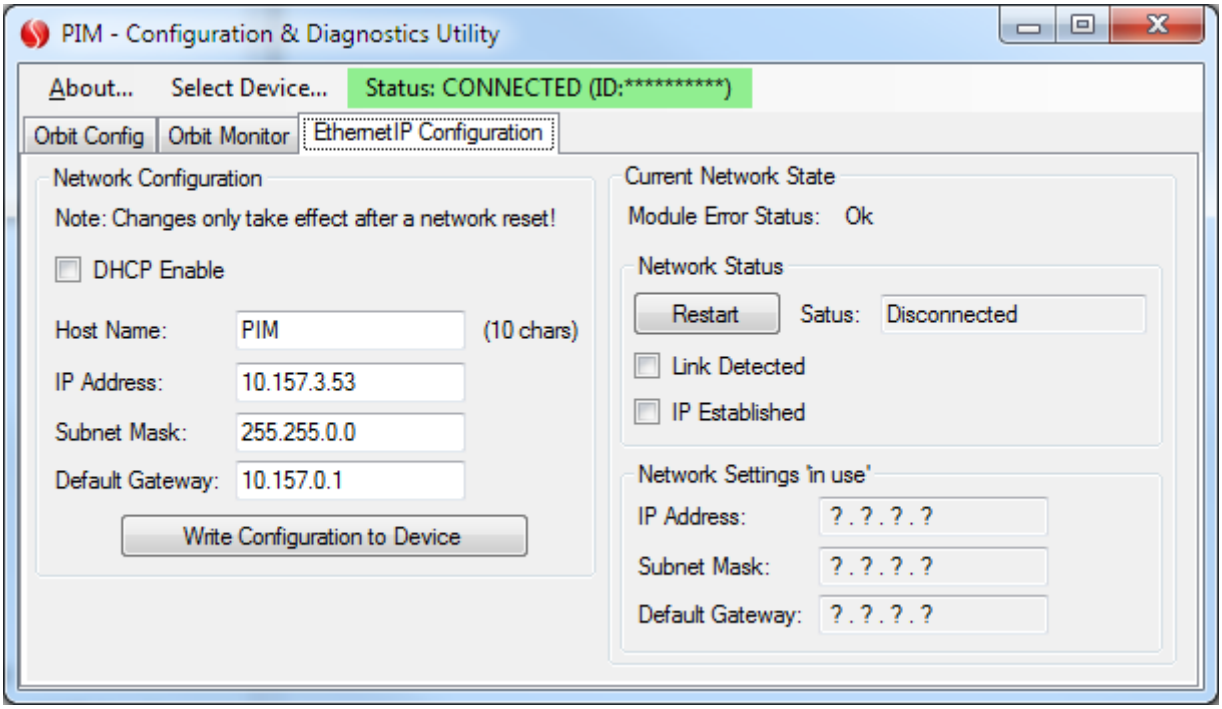
Electronic data sheets are provided with supporting protocols (currently Ethernet/IP, ModbusTCP, ETHERCAT, PROFINET and CC-Link). These are available via the Datasheet Manager from the Orbit Suite.

Note. For the earlier version of the Ethernet IP product (part no. 977037-3), please consult Technical Support for the appropriate files; do not use the Ethernet IP files supplied with the Datasheet Manager.



11.1. Configuration Tab (Ethernet devices)

The Network configuration tab on the Windows Application will appear as shown below (the tab name is protocol specific (NOTE This tab is not available for ETHERCAT PIM devices)): -



The left side of the interface provides controls for configuring the connection to the Network and the right side shows the current status of the connection.

If DHCP is ‘Enabled’, the configuration controls for IP Address, Subnet Mask and Default Gateway are disabled as the unit will obtain network settings from the DHCP server. The only setting available with DHCP Enabled is the “Host Name”.

The settings obtained will be shown in the Current Network State fields once the connection has been established – whether a fixed IP address etc is in use (DHCP Disabled) or not (DHCP Enabled). This provides conclusive values for the settings the device is using on the Network.

When settings have been updated, click the “Write Configuration to Device” button to update the PIM with the new settings – you will be provided with an option to also restart the external interface, (the external interface must be restarted to apply settings).

The external Network interface can be restarted manually using the button provided, however when changing the state of DHCP Enable, re-connecting can take some time.

11.2. EtherNet/IP

The Orbit® PIM EtherNet/IP variant product provides communications between an Orbit® network of instruments and an EtherNet/IP Controller / PLC.

This section provides the information required to configure the PIM on the EtherNet/IP Network as well as accessing parameterised information from the Orbit® Network via the PIM’s EtherNet/IP interface.

It does not attempt to cover any information regarding the specific programming or configuration of any Controller / PLC. Please see your Controller / PLC documentation.

The EtherNet/IP interface supports 10/100Mbit, full or half duplex operation.

11.2.1.Communications Information

The EtherNet/IP variant of the PIM provides both Explicit and Implicit messaging. The following sections describe these interfaces and the settings needed to extract information.

Note as well as setting IP Configuration though the Solartron PIM utility the IP Address can be set using Anybus IPConfig application, However the PIM Utility is required to setup the Modules and orbit configuration.

It is possible to view the register information through a web browser by typing in the IP Address displayed on the PIM module into a web browser and then selecting the parameters screen.

11.2.1.1.Explicit Messaging

These types of messages are used to access specific parameter values individually.

Note: No Data Synchronisation of module Readings can be maintained with this type of messaging. A read of a Module Reading parameter will provide the latest value available, subsequently accessing another module reading parameter will not necessarily yield a reading from the same ‘set’ of data on the Orbit Network i.e. the entire Network of Orbit Readings could have been updated between Explicit Parameter ‘Reads’.

The Explicit Messaging Settings required to access parameter instances are as follows: -

Service #	**0x01**
Class #	**0x0F**

The parameter instance numbers, parameter type and detailed information are provided in the file “EthernetIP 977152-3 ADI_Map.csv”

11.2.1.2.Implicit Messaging

These types of messages are used to read or write a ‘block’ of data.

Note: The Orbit Network ‘Readings’ are available in the ‘read’ block of data, and the data contained within a reply to this type of message will contain a set of Synchronised Readings from the Orbit Modules, where Synchronised means all the readings were sampled within a 256uS window of each other.

The Implicit messaging settings required to communicate with the PIM are as follows: -

Unicast Connection Type.	
Read Assembly Instance	**100**
Write Assembly Instance	**150**
Configuration Assembly Instance	**3**

For details of the Read-able block using implicit messaging, please see the file “EthernetIP 977152-3 CyclicRead.csv”, which includes details of total block size, parameter types as well as byte offsets in the response ‘block’ of data.

For details of the Writable block using implicit messaging, please see the file “EthernetIP 977152-3 CyclicWrite.csv” , which includes details of total block size, parameter types as well as byte offsets in the ‘block’ of data.

11.3. PROFINET

The Orbit® PIM PROFINET variant product provides communications between an Orbit® network of instruments and an PROFINET Controller / PLC.

This section provides the information required to configure the PIM for the PROFINET Network as well as accessing parameterised information from the Orbit Network via the PIM’s EtherNet/IP interface.
It does not attempt to cover any information regarding the specific programming or configuration of any Controller / PLC. Please see your Controller / PLC documentation.

The PROFINET interface supports 10/100Mbit, full or half duplex operation.

11.3.1.Communications Information

The PROFINET variant of the PIM provides both Explicit and Implicit messaging. The following sections describe these interfaces and the settings needed to extract information.

A GSDML (electronic data sheet) file is included in the support pack with the device information including register information.

For details of the Read-able block using implicit messaging, please see the file “PROFINET 977038-3 CyclicRead.csv”, which includes details of total block size, parameter types as well as byte offsets in the response ‘block’ of data.

For details of the Writable block using implicit messaging, please see the file “PROFINET 977038-3 CyclicWrite.csv” , which includes details of total block size, parameter types as well as byte offsets in the ‘block’ of data.

Note as well as setting IP Configuration though the Solartron PIM utility the IP Address can be set using Anybus IPConfig application, Proneta or TIA Portal (as standard), However the PIM Utility is required to setup the Modules and orbit configuration.

It is possible to view the register information through a web browser by typing in the IP Address displayed on the PIM module into a web browser and then selecting the parameters screen.

11.4. ModbusTCP

The ModbusTCP PIM variant provides communications between an Orbit® network of instruments and an ModbusTCP Master.
The address ranges define the cyclic and implicit data sections with Input registers and output from 0 to being the cyclic data and holding registers from 4112 (as detailed clearly in the ADI map “ModbusTCP 977150-3 ADI_Map.csv”)

For details of the Read-able block using implicit/cyclic messaging, please see the file “ModbusTCP 977150-3 CyclicRead.csv”, which includes details of total block size, parameter types as well as byte offsets in the response ‘block’ of data.

For details of the Writable block using implicit/cyclic messaging, please see the file “ModbusTCP 977150-3 CyclicWrite.csv” , which includes details of total block size, parameter types as well as byte offsets in the ‘block’ of data.

Note as well as setting IP Configuration though the Solartron PIM utility, the IP Address can be set using Anybus IPConfig; however the PIM Utility is required to setup the Modules and orbit configuration.

It is possible to view the register information through a web browser by typing in the IP Address displayed on the PIM module into a web browser and then selecting the parameters screen.

11.5. ETHERCAT

The ETHERCAT variant of the PIM provides both Explicit and Implicit data sets. However, they are all communicated through the same Ethercat backbone. Note that there is a data latency reading the explicit non cyclic data.

The following sections describe these interfaces and the settings needed to extract information.

An ESI XML (electronic data sheet) file is included in the support pack (Datasheet Manager) with the device information including register information (for Twincat3 using the visual studio IDE this should be copied to c:\Twincat\3.1\Confic\IO\Ethercat\ (path will vary if the user has not installed to the standard location)).

For details of the Read-able block using implicit messaging, please see the file “ETHERCAT 97749-3 CyclicRead.csv”, which includes details of total block size, parameter types as well as byte offsets in the response ‘block’ of data.

For details of the Writable block using implicit messaging, please see the file “ETHERCAT 977149-3 CyclicWrite.csv” , which includes details of total block size, parameter types as well as byte offsets in the ‘block’ of data.

Please note the PIM Utility is required to setup the Modules and orbit configuration.

11.6. CC-Link

The Orbit® PIM CC-Link variant product provides communications between an Orbit® network of instruments and a CC-Link Controller / PLC.

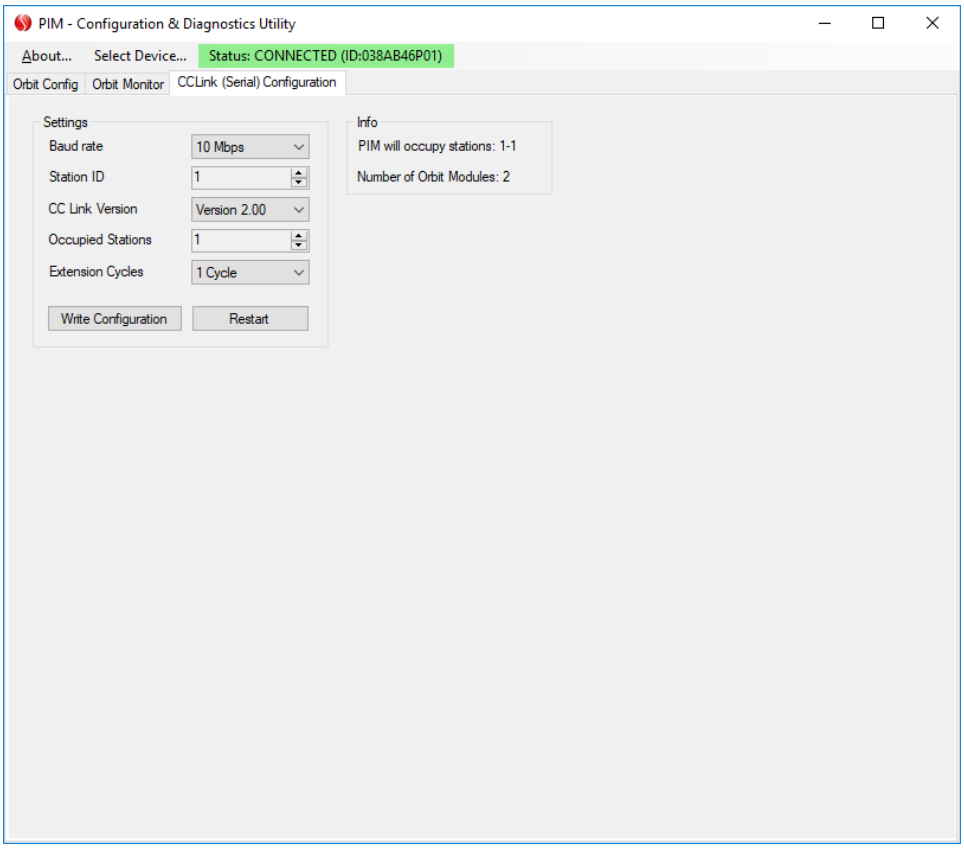
This section provides the information required to configure the PIM for the CC-Link network as well as accessing parameterised information from the Orbit® Network via the PIM’s CC-Link interface.
It does not attempt to cover any information regarding the specific programming or configuration of any Controller / PLC. Please see your Controller / PLC documentation.

The CC-Link variant of the PIM allows the following parameters to be configured:

Parameter	Available Values
Baud Rate	156 kbps 625 kbps 2.5 Mbps 5 Mbps 10 Mbps
Station ID	1-32
CC Link Version	Version 1.10 or Version 2.00
Occupied Stations	1-4 Stations
Extension Cycles	CC-Link version 1.10: Only single operation. CC-Link version 2.00: 1, 2, 4 or 8 extension cycles are available.

11.6.1.Configuration

The CC-Link configuration tab on the Windows Application will appear as shown below: -



The left side of the interface provides controls for configuring the connection to the Network and the right side shows the current status of the connection.

When settings have been updated, click the “Write Configuration to Device” button to update the PIM with the new settings – you will be provided with an option to also restart the external interface, (the external interface must be restarted to apply settings).

The CC-Link interface can be restarted manually, regardless of whether any settings have been changed using the Restart button provided.

11.6.2.Communications Information

The CC-Link PIM can provide readings and status information from 2 to 64 Orbit® Modules depending on the how the CC-Link network and individual PIM are configured.

Version	1.10				2.00															
Cycles	1				1				2				3				4			
Stations	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Number of Orbit Modules	2	4	6	8	2	4	6	8	4	8	12	16	8	16	24	32	16	32	48	64
Module Status Available	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	x	✓	✓	✓	x	✓	✓	✓

Status information (if supported) for each Orbit® module is mapped into the Remote Input (RX) area of the PIMs address space. The status code for each module is packed into 8-bits.

Readings from each Orbit® module are mapped into the Remote Register (RWr) area of PIMs address space. The reading for each module is packed into two words (32-bits).

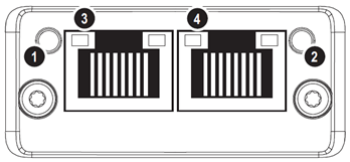
An CSP+ file for the PIM is included in the support pack (Datasheet Manager) which can be imported into the CC-Link Master/PLC to aid development.

For connections, see CC-Link connections

12. Status Indicators & Protocol Connections

12.1. Ethernet Products

#	Item
1	Network Status LED
2	Module Status LED
3	Link/Activity LED (port 1)
4	Link/Activity LED (port 2)



Anybus Module

Network Status LED (1)

Note: A test sequence is performed on this LED during start-up

LED State	Description
Off	No power or no IP address
Green	Online, one or more connections established (CIP Class 1 or 3)
Green, flashing	Online, no connections established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)

Module Status LED (2)

Note: A test sequence is performed on this LED during start-up.

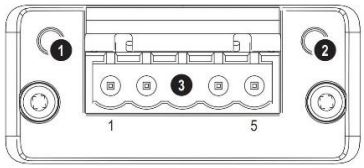
LED State	Description
Off	No power
Green	Controlled by a Scanner in Run state
Green, flashing	Not configured, or Scanner in Idle state
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Red, flashing	Recoverable fault(s). Module is configured, but stored parameters differ from currently used parameters.

LINK/Activity LEDs (3 & 4)

LED State	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

12.2. CC-Link

#	Item
1	RUN LED
2	ERROR LED
3	CC-Link connector



Anybus CC-Link Module

CC-Link Connector

Pin	Signal	Description
1	DA	Positive RS485 RxD/TxD
2	DB	Negative RS485 RxD/TxD
3	DG	Signal Ground
4	SLD	Cable Shield
5	FG	Functional Earth

Note.
For proper EMC behaviour, the Anybus CC-Link Module must be properly connected to earth via the FG pad.

RUN LED

LED State	Description
Off	No network participation, timeout status (no power)
Green	Participating, normal operation
Red	Major fault (FATAL error)

ERROR LED

LED State	Description
Off	No error detected (no power)
Red	Major fault (Exception or FATAL event)
Red, flickering	CRC error (temporary flickering)
Red, flashing	Station Number or Baud rate has changed since startup (flashing)

13. Accessories

806127-xxx	Orbit cables specifically designed to ensure good system performance. Available in various lengths.
804067-3	Screwlock kit (supplied with cables).
971000-3	TCON connector (for mounting/connecting Orbit modules)
209501	Orbit3 Earth and Mounting Bracket – used to mechanically lock the TCONS together in environments subject to vibration and to produce a good earth to chassis at the TCON backbone.
802968	Terminator Connector used to provide a matched impedance and to be connected at the end of the TCON backbone

14. Return of goods

See user leaflet

15. Revision History

REVISION	DATE	COMMENTS
1	14/07/15	Initial issue
2	04/08/15	Added Installing the Orbit3 Support Pack for Windows® software
3	11/08/16	Module Units Of Measure Parameters added.
4	08/05/17	Added PROFINET and ModbusTCP products
5	24/05/17	Added Datasheet manager
6	02/11/17	In PLC Network Protocols added note for earlier Ethernet IP product: 977037-3
7	27/11/17	Out of date PIM screenshot removed in Grounding, cables and power supplies
8	27/02/18	Added ETHERCAT product
9	06/02/19	WCM / WHT support information added.
10	11/03/19	WCM / WHT Channel Configuration and usage improved. Firmware Upgrades updated. Module Status Codes updated.
11	24/06/19	CC-Link added
12	27/11/19	Section 9.3 added to include “Save / Load” details. All images of utility updated to include “Save / Load” menu item.