PIP – PROTECTION INTERFACE PLATFORM

User Manual

MAG-311 Version 4, February 2024

Designed and manufactured in Australia by Ampcontrol Pty Ltd

WARNING!

The **warning** symbol highlights a potential risk of **injury or death**.

Please share these warnings with other operators.

CAUTION!

The **caution** symbol highlights a potential risk of **damage to equipment**.

Please share these cautions with other operators.

NOTE

The **note** symbol highlights **key information**.

Please share these notes with other operators.

ENVIRO

The **enviro** (environmental) symbol highlights areas which may have an impact on the surrounding **fauna and/or flora**.

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Before You Begin

Thank you for purchasing the Ampcontrol PIP.

WARNING!

In the interests of **safety and correct equipment operation**, please take the time to read and understand the content in this manual.

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DEFINITIONS

Term	*Definition*
2FB	2x Fixed Outlet IO Block
4FB	4x Fixed Outlet IO Block
2WB	2x Withdrawable Outlet IO Block
4WB	4x Withdrawable Outlet IO Block
CB	Circuit Breaker
CCM	Cable Connection Module
EC	Earth Continuity
EFLO	Earth Fault Lockout
EL	Earth Leakage
ELV	Extra Low Voltage
EMF	Electro-Motive Force
FC	Frozen Contactor
FLC	Full Load Current
FMEA	Failure Modes and Effect Analysis
Healthy	A state in which nothing should trip during the transition of the state under test
HMI	Human Machine Interface
IPE	Integrated Protection Relay Type E
LCM	Load Connection Module
LOV	Loss of Vacuum
MC	Main Contactor
MEM	Main Electronics Module
OL	Overload
OTS	Outlet Test System
Outlet	The interface that sits on the load side of the Main Contactor
PIP	Protection Interface Platform
PIPS	Protection Interface Platform Screen
PI2	Protection Interface IO Block Configuration 2
PIP	Integrated starter with AS/NZS 2081 protection for underground hard rock mines
RTD	Resistive Termination Device
Running	Main contactor closed and main contactor auxiliary indication in correspondence with the main contactors state (i.e. indicating that the main contactor is closed).
SC	Short Circuit
Start	A sequence beginning with a start command being issues from the PLC, the completion of several outlet pre-energising checks leading up to the closing of the main contactor
Stopped	Main contactor open and main contactor auxiliary indication in correspondence with the main contactor state (i.e. indicating that the main contactor is closed).
Trip	A fault condition which requires the opening of the main contactor or the circuit breaker (fault dependent) to clear the fault, or prevents the closing of the main contactor or circuit breaker
TXF	Transformer
UC	Under current
UV	Under Voltage

1 VERSION HISTORY

IP HMI Software Version History

Version	Release Date	Changes
V1	Original Release -	Original Release
V1.2	June 2022	Added additional features: - 'MCF Reset' setting moved to roll call process. - Display SC trip values on outlet settings page - 'Insulation Test' voltage setting for 3.3kV outlets. - Touch screen calibration. - Added Modbus TCP functionality.
V1.3	July 2022	Added outlet starting functionality when in fan bypass mode.
V1.4	August 2022	Added Additional features: - 'Authorisation State' feedback to EIP. - Authorisation consumption through EIP / MODBUS. - IPE-RV to compatible relays. - 0.5s wait states after EFLO and HV insulation tests. - PIP serial number to rollcall step.
V1.4.1	October 2022	Fixed UI Glitchs on iFan menus. - Unauthorised Remote DCB connections had a 'Remove' button rather than 'Approve'. - The Remote DCB Status widget didn't update when the other DCB Authorised the connection.
V1.4.2	October 2022	- The PIP will drop connection to a device which is marked as 'Target device not valid PIP'. - Improved invalid response functionality.
V1.4.3	November 2022	Improved outlet and system log systems for remote assistance and fault finding.
V1.4.4	November 2022	The Dip switches for a single outlet using a 2FBIO has been moved to Dip switch 1 and 8 on.
V1.4.5	January 2023	- Improved EIP obstruction implementation. - Modified Debug/OS logs to be stamped with the PIP time and increased the verbosity of some Debug/OS Logs. - Fixed Network setting refresh operation. - Improved screen switching functionality.
V2.0	August 2023	- Dual / Triple Feed control feature added. - Roll Call process revised so configuration is entered and not detected. - Added customer utilisation fields for the RTX descriptions.
V2.1	October 2023	- Modified the Actuator Position check when Withdrawable cassette is Isolated.

IP HMI OS Software Version History

Version	Release Date	Changes
V1	Original Release -	Original Release
V1.1	August 2022	Updated OS driver and Library files.

2 SAFETY AND OTHER WARNINGS

For safety reasons, the PIP and associated hardware must be installed, operated and serviced only by competent personnel. Please read and understand this instruction manual completely before installing, operating or servicing this equipment. Failure to install or operate this equipment in accordance with the instructions contained in this manual may create hazardous operating conditions.

2.1 Safe Use of Equipment

The equipment supplied has been designed and manufactured to ensure safe operation. The equipment must only be used within the design parameters.

The instructions within this manual must be observed as an aid towards achieving the safest possible installation.

Persons responsible for installation, maintenance, or operation, must observe the following instructions:

2.1.1 **Changes to Equipment**

Changes in the design and modifications to the equipment are not permitted. Unauthorised changes made to the hardware or operating firmware will void the manufacturer's warranty and may compromise the integrity of the system into which it is installed and other connected equipment.

2.1.2 **Equipment Knowledge**

Experience with, or understanding of, this equipment is essential for the safe installation and removal of the equipment. Therefore, please read and understand this manual prior to use. Competency based training courses are recommended and are available on request.

2.1.3 **Manual Handling**

Precautions have been taken to ensure all equipment is safe to handle and free from sharp edges. However, care should always be taken when handling equipment and gloves should be worn.

2.1.4 **Installation**

Correct operation depends on the PIP and associated equipment being installed and configured correctly.

2.2 Supplementary Documentation

The PIP User Manual is expected to be read in conjunction with the selected protection relay user manual as well as the equipment operation manual.

2.3 Requirements for Safe Operation

- Configuration of connected IP relays are to satisfy their respective requirements of safe use
- All requirements for safe operation should be integrated into the user’s own work procedures
- The PIP and associated hardware must be installed, operated and serviced only by authorised and competent personnel
- The PIP and PIPS are not designed for use in explosive atmospheres
- Do not operate in direct sunlight
- Do not operate the PIP and associated hardware outside of their electrical or mechanical ratings
- The PIP and associated hardware is designed for use within a suitably IP rated enclosure

3 RECEIVING AND STORAGE

3.1 Receiving

All possible precautions are taken to protect the equipment against damage during shipment; however, before accepting delivery, check all items against the packing list. If there is evidence of physical damage or missing items, please notify Ampcontrol immediately.

In the case of any discrepancies to the packing list. Keep a record of any claims and correspondence. Photographs are recommended.

Where practicable do not remove protective covers prior to installation unless there are indications of damage. Boxes opened for inspection and inventory should be carefully repacked to ensure protection of the contents or else the parts should be packaged and stored in a safe place. Examine all packing boxes, wrappings and covers for items attached to them, retain and store any approval documentation for your safety file as applicable prior to wrapping being discarded.

3.2 Inspection

Equipment that is found to be damaged or has been modified away from its published specification must not be used. Please contact Ampcontrol if the equipment is suspected to be different than that ordered or if it does not match the published specifications.

3.3 Storage after Delivery

When the equipment is not to be installed immediately, proper storage is important to ensure protection of equipment and validity of warranty.

All equipment should be stored indoors between 0–40 ˚C, preferably on shelves and protected from moisture and sunlight.

3.4 Unpacking of Equipment

The method of packing used will depend on the size and quantity of the equipment. The following cautions should be interpreted as appropriate.

CAUTION!

Take care when unpacking crates as the **contents may have shifted during transport**.

ENVIRO

The disposal of packaging materials, replaced parts, or components must comply with environmental restrictions without polluting the soil, air or water.

Ensure that any timber and cardboard used as **packaging is disposed of in a safe and environmentally responsible manner**.

Where possible, dispose of all waste products i.e. oils, metals, plastic and rubber products by using an approved recycling service centre.

4 PRODUCT DESCRIPTION

4.1 Overview

The Ampcontrol Protection Interface Platform (PIP) is an intelligent controller that is used to interface with the Ampcontrol Integrated Protection Relays. The platform standardises the interface between the latest protection relays offered by Ampcontrol and any external interfaces (PLC or Networks).

The platform consists of the following equipment:

- Protection Interface Module (PIP), the main control device
- Protection Interface IO Block (PI2), this is the system IO block
- PIP Screen (PIPS), an optional screen to be used with the PIP
- Distributed outlet IO blocks
    - 2FB – 2x Fixed Outlet IO Block
    - 4FB – 4x Fixed Outlet IO Block
    - 2WB – 2x Withdrawable Outlet IO Block (Ampcontrol OCS only)
    - 4WB – 4x Withdrawable Outlet IO Block (Ampcontrol OCS only)
- Protection Feeder Group (PFG) IO block, this provides dual and triple feed control functionality
- Desired Protection Relay(s)
    - IPE – Integrated Protection Relay Type IPE
    - OCS - Outlet Cassette System Protection Electronics
    - OCS-RV - Outlet Cassette System Protection Electronics (Residual Voltage Version)

4.2 Features

- Ethernet communications – Modbus TCP and Ethernet IP
- Remote desktop interface (VNC)
- Fan Interlock between controllers
- Ethernet/IP communications for real-time monitoring and control of system parameters and access to data logs

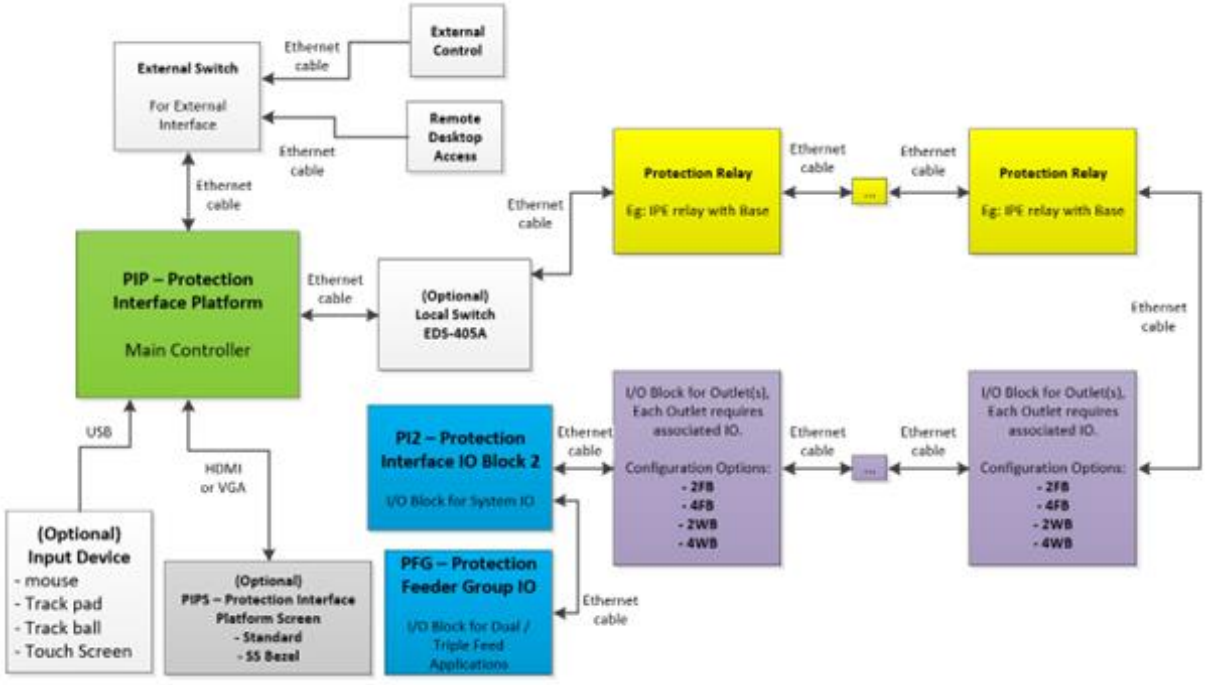


Figure 1: PIP System Block Diagram

5 INSTALLATION

5.1 General Warnings

These instructions have been designed to assist users of the PIP with installation.

Before the PIP can be installed, there are a number of things that need to be considered and understood to prevent incorrect or unsafe operation of the PIP or the system into which it is installed. Along with relevant competence, and an understanding of the target application, the following points should be considered:

5.1.1 **Ensure that the information provided in this user manual is fully understood.**

It is extremely important that the limitations and functionality of the PIP are understood to prevent incorrect installation and use from creating a potentially dangerous risk. If in doubt as to the nature of the limitations or their implication, consult a competent authority such as a supervisor or Ampcontrol technical representative.

5.1.2 **Ensure that the application into which the PIP is being installed has been properly defined, designed and approved.**

Any system intended to mitigate the risk of injury needs to be properly designed and implemented. Such a system must be the result of structured risk analysis with the outcomes used to define the system requirements. These requirements, in turn, will guide the choice of instrumentation, logic solvers and actuators needed to implement the system. Understanding the needs of the system will ensure proper selection of equipment.

5.1.3 **Ensure that the PIP will properly perform the required functions within the system design.**

It is important to understand how the PIP is intended to interact with other equipment within a system. For safe and reliable use, it is crucial that neither the PIP's logical operation nor its signalling be compromised by incompatibilities with connected equipment.

5.1.4 **Modifications of any form to the PIP are prohibited.**

The PIP as supplied has been designed and manufactured to comply with the requirements of protection standards. If modifications of any form are made to the PIP, the equipment may no longer be fit for use. If any modifications or damage to the PIP is evident, do not use the equipment and contact Ampcontrol for advice.

5.2 Mandatory Installation Practices

The following information must be adhered to when installing the PIP. Failure to adhere to this information may give rise to unsafe operation.

Using the PIP in a manner that exceeds its electrical, functional or physical specifications, or in a way that is contrary to its operating restrictions, may create risks to personnel and/or equipment resulting in injury or death.

- The PIP must be powered within the specified voltage range
- The installation of the PIP must be carried out by suitably trained and qualified personnel
- Identification labels fixed to the PIP must not be damaged, removed or covered
- The installation shall be in accordance with the relevant installation Standards/Codes of Practice
- PIP must not be modified. The unit is built to, and complies with the relevant standards and modifications to its design and construction will render the unit non-compliant
- Complete and accurate records of the installation(s) must be maintained
- Connections to the PIP should not be made or removed while powered

NOTE

If the PIP is to be used in a hazardous environment, it must be installed within suitably certified flameproof enclosure.

NOTE

The equipment is to be operated within an ambient temperature range of – 20 °C to + 40 °C.

5.3 Electrical Installation Overview

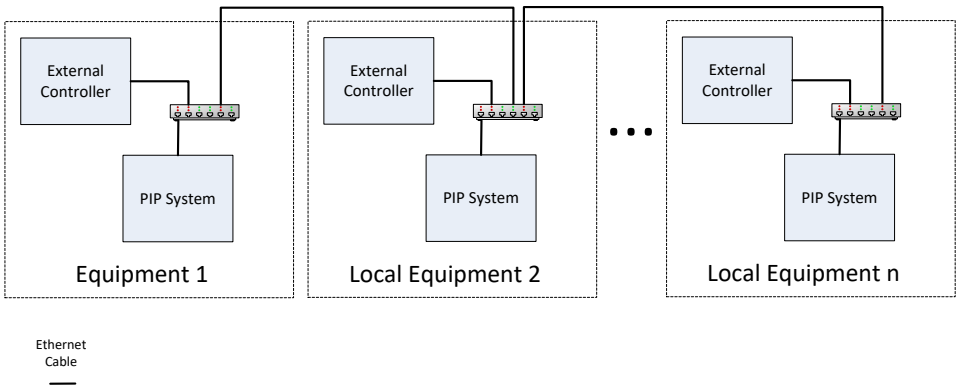


Figure 2: External PIP Communications Diagram

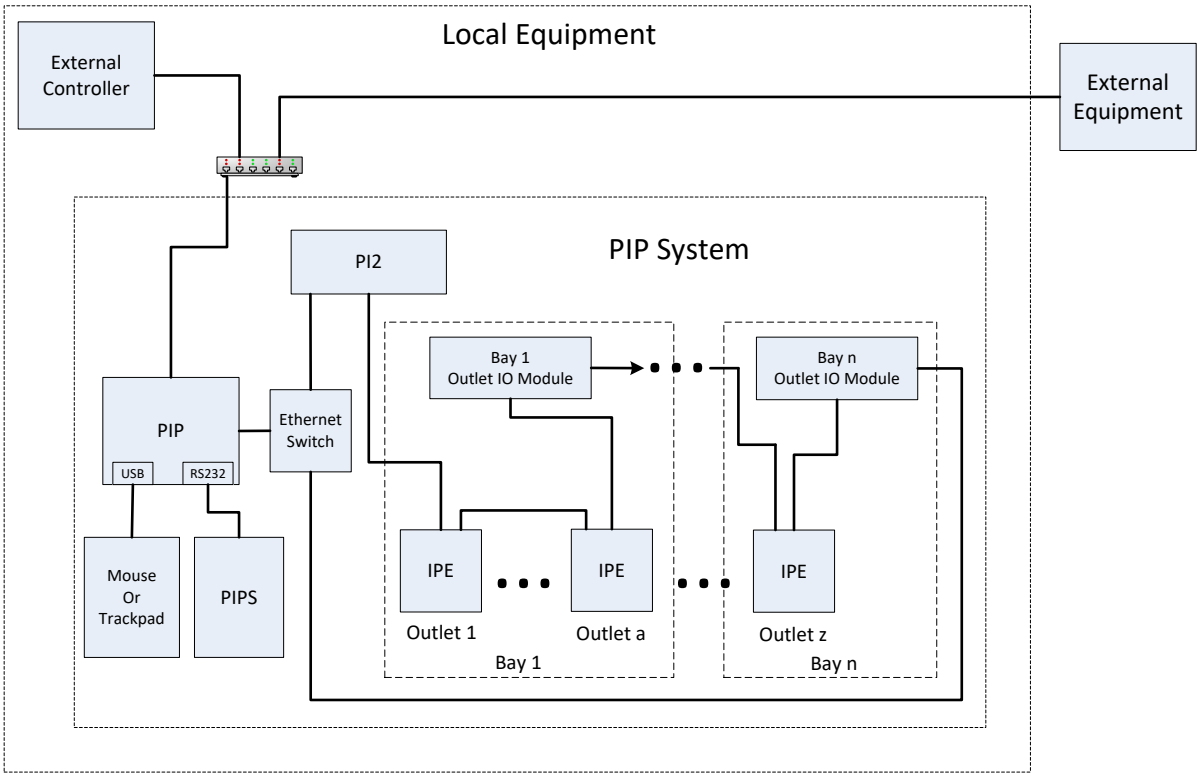


Figure 3: PIP System Communications Diagram

5.4 Equipment Installation Information

5.4.1 PIP Dimensions and Mounting Arrangement (198609)

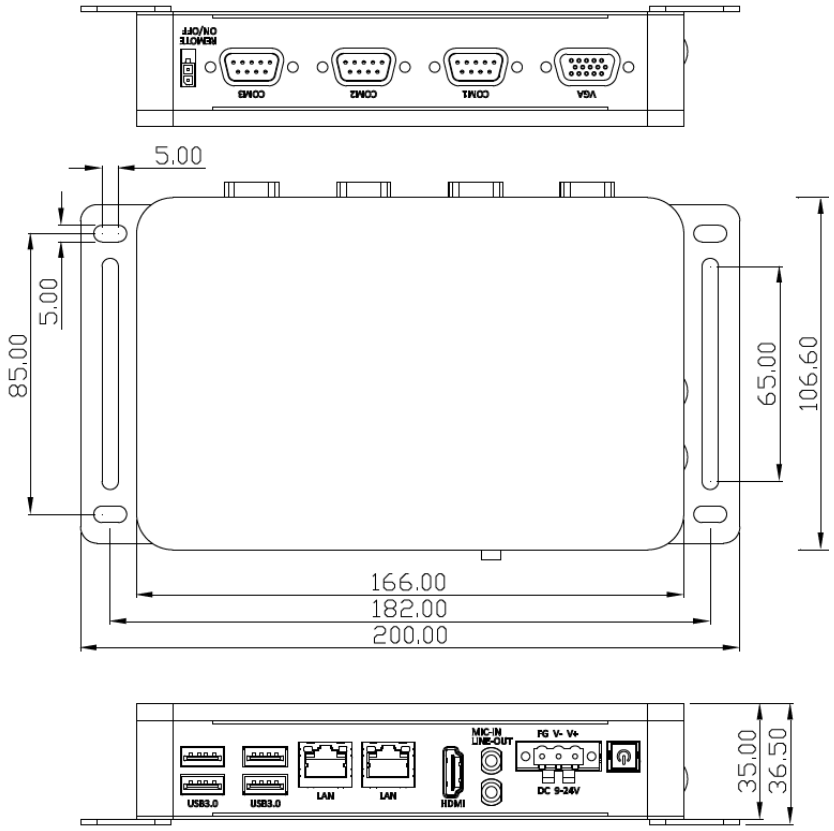


Figure 4: PIP Dimensions

5.4.2 PIP Electrical Connections

PIP Connector Type	Designation	Note
VGA	Leave Disconnected	
COM1	Leave Disconnected	
COM2	Leave Disconnected	
COM3	Leave Disconnected	
Power Plug (PG, V-, V+)	Power connections (9-24 VDC) Recommend an isolated 12-15 VDC supply with transient protection	- V+ = 12-15 V Positive - V- = 12-15 V Negative - PG = Earth Connection (see note below)
Mic in	Leave Disconnected	
Line out	Leave Disconnected	
HDMI	PIPS connection	Current resolution is 1280 x 800 (16:10 aspect ratio)

PIP Connector Type	Designation	Note
LAN Port 1	External Ethernet Connection. IP Address Configurable. **Default** IP Address: 192.168.0.10 **Default** Subnet Mask: 255.255.255.0 **Default** Gateway: 0.0.0.0	Port closest to HDMI connection.
LAN Port 2	Local Ethernet Connection for PIP system modules.	Port closest to USB inputs. For connection to Ampcontrol devices only (System IO, Protection Relays and outlet IO).
USB3	Input device connection **Default**: Beckhoff touchscreen	For input devices such as: - PIP Dongle - Touch screen - Mouse - Track pad
USB3	Input device connection **Default**: PIP Dongle	
USB3	Input device connection	
USB3	Input device connection	

NOTE

It is recommended that an **isolated 12-15 VDC power supply** with additional transient protection be used to supply the PIP.

Using a 24 VDC supply is at the upper limit of input range, where any power quality issues (surges, swells and power cycling) may cause damage to the power input circuitry.

NOTE

The **negative power supply** input should **not** be tied to the same earth as the Protective Ground (PG) terminal. This provides additional protection in the screen.

The pointing input device, used to navigate the operating screens, is an optional input depending on application. For applications utilising the HMI over a remote network do not require an input device to be connected to the PIP. If installations use a mouse, keyboard or touch screen device, these can be connected through the USB connections on the PIP.

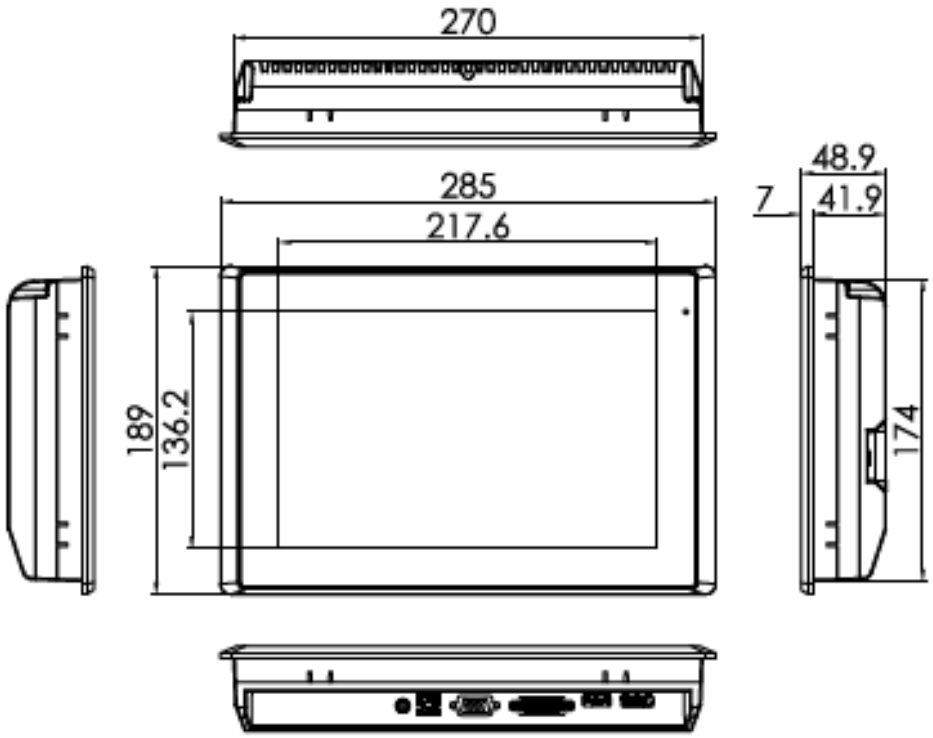
All alternative hardware connected to the PIP should be trialled during FAT to ensure device drivers are compatible. In addition to the hardware drivers, consideration of the environmental and expected usage scenarios must be considered in the selection of these devices.

NOTE

The **pointing device** input (mouse, keyboard, touch screen, etc) **is optional** and can be chosen by user.

When a touch screen is connected or used in the system, the PIP will provide a screen calibration option in the settings menu. It should be noted that the screen calibration can be performed remotely or virtually however this may cause inconsistent operation with the physical device. Calibration should only be performed on the physical touch screen.

5.4.3 **PIPS Mechanical Dimensions (198599)**



Mounting cut-out = 273 x 177

Figure 5: PIPS Dimensions

5.4.4 **PIPS Electrical Connections**

PIPS Connector Type	Designation	Note
Power Connector (3 Pin)	Power connections (9-36 VDC)	- V+ = 24 V Positive - V- = 24 V Negative - PG = Earth (see note below)
HDMI	PIP Connection, Video input	
USB Type B	Touch Screen Output	
Line In	Leave disconnected	
VGA	Leave disconnected	
DVI-D	Leave disconnected	
DP (Display Port)	Leave disconnected	
RS-232 (DB-9)	Leave disconnected	

NOTE

The **negative powers** input should **not** be tied to the same earth as the Protective Ground (PG) terminal. This provides additional protection in the screen.

The PIPS is an optional interface, if a HMI is not connected to the PIP when PIP is powered up the PIP will emulate a screen to allow external connections to remote desktop into the system. If a screen is connected on next power cycle, that screen will be the default output. Note remote desktop access will always allow the HMI to be viewed regardless of physical screen being present or not.

The PIPS (198599) have an Aluminium Bezel. For a stainless-steel bezel option please use the alternative PIPS SS (300716).

Alternative screens can be utilised with the PIP, integrators should consider the following aspects.

- HDMI connection for the screen and USB for the touch panel
- Aspect Ratio of 16:10 with minimum horizontal resolution of 1024 pixels.
- In addition to the connectivity and resolution requirements outlined, environmental and expected usage scenarios must be considered in the selection of the screen.

NOTE

Alternative **screens** require **connectivity**, **resolution**, **environmental** and **expected usage scenarios** to be considered in the selection of the screen.

5.4.5 **PI2 – Protection Interface IO Block 2 (198608)**

The PI2 orchestrates the IO interaction of the PIP. For further information regarding the BECKHOFF components, please refer to the appropriate manufacturer user manuals.

Approximate dimensions 99 (W) x 100 (H) x 69 (D).

Bus Coupler BK9105	**BUS TERMINAL 1**	**BUS TERMINAL 2**	**BUS TERMINAL 3**	**BUS END**
	KL1408 8ch Digital Input (1 wire)	**KL1809 16ch Digital Input (1 wire)**	**KL3454 4ch Analog Input 4-20mA**	**KL9010**

NOTE

Card order is important, faults will occur when defined order is not followed.

Input voltages are limited to 24 VDC typ. 3 mA and Outputs are limited to 400 mA @ 24 VDC.

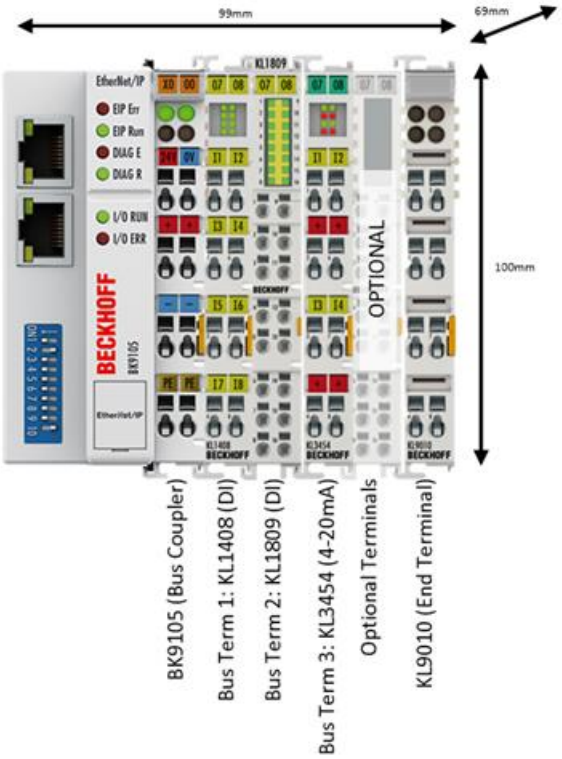


Figure 6: PI2 Dimensions

Table 1: PI2 – Protection Interface IO Block 2 Dip Switch Detail

Dip Switch	1	2	3	4	5	6	7	8	9	10
Setting	0	0	0	0	0	0	0	1	0	0

*0 = Off, 1 = On

Table 2: PI2 – Protection Interface IO Block 2 Electrical Wiring Detail

Outlet	Function	Bus Coupler BK9105	BT 1	BT 2	BT 3	BUS END
			KL1408 8ch DI	KL1809 16ch DI	KL3454 4ch AI 4-20 mA	KL9010
System IO	Emergency Stop 1 Indication		1			
System IO	Emergency Stop 2 Indication		2			
System IO	Emergency Stop 3 Indication		3			
System IO	Emergency Stop 4 Indication		4			
System IO	Authorisation pushbutton 1 (iFan)		5			
System IO	Authorisation pushbutton 2 (Elec)		6			
System IO	Authorisation pushbutton 3 (Bypass)		7			
System IO	CB Interlock - Outlet 1			1		
System IO	CB Interlock - Outlet 2			2		
System IO	CB Interlock - Outlet 3			3		
System IO	CB Interlock - Outlet 4			4		
System IO	CB Interlock - Outlet 5			5		
System IO	CB Interlock - Outlet 6			6		
System IO	CB Interlock - Outlet 7			7		
System IO	CB Interlock - Outlet 8			8		
System IO	CB Interlock - Outlet 9			9		
System IO	CB Interlock - Outlet 10			10		
System IO	CB Interlock - Outlet 11			11		
System IO	CB Interlock - Outlet 12			12		
System IO	CB Interlock - Outlet 13			13		
System IO	CB Interlock - Outlet 14			14		
System IO	CB Interlock - Outlet 15			15		
System IO	CB Interlock - Outlet 16			16		
System IO	Temperature sensor (4-20 mA) 1				1	
System IO	Temperature sensor (4-20 mA) 2				2	
System IO	Temperature sensor (4-20 mA) 3				3	
System IO	Temperature sensor (4-20 mA) 4				4	

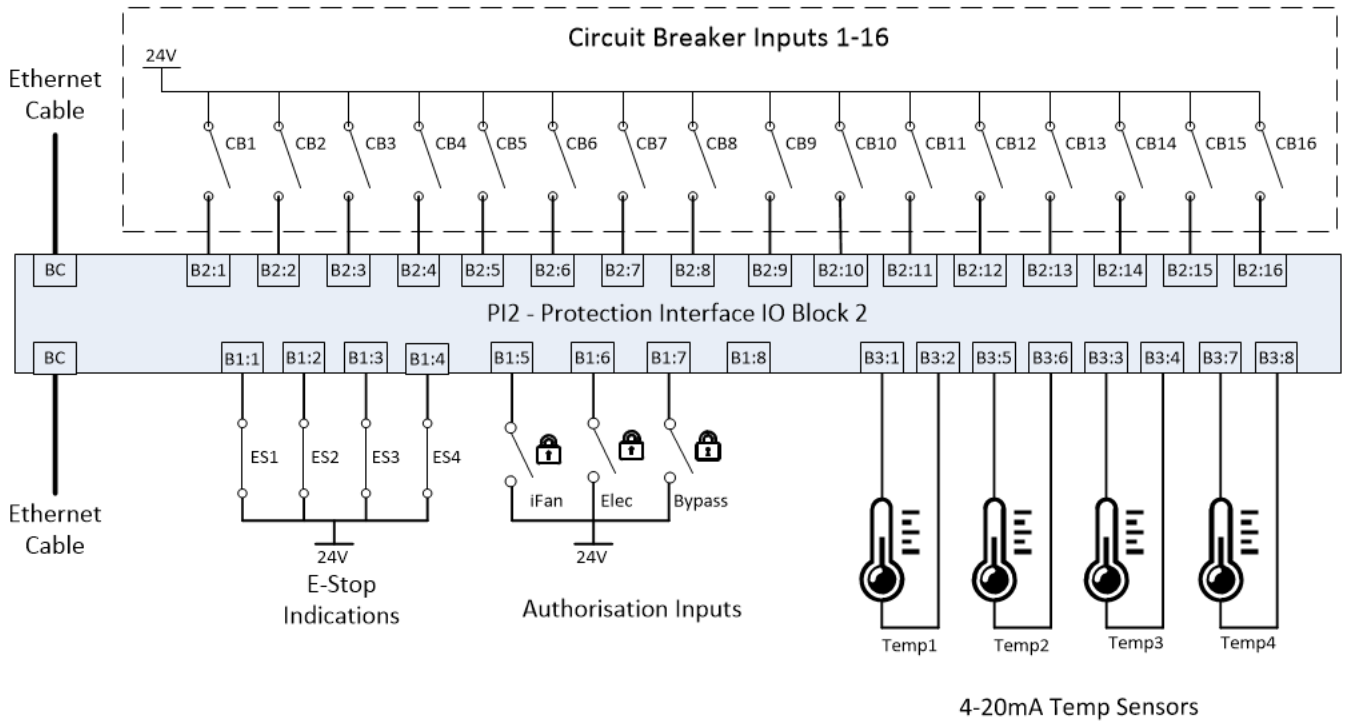


Figure 7: PI2 – Protection Interface IO Block 2 Electrical Schematic

5.4.6 **2FB – 2x Fixed Outlet IO Block (198601)**

The 2FB provides the IO for up to 2 outlets in a fixed configuration.

For further information regarding the BECKHOFF components, please refer to the appropriate manufacturer user manuals.

Approximate dimensions 75 (W) x 100 (H) x 69 (D).

Bus Coupler BK9105	**BUS TERMINAL 1**	**BUS END**
	KL2408 8ch Digital Output (1 wire)	**KL9010**

NOTE

Card order is important, faults will occur when defined order is not followed.

Input voltages are limited to 24 VDC typ. 3 mA and Outputs are limited to 400 mA @ 24 VDC.

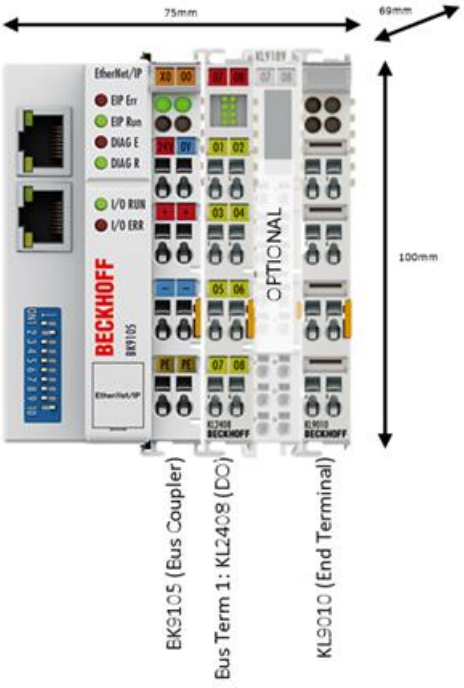


Figure 8: 2FB Dimensions

Table 3:2FB – 2x Fixed Outlet IO Block Dip Switch Detail

Dip Switch	1	2	3	4	5	6	7	8	9	10
1 Fixed Outlet	Bus Coupler Number				0	0	0	0	0	0
2 Fixed Outlet	Bus Coupler Number				1	0	0	0	0	0

*0 = Off, 1 = On

Table 4: Bus Coupler Number Dip Switch Configuration

Bus Coupler Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Dip 1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Dip 2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Dip 3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
Dip 4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

*0 = Off, 1 = On

Table 5: 2FB – 2x Fixed Outlet IO Block Wiring Detail

Outlet	Function	Bus Coupler BK9105	BT 1	BUS END
			KL2408 8ch DO	KL9010
1	FC Test		1	
1	Comm's Test		2	
1	EL Test		3	
1	STOP (MC Supply)		4	
2	FC Test		5	
2	Comm's Test		6	
2	EL Test		7	
2	STOP (MC Supply)		8	

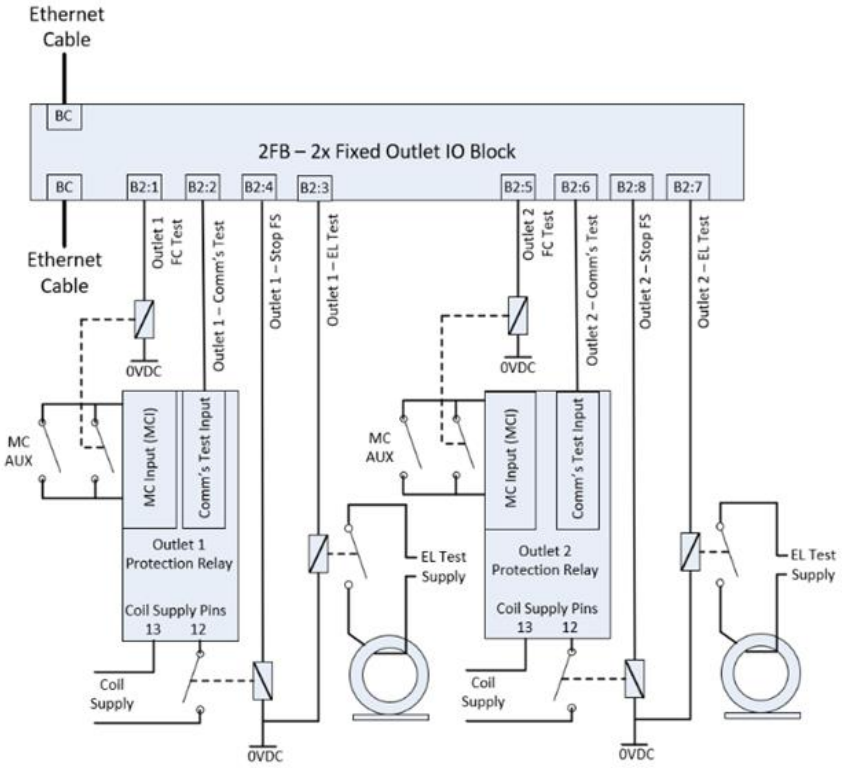


Figure 9: 2FB – 2x Fixed Outlet IO Block Wiring Detail

5.4.7 **4FB – 4x Fixed Outlet IO Block (198602)**

The 4FB provides the IO for up to 4 outlets in a fixed configuration.

For further information regarding the BECKHOFF components, please refer to the appropriate manufacturer user manuals.

Approximate dimensions 75 (W) x 100 (H) x 69 (D).

Bus Coupler BK9105	**BUS TERMINAL 1**	**BUS END**
	KL2809 16ch Digital Output (1 wire)	**KL9010**

NOTE

Card order is important, faults will occur when defined order is not followed.

Input voltages are limited to 24 VDC typ. 3 mA and Outputs are limited to 400 mA @ 24 VDC.

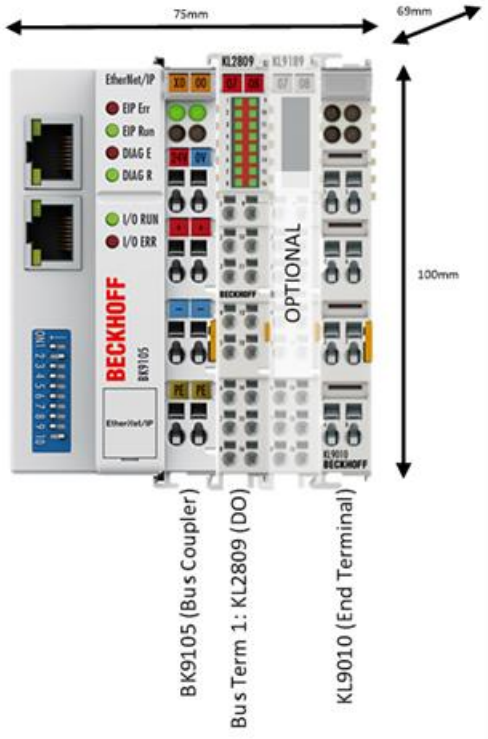


Figure 10: 4FB Dimensions

Table 6: 4FB – 4x Fixed Outlet IO Block Dip Switch Detail

Dip Switch	1	2	3	4	5	6	7	8	9	10
3 Fixed Outlet	Bus Coupler Number				0	1	0	0	0	0
4 Fixed Outlet	Bus Coupler Number				1	1	0	0	0	0

*0 = Off, 1 = On

Table 7: Bus Coupler Number Dip Switch Configuration

Bus Coupler Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Dip 1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Dip 2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Dip 3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
Dip 4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

*0 = Off, 1 = On

Table 8: 4FB – 4x Fixed Outlet IO Block Wiring Detail

Outlet	Function	Bus Coupler BK9105	BT 1	BUS END
			KL2809 16ch DO	KL9010
1	FC Test		1	
1	Comm's Test		2	
1	EL Test		3	
1	STOP (MC Supply)		4	
2	FC Test		5	
2	Comm's Test		6	
2	EL Test		7	
2	STOP (MC Supply)		8	
3	FC Test		9	
3	Comm's Test		10	
3	EL Test		11	
3	STOP (MC Supply)		12	
4	FC Test		13	
4	Comm's Test		14	
4	EL Test		15	
4	STOP (MC Supply)		16	

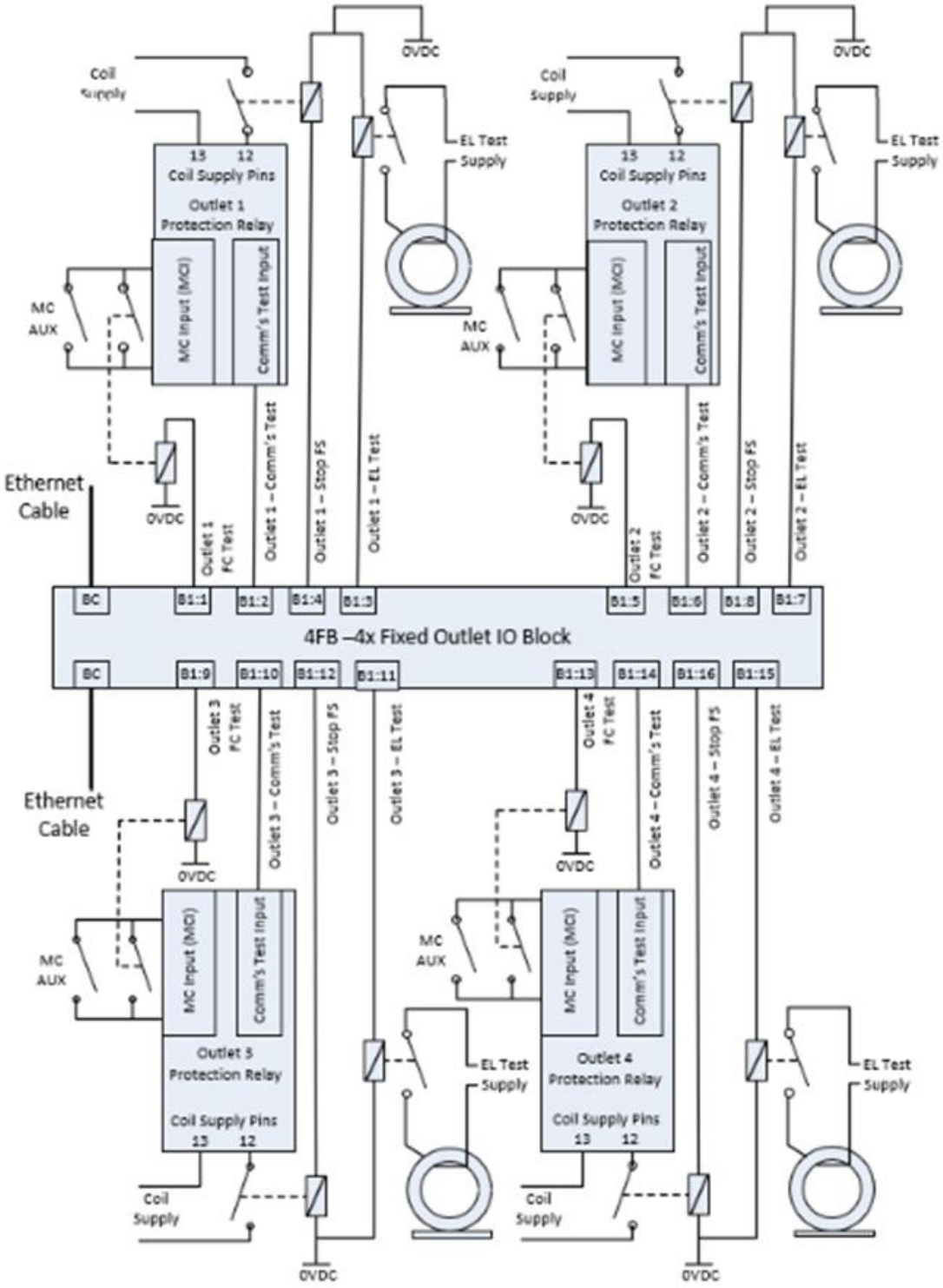


Figure 11: 4FB – 4x Fixed Outlet IO Block Wiring Detail

5.4.8 **2WB – 2x Withdrawable Outlet IO Block (198600)**

The 2WB provides the IO for up to 2 outlets in a withdrawable configuration (For OCS Applications only).

For further information regarding the BECKHOFF components, please refer to the appropriate manufacturer user manuals.

Approximate dimensions 99 (W) x 100 (H) x 69 (D).

Bus Coupler BK9105	BUS TERMINAL 1	BUS TERMINAL 2	BUS TERMINAL 3	BUS END
	KL1809 16ch Digital Input (1 wire)	KL2809 16ch Digital Output (1 wire)	KL3464 4ch Analog Input (2 wire)	KL9010

NOTE

Card order is important, faults will occur when defined order is not followed.

Input voltages are limited to 24 VDC typ. 3 mA and Outputs are limited to 400 mA @ 24 VDC.

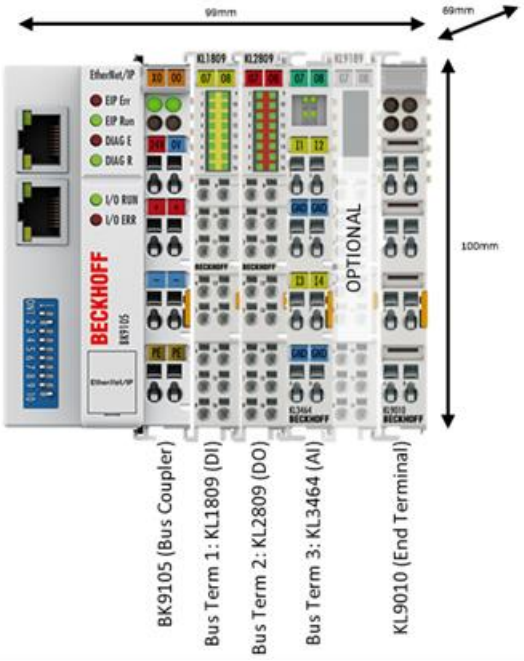


Figure 12: 2WB Dimensions

Table 9: 2WB – 2x Withdrawable Outlet IO Block Dip Switch Detail

Dip Switch	1	2	3	4	5	6	7	8	9	10
1 Withdrawable Outlet	Bus Coupler Number				0	0	1	0	0	0
2 Withdrawable Outlet	Bus Coupler Number				1	0	1	0	0	0

*0 = Off, 1 = On

Table 10: Bus Coupler Number Dip Switch Configuration

Bus Coupler Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Dip 1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Dip 2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Dip 3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
Dip 4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

*0 = Off, 1 = On

Table 11: 2WB – 2x Withdrawable Outlet IO Block Wiring Detail

Outlet	Function	Bus Coupler BK9105	BT 1	BT 2	BT 3	BUS END
			KL1809 16ch DI	KL2809 16ch DO	KL3464 4ch AI	KL9010
1	Plug INTERLOCK		1			
1	ISOLATE Switch		3			
1	Service LIMIT SW		4			
1	Earth LIMIT SW		5			
1	FC Test			1		
1	Comm’s Test			2		
1	EL Test			3		
1	STOP (MC Supply)			4		
1	Drive IN (Earth)			5		
1	Drive OUT (Service)			6		
1	Earth LIGHT			7		
1	Actuator POSITION (0-10 V)				1	
2	Plug INTERLOCK		9			
2	ISOLATE Switch		11			
2	Service LIMIT SW		12			
2	Earth LIMIT SW		13			
2	FC Test			9		
2	Comm’s Test			10		
2	EL Test			11		
2	STOP (MC Supply)			12		
2	Drive IN (Service)			13		
2	Drive OUT (Earth)			14		
2	Earth LIGHT			15		
2	Actuator POSITION (0-10 V)				3	

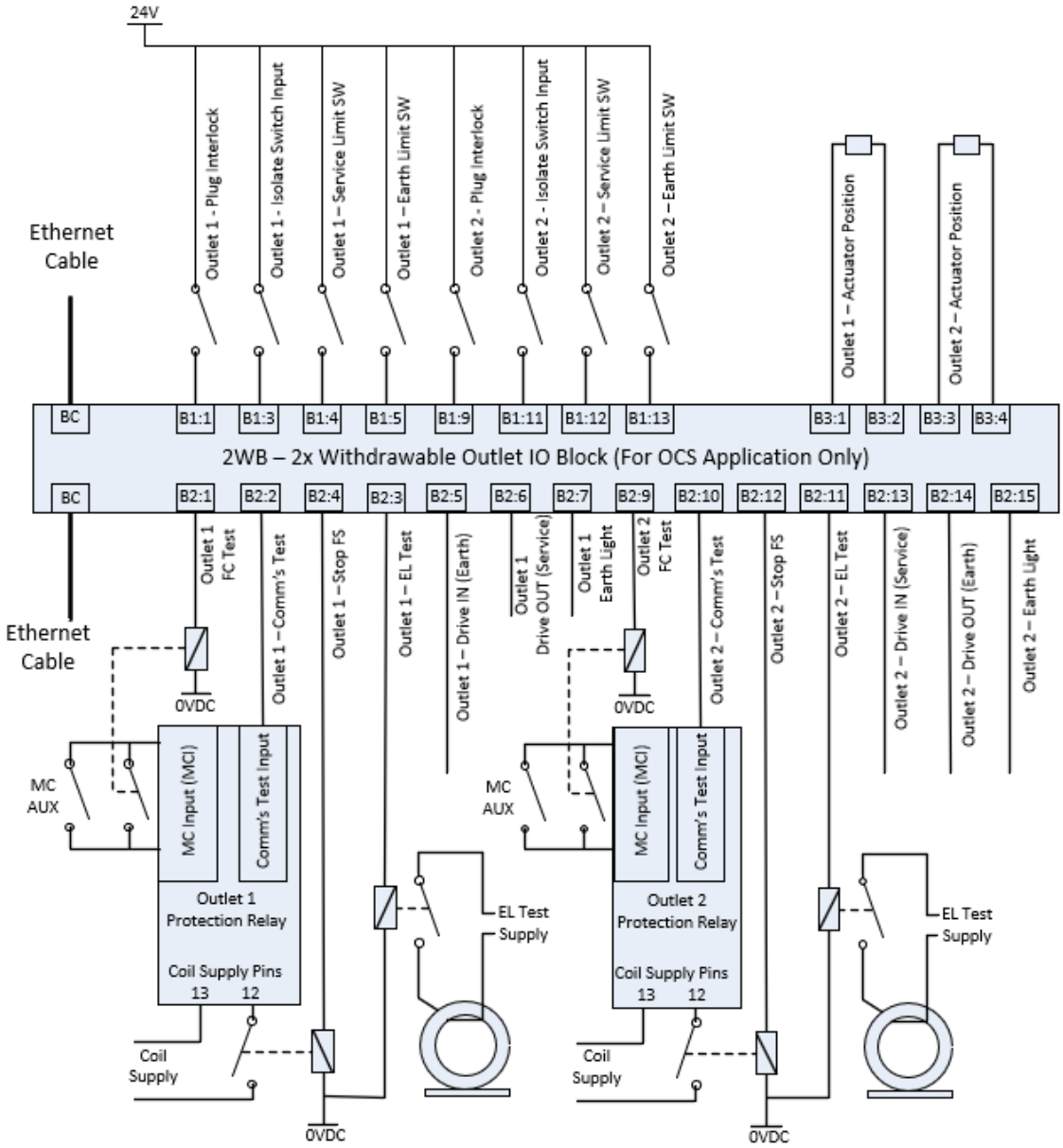


Figure 13: 2WB – 2x Withdrawable Outlet IO Block Wiring Detail

5.4.9 **4WB – 4x Withdrawable Outlet IO Block (198598)**

The 4WB provides the IO for up to 4 outlets in a withdrawable configuration.

For further information regarding the BECKHOFF components, please refer to the appropriate manufacturer user manuals.

Approximate dimensions 123 (W) x 100 (H) x 69 (D).

Bus Coupler BK9105	**BUS TERMINAL 1**	**BUS TERMINAL 2**	**BUS TERMINAL 3**	**BUS TERMINAL 4**	**BUS TERMINAL 5**	**BUS END**
	KL1809 16ch Digital Input (1 wire)	**KL1809 16ch Digital Input (1 wire)**	**KL2809 16ch Digital Output (1 wire)**	**KL2809 16ch Digital Output (1 wire)**	**KL3464 4ch Analog Input (2 wire)**	**KL9010**

NOTE

Card order is important, faults will occur when defined order is not followed.

Input voltages are limited to 24 VDC typ. 3 mA and Outputs are limited to 400 mA @ 24 VDC.

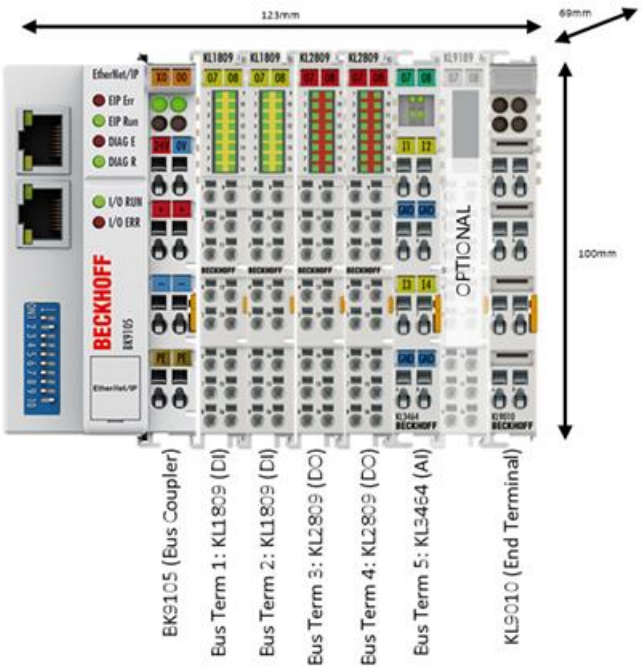


Figure 14: 4WB Dimensions

Table 12: 4WB – 4x Withdrawable Outlet IO Block Dip Switch Detail

Dip Switch	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3 Withdrawable Outlet	Bus Coupler Number				0	1	1	0	0	0
4 Withdrawable Outlet	Bus Coupler Number				1	1	1	0	0	0

*0 = Off, 1 = On

Table 13: Bus Coupler Number Dip Switch Configuration

Bus Coupler Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Dip 1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Dip 2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
Dip 3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
Dip 4	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

*0 = Off, 1 = On

Table 14: 4WB – 4x Withdrawable Outlet IO Block Wiring Detail

Outlet	Function	Bus Coupler BK9105	BT 1	BT 2	BT 3	BT 4	BT 5	BUS END
			KL1809 16ch DI	KL1809 16ch DI	KL2809 16ch DO	KL2809 16ch DO	KL3464 4ch AI	KL9010
1	Plug INTERLOCK		1					
1	ISOLATE Switch		3					
1	Service LIMIT SW		4					
1	Earth LIMIT SW		5					
1	FC Test				1			
1	Comm's Test				2			
1	EL Test				3			
1	STOP (MC Supply)				4			
1	Drive IN (Earth)				5			
1	Drive OUT (Service)				6			
1	Earth LIGHT				7			
1	Actuator POSITION (0-10 V)						1	
2	Plug INTERLOCK		9					
2	ISOLATE Switch		11					
2	Service LIMIT SW		12					
2	Earth LIMIT SW		13					
2	FC Test				9			
2	Comm's Test				10			
2	EL Test				11			
2	STOP (MC Supply)				12			
2	Drive IN (Service)				13			
2	Drive OUT (Earth)				14			
2	Earth LIGHT				15			
2	Actuator POSITION (0-10 V)						2	

Outlet	Function	Bus Coupler BK9105	BT 1	BT 2	BT 3	BT 4	BT 5	BUS END
3	Plug INTERLOCK			1				
3	ISOLATE Switch			3				
3	Service LIMIT SW			4				
3	Earth LIMIT SW			5				
3	FC Test					1		
3	Comm's Test					2		
3	EL Test					3		
3	STOP (MC Supply)					4		
3	Drive IN (Earth)					5		
3	Drive OUT (Service)					6		
3	Earth LIGHT					7		
3	Actuator POSITION (0-10 V)						3	
4	Plug INTERLOCK			9				
4	ISOLATE Switch			11				
4	Service LIMIT SW			12				
4	Earth LIMIT SW			13				
4	FC Test					9		
4	Comm's Test					10		
4	EL Test					11		
4	STOP (MC Supply)					12		
4	Drive IN (Service)					13		
4	Drive OUT (Earth)					14		
4	Earth LIGHT					15		
4	Actuator POSITION (0-10 V)						4	

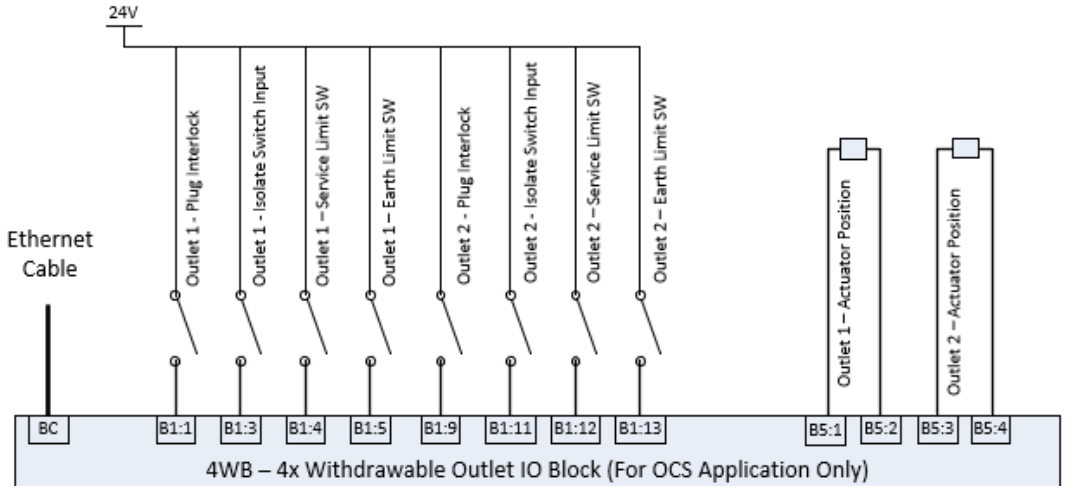


Figure 15: 4WB – 4x Withdrawable Outlet IO Block Wiring Detail (Wiring Part 1)

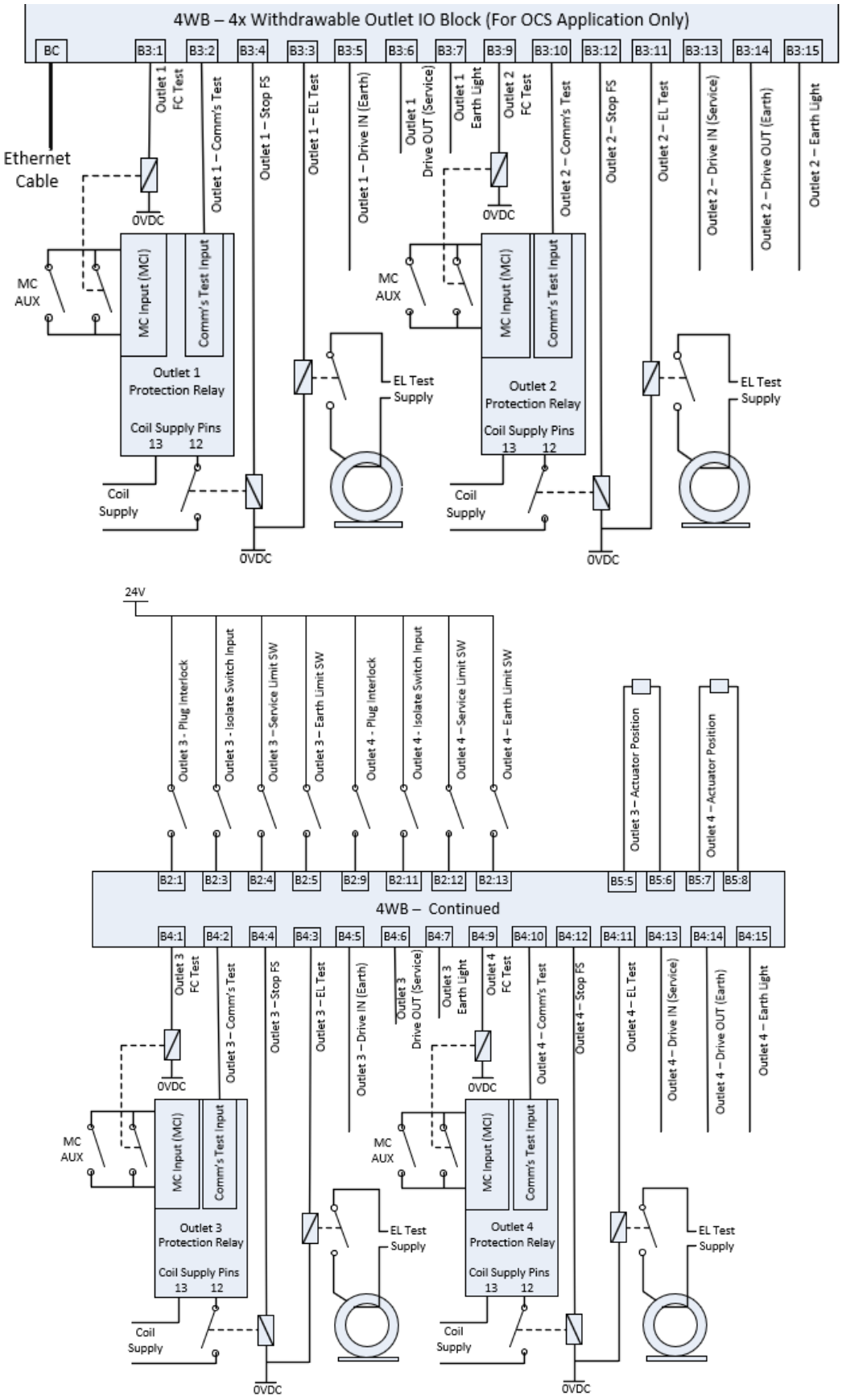


Figure 16: 4WB – 4x Withdrawable Outlet IO Block Wiring Detail (Wiring Part 2)

5.4.10 **GFB – Group Feeder IO Block (302301)**

The GFB is used on systems that require switchable dual / triple feed outlets. This allows outlets to be either singularly controlled or linked as a dual / triple control feeder. For further information regarding the BECKHOFF components, please refer to the appropriate manufacturer user manuals.

The EK9500 Bus Coupler module is required to be configured before use, unlike the KL1809 of the other modules. The IPv4 address is required to be set to 172.16.17.150 with a IPv4 subnet mask of 255.255.255.0, for further detail on this process see Appendix G.

Approximate dimensions 100 (W) x 100 (H) x 72 (D).

	BUS TERMINAL 1	BUS TERMINAL 2	BUS END
Bus Coupler EK9500	**EL1104**	**KL2624**	**KL9010**
	4ch Digital Input (1 wire)	**4x Relay Output (2 terminals)**	**-**

NOTE

Card order is important, faults will occur when defined order is not followed.

Input voltages are limited to 24 VDC typ. 3 mA and Outputs are limited to 400 mA @ 24 VDC.

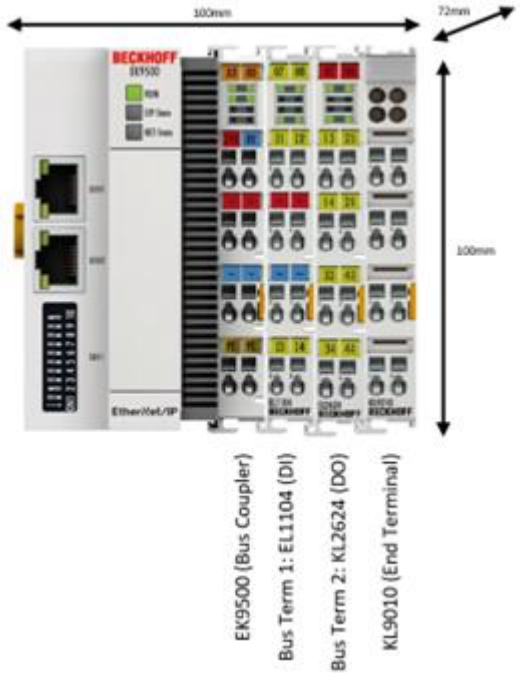


Figure 17 - GFB Dimensions

Table 15: PFG – 4x Withdrawable Outlet IO Block Dip Switch Detail

Dip Switch	1	2	3	4	5	6	7	8	9	10
FGB	0	1	1	0	1	0	0	1	0	0

*0 = Off, 1 = On

Outlet	Function	Bus Coupler EK9500	BT 1	BT 2	BUS END
			EL1104	KL2624	KL9010
			4ch DI	4ch RO	
Group 1	Group 1 Enable	-	1	-	-
Group 2	Group 2 Enable	-	5	-	-
Group 3	Group 3 Enable	-	4	-	-
Group 4	Group 4 Enable	-	8	-	-
Group 1	Group 1 CT Switching Output A	-	-	1	-
Group 1	Group 1 CT Switching Output B	-	-	2	-
Group 2	Group 2 CT Switching Output A	-	-	5	-
Group 2	Group 2 CT Switching Output B	-	-	6	-
Group 3	Group 3 CT Switching Output A	-	-	3	-
Group 3	Group 3 CT Switching Output B	-	-	4	-
Group 4	Group 4 CT Switching Output A	-	-	7	-
Group 4	Group 4 CT Switching Output B	-	-	8	-

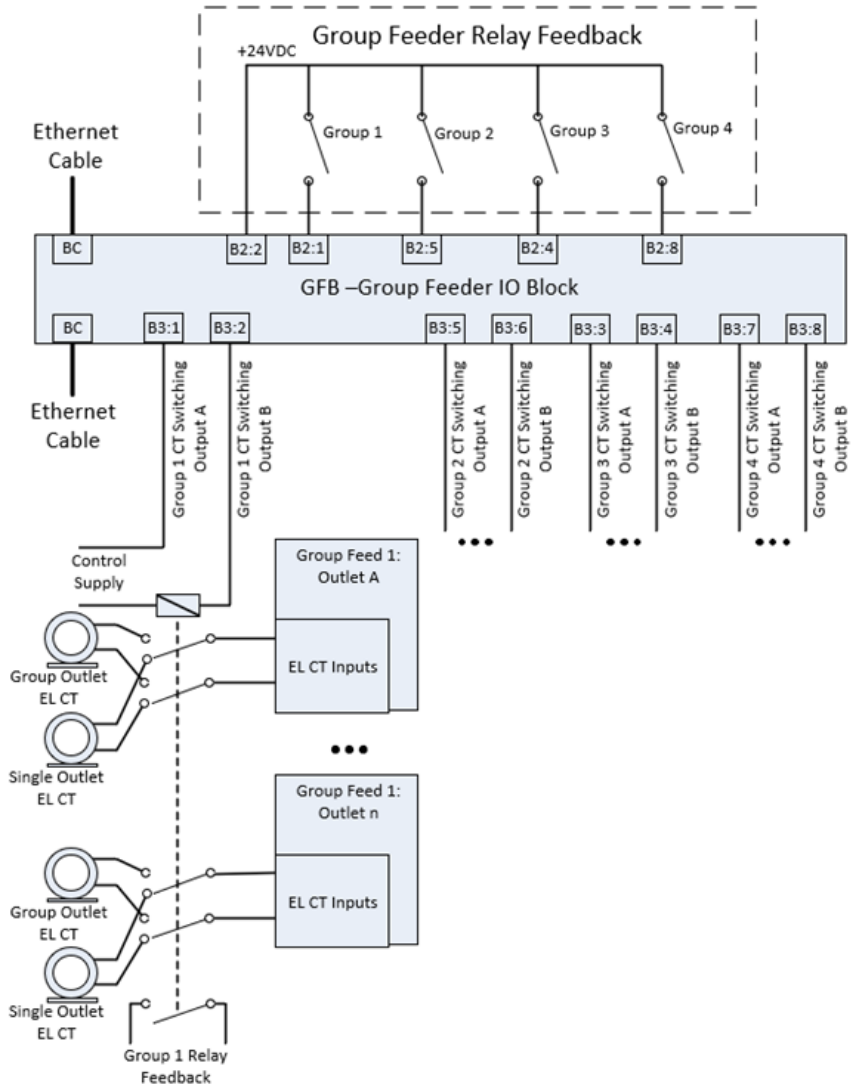


Figure 18 - GFB – Group Feeder IO Block Wiring Detail

5.4.11 **IO Block Bus Coupler Wiring Detail**

The IO blocks utilised in the system all utilise the BECKHOFF BK9105 Bus Coupler to connect the IO cards to the PIP. The bus coupler requires power to operate and power to pass through to the connected modules as well as the Ethernet connection.

Table 16: IO Block Bus Coupler Wiring Connections

Outlet	Function
BK9105	Bus Coupler Supply (+24/0 V)
BK9105	Power Contact +24 V
BK9105	Power Contact 0 V
BK9105	Power Contact Protective Earth
BK9105	Ethernet connection

5.4.12 **Optional Distribution Terminals for IO Blocks**

To simplify wiring requirements, BECKHOFF include “potential distribution terminals”. These can be added throughout the block as required and will not interfere with the ordering of the IO. These include the following modules:

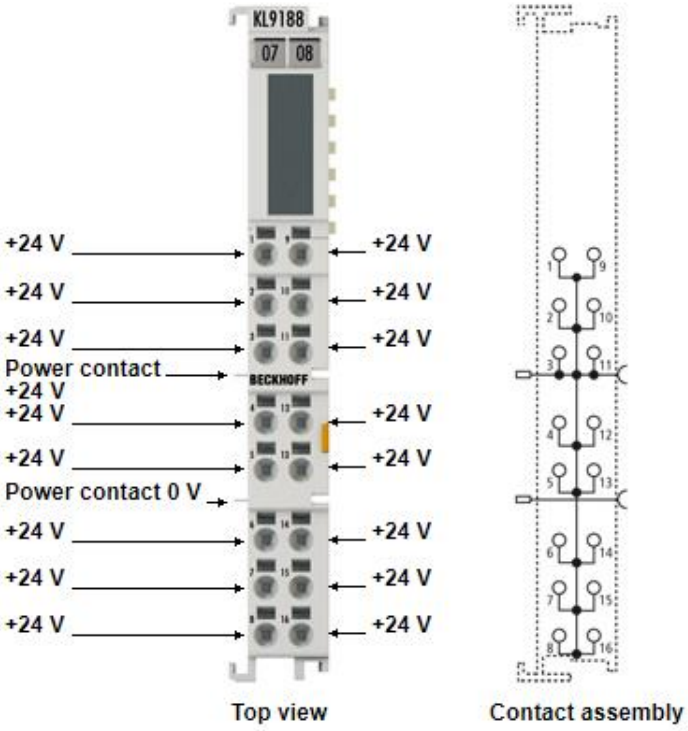


Figure 19: KL9188 - Potential Distribution Terminal, 16x 24 VDC

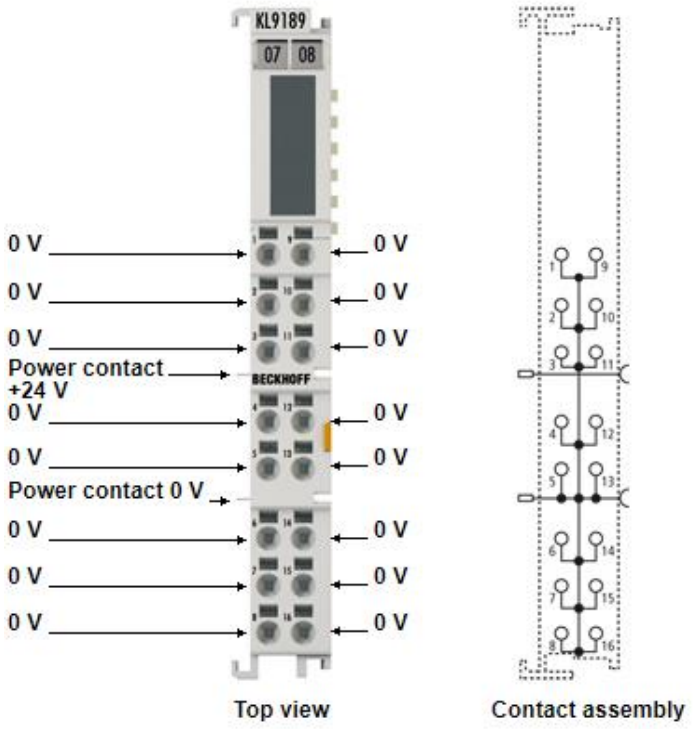


Figure 20: KL9189 - Potential Distribution Terminal, 16x 0 VDC

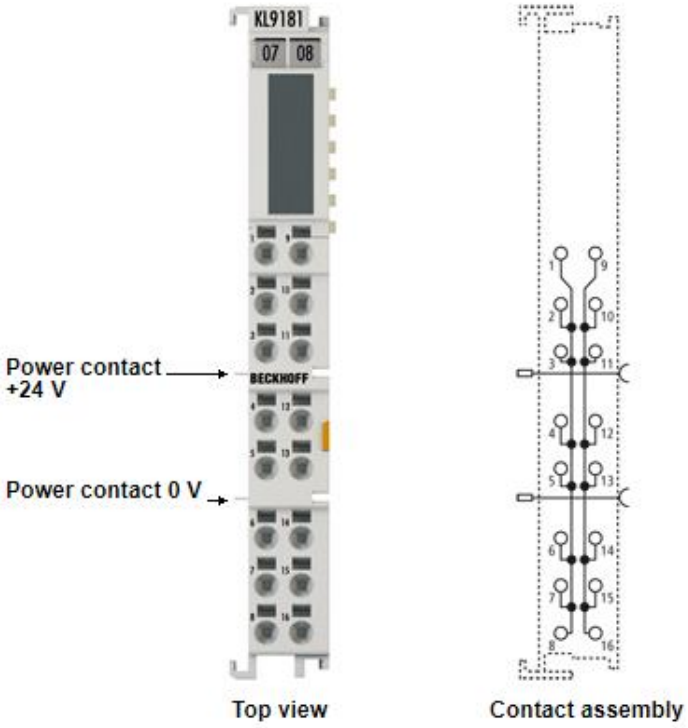


Figure 21: KL9181 - Potential Distribution Terminal, 8x 2 potentials

5.4.13 **Local Communications Network**

The Local communications network (LAN Port 2 of the PIP) is used by the PIP to communicate to the System IO, Outlet IO and protection relays. This network and all associated equipment use predefined IP addresses and configuration. This is not configurable by customers and is isolated to the external communications port. Nothing other than defined in this user manual should be connected to this port.

NOTE

Local Communications Network (LAN Port 2 of the PIP) is for PIP system only, external networks will not be accessible through this port.

The Local Switch (optional) shown in the standard layout is used to interface the protection relays and distributed outlet IO blocks to the PIP module. The local switch is optional, where users are able to daisy chain modules on the network with the understanding that there is no redundancy. If a cable fails every module down the link will be offline and the PIP will throw appropriate errors.

A redundancy communications ring can be achieved through the use of a managed switch that supports the topology. This ring communications allows a single Ethernet cable to be lost without the communications failing.

5.4.14 **External Communications Network**

The PIP provides an external Ethernet IP / Modbus TCP interface (LAN Port 1 of the PIP). The external designated network can be configured as desired by the user. The network settings will be stored in the PIP and on the PIP dongle.

NOTE

External Communications Network (LAN Port 1 of the PIP) is for external communications to the PIP. **PIP system equipment should Not be installed on this network.**

6 COMMISSIONING

Prior to being put into service, the system must be correctly commissioned. This manual does not cover system commissioning; the full scope of commissioning tests should be determined during the risk assessment or FMEA covering the design of the electrical protection system.

6.1 PIP Roll Call Process

A new installation will require the PIP to be initialised allowing the PIP to know how it has been installed and what IO and outlets are available.

Version 2 of the PIP FW has altered the roll call process. For these details please obtain a copy of the previous user manual or contact customer support for details.

The PIP commissioning process will follow a step-by-step process outlined below when power is applied.

1- On first power up the PIP will boot to a summary page identifying the Hardware Serial Number, Firmware Version, and OS Version. If a SW update package has been loaded this will be available to initiate from this screen.

Figure 22: PIP Landing Page on First Power up

- Step 1: Screen will request configuration about number of outlets and whether a MCF reset can be sent through comms or if the physical button on relay is required to be pressed.

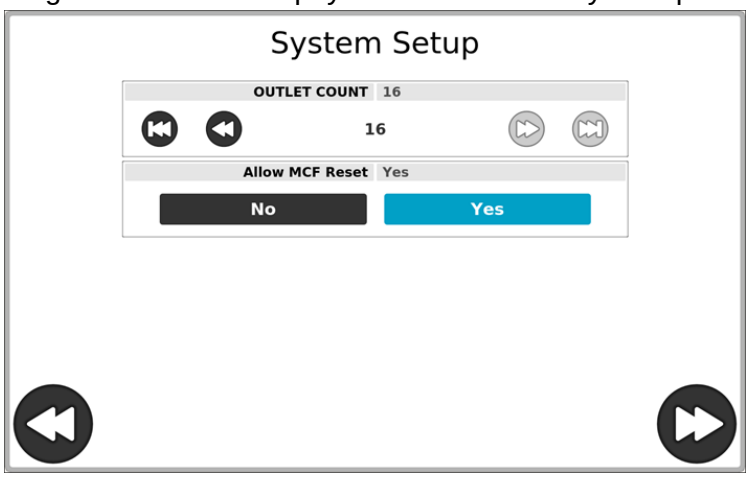


Figure 23: Step 1 of Roll Call Process

CAUTION!

The **MCF Reset** setting needs to be appropriately assessed in the equipment's **design risk assessment**.

- Step 2: This page (and following pages for the same number of outlets selected in Step 1) will request the Outlet specific details. This includes outlet family type, System voltage and Insulation test level for that outlet, and whether a SC trip will activate the CBR or MCR.

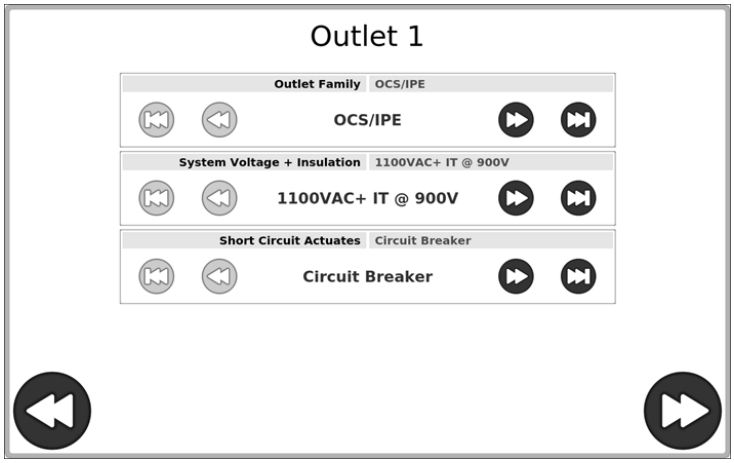


Figure 24: Step 2 of Roll Call Process, Outlet Configuration

- Step 3: This page allows the user to configure the system topology and how the physical equipment is wired and allocated to outlet IO Blocks. To change IO Block Configuration, the black squares can be clicked. The number of IO Blocks (Bays) is configured at bottom of screen.

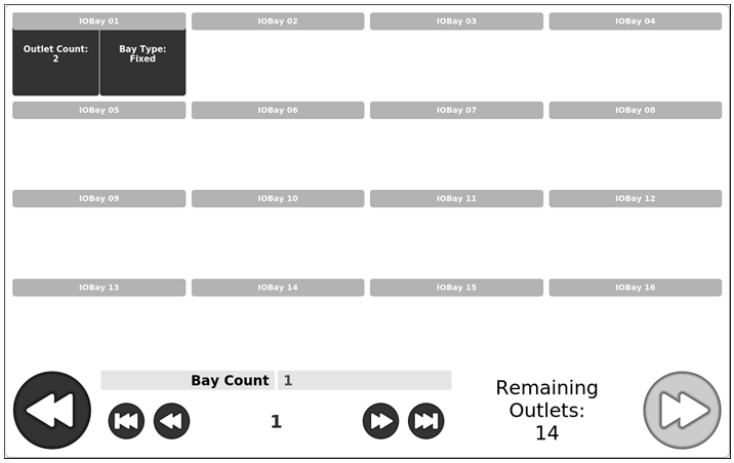


Figure 25: Step 3 of Roll Call Process, System Topology Configuration

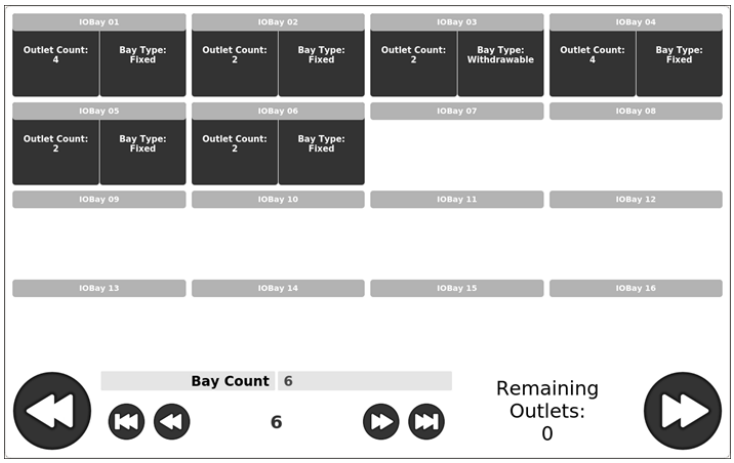


Figure 26: Step 3 of Roll Call Process, All Outlets Allocated

- Step 4: Feeder Group Configuration. This screen allows the user to configure the Group Feed relationships:
  - None: No Group Feed Control to be implemented.
  - Fixed: Outlets cannot be used as Single outlets. Physically wired as dual or parallel
  - PIP: Group can be selected as “Group” or “Single Outlet” functionality from the PIP menus. The external relays controlled by the PIP GFB will provide feedback back into the GFB, which will validate the output contact follows the desired setting selection.
  - IO: Group can operate as “Group” or “Single Outlet” functionality, however this is controlled by external switching and the GFB feedback input is used to determine if group is active or inactive.

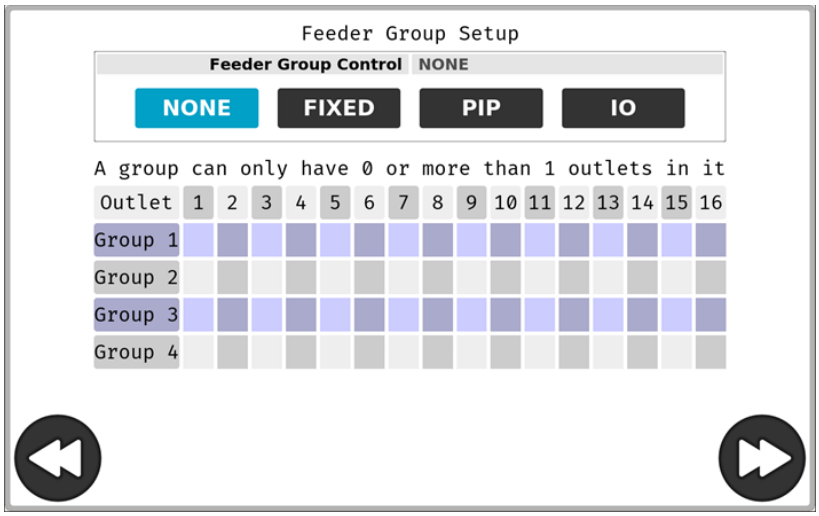


Figure 27: Step 4 of Roll Call Process, Group Feed Configuration

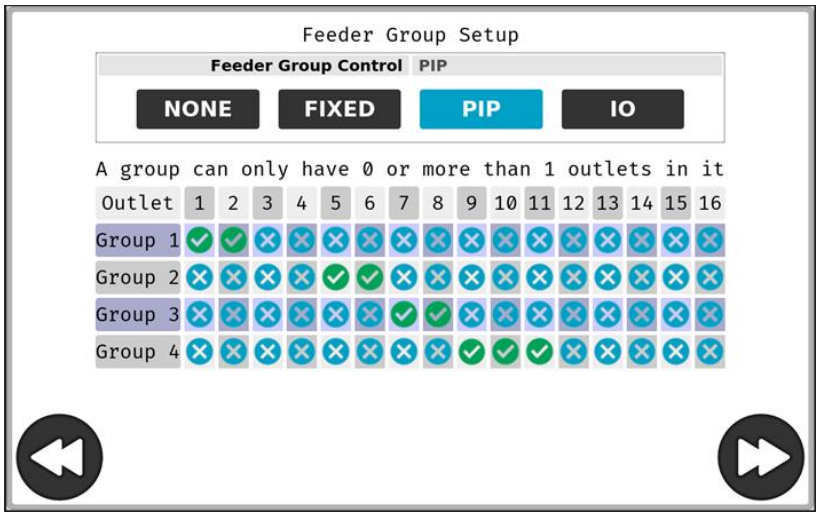


Figure 28: Step 4 of Roll Call Process, Example Group Feed Configuration

- Step 5: Confirmation of System Configuration and Topology. If design is correct, the PIP will save this new System Configuration File to its internal memory as well as the connected PIP Dongle and restart.
  Once a system configuration file has been created the PIP will always boot to the main PIP screen, this can be seen in the next section of user manual.

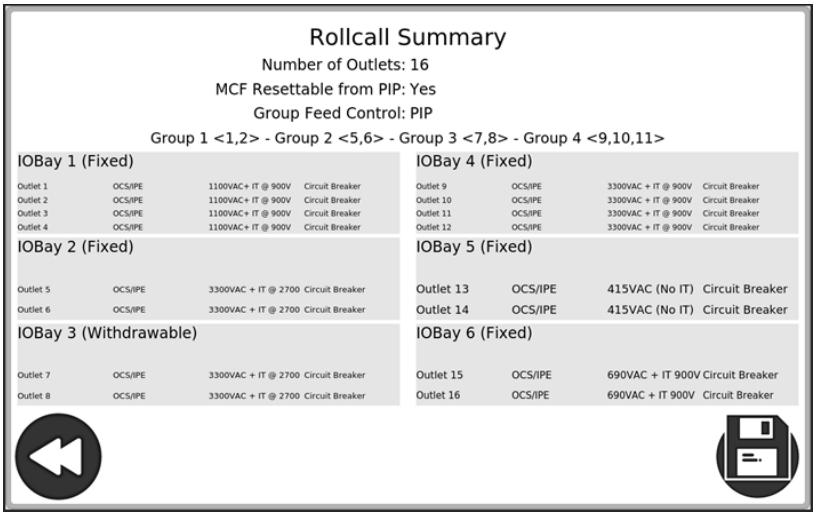


Figure 29: Step 5 of Roll Call Process, System Configuration

On each power up, the PIP will perform a communications test to ensure the protection relays are still connected to the correct IO blocks. If there are any faults, errors or inconsistences, the appropriate warning will be displayed. If protection relays are missing or faulty, that outlet will be blocked out until fault rectified.

NOTE

A IO Comms Test will be performed on each power up, missing relays or outlets with faults will be blocked until issue rectified.

6.2 Replacing PIP Module

If a PIP module needs to be replaced the following should be considered in the work procedures.

1. Note location of connections (plugs, wiring, dongle etc).
2. Remove plugs / wiring from PIP.
3. Undo fasteners securing PIP in position.
4. Install replacement PIP, following steps 1,2,3 in reverse.
5. Record serial number for equipment installed, for documentation/n purposes
6. Power up equipment and ensure dongle configuration file is loaded correctly (see section 6.3).
7. Return failed equipment for repair / warranty.

6.3 PIP System Configuration File Fault or Mismatch

If a PIP or PIP dongle has failed during operation, a new item can be installed with the following process followed during the following power up. On power up the system configuration file is checked between the PIP and PIP dongle, if these are different the following operations will take place.

- If PIP dongle has valid file; the dongle file will be used and copied across to the PIP memory, overwriting the existing PIP file.
- If the PIP dongle file is corrupt or blank; the PIP internal memory settings file will be used and copied across to the PIP dongle.
- If PIP and PIP dongle setting files are corrupt or invalid; the PIP will boot into the rollcall process.

To prevent losing PIP System configuration files, it is recommended that the configuration file be backed up at commissioning and whenever changes are made to the system. See below for details.

NOTE

Installing a **non-blank PIP dongle** into a PIP with existing configuration file will cause the PIP system configuration file to be overwritten with that on the PIP dongle.

If the PIP dongle is removed when files are being saved, the dongle can become corrupt. It is not recommended that the PIP dongle be removed while in use.

If dongle is removed during operation and replaced with another, a comparison check will not be performed and the dongle will be overwritten with the PIP’s internal setting configuration file upon saving of any PIP setting.

NOTE

To prevent the potential of **corrupting the PIP dongle**, it is recommended that the **PIP dongle not be removed while equipment is powered or being written to**.

To generate a backup of the system configuration file found in the PIP and PIP dongle, the following process can be undertaken.

NOTE

It is required that the system be correctly configured with both PIP and PIP Dongle containing valid non corrupt files, as well as no system errors are being present.

Using PC:

1. Remove power to the PIP system.
2. Remove PIP dongle.
3. Access the dongle on a PC and copy the file. This can be stored on PC or saved to another PIP dongle.
4. Reinstall the removed PIP dongle back into the PIP.
5. The configuration has now been backed up.

The file can be copied from the dongle when installed to a PC. Alternatively, a blank PIP dongle can be installed into the PIP and the file will be copied to dongle on power up.

Using PIP:

1. Remove power to the PIP system.
2. Remove PIP dongle.
3. Install a new blank PIP dongle.
   (**It should be verified that the dongle is blank, if a file exist it will be written to the PIP overwriting required PIP configuration file**).
4. Re-apply power to PIP system.
5. When the PIP powers up it will identify the blank dongle and copy the PIP configuration file across to the dongle.
6. The configuration file has now been backed up on the removed PIP dongle.

7 PIP GUI OPERATION

The PIP's Graphical User Interface (GUI) can be accessed through two ways:

1- PIP Screen (PIPS) or Alternative Screen.
2- Remote Desktop through Ethernet connection.

When accessing the GUI through the Ethernet connection, the operation and functionality of the GUI will be the same as if interacted through the dedicated PIPS.

The PIP provides an intuitive interface to navigate the system functionality and configuration, logs and outlet management. The screens provide a standardised common control interface and menu structure. All outlet control and protection settings are made through this interface.

The following sections provide an overview of the interface screens and various elements.

Some notes to make for overall operation,

- Buttons, tiles, links and interactive icons will be a dark grey colour.
- Blue highlight will indicate the current selected item.
- Light grey items are for information indication.

7.1 Overview Screen

The overview screen is displayed in Figure 30 below. This figure shows the interface for a system with 16 outlets connected. If the system topology has fewer outlets the number of outlet tiles will be reduced.

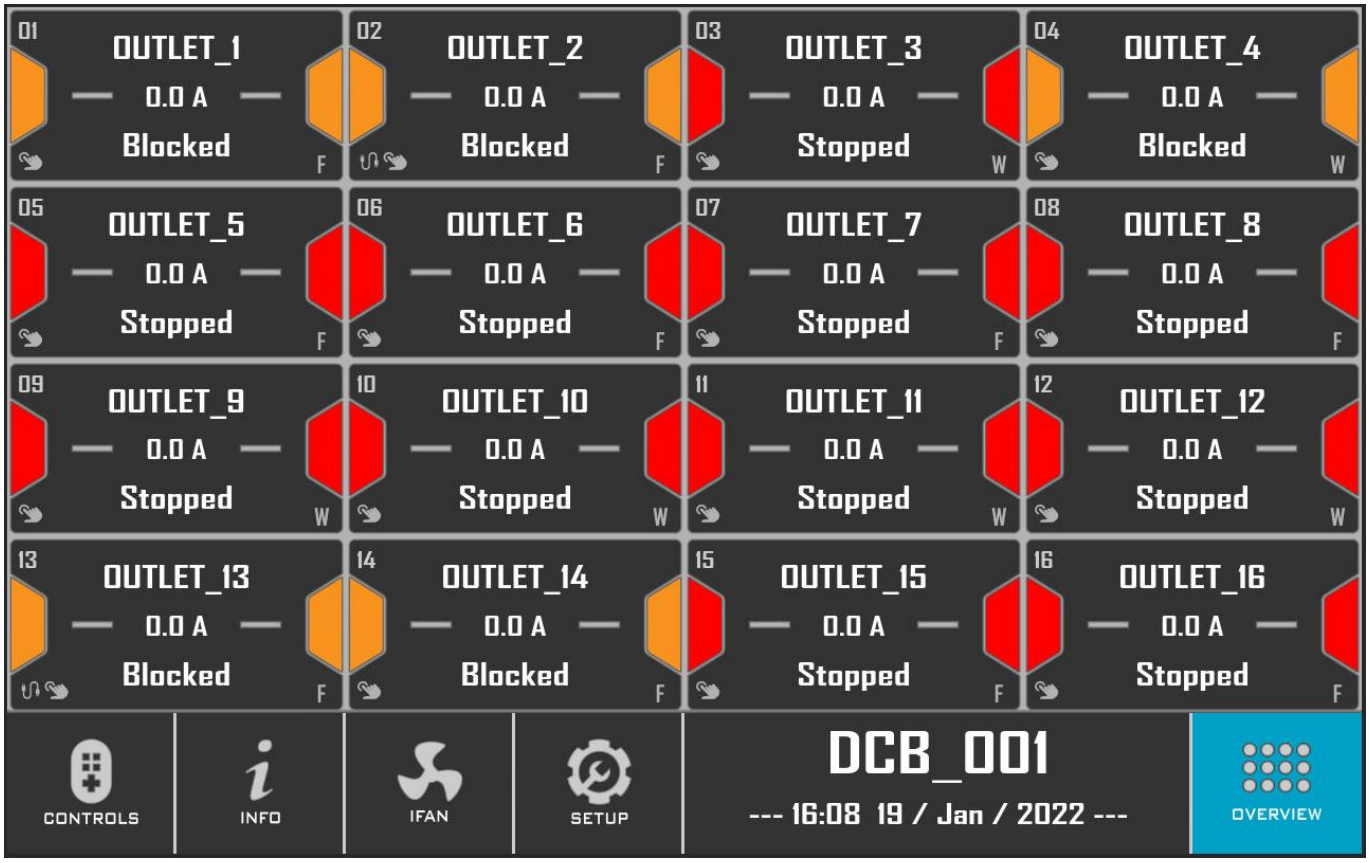


Figure 30: PIP UI Interface – 16 Outlet Configuration shown

Each tile represents an outlet, clicking on a specific outlet tile will navigate to that outlets screen. Each tile presents key outlet details:

1. Outlet Number.
2. Outlet Description.
3. Outlet Average Current Measured.
4. Outlet State Designated by Colour.
5. Outlet configuration (F - Fixed, W - Withdrawable).
6. Outlets Operating State.
7. Outlet Control method (PIP, External, PIP / External).

Figure 31: PIP Overview Interface - Outlet Tile

The PIP toolbar is located across the bottom of the screen. This toolbar is standardised across all screens. The icon / button function can be seen in table below.

NOTE

A blue icon indicates that button is active.

Table 17: PIP Overview Elements

Description	Icon
This button takes you to the outlet control page.	
This button takes you to the IFan setup page.	
This button takes you back to the main overview page.	

Description	Icon
This button takes you to the PIP information page.	
This button takes you to the PIP setup page.	
This is not a button and provides the user with the designated PIP name, time and active PIP notifications.	See below
	

7.2 Control Page

The control page provides a simple interface to all outlets on a single page. This page provides 4 control functions, Outlet Control (Start / Stop), EC Series Testing, EC Shunt Testing, EL Trip Testing, Pilot Isolate. The control menu is shown in the figures below.

Figure 32: PIP Control Interface

Figure 33: PIP Start Control Interface

When accessing any of the outlet testing menus, the PIP needs to be authorised (Electrician Authorisation) to operate.

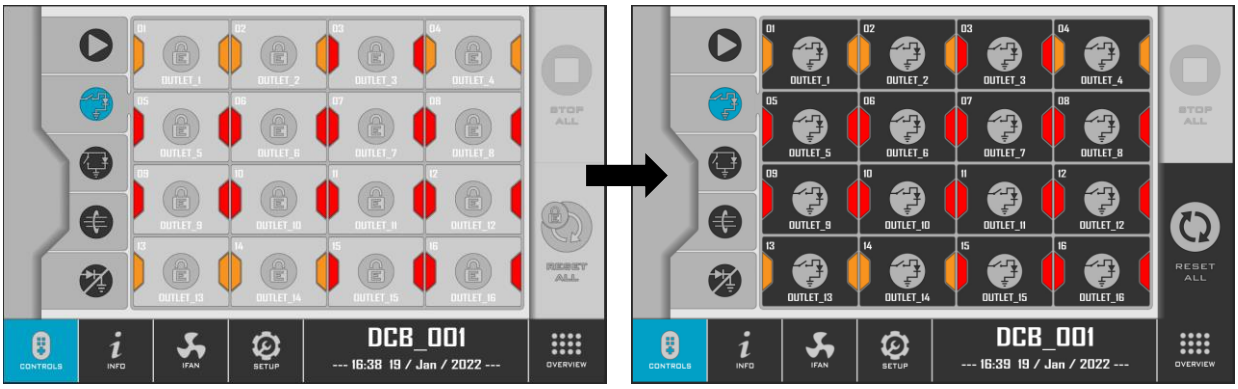


Figure 34: PIP Control Test Interface – EC Series Test

When performing test, the outlets display will change depending on the status of the outlet. Table 18 outlines stages displayed and their meaning.

Table 18: Outlet Testing Through Control Page

Description	Icon
	Outlet healthy and ready for test.
	White block + blue illuminated icon indicate test active / being performed.
	Yellow halo around test button indicates outlet has tripped due to test buttons function.
	Dark block with yellow halo around trip function indicates test not being performed and outlet has an active trip the same as the test buttons function.
	Dark block with no yellow halo around trip function indicates test not being performed and outlet has an active trip which is not the same as the test buttons function.
	White block + No test function indicates that the test function does not exist for that Protection Relay type.

There are generic control functions displayed across all control pages as outlined in Table 19.

Table 19: Control Page Authorisation

Description	Icon
	Stop all outlets, this button will only be available when 1 or more outlets are running.
	Reset all outlets is only available when unlocked. Authorisation level indicated by lock icon, E for Electrician Authorisation.

7.3 PIP Info Page

The info page presents all of the PIP system information. This includes PIP specific System Logs, E-Stop input Status, Temperature input status, Outlet information, General PIP information. The info page layout is shown below.

Figure 35: PIP Information Interface

7.3.1 **System Logs Page**

This page provides access to 50 logs associated with the PIP. The possible logs displayed here can be seen in Appendix A.

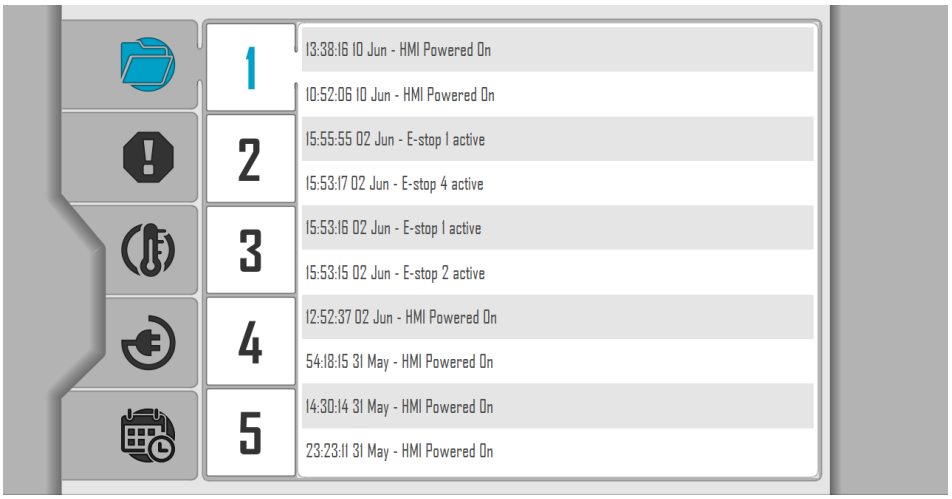


Figure 36: PIP System Log Interface

7.3.2 **E-Stops Page**

This page displays the status of the 4 possible E-Stop inputs. When an E-Stop is active all outlets will receive a stop request and will remain blocked until E-Stops have been cleared.

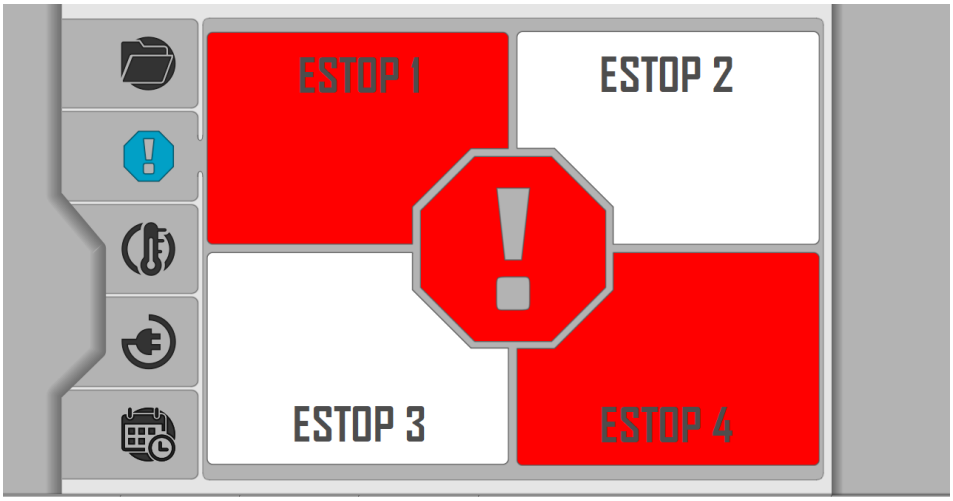


Figure 37: PIP E/Stop Interface

7.3.3 **Temperatures Page**

The PIP has allowance for up to 4 temperature inputs for monitoring. These temperature inputs do not have any control impact and are for monitoring only.

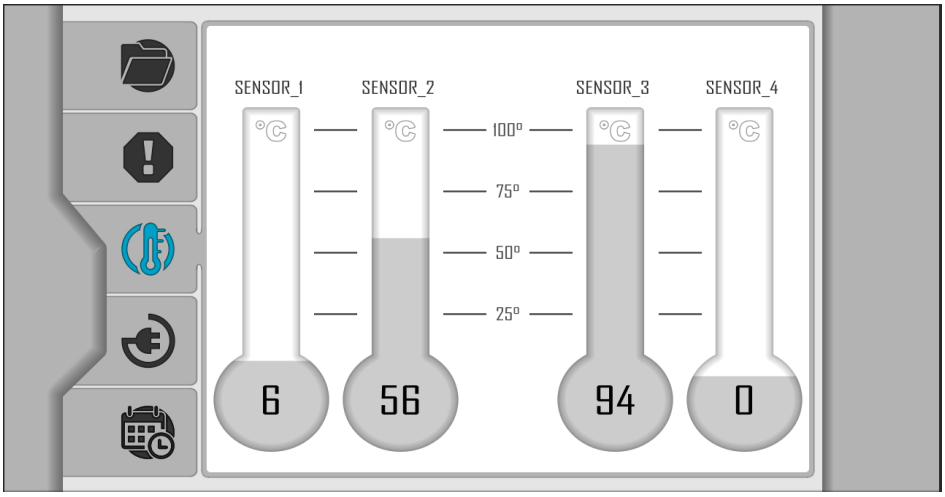


Figure 38: PIP Temperature Input Interface

NOTE

If the Temperature inputs are not being used, leave input disconnected. This will be displayed as ~0 deg.

7.3.4 **Outlets Page**

The outlet page provides all information relating to protection relays installed. Clicking on the specific outlet will display the information for that outlet only on the screen, see below. When looking at the outlet specific details you can navigate through the outlets by using the forward and reverse buttons.

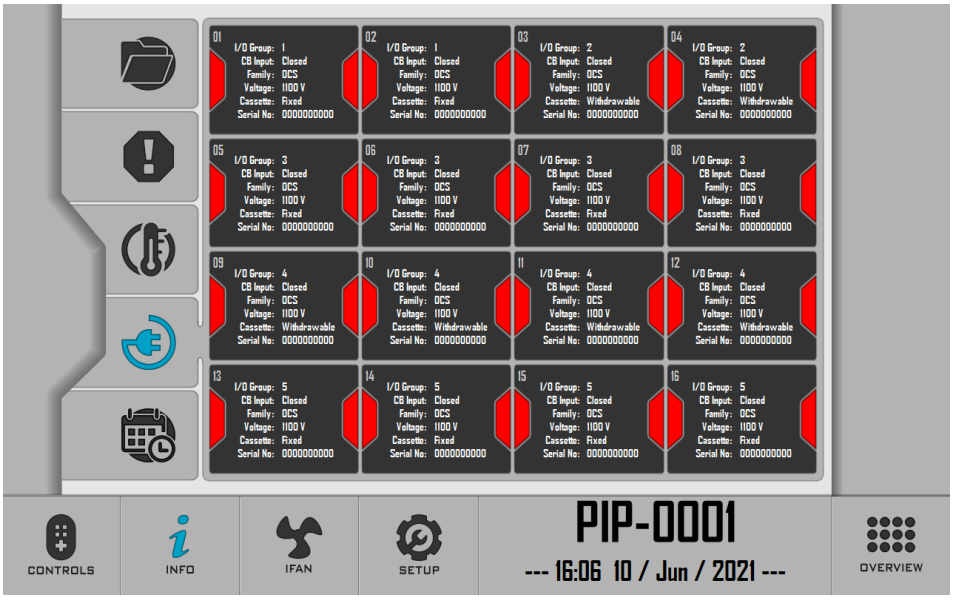


Figure 39: PIP Outlet Summary Interface

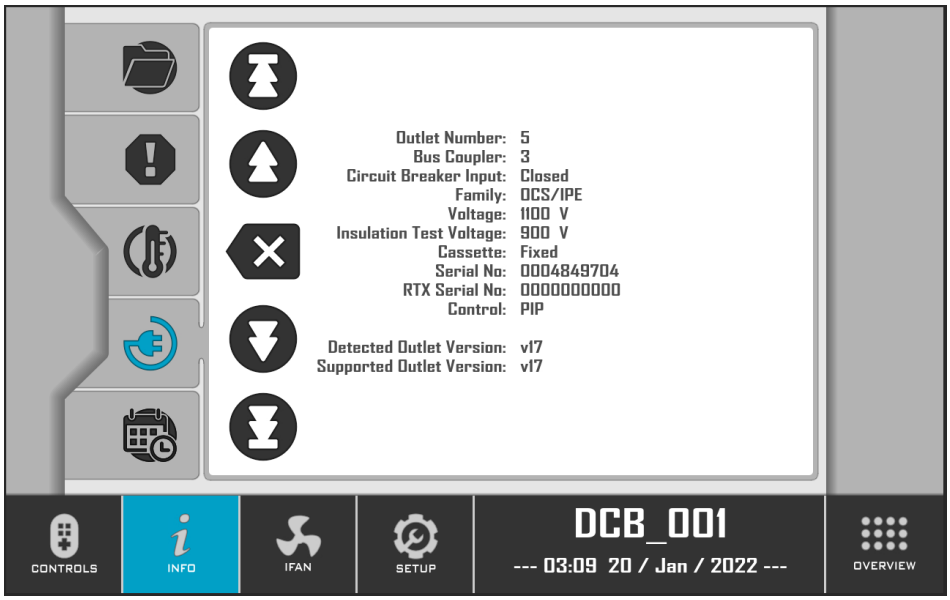


Figure 40: PIP Outlet Detail Interface

Description	Note
Outlet Number	Outlet being displayed on screen
Bus Coupler	IO Block Module Number
Circuit Breaker Input	Outlets upstream CB status
Family	Family type of protection relay, ie., OCS/IPE
Voltage	Outlets System Voltage
Insulation Test Voltage	Voltage used for IT test
Cassette	Outlet configuration (Fixed / Withdrawable)
Serial Number	Protection relay Serial Number
RTX Serial Number	RTX Serial Number
Control	Outlet control type (PIP, External, Both)
Detected Outlet Version	Software version of connected protection relay
Supported Outlet Version	PIP's supported software version of connected protection relay family

7.3.5 **General Page**

The general page presents the PIP's information including Serial Number, HMI Application Version, HMI Hardware Version, HMI Operating System, HMI Dongle Status.

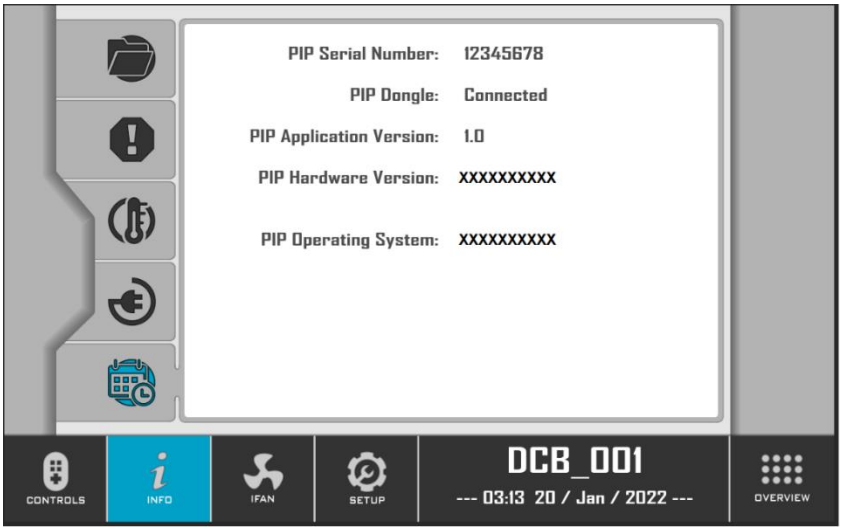


Figure 41: PIP Detail Interface

7.4 iFan Configuration Page and Bypass Mode

The iFan configuration interface presents all of the PIP's fan interlocking control and configuration. The main setup page layouts are shown below.

Figure 42: PIP iFan Interface

The iFan setup includes the following:

Item	Description
Local iFans Required	Minimum number of iFan loads required to be running from this PIP
Full Load Current %	The required current level, in % of outlets full load setting
Remote iFans Required	Minimum number of iFan loads required to be running from other identified PIP's
Remote PIP IP Address	The IP address of linked PIP performing fan interlocking
Remote PIP Asset Name	The asset name of linked PIP performing fan interlocking

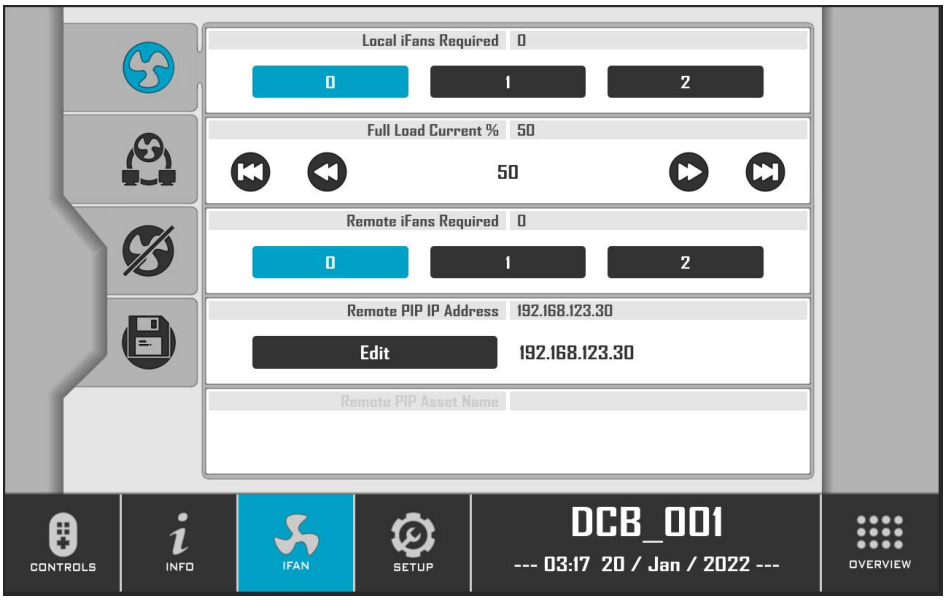


Figure 43: PIP iFan Setup Interface

To perform fan interlocking through an externally connected PIP will require the Ethernet connection to be validated from the master PIP before it can be used. To verify connections:

1- (At Master PIP) Configure the IP address of the Master PIP.

2- (At Slave PIP) Configure the IP address of the Slave PIP

3- (At Slave PIP) Specify the IP address of the Master PIP on the iFan Setup.

4- (At Master PIP) Access the iFan Connections Page and authorise access using the iFan input.

   a. Once authorised you can view the remote PIP's requesting access for iFan operation.
   b. To approve a PIP, simply click on device in the 'Connections Requiring Approval' and press the up arrow to shift it to the approved list.
   c. To de-activate approval for a specific PIP, click on device from the 'Approved Connections List' and press the down arrow to move it back to the connections requesting approval list.

Figure 44: PIP Remote iFan Connections

Bypass functionality has been implemented through a Bypass page and associated Bypass Authorisation. The process to action a bypass mode depends on the bypass configuration from the general settings page, either function will require authorisation from a Bypass input (as shown by the B on the padlock). Once authorised there are two modes of operation:

1- Non-timed Mode. Bypass activated by pressing the 'Activate Bypass' button on screen.

2- Timed Mode. Bypass activated in time intervals. When operating in this mode additional time can be added as required by using the two addition buttons (+1 Hr, +5 Hr).

NOTE

Authorisation required is specified by letter in locked symbol.

'E' for Electrician

'B' for Bypass

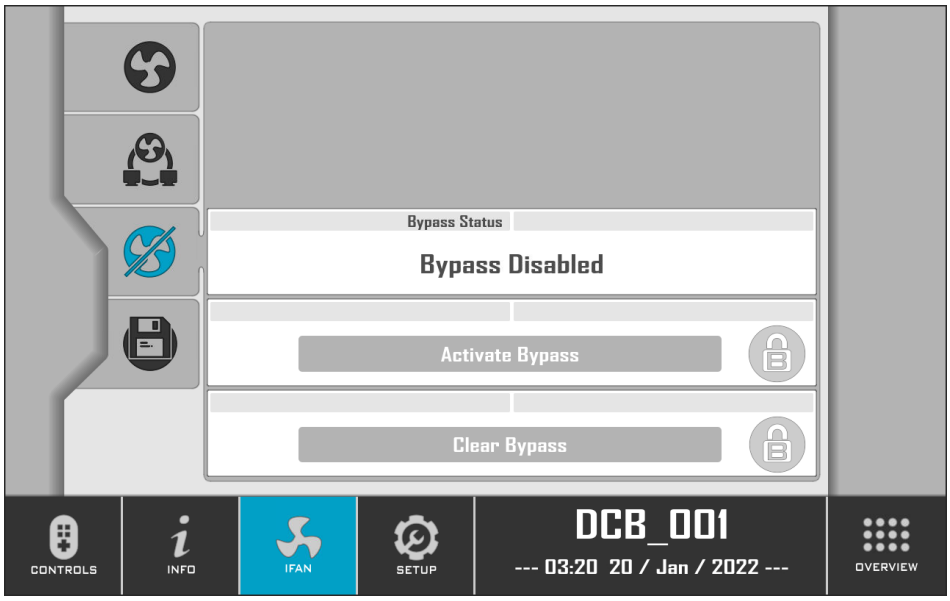


Figure 45: PIP iFan Bypass Control, Non-timed Operation

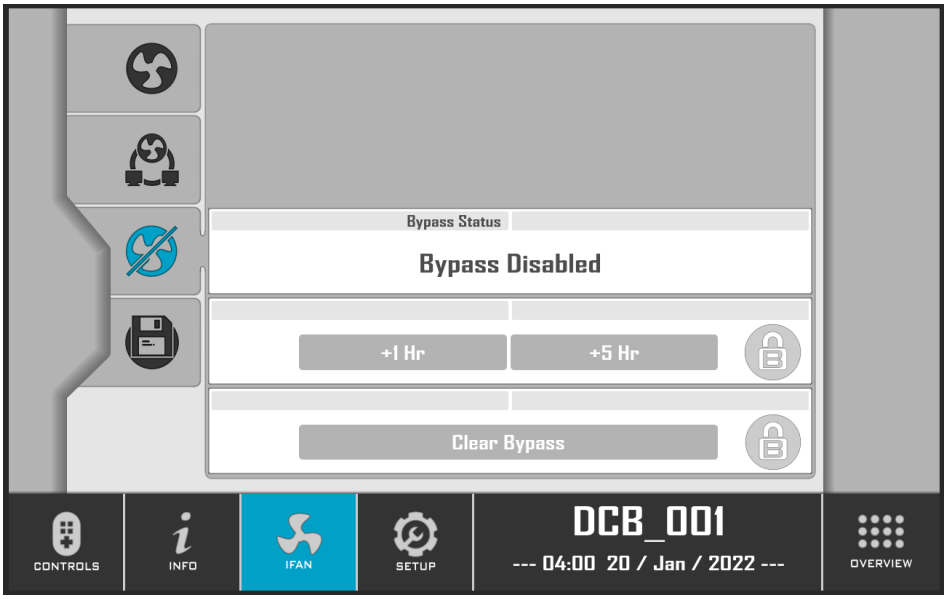


Figure 46: PIP iFan Bypass, Timed Operation

To clear the bypass functionality will depend on the Bypass mode configured in the general settings page. There are three modes of operation:

1- Authorisation Required. Bypass input required to action ‘Clear Bypass’.

2- Authorisation Not Required. Allows all users access to action the ‘Clear Bypass’ button.

3- Bypass Timeout. In this mode the PIP will exit Bypass mode when timer ends. The ‘Clear Bypass’ button can still be actioned in this mode to clear timer.

Saving iFan configuration requires the iFan authorisation input to be actioned.

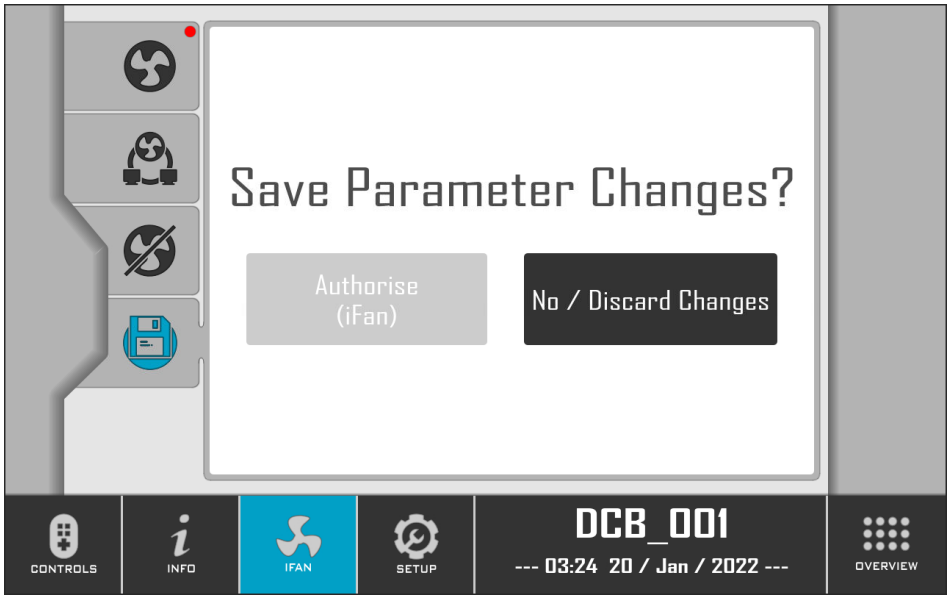


Figure 47: PIP iFan Setting Save Interface

When in Bypass mode, the user is required to accept an additional start prompt on the HMI as a secondary precaution and acknowledgement that the equipment is running in Bypass mode. This will assist capturing equipment that should not be running in Bypass mode. When an outlet is controlled externally and is operating in Bypass mode, a different start command will be required.

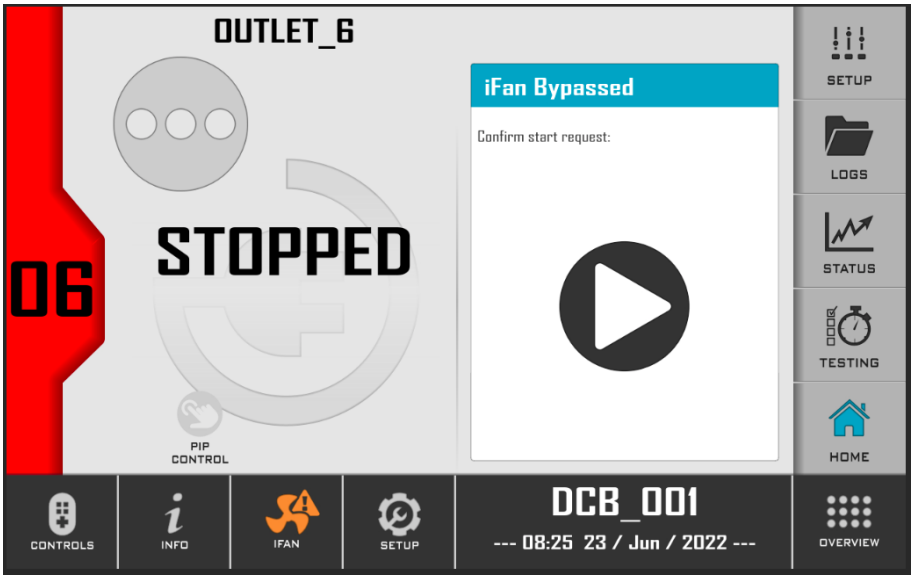


Figure 48: Additional Prompt for Outlet Start in Bypass Mode

7.5 PIP Setup Page

The PIP setup page provides all of the system configuration and setup menus. The page includes Network settings, Outlet and General Descriptions, Time/Date configuration menus. The page layout is shown below.

Figure 49: PIP Setup Interface

7.5.1 **Network Settings**

This menu allows the user to configure the PIP IP Address and the Network Time Protocol if desired.

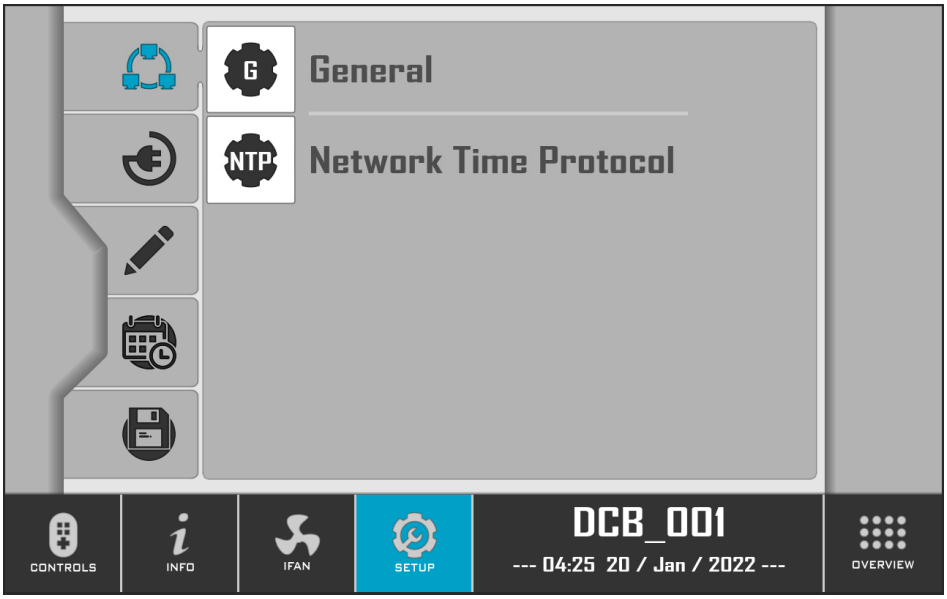


Figure 50: PIP Network Setting Interface

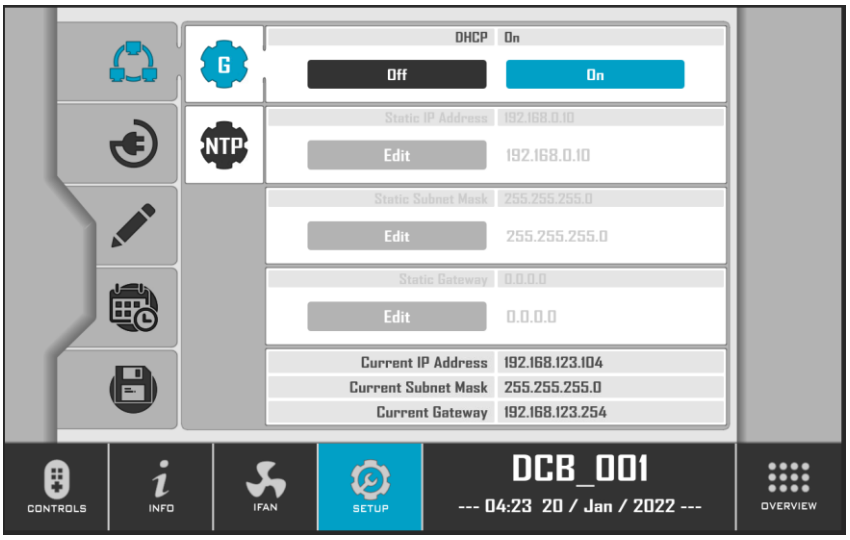


Figure 51: PIP Network Configuration Interface

Figure 52: PIP NTP Configuration Interface

7.5.2 **Outlet Descriptions**

This menu allows the user to configure the outlet descriptions for each outlet. Navigating the outlets desired is achieved by clicking on that outlet tile. The outlet setup also includes the control input restriction (PIP, External, PIP / EXT), kVAh / Run Time / Contactor Count reset options.

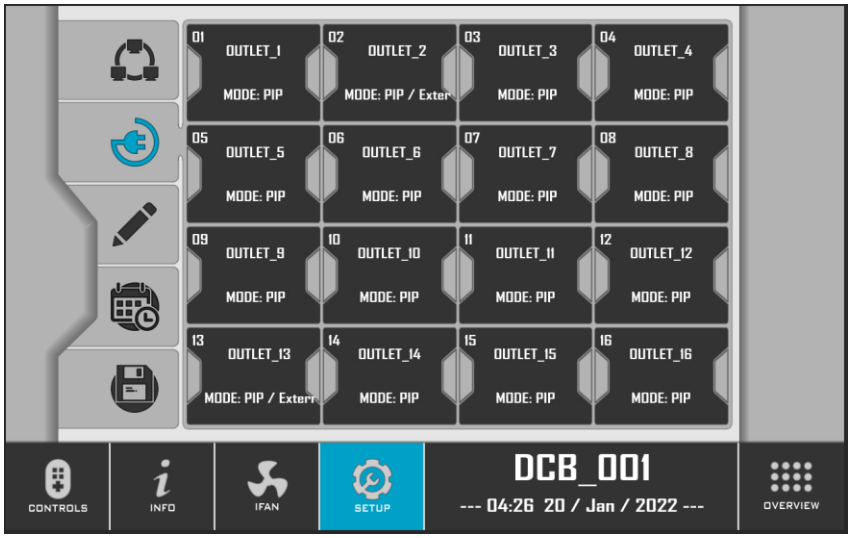


Figure 53: PIP Outlet Setup Interface

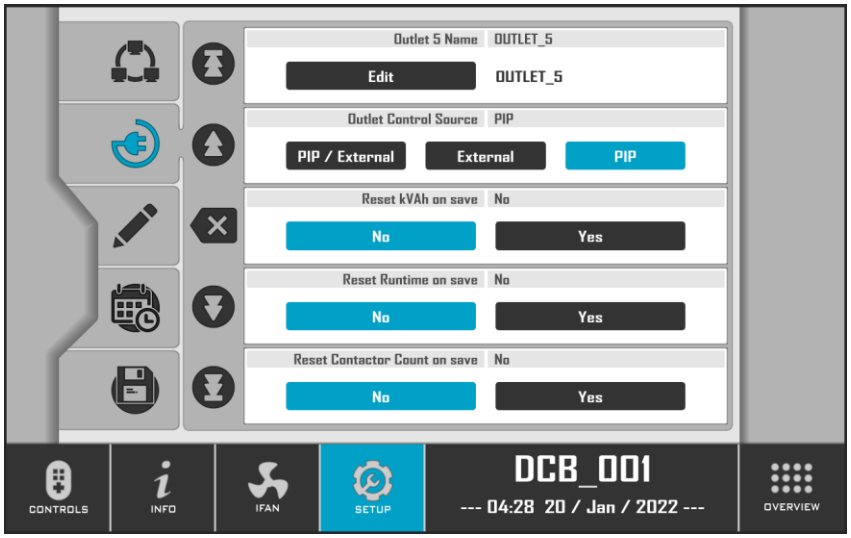


Figure 54: PIP Outlet System Setting Interface

The outlet control input identifies where the outlet will be controlled from. When set to PIP, only the PIP interface can control the outlet. When set to External, only the external source (through Modbus or Ethernet IP) can control the outlet. When set to PIP/Ext, either can be used to control the outlet. It should be noted that when operating in PIP/Ext, the PIP will be required to identify a communications heartbeat as well as receive the required outlet enable. If either of these are not available, the associated outlets will be blocked from operation.

NOTE

A communications Heartbeat and outlet enable is required whenever External control is allowed, without these the associated outlets will be blocked.

The heartbeat signal needs to be a consecutively incrementing register controlled from a single source. If multiple sources try to send the heartbeat signal, the incrementing may be interrupted / inconsistent causing the outlets to be blocked.

NOTE

The heartbeat is required to be a continuously incremented register. Interruption of this will cause associated outlets to be blocked.

7.5.3 **General Descriptions**

This menu allows the user to configure the Asset, E-Stop and Temperature Sensor Names.

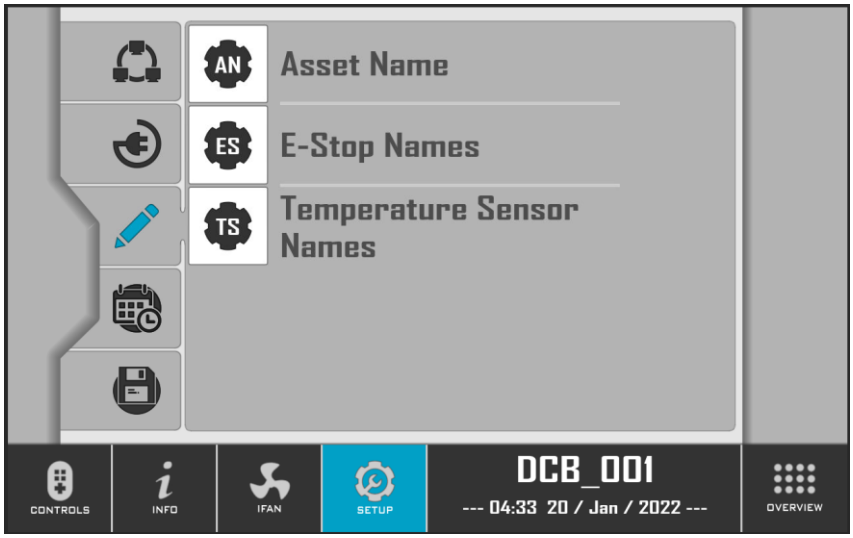


Figure 55: PIP General Description Interface

The PIP engineering level authorisation Password, system time and date can be setup from this menu. The Screen menu provides idle time selection, the time before the PIP will return to its default overview page, as well as touch screen calibration.

The screen calibration settings are stored on the PIP Dongle. If a Dongle or PIPS (or other screen) is changed, it is recommended that a new calibration be performed to eliminate operator frustration. If a calibration has not been performed there may be an error in touch position identification, as such it may be difficult to access the menu to perform a calibration. Under these circumstances it is recommended to access function over the network or through a mouse input connected directly to the PIP.

It should be noted that the screen calibration can be performed remotely or virtually however this may cause inconsistent operation with the physical device. Calibration should only be performed on the physical touch screen.

Performing a screen calibration will cause the PIP to restart after completion. This warning is presented to user before continuing. The PIP will then ask user to touch the point on screen, for increased precision use a stylus.

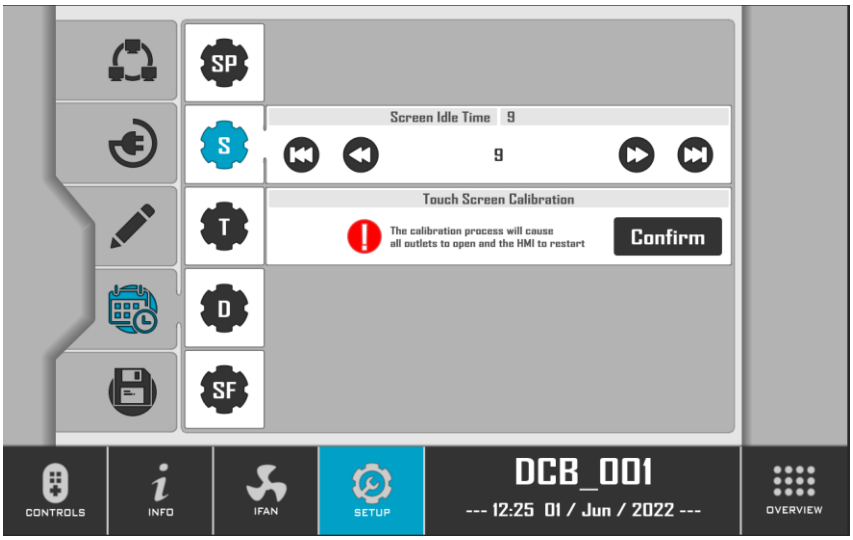


Figure 56: PIP Touch Screen Calibration Warning

7.5.4 **Configuration Page**

This menu allows the user to configure the System Password, Screen configuration and Time / Date settings. The Ability to reset Main Contactor Faults from the HMI is also enabled from this menu. Enabling the MCF reset, will allow MCF resets to be performed from the HMI, disabling this setting will require the physical push button on the screen.

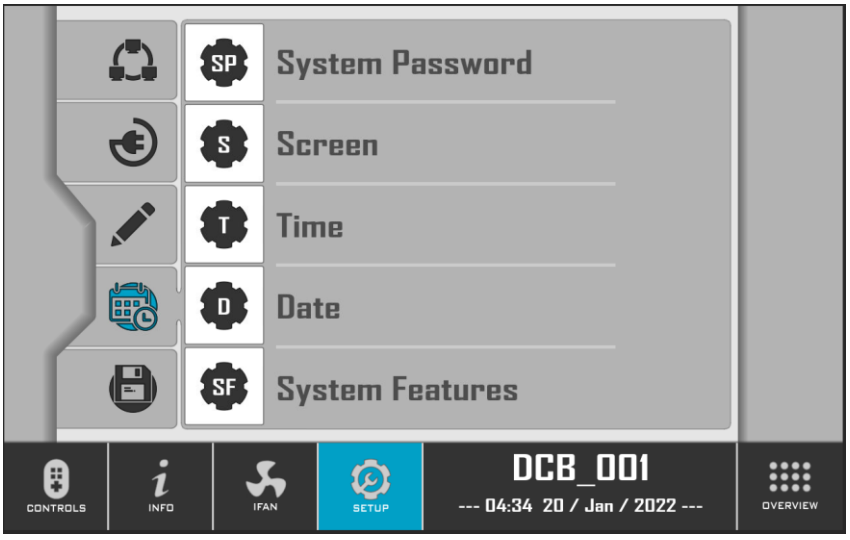


Figure 57: PIP General Settings Interface

The PIP engineering level authorisation password, system time and date can be setup from this menu.

The Screen menu provides idle time selection (this is the time before the PIP will return to its default overview page) as well as touch screen calibration.

The screen calibration settings are stored on the PIP Dongle. If a Dongle or PIPS (or other screen) is changed, it is recommended that a new calibration be performed to eliminate operator frustration. If a calibration has not been performed there may be an error in touch position identification, as such it may be difficult to access the menu to perform a calibration. Under these circumstances it is recommended to access function over the network or through a mouse input connected directly to the PIP.

It should be noted that the screen calibration can be performed remotely or virtually however this may cause inconsistent operation with the physical device. Calibration should only be performed on the physical touch screen.

Performing a screen calibration will cause the PIP to restart after completion. This warning is presented to user before continuing. The PIP will then ask user to touch the point on screen, for increased precision use a stylus.

Figure 58: PIP Touch Screen Calibration Warning

The system features menu includes the following attributes:

Item	Description
Minimum of one iFan Required	Prevents the issue of inadvertently setting both the local and remote iFans required to 0 when set to YES.
iFan Bypass Times out	NO – On / Off functionality only YES - Adds time out functionality to remove the bypass mode as back up.
Authorise required to clear iFan Bypass	NO – Anyone can clear the bypass mode YES – Requires Authorisation to clear bypass mode

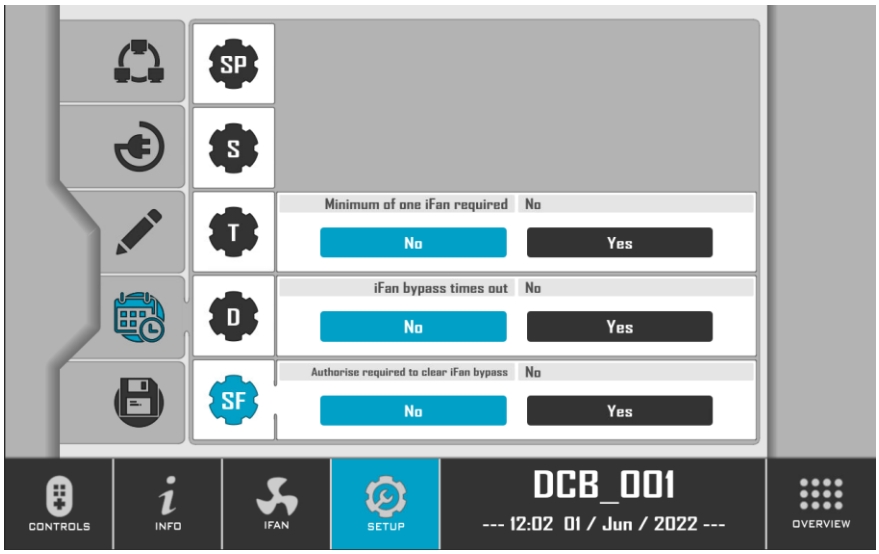


Figure 59: PIP System Features Interface

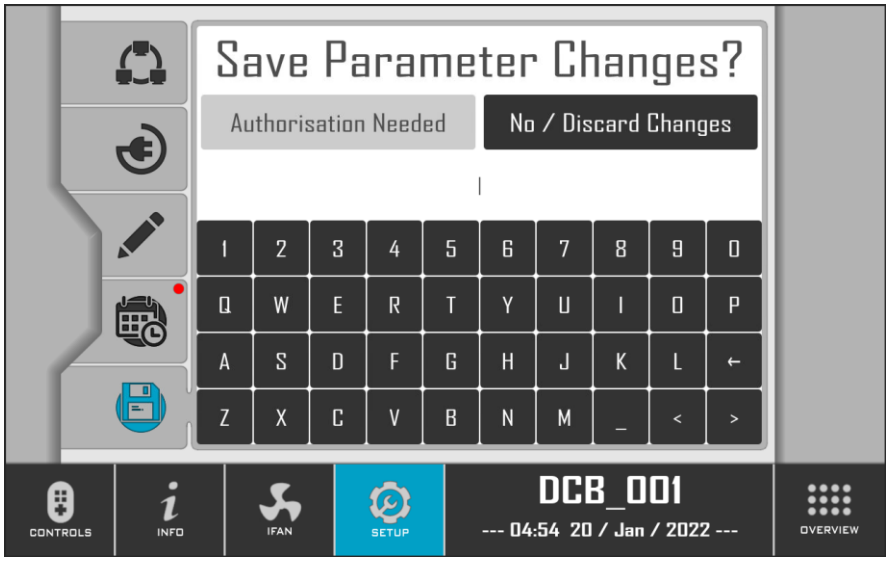


Figure 60: PIP System Setting Authorisation Interface

NOTE

Default PIP System Password = ‘wombat123’

8 OUTLET GUI OPERATION

The outlet screens have a standardised structure and are the same for all outlets. This includes the outlet home screen and the outlet specific menus. The following sections will outline the outlet screen structure.

8.1 Outlet Home Screen

An outlet home screen is displayed below.

Figure 61: PIP Outlet Interface

- Outlet number and Status colour

  The outlet currently being displayed is identified by the number in the indentation on the left of the screen.
  The colour of the indentation provides feedback on the status of the outlet. This colour is repeated on the PIP's home page (overview page). The colour operation is detailed in Table 20.

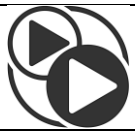
Table 20: Outlet Colour Lighting Overview

Screen Lighting	***Outlet State***
White	Starting, Running, Paused
Yellow	Tripped, Blocked
Red	Stopped

- Outlet Control

The buttons displayed at the top left of the page are action buttons to control the outlet. Refer to Table 21 for an overview of the buttons/icons.

Table 21: Outlet Control Buttons

Description	Icon	Description	Icon
Start		Requires Electrician Authorisation	
Stop		Reset	
System Undertaking Check		Remote Start Mode	
Group Feed Start			

NOTE

If the PIP is configured for remote start mode then the local start button within the UI will be unavailable.

- Outlet Status

The outlets state will be displayed in text under the outlets control buttons. Certain outlet specific conditions are also shown here by icons. Refer to Table 22 for an overview of the icons.

Table 22: Outlet Status Icons

Description	Icon	Description	Icon
PIP Control; outlet controlled through the PIP HMI only		Pilot termination set to RTX Mode	
External Control; outlet controlled externally only		Pilot has been disabled from PIP Controls Page	
PIP / EXT Control; outlet controlled through either the PIP HMI or Externally			

- Outlet Status and Trip Indication

  The gauge displayed in the centre of the screen will display the outlet current and the full load current set point during normal operation.

  When the outlet trips this section will change to display the type of trip/s that are active. A more detailed description of the active trip can be revealed by selecting the trip message. See the user manual of protection relay used for the full list of trip messages to be displayed here.

  When operating in Motor Overload Mode, and a thermal overload occurs the outlets thermal accumulator will be displayed with the ability to reset with electrician's authorisation.

- Outlet Menu's

  These are common to all outlet screens. This display bar shows all available and selected outlet menu options. The blue icon infill represents the active menu option. Menu options include:

  a. Setup – Navigates to the outlets SETUP screen.
  b. Logs – Navigates to the outlets LOGS screen.
  c. Status – Navigates to the outlets STATUS screen.
  d. Testing – Navigates to the outlets TESTING page.
  e. Home – returns display to outlets HOME screen.

NOTE

After the chosen time of inactivity on any menu option the display will revert to the HOME screen. Any unsaved changes to the PIP's configuration will be lost. This can be configured on the HMI Setup Menu

8.2 Outlet Testing Screen

The TESTING screen is shown below. An Electrician authorisation is required to access this page. The possible actions include the following tests:

- Earth Leakage

  This button will energise until an earth leakage trip is detected and then turn off. If no trip occurs within 1 second, the button will turn off and a test fail trip will occur. Upon test completion, whether that be successful or fail, the test output will de-energise.

- Earth Continuity Series / Shunt

  These buttons will activate an open circuit (series test) or short circuit (shunt test) fault for 5.5 seconds.

- Frozen Contact

  This button will energise an output contact in that will be wired in parallel to the Main Contactor Input (MCI) to provide a Logical MCF Fault.

- Outlet Mapping

  This test is performed by the PIP to ensure the outlet IO is connected to the correct outlet and the outlet protection relays are identified correctly.

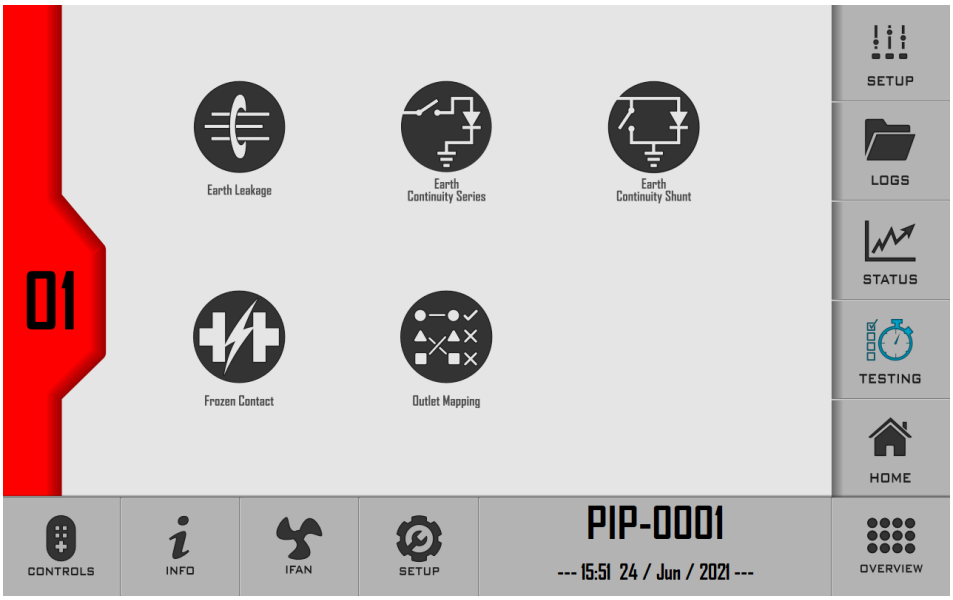


Figure 62: PIP Outlet Test Interface

Selecting the test will illuminate the button blue, when the icon returns to the normal colour the test has finished. A yellow halo around the test button (similar to that used on the PIP control interface) will indicate that the outlet has tripped because of that test function.

8.3 Outlet Status Screen

These screens display an overview of an outlets status as well as the outlets protection relay diagnostic data. The buttons located on the left of the screen allow the user to navigate through the status pages. On each status page the outlet can be started from the play button. This can allow the outlet to be started while monitoring the desired parameters.

Refer to Table 23 for an overview of the information contained within this menu.

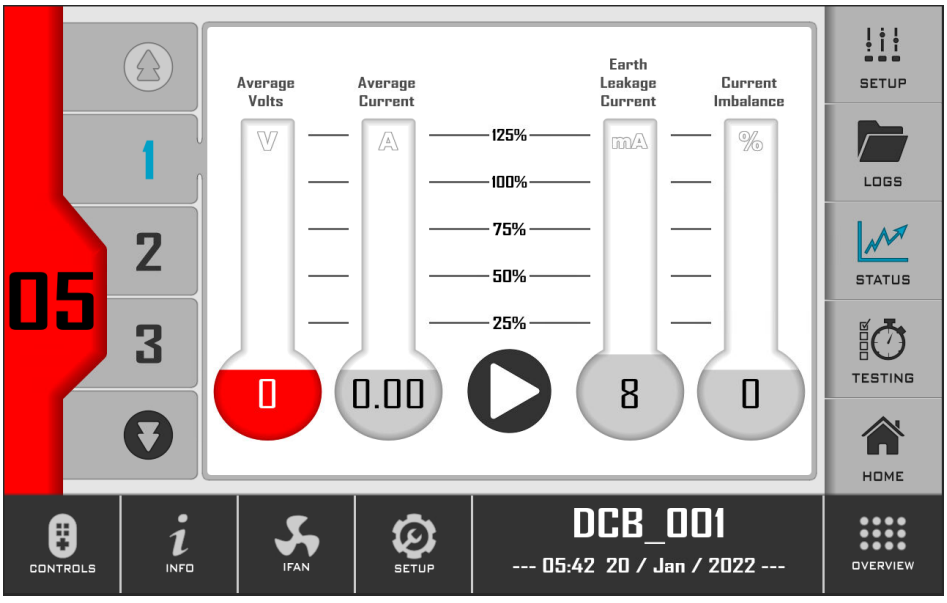


Figure 63: PIP Outlet Status Interface

NOTE

The protection system constantly injects a test signal into outlets Earth Leakage core balance CT. The earth leakage on the outlet will read a small non-zero value, even when the outlet is open. This confirms that the earth leakage detection system is operational.

Table 23: Status Page Overview

Page	Overview	Page	Overview
1	Average Voltage Average Current Earth Leakage Current Current Imbalance (Items presented as graphs)	2	Pilot EC Shunt Pilot EC Series Thermal Accumulator (TAC) Internal Temperature (Items presented as graphs)
3	Power Monitoring (kVA, kVAh) Run Time (hr) Contactor Count	4	IR Test Result EFLO Test Result A EFLO Test Result B EFLO Test Result C
5	Protection relay Trip Mask 1/2/3	6	Protection relay Shadow Trip Mask 1/2/3
7	Protection relay control bits - Status Mask - Enable Mask - Digital I/O	8	Average Volts (V) A / B / C Phase to Earth (V) Average Current (A) A / B / C Phase Current (A)
9	Heartbeat Volts A/B/C (%) Volts Average (%) Current A/B/C (%) Average Current (%) Current Imbalance (%)	10	Earth Leakage Current Pilot Series / Shunt Resistance TAC Level Trip Mask 1-3 Enable Mask 1
11	Status Mask 2 Digital IO RTC (Settings) IPX Software Version Insulation Test Result	12	EFLO Test Result (A,B,C) Internal Temperature Shadow Trip Mask 1/2/3 RTX RTD Temp 1-3
13	RTX RTD Temp 4-5 RTX Inputs RTX Status RTX Serial Number + CRC RTX Software Version RTX Internal Temperature RTX Machine Type	14	RTX Machine ID Protection System ID Max and Min Series EC (OCS RV only) Max and Min Shunt EC (OCS RV Only)
15	Reserved	16-17	Comms Board Flags Current Event Log ID Comms Software Version Comms Serial Number + CRC
18	Reserved		

8.4 Outlet Logs Screen

These screens display the 50 stored logs of the protection relay connected.

Figure 64: Outlet Logs Interface

8.5 Outlet Setup Screen

These screens allow the user to configure all control and protection settings for that outlet. The menu is navigated via the five options down the left-hand side of the display with the blue icon representing the active menu selection. The outlet must be stopped before parameters can be modified. The following provides an overview of each of Setup menu options from top to bottom.

- **Outlet Control**
  - Starting Options (SO)
    - Remote start at Machine
    - Pilot Mode
    - Settings Save target (information only)
  - (If RTX Connected) RTX Machine Details (RM)
    - Load Machine Type
    - Load Machine ID
  - (If RTX Connected) RTX Temperatures (RT)
    - RTD 1-2 Trip Level
    - RTD 3-5 Trip Level
    - RTD 1-2 Reset Level
    - RTD 3-5 Reset Level
  - (Withdrawable OCS Only) Withdrawable Cassette (WC)
    - Actuator Calibration

- **Personnel Protection**
  - Earth Continuity (EC)
    - Trip Time
    - Trip Level
    - Latch EC Trip
  - Earth Leakage (EL)
    - Trip Time
    - Trip Level
  - Frozen Contact / Loss of Vacuum (FC)
    - Back EMF Time
    - Loss of Vacuum Level
  - Insulation Test Level
    - Insulation Test Level
    - Insulation Test Voltage (if applicable)
- **Load Protection**
  - Overload (OL)
    - Overload Model
    - Overcurrent Time Multiplier
    - Full Load Current (FLC)
    - Thermal Accumulator Start Block Level (TAC)
    - Thermal Cooling Multiplier
  - Short Circuit (SC)
    - Trip Multiplier (SC Level)
    - Trip Time
  - Under Voltage (UV)
    - Trip Level
  - Current Imbalance (CI)
    - Trip Level
  - Under Current (UC)
    - Trip Level
- **General Setup**
  - Outlet Name (ON)
- **Save** Changes – When no setting changes have been made this page displays the outlets 'Active Stored Settings'.

NOTE

Parameters cannot be changed while the outlet is running.

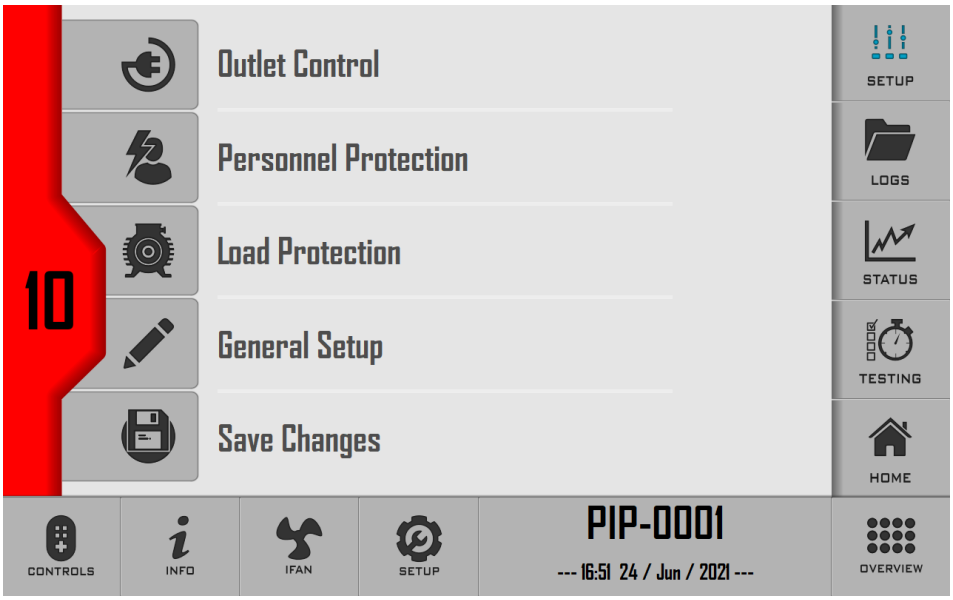


Figure 65: PIP Outlet Protection Setup Interface

Parameter modifications are also indicated by a red dot in the top right-hand corner of the corresponding menu tile.

NOTE

After the screen idle time has elapsed on any menu option the display will revert to the HOME screen. Any unsaved changes to the PIP's configuration will be lost.

8.5.1.1 Parameter Saving

Parameter saving requires an electrician authorisation. All parameter changes are logged. Once authorised, the parameter change acceptance time will vary depending on whether the PIP is operating in Diode or RTX Mode. When in Diode Mode the process is quicker than when operating in RTX Mode. If the change occurred successfully, a confirmation message appears, and the UI returns to the 'Active Stored Settings' page.

If the Pilot Mode is being changed, no other parameters are permitted to be changed. Likewise, if any other parameters are being modified, then the Pilot Mode cannot be changed.

NOTE

It is recommended to change pilot mode first to save modifying parameters a second time.

Figure 66: Outlet Setting Overview Page

For a Pilot Mode change, once the change has been verified, then the parameter sets for the new Pilot Mode are loaded (e.g. if changing from Diode to RTX mode, then all the RTX parameters will need to be loaded into the protection relay).

When a parameter set is loaded, the parameter Invalid Masks are checked. If any UI parameter is invalid, it will be added to a list (shown in status pages), and a trip will be flagged. To make a parameter 'valid' again, it can either be explicitly modified, or it will be set to its default value implicitly the next time any other parameter value is changed and saved.

Parameter sets will be reloaded at the following times:

- At start-up
- When they have their values changed
- After an internal Comms Fault is cleared
- If the RTX is detached, and reattached

Anytime that parameters are being changed or loaded/reloaded, then a "Parameter Syncing" message will display on the outlets home screen. During this time no outlet starts will be permitted.

8.5.1.2 RTX Configuration

When operating in RTX mode, it is possible to connect RTD input that can be monitored from the PIP. The RTX can be programmed with a name to allow it to be identified easier by the user. This identifier can be up to 15 characters. Refer to the protection relay user manual for the RTX abbreviations available.

The RTD inputs are all individually monitored however there are only two trip levels that can be configured with corresponding reset levels. RTD inputs 1 & 2 are grouped to one trip / reset setting, with the remaining RTD inputs 3, 4 & 5 being grouped to the second trip / reset setting.

The trip levels can be set to any value 0-200 °C with the corresponding reset value also being set to any value 0-200 °C.

For a reset to occur, all RTD inputs of that group need to be below the reset level.

8.6 Outlet Cassette System – Withdrawable Version

The PIP can also interface with the Ampcontrol OCS system. The additional withdrawable setup screens allow the user to calibrate and control the actuating of the withdrawable cassette. When an outlet is initialised as a withdrawable cassette, the outlet home screen will display an additional Earth/Service button.

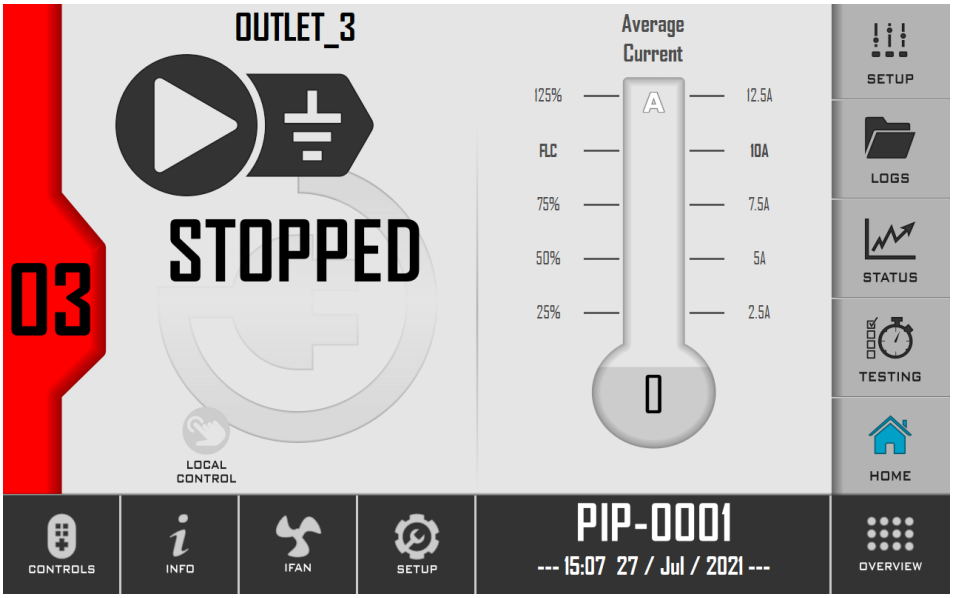


Figure 67: PIP Withdrawable Outlet Home Interface, Outlet Cassette in Service Position

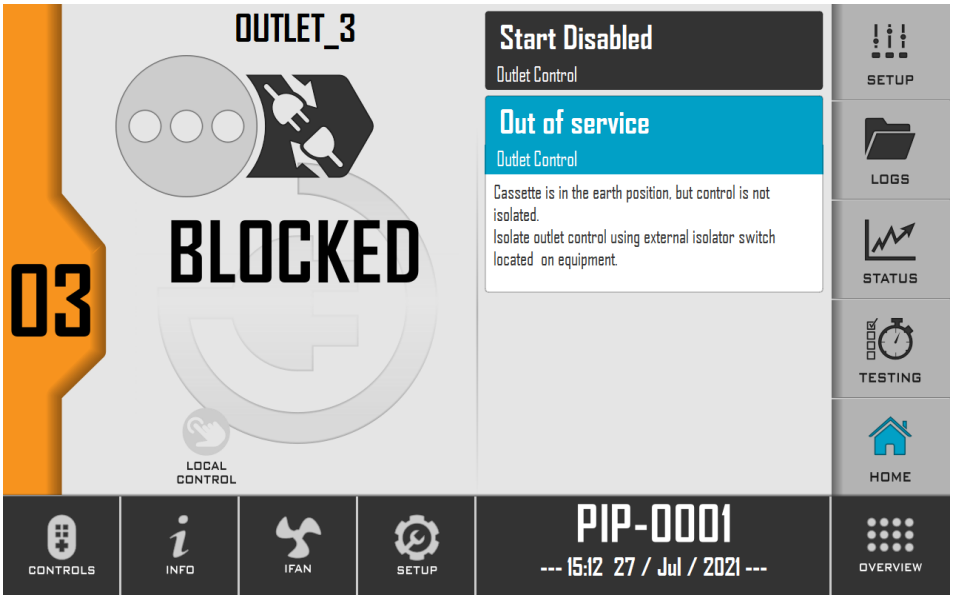


Figure 68: PIP Withdrawable Outlet Home Interface, Outlet Cassette in Earth Position – Actuator Not Isolated

As the outlet is actuating between the two positions, the GUI will indicate the relative actuator position, see figure below.

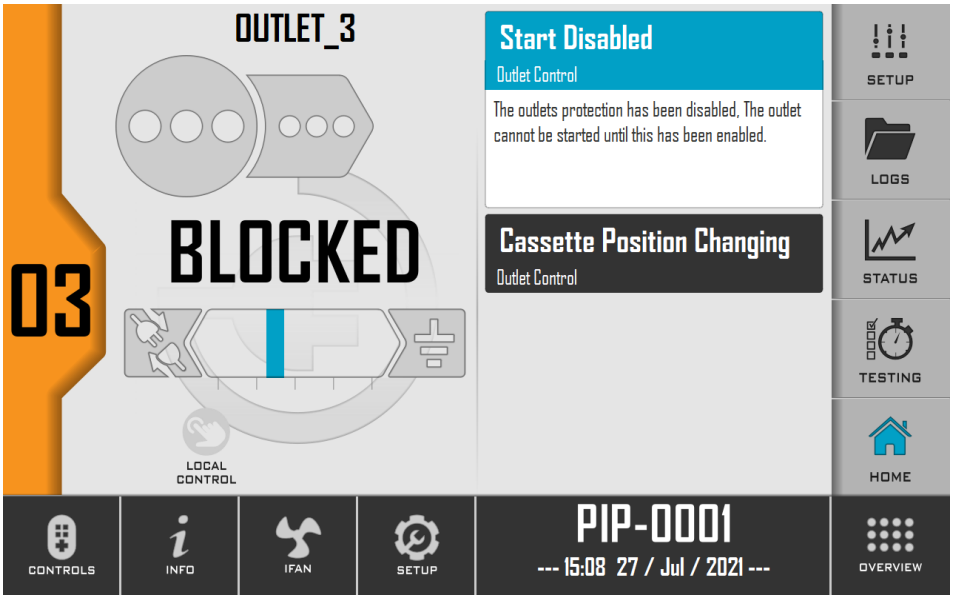


Figure 69: PIP Withdrawable Outlet Home Interface, Actuator Position during position change

When the cassette is in the Earth Position, the outlet colour will change to Orange to indicate the outlet is currently blocked. When the actuator isolation switch has been operated the outlet colour will change to Yellow / Green, to indicate cassette in earth position and has been isolated.

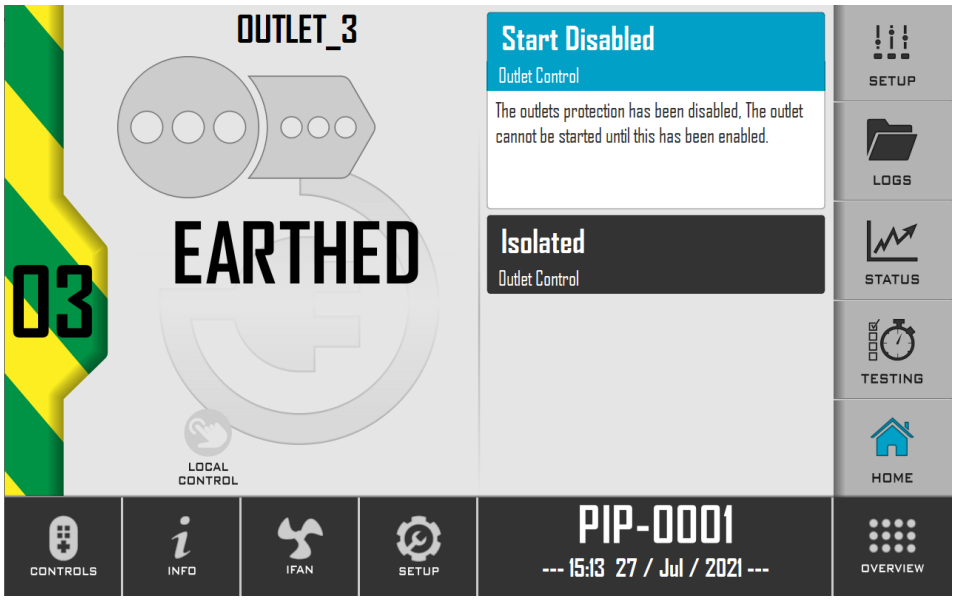


Figure 70: PIP Withdrawable Outlet Home Interface, Outlet Cassette in Earth Position – Actuator Isolated

The Cassette calibration controls can be accessed from the outlets setup screen as seen below. To access the calibration process the system will need an electrician authorisation.

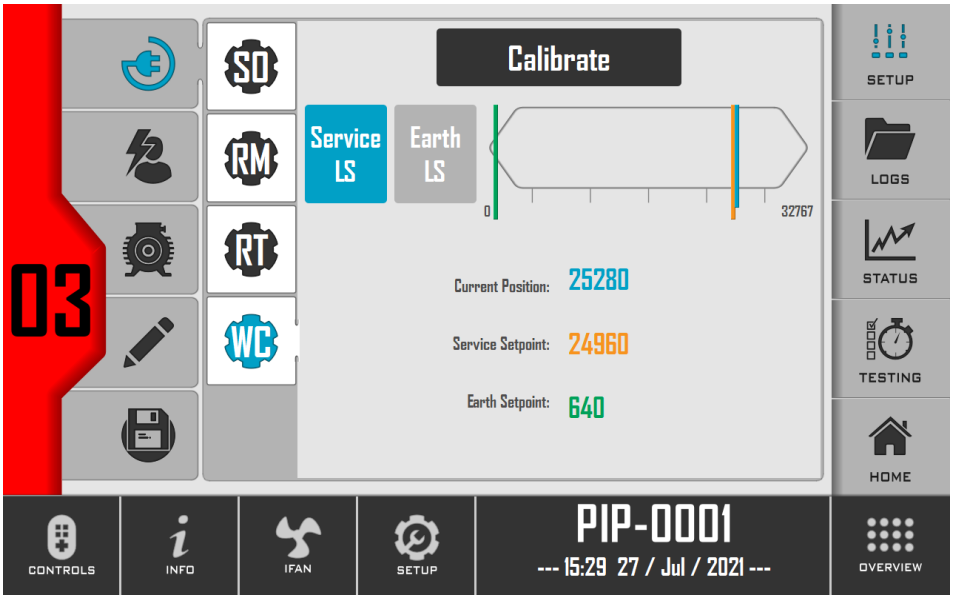


Figure 71: PIP Withdrawable Outlet Calibration Interface

When an outlet is configured as a withdrawable cassette, an additional Isolation proof test will be shown in the outlet test menu. To perform the test the outlet needs to be in the Earth Position and the external actuator isolation switch operated. A successful test will result in an Actuator Failed to operate trip.

Figure 72: PIP Withdrawable Outlet Test Interface

Figure 73: PIP Withdrawable Outlet Test Interface, when Earthed

8.7 Outlet Starting

To energise an outlet, the following start sequence will be followed:

- If there are any active trips, the PIP will ignore any start command received
- If all trips are cleared, the PIP can initiate the protection relay to perform its start sequence
- Check Protection relay for the appropriate start sequence
- The outlet will continue in the running state with the outlets contactor closed until a stop command is received or a protection function trips
- If at any point during the start sequence a stop command is received or a protection function trips, the start sequence is immediately cancelled and the Main Contactor (or Circuit Breaker) will be opened

8.8 Outlet Resets

All Outlet and PIP resets handled through the HMI. Most trips are reset with a general reset, not requiring authorised access. Some trips require an electricians authorised reset to provide a level of competency associated with resetting faults. Authorisation is provided by either a physical input or over the communications channel.

Refer to the protection relay for clarification of reset requirements. In general, the following latched trips may be cleared (once the fault has cleared) with a general reset:

- Earth Continuity (EC)
- Overload (OL)
- Current Imbalance (CI)
- Under Voltage (UV)
- Under Current (UC)
- Earth Fault Lockout (EFLO)
- Insulation Test
- Remote start stuck

The following latched trips may be cleared only after authorised confirmation:

- Earth Leakage (EL)
- Earth Leakage CT detect (EL CT)
- Short Circuit (SC)
- Main Contactor Faults (This is only available if the PIP has been configured to allow software resets of the MCF trip)
    - Frozen Contact (FC)
    - Loss of Vacuum (LOV)
    - Fail to Close (FTC)
    - Fail to Open (FTO)

8.9 PIP System and Outlet Event Logs

The PIP will record system generated event logs, while the protection relay will record the outlet generated event logs. A real time clock/calendar is included, allowing each log to sequentially record the time, date and details of each event.

The PIP will record and display the following events. This is in addition to those provided by the protection relay (refer to the protection relay user manual for these logs).

See Appendix A

8.10 PIP Group Feeder Operation

The PIP system has been developed to control dual and triple feed outlet configurations. The system setup of the group feed is addressed in the roll call section. The Group Feeder IO Block (GFB) is only required when the groups can be operated in a single individual outlet configuration.

If all group feeds are non-configurable, the group control is always active. When a group can be operated as individual outlets, the group control will be disabled when the group feed enable input is active. When group is disabled, all outlets of that group will operate as individual outlets.

The following is required to operate a group feed:

- All outlets have same protection settings.
- All outlets set to RTX mode, with Machine Name and ID matching.
- Group Relay Feedback input high (if group is configurable this input indicates group is operating as individual outlets).
- A single outlet can be part of multiple groups, however only a single group where the outlet is used can be active at a single time.

The following controls will take place when the group is active.

- Group Start is available from any outlet in group.
- When any outlet in group is stopped, all outlets will be stopped.
- If any outlet is tripped/blocked, all outlets will be blocked.
- Group configuration only when outlets are stopped.
- Group feeder relay feedback state change will cause all outlets of group to be sent stop command.
- If Group Feeder IO Block (GFB) goes offline, all configurable outlets will be blocked and a system log generated.
- If Group Feeder IO Block (GFB) state does not match expected state, all configurable outlets will be blocked and a system log generated.

When a group is active and outlets are healthy, a start can be initiated from any outlet in that group (Figure 74). Once a start has been pressed, a confirmation start button will be provided on the screen to prevent false start requests for group outlets (Figure 75).The start icons available in the Controls Menu will be blocked for active group feed outlets (Figure 76).

Figure 74: Group Start Button from Outlet Page

Figure 75: Group Start Confirmation Button from Outlet Page

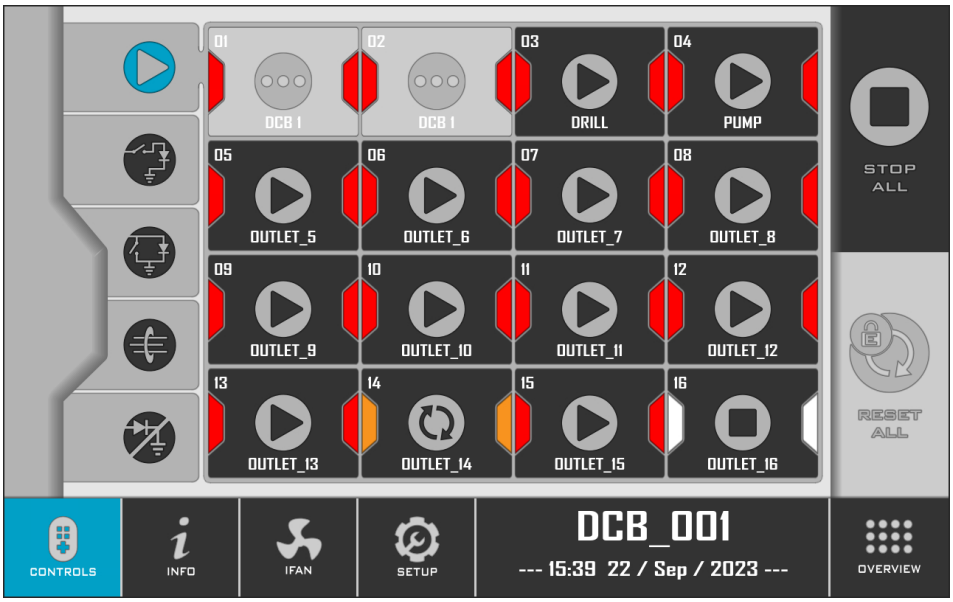


Figure 76: Outlet Start Option Blocked on Controls Page

When a group start is initiated, the individual EFLO test results are collected, and an actual result is stored in the system logs. This calculation uses the parallel resistance formula,

$$R_{GROUP}(n) = 1 / (1/R1 + 1/R2 + 1/R3 + \ldots. + 1/Rn)$$

8.10.1 **Group Feed Identification**

The PIP will display a group feed icon on the overview screen on the outlets associated with a group feed. For outlets used in multiple grouping, multiple squares will be shown (only one group will be active at a single time).

Table 24: Group Feeder Icons on Outlet Tile

Description	***Icon***
Group Feed 1 Active	
Group Feed 2 Active	
Group Feed 3 Active	
Group Feed 4 Active	

Description	***Icon***
Group Feed 1 Not Active	
Group Feed 2 Not Active	
Group Feed 3 Not Active	
Group Feed 4 Not Active	

8.10.2 **Outlet Settings**

When a group is configurable and can run as individual outlets, each outlet will need to be setup as Group or individual.

This is accessed through the outlets setting menu, Setup - Outlet Control – Group Feed.

Figure 77

This menu has two settings available (Figure 78 and Figure 79):

- Group feed mode: Group or Individual
- Group Machine Type / ID: This sets the RTX setting requirement.
    - The RTX Type and ID will need to be confirmed from this menu, these settings can be seen in Figure 80.

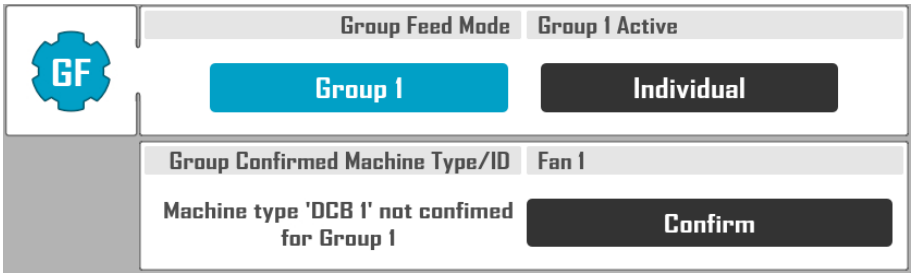


Figure 78: Group Feed Settings, RTX Type and ID to be confirmed

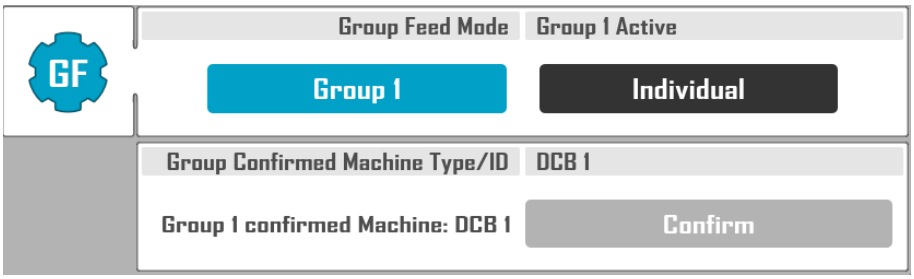


Figure 79: Group Feed Settings, RTX Type and ID confirmed

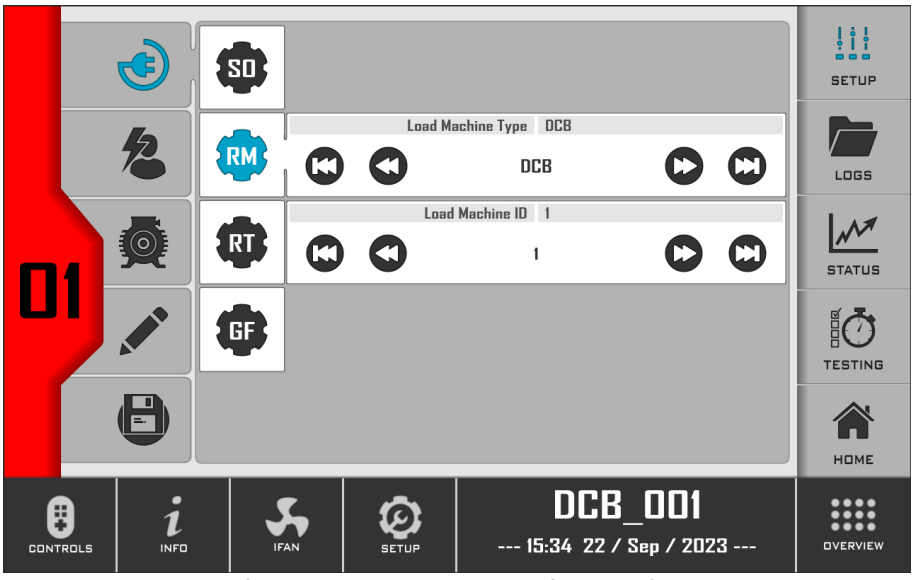


Figure 80: RTX Type and ID setting

9 COMMUNICATIONS

The PIP provides a communication link over Modbus TCP and Ethernet IP communications protocols. The implementation of these allows all PIP and outlet data to be viewable over typical modern networks. The PIP also allows limited control inputs for the outlets, this includes Starts, Stops, Resets and authorisation inputs.

The details of these protocols can be seen in Appendix B (Ethernet IP) and Appendix C (Modbus TCP). A current spread sheet can be downloaded from the Ampcontrol website.

9.1 Remote Desktop Access

The PIP has implemented Virtual Network Computing (VNC), this can be used to monitor, control and configure the PIP remotely. The VNC will need to be used in conjunction with either MODBUS TCP or Ethernet IP, to provide the authorisation inputs as required. Any VNC software can be used by accessing the unit directly through the configured IP address. To ensure there are no network conflicts each PIP will need to have the Network Settings manually configured initially.

10 SYSTEM IO CONFIGURATION

The PIP can be physically wired in a number of ways to provide versatility in the Ethernet connections from PIP to IO modules and protection relays. There is no single network layout to make the system operate. The following sections will outline the possible options that can be implemented depending on the system topology. Ampcontrol has implemented the design using a non-managed 5 port switch (MOXA EDS-405A). Alternative switches can be used to achieve the desired topology and redundancy.

10.1 IP Address of System Components

To reduce complexity, IP Address for the local PIP equipment has been defined by Ampcontrol and are not required to be altered by the user. The IP address used for the IO modules are selected through the dip switches as indicated in the above section. Incorrect configuration of these dip switches will result in system faults or clashes.

The outlet IP addresses have been eliminated by allocating each outlet with a dedicated address. When installing relays into the system it is vital that the dongle inserted into the relay has the correct outlet identification and is in the correct position to prevent system faults or clashes.

10.2 Network Connection Options

The Network connection options can vary depending on the physical location of the outlets and associated IO Blocks, the desired topology, redundancy requirements, etc. See Appendix F for some example system configuration options.

10.3 IO Block Configuration

The IO blocks are directly assigned to outlets using consecutive sequencing. When configuring the various IO blocks the outlet designation will begin at 1 and continue to count up until the last IO block has been identified. Missing IO blocks or incorrectly configuring IO blocks will cause system faults or clashes.

Example 1: A system includes 2x 2FB, 2x 4FB. One 2FB is configured as a single outlet and one 4FB is configured as a 3 outlet. The system would identify the following with the shown bus coupler numbers used:

Table 25: IO Block Configuration Example 1

IO Block	IO Block Outlet setting	Bus Coupler Number	Associated Outlet Number
2FB	1 Outlet	1	1
			-
4FB	4 Outlets	2	2
			3
			4
			5
4FB	3 Outlets	3	6
			7
			8
			-
2FB	2 Outlets	4	9
			10

Example 2: The same system above but with bus coupler numbers on the 4FB IO blocks swapped:

Table 26: IO Block Configuration Example 2

IO Block	IO Block Outlet setting	Bus Coupler Number	Associated Outlet Number
2FB	1 Outlet	1	1
			-
4FB	4 Outlets	3	5
			6
			7
			8
4FB	3 Outlets	2	2
			3
			4
			-
2FB	2 Outlets	4	9
			10

11 SERVICE, MAINTENANCE & DISPOSAL

11.1 Equipment Service

A number of external system-based checks should be completed on a regular basis. These 'routine inspections' must be carried out by suitably trained people with knowledge of the PIP and the systems into which it is fitted. Routine inspections may take the form of either visual-only checks, or visual and 'hands-on' checks.

11.1.1 **Inspections**

A basic visual inspection focuses on looking at the installation for signs of physical damage, water or dust ingress and the condition of cables and labels. This level of inspection may also include cleaning the display panel.

Observations would typically be:

Check that the PIP enclosure, frame, operators, display, seals, component mounting, network cables etc. are in good order with no physical damage

- Check that connected cables are free from cuts, abrasions and obvious signs of damage. Cable restraints are in good order and correctly fitted
- Check that labels on enclosure and covers are present and in good condition (especially warning labels)
- Check that no modifications have been carried out to installed equipment
- Check that the compartments are free from water and dust ingress internally
- Verify all terminal compartment electrical connections are secure and correctly torques to required specifications

11.2 Equipment Maintenance

Repairs are limited to nominated OEM accessories; the PIP must be returned to Ampcontrol for all other repairs.

WARNING!

Repairs are limited to nominated OEM accessories and spare parts. **The PIP must be returned to Ampcontrol for all other repairs**.

11.3 Disposal

Please return unwanted units to the Ampcontrol for disposal/recycling.

ENVIRO

The electronic equipment discussed in this manual **must not be treated as general waste**. By ensuring that this product is disposed of correctly you will be helping to prevent potentially negative consequences for the environment which could otherwise be caused by incorrect waste handling of this product.

12 SPECIFICATIONS

NOTE

The PIP's default settings are indicated below with bold font. The default settings for a specific integrated protection relay can be found in that products user manual

PIP Specifications (198609)		
General		
Control Voltage	24 V (9-24 VDC)	
Power consumption	48 W (2 A @24 VDC)	
PIP Weight	1.6 kg	
Mechanical & Environmental		
Dimensions (H x W x D)	Footprint: 200 x 110 x 40 (mm) Mounting: 182 x 85 (mm)	
PIP Operating Temperature	-20 °C to +60 °C with 0.5 m/s air flow	
PIP Storage Temperature	-30 °C to +60 °C	
IP Rating of enclosure required	IP55 or greater	
Humidity	Between 10 % relative humidity and the dew point, non-condensing	
UV Stability	None	
Compatible Protection Relays		
IPE / OCS	Integrated Protection relay Type E / Outlet Cassette System Protection Element	
OCS-RV	Outlet Cassette system Protection Element – Residual Voltage	
Network Parameters		
IP Address	nnn.nnn.nnn.nnn format. (Where nnn is from 1 to 3 characters and ranges from 0 to 255)	**192.168.0.10**
Subnet Mask		**255.255.255.0**
Gateway		**1.1.1.1**
PIP Dongle (199859)		
Memory Allocation Description	pip_dongle	
Temperature rating	Industrial rated, 70 °C	
Format	FAT32	
Size	Minimum 512 mB, wear levelling / high write endurance	

PIPS Specifications (198599)*	
General	
Control Voltage	24 V (9-36 VDC)
Power consumption	5.2 W
PIP Weight	1.9 kg
Mechanical & Environmental	
Screen Size	10.1 ”
Dimensions (H x W x D)	Footprint: 285 x 190 x 50 (mm) Mounting cut-out: 270 x 174 (mm)
Resolution	1280 x 800
PIP Operating Temperature	0 °C to +50 °C
PIP Storage Temperature	-30 °C to +70 °C
IP Rating	IP66
Humidity	Between 10 % relative humidity and the dew point, non-condensing
UV Stability	None
Material + Bezel	Aluminium die-casting back cover + Aluminium Bezel

PIPS SS Specifications (300716)	
General	
Control Voltage	24 V (9-36 VDC)
Power consumption	6 W
PIP Weight	2.3 kg
Mechanical & Environmental	
Screen Size	10.1 ”
Dimensions (H x W x D)	Footprint: 296 x 200 x 50 (mm) Mounting cut-out: 272 x 176 (mm)
Resolution	1280 x 800
PIP Operating Temperature	-20 °C to +60 °C
PIP Storage Temperature	-30 °C to +70 °C
IP Rating	IP66/IP69K compliant front bezel
Humidity	Between 10 % relative humidity and the dew point, non-condensing
UV Stability	None
Material + Bezel	Aluminium die-casting back cover + 316 Stainless Steel Bezel

IO Block Specifications*	
Beckhoff General & Environmental	
Control Voltage	24 VDC (-15 % /+20 %)
Operating Temperature	-25 °C to +60 °C
Storage Temperature	-40 °C to +85 °C
IP Rating	IP20
Humidity	Between 10 % relative humidity and the dew point, non-condensing
UV Stability	None
PI2 Mechanical (198608)	
Approximate Dimensions (H x W x D)	100 x 99 x 69 (mm)
Power consumption	~ 6.84 - 9 W (~ 285 mA - 375 mA)
2FB Mechanical (198601)	
Approximate Dimensions (H x W x D)	100 x 75 x 69 (mm)
Power consumption	~ 2.4 - 13.8 W (~ 100 mA - 575 mA)
4FB Mechanical (198602)	
Approximate Dimensions (H x W x D)	100 x 75 x 69 (mm)
Power consumption	~ 3.12 - 16.2 W (~ 130 mA - 675 mA)
2WB Mechanical (198600)	
Approximate Dimensions (H x W x D)	100 x 99 x 69 (mm)
Power consumption	~ 7.56 - 18.96 W (~ 315 mA - 790 mA)
4WB Mechanical (198598)	
Approximate Dimensions (H x W x D)	100 x 123 x 69 (mm)
Power consumption	~ 10.32 - 33.6 W (~ 430 mA - 1.4 A)
GFB Mechanical (302301)	
Approximate Dimensions (H x W x D)	100 x 100 x 72 (mm)
Power consumption	~ 9.8 w (~ 410 mA)

* Refer to Beckhoff user manuals for latest specifications

Find Out More
For more information on this product, contact Ampcontrol Customer Service on +61 1300 267 373 or *customerservice@ampcontrolgroup.com* or visit the Ampcontrol website: www.ampcontrolgroup.com

13 EQUIPMENT LIST

13.1 PIP & Accessories

System Components	
Part Number	**Description**
300104	KIT Protection Interface Platform (PIP) C/W Dongle & 12 VPS
198608	Protection Interface IO Block 2 (PI2)
198601	2FB - 2 Outlet Fixed IO Block
198602	4FB - 4 Outlet Fixed IO Block
198600	2WB - 2 outlet Withdrawable IO Block
198598	4WB - 4 outlet Withdrawable IO Block
302301	GFB – Group Feed IO Block
198557	IPE Outlet Kit (Relay + Base + Plug Kit)
198599	PIPS - PIP Screen 10.1 ” (Optional)
300716	PIPS SS - PIP Screen 10.1 ” Stainless Steel Bezel (Optional)
199332	HDMI to DVI Cable 1.5 m (to connect PIP to PIPS) (Optional)
176082	Temp Sensor (Optional)
198558	MOXA 5x Ethernet Port Switch (Un managed) (Optional)
157711	Power supply 24 V 10 A
165165	Track Pad – Hazardous Area (Optional)
172912	Trackpad Interface – Hazardous Area (Optional)

Accessories		
Part Number	**Description**	**Manufacturer Part Number**
198609	Protection Interface Platform (PIP) V01	
199859	PIP System Dongle	
302477	Power Supply 12V 5A (For PIP)	
197358	Relay IPE without Plug Set	
180902	IPX Base 5m Tails	
195677	OCS / IPE Plug Set	
196912	RTX C/W Dongle	
160292	RTX	
172094	RTX Dongle	
-	Mouse (wired) – Most USB type will work	Not available through Ampcontrol
-	Mouse (wireless) – Most USB type will work	Not available through Ampcontrol
198594	8ch Power Distribution - KL9184	KL9184
198591	8ch 0V Potential Distribution - KL9187	KL9187
198594	16ch Power Distribution - KL9188	KL9184
198592	16ch 0V Potential Distribution - KL9189	KL9189
198558	MOXA 2x Ethernet Port + 3x Fibre Port Switch	EDS-405A
178843	MOXA 8x Ethernet Port Switch	EDS-408A

Outlet Dongle Part Numbers		
Part Number	**Description**	
199230	IPE Dongle Outlet 1 - PIP	(1000V, for 3300V add note to Purchase order)
199231	IPE Dongle Outlet 2 - PIP	
199232	IPE Dongle Outlet 3 - PIP	
199233	IPE Dongle Outlet 4 - PIP	
199234	IPE Dongle Outlet 5 - PIP	
199235	IPE Dongle Outlet 6 - PIP	
199236	IPE Dongle Outlet 7 - PIP	
199237	IPE Dongle Outlet 8 - PIP	
199238	IPE Dongle Outlet 9 - PIP	
199239	IPE Dongle Outlet 10 - PIP	
199240	IPE Dongle Outlet 11 - PIP	
199241	IPE Dongle Outlet 12 - PIP	
199242	IPE Dongle Outlet 13 - PIP	
199243	IPE Dongle Outlet 14 - PIP	
199244	IPE Dongle Outlet 15 - PIP	
199245	IPE Dongle Outlet 16 - PIP	

System Component Subassemblies.

(198557) IPE Protection Relay Kit		
Part Number	**Description**	**Repair Part Number**
197358	IPE Protection Relay Without Plug Kit	174311
180902	BASE-5 M Tails	190597
195677	OCS / IPE Plug Set	

For other IPE Relay items required see IPE user manual

13.2 IO Outlet Kits

(198608) Protection Interface IO Block 2 (PI2)				
Part Number	**Qty**	**Description**	**Manufacturer Part Number**	**Repair Part Number**
198668	1	Bus Coupler	BK9105	
198597	1	4ch 4-20 mA - 2 wire	KL3454	
198610	1	8ch Digital Input - 1 wire	KL1408	
198611	2	16ch Digital Input 3ms - 1 wire	KL1809	
198595	1	Bus End	KL9010	

(198601) Fixed IO Block 2 Outlet (2FB)				
Part Number	**Qty**	**Description**	**Manufacturer Part Number**	**Repair Part Number**
198668	1	Bus Coupler	BK9105	
198612	1	8ch Digital Output - 1 Wire	KL2408	
198591	1	8ch 0V Potential Distribution	KL9187	
198595	1	Bus End	KL9010	

(198602) Fixed IO Block 4 Outlet (4FB)				
Part Number	**Qty**	**Description**	**Manufacturer Part Number**	**Repair Part Number**
198668	1	Bus Coupler	BK9105	
198613	1	16ch Digital Output - 1 wire	KL2809	
198592	1	16ch 0V Potential Distribution	KL9189	
198595	1	Bus End	KL9010	

(198600) 2WB - 2 outlet Withdrawable IO Kit				
Part Number	**Qty**	**Description**	**Manufacturer Part Number**	**Repair Part Number**
198668	1	Bus Coupler	BK9105	
198596	1	4ch Analog Input - 2 wire	KL3464	
198611	1	16ch Digital Input 3ms - 1 wire	KL1809	
198613	1	16ch Digital Output - 1 wire	KL2809	
198592	2	16ch 0V Potential Distribution	KL9189	
198595	1	Bus End	KL9010	

(198598) 4WB - 4 outlet Withdrawable IO Kit				
Part Number	**Qty**	**Description**	**Manufacturer Part Number**	**Repair Part Number**
198668	1	Bus Coupler	BK9105	
198596	1	4ch Analog Input - 2 wire	KL3464	
198611	2	16ch Digital Input 3ms - 1 wire	KL1809	
198613	2	16ch Digital Output - 1 wire	KL2809	
198592	4	16ch 0V Potential Distribution	KL9189	
198595	1	Bus End	KL9010	

(302301) Group Fixed IO Block Kit				
Part Number	**Qty**	**Description**	**Manufacturer Part Number**	**Repair Part Number**
303146	1	Bus Coupler	EK9500	
	1	4ch Digital Input (1 wire)	EL1104	
	1	4x Relay Output (2 terminals)	KL2624	
198595	1	Bus End	KL9010	

14 APPENDIX A: PIP System and Outlet Event Logs

Log Message	Notes on Cause and Message
Empty Entry	Place holder log used when no log exists for this location. This should only be seen on brand new PIP units which haven't generated a log for this slot yet.
PIP Powered On	The PIP has powered up normally
NTP Server Fault	The NTP server has not responded to our request within 4 Seconds
Communication fault to Module in bay %1	The EIP Connection to the IO Brick in bay %1 has dropped.
Cassette Earthed, outlet %1	The Cassette for outlet %1 has now successfully arrived at the Earthed Position.
Cassette Isolated, outlet %1	The Cassette for outlet %1 has been Isolated in the Earth position
Service/Earth limit switch failed to actuate, outlet %1	The Cassette was commanded to move to a location and failed to reach that location (e.g the limit switches do not confirm the cassette has arrived) within 10 seconds
Service/Earth limit activated but analog position does not match the calibration setting for service/earth position, outlet %1	The Cassette was commanded to move to a location, and the limit switches have confirmed the Cassette is in that location, however the actuator's feedback does not confirm that is has arrived at the location. This may be due to the cassette system not being correctly calibrated.
Analog position feedback failed to change during drive operation, outlet %1	The Cassette was commanded to move to a location; however the Actuator's feedback is not showing that the Cassette is moving after half a second.
Drive to service/earth operation failed. Cassette left earth/service but did not reach target limit switch, outlet %1	
Drive to service/earth operation failed. Cassette did not clear origin limit switch, outlet %1	
The cassette moved from the earth position while the isolation input is active, outlet %1	
Outlets stopped due to iFan threshold	The PIP system has dropped below the required number of active iFans and hence any running, non iFan outlets have been commanded to stop.
E-stop %1 active	The E-Stop number %1 has been detected as being pressed, all running outlets have been commanded to Stop.
Uncontrolled changes to parameters have been detected, outlet %1	Outlet %1 is in Diode mode; however its current Parameters don't match the values that are stored in the PIP. This means that the relay has had its parameters modified via another method than using the PIP. This could be that the relay dongle has lost its values, or the dongle has been changed with another one. The PIP only checks for Uncontrolled Changes when the relay is first connected to, or if the outlet goes offline and comes back online. This check is also not carried out if the outlet is in Remote Termination module mode since the module can be moved correctly from one outlet to the next.

Detected protection relay or outlet voltage is different from configured, outlet %1	During the Rollcall process, Each outlet's family is stored in the PIP. This message denotes that outlet %1's Protection Family doesn't match the Family at Rollcall. This is usually triggered by installing an different family type, ie IPE-RV relay in an outlet which previously had an IPE installed in it (or vice versa)
Version change detected in protection relay, outlet %1	The relay installed in Outlet %1 has changed Firmware version from the last time we saw the outlet. This will usually means that a different relay hardware has been installed.
Outlet mapping signal detected on outlet %1 but also on other outlets	When an outlet comes online (either when the PIP boots or the Outlet drops and then re-connects) the PIP System confirms that the Outlet's IP matches the correct Outlet's Physical location by Setting the Outlet's corresponding digital output on the bay's IO Brick high. The relay is then monitored to confirm that the Digital signal is correctly seen. This log means that when we set outlet %1's signal high, Outlet %1 saw the signal, but so did outlets not currently being tested. This implies a wiring issue in the System, or the relay has been given an incorrect IP address. This log message and "Unexpected outlet mapping input on outlet %1, expected outlet %2" are normally generated in close proximity, since they both refer to a similar issue.
Unexpected outlet mapping input on outlet %1, expected outlet %2	When carrying out the test described above, this message denotes the other outlets that this signal was also seen on. This log message and "Outlet mapping signal detected on outlet %1 but also on other outlets" are normally generated in close proximity, since they both refer to a similar issue.
Outlet mapping input was not detected, outlet %1	When carrying out the Outlet mapping test described above, Outlet %1 was expected to see the digital signal, however it did not. This implies that the outlet's IP address is incorrect or the outlet has not been correctly wired up.
External Controller is inhibiting starting, outlet %1	An external controller (such as a PLC) has changed %1 Outlet's enable status to disabled. This will stop the outlet from being started via any control source. Note only outlets which are setup for External control or External/PIP control can be disabled by the PLC. Outlet's which are only PIP controlled will ignore control by external sources. (This covers both EIP and Modbus interface)
Communications from the External Controller has been lost	The heartbeat from the external controller has not been correctly incremented within the last second.
External Controller Start, outlet %1	The External controller has started outlet %1
Electrician Authorise via External Controller	The External controller has sent an Electrician Authorisation
iFan Authorise via External Controller	The External controller hand sent an iFan authorisation
Communication fault to System IO Module	The EIP Connection to the System IO Module has been dropped.
Circuit breaker open, outlet %1	The CB Indication signal for outlet %1 show the CB has been opened. The PIP will send a stop command to the outlet %1. Note: The PIP cannot control the CB in anyway, this simply shows the status of the CB indication signal.

iFan Authorise input stuck high	The Digital input for the iFan Authorisation has been high for at least 1min. Since the Authorisation signal is required to make a low to high transition to initiate an iFan authorisation, the input will not operate correctly until the signal first goes low
Electrician Authorise input stuck high	The Digital input for the Electrician Authorisation has been high for at least 1min. Since the Authorisation signal is required to make a low to high transition to initiate an Electrician authorisation, the input will not operate correctly until the signal first goes low
Bypass Authorise input stuck high	The Digital input for the Bypass Authorisation has been high for at least 1min. Since the Authorisation signal is required to make a low to high transition to initiate a Bypass authorisation, the input will not operate correctly until the signal first goes low
Electrician Authorise detected	The Digital input for the Electrician Authorisation has transitioned from low to high, thereby causing an Electrician authorisation.
Engineer Authorise detected	The Engineer Password was entered correctly into the system authorising the storing of PIP system settings changes
iFan Authorise detected	The Digital input for the iFan Authorisation has transitioned from low to high, thereby causing an iFan authorisation.
Bypass Authorise detected	The Digital input for the Bypass Authorisation has transitioned from low to high, thereby causing a Bypass authorisation.
Cannot communicate with remote iFan PIP	The PIP System is unable to establish a Ethernet connection with the IP address given as the remote DCB. This implies either there is no device at that IP address, the IP address cannot be routed to or the device is actively refusing the connection.
Target device not valid PIP	The PIP System was able to connect to the remote device, however the device is not responding as expected for a PIP device.
PIP dongle unresponsive	While defined, this Log entry is never triggered.
PIP dongle disconnected	The PIP filed to write to the Dongle the last time it attempted to do so. This implies the dongle is not currently plugged in or it is disconnected. The status of the Dongle is checked once per min or when the system attempts to save to the Dongle.
Software updated - OS	The update file being applied contains OS update details
Software updated - application	The update file being applied contains Firmware/Application update details
Network Configuration Disabled (missing binary)	The required Network Configuration command is not available. This means the PIP system was started on an OS image which does not contain all the required functions (eg a general Linux image or windows) and hence all network configuration functions within the HMI have been disabled.

Network Configuration Failed (Type: %1, Err Code: %2)	When attempting to apply the new network configuration, the system either failed and crashed, or rejected the details. This can mean that the IP address, Netmask or Gateway were invalid. %1 defines the error type. Type 0 being errors related to executing the configuration command, with Error Codes (%2) being 1 = Crashed, 2 = Timedout, 3= ReadError, 4= WriteError, 5 = UnknownError. Type 1 being errors related to the command executing correctly, but the settings/arguments were rejected. Error Codes (%2) being -1 = Failed to apply settings, 2 invalid arguments provided.
Comms test performed on outlet %1	a Comms test (or IO Mapping Test) was requested on outlet %1 by the user.
EC Series test performed on outlet %1	a EC Series Test was requested on outlet %1 by the user.
EC Shunt test performed on outlet %1	
EL test performed on outlet %1	
FC test performed on outlet %1	
IP test performed on outlet %1	
RV_A test performed on outlet %1	
RV_B test performed on outlet %1	
RV_C test performed on outlet %1	
The Pilot for Outlet %1 was disabled	
The Pilot for Outlet %1 was enabled	
The Pre-System Time modification	This log message is generated just before the PIP's System time is modified. Combined with the "The Post System Time modification" log message, this allows users to calculate the timestamp of logs generated before this one, based upon the updated time. The PIP System does not contain its own battery, therefore when the PIP loses power, it will lose its internal time. When the PIP powers up, it will attempt to re-obtain the correct time from either a NTP server, if one is defined, or from the first relay it can talk to (since relays have an IS Battery and hence keep their own internal time.) This means these two log messages will appear shortly after the PIP system powers up as the system finds a reliable time source. Modifications to the PIP's system time (from either a NTP server or manually by the User) are pushed down into the relays so that all relays are time synced within a few seconds of each other.
The Post System Time modification	This log message is generated just after the PIP's system time is modified. Combined with the "The Pre-System Time modification" log message, this allows users to calculate the timestamp of logs generated before this one, based upon the updated time.
External Controller Start (iFan Bypassed), outlet %1	When the system is in iFan Bypass mode, the normal external start command is disabled and a special start command needs to be used instead. Starting the outlet using this new command causes this 'special' external controller start log to be generated.

Segfault Test requested.	From within the hidden remote page, the system seg fault test button was used. This causes a purposeful Seg fault crash of the PIP, to test the crash logging system.
PIP Unexpectedly Restarted (ID: %1)	The PIP System started up after a crash was detected. This will also cause a system crash log to be generated and visible via the hidden admin screen.
iFan (Outlet %1) stopped or current below required FLC percent.	Previous entry of the log did not capture which iFan caused the count to drop. The local iFans that caused the count to drop below the threshold are logged using this entry.
Outlets stopped due to iFan threshold (Remote Outlet)	We can now also differentiate between the source being local or remote
Group %1 Insulation Test result: %2	This log is generated when all the outlets in the group start successfully. The result is generated by adding the IT result for each outlet in parallel
Group %1 EFLO A result: %2	This log is generated when all the outlets in the group start successfully. The result is generated by averaging the EFLO A for all the outlets in the group
Group %1 EFLO B result: %2	This log is generated when all the outlets in the group start successfully. The result is generated by averaging the EFLO B for all the outlets in the group
Group %1 EFLO C result: %2	This log is generated when all the outlets in the group start successfully. The result is generated by averaging the EFLO C for all the outlets in the group

The PIP will also display Banner messages that will show in the permanent bottom section of the where the PIP name is displayed.

Time Sync	NTP server fault. Check network connection.
Authorisation controller	iFan Authorise input stuck high
	Electrician Authorise input stuck high
	Bypass Authorise input stuck high
Remote iFan monitor	Cannot communicate with remote iFan HMI
	Remote iFan target Device Not a Valid HMI
System IO Module	Communication fault to System IO Module
File system module	PIP dongle Initalising
	PIP local storage unresponsive
	PIP dongle disconnected

Table 27: Event Log Descriptions

Header text	Dropdown text	Comment - fault
The Following Obstructions are generated within the IPX and is passed to the PIP via the Outlet's Trip Registers		
Remote Start	The outlet is in remote start mode. Local start is not available	
Thermal Start Block	Motor too hot. Thermal Accumulator at xxx%. Restart available when TAC below xx%	This trip has a different UX. See wireframe
Outlet Dongle Error	Invalid outlet dongle parameters. Try changing a setting and re-saving. If this fails to clear fault, try replacing the outlet dongle. Contact Customer Service for further information	
Unexpected fault	Trip mask 1, bit 0x0008, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Residual Voltage Trip	Measured residual voltage exceeded xxV.	
Stop Pending	A stop has been requested and outlet is still running. Trip will clear automatically.	
Remote Start Fault	There is a fault in the pilot circuit preventing the 100 Ω start resistor being detected. Trip will automatically clear when correct resistance detected.	
Earth Continuity Shunt Trip	Pilot shunt resistance below trip level, 1.5 kΩ Measured value = xxΩ	
Earth Leakage CT Detect Fault	The Earth Leakage CT cannot be detected	
Unexpected fault	Fault should clear with reset, if fault is persistent contact Customer Service. OCS RV Relay Trip mask 1, bit 0x0080	
Earth Leakage Trip	Fault current detected above trip level, xxmA	
Unexpected fault	Fault should clear with reset, if fault is persistent contact Customer Service. OCS RV Relay Trip mask 1, bit 0x0100	
Earth Continuity Series Trip	Pilot series resistance above trip level, xxΩ. Measured value = xxΩ	
Earth Fault Lockout Trip	An Earth Fault has been detected on the load side of the contactor	
Overload Trip	Thermal capacity of load exceeded	
Instantaneous Short Circuit Trip	Load current exceeded 2x xxA for yyms	xx = SC multiplier x FLC. yy = SC time
Current Balance Trip	Current imbalance detected above trip level, xx%. Measured value xx%	
Short Circuit Trip	Load current exceeded xxA for (yy + 60) ms	xx = SC multiplier x FLC. yy = SC time

Main Contactor Fail	MCF Fault Occurred. This can be caused by “Loss of Vacuum”, “Frozen Contactor”, “Close Fail” or an “External Open”. Recommend inspecting hardware to check for failure.	Depending on engineering setting, reset may or may not be available for this trip.
Undervoltage Trip	Less than yyV detected on the line. This trip will automatically clear.	yy = UV setting (in volts)
System Error	Internal Electronics Fault, Internal Logic Error. Please cycle power to clear	
Uncommanded Open	The contactor opened unexpectedly. This can be caused by additional permissive in the MC circuit, MC Coil supply voltage issues, MC Aux Contact or MC failure.	
Undercurrent Trip	Outlet current detected below trip level, xxA.	
Remote Start Stuck	Remote start button detected for more than 5 seconds after contactor closed.	
Fail to Close - Logical	Contactor is reporting open when commanding it closed. Contactor MCI feedback failed to be detected within 1 second of MCR output closing. This can be caused by additional permissive in the MC circuit, MC Coil supply voltage issues, MC Aux Contact or MC failure.	
Loss of Vacuum - Electrical	Detected xxV on the outlet load while contactor should be open.	
Frozen Contactor - Logical	Contactor is reporting closed when commanding it open. This can be caused by MC Aux Contact or MC failure.	
No Coil Supply	Failed to detect coil supply voltage. This can be caused by additional permissive in the MC circuit and MC Coil supply voltage issues.	
Protection Relay Communications	The relay is reporting loss of data communications. Communications to relay has not been detected for 1 second. Try resetting to continue, failing this, a power cycle may be required. If the outlet continues to fail replace protection relay or PIP and contact customer service.	This message should never be displayed on the PIP, since if the PIP hasn't got comms to the Outlet (which is the cause of this trip) then it can't read the trip to display this message
Start Disabled	The outlets protection has been disabled, The outlet cannot be started until this has been enabled.	
Insulation Test Failed	The outlet failed the pre start insulation test. Relay measured XXMohms, trip point set to YY.	XX = Insulation test result in live data (offset 29 in live data), YY = trip value (offset 18 of settings)
CCM fault	The connected Cable Connection Module has a voltage rating not compatible with this protection electronics	

Relay battery Trip	Protection Electronics Battery voltage has dropped below valid range. Replace relay and return faulted relay to Ampcontrol for service.	
Unexpected fault	Trip mask 2, bit 0x4000, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Pilot Interlock Trip	Fast acting pilot interlock trip occurred	
Unexpected fault	Trip mask 2, bit 0x8000, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0001, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0002, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0004, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0008, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0010, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0020, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0040, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
Unexpected fault	Trip mask 3, bit 0x0080, Reset outlet to clear, if trip is persistent contact Ampcontrol Service.	
RTX Initialising	The protection relay is loading details from the connected remote termination unit, or a setting has been modified and is being saved. Outlet will remain stopped until completed. This trip will automatically clear when completed.	
RTX Offline	Remote Termination device not detected	
RTX Parameter Error	Corrupt parameter settings detected. Try saving parameters to clear fault. If this does not clear fault replace the dongle in the remote termination unit. This trip will automatically clear when resolved.	
RTX RTD Group 1 Trip	Input 1 or 2 detected temperature above trip level yyy°C	yyy = trip setting
RTX RTD Group 2 Trip	Input 3, 4, or 5 detected temperature above trip level yyy°C	yyy = trip setting
RTX Stop	Remote termination unit has detected a Stop request (Stop input is open circuit). This trip is cleared when the Digital Stop input has closed (Stop input is shorted).	

RTX PTC Trip	Remote termination unit has detected a PTC trip (input open circuit). This trip is cleared when the PTC input has closed(input shorted).	
RTX Comms Timeout	Remote termination unit has communications fault. This trip will automatically clear when communications is restored. Perform an EC Series test to re-connect a remote termination unit if fault does not clear.	
The Following Obstructions are generated within the PIP based upon the outlet's comms state and custom controllers which monitor specific activities		
Outlet Syncing	The Outlet is currently having its settings updated.	
Calibration required	Withdrawable cassette control requires calibration. Access this in the setup menu (Setup / Outlet Control / Withdrawable Cassette). This process will need authorisation to be performed.	
Position unknown	Withdrawable cassette control requires calibration. Access this in the setup menu (Setup / Outlet Control / Withdrawable Cassette). This process will need authorisation to be performed.	
Cassette Position Changing	Cassette is being driven to the service or earth position as indicated. Outlet will be disabled during transition.	
Out of service	Cassette is in the earth position, but control is not isolated. Isolate outlet control using external isolator switch located on equipment.	
Isolated	Cassette is in the earth position and control is isolated. The isolation switch may be physically locked in this position on equipment.	
Cassette Calibration in Progress	Cassette is being automatically calibrated. Outlet will be disabled until calibration complete.	
Service Limit Switch Fault	Cassette service limit switch failed to be detected. Cassette needs to be serviced.	Authorised reset required to clear, once fault clears
Earth Limit Switch Fault	Cassette earth limit switch failed to be detected. Cassette needs to be serviced.	Authorised reset required to clear, once fault clears
Service Analog Position Discrepancy	Service limit activated but analog position does not match the calibration setting for service/earth position. Recommend performing calibration and manual inspection of cassette actuating / position.	

Earth Analog Position Discrepancy	Earth limit activated but analog position does not match the calibration setting for service/earth position. Recommend performing calibration and manual inspection of cassette actuating / position.	
Actuator fail to operate	Analog position feedback is not changing during drive operation. Check Analog wiring or actuator feedback.	General reset required to clear
Failed to reach target	Cassette actuating failed. Initial limit switch state change detected confirming cassette left origin but did not reach target limit switch. Recommend performing calibration and manual inspection of cassette actuating / position.	General reset required to clear
Failed to move	Cassette actuating failed. Cassette did not clear origin limit switch. Recommend performing calibration and manual inspection of cassette actuating / position.	General reset required to clear
Isolation failed	The cassette moved from the earth position while the isolation input is active. Recommend physical inspection. Check physical state of isolation switch followed by internal electrical connections.	General reset required to clear, once isolation switch is disabled
iFans unavailable - remote	Minimum number of remote iFans has not been detected. Please connect more iFans to system and start outlets to continue.	
iFans unavailable - local	Minimum number of local iFans has not been detected. Please connect more iFans to system and start outlets to continue.	
iFans not running - remote	Minimum number of remote iFans not running. Need to start iFan outlets to continue.	
iFans not running - local	Minimum number of local iFans not running. Need to start iFan outlets to continue.	
		Not a fault
E-Stops active	E-stop xx active	Repeat this block state for each e-stop which is active
Parameter error	Uncontrolled changes to parameters have been detected. Review and save settings	Triggered by dongle change or parameter corruption. May coincide with IPX param trip (0x0004, trip mask 1)
Voltage Configuration	Detected protection relay or outlet voltage is different from configured. Check physical system voltage and PIP System voltage configuration. If this fault remains and is isolated to a single outlet, replace protection relay base. Failure to resolve, contact customer service.	This becomes a special case with its own UX.
Outlet protection Family changed	The protection relay installed does not match the factory configuration for relay type.	

Relay version	Protection Relay version has changed. This may result in increased / reduced protection settings. Please review outlet settings and save to clear fault.	
Outlet Mapping Test Fail	Unexpected outlet mapping input detected. Please check wiring connections and physical routing of test signals. Fault will clear with successful IO Mapping test. This can be performed in the outlet's testing menu.	
Outlet Mapping test in Progress	The outlet mapping is currently being tested. This notice will clear after a successful test.	
Outlet Mapping Test Fail	Outlet mapping input for this outlet was not detected. Please check wiring connections and physical routing of test signals. Fault will clear with successful IO Mapping test. This can be performed in the outlet's testing menu.	
Local control unavailable	Control mode set to 'External Controller only'	
Start Disabled by External Controller	External Controller has inhibited the outlet from starting.	Only when control mode is 'Ext and PIP'. Command must be sent via the Outlet Enable controller.
External Controller Timeout	Communications has been lost to external controller. Check Network connection.	When control mode is either 'Ext only' or 'Ext and PIP'
Settings Conflict	Remote start and external control cannot be selected at the same time.	When control mode is either 'Ext only' or 'Ext and PIP' and the remote start is enabled for the outlet.
		Not a fault
Circuit breaker open	The circuit breaker associated with this outlet is open	

Group Feed I/O Unhealthy	Group feed IO stuck in an invalid state. (Input: 1, Output: 0) Failure to resolve, call customer service.	The red colour implies Input and output value generated from observed value not that it will be red
Outlet Settings Mismatch	Outlets in group 1 do not have matching outlet settings. Please review outlet settings to clear fault. Outlets in group: 4, 5, 6	
Outlet Tripped	Fault in group Outlet 5 (Tripped). Fault will clear for the group once the trip is cleared.	
Machine Type/ID Mismatch	Outlets in group 1 do not have matching Machine Type/ID. Please review outlet settings to clear fault. Outlets in group: 4, 5, 6	
Machine Type Invalid	Interlocked Fan is an invalid machine type for group feed	
Outlet Blocked	Obstruction in group Outlet 4 (Blocked). Fault will clear for the group once the obstructon is cleared.	
Machine Type/ID Invalid	Group 1 (inactive) blocking individual outlet. The Machine Type/ID (Conveyor 1) is reserved for group feed. Ensure correct load is connected to the outlet.	
Stopping Outlets	Waiting for all the outlets in the Group 1 to stop.	

15 APPENDIX B: PIP Ethernet IP Communications

All parameters (both Read/Write and Read Only) are presented as a continuous block of 16-bit values. For MODBUS communications they are addressed as "Holding Registers". All strings are returned as byte-packed words. All undefined registers will return 0 when read.

HMI specific data and outlet data are presented in the following blocks:

15.1 Identity Object, Class ID: 0x01

This object provides general information about this device to other EIP compatible devices. It is the first port of call when searching/interrogating devices on the network.

15.1.1 **Class Attribute List**

Attr ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT (16)	Revision of this object
2	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device

15.1.2 **Instance Attribute List**

Attr ID	Access Rule	Name String	Data Type	Description
1	Get	Vendor ID	UINT	CIP Vendor ID (Ampcontrol doesn't have one so we tend to use RTA at the moment.)
2	Get	Device Type	UINT	
3	Get	Product Code	UINT	
4	Get	Revision	STRUCT	
5	Get	Status	WORD	
6	Get	Serial Number	UDINT	
7	Get	Product Name	SHORT_STRING	

15.2 Parameter Object, Class ID: 0x0F

15.2.1 Class Attribute List

Attr ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT (16)	Revision of this object
2	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device
3	Get	Number of Instances	UINT (16)	Number of object instances currently created at this class level of the device.

15.3 HMI General. Object, Class ID: 0x64

15.3.1 Class Services

Service Code	Class	Instance	Service Name	Description of Service
0x0E	X	X	Get_Attribute_Single	Reads a single attribute value
0x10			Set_Attribute_Single	Sets a single attribute value
0x01		X	Get_All_Attributes	Reads all marked attributes and concatenates their values into a single struct

15.3.2 Class Attribute List

Attr ID (Dec)	Attr ID (Hex)	Access Rule	Name	Data Type	Description
1	0x01	Get	Revision	UINT (16)	Revision of this object
2	0x02	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device
3	0x03	Get	Number of Instances	UINT (16)	Number of object instances currently created at this class level of the device.

15.3.3 **Instance Attribute List**

Attr ID (Dec)	Attr ID (Hex)	Access Rule	Name String	Data Type	Description
1	0x01	Get / GAll	Estop Status	WORD	
2	0x02	Get / Gall	CB Interlock	WORD	Bit 0 represents outlet 1, bit 1 represents outlet 2 etc. Bit high, CB Closed / Bit Low, CB Open
3	0x03	Get / GAll	IO Device Status	DWORD	Bit 0 represents outlet 1, bit 1 represents outlet 2 etc. Bit high, IO Online / Bit Low, IO Offline
4	0x04	Get / GAll	System IO Device Status	DWORD	Online bit = 1 /Offline bit = 0
5	0x05	Get / GAll	Dongle Status	DWORD	
6	0x06	Get / GAll	Temp Sensor 1 Value	UINT (16)	
7	0x07	Get / GAll	Temp Sensor 2 Value	UINT (16)	
8	0x08	Get / GAll	Temp Sensor 3 Value	UINT (16)	
9	0x09	Get / GAll	Temp Sensor 4 Value	UINT (16)	
10	0x0A	Get	PIP Asset Name	LOGIX_STRING(32)	
11	0x0B	Get	Time and Date	DT_STRUCT	
12	0x0C	Get	Estop 1 Name	LOGIX_STRING(32)	
13	0x0D	Get	Estop 2 Name	LOGIX_STRING(32)	
14	0x0E	Get	Estop 3 Name	LOGIX_STRING(32)	
15	0x0F	Get	Estop 4 Name	LOGIX_STRING(32)	
16	0x10	Get	Temp Sensor 1 Name	LOGIX_STRING(32)	
17	0x11	Get	Temp Sensor 2 Name	LOGIX_STRING(32)	
18	0x12	Get	Temp Sensor 3 Name	LOGIX_STRING(32)	

Attr ID (Dec)	Attr ID (Hex)	Access Rule	Name String	Data Type	Description
19	0x13	Get	Temp Sensor 4 Name	LOGIX_STRING(32)	
20	0x14	Get	Electrician Authorisation	BOOL	Returns the current Elec Auth State
21	0x15	Get	iFan Authorisation	BOOL	Returns the current iFAN Auth State
22	0x16	Get	Bypass Authorisation	BOOL	Returns the current Bypass Auth State
50	0x32	Get	System Log 1	LOG_STRUCT	
51	0x33	Get	System Log 2	LOG_STRUCT	
52	0x34	Get	System Log 3	LOG_STRUCT	
53	0x35	Get	System Log 4	LOG_STRUCT	
54	0x36	Get	System Log 5	LOG_STRUCT	
55	0x37	Get	System Log 6	LOG_STRUCT	
56	0x38	Get	System Log 7	LOG_STRUCT	
57	0x39	Get	System Log 8	LOG_STRUCT	
58	0x3A	Get	System Log 9	LOG_STRUCT	
59	0x3B	Get	System Log 10	LOG_STRUCT	
60	0x3C	Get	System Log 11	LOG_STRUCT	
61	0x3D	Get	System Log 12	LOG_STRUCT	
62	0x3E	Get	System Log 13	LOG_STRUCT	
63	0x3F	Get	System Log 14	LOG_STRUCT	
64	0x40	Get	System Log 15	LOG_STRUCT	
65	0x41	Get	System Log 16	LOG_STRUCT	
66	0x42	Get	System Log 17	LOG_STRUCT	
67	0x43	Get	System Log 18	LOG_STRUCT	
68	0x44	Get	System Log 19	LOG_STRUCT	
69	0x45	Get	System Log 20	LOG_STRUCT	
70	0x46	Get	System Log 21	LOG_STRUCT	
71	0x47	Get	System Log 22	LOG_STRUCT	
72	0x48	Get	System Log 23	LOG_STRUCT	
73	0x49	Get	System Log 24	LOG_STRUCT	

Attr ID (Dec)	Attr ID (Hex)	Access Rule	Name String	Data Type	Description
74	0x4A	Get	System Log 25	LOG_STRUCT	
75	0x4B	Get	System Log 26	LOG_STRUCT	
76	0x4C	Get	System Log 27	LOG_STRUCT	
77	0x4D	Get	System Log 28	LOG_STRUCT	
78	0x4E	Get	System Log 29	LOG_STRUCT	
79	0x4F	Get	System Log 30	LOG_STRUCT	
80	0x50	Get	System Log 31	LOG_STRUCT	
81	0x51	Get	System Log 32	LOG_STRUCT	
82	0x52	Get	System Log 33	LOG_STRUCT	
83	0x53	Get	System Log 34	LOG_STRUCT	
84	0x54	Get	System Log 35	LOG_STRUCT	
85	0x55	Get	System Log 36	LOG_STRUCT	
86	0x56	Get	System Log 37	LOG_STRUCT	
87	0x57	Get	System Log 38	LOG_STRUCT	
88	0x58	Get	System Log 39	LOG_STRUCT	
89	0x59	Get	System Log 40	LOG_STRUCT	
90	0x5A	Get	System Log 41	LOG_STRUCT	
91	0x5B	Get	System Log 42	LOG_STRUCT	
92	0x5C	Get	System Log 43	LOG_STRUCT	
93	0x5D	Get	System Log 44	LOG_STRUCT	
94	0x5E	Get	System Log 45	LOG_STRUCT	
95	0x5F	Get	System Log 46	LOG_STRUCT	
96	0x60	Get	System Log 47	LOG_STRUCT	
97	0x61	Get	System Log 48	LOG_STRUCT	
98	0x62	Get	System Log 49	LOG_STRUCT	
99	0x63	Get	System Log 50	LOG_STRUCT	

15.4 HMI Obstructions, Class ID: 0x66

15.4.1 Class Attribute List

Attr ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT (16)	Revision of this object
2	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device
3	Get	Number of Instances	UINT (16)	Number of object instances currently created at this class level of the device.

15.4.2 Instance Attribute List

Attr ID	Access Rule	Name String	Data Type	Description
1	Get / G_ALL	Outlet Number	DINT(32)	1-16 Outlet number this Obstruction applies to
2	Get / G_ALL	Obstruction Title	LOGIX_STRING(32)	
3	Get / G_ALL	Obstruction Description	LOGIX_STRING(200)	

15.5 iFan Controller, Class ID: 0x67

15.5.1 Class Attribute List

Attr ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT (16)	Revision of this object
2	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device
3	Get	Number of Instances	UINT (16)	Number of object instances currently created at this class level of the device.

15.5.2 **Instance Attribute List**

Attr ID	Access Rule	Name String	Data Type	Description
1	Get / G_ALL	Local iFans	USINT(8)	
2	Get / G_ALL	Local Active iFans	USINT(8)	
3	Get / G_ALL	Req Local iFans	USINT(8)	
4	Get / G_ALL	Remote iFans	USINT(8)	
5	Get / G_ALL	Remote Active iFans	USINT(8)	
6	Get / G_ALL	Req Remote iFans	USINT(8)	
7	Get	Remote DCB Valid	BOOL	
8	Get	iFan Required	BOOL	
9	Get	iFan Bypass Counter	UDINT(32)	
10	Get	Remote PIP Address	UDINT(32)	
11	Get	Remote PIP Name	LOGIX_STRING(32)	
12	Get	iFan FLC Active %	USINT(8)	
13	Get	Bypass Auto Expire	BOOL	

15.6 Outlet Object, Class ID: 0x68

15.6.1 **Class Services**

Service Code	Class	Instance	Service Name	Description of Service
0x0E	X	X	Get_Attribute_Single	Reads a single attribute value
0x10			Set_Attribute_Single	Sets a single attribute value
0x01		X	Get_All_Attributes	Reads all marked attributes and concatenates their values into a single struct

15.6.2 **Class Attribute List**

Attr ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT (16)	Revision of this object
2	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device (16)
3	Get	Number of Instances	UINT (16)	Number of object instances currently created at this class level of the device. (Number of Outlets)

15.6.3 **Instance Attribute List**

Attr ID	Access Rule	Name String	Data Type	Description
1	Get / G_ALL	Outlet Status	STRUCT of	
			DINT(32)	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
			LOGIX_STRING(32)	String representing the Outlet Status
2	Get / G_ALL	Volts Average	REAL	Volts
3	Get	Phase Voltages	STRUCT of	
			REAL	Phase A Volts
			REAL	Phase B Volts
			REAL	Phase C Volts
4	Get / G_ALL	Current Average	REAL	Amps
5	Get	Phase Currents	STRUCT of	
			REAL	Phase A Current
			REAL	Phase B Current
			REAL	Phase C Current

Attr ID	Access Rule	Name String	Data Type	Description
6	Get / G_ALL	Current Balance	DINT(32)	0-100 percent
7	Get / G_ALL	Earth Leakage Current / Residual Voltage	REAL	MilliAmps (EL) / Volts (RV)
8	Get / G_ALL	Pilot Series	DINT(32)	0-200 Ohms
9	Get / G_ALL	Pilot Shunt	REAL	900 - 10,000 Ohms
10	Get	Overcurrent Motor Overload	DINT(32)	0 – 120 %
11	Get / G_ALL	Outlet Status Masks	STRUCT of	
			WORD	Trip Mask 1, See Register Details in Appendix D
			WORD	Trip Mask 2, See Register Details in Appendix D
			WORD	Trip Mask 3, See Register Details in Appendix D
			WORD	Status Mask, See Register Details in Appendix D
12	Get / G_ALL	Digital IO	DWORD	See Register Details in Appendix D
13	Get / G_ALL	RTX Status	WORD	
14	Get / G_ALL	RTX Inputs	WORD	
15	Get	RTX Machine Details	STRUCT of	
			UINT(16)	Machine Type
			UINT(16)	Machine ID
			LOGIX_STRING(32)	Machine Type (decoded to string)

Attr ID	Access Rule	Name String	Data Type	Description
16	Get	RTX Temperatures	STRUCT of	
			UINT(16)	Internal
			UINT(16)	RTD 1
			UINT(16)	RTD 2
			UINT(16)	RTD 3
			UINT(16)	RTD 4
			UINT(16)	RTD 5
17	Get	RTX Serial Number	UDINT(32)	
18	Get	RTX SW Version	UDINT(32)	
19	Get	Cassette Status	STRUCT of	
			UINT(16)	Cassette Status (ID) See Register Details in Appendix D
			UINT(16)	Cassette Position
			LOGIX_STRING(32)	Cassette Status (String)
20	Get	Internal Temperature	UDINT(32)	
21	Get	Outlet IO Status	UINT(16)	
22	Get	PIP Control Status	UINT(16)	
23	Get	Outlet Description	LOGIX_STRING(32)	
24	Get	Protection Family ID	UINT(16)	
25	Get	SW Version	UINT(16)	
26	Get	Test Results	STRUCT of	
			UINT(16)	Insulation Test Result
			UINT(16)	EFLO Phase A
			UINT(16)	EFLO Phase B
			UINT(16)	EFLO Phase C

Attr ID	Access Rule	Name String	Data Type	Description
27	Get	Observed Spans	STRUCT of	
			UINT(16)	Max Series EC value (0 – 200 Ohms)
			UINT(16)	Min Series EC value (0 - 200 Ohms)
			UINT(16)	Max Shunt EC value (Ohms x 100 (9-100))
			UINT(16)	Min Shunt EC value (Ohms x 100 (9-100))
			UINT(16)	Max Residual Voltage value (0-1800 Volts)
			UINT(16)	Min Residual Voltage value (0-1800 Volts)
28	Get	Shadow Trips	STRUCT of	
			WORD	Relay
			WORD	Shadow Trips 2, follows Trip Mask 1 see Register Details in Appendix D
			WORD	Shadow Trips 3, follows Trip Mask 1 see Register Details in Appendix D
			WORD	<Padding>
29	Get	Runtime Stats	STRUCT of	
			REAL	kVA
			REAL	kVAh
			REAL	Run Time
			UDINT(32)	Contactor Count
30	Get	Control Mode	DINT(32)	Control mode: 0 = Both, 1 = PLC, 2 = Local
100	Get	Pilot Mode	LOGIX_STRING(32)	
101	Get	Loss of Vacuum Level	LOGIX_STRING(32)	
102	Get	Voltage Level	LOGIX_STRING(32)	
103	Get	Insulation Test Voltage	LOGIX_STRING(32)	
104	Get	Short CCt Relay	LOGIX_STRING(32)	

Attr ID	Access Rule	Name String	Data Type	Description
150	Get	Machine Type	LOGIX_STRING(32)	
151	Get	Machine ID	LOGIX_STRING(32)	
152	Get	Full Load Current Range	LOGIX_STRING(32)	
153	Get	Short Circuit Trip Level	LOGIX_STRING(32)	
154	Get	Short Circuit Trip Time	LOGIX_STRING(32)	
155	Get	Overcurrent Curve	LOGIX_STRING(32)	
156	Get	Overcurrent Time Multiplier	LOGIX_STRING(32)	
157	Get	Overload Cooling Multiplier	LOGIX_STRING(32)	
158	Get	<Reserved>		
159	Get	Overload Start Block Level	LOGIX_STRING(32)	
160	Get	Current Balance Trip Level	LOGIX_STRING(32)	
161	Get	Under Current Trip Level	LOGIX_STRING(32)	
162	Get	Earth Leakage Trip Level / Residual voltage trip level	LOGIX_STRING(32)	
163	Get	Earth Leakage Trip Time / Residual Voltage Trip Time	LOGIX_STRING(32)	
164	Get	Earth Continuity Trip Level	LOGIX_STRING(32)	
165	Get	Earth Continuity Trip Time	LOGIX_STRING(32)	
166	Get	Earth Continuity Latch	LOGIX_STRING(32)	
167	Get	Remote Start	LOGIX_STRING(32)	
168	Get	Insulation Test Trip Level	LOGIX_STRING(32)	
169	Get	Under Voltage Trip Level	LOGIX_STRING(32)	
170	Get	RTX RTD 1-2 Trip Temp	LOGIX_STRING(32)	
171	Get	RTX RTD 3-5 Trip Temp	LOGIX_STRING(32)	
172	Get	RTX RTD 1-2 Reset Temp	LOGIX_STRING(32)	
173	Get	RTX RTD 3-5 Reset Temp	LOGIX_STRING(32)	
174	Get	Back EMF Time	LOGIX_STRING(32)	
175	Get	<Reserved> / Pilot Interlock Time (RV version)	LOGIX_STRING(32)	

Attr ID	Access Rule	Name String	Data Type	Description
200	Get	Relay Log 1	LOG_STRUCT	
201	Get	Relay Log 2	LOG_STRUCT	
202	Get	Relay Log 3	LOG_STRUCT	
203	Get	Relay Log 4	LOG_STRUCT	
204	Get	Relay Log 5	LOG_STRUCT	
205	Get	Relay Log 6	LOG_STRUCT	
206	Get	Relay Log 7	LOG_STRUCT	
207	Get	Relay Log 8	LOG_STRUCT	
208	Get	Relay Log 9	LOG_STRUCT	
209	Get	Relay Log 10	LOG_STRUCT	
210	Get	Relay Log 11	LOG_STRUCT	
211	Get	Relay Log 12	LOG_STRUCT	
212	Get	Relay Log 13	LOG_STRUCT	
213	Get	Relay Log 14	LOG_STRUCT	
214	Get	Relay Log 15	LOG_STRUCT	
215	Get	Relay Log 16	LOG_STRUCT	
216	Get	Relay Log 17	LOG_STRUCT	
217	Get	Relay Log 18	LOG_STRUCT	
218	Get	Relay Log 19	LOG_STRUCT	
219	Get	Relay Log 20	LOG_STRUCT	
220	Get	Relay Log 21	LOG_STRUCT	
221	Get	Relay Log 22	LOG_STRUCT	
222	Get	Relay Log 23	LOG_STRUCT	
223	Get	Relay Log 24	LOG_STRUCT	
224	Get	Relay Log 25	LOG_STRUCT	
225	Get	Relay Log 26	LOG_STRUCT	
226	Get	Relay Log 27	LOG_STRUCT	

Attr ID	Access Rule	Name String	Data Type	Description
227	Get	Relay Log 28	LOG_STRUCT	
228	Get	Relay Log 29	LOG_STRUCT	
229	Get	Relay Log 30	LOG_STRUCT	
230	Get	Relay Log 31	LOG_STRUCT	
231	Get	Relay Log 32	LOG_STRUCT	
232	Get	Relay Log 33	LOG_STRUCT	
233	Get	Relay Log 34	LOG_STRUCT	
234	Get	Relay Log 35	LOG_STRUCT	
235	Get	Relay Log 36	LOG_STRUCT	
236	Get	Relay Log 37	LOG_STRUCT	
237	Get	Relay Log 38	LOG_STRUCT	
238	Get	Relay Log 39	LOG_STRUCT	
239	Get	Relay Log 40	LOG_STRUCT	
240	Get	Relay Log 41	LOG_STRUCT	
241	Get	Relay Log 42	LOG_STRUCT	
242	Get	Relay Log 43	LOG_STRUCT	
243	Get	Relay Log 44	LOG_STRUCT	
244	Get	Relay Log 45	LOG_STRUCT	
245	Get	Relay Log 46	LOG_STRUCT	
246	Get	Relay Log 47	LOG_STRUCT	
247	Get	Relay Log 48	LOG_STRUCT	
248	Get	Relay Log 49	LOG_STRUCT	
249	Get	Relay Log 50	LOG_STRUCT	
300	Get/Set	Block Outlet with Message	LOGIX_STRING(32)	If a string is written to this attribute, the outlet will be blocked and the string displayed on the HMI. Clear the string to remove the block. This string will be cleared when the PIP Starts up.

Attr ID	Access Rule	Name String	Data Type	Description
350	Get/Set	Earth Resistance Test (HPC Only)	Bool	Writing True to this attribute requests an Earth Resistance Test to begin. The HPC will trip if a test is requested while the Main contactor is closing or closed. Reading this attribute will return true if a Earth Resistance Test is currently underway. On none HPC Outlets, writing to this attribute will have no effect and it will always read as false.

15.7 Group Feeder Object, Class ID: 0x69

15.7.1 **Class Services**

Service Code	Class	Instance	Service Name	Description of Service
0x0E	X	X	Get_Attribute_Single	Reads a single attribute value
0x10			Set_Attribute_Single	Sets a single attribute value
0x01		X	Get_All_Attributes	Reads all marked attributes and concatenates their values into a single struct

15.7.2 **Class Attribute List**

Attr ID	Access Rule	Name	Data Type	Description
1	Get	Revision	UINT (16)	Revision of this object
2	Get	Max Instance	UINT (16)	Maximum instance number of an object currently created in this class level of the device (16)
3	Get	Number of Instances	UINT (16)	Number of object instances currently created at this class level of the device. (Number of Feeder groups with outlets assigned to them)

15.7.3 **Instance Attribute List**

Attr ID	Access Rule	Name String	Data Type	Description
1	Get / G_ALL	Feeder Group Status	STRUCT of	0 = Init, 1 = Disabled, 2 = Stopping_All, 3 = IO_invalid, 4 = Group_Not_Ready, 5 = Group_Ready, 6 = Group_Starting, 7 = Group_Running, 8 = Individual_Free, 9 = Individual_Busy
			DINT(32)	
			LOGIX_STRING(32)	String representing the Group Status
2	Get	Outlets In Group Mask	WORD	Bitmask representation of outlets within this group. Bit0 = Outlet1, Bit1 = Outlet2 etc.
3	Get / G_ALL	Outlets Blocking Mask	WORD	Bitmask representation of outlets stopping this group from starting. Bit0 = Outlet1, Bit1 = Outlet2 etc.
4	Get	Most recent Insulation test result	UINT(16)	IT result of all the outlets in the group added in parallel (multiple of 0.1 MΩ)
5	Get	Most recent EFLO A test result	UINT(16)	EFLO A result of all the outlets in the group added in parallel (%age of 1 MΩ)
6	Get	Most recent EFLO B test result	UINT(16)	EFLO B result of all the outlets in the group added in parallel (%age of 1 MΩ)
7	Get	Most recent EFLO C test result	UINT(16)	EFLO C result of all the outlets in the group added in parallel (%age of 1 MΩ)
8	Get / G_ALL	Volts Average	REAL	Volts
9	Get / G_ALL	Current Average of Group	REAL	Sum of Average Currents from all outlets in group (Amps)
10	Get / G_ALL	Earth Leakage Current / Residual Voltage	REAL	Max Outlet Value in Feed Grouper (MilliAmps (EL) / Volts (RV))
11	Get	Allowed Machine Type	LOGIX_STRING(32)	
12	Get	Allowed Machine ID	LOGIX_STRING(32)	

15.8 Implicit Assemblies

Assembly instances		All offsets/values are 16bit in size
Offset	Name	Description
0	Outlet PLC Start Enables	When the control mode for the outlet is 'both', set the bit corresponding to the outlet to enable it to start. This will control the inhibit command to the Outlet Enable custom controller If the control mode for the outlet is 'PIP', this register has no effect Bitmask definition: 0x0001 --> Outlet 1 0x0002 --> Outlet 2 ... 0x8000 --> Outlet 16
1	External Controller Heartbeat	Must be updated with an incrementing number more than once a second for the external controller enable to remain valid. Reading the register will return the internal status as generated from the periodic writes.
2	Outlet 1 Control	**Null CMD:** 0x0000 **Start:** Write 0x00AA to start (0000,0000,1010,1010) **Start (iFan Bypass Mode):** Write 0x0055 to start (0000,0000,0101,0101) **General Reset:** Write 0xAA00 to reset general trips (e.g. EC open). (1010,1010,0000,0000) **Auth Reset:** Write 0x5500 to reset restricted trips (e.g. EL) (0101,0101,0000,0000) **Start Feeder Group:** Write 0xA5A5 to start (Start on any Outlet within Active Feeder Group) **Stop:** Write any other bit pattern All commands must be re-set to 0x0000 to be actioned by the PIP All commands go through the normal button logic, and hence an invalid command (such as a start when outlet blocked) will have no effect. When in iFan Bypass mode, 0x00AA will be ignored and stop the outlet When in not in iFan Bypass mode, 0x0055 will be ignored and stop the outlet
3	Outlet 2 Control	
4	Outlet 3 Control	
5	Outlet 4 Control	
6	Outlet 5 Control	
7	Outlet 6 Control	
8	Outlet 7 Control	
9	Outlet 8 Control	
10	Outlet 9 Control	
11	Outlet 10 Control	
12	Outlet 11 Control	
13	Outlet 12 Control	
14	Outlet 13 Control	
15	Outlet 14 Control	
16	Outlet 15 Control	

Offset	Name	Description
17	Outlet 16 Control	
18	Authorise	Set to 0x00AA by user to send an Electrician Authorise command. Set to 0x0055 by user to send a Deputy Authorise command. Set to 0xAA00 to clear any Elec or iFan Authorisation currently active Use in conjunction with RDP for full UI capability. Cleared by PIP Commands accepted irrespective of the external controller heartbeat status

Offset	Name	Description
0	Outlet 1 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
1	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
2	Average Current (Amps)	The average current value in Amps x 10
3	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
4	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
5	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
6	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
7	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
8	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
9	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. See Register Details in Appendix D
10	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
11	Cassette Status	ID of the current state of the Cassette Controller
12	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
13	<Spare>	
14	<Spare>	

Offset	Name	Description
15	Outlet 2 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
16	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
17	Average Current (Amps)	The average current value in Amps x 10
18	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level. Range is 0 to 100 %
19	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
20	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
21	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
22	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
23	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
24	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
25	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
26	Cassette Status	ID of the current state of the Cassette Controller
27	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
28	<Spare>	
29	<Spare>	
30	Outlet 3 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
31	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
32	Average Current (Amps)	The average current value in Amps x 10
33	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level. Range is 0 to 100 %
34	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω

Offset	Name	Description
35	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100 Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
36	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
37	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
38	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
39	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
40	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
41	Cassette Status	ID of the current state of the Cassette Controller
42	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
43	<Spare>	
44	<Spare>	
45	Outlet 4 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
46	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
47	Average Current (Amps)	The average current value in Amps x 10
48	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
49	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
50	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
51	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
52	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
53	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
54	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
55	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
56	Cassette Status	ID of the current state of the Cassette Controller

Offset	Name	Description
57	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
58	<Spare>	
59	<Spare>	
60	Outlet 5 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
61	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
62	Average Current (Amps)	The average current value in Amps x 10
63	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
64	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
65	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
66	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
67	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
68	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
69	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
70	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
71	Cassette Status	ID of the current state of the Cassette Controller
72	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
73	<Spare>	
74	<Spare>	
75	Outlet 6 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
76	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
77	Average Current (Amps)	The average current value in Amps x 10
78	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %

Offset	Name	Description
79	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
80	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
81	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
82	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
83	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
84	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
85	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
86	Cassette Status	ID of the current state of the Cassette Controller
87	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
88	<Spare>	
89	<Spare>	
90	Outlet 7 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
91	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
92	Average Current (Amps)	The average current value in Amps x 10
93	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
94	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
95	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)

Offset	Name	Description
96	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
97	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
98	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
99	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
100	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
101	Cassette Status	ID of the current state of the Cassette Controller
102	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
103	<Spare>	
104	<Spare>	
105	Outlet 8 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
106	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
107	Average Current (Amps)	The average current value in Amps x 10
108	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
109	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
110	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
111	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
112	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
113	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
114	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
115	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
116	Cassette Status	ID of the current state of the Cassette Controller
117	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)

Offset	Name	Description
118	<Spare>	
119	<Spare>	
120	Outlet 9 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
121	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
122	Average Current (Amps)	The average current value in Amps x 10
123	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
124	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
125	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
126	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
127	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
128	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
129	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
130	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
131	Cassette Status	ID of the current state of the Cassette Controller
132	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
133	<Spare>	
134	<Spare>	
135	Outlet 10 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
136	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
137	Average Current (Amps)	The average current value in Amps x 10
138	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %

Offset	Name	Description
139	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
140	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
141	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
142	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
143	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
144	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. See Register Details in Appendix D
145	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
146	Cassette Status	ID of the current state of the Cassette Controller
147	Cassette Position	Number from 0 to 200, where 0 = 0%(Service) and 200 = 100% (Earthed)
148	<Spare>	
149	<Spare>	
150	Outlet 11 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
151	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
152	Average Current (Amps)	The average current value in Amps x 10
153	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level. Range is 0 to 100 %
154	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
155	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
156	Trip Mask 1	The 16-bit mask of possible trips. Full details are provided in Section 2.1
157	Trip Mask 2	The 16-bit mask of possible trips. Full details are provided in Section 2.3
158	Trip Mask 3	The 16-bit mask of possible trips. Full details are provided in Section 2.2
159	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5

Offset	Name	Description
160	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
161	Cassette Status	ID of the current state of the Cassette Controller
162	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
163	<Spare>	
164	<Spare>	
165	Outlet 12 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
166	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
167	Average Current (Amps)	The average current value in Amps x 10
168	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
169	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
170	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
171	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
172	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
173	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
174	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
175	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
176	Cassette Status	ID of the current state of the Cassette Controller
177	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
178	<Spare>	
179	<Spare>	
180	Outlet 13 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
181	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V

Offset	Name	Description
182	Average Current (Amps)	The average current value in Amps x 10
183	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
184	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
185	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
186	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
187	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
188	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
189	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. The bit values are provided in Section 2.5
190	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
191	Cassette Status	ID of the current state of the Cassette Controller
192	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
193	<Spare>	
194	<Spare>	
195	Outlet 14 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
196	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
197	Average Current (Amps)	The average current value in Amps x 10
198	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100%
199	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200Ω
200	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
201	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D

Offset	Name	Description
202	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
203	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
204	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. See Register Details in Appendix D
205	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
206	Cassette Status	ID of the current state of the Cassette Controller
207	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
208	<Spare>	
209	<Spare>	
210	Outlet 15 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
211	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
212	Average Current (Amps)	The average current value in Amps x 10
213	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
214	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
215	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
216	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
217	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
218	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
219	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. See Register Details in Appendix D
220	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
221	Cassette Status	ID of the current state of the Cassette Controller
222	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
223	<Spare>	

Offset	Name	Description
224	<Spare>	
225	Outlet 16 Outlet status	0 = offline, 1 = unsupported, 2 = tripped, 3 = resettable trip, 4 = blocked, 5 = paused, 6 = closing, 7 = closed, 8 = waiting for start, 9 = earth isolated, 10 = resettable block, 11 = auth resettable block
226	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
227	Average Current (Amps)	The average current value in Amps x 10
228	Earth Leakage Current / Residual Voltage Level	The unbalanced 3-phase current. This value is given as a percentage of the trip level Range is 0 to 100 %
229	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms. When in diode remote start mode, the 100 Ω start resistance will be subtracted as required. Range of values is 0 Ω to 200 Ω
230	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15)
231	Trip Mask 1	The 16-bit mask of possible trips. See Register Details in Appendix D
232	Trip Mask 2	The 16-bit mask of possible trips. See Register Details in Appendix D
233	Trip Mask 3	The 16-bit mask of possible trips. See Register Details in Appendix D
234	Digital IO	The Read in the Digital Inputs and also the output state of the IPX. See Register Details in Appendix D
235	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed
236	Cassette Status	ID of the current state of the Cassette Controller
237	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
238	<Spare>	
239	<Spare>	

15.9 CIP Notes

Data Types	Description
BOOL	Boolean
SINT	Short Integer (8Bit)
INT	Integer (16Bit)
DINT	Double Integer (32Bit)
LINT	Long Integer (64Bit)
USINT	Unsigned Short Integer (8Bit)
UINT	Unsigned Integer (16Bit)
UDINT	Unsigned Double Integer (32Bit)
ULINT	Unsigned Long Integer (64Bit)
REAL	Floating point (4bytes encoding)
LREAL	Long float (8Bytes encoding)
ITIME	Duration (short)
TIME	Duration
FTIME	Duration (high resolution)
LTIME	Duration (long)
DATE	Date only
TIME_OF_DAY or TOD	Time of day
DATE_AND_TIME or DT	Date and time of day
STRING	character string (1 byte per character)
STRING2	character string (2 bytes per character)
STRINGN	character string (N-bytes per character)
SHORT_STRING	character string (1 byte per character, 1 (255 Characters Maximum) byte length indicator)
STRINGI	International character string
BYTE	bit string – 8-bits
WORD	bit string - 16-bits
DWORD	bit string - 32-bits
LWORD	bit string - 64-bits
EPATH	CIP path segments
ENGUNIT	Engineering Units

Custom Data Types

LOGIX_STRING	The Logix String is a struct which is supported natively within the Logix PLC. The number in the () represents the max number of characters which will be returned
	Note: The data sent from the PIP to the PLC will pad this structure to equal the number in () plus DINT. Eg LOGIX_STRING(32) will always return 36 bytes, even if the string is shorter than that
	DINT - String character count
	CHAR[] - Character array with the string up to the String Character Count

DT_STRUCT	Date and Time Structure (24 bytes long)
	DINT - Year
	DINT - Month
	DINT - Day
	DINT - Hour
	DINT - Min
	DINT - Sec

LOG_STRUCT	Log Date and Time with Log String
	DINT - Year
	DINT - Month
	DINT - Day
	DINT - Hour
	DINT - Min
	DINT - Sec
	LOGIX_STRING(200) - Log String

16 APPENDIX C: PIP MODBUS TCP Communications

PIP Communications Map
All parameters (both Read/Write and Read Only) are presented as a continuous block of 16-bit values
For MODBUS communications they are addressed as "Holding Registers"
All strings are returned as byte-packed words
All undefined registers will return 0 when read
PIP specific data and outlet data are presented in the following blocks:

Address (HEX)	Address (DEC)	Registers (16 bit)	Data	Number of registers
0000	0	256	Controls	19
0100	256	512	High Speed Data	480
0300	768	1024	Medium Speed Data	687
0700	1792	1024	Active Settings	560
0B00	2816	2304	PIP Data	973
		5120		Total words
		10240		Bytes
		10		kB

16.1 Modbus Controls

Address (HEX)	Address (DEC)	Read / Write	Name	Description
0000	0	R/W	Outlet Start Enables	When the control mode for the outlet is 'both', set the bit corresponding to the outlet to enable it to start. This will control the inhibit command to the Outlet Enable custom controller If the control mode for the outlet is 'PIP', this register has no effect Bitmask definition: 0x0001 --> Outlet 1 0x0002 --> Outlet 2 ... 0x8000 --> Outlet 16
0001	1	R/W	External Controller heartbeat	Must be updated with an incrementing number more than once a second for the enable to remain valid. Reading the register will return the internal status as generated from the periodic writes

Address (HEX)	Address (DEC)	Read / Write	Name	Description
0002	2	R/W	Outlet 1	Null CMD: 0x0000. **Start:** Write 0x00AA to start (0000,0000,1010,1010) **Start (iFan Bypass Mode):** Write 0x0055 to start (0000,0000,0101,0101) **General Reset:** Write 0xAA00 to reset general trips **Start Feeder Group** : Write 0xA5A5 to start (Start on any Outlet within Active Feeder Group) (e.g. EC open). (1010,1010,0000,0000) **Auth Reset:** Write 0x5500 to reset restricted trips (0101,0101,0000,0000) (e.g. EL) **Stop:** Write any other bit pattern All commands will be re-set to 0x0000 when actioned by the PIP All commands go through the normal button logic, and hence an invalid command (such as a start when outlet blocked) will have no effect. When in iFan Bypass mode, 0x00AA will be ignored and stop the outlet When in not in iFan Bypass mode, 0x0055 will be ignored and stop the outlet
0003	3	R/W	Outlet 2	
0004	4	R/W	Outlet 3	
0005	5	R/W	Outlet 4	
0006	6	R/W	Outlet 5	
0007	7	R/W	Outlet 6	
0008	8	R/W	Outlet 7	
0009	9	R/W	Outlet 8	
000A	10	R/W	Outlet 9	
000B	11	R/W	Outlet 10	
000C	12	R/W	Outlet 11	
000D	13	R/W	Outlet 12	
000E	14	R/W	Outlet 13	
000F	15	R/W	Outlet 14	
0010	16	R/W	Outlet 15	
0011	17	R/W	Outlet 16	
0012	18	R/W	Authorise	Set to 0x00AA (0000,0000,1010,1010)by user to send an Electrician Authorise command Set to 0x0055 (0000,0000,0101,0101) by user to send a Deputy Authorise command Set to 0xAA00 to clear any Elec or iFan Authorisation currently active Use in conjunction with RDP for full UI capability. Cleared by PIP Commands accepted irrespective of the External controller heartbeat status

16.2 High Speed Data

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
256	0100	R	0	1	Outlet status	See Register Details
257	0101	R	0	2	Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts. Range 0 to 4946 V
258	0102	R	0	3	Average Current (A)	Average current as a double integer (A)
259	0103	R	0	4		
260	0104	R	0	5		
261	0105	R	0	6		
262	0106	R	0	7	Earth Leakage Current / Residual Voltage Level	OCS - The unbalanced 3-phase current as mA x 10 OCS-RV - The Residual voltage 0-1800 V
263	0107	R	0	8	Pilot Series Resistance	Earth continuity series measurement. This value is returned in Ohms When in diode remote start mode, the 100 Ω start resistance will be subtracted as required Range of values is 0 Ω to 200 Ω
264	0108	R	0	9	Pilot Shunt Resistance	Earth continuity shunt measurement. This value is returned in Ohms x 100. Range of values is 0.9 kΩ to 10 kΩ. (9 to 100). Trip if below 1.5 kΩ (ie. value <15).
265	0109	R	0	10	Trip Mask 1	The 16-bit mask of possible trips. See Register Details
266	010A	R	0	11	Trip Mask 2	The 16-bit mask of possible trips. See Register Details
267	010B	R	0	12	Trip Mask 3	The 16-bit mask of possible trips. See Register Details
268	010C	R	0	13	Digital IO Relay	See Register Details
269	010D	R	0	14	RTX Inputs	The state of digital inputs and the RTD inputs represented as open or closed. See Register Details
270	010E	R	0	15	Cassette Status	ID of the current state of the Cassette Controller, See Register Details
271	010F	R	0	16	Cassette Position	Number from 0 to 200, where 0 = 0 % (Service) and 200 = 100 % (Earthed)
272	0110	R	0	17	Current Balance	The maximum deviation of a phase current from the

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
						average multiplied by 100 then divided by the average current. Range is 0 to 100 %.
273	0111	R	0	18	Overcurrent/Motor Overload value	Shows the state of the thermal accumulator: 0 % = Cold, 100 % = Trip. Range is 0 to 120 %.
274	0112	R	0	19	Volts A (%)	Phase to earth line voltage. The value is a percentage of the nominal system voltage. Range 0 % to 150 %.
275	0113	R	0	20	Volts B (%)	
276	0114	R	0	21	Volts C (%)	
277	0115	R	0	22	Current A (%)	Line current represented as a percentage of the Full Load Current setting.
278	0116	R	0	23	Current B (%)	
279	0117	R	0	24	Current C (%)	
280	0118	R	0	25	Earth Leakage Current (%)	The unbalanced 3-phase current. This value is given as a percentage of the trip level. Range is 0 to 100%. (0 with OCS-RV version)
281	0119	R	0	26	Average Current (%)	Average current as a percentage of full scale, as a % of FL
282	011A	R	0	27	Spare	
283	011B	R	0	28	Spare	
284	011C	R	0	29	Spare	
285	011D	R	0	30	Spare	
286	011E	R	1	31	Outlet status	
287	011F	R	1	32	Volts Average	
288	0120	R	1	33	Average Current (A)	
289	0121	R	1	34		
290	0122	R	1	35		
291	0123	R	1	36		
292	0124	R	1	37	EL Current / RV Level	
293	0125	R	1	38	Pilot Series Resistance	
294	0126	R	1	39	Pilot Shunt Resistance	
295	0127	R	1	40	Trip Mask 1	
296	0128	R	1	41	Trip Mask 2	
297	0129	R	1	42	Trip Mask 3	
298	012A	R	1	43	Digital IO Relay	
299	012B	R	1	44	RTX Inputs	
300	012C	R	1	45	Cassette Status	
301	012D	R	1	46	Cassette Position	
302	012E	R	1	47	Current Balance	
303	012F	R	1	48	OC/MOL value	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
304	0130	R	1	49	Volts A (%)	
305	0131	R	1	50	Volts B (%)	
306	0132	R	1	51	Volts C (%)	
307	0133	R	1	52	Current A (%)	
308	0134	R	1	53	Current B (%)	
309	0135	R	1	54	Current C (%)	
310	0136	R	1	55	EL Current (%)	
311	0137	R	1	56	Average Current (%)	
312	0138	R	1	57	Spare	
313	0139	R	1	58	Spare	
314	013A	R	1	59	Spare	
315	013B	R	1	60	Spare	
316	013C	R	2	61	Outlet status	
317	013D	R	2	62	Volts Average	
318	013E	R	2	63	Average Current (A)	
319	013F	R	2	64		
320	0140	R	2	65		
321	0141	R	2	66		
322	0142	R	2	67	EL Current / RV Level	
323	0143	R	2	68	Pilot Series Resistance	
324	0144	R	2	69	Pilot Shunt Resistance	
325	0145	R	2	70	Trip Mask 1	
326	0146	R	2	71	Trip Mask 2	
327	0147	R	2	72	Trip Mask 3	
328	0148	R	2	73	Digital IO Relay	
329	0149	R	2	74	RTX Inputs	
330	014A	R	2	75	Cassette Status	
331	014B	R	2	76	Cassette Position	
332	014C	R	2	77	Current Balance	
333	014D	R	2	78	OC/MOL value	
334	014E	R	2	79	Volts A (%)	
335	014F	R	2	80	Volts B (%)	
336	0150	R	2	81	Volts C (%)	
337	0151	R	2	82	Current A (%)	
338	0152	R	2	83	Current B (%)	
339	0153	R	2	84	Current C (%)	
340	0154	R	2	85	EL Current (%)	
341	0155	R	2	86	Average Current (%)	
342	0156	R	2	87	Spare	
343	0157	R	2	88	Spare	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
344	0158	R	2	89	Spare	
345	0159	R	2	90	Spare	
346	015A	R	3	91	Outlet status	
347	015B	R	3	92	Volts Average	
348	015C	R	3	93	Average Current (A)	
349	015D	R	3	94		
350	015E	R	3	95		
351	015F	R	3	96		
352	0160	R	3	97	EL Current / RV Level	
353	0161	R	3	98	Pilot Series Resistance	
354	0162	R	3	99	Pilot Shunt Resistance	
355	0163	R	3	100	Trip Mask 1	
356	0164	R	3	101	Trip Mask 2	
357	0165	R	3	102	Trip Mask 3	
358	0166	R	3	103	Digital IO Relay	
359	0167	R	3	104	RTX Inputs	
360	0168	R	3	105	Cassette Status	
361	0169	R	3	106	Cassette Position	
362	016A	R	3	107	Current Balance	
363	016B	R	3	108	OC/MOL value	
364	016C	R	3	109	Volts A (%)	
365	016D	R	3	110	Volts B (%)	
366	016E	R	3	111	Volts C (%)	
367	016F	R	3	112	Current A (%)	
368	0170	R	3	113	Current B (%)	
369	0171	R	3	114	Current C (%)	
370	0172	R	3	115	EL Current (%)	
371	0173	R	3	116	Average Current (%)	
372	0174	R	3	117	Spare	
373	0175	R	3	118	Spare	
374	0176	R	3	119	Spare	
375	0177	R	3	120	Spare	
376	0178	R	4	121	Outlet status	
377	0179	R	4	122	Volts Average	
378	017A	R	4	123	Average Current (A)	
379	017B	R	4	124		
380	017C	R	4	125		
381	017D	R	4	126		
382	017E	R	4	127	EL Current / RV Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
383	017F	R	4	128	Pilot Series Resistance	
384	0180	R	4	129	Pilot Shunt Resistance	
385	0181	R	4	130	Trip Mask 1	
386	0182	R	4	131	Trip Mask 2	
387	0183	R	4	132	Trip Mask 3	
388	0184	R	4	133	Digital IO Relay	
389	0185	R	4	134	RTX Inputs	
390	0186	R	4	135	Cassette Status	
391	0187	R	4	136	Cassette Position	
392	0188	R	4	137	Current Balance	
393	0189	R	4	138	OC/MOL value	
394	018A	R	4	139	Volts A (%)	
395	018B	R	4	140	Volts B (%)	
396	018C	R	4	141	Volts C (%)	
397	018D	R	4	142	Current A (%)	
398	018E	R	4	143	Current B (%)	
399	018F	R	4	144	Current C (%)	
400	0190	R	4	145	EL Current (%)	
401	0191	R	4	146	Average Current (%)	
402	0192	R	4	147	Spare	
403	0193	R	4	148	Spare	
404	0194	R	4	149	Spare	
405	0195	R	4	150	Spare	
406	0196	R	5	151	Outlet status	
407	0197	R	5	152	Volts Average	
408	0198	R	5	153	Average Current (A)	
409	0199	R	5	154		
410	019A	R	5	155		
411	019B	R	5	156		
412	019C	R	5	157	EL Current / RV Level	
413	019D	R	5	158	Pilot Series Resistance	
414	019E	R	5	159	Pilot Shunt Resistance	
415	019F	R	5	160	Trip Mask 1	
416	01A0	R	5	161	Trip Mask 2	
417	01A1	R	5	162	Trip Mask 3	
418	01A2	R	5	163	Digital IO Relay	
419	01A3	R	5	164	RTX Inputs	
420	01A4	R	5	165	Cassette Status	
421	01A5	R	5	166	Cassette Position	
422	01A6	R	5	167	Current Balance	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
423	01A7	R	5	168	OC/MOL value	
424	01A8	R	5	169	Volts A (%)	
425	01A9	R	5	170	Volts B (%)	
426	01AA	R	5	171	Volts C (%)	
427	01AB	R	5	172	Current A (%)	
428	01AC	R	5	173	Current B (%)	
429	01AD	R	5	174	Current C (%)	
430	01AE	R	5	175	EL Current (%)	
431	01AF	R	5	176	Average Current (%)	
432	01B0	R	5	177	Spare	
433	01B1	R	5	178	Spare	
434	01B2	R	5	179	Spare	
435	01B3	R	5	180	Spare	
436	01B4	R	6	181	Outlet status	
437	01B5	R	6	182	Volts Average	
438	01B6	R	6	183	Average Current (A)	
439	01B7	R	6	184		
440	01B8	R	6	185		
441	01B9	R	6	186		
442	01BA	R	6	187	EL Current / RV Level	
443	01BB	R	6	188	Pilot Series Resistance	
444	01BC	R	6	189	Pilot Shunt Resistance	
445	01BD	R	6	190	Trip Mask 1	
446	01BE	R	6	191	Trip Mask 2	
447	01BF	R	6	192	Trip Mask 3	
448	01C0	R	6	193	Digital IO Relay	
449	01C1	R	6	194	RTX Inputs	
450	01C2	R	6	195	Cassette Status	
451	01C3	R	6	196	Cassette Position	
452	01C4	R	6	197	Current Balance	
453	01C5	R	6	198	OC/MOL value	
454	01C6	R	6	199	Volts A (%)	
455	01C7	R	6	200	Volts B (%)	
456	01C8	R	6	201	Volts C (%)	
457	01C9	R	6	202	Current A (%)	
458	01CA	R	6	203	Current B (%)	
459	01CB	R	6	204	Current C (%)	
460	01CC	R	6	205	EL Current (%)	
461	01CD	R	6	206	Average Current (%)	
462	01CE	R	6	207	Spare	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
463	01CF	R	6	208	Spare	
464	01D0	R	6	209	Spare	
465	01D1	R	6	210	Spare	
466	01D2	R	7	211	Outlet status	
467	01D3	R	7	212	Volts Average	
468	01D4	R	7	213	Average Current (A)	
469	01D5	R	7	214		
470	01D6	R	7	215		
471	01D7	R	7	216		
472	01D8	R	7	217	EL Current / RV Level	
473	01D9	R	7	218	Pilot Series Resistance	
474	01DA	R	7	219	Pilot Shunt Resistance	
475	01DB	R	7	220	Trip Mask 1	
476	01DC	R	7	221	Trip Mask 2	
477	01DD	R	7	222	Trip Mask 3	
478	01DE	R	7	223	Digital IO Relay	
479	01DF	R	7	224	RTX Inputs	
480	01E0	R	7	225	Cassette Status	
481	01E1	R	7	226	Cassette Position	
482	01E2	R	7	227	Current Balance	
483	01E3	R	7	228	OC/MOL value	
484	01E4	R	7	229	Volts A (%)	
485	01E5	R	7	230	Volts B (%)	
486	01E6	R	7	231	Volts C (%)	
487	01E7	R	7	232	Current A (%)	
488	01E8	R	7	233	Current B (%)	
489	01E9	R	7	234	Current C (%)	
490	01EA	R	7	235	EL Current (%)	
491	01EB	R	7	236	Average Current (%)	
492	01EC	R	7	237	Spare	
493	01ED	R	7	238	Spare	
494	01EE	R	7	239	Spare	
495	01EF	R	7	240	Spare	
496	01F0	R	8	241	Outlet status	
497	01F1	R	8	242	Volts Average	
498	01F2	R	8	243	Average Current (A)	
499	01F3	R	8	244		
500	01F4	R	8	245		
501	01F5	R	8	246		
502	01F6	R	8	247	EL Current / RV Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
503	01F7	R	8	248	Pilot Series Resistance	
504	01F8	R	8	249	Pilot Shunt Resistance	
505	01F9	R	8	250	Trip Mask 1	
506	01FA	R	8	251	Trip Mask 2	
507	01FB	R	8	252	Trip Mask 3	
508	01FC	R	8	253	Digital IO Relay	
509	01FD	R	8	254	RTX Inputs	
510	01FE	R	8	255	Cassette Status	
511	01FF	R	8	256	Cassette Position	
512	0200	R	8	257	Current Balance	
513	0201	R	8	258	OC/MOL value	
514	0202	R	8	259	Volts A (%)	
515	0203	R	8	260	Volts B (%)	
516	0204	R	8	261	Volts C (%)	
517	0205	R	8	262	Current A (%)	
518	0206	R	8	263	Current B (%)	
519	0207	R	8	264	Current C (%)	
520	0208	R	8	265	EL Current (%)	
521	0209	R	8	266	Average Current (%)	
522	020A	R	8	267	Spare	
523	020B	R	8	268	Spare	
524	020C	R	8	269	Spare	
525	020D	R	8	270	Spare	
526	020E	R	9	271	Outlet status	
527	020F	R	9	272	Volts Average	
528	0210	R	9	273	Average Current (A)	
529	0211	R	9	274		
530	0212	R	9	275		
531	0213	R	9	276		
532	0214	R	9	277	EL Current / RV Level	
533	0215	R	9	278	Pilot Series Resistance	
534	0216	R	9	279	Pilot Shunt Resistance	
535	0217	R	9	280	Trip Mask 1	
536	0218	R	9	281	Trip Mask 2	
537	0219	R	9	282	Trip Mask 3	
538	021A	R	9	283	Digital IO Relay	
539	021B	R	9	284	RTX Inputs	
540	021C	R	9	285	Cassette Status	
541	021D	R	9	286	Cassette Position	
542	021E	R	9	287	Current Balance	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
543	021F	R	9	288	OC/MOL value	
544	0220	R	9	289	Volts A (%)	
545	0221	R	9	290	Volts B (%)	
546	0222	R	9	291	Volts C (%)	
547	0223	R	9	292	Current A (%)	
548	0224	R	9	293	Current B (%)	
549	0225	R	9	294	Current C (%)	
550	0226	R	9	295	EL Current (%)	
551	0227	R	9	296	Average Current (%)	
552	0228	R	9	297	Spare	
553	0229	R	9	298	Spare	
554	022A	R	9	299	Spare	
555	022B	R	9	300	Spare	
556	022C	R	10	301	Outlet status	
557	022D	R	10	302	Volts Average	
558	022E	R	10	303	Average Current (A)	
559	022F	R	10	304		
560	0230	R	10	305		
561	0231	R	10	306		
562	0232	R	10	307	EL Current / RV Level	
563	0233	R	10	308	Pilot Series Resistance	
564	0234	R	10	309	Pilot Shunt Resistance	
565	0235	R	10	310	Trip Mask 1	
566	0236	R	10	311	Trip Mask 2	
567	0237	R	10	312	Trip Mask 3	
568	0238	R	10	313	Digital IO Relay	
569	0239	R	10	314	RTX Inputs	
570	023A	R	10	315	Cassette Status	
571	023B	R	10	316	Cassette Position	
572	023C	R	10	317	Current Balance	
573	023D	R	10	318	OC/MOL value	
574	023E	R	10	319	Volts A (%)	
575	023F	R	10	320	Volts B (%)	
576	0240	R	10	321	Volts C (%)	
577	0241	R	10	322	Current A (%)	
578	0242	R	10	323	Current B (%)	
579	0243	R	10	324	Current C (%)	
580	0244	R	10	325	EL Current (%)	
581	0245	R	10	326	Average Current (%)	
582	0246	R	10	327	Spare	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
583	0247	R	10	328	Spare	
584	0248	R	10	329	Spare	
585	0249	R	10	330	Spare	
586	024A	R	11	331	Outlet status	
587	024B	R	11	332	Volts Average	
588	024C	R	11	333	Average Current (A)	
589	024D	R	11	334		
590	024E	R	11	335		
591	024F	R	11	336		
592	0250	R	11	337	EL Current / RV Level	
593	0251	R	11	338	Pilot Series Resistance	
594	0252	R	11	339	Pilot Shunt Resistance	
595	0253	R	11	340	Trip Mask 1	
596	0254	R	11	341	Trip Mask 2	
597	0255	R	11	342	Trip Mask 3	
598	0256	R	11	343	Digital IO Relay	
599	0257	R	11	344	RTX Inputs	
600	0258	R	11	345	Cassette Status	
601	0259	R	11	346	Cassette Position	
602	025A	R	11	347	Current Balance	
603	025B	R	11	348	OC/MOL value	
604	025C	R	11	349	Volts A (%)	
605	025D	R	11	350	Volts B (%)	
606	025E	R	11	351	Volts C (%)	
607	025F	R	11	352	Current A (%)	
608	0260	R	11	353	Current B (%)	
609	0261	R	11	354	Current C (%)	
610	0262	R	11	355	EL Current (%)	
611	0263	R	11	356	Average Current (%)	
612	0264	R	11	357	Spare	
613	0265	R	11	358	Spare	
614	0266	R	11	359	Spare	
615	0267	R	11	360	Spare	
616	0268	R	12	361	Outlet status	
617	0269	R	12	362	Volts Average	
618	026A	R	12	363	Average Current (A)	
619	026B	R	12	364		
620	026C	R	12	365		
621	026D	R	12	366		
622	026E	R	12	367	EL Current / RV Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
623	026F	R	12	368	Pilot Series Resistance	
624	0270	R	12	369	Pilot Shunt Resistance	
625	0271	R	12	370	Trip Mask 1	
626	0272	R	12	371	Trip Mask 2	
627	0273	R	12	372	Trip Mask 3	
628	0274	R	12	373	Digital IO Relay	
629	0275	R	12	374	RTX Inputs	
630	0276	R	12	375	Cassette Status	
631	0277	R	12	376	Cassette Position	
632	0278	R	12	377	Current Balance	
633	0279	R	12	378	OC/MOL value	
634	027A	R	12	379	Volts A (%)	
635	027B	R	12	380	Volts B (%)	
636	027C	R	12	381	Volts C (%)	
637	027D	R	12	382	Current A (%)	
638	027E	R	12	383	Current B (%)	
639	027F	R	12	384	Current C (%)	
640	0280	R	12	385	EL Current (%)	
641	0281	R	12	386	Average Current (%)	
642	0282	R	12	387	Spare	
643	0283	R	12	388	Spare	
644	0284	R	12	389	Spare	
645	0285	R	12	390	Spare	
646	0286	R	13	391	Outlet status	
647	0287	R	13	392	Volts Average	
648	0288	R	13	393	Average Current (A)	
649	0289	R	13	394		
650	028A	R	13	395		
651	028B	R	13	396		
652	028C	R	13	397	EL Current / RV Level	
653	028D	R	13	398	Pilot Series Resistance	
654	028E	R	13	399	Pilot Shunt Resistance	
655	028F	R	13	400	Trip Mask 1	
656	0290	R	13	401	Trip Mask 2	
657	0291	R	13	402	Trip Mask 3	
658	0292	R	13	403	Digital IO Relay	
659	0293	R	13	404	RTX Inputs	
660	0294	R	13	405	Cassette Status	
661	0295	R	13	406	Cassette Position	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
662	0296	R	13	407	Current Balance	
663	0297	R	13	408	OC/MOL value	
664	0298	R	13	409	Volts A (%)	
665	0299	R	13	410	Volts B (%)	
666	029A	R	13	411	Volts C (%)	
667	029B	R	13	412	Current A (%)	
668	029C	R	13	413	Current B (%)	
669	029D	R	13	414	Current C (%)	
670	029E	R	13	415	EL Current (%)	
671	029F	R	13	416	Average Current (%)	
672	02A0	R	13	417	Spare	
673	02A1	R	13	418	Spare	
674	02A2	R	13	419	Spare	
675	02A3	R	13	420	Spare	
676	02A4	R	14	421	Outlet status	
677	02A5	R	14	422	Volts Average	
678	02A6	R	14	423	Average Current (A)	
679	02A7	R	14	424		
680	02A8	R	14	425		
681	02A9	R	14	426		
682	02AA	R	14	427	EL Current / RV Level	
683	02AB	R	14	428	Pilot Series Resistance	
684	02AC	R	14	429	Pilot Shunt Resistance	
685	02AD	R	14	430	Trip Mask 1	
686	02AE	R	14	431	Trip Mask 2	
687	02AF	R	14	432	Trip Mask 3	
688	02B0	R	14	433	Digital IO Relay	
689	02B1	R	14	434	RTX Inputs	
690	02B2	R	14	435	Cassette Status	
691	02B3	R	14	436	Cassette Position	
692	02B4	R	14	437	Current Balance	
693	02B5	R	14	438	OC/MOL value	
694	02B6	R	14	439	Volts A (%)	
695	02B7	R	14	440	Volts B (%)	
696	02B8	R	14	441	Volts C (%)	
697	02B9	R	14	442	Current A (%)	
698	02BA	R	14	443	Current B (%)	
699	02BB	R	14	444	Current C (%)	
700	02BC	R	14	445	EL Current (%)	
701	02BD	R	14	446	Average Current (%)	

Address (DEC)	Address (HEX)	Read / Write	Outlet number	Register count	Name	Description
702	02BE	R	14	447	Spare	
703	02BF	R	14	448	Spare	
704	02C0	R	14	449	Spare	
705	02C1	R	14	450	Spare	
706	02C2	R	15	451	Outlet status	
707	02C3	R	15	452	Volts Average	
708	02C4	R	15	453	Average Current (A)	
709	02C5	R	15	454		
710	02C6	R	15	455		
711	02C7	R	15	456		
712	02C8	R	15	457	EL Current / RV Level	
713	02C9	R	15	458	Pilot Series Resistance	
714	02CA	R	15	459	Pilot Shunt Resistance	
715	02CB	R	15	460	Trip Mask 1	
716	02CC	R	15	461	Trip Mask 2	
717	02CD	R	15	462	Trip Mask 3	
718	02CE	R	15	463	Digital IO Relay	
719	02CF	R	15	464	RTX Inputs	
720	02D0	R	15	465	Cassette Status	
721	02D1	R	15	466	Cassette Position	
722	02D2	R	15	467	Current Balance	
723	02D3	R	15	468	OC/MOL value	
724	02D4	R	15	469	Volts A (%)	
725	02D5	R	15	470	Volts B (%)	
726	02D6	R	15	471	Volts C (%)	
727	02D7	R	15	472	Current A (%)	
728	02D8	R	15	473	Current B (%)	
729	02D9	R	15	474	Current C (%)	
730	02DA	R	15	475	EL Current (%)	
731	02DB	R	15	476	Average Current (%)	
732	02DC	R	15	477	Spare	
733	02DD	R	15	478	Spare	
734	02DE	R	15	479	Spare	
735	02DF	R	15	480	Spare	

16.3 Medium Speed Data

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
768	0300	R	PIP	System IO	IO Module status	Bit field. 0 = faulted IO Module, 1 healthy IO Module Bit 0 = IO module 1 … Bit 15 = IO module 16
769	0301	R	PIP	System IO	Temperature Sensor 1	degC x 10
770	0302	R	PIP	System IO	Temperature Sensor 2	degC x 10
771	0303	R	PIP	System IO	Temperature Sensor 3	degC x 10
772	0304	R	PIP	System IO	Temperature Sensor 4	degC x 10
773	0305	R	PIP	System IO	E-Stops Status	Bitwise - Active / Tripped 0 = E-Stop not pressed, 1 = E-Stop pressed Bit 0 = E-Stop 1 Bit 1 = E-Stop 2 Bit 2 = E-Stop 3 Bit 3 = E-Stop 4 Bit 4-15 = Unused
774	0306	R	PIP	System IO	Authorisation (Deputy)	Current authorisation status. 1 if authorised, 0 if unauthorised
775	0307	R	PIP	System IO	Authorisation (Electrician)	Current authorisation status. 1 if authorised, 0 if unauthorised
776	0308	R	PIP	System IO	Authorisation (Bypass)	Current authorisation status. 1 if authorised, 0 if unauthorised
777	0309	R	PIP	System IO	CB Interlock	Bitwise representation of CB input status Bit 0 = CB Outlet 1 Bit 1 = CB Outlet 2 …… Bit 14 = CB Outlet 15 Bit 15 = CB Outlet 16

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
778	030A	R	PIP	System IO	System IO module healthy status	Boolean representing whether the System IO module is healthy (communicating with the system correctly) True = healthy, False = unhealthy
779	030B	R	PIP	iFan	Local iFans Required	0, 1, 2
780	030C	R	PIP	iFan	Local iFans Available	
781	030D	R	PIP	iFan	Local iFans Running	
782	030E	R	PIP	iFan	Remote iFans Required	0, 1, 2
783	030F	R	PIP	iFan	Remote iFans Available	
784	0310	R	PIP	iFan	Remote iFans Running	
786	0312	R	PIP	iFan	iFan Bypass	Bypass is active if > Zero (32bit Value)
788	0314	R	PIP	PIP Dongle	PIP Dongle Status	Number representing current status: 0 = initialising 1 = confirm overwrite 2 = healthy 3 = internal settings unhealthy 4 = dongle unhealthy
789	0315	R	PIP	Spare		
…	…			…		
816	0330	R	PIP	Spare		
817	0331	R	0		Enable Mask	The 16-bit mask of the Relay Enable Bits.
818	0332	R	0		Shadow Trip Mask 1	The 16-bit mask of possible trips which occurred during the last run period. The mask bit definitions match Trip Mask 1
819	0333	R	0		Shadow Trip Mask 2	The 16-bit mask of possible trips which occurred during the last run period. The mask bit definitions match Trip Mask 2
820	0334	R	0		Shadow Trip Mask 3	The 16-bit mask of possible trips which occurred during the last run period. The mask bit definitions match Trip Mask 3

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
821	0335	R	0		RTX Status	The 16-bit mask of possible RTX status values. Full details are provided in Section 2.7.
822	0336	R	0		Insulation Test Result	Result of the last Insulation Test. This value is returned in Ohms x 100,000. Range of values is 0.5 MΩ to 100 MΩ. If the reported value is 0, an internal error has occurred.
823	0337	R	0		EFLO Test Result A	Scaled as a % of leakage to earth. Nominal trip point is 1 MΩ when all three phases are short circuited, which is recorded as 100 %. Records the value of the last EFLO test performed.
824	0338	R	0		EFLO Test Result B	
825	0339	R	0		EFLO Test Result C	
826	033A	R	0		Internal Temperature	Temperature measured inside the relay. Value is given to the nearest degree. Range of values is -20 ˚C to + 100 ˚C. Should be a signed integer.
827	033B	R	0		RTX Internal Temp	Temperature measured within the RTX. Value is given to the nearest degree. Range of values is -20 ˚C to +100 ˚C.
828	033C	R	0		RTX RTD Temp 1	Temperature measured by each of the RTX's RTD inputs. These values are only valid while the pilot mode is set to RTX and an RTX is online. Value is signed and in degrees, from -20 ˚C to + 300 ˚C. 32767 - Open Circuit 32766 - Short Circuit 32765 - Other Fault 32764 - RTX Offline
829	033D	R	0		RTX RTD Temp 2	
830	033E	R	0		RTX RTD Temp 3	
831	033F	R	0		RTX RTD Temp 4	
832	0340	R	0		RTX RTD Temp 5	
833	0341	R	0		RTX Machine Type	In RTX mode, these locations contain the current parameter value for the RTX Machine Type and ID parameters. If the parameter is invalid, the corresponding value will be the default parameter value.
834	0342	R	0		RTX Machine ID	In diode mode they will both display the default value.
835	0343	R	0		kVA	kVA as IEEE-754 Double Precision floating point
839	0347	R	0		kVAh	kVA as IEEE-754 Double Precision floating point
843	034B	R	0		Run Time	Number of hours spent in "running" state as IEEE-754 Double

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
847	034F	R	0		Contactor Count	
849	0351	R	0		Cassette Analog Position	Raw analog voltage measurement, 0-32767 integer value
850	0352	R	0	Spare		
…	…			…		
866	0362	R	0	Spare		
867	0363	R	1	Status and measurement	Enable Mask	
868	0364	R	1		Shadow Trip Mask 1	
869	0365	R	1		Shadow Trip Mask 2	
870	0366	R	1		Shadow Trip Mask 3	
871	0367	R	1		RTX Status	
872	0368	R	1		Insulation Test Result	
873	0369	R	1		EFLO Test Result A	
874	036A	R	1		EFLO Test Result B	
875	036B	R	1		EFLO Test Result C	
876	036C	R	1		Internal Temperature	
877	036D	R	1		RTX Internal Temp	
878	036E	R	1		RTX RTD Temp 1	
879	036F	R	1		RTX RTD Temp 2	
880	0370	R	1		RTX RTD Temp 3	
881	0371	R	1		RTX RTD Temp 4	
882	0372	R	1		RTX RTD Temp 5	
883	0373	R	1		RTX Machine Type	
884	0374	R	1		RTX Machine ID	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
885	0375	R	1		kVA	
889	0379	R	1		kVAh	
893	037D	R	1		Run Time	
897	0381	R	1		Contactor Count	
899	0383	R	1		Cassette Analog Position	
900	0384	R	1	Spare		
…	…			…		
916	0394	R	1	Spare		
917	0395	R	2	Status and measurement	Enable Mask	
918	0396	R	2		Shadow Trip Mask 1	
919	0397	R	2		Shadow Trip Mask 2	
920	0398	R	2		Shadow Trip Mask 3	
921	0399	R	2		RTX Status	
922	039A	R	2		Insulation Test Result	
923	039B	R	2		EFLO Test Result A	
924	039C	R	2		EFLO Test Result B	
925	039D	R	2		EFLO Test Result C	
926	039E	R	2		Internal Temperature	
927	039F	R	2		RTX Internal Temp	
928	03A0	R	2		RTX RTD Temp 1	
929	03A1	R	2		RTX RTD Temp 2	
930	03A2	R	2		RTX RTD Temp 3	
931	03A3	R	2		RTX RTD Temp 4	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
932	03A4	R	2		RTX RTD Temp 5	
933	03A5	R	2		RTX Machine Type	
934	03A6	R	2		RTX Machine ID	
935	03A7	R	2		kVA	
939	03AB	R	2		kVAh	
943	03AF	R	2		Run Time	
947	03B3	R	2		Contactor Count	
949	03B5	R	2		Cassette Analog Position	
950	03B6	R	2	Spare		
…	…			…		
966	03C6	R	2	Spare		
967	03C7	R	3	Status and measurement	Enable Mask	
968	03C8	R	3		Shadow Trip Mask 1	
969	03C9	R	3		Shadow Trip Mask 2	
970	03CA	R	3		Shadow Trip Mask 3	
971	03CB	R	3		RTX Status	
972	03CC	R	3		Insulation Test Result	
973	03CD	R	3		EFLO Test Result A	
974	03CE	R	3		EFLO Test Result B	
975	03CF	R	3		EFLO Test Result C	
976	03D0	R	3		Internal Temperature	
977	03D1	R	3		RTX Internal Temp	
978	03D2	R	3		RTX RTD Temp 1	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
979	03D3	R	3		RTX RTD Temp 2	
980	03D4	R	3		RTX RTD Temp 3	
981	03D5	R	3		RTX RTD Temp 4	
982	03D6	R	3		RTX RTD Temp 5	
983	03D7	R	3		RTX Machine Type	
984	03D8	R	3		RTX Machine ID	
985	03D9	R	3		kVA	
989	03DD	R	3		kVAh	
993	03E1	R	3		Run time	
997	03E5	R	3		Contactor count	
999	03E7	R	3		Cassette Analog Position	
1000	03E8	R	3	Spare		
…	…			…		
1016	03F8	R	3	Spare		
1017	03F9	R	4	Status and measurement	Enable Mask	
1018	03FA	R	4		Shadow Trip Mask 1	
1019	03FB	R	4		Shadow Trip Mask 2	
1020	03FC	R	4		Shadow Trip Mask 3	
1021	03FD	R	4		RTX Status	
1022	03FE	R	4		Insulation Test Result	
1023	03FF	R	4		EFLO Test Result A	
1024	0400	R	4		EFLO Test Result B	
1025	0401	R	4		EFLO Test Result C	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1026	0402	R	4		Internal Temperature	
1027	0403	R	4		RTX Internal Temp	
1028	0404	R	4		RTX RTD Temp 1	
1029	0405	R	4		RTX RTD Temp 2	
1030	0406	R	4		RTX RTD Temp 3	
1031	0407	R	4		RTX RTD Temp 4	
1032	0408	R	4		RTX RTD Temp 5	
1033	0409	R	4		RTX Machine Type	
1034	040A	R	4		RTX Machine ID	
1035	040B	R	4		kVA	
1039	040F	R	4		kVAh	
1043	0413	R	4		Run time	
1047	0417	R	4		Contactor count	
1049	0419	R	4		Cassette Analog Position	
1050	041A	R	4	Spare		
…	…			…		
1066	042A	R	4	Spare		
1067	042B	R	5	Status and measurement	Enable Mask	
1068	042C	R	5		Shadow Trip Mask 1	
1069	042D	R	5		Shadow Trip Mask 2	
1070	042E	R	5		Shadow Trip Mask 3	
1071	042F	R	5		RTX Status	
1072	0430	R	5		Insulation Test Result	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1073	0431	R	5		EFLO Test Result A	
1074	0432	R	5		EFLO Test Result B	
1075	0433	R	5		EFLO Test Result C	
1076	0434	R	5		Internal Temperature	
1077	0435	R	5		RTX Internal Temp	
1078	0436	R	5		RTX RTD Temp 1	
1079	0437	R	5		RTX RTD Temp 2	
1080	0438	R	5		RTX RTD Temp 3	
1081	0439	R	5		RTX RTD Temp 4	
1082	043A	R	5		RTX RTD Temp 5	
1083	043B	R	5		RTX Machine Type	
1084	043C	R	5		RTX Machine ID	
1085	043D	R	5		kVA	
1089	0441	R	5		kVAh	
1093	0445	R	5		Run time	
1097	0449	R	5		Contactor count	
1099	044B	R	5		Cassette Analog Position	
1100	044C	R	5	Spare		
…	…			…		
1116	045C	R	5	Spare		
1117	045D	R	6	Status and measurement	Enable Mask	
1118	045E	R	6		Shadow Trip Mask 1	
1119	045F	R	6		Shadow Trip Mask 2	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1120	0460	R	6		Shadow Trip Mask 3	
1121	0461	R	6		RTX Status	
1122	0462	R	6		Insulation Test Result	
1123	0463	R	6		EFLO Test Result A	
1124	0464	R	6		EFLO Test Result B	
1125	0465	R	6		EFLO Test Result C	
1126	0466	R	6		Internal Temperature	
1127	0467	R	6		RTX Internal Temp	
1128	0468	R	6		RTX RTD Temp 1	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1129	0469	R	6		RTX RTD Temp 2	
1130	046A	R	6		RTX RTD Temp 3	
1131	046B	R	6		RTX RTD Temp 4	
1132	046C	R	6		RTX RTD Temp 5	
1133	046D	R	6		RTX Machine Type	
1134	046E	R	6		RTX Machine ID	
1135	046F	R	6		kVA	
1139	0473	R	6		kVAh	
1143	0477	R	6		Run time	
1147	047B	R	6		Contactor count	
1149	047D	R	6		Cassette Analog Position	
1150	047E	R	6	Spare		
…	…			…		
1166	048E	R	6	Spare		
1167	048F	R	7	Status and measurement	Enable Mask	
1168	0490	R	7		Shadow Trip Mask 1	
1169	0491	R	7		Shadow Trip Mask 2	
1170	0492	R	7		Shadow Trip Mask 3	
1171	0493	R	7		RTX Status	
1172	0494	R	7		Insulation Test Result	
1173	0495	R	7		EFLO Test Result A	
1174	0496	R	7		EFLO Test Result B	
1175	0497	R	7		EFLO Test Result C	
1176	0498	R	7		Internal Temperature	
1177	0499	R	7		RTX Internal Temp	
1178	049A	R	7		RTX RTD Temp 1	
1179	049B	R	7		RTX RTD Temp 2	
1180	049C	R	7		RTX RTD Temp 3	
1181	049D	R	7		RTX RTD Temp 4	
1182	049E	R	7		RTX RTD Temp 5	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1183	049F	R	7		RTX Machine Type	
1184	04A0	R	7		RTX Machine ID	
1185	04A1	R	7		kVA	
1189	04A5	R	7		kVAh	
1193	04A9	R	7		Run time	
1197	04AD	R	7		Contactor count	
1199	04AF	R	7		Cassette Analog Position	
1200	04B0	R	7	Spare		
…	…			…		
1216	04C0	R	7	Spare		
1217	04C1	R	8	Status and measurement	Enable Mask	
1218	04C2	R	8		Shadow Trip Mask 1	
1219	04C3	R	8		Shadow Trip Mask 2	
1220	04C4	R	8		Shadow Trip Mask 3	
1221	04C5	R	8		RTX Status	
1222	04C6	R	8		Insulation Test Result	
1223	04C7	R	8		EFLO Test Result A	
1224	04C8	R	8		EFLO Test Result B	
1225	04C9	R	8		EFLO Test Result C	
1226	04CA	R	8		Internal Temperature	
1227	04CB	R	8		RTX Internal Temp	
1228	04CC	R	8		RTX RTD Temp 1	
1229	04CD	R	8		RTX RTD Temp 2	
1230	04CE	R	8		RTX RTD Temp 3	
1231	04CF	R	8		RTX RTD Temp 4	
1232	04D0	R	8		RTX RTD Temp 5	
1233	04D1	R	8		RTX Machine Type	
1234	04D2	R	8		RTX Machine ID	
1235	04D3	R	8		kVA	
1239	04D7	R	8		kVAh	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1243	04DB	R	8		Run time	
1247	04DF	R	8		Contactor count	
1249	04E1	R	8		Cassette Analog Position	
1250	04E2	R	8	Spare		
…	…			…		
1266	04F2	R	8	Spare		
1267	04F3	R	9	Status and measurement	Enable Mask	
1268	04F4	R	9		Shadow Trip Mask 1	
1269	04F5	R	9		Shadow Trip Mask 2	
1270	04F6	R	9		Shadow Trip Mask 3	
1271	04F7	R	9		RTX Status	
1272	04F8	R	9		Insulation Test Result	
1273	04F9	R	9		EFLO Test Result A	
1274	04FA	R	9		EFLO Test Result B	
1275	04FB	R	9		EFLO Test Result C	
1276	04FC	R	9		Internal Temperature	
1277	04FD	R	9		RTX Internal Temp	
1278	04FE	R	9		RTX RTD Temp 1	
1279	04FF	R	9		RTX RTD Temp 2	
1280	0500	R	9		RTX RTD Temp 3	
1281	0501	R	9		RTX RTD Temp 4	
1282	0502	R	9		RTX RTD Temp 5	
1283	0503	R	9		RTX Machine Type	
1284	0504	R	9		RTX Machine ID	
1285	0505	R	9		kVA	
1289	0509	R	9		kVAh	
1293	050D	R	9		Run time	
1297	0511	R	9		Contactor count	
1299	0513	R	9		Cassette Analog Position	
1300	0514	R	9	Spare		

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
…	…			…		
1316	0524	R	9	Spare		
1317	0525	R	10	Status and measurement	Enable Mask	
1318	0526	R	10		Shadow Trip Mask 1	
1319	0527	R	10		Shadow Trip Mask 2	
1320	0528	R	10		Shadow Trip Mask 3	
1321	0529	R	10		RTX Status	
1322	052A	R	10		Insulation Test Result	
1323	052B	R	10		EFLO Test Result A	
1324	052C	R	10		EFLO Test Result B	
1325	052D	R	10		EFLO Test Result C	
1326	052E	R	10		Internal Temperature	
1327	052F	R	10		RTX Internal Temp	
1328	0530	R	10		RTX RTD Temp 1	
1329	0531	R	10		RTX RTD Temp 2	
1330	0532	R	10		RTX RTD Temp 3	
1331	0533	R	10		RTX RTD Temp 4	
1332	0534	R	10		RTX RTD Temp 5	
1333	0535	R	10		RTX Machine Type	
1334	0536	R	10		RTX Machine ID	
1335	0537	R	10		kVA	
1339	053B	R	10		kVAh	
1343	053F	R	10		Run time	
1347	0543	R	10		Contactor count	
1349	0545	R	10		Cassette Analog Position	
1350	0546	R	10	Spare		
…	…			…		
1366	0556	R	10	Spare		
1367	0557	R	11	Status and measurement	Enable Mask	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1368	0558	R	11		Shadow Trip Mask 1	
1369	0559	R	11		Shadow Trip Mask 2	
1370	055A	R	11		Shadow Trip Mask 3	
1371	055B	R	11		RTX Status	
1372	055C	R	11		Insulation Test Result	
1373	055D	R	11		EFLO Test Result A	
1374	055E	R	11		EFLO Test Result B	
1375	055F	R	11		EFLO Test Result C	
1376	0560	R	11		Internal Temperature	
1377	0561	R	11		RTX Internal Temp	
1378	0562	R	11		RTX RTD Temp 1	
1379	0563	R	11		RTX RTD Temp 2	
1380	0564	R	11		RTX RTD Temp 3	
1381	0565	R	11		RTX RTD Temp 4	
1382	0566	R	11		RTX RTD Temp 5	
1383	0567	R	11		RTX Machine Type	
1384	0568	R	11		RTX Machine ID	
1385	0569	R	11		kVA	
1389	056D	R	11		kVAh	
1393	0571	R	11		Run time	
1397	0575	R	11		Contactor count	
1399	0577	R	11		Cassette Analog Position	
1400	0578	R	11	Spare		
…	…			…		
1416	0588	R	11	Spare		
1417	0589	R	12	Status and measurement	Enable Mask	
1418	058A	R	12		Shadow Trip Mask 1	
1419	058B	R	12		Shadow Trip Mask 2	
1420	058C	R	12		Shadow Trip Mask 3	
1421	058D	R	12		RTX Status	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1422	058E	R	12		Insulation Test Result	
1423	058F	R	12		EFLO Test Result A	
1424	0590	R	12		EFLO Test Result B	
1425	0591	R	12		EFLO Test Result C	
1426	0592	R	12		Internal Temperature	
1427	0593	R	12		RTX Internal Temp	
1428	0594	R	12		RTX RTD Temp 1	
1429	0595	R	12		RTX RTD Temp 2	
1430	0596	R	12		RTX RTD Temp 3	
1431	0597	R	12		RTX RTD Temp 4	
1432	0598	R	12		RTX RTD Temp 5	
1433	0599	R	12		RTX Machine Type	
1434	059A	R	12		RTX Machine ID	
1435	059B	R	12		kVA	
1439	059F	R	12		kVAh	
1443	05A3	R	12		Run time	
1447	05A7	R	12		Contactor count	
1449	05A9	R	12		Cassette Analog Position	
1450	05AA	R	12	Spare		
…	…			…		
1466	05BA	R	12	Spare		
1467	05BB	R	13	Status and measurement	Enable Mask	
1468	05BC	R	13		Shadow Trip Mask 1	
1469	05BD	R	13		Shadow Trip Mask 2	
1470	05BE	R	13		Shadow Trip Mask 3	
1471	05BF	R	13		RTX Status	
1472	05C0	R	13		Insulation Test Result	
1473	05C1	R	13		EFLO Test Result A	
1474	05C2	R	13		EFLO Test Result B	
1475	05C3	R	13		EFLO Test Result C	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1476	05C4	R	13		Internal Temperature	
1477	05C5	R	13		RTX Internal Temp	
1478	05C6	R	13		RTX RTD Temp 1	
1479	05C7	R	13		RTX RTD Temp 2	
1480	05C8	R	13		RTX RTD Temp 3	
1481	05C9	R	13		RTX RTD Temp 4	
1482	05CA	R	13		RTX RTD Temp 5	
1483	05CB	R	13		RTX Machine Type	
1484	05CC	R	13		RTX Machine ID	
1485	05CD	R	13		kVA	
1489	05D1	R	13		kVAh	
1493	05D5	R	13		Run time	
1497	05D9	R	13		Contactor count	
1499	05DB	R	13		Cassette Analog Position	
1500	05DC	R	13	Spare		
…	…			…		
1516	05EC	R	13	Spare		
1517	05ED	R	14	Status and measurement	Enable Mask	
1518	05EE	R	14		Shadow Trip Mask 1	
1519	05EF	R	14		Shadow Trip Mask 2	
1520	05F0	R	14		Shadow Trip Mask 3	
1521	05F1	R	14		RTX Status	
1522	05F2	R	14		Insulation Test Result	
1523	05F3	R	14		EFLO Test Result A	
1524	05F4	R	14		EFLO Test Result B	
1525	05F5	R	14		EFLO Test Result C	
1526	05F6	R	14		Internal Temperature	
1527	05F7	R	14		RTX Internal Temp	
1528	05F8	R	14		RTX RTD Temp 1	
1529	05F9	R	14		RTX RTD Temp 2	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1530	05FA	R	14		RTX RTD Temp 3	
1531	05FB	R	14		RTX RTD Temp 4	
1532	05FC	R	14		RTX RTD Temp 5	
1533	05FD	R	14		RTX Machine Type	
1534	05FE	R	14		RTX Machine ID	
1535	05FF	R	14		kVA	
1539	0603	R	14		kVAh	
1543	0607	R	14		Run time	
1547	060B	R	14		Contactor count	
1549	060D	R	14		Cassette Analog Position	
1550	060E	R	14	Spare		
…	…			…		
1566	061E	R	14	Spare		
1567	061F	R	15	Status and measurement	Enable Mask	
1568	0620	R	15		Shadow Trip Mask 1	
1569	0621	R	15		Shadow Trip Mask 2	
1570	0622	R	15		Shadow Trip Mask 3	
1571	0623	R	15		RTX Status	
1572	0624	R	15		Insulation Test Result	
1573	0625	R	15		EFLO Test Result A	
1574	0626	R	15		EFLO Test Result B	
1575	0627	R	15		EFLO Test Result C	
1576	0628	R	15		Internal Temperature	
1577	0629	R	15		RTX Internal Temp	
1578	062A	R	15		RTX RTD Temp 1	
1579	062B	R	15		RTX RTD Temp 2	
1580	062C	R	15		RTX RTD Temp 3	
1581	062D	R	15		RTX RTD Temp 4	
1582	062E	R	15		RTX RTD Temp 5	
1583	062F	R	15		RTX Machine Type	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Category	Name	Description
1584	0630	R	15		RTX Machine ID	
1585	0631	R	15		kVA	
1589	0635	R	15		kVAh	
1593	0639	R	15		Run time	
1597	063D	R	15		Contactor count	
1599	063F	R	15		Cassette Analog Position	
1600	0640	R	15	Spare		
…	…			…		
1616	0650	R	15	Spare		

16.4 Modbus Active Settings

Settings
(note this is switched automatically between Relay and RTX depending on pilot mode)

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1792	0700	R	0	Pilot Mode	0-1 (0: diode termination, 1: RTX termination)
1793	0701	R	0	Loss of Vacuum Level	Value in volts (25, 50, 100, 150)
1794	0702	R	0	Voltage Level	Value in volts (415, 690, 1100, 3300)
1795	0703	R	0	Insulation Test Level	Value in volts (0, 900, 2700)
1796	0704	R	0	Machine Type	0-255* for RTX pilot mode; 0 for diode pilot mode
1797	0705	R	0	Machine ID	0-255* for RTX pilot mode; 0 for diode pilot mode
1798	0706	R	0	Full Load Current Range	Full Load Current as shown on UI * 10 (to include 1 decimal place)
1799	0707	R	0	Short Circuit Trip Level	Short Circuit Multiplier as shown on UI * 100 (to include 2 decimal places)
1800	0708	R	0	Short Circuit Trip Time	Short Circuit operating time in ms
1801	0709	R	0	Overcurrent Curve	0-2 (0: very inverse, 1: extremely inverse, 2: Motor Overload)
1802	070A	R	0	Overcurrent Time Multiplier	Multiplier * 1000 (3 decimal places)
1803	070B	R	0	Overload Cooling Multiplier	Cooling multiplier * 10 (1 decimal place)
1804	070C	R	0	<Reserved>	0
1805	070D	R	0	Overload Start Block Level	20 % - 90 %
1806	070E	R	0	Current Unbalance Trip Level	0 % (OFF) – 50 %
1807	070F	R	0	Under Current Trip Level	0 % (OFF) – 95 %
1808	0710	R	0	Earth Leakage Trip Level / Residual voltage trip level	100 - 500 for EL (mA) (OCS-RV, 15 - 1500 for RV (volts))
1809	0711	R	0	Earth Leakage Trip Time / Residual Voltage Trip Time	0 - 500 for EL (ms) (OCS-RV, 40 - 5000 for RV (ms))

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1810	0712	R	0	Earth Continuity Trip Level	10 - 45 (ohms)
1811	0713	R	0	Earth Continuity Trip Time	0 (OFF) – 5000 ms
1812	0714	R	0	Earth Continuity Latch	0: ON, 1: OFF
1813	0715	R	0	Remote Start	0: disabled, 1: enabled
1814	0716	R	0	Insulation Test Trip Level	0 (OFF) – M Ω
1815	0717	R	0	Under Voltage Trip Level	0 % (OFF) – 95 %
1816	0718	R	0	RTX RTD 1-2 Trip Temp	0-200 for RTX Termination
1817	0719	R	0	RTX RTD 3-5 Trip Temp	0-200 for RTX Termination
1818	071A	R	0	RTX RTD 1-2 Reset Temp	0-200 for RTX Termination
1819	071B	R	0	RTX RTD 3-5 Reset Temp	0-200 for RTX Termination
1820	071C	R	0	Back EMF Time	2 – 20 sec
1821	071D	R	0	<Reserved> / Pilot Interlock Time (RV version)	0 (OFF) – 500 ms (RV only)
1822	071E	R	0	Spare	
1823	071F	R	0	Spare	
1824	0720	R	0	Spare	
1825	0721	R	0	Spare	
1826	0722	R	0	Spare	
1827	0723	R	1	Pilot Mode	
1828	0724	R	1	Loss of Vacuum Level	
1829	0725	R	1	Voltage Level	
1830	0726	R	1	Insulation Test Level	
1831	0727	R	1	Machine Type	
1832	0728	R	1	Machine ID	
1833	0729	R	1	Full Load Current Range	
1834	072A	R	1	Short Circuit Trip Level	
1835	072B	R	1	Short Circuit Trip Time	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1836	072C	R	1	Overcurrent Curve	
1837	072D	R	1	Overcurrent Time Multiplier	
1838	072E	R	1	Overload Cooling Multiplier	
1839	072F	R	1	<Reserved>	
1840	0730	R	1	Overload Start Block Level	
1841	0731	R	1	Current Unbalance Trip Level	
1842	0732	R	1	Under Current Trip Level	
1843	0733	R	1	Earth Leakage Trip Level / Residual voltage trip level	
1844	0734	R	1	Earth Leakage Trip Time / Residual Voltage Trip Time	
1845	0735	R	1	Earth Continuity Trip Level	
1846	0736	R	1	Earth Continuity Trip Time	
1847	0737	R	1	Earth Continuity Latch	
1848	0738	R	1	Remote Start	
1849	0739	R	1	Insulation Test Trip Level	
1850	073A	R	1	Under Voltage Trip Level	
1851	073B	R	1	RTX RTD 1-2 Trip Temp	
1852	073C	R	1	RTX RTD 3-5 Trip Temp	
1853	073D	R	1	RTX RTD 1-2 Reset Temp	
1854	073E	R	1	RTX RTD 3-5 Reset Temp	
1855	073F	R	1	Back EMF Time	
1856	0740	R	1	<Reserved> / Pilot Interlock Time (RV version)	
1857	0741	R	1	Spare	
1858	0742	R	1	Spare	
1859	0743	R	1	Spare	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1860	0744	R	1	Spare	
1861	0745	R	1	Spare	
1862	0746	R	2	Pilot Mode	
1863	0747	R	2	Loss of Vacuum Level	
1864	0748	R	2	Voltage Level	
1865	0749	R	2	Insulation Test Level	
1866	074A	R	2	Machine Type	
1867	074B	R	2	Machine ID	
1868	074C	R	2	Full Load Current Range	
1869	074D	R	2	Short Circuit Trip Level	
1870	074E	R	2	Short Circuit Trip Time	
1871	074F	R	2	Overcurrent Curve	
1872	0750	R	2	Overcurrent Time Multiplier	
1873	0751	R	2	Overload Cooling Multiplier	
1874	0752	R	2	<Reserved>	
1875	0753	R	2	Overload Start Block Level	
1876	0754	R	2	Current Unbalance Trip Level	
1877	0755	R	2	Under Current Trip Level	
1878	0756	R	2	Earth Leakage Trip Level / Residual voltage trip level	
1879	0757	R	2	Earth Leakage Trip Time / Residual Voltage Trip Time	
1880	0758	R	2	Earth Continuity Trip Level	
1881	0759	R	2	Earth Continuity Trip Time	
1882	075A	R	2	Earth Continuity Latch	
1883	075B	R	2	Remote Start	
1884	075C	R	2	Insulation Test Trip Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1885	075D	R	2	Under Voltage Trip Level	
1886	075E	R	2	RTX RTD 1-2 Trip Temp	
1887	075F	R	2	RTX RTD 3-5 Trip Temp	
1888	0760	R	2	RTX RTD 1-2 Reset Temp	
1889	0761	R	2	RTX RTD 3-5 Reset Temp	
1890	0762	R	2	Back EMF Time	
1891	0763	R	2	<Reserved> / Pilot Interlock Time (RV version)	
1892	0764	R	2	Spare	
1893	0765	R	2	Spare	
1894	0766	R	2	Spare	
1895	0767	R	2	Spare	
1896	0768	R	2	Spare	
1897	0769	R	3	Pilot Mode	
1898	076A	R	3	Loss of Vacuum Level	
1899	076B	R	3	Voltage Level	
1900	076C	R	3	Insulation Test Level	
1901	076D	R	3	Machine Type	
1902	076E	R	3	Machine ID	
1903	076F	R	3	Full Load Current Range	
1904	0770	R	3	Short Circuit Trip Level	
1905	0771	R	3	Short Circuit Trip Time	
1906	0772	R	3	Overcurrent Curve	
1907	0773	R	3	Overcurrent Time Multiplier	
1908	0774	R	3	Overload Cooling Multiplier	
1909	0775	R	3	<Reserved>	
1910	0776	R	3	Overload Start Block Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1911	0777	R	3	Current Unbalance Trip Level	
1912	0778	R	3	Under Current Trip Level	
1913	0779	R	3	Earth Leakage Trip Level / Residual voltage trip level	
1914	077A	R	3	Earth Leakage Trip Time / Residual Voltage Trip Time	
1915	077B	R	3	Earth Continuity Trip Level	
1916	077C	R	3	Earth Continuity Trip Time	
1917	077D	R	3	Earth Continuity Latch	
1918	077E	R	3	Remote Start	
1919	077F	R	3	Insulation Test Trip Level	
1920	0780	R	3	Under Voltage Trip Level	
1921	0781	R	3	RTX RTD 1-2 Trip Temp	
1922	0782	R	3	RTX RTD 3-5 Trip Temp	
1923	0783	R	3	RTX RTD 1-2 Reset Temp	
1924	0784	R	3	RTX RTD 3-5 Reset Temp	
1925	0785	R	3	Back EMF Time	
1926	0786	R	3	<Reserved> / Pilot Interlock Time (RV version)	
1927	0787	R	3	Spare	
1928	0788	R	3	Spare	
1929	0789	R	3	Spare	
1930	078A	R	3	Spare	
1931	078B	R	3	Spare	
1932	078C	R	4	Pilot Mode	
1933	078D	R	4	Loss of Vacuum Level	
1934	078E	R	4	Voltage Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1935	078F	R	4	Insulation Test Level	
1936	0790	R	4	Machine Type	
1937	0791	R	4	Machine ID	
1938	0792	R	4	Full Load Current Range	
1939	0793	R	4	Short Circuit Trip Level	
1940	0794	R	4	Short Circuit Trip Time	
1941	0795	R	4	Overcurrent Curve	
1942	0796	R	4	Overcurrent Time Multiplier	
1943	0797	R	4	Overload Cooling Multiplier	
1944	0798	R	4	<Reserved>	
1945	0799	R	4	Overload Start Block Level	
1946	079A	R	4	Current Unbalance Trip Level	
1947	079B	R	4	Under Current Trip Level	
1948	079C	R	4	Earth Leakage Trip Level / Residual voltage trip level	
1949	079D	R	4	Earth Leakage Trip Time / Residual Voltage Trip Time	
1950	079E	R	4	Earth Continuity Trip Level	
1951	079F	R	4	Earth Continuity Trip Time	
1952	07A0	R	4	Earth Continuity Latch	
1953	07A1	R	4	Remote Start	
1954	07A2	R	4	Insulation Test Trip Level	
1955	07A3	R	4	Under Voltage Trip Level	
1956	07A4	R	4	RTX RTD 1-2 Trip Temp	
1957	07A5	R	4	RTX RTD 3-5 Trip Temp	
1958	07A6	R	4	RTX RTD 1-2 Reset Temp	
1959	07A7	R	4	RTX RTD 3-5 Reset Temp	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1960	07A8	R	4	Back EMF Time	
1961	07A9	R	4	<Reserved> / Pilot Interlock Time (RV version)	
1962	07AA	R	4	Spare	
1963	07AB	R	4	Spare	
1964	07AC	R	4	Spare	
1965	07AD	R	4	Spare	
1966	07AE	R	4	Spare	
1967	07AF	R	5	Pilot Mode	
1968	07B0	R	5	Loss of Vacuum Level	
1969	07B1	R	5	Voltage Level	
1970	07B2	R	5	Insulation Test Level	
1971	07B3	R	5	Machine Type	
1972	07B4	R	5	Machine ID	
1973	07B5	R	5	Full Load Current Range	
1974	07B6	R	5	Short Circuit Trip Level	
1975	07B7	R	5	Short Circuit Trip Time	
1976	07B8	R	5	Overcurrent Curve	
1977	07B9	R	5	Overcurrent Time Multiplier	
1978	07BA	R	5	Overload Cooling Multiplier	
1979	07BB	R	5	<Reserved>	
1980	07BC	R	5	Overload Start Block Level	
1981	07BD	R	5	Current Unbalance Trip Level	
1982	07BE	R	5	Under Current Trip Level	
1983	07BF	R	5	Earth Leakage Trip Level / Residual voltage trip level	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
1984	07C0	R	5	Earth Leakage Trip Time / Residual Voltage Trip Time	
1985	07C1	R	5	Earth Continuity Trip Level	
1986	07C2	R	5	Earth Continuity Trip Time	
1987	07C3	R	5	Earth Continuity Latch	
1988	07C4	R	5	Remote Start	
1989	07C5	R	5	Insulation Test Trip Level	
1990	07C6	R	5	Under Voltage Trip Level	
1991	07C7	R	5	RTX RTD 1-2 Trip Temp	
1992	07C8	R	5	RTX RTD 3-5 Trip Temp	
1993	07C9	R	5	RTX RTD 1-2 Reset Temp	
1994	07CA	R	5	RTX RTD 3-5 Reset Temp	
1995	07CB	R	5	Back EMF Time	
1996	07CC	R	5	<Reserved> / Pilot Interlock Time (RV version)	
1997	07CD	R	5	Spare	
1998	07CE	R	5	Spare	
1999	07CF	R	5	Spare	
2000	07D0	R	5	Spare	
2001	07D1	R	5	Spare	
2002	07D2	R	6	Pilot Mode	
2003	07D3	R	6	Loss of Vacuum Level	
2004	07D4	R	6	Voltage Level	
2005	07D5	R	6	Insulation Test Level	
2006	07D6	R	6	Machine Type	
2007	07D7	R	6	Machine ID	
2008	07D8	R	6	Full Load Current Range	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2009	07D9	R	6	Short Circuit Trip Level	
2010	07DA	R	6	Short Circuit Trip Time	
2011	07DB	R	6	Overcurrent Curve	
2012	07DC	R	6	Overcurrent Time Multiplier	
2013	07DD	R	6	Overload Cooling Multiplier	
2014	07DE	R	6	<Reserved>	
2015	07DF	R	6	Overload Start Block Level	
2016	07E0	R	6	Current Unbalance Trip Level	
2017	07E1	R	6	Under Current Trip Level	
2018	07E2	R	6	Earth Leakage Trip Level / Residual voltage trip level	
2019	07E3	R	6	Earth Leakage Trip Time / Residual Voltage Trip Time	
2020	07E4	R	6	Earth Continuity Trip Level	
2021	07E5	R	6	Earth Continuity Trip Time	
2022	07E6	R	6	Earth Continuity Latch	
2023	07E7	R	6	Remote Start	
2024	07E8	R	6	Insulation Test Trip Level	
2025	07E9	R	6	Under Voltage Trip Level	
2026	07EA	R	6	RTX RTD 1-2 Trip Temp	
2027	07EB	R	6	RTX RTD 3-5 Trip Temp	
2028	07EC	R	6	RTX RTD 1-2 Reset Temp	
2029	07ED	R	6	RTX RTD 3-5 Reset Temp	
2030	07EE	R	6	Back EMF Time	
2031	07EF	R	6	<Reserved> / Pilot Interlock Time (RV version)	
2032	07F0	R	6	Spare	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2033	07F1	R	6	Spare	
2034	07F2	R	6	Spare	
2035	07F3	R	6	Spare	
2036	07F4	R	6	Spare	
2037	07F5	R	7	Pilot Mode	
2038	07F6	R	7	Loss of Vacuum Level	
2039	07F7	R	7	Voltage Level	
2040	07F8	R	7	Insulation Test Level	
2041	07F9	R	7	Machine Type	
2042	07FA	R	7	Machine ID	
2043	07FB	R	7	Full Load Current Range	
2044	07FC	R	7	Short Circuit Trip Level	
2045	07FD	R	7	Short Circuit Trip Time	
2046	07FE	R	7	Overcurrent Curve	
2047	07FF	R	7	Overcurrent Time Multiplier	
2048	0800	R	7	Overload Cooling Multiplier	
2049	0801	R	7	<Reserved>	
2050	0802	R	7	Overload Start Block Level	
2051	0803	R	7	Current Unbalance Trip Level	
2052	0804	R	7	Under Current Trip Level	
2053	0805	R	7	Earth Leakage Trip Level / Residual Voltage Trip Level	
2054	0806	R	7	Earth Leakage Trip Time / Residual Voltage Trip Time	
2055	0807	R	7	Earth Continuity Trip Level	
2056	0808	R	7	Earth Continuity Trip Time	
2057	0809	R	7	Earth Continuity Latch	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2058	080A	R	7	Remote Start	
2059	080B	R	7	Insulation Test Trip Level	
2060	080C	R	7	Under Voltage Trip Level	
2061	080D	R	7	RTX RTD 1-2 Trip Temp	
2062	080E	R	7	RTX RTD 3-5 Trip Temp	
2063	080F	R	7	RTX RTD 1-2 Reset Temp	
2064	0810	R	7	RTX RTD 3-5 Reset Temp	
2065	0811	R	7	Back EMF Time	
2066	0812	R	7	<Reserved> / Pilot Interlock Time (RV version)	
2067	0813	R	7	Spare	
2068	0814	R	7	Spare	
2069	0815	R	7	Spare	
2070	0816	R	7	Spare	
2071	0817	R	7	Spare	
2072	0818	R	8	Pilot Mode	
2073	0819	R	8	Loss of Vacuum Level	
2074	081A	R	8	Voltage Level	
2075	081B	R	8	Insulation Test Level	
2076	081C	R	8	Machine Type	
2077	081D	R	8	Machine ID	
2078	081E	R	8	Full Load Current Range	
2079	081F	R	8	Short Circuit Trip Level	
2080	0820	R	8	Short Circuit Trip Time	
2081	0821	R	8	Overcurrent Curve	
2082	0822	R	8	Overcurrent Time Multiplier	
2083	0823	R	8	Overload Cooling Multiplier	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2084	0824	R	8	<Reserved>	
2085	0825	R	8	Overload Start Block Level	
2086	0826	R	8	Current Unbalance Trip Level	
2087	0827	R	8	Under Current Trip Level	
2088	0828	R	8	Earth Leakage Trip Level / Residual Voltage Trip Level	
2089	0829	R	8	Earth Leakage Trip Time / Residual Voltage Trip Time	
2090	082A	R	8	Earth Continuity Trip Level	
2091	082B	R	8	Earth Continuity Trip Time	
2092	082C	R	8	Earth Continuity Latch	
2093	082D	R	8	Remote Start	
2094	082E	R	8	Insulation Test Trip Level	
2095	082F	R	8	Under Voltage Trip Level	
2096	0830	R	8	RTX RTD 1-2 Trip Temp	
2097	0831	R	8	RTX RTD 3-5 Trip Temp	
2098	0832	R	8	RTX RTD 1-2 Reset Temp	
2099	0833	R	8	RTX RTD 3-5 Reset Temp	
2100	0834	R	8	Back EMF Time	
2101	0835	R	8	<Reserved> / Pilot Interlock Time (RV version)	
2102	0836	R	8	Spare	
2103	0837	R	8	Spare	
2104	0838	R	8	Spare	
2105	0839	R	8	Spare	
2106	083A	R	8	Spare	
2107	083B	R	9	Pilot Mode	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2108	083C	R	9	Loss of Vacuum Level	
2109	083D	R	9	Voltage Level	
2110	083E	R	9	Insulation Test Level	
2111	083F	R	9	Machine Type	
2112	0840	R	9	Machine ID	
2113	0841	R	9	Full Load Current Range	
2114	0842	R	9	Short Circuit Trip Level	
2115	0843	R	9	Short Circuit Trip Time	
2116	0844	R	9	Overcurrent Curve	
2117	0845	R	9	Overcurrent Time Multiplier	
2118	0846	R	9	Overload Cooling Multiplier	
2119	0847	R	9	<Reserved>	
2120	0848	R	9	Overload Start Block Level	
2121	0849	R	9	Current Unbalance Trip Level	
2122	084A	R	9	Under Current Trip Level	
2123	084B	R	9	Earth Leakage Trip Level / Residual Voltage Trip Level	
2124	084C	R	9	Earth Leakage Trip Time / Residual Voltage Trip Time	
2125	084D	R	9	Earth Continuity Trip Level	
2126	084E	R	9	Earth Continuity Trip Time	
2127	084F	R	9	Earth Continuity Latch	
2128	0850	R	9	Remote Start	
2129	0851	R	9	Insulation Test Trip Level	
2130	0852	R	9	Under Voltage Trip Level	
2131	0853	R	9	RTX RTD 1-2 Trip Temp	
2132	0854	R	9	RTX RTD 3-5 Trip Temp	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2133	0855	R	9	RTX RTD 1-2 Reset Temp	
2134	0856	R	9	RTX RTD 3-5 Reset Temp	
2135	0857	R	9	Back EMF Time	
2136	0858	R	9	<Reserved> / Pilot Interlock Time (RV version)	
2137	0859	R	9	Spare	
2138	085A	R	9	Spare	
2139	085B	R	9	Spare	
2140	085C	R	9	Spare	
2141	085D	R	9	Spare	
2142	085E	R	10	Pilot Mode	
2143	085F	R	10	Loss of Vacuum Level	
2144	0860	R	10	Voltage Level	
2145	0861	R	10	Insulation Test Level	
2146	0862	R	10	Machine Type	
2147	0863	R	10	Machine ID	
2148	0864	R	10	Full Load Current Range	
2149	0865	R	10	Short Circuit Trip Level	
2150	0866	R	10	Short Circuit Trip Time	
2151	0867	R	10	Overcurrent Curve	
2152	0868	R	10	Overcurrent Time Multiplier	
2153	0869	R	10	Overload Cooling Multiplier	
2154	086A	R	10	<Reserved>	
2155	086B	R	10	Overload Start Block Level	
2156	086C	R	10	Current Unbalance Trip Level	
2157	086D	R	10	Under Current Trip Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2158	086E	R	10	Earth Leakage Trip Level / Residual Voltage Trip Level	
2159	086F	R	10	Earth Leakage Trip Time / Residual Voltage Trip Time	
2160	0870	R	10	Earth Continuity Trip Level	
2161	0871	R	10	Earth Continuity Trip Time	
2162	0872	R	10	Earth Continuity Latch	
2163	0873	R	10	Remote Start	
2164	0874	R	10	Insulation Test Trip Level	
2165	0875	R	10	Under Voltage Trip Level	
2166	0876	R	10	RTX RTD 1-2 Trip Temp	
2167	0877	R	10	RTX RTD 3-5 Trip Temp	
2168	0878	R	10	RTX RTD 1-2 Reset Temp	
2169	0879	R	10	RTX RTD 3-5 Reset Temp	
2170	087A	R	10	Back EMF Time	
2171	087B	R	10	<Reserved> / Pilot Interlock Time (RV version)	
2172	087C	R	10	Spare	
2173	087D	R	10	Spare	
2174	087E	R	10	Spare	
2175	087F	R	10	Spare	
2176	0880	R	10	Spare	
2177	0881	R	11	Pilot Mode	
2178	0882	R	11	Loss of Vacuum Level	
2179	0883	R	11	Voltage Level	
2180	0884	R	11	Insulation Test Level	
2181	0885	R	11	Machine Type	
2182	0886	R	11	Machine ID	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2183	0887	R	11	Full Load Current Range	
2184	0888	R	11	Short Circuit Trip Level	
2185	0889	R	11	Short Circuit Trip Time	
2186	088A	R	11	Overcurrent Curve	
2187	088B	R	11	Overcurrent Time Multiplier	
2188	088C	R	11	Overload Cooling Multiplier	
2189	088D	R	11	<Reserved>	
2190	088E	R	11	Overload Start Block Level	
2191	088F	R	11	Current Unbalance Trip Level	
2192	0890	R	11	Under Current Trip Level	
2193	0891	R	11	Earth Leakage Trip Level / Residual Voltage Trip Level	
2194	0892	R	11	Earth Leakage Trip Time / Residual Voltage Trip Time	
2195	0893	R	11	Earth Continuity Trip Level	
2196	0894	R	11	Earth Continuity Trip Time	
2197	0895	R	11	Earth Continuity Latch	
2198	0896	R	11	Remote Start	
2199	0897	R	11	Insulation Test Trip Level	
2200	0898	R	11	Under Voltage Trip Level	
2201	0899	R	11	RTX RTD 1-2 Trip Temp	
2202	089A	R	11	RTX RTD 3-5 Trip Temp	
2203	089B	R	11	RTX RTD 1-2 Reset Temp	
2204	089C	R	11	RTX RTD 3-5 Reset Temp	
2205	089D	R	11	Back EMF Time	
2206	089E	R	11	<Reserved> / Pilot Interlock Time (RV version)	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2207	089F	R	11	Spare	
2208	08A0	R	11	Spare	
2209	08A1	R	11	Spare	
2210	08A2	R	11	Spare	
2211	08A3	R	11	Spare	
2212	08A4	R	12	Pilot Mode	
2213	08A5	R	12	Loss of Vacuum Level	
2214	08A6	R	12	Voltage Level	
2215	08A7	R	12	Insulation Test Level	
2216	08A8	R	12	Machine Type	
2217	08A9	R	12	Machine ID	
2218	08AA	R	12	Full Load Current Range	
2219	08AB	R	12	Short Circuit Trip Level	
2220	08AC	R	12	Short Circuit Trip Time	
2221	08AD	R	12	Overcurrent Curve	
2222	08AE	R	12	Overcurrent Time Multiplier	
2223	08AF	R	12	Overload Cooling Multiplier	
2224	08B0	R	12	<Reserved>	
2225	08B1	R	12	Overload Start Block Level	
2226	08B2	R	12	Current Unbalance Trip Level	
2227	08B3	R	12	Under Current Trip Level	
2228	08B4	R	12	Earth Leakage Trip Level / Residual Voltage Trip Level	
2229	08B5	R	12	Earth Leakage Trip Time / Residual Voltage Trip Time	
2230	08B6	R	12	Earth Continuity Trip Level	
2231	08B7	R	12	Earth Continuity Trip Time	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2232	08B8	R	12	Earth Continuity Latch	
2233	08B9	R	12	Remote Start	
2234	08BA	R	12	Insulation Test Trip Level	
2235	08BB	R	12	Under Voltage Trip Level	
2236	08BC	R	12	RTX RTD 1-2 Trip Temp	
2237	08BD	R	12	RTX RTD 3-5 Trip Temp	
2238	08BE	R	12	RTX RTD 1-2 Reset Temp	
2239	08BF	R	12	RTX RTD 3-5 Reset Temp	
2240	08C0	R	12	Back EMF Time	
2241	08C1	R	12	<Reserved> / Pilot Interlock Time (RV version)	
2242	08C2	R	12	Spare	
2243	08C3	R	12	Spare	
2244	08C4	R	12	Spare	
2245	08C5	R	12	Spare	
2246	08C6	R	12	Spare	
2247	08C7	R	13	Pilot Mode	
2248	08C8	R	13	Loss of Vacuum Level	
2249	08C9	R	13	Voltage Level	
2250	08CA	R	13	Insulation Test Level	
2251	08CB	R	13	Machine Type	
2252	08CC	R	13	Machine ID	
2253	08CD	R	13	Full Load Current Range	
2254	08CE	R	13	Short Circuit Trip Level	
2255	08CF	R	13	Short Circuit Trip Time	
2256	08D0	R	13	Overcurrent Curve	
2257	08D1	R	13	Overcurrent Time Multiplier	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2258	08D2	R	13	Overload Cooling Multiplier	
2259	08D3	R	13	<Reserved>	
2260	08D4	R	13	Overload Start Block Level	
2261	08D5	R	13	Current Unbalance Trip Level	
2262	08D6	R	13	Under Current Trip Level	
2263	08D7	R	13	Earth Leakage Trip Level / Residual Voltage Trip Level	
2264	08D8	R	13	Earth Leakage Trip Time / Residual Voltage Trip Time	
2265	08D9	R	13	Earth Continuity Trip Level	
2266	08DA	R	13	Earth Continuity Trip Time	
2267	08DB	R	13	Earth Continuity Latch	
2268	08DC	R	13	Remote Start	
2269	08DD	R	13	Insulation Test Trip Level	
2270	08DE	R	13	Under Voltage Trip Level	
2271	08DF	R	13	RTX RTD 1-2 Trip Temp	
2272	08E0	R	13	RTX RTD 3-5 Trip Temp	
2273	08E1	R	13	RTX RTD 1-2 Reset Temp	
2274	08E2	R	13	RTX RTD 3-5 Reset Temp	
2275	08E3	R	13	Back EMF Time	
2276	08E4	R	13	<Reserved> / Pilot Interlock Time (RV version)	
2277	08E5	R	13	Spare	
2278	08E6	R	13	Spare	
2279	08E7	R	13	Spare	
2280	08E8	R	13	Spare	
2281	08E9	R	13	Spare	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2282	08EA	R	14	Pilot Mode	
2283	08EB	R	14	Loss of Vacuum Level	
2284	08EC	R	14	Voltage Level	
2285	08ED	R	14	Insulation Test Level	
2286	08EE	R	14	Machine Type	
2287	08EF	R	14	Machine ID	
2288	08F0	R	14	Full Load Current Range	
2289	08F1	R	14	Short Circuit Trip Level	
2290	08F2	R	14	Short Circuit Trip Time	
2291	08F3	R	14	Overcurrent Curve	
2292	08F4	R	14	Overcurrent Time Multiplier	
2293	08F5	R	14	Overload Cooling Multiplier	
2294	08F6	R	14	<Reserved>	
2295	08F7	R	14	Overload Start Block Level	
2296	08F8	R	14	Current Unbalance Trip Level	
2297	08F9	R	14	Under Current Trip Level	
2298	08FA	R	14	Earth Leakage Trip Level / Residual Voltage Trip Level	
2299	08FB	R	14	Earth Leakage Trip Time / Residual Voltage Trip Time	
2300	08FC	R	14	Earth Continuity Trip Level	
2301	08FD	R	14	Earth Continuity Trip Time	
2302	08FE	R	14	Earth Continuity Latch	
2303	08FF	R	14	Remote Start	
2304	0900	R	14	Insulation Test Trip Level	
2305	0901	R	14	Under Voltage Trip Level	
2306	0902	R	14	RTX RTD 1-2 Trip Temp	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2307	0903	R	14	RTX RTD 3-5 Trip Temp	
2308	0904	R	14	RTX RTD 1-2 Reset Temp	
2309	0905	R	14	RTX RTD 3-5 Reset Temp	
2310	0906	R	14	Back EMF Time	
2311	0907	R	14	<Reserved> / Pilot Interlock Time (RV version)	
2312	0908	R	14	Spare	
2313	0909	R	14	Spare	
2314	090A	R	14	Spare	
2315	090B	R	14	Spare	
2316	090C	R	14	Spare	
2317	090D	R	15	Pilot Mode	
2318	090E	R	15	Loss of Vacuum Level	
2319	090F	R	15	Voltage Level	
2320	0910	R	15	Insulation Test Level	
2321	0911	R	15	Machine Type	
2322	0912	R	15	Machine ID	
2323	0913	R	15	Full Load Current Range	
2324	0914	R	15	Short Circuit Trip Level	
2325	0915	R	15	Short Circuit Trip Time	
2326	0916	R	15	Overcurrent Curve	
2327	0917	R	15	Overcurrent Time Multiplier	
2328	0918	R	15	Overload Cooling Multiplier	
2329	0919	R	15	<Reserved>	
2330	091A	R	15	Overload Start Block Level	
2331	091B	R	15	Current Unbalance Trip Level	

Address (DEC)	Address (HEX)	Read / Write	Outlet Number	Name	Description
2332	091C	R	15	Under Current Trip Level	
2333	091D	R	15	Earth Leakage Trip Level / Residual Voltage Trip Level	
2334	091E	R	15	Earth Leakage Trip Time / Residual Voltage Trip Time	
2335	091F	R	15	Earth Continuity Trip Level	
2336	0920	R	15	Earth Continuity Trip Time	
2337	0921	R	15	Earth Continuity Latch	
2338	0922	R	15	Remote Start	
2339	0923	R	15	Insulation Test Trip Level	
2340	0924	R	15	Under Voltage Trip Level	
2341	0925	R	15	RTX RTD 1-2 Trip Temp	
2342	0926	R	15	RTX RTD 3-5 Trip Temp	
2343	0927	R	15	RTX RTD 1-2 Reset Temp	
2344	0928	R	15	RTX RTD 3-5 Reset Temp	
2345	0929	R	15	Back EMF Time	
2346	092A	R	15	<Reserved> / Pilot Interlock Time (RV version)	
2347	092B	R	15	Spare	
2348	092C	R	15	Spare	
2349	092D	R	15	Spare	
2350	092E	R	15	Spare	
2351	092F	R	15	Spare	

16.5 Modbus HMI Data

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
2816	0B00	4	R	PIP	PIP Serial Number	The PIP's Serial number as a 64-bit number
2820	0B04	1	R	PIP	PIP Firmware version	
2821	0B05	1	R	PIP	Spare	
…	…				…	
2826	0B0A	1	R	PIP	Spare	
2827	0B0B	16	R	PIP	Asset Name	Asset name
2843	0B1B	1	R	PIP	Year	
2844	0B1C	1	R	PIP	Month	
2845	0B1D	1	R	PIP	Day	
2846	0B1E	1	R	PIP	Hour	
2847	0B1F	1	R	PIP	Minute	
2848	0B20	1	R	PIP	Time Zone	
2849	0B21	1	R	PIP	NTP	0: disabled, 1: enabled
2850	0B22	4	R	PIP	NTP IP Address	4 bytes big endian 192.168.0.1 = 1, 0, 168, 192
2854	0B26	1	R	PIP	Outlet quantity	i.e. Total number of outlets in System
2855	0B27	1	R	PIP	Idle Time	value minutes
2856	0B28	1	R	PIP	Screen Brightness	
2857	0B29	1	R	PIP	Spare	
…	…				…	
2865	0B31	1	R	PIP	Spare	
2866	0B32	8	R	E-Stops	E-Stop 1 Description	
2874	0B3A	8	R	E-Stops	E-Stop 2 Description	
2882	0B42	8	R	E-Stops	E-Stop 3 Description	
2890	0B4A	8	R	E-Stops	E-Stop 4 Description	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
2898	0B52	1	R	Temperature Inputs	Spare	
2899	0B53	8	R	Temperature Inputs	T1 Description Word 1	
2907	0B5B	8	R	Temperature Inputs	T2 Description Word 1	
2915	0B63	8	R	Temperature Inputs	T3 Description Word 1	
2923	0B6B	8	R	Temperature Inputs	T4 Description Word 1	
2931	0B73	4	R	iFan	Remote ifan IP address	4 bytes big endian 192.168.0.1 = 1, 0, 168, 192
2935	0B77	1	R	0	IO Module number	The ID number of the IO brick that controls this outlet
2936	0B78	1	R	0	Fixed/withdrawable	0 = Unknown, 1 = Fixed, 2 = Withdrawable
2937	0B79	1	R	0	Expected protection type	0 = OCS/IPE, 1 = OCS-RV, 2 = DCS, 3 = Rockstarter
2938	0B7A	1	R	0	Installed protection type	0 = OCS/IPE, 1 = OCS-RV, 2 = DCS, 3 = Rockstarter
2939	0B7B	1	R	0	Control Mode	Control mode: 0 = Both, 1 = External, 2 = PIP
2940	0B7C	1	R	0	Protection Serial Number Low Word	Comms Board serial number. These two 16-bit integers form the upper and lower words of the 32-bit serial number
2941	0B7D	1	R	0	Protection Serial Number High Word	
2942	0B7E	1	R	0	Relay Software Version	The software version of the main relay processor. The version number has a minor and major part. The major version is in the high byte, the minor version in the low byte

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
2943	0B7F	1	R	0	Comms Software Version	The software version of the Comms Board processor. The version number has a minor and major part. The major version is in the high byte, the minor version is in the low byte
2944	0B80	1	R	0	RTX Serial Number Low	RTX serial number. These two 16-bit integers form the upper and lower words of the 32-bit serial number
2945	0B81	1	R	0	RTX Serial Number High	
2946	0B82	1	R	0	RTX SW Version	The software version of the attached RTX. The version number has a minor and major part. The major version is in the high byte, the minor version is in the low byte
2947	0B83	1	R	0	Outlet Description Word 1	2 ASCII characters of outlet description
2948	0B84	1	R	0	Outlet Description Word 2	2 ASCII characters of outlet description
2949	0B85	1	R	0	Outlet Description Word 3	2 ASCII characters of outlet description
2950	0B86	1	R	0	Outlet Description Word 4	2 ASCII characters of outlet description
2951	0B87	1	R	0	Outlet Description Word 5	2 ASCII characters of outlet description
2952	0B88	1	R	0	Outlet Description Word 6	2 ASCII characters of outlet description
2953	0B89	1	R	0	Outlet Description Word 7	2 ASCII characters of outlet description
2954	0B8A	1	R	0	Outlet Description Word 8	2 ASCII characters of outlet description
2955	0B8B	1	R	0	Spare	
…	…				…	
2964	0B94	1	R	0	Spare	
2965	0B95	1	R	1	IO Module number	
2966	0B96	1	R	1	Fixed/withdrawable	
2967	0B97	1	R	1	Expected protection type	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
2968	0B98	1	R	1	Installed protection type	
2969	0B99	1	R	1	Control Mode	
2970	0B9A	1	R	1	Protection Serial Number Low Word	
2971	0B9B	1	R	1	Protection Serial Number High Word	
2972	0B9C	1	R	1	Relay Software Version	
2973	0B9D	1	R	1	Comms Software Version	
2974	0B9E	1	R	1	RTX Serial Number Low	
2975	0B9F	1	R	1	RTX Serial Number High	
2976	0BA0	1	R	1	RTX SW Version	
2977	0BA1	1	R	1	Outlet Description Word 1	
2978	0BA2	1	R	1	Outlet Description Word 2	
2979	0BA3	1	R	1	Outlet Description Word 3	
2980	0BA4	1	R	1	Outlet Description Word 4	
2981	0BA5	1	R	1	Outlet Description Word 5	
2982	0BA6	1	R	1	Outlet Description Word 6	
2983	0BA7	1	R	1	Outlet Description Word 7	
2984	0BA8	1	R	1	Outlet Description Word 8	
2985	0BA9	1	R	1	Spare	
…	…				…	
2994	0BB2	1	R	1	Spare	
2995	0BB3	1	R	2	IO Module number	
2996	0BB4	1	R	2	Fixed/withdrawable	
2997	0BB5	1	R	2	Expected protection type	
2998	0BB6	1	R	2	Installed protection type	
2999	0BB7	1	R	2	Control Mode	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3000	0BB8	1	R	2	Protection Serial Number Low Word	
3001	0BB9	1	R	2	Protection Serial Number High Word	
3002	0BBA	1	R	2	Relay Software Version	
3003	0BBB	1	R	2	Comms Software Version	
3004	0BBC	1	R	2	RTX Serial Number Low	
3005	0BBD	1	R	2	RTX Serial Number High	
3006	0BBE	1	R	2	RTX SW Version	
3007	0BBF	1	R	2	Outlet Description Word 1	
3008	0BC0	1	R	2	Outlet Description Word 2	
3009	0BC1	1	R	2	Outlet Description Word 3	
3010	0BC2	1	R	2	Outlet Description Word 4	
3011	0BC3	1	R	2	Outlet Description Word 5	
3012	0BC4	1	R	2	Outlet Description Word 6	
3013	0BC5	1	R	2	Outlet Description Word 7	
3014	0BC6	1	R	2	Outlet Description Word 8	
3015	0BC7	1	R	2	Spare	
…	…				…	
3024	0BD0	1	R	2	Spare	
3025	0BD1	1	R	3	IO Module number	
3026	0BD2	1	R	3	Fixed/withdrawable	
3027	0BD3	1	R	3	Expected protection type	
3028	0BD4	1	R	3	Installed protection type	
3029	0BD5	1	R	3	Control Mode	
3030	0BD6	1	R	3	Protection Serial Number Low Word	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3031	0BD7	1	R	3	Protection Serial Number High Word	
3032	0BD8	1	R	3	Relay Software Version	
3033	0BD9	1	R	3	Comms Software Version	
3034	0BDA	1	R	3	RTX Serial Number Low	
3035	0BDB	1	R	3	RTX Serial Number High	
3036	0BDC	1	R	3	RTX SW Version	
3037	0BDD	1	R	3	Outlet Description Word 1	
3038	0BDE	1	R	3	Outlet Description Word 2	
3039	0BDF	1	R	3	Outlet Description Word 3	
3040	0BE0	1	R	3	Outlet Description Word 4	
3041	0BE1	1	R	3	Outlet Description Word 5	
3042	0BE2	1	R	3	Outlet Description Word 6	
3043	0BE3	1	R	3	Outlet Description Word 7	
3044	0BE4	1	R	3	Outlet Description Word 8	
3045	0BE5	1	R	3	Spare	
…	…				…	
3054	0BEE	1	R	3	Spare	
3055	0BEF	1	R	4	IO Module number	
3056	0BF0	1	R	4	Fixed/withdrawable	
3057	0BF1	1	R	4	Expected protection type	
3058	0BF2	1	R	4	Installed protection type	
3059	0BF3	1	R	4	Control Mode	
3060	0BF4	1	R	4	Protection Serial Number Low Word	
3061	0BF5	1	R	4	Protection Serial Number High Word	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3062	0BF6	1	R	4	Relay Software Version	
3063	0BF7	1	R	4	Comms Software Version	
3064	0BF8	1	R	4	RTX Serial Number Low	
3065	0BF9	1	R	4	RTX Serial Number High	
3066	0BFA	1	R	4	RTX SW Version	
3067	0BFB	1	R	4	Outlet Description Word 1	
3068	0BFC	1	R	4	Outlet Description Word 2	
3069	0BFD	1	R	4	Outlet Description Word 3	
3070	0BFE	1	R	4	Outlet Description Word 4	
3071	0BFF	1	R	4	Outlet Description Word 5	
3072	0C00	1	R	4	Outlet Description Word 6	
3073	0C01	1	R	4	Outlet Description Word 7	
3074	0C02	1	R	4	Outlet Description Word 8	
3075	0C03	1	R	4	Spare	
…	…				…	
3084	0C0C	1	R	4	Spare	
3085	0C0D	1	R	5	IO Module number	
3086	0C0E	1	R	5	Fixed/withdrawable	
3087	0C0F	1	R	5	Expected protection type	
3088	0C10	1	R	5	Installed protection type	
3089	0C11	1	R	5	Control Mode	
3090	0C12	1	R	5	Protection Serial Number Low Word	
3091	0C13	1	R	5	Protection Serial Number High Word	
3092	0C14	1	R	5	Relay Software Version	
3093	0C15	1	R	5	Comms Software Version	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3094	0C16	1	R	5	RTX Serial Number Low	
3095	0C17	1	R	5	RTX Serial Number High	
3096	0C18	1	R	5	RTX SW Version	
3097	0C19	1	R	5	Outlet Description Word 1	
3098	0C1A	1	R	5	Outlet Description Word 2	
3099	0C1B	1	R	5	Outlet Description Word 3	
3100	0C1C	1	R	5	Outlet Description Word 4	
3101	0C1D	1	R	5	Outlet Description Word 5	
3102	0C1E	1	R	5	Outlet Description Word 6	
3103	0C1F	1	R	5	Outlet Description Word 7	
3104	0C20	1	R	5	Outlet Description Word 8	
3105	0C21	1	R	5	Spare	
…	…				…	
3114	0C2A	1	R	5	Spare	
3115	0C2B	1	R	6	IO Module number	
3116	0C2C	1	R	6	Fixed/withdrawable	
3117	0C2D	1	R	6	Expected protection type	
3118	0C2E	1	R	6	Installed protection type	
3119	0C2F	1	R	6	Control Mode	
3120	0C30	1	R	6	Protection Serial Number Low Word	
3121	0C31	1	R	6	Protection Serial Number High Word	
3122	0C32	1	R	6	Relay Software Version	
3123	0C33	1	R	6	Comms Software Version	
3124	0C34	1	R	6	RTX Serial Number Low	
3125	0C35	1	R	6	RTX Serial Number High	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3126	0C36	1	R	6	RTX SW Version	
3127	0C37	1	R	6	Outlet Description Word 1	
3128	0C38	1	R	6	Outlet Description Word 2	
3129	0C39	1	R	6	Outlet Description Word 3	
3130	0C3A	1	R	6	Outlet Description Word 4	
3131	0C3B	1	R	6	Outlet Description Word 5	
3132	0C3C	1	R	6	Outlet Description Word 6	
3133	0C3D	1	R	6	Outlet Description Word 7	
3134	0C3E	1	R	6	Outlet Description Word 8	
3135	0C3F	1	R	6	Spare	
…	…				…	
3144	0C48	1	R	6	Spare	
3145	0C49	1	R	7	IO Module number	
3146	0C4A	1	R	7	Fixed/withdrawable	
3147	0C4B	1	R	7	Expected protection type	
3148	0C4C	1	R	7	Installed protection type	
3149	0C4D	1	R	7	Control Mode	
3150	0C4E	1	R	7	Protection Serial Number Low Word	
3151	0C4F	1	R	7	Protection Serial Number High Word	
3152	0C50	1	R	7	Relay Software Version	
3153	0C51	1	R	7	Comms Software Version	
3154	0C52	1	R	7	RTX Serial Number Low	
3155	0C53	1	R	7	RTX Serial Number High	
3156	0C54	1	R	7	RTX SW Version	
3157	0C55	1	R	7	Outlet Description Word 1	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3158	0C56	1	R	7	Outlet Description Word 2	
3159	0C57	1	R	7	Outlet Description Word 3	
3160	0C58	1	R	7	Outlet Description Word 4	
3161	0C59	1	R	7	Outlet Description Word 5	
3162	0C5A	1	R	7	Outlet Description Word 6	
3163	0C5B	1	R	7	Outlet Description Word 7	
3164	0C5C	1	R	7	Outlet Description Word 8	
3165	0C5D	1	R	7	Spare	
…	…				…	
3174	0C66	1	R	7	Spare	
3175	0C67	1	R	8	IO Module number	
3176	0C68	1	R	8	Fixed/withdrawable	
3177	0C69	1	R	8	Expected protection type	
3178	0C6A	1	R	8	Installed protection type	
3179	0C6B	1	R	8	Control Mode	
3180	0C6C	1	R	8	Protection Serial Number Low Word	
3181	0C6D	1	R	8	Protection Serial Number High Word	
3182	0C6E	1	R	8	Relay Software Version	
3183	0C6F	1	R	8	Comms Software Version	
3184	0C70	1	R	8	RTX Serial Number Low	
3185	0C71	1	R	8	RTX Serial Number High	
3186	0C72	1	R	8	RTX SW Version	
3187	0C73	1	R	8	Outlet Description Word 1	
3188	0C74	1	R	8	Outlet Description Word 2	
3189	0C75	1	R	8	Outlet Description Word 3	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3190	0C76	1	R	8	Outlet Description Word 4	
3191	0C77	1	R	8	Outlet Description Word 5	
3192	0C78	1	R	8	Outlet Description Word 6	
3193	0C79	1	R	8	Outlet Description Word 7	
3194	0C7A	1	R	8	Outlet Description Word 8	
3195	0C7B	1	R	8	Spare	
…	…				…	
3204	0C84	1	R	8	Spare	
3205	0C85	1	R	9	IO Module number	
3206	0C86	1	R	9	Fixed/withdrawable	
3207	0C87	1	R	9	Expected protection type	
3208	0C88	1	R	9	Installed protection type	
3209	0C89	1	R	9	Control Mode	
3210	0C8A	1	R	9	Protection Serial Number Low Word	
3211	0C8B	1	R	9	Protection Serial Number High Word	
3212	0C8C	1	R	9	Relay Software Version	
3213	0C8D	1	R	9	Comms Software Version	
3214	0C8E	1	R	9	RTX Serial Number Low	
3215	0C8F	1	R	9	RTX Serial Number High	
3216	0C90	1	R	9	RTX SW Version	
3217	0C91	1	R	9	Outlet Description Word 1	
3218	0C92	1	R	9	Outlet Description Word 2	
3219	0C93	1	R	9	Outlet Description Word 3	
3220	0C94	1	R	9	Outlet Description Word 4	
3221	0C95	1	R	9	Outlet Description Word 5	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3222	0C96	1	R	9	Outlet Description Word 6	
3223	0C97	1	R	9	Outlet Description Word 7	
3224	0C98	1	R	9	Outlet Description Word 8	
3225	0C99	1	R	9	Spare	
…	…				…	
3234	0CA2	1	R	9	Spare	
3235	0CA3	1	R	10	IO Module number	
3236	0CA4	1	R	10	Fixed/withdrawable	
3237	0CA5	1	R	10	Expected protection type	
3238	0CA6	1	R	10	Installed protection type	
3239	0CA7	1	R	10	Control Mode	
3240	0CA8	1	R	10	Protection Serial Number Low Word	
3241	0CA9	1	R	10	Protection Serial Number High Word	
3242	0CAA	1	R	10	Relay Software Version	
3243	0CAB	1	R	10	Comms Software Version	
3244	0CAC	1	R	10	RTX Serial Number Low	
3245	0CAD	1	R	10	RTX Serial Number High	
3246	0CAE	1	R	10	RTX SW Version	
3247	0CAF	1	R	10	Outlet Description Word 1	
3248	0CB0	1	R	10	Outlet Description Word 2	
3249	0CB1	1	R	10	Outlet Description Word 3	
3250	0CB2	1	R	10	Outlet Description Word 4	
3251	0CB3	1	R	10	Outlet Description Word 5	
3252	0CB4	1	R	10	Outlet Description Word 6	
3253	0CB5	1	R	10	Outlet Description Word 7	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3254	0CB6	1	R	10	Outlet Description Word 8	
3255	0CB7	1	R	10	Spare	
…	…				…	
3264	0CC0	1	R	10	Spare	
3265	0CC1	1	R	11	IO Module number	
3266	0CC2	1	R	11	Fixed/withdrawable	
3267	0CC3	1	R	11	Expected protection type	
3268	0CC4	1	R	11	Installed protection type	
3269	0CC5	1	R	11	Control Mode	
3270	0CC6	1	R	11	Protection Serial Number Low Word	
3271	0CC7	1	R	11	Protection Serial Number High Word	
3272	0CC8	1	R	11	Relay Software Version	
3273	0CC9	1	R	11	Comms Software Version	
3274	0CCA	1	R	11	RTX Serial Number Low	
3275	0CCB	1	R	11	RTX Serial Number High	
3276	0CCC	1	R	11	RTX SW Version	
3277	0CCD	1	R	11	Outlet Description Word 1	
3278	0CCE	1	R	11	Outlet Description Word 2	
3279	0CCF	1	R	11	Outlet Description Word 3	
3280	0CD0	1	R	11	Outlet Description Word 4	
3281	0CD1	1	R	11	Outlet Description Word 5	
3282	0CD2	1	R	11	Outlet Description Word 6	
3283	0CD3	1	R	11	Outlet Description Word 7	
3284	0CD4	1	R	11	Outlet Description Word 8	
3285	0CD5	1	R	11	Spare	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
…	…				…	
3294	0CDE	1	R	11	Spare	
3295	0CDF	1	R	12	IO Module number	
3296	0CE0	1	R	12	Fixed/withdrawable	
3297	0CE1	1	R	12	Expected protection type	
3298	0CE2	1	R	12	Installed protection type	
3299	0CE3	1	R	12	Control Mode	
3300	0CE4	1	R	12	Protection Serial Number Low Word	
3301	0CE5	1	R	12	Protection Serial Number High Word	
3302	0CE6	1	R	12	Relay Software Version	
3303	0CE7	1	R	12	Comms Software Version	
3304	0CE8	1	R	12	RTX Serial Number Low	
3305	0CE9	1	R	12	RTX Serial Number High	
3306	0CEA	1	R	12	RTX SW Version	
3307	0CEB	1	R	12	Outlet Description Word 1	
3308	0CEC	1	R	12	Outlet Description Word 2	
3309	0CED	1	R	12	Outlet Description Word 3	
3310	0CEE	1	R	12	Outlet Description Word 4	
3311	0CEF	1	R	12	Outlet Description Word 5	
3312	0CF0	1	R	12	Outlet Description Word 6	
3313	0CF1	1	R	12	Outlet Description Word 7	
3314	0CF2	1	R	12	Outlet Description Word 8	
3315	0CF3	1	R	12	Spare	
…	…				…	
3324	0CFC	1	R	12	Spare	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3325	0CFD	1	R	13	IO Module number	
3326	0CFE	1	R	13	Fixed/withdrawable	
3327	0CFF	1	R	13	Expected protection type	
3328	0D00	1	R	13	Installed protection type	
3329	0D01	1	R	13	Control Mode	
3330	0D02	1	R	13	Protection Serial Number Low Word	
3331	0D03	1	R	13	Protection Serial Number High Word	
3332	0D04	1	R	13	Relay Software Version	
3333	0D05	1	R	13	Comms Software Version	
3334	0D06	1	R	13	RTX Serial Number Low	
3335	0D07	1	R	13	RTX Serial Number High	
3336	0D08	1	R	13	RTX SW Version	
3337	0D09	1	R	13	Outlet Description Word 1	
3338	0D0A	1	R	13	Outlet Description Word 2	
3339	0D0B	1	R	13	Outlet Description Word 3	
3340	0D0C	1	R	13	Outlet Description Word 4	
3341	0D0D	1	R	13	Outlet Description Word 5	
3342	0D0E	1	R	13	Outlet Description Word 6	
3343	0D0F	1	R	13	Outlet Description Word 7	
3344	0D10	1	R	13	Outlet Description Word 8	
3345	0D11	1	R	13	Spare	
…	…				…	
3354	0D1A	1	R	13	Spare	
3355	0D1B	1	R	14	IO Module number	
3356	0D1C	1	R	14	Fixed/withdrawable	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3357	0D1D	1	R	14	Expected protection type	
3358	0D1E	1	R	14	Installed protection type	
3359	0D1F	1	R	14	Control Mode	
3360	0D20	1	R	14	Protection Serial Number Low Word	
3361	0D21	1	R	14	Protection Serial Number High Word	
3362	0D22	1	R	14	Relay Software Version	
3363	0D23	1	R	14	Comms Software Version	
3364	0D24	1	R	14	RTX Serial Number Low	
3365	0D25	1	R	14	RTX Serial Number High	
3366	0D26	1	R	14	RTX SW Version	
3367	0D27	1	R	14	Outlet Description Word 1	
3368	0D28	1	R	14	Outlet Description Word 2	
3369	0D29	1	R	14	Outlet Description Word 3	
3370	0D2A	1	R	14	Outlet Description Word 4	
3371	0D2B	1	R	14	Outlet Description Word 5	
3372	0D2C	1	R	14	Outlet Description Word 6	
3373	0D2D	1	R	14	Outlet Description Word 7	
3374	0D2E	1	R	14	Outlet Description Word 8	
3375	0D2F	1	R	14	Spare	
…	…				…	
3384	0D38	1	R	14	Spare	
3385	0D39	1	R	15	IO Module number	
3386	0D3A	1	R	15	Fixed/withdrawable	
3387	0D3B	1	R	15	Expected protection type	
3388	0D3C	1	R	15	Installed protection type	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3389	0D3D	1	R	15	Control Mode	
3390	0D3E	1	R	15	Protection Serial Number Low Word	
3391	0D3F	1	R	15	Protection Serial Number High Word	
3392	0D40	1	R	15	Relay Software Version	
3393	0D41	1	R	15	Comms Software Version	
3394	0D42	1	R	15	RTX Serial Number Low	
3395	0D43	1	R	15	RTX Serial Number High	
3396	0D44	1	R	15	RTX SW Version	
3397	0D45	1	R	15	Outlet Description Word 1	
3398	0D46	1	R	15	Outlet Description Word 2	
3399	0D47	1	R	15	Outlet Description Word 3	
3400	0D48	1	R	15	Outlet Description Word 4	
3401	0D49	1	R	15	Outlet Description Word 5	
3402	0D4A	1	R	15	Outlet Description Word 6	
3403	0D4B	1	R	15	Outlet Description Word 7	
3404	0D4C	1	R	15	Outlet Description Word 8	
3405	0D4D	1	R	15	Spare	
…	…				…	
3414	0D56	1	R	15	Spare	
3415	0D57	5	R	PIP	PIP Log 1	
3420	0D5C	5	R	PIP	PIP Log 2	
3425	0D61	5	R	PIP	PIP Log 3	
3430	0D66	5	R	PIP	PIP Log 4	
3435	0D6B	5	R	PIP	PIP Log 5	
3440	0D70	5	R	PIP	PIP Log 6	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3445	0D75	5	R	PIP	PIP Log 7	
3450	0D7A	5	R	PIP	PIP Log 8	
3455	0D7F	5	R	PIP	PIP Log 9	
3460	0D84	5	R	PIP	PIP Log 10	
3465	0D89	5	R	PIP	PIP Log 11	
3470	0D8E	5	R	PIP	PIP Log 12	
3475	0D93	5	R	PIP	PIP Log 13	
3480	0D98	5	R	PIP	PIP Log 14	
3485	0D9D	5	R	PIP	PIP Log 15	
3490	0DA2	5	R	PIP	PIP Log 16	
3495	0DA7	5	R	PIP	PIP Log 17	
3500	0DAC	5	R	PIP	PIP Log 18	
3505	0DB1	5	R	PIP	PIP Log 19	
3510	0DB6	5	R	PIP	PIP Log 20	
3515	0DBB	5	R	PIP	PIP Log 21	
3520	0DC0	5	R	PIP	PIP Log 22	
3525	0DC5	5	R	PIP	PIP Log 23	Present / Removed bitwise
3530	0DCA	5	R	PIP	PIP Log 24	
3535	0DCF	5	R	PIP	PIP Log 25	
3540	0DD4	5	R	PIP	PIP Log 26	
3545	0DD9	5	R	PIP	PIP Log 27	
3550	0DDE	5	R	PIP	PIP Log 28	
3555	0DE3	5	R	PIP	PIP Log 29	
3560	0DE8	5	R	PIP	PIP Log 30	
3565	0DED	5	R	PIP	PIP Log 31	
3570	0DF2	5	R	PIP	PIP Log 32	

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3575	0DF7	5	R	PIP	PIP Log 33	
3580	0DFC	5	R	PIP	PIP Log 34	
3585	0E01	5	R	PIP	PIP Log 35	
3590	0E06	5	R	PIP	PIP Log 36	
3595	0E0B	5	R	PIP	PIP Log 37	
3600	0E10	5	R	PIP	PIP Log 38	
3605	0E15	5	R	PIP	PIP Log 39	
3610	0E1A	5	R	PIP	PIP Log 40	
3615	0E1F	5	R	PIP	PIP Log 41	
3620	0E24	5	R	PIP	PIP Log 42	
3625	0E29	5	R	PIP	PIP Log 43	
3630	0E2E	5	R	PIP	PIP Log 44	
3635	0E33	5	R	PIP	PIP Log 45	
3640	0E38	5	R	PIP	PIP Log 46	
3645	0E3D	5	R	PIP	PIP Log 47	
3650	0E42	5	R	PIP	PIP Log 48	
3655	0E47	5	R	PIP	PIP Log 49	
3660	0E4C	5	R	PIP	PIP Log 50	
3665	0E51	1	R	Group Feed	Spare	
…	…				…	
3696	E70	1	R	15	Spare	
3697	0E71	1			Feeder Group 1 Status	0 = Group Disabled, 1 = Group_IO_Fault, 2 = Group_IO_Offline, 3 = Group_Active_Blocked 4 = Group_Active_Ready_To_Start, 5 = Group_Active_Running
3698	0E72	1			Outlets In Group Mask	Bitmask representation of outlets within this group. Bit0 = Outlet1, Bit1 = Outlet2 etc.

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3699	0E73	1			Outlets Blocking Mask	Bitmask representation of outlets stopping this group from starting. Bit0 = Outlet1, Bit1 = Outlet2 etc.
3700	0E74	1			Most recent Insulation test result	IT result of all the outlets in the group added in parallel (multiple of 0.1 MΩ)
3701	0E75	1			Most recent EFLO A Result	EFLO A result of all the outlets in the group added in parallel (% age of 1 MΩ)
3702	0E76	1			Most recent EFLO B Result	EFLO B result of all the outlets in the group added in parallel (% age of 1 MΩ)
3703	0E77	1			Most recent EFLO C Result	EFLO C result of all the outlets in the group added in parallel (% age of 1 MΩ)
3704	0E78	1			Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts Range 0 to 4946 V
3705	0E79	4			Average Current	Sum of Average Currents from all outlets in group value in Amps as a Double Integer
3709	0E7D	1			Earth Leakage/Residual Voltage	Max Outlet Value in Feed Grouper (Range is 0 to 100 % Trip Level. (EL) / 0 to 1800 Volts (RV))
3710	0E7E	1			Allowed Machine Type	The Machine type allowed for the group
3711	0E7F	1			Allowed Machine ID	The Machine id allowed for the group
3712	0E80	1			Spare	
…	…				…	
3719	0E87	1			Spare	
3720	0E88	1			Feeder Group 2 Status	0 = Group Disabled, 1 = Group_IO_Fault, 2 = Group_IO_Offline, 3 = Group_Active_Blocked 4 = Group_Active_Ready_To_Start, 5 = Group_Active_Running
3721	0E89	1			Outlets In Group Mask	Bitmask representation of outlets within this group. Bit0 = Outlet1, Bit1 = Outlet2 etc.

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3722	0E8A	1			Outlets Blocking Mask	Bitmask representation of outlets stopping this group from starting. Bit0 = Outlet1, Bit1 = Outlet2 etc.
3723	0E8B	1			Most recent Insulation test result	IT result of all the outlets in the group added in parallel (multiple of 0.1 MΩ)
3724	0E8C	1			Most recent EFLO A Result	EFLO A result of all the outlets in the group added in parallel (% age of 1 MΩ)
3725	0E8D	1			Most recent EFLO B Result	EFLO B result of all the outlets in the group added in parallel (% age of 1 MΩ)
3726	0E8E	1			Most recent EFLO C Result	EFLO C result of all the outlets in the group added in parallel (% age of 1 MΩ)
3727	0E8F	1			Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts Range 0 to 4946 V
3728	0E90	4			Average Current	Sum of Average Currents from all outlets in group value in Amps as a Double Integer
3732	0E94	1			Earth Leakage/Residual Voltage	Max Outlet Value in Feed Grouper (Range is 0 to 100 % Trip Level. (EL) / 0 to 1800 Volts (RV))
3733	0E95	1			Allowed Machine Type	The Machine type allowed for the group
3734	0E96	1			Allowed Machine ID	The Machine id allowed for the group
3735	0E97	1			Spare	
…	…				…	
3742	0E9E	1			Spare	
3743	0E9F	1			Feeder Group 3 Status	0 = Group Disabled, 1 = Group_IO_Fault, 2 = Group_IO_Offline, 3 = Group_Active_Blocked 4 = Group_Active_Ready_To_Start, 5 = Group_Active_Running
3744	0EA0	1			Outlets In Group Mask	Bitmask representation of outlets within this group. Bit0 = Outlet1, Bit1 = Outlet2 etc.

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3745	0EA1	1			Outlets Blocking Mask	Bitmask representation of outlets stopping this group from starting. Bit0 = Outlet1, Bit1 = Outlet2 etc.
3746	0EA2	1			Most recent Insulation test result	IT result of all the outlets in the group added in parallel (multiple of 0.1 MΩ)
3747	0EA3	1			Most recent EFLO A Result	EFLO A result of all the outlets in the group added in parallel (% age of 1 MΩ)
3748	0EA4	1			Most recent EFLO B Result	EFLO B result of all the outlets in the group added in parallel (% age of 1 MΩ)
3749	0EA5	1			Most recent EFLO C Result	EFLO C result of all the outlets in the group added in parallel (% age of 1 MΩ)
3750	0EA6	1			Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts Range 0 to 4946 V
3751	0EA7	4			Average Current	Sum of Average Currents from all outlets in group value in Amps as a Double Integer
3755	0EAB	1			Earth Leakage/Residual Voltage	Max Outlet Value in Feed Grouper (Range is 0 to 100 % Trip Level. (EL) / 0 to 1800 Volts (RV))
3756	0EAC	1			Allowed Machine Type	The Machine type allowed for the group
3757	0EAD	1			Allowed Machine ID	The Machine id allowed for the group
3758	0EAE	1			Spare	
…	…				…	
3765	0EB5	1			Spare	
3766	0EB6	1			Feeder Group 4 Status	0 = Group Disabled, 1 = Group_IO_Fault, 2 = Group_IO_Offline, 3 = Group_Active_Blocked 4 = Group_Active_Ready_To_Start, 5 = Group_Active_Running
3767	0EB7	1			Outlets In Group Mask	Bitmask representation of outlets within this group. Bit0 = Outlet1, Bit1 = Outlet2 etc.

Address (DEC)	Address (HEX)	MB Reg Count	Read / Write	Outlet Number	Name	Description
3768	0EB8	1			Outlets Blocking Mask	Bitmask representation of outlets stopping this group from starting. Bit0 = Outlet1, Bit1 = Outlet2 etc.
3769	0EB9	1			Most recent Insulation test result	IT result of all the outlets in the group added in parallel (multiple of 0.1 MΩ)
3770	0EBA	1			Most recent EFLO A Result	EFLO A result of all the outlets in the group added in parallel (% age of 1 MΩ)
3771	0EBB	1			Most recent EFLO B Result	EFLO B result of all the outlets in the group added in parallel (% age of 1 MΩ)
3772	0EBC	1			Most recent EFLO C Result	EFLO C result of all the outlets in the group added in parallel (% age of 1 MΩ)
3773	0EBD	1			Volts Average	The average 3-phase, phase-to-phase voltage. This value is returned in Volts Range 0 to 4946 V
3774	0EBE	4			Average Current	Sum of Average Currents from all outlets in group value in Amps as a Double Integer
3778	0EC2	1			Earth Leakage/Residual Voltage	Max Outlet Value in Feed Grouper (Range is 0 to 100 % Trip Level. (EL) / 0 to 1800 Volts (RV))
3779	0EC3	1			Allowed Machine Type	The Machine type allowed for the group
3780	0EC4	1			Allowed Machine ID	The Machine id allowed for the group
3781	0EC5	1			Spare	
…	…				…	
3788	0ECC	1			Spare	

17 APPENDIX D: Communications Register Details

17.1 Outlet Status

Value	Details
0	Offline
1	Unsupported
2	Tripped
3	Resettable trip
4	Blocked
5	Paused
6	Closing
7	Closed
8	Waiting for start
9	Earth isolated
10	Resettable block
11	Auth resettable block

17.2 Trip Mask 1

Bitmask	Trip Name	Details
0x0001	Remote Start Ready	The outlet is set to start via the 'Remote Start' button. This trip is set so that the system cannot be started This trip is automatically cleared when a remote start is requested
0x0002	Start Blocked	The thermal accumulator is above the start blocking threshold
0x0004	Relay Parameter Error	Hardware related error was detected with the relay dongle parameters. The cause of this trip can be read from the parameter status. This trip will automatically clear once the cause of the error is rectified
0x0008	Unused	
	Residual Voltage Trip	(IPE-RV / OCS-RV Only) The measured residual Voltage has exceeded the selected trip level for the selected trip time This trip is cleared via a 'Residual Voltage' reset request
0x0010	Relay Stop	The relay has been requested to stop. This trip automatically clears once the relay has exited Run mode. This trip is used internally by the relay and will not normally be seen by external controllers
0x0020	Remote Start Error	There is an error in the Remote Start Circuitry which is stopping the relay from seeing the 100 Ω start resistor This trip will automatically clear when the 100 Ω start resistor is detected by the relay
0x0040	Shunt Earth Continuity	The shunt resistance on the pilot is detected as less than 1.5 kΩ (e.g. the pilot is shorted). This trip is cleared via a general reset request if the earth continuity latch parameter is on, otherwise it will automatically clear when the fault is corrected
0x0080	Earth Leakage CT Detect	The Earth Leakage CT is not being detected. This trip will automatically clear once the CT is detected
	Unused	Not used for IPE-RV / OCS-RV

Bitmask	Trip Name	Details
0x0100	Earth Leakage	An earth leakage current of greater than the specified limit was detected. This trip is cleared via an 'Earth Leakage' reset request
	Unused	Not used for IPE-RV / OCS-RV
0x0200	Series Earth Continuity	The series resistance on the pilot is greater than the EC trip level (e.g. the Pilot is open circuit). This trip is cleared via a general reset request if the earth continuity latch parameter is on, otherwise it will automatically clear when the fault is cleared
0x0400	Earth Fault Lockout	The cable failed the LV Earth Fault Lockout Test This trip is cleared via a general reset request
0x0800	Motor Overload	The thermal model for the selected motor has tripped the system to prevent motor damage. This trip is cleared via a general reset request or automatically as determined by the Overload Trip Reset Parameter's value. It will only be cleared if the Motor Overload value is below the selected Overload Trip Reset value
0x1000	Short Circuit-INST	An instantaneous Short Circuit was detected. This trip is cleared via a 'Short Circuit' reset request (trips at 2x SC-LT in MOL)
0x2000	Current Balance	The current imbalance was greater than the configured value. This trip is cleared via a general reset request
0x4000	Short Circuit – LT	MOL OC mode only - A 'Long Time' Short circuit trip was detected (trips at selected level, but 60 ms slower than SC-INST)
0x8000	Main Contactor Fail Hardware Latch	Indicates the state of the MCF Hardware Latch circuit. The latch gets set while ever any of "Loss of Vacuum", "Frozen Contactor", "Close Fail" or an "External Open" reset is set. This trip can only be cleared by pressing the Main Contactor reset button located on the relay. The MCF LED on the relay will also flash while this trip is set

17.3 Trip Mask 2

Bitmask	Trip Name	Details
0x0001	Under Voltage	No voltage was detected on the lines after the main contactor was closed. This is automatically reset
0x0002	Internal Logic Error	A fault with the internal operation of the relay's logic has occurred. This trip can only be cleared with a power cycle of the relay
0x0004	External MC Open	The Main Contactor was detected as having been opened while the system is in run mode. This trip is cleared via an "MCF Reset" request
0x0008	Undercurrent Trip	No current was detected on the lines after the main contactor was closed. This trip is cleared via a general reset request
0x0010	Remote Start Stuck	While in diode mode the remote start button was held down for 5 seconds after the main contactor was closed. This trip is cleared when the remote start button is released
0x0020	Close Fail	Set when the MCI signal is not detected within 1 second of the MCR output closing. This trip is cleared via an "MCF Reset" request
0x0040	Loss of Vacuum	Set when the voltage is detected on the load side of the MC when the MCR output is open. This trip is cleared via an "MCF Reset" request
0x0080	Frozen Contactor	Set when the MCI signal detected and the MCR output is open. This trip is cleared via an "MCF Reset" request
0x0100	No Coil Supply	The voltage used to drive the Main Contactor Coil is not present. This trip is automatically cleared once the coil voltage is detected
0x0200	PIP Comms Timeout	The heartbeat from the PIP was not detected for 1 second. This trip is automatically cleared once the PIP heartbeat is detected
0x0400	Start Disabled	The starting of the system has been disabled by the PIP. This trip is set/cleared based upon the state of the 'Outlet Enable' bit in the 'Enable Mask' assembly instance
0x0800	Insulation Test Failed	The cable failed the Insulation Test. This trip is cleared via a general reset request
0x1000	CCM ID Trip	The connected Cable Connection Module has a voltage rating not compatible with this relay
0x2000	MCF Battery Trip	The voltage of the battery which powers the MCF Latch and Ram circuits has dropped below its valid range
0x4000	Unused	
	Pilot Interlock Trip	Fast Acting pilot interlock trip occurred
0x8000	Unused	

17.4 Trip Mask 3

Bitmask	Trip Name	Details
0x0001	Unused	
0x0002	Unused	
0x0004	Unused	
0x0008	Unused	
0x0010	Unused	
0x0020	Unused	
0x0040	Unused	
0x0080	Unused	
0x0100	RTX Initialising	The relay is loading the details from the RTX. This trip stops the relay from starting before the RTX details have been fully loaded. This trip will automatically clear once all the parameters have been loaded. Modifying an RTX parameter will cause this trip to become asserted again while the RTX is updated
0x0200	RTX Offline	The RTX is currently offline (only occurs while in RTX mode). This trip will automatically clear once the RTX is back online
0x0400	RTX Parameter Error	Hardware related error was detected with the RTX Dongle Parameters. The cause of this trip can be read from the Parameter Status assembly instance. This trip will automatically clear once the cause of the error is rectified
0x0800	RTX RTD Group 1 Trip	The RTD Temperature value of input 1 or 2 is above the specified trip level or is in error (defined by RTX Load parameter 20). This trip is automatically cleared depending on the setting of parameter 22. See Section 6 for further details
0x1000	RTX RTD Group 2 Trip	The RTD Temperature value of input 3, 4 or 5 is above the specified trip level, or is in error (defined by RTX Load parameter 21). This trip is automatically cleared depending on the setting of parameter 23. See section 6 for further details
0x2000	RTX Stop	The RTX Digital Stop input is open circuit (e.g. the stop button has been pressed). This trip is cleared when the RTX Digital Stop input is short circuited again
0x4000	RTX PTC Trip	The RTX Digital PTC input is open circuit (e.g. the PTC has been opened). This trip is cleared when the RTX Digital PTC input is short circuited again
0x8000	RTX Comms Timeout	The relay has failed to read/write status words and/or parameters to the RTX. The RTX is still online and responding to commands

17.5 Relay Enable Mask

Bitmask	Trip Name	Details
0x0001	OCS / IPE Outlet Enable	While this bit is set to zero, the outlet will not be allowed to start either via a PIP request or a Remote Start request. This bit is designed to allow the PIP to disable a remote start without having to change the outlet parameters
0x0002	EFLO Wait Enable	When set, the EFLO function will wait 0.5 s after completion of the test before the start sequence continues
0x0004	IT Wait Enable	When set, the IT function will wait 0.5 s after completion of the test before the start sequence continues
0x0008	OCS-RV / IPE-RV Outlet Enable	While this bit is set to zero, the outlet will not be allowed to start either via a PIP request or a Remote Start request. This bit is designed to allow the PIP to disable a remote start without having to change the outlet parameters
0x0010	DO NOT use	Not Used
0x0020	DO NOT use	Not Used
0x0040	DO NOT use	Not Used
0x0080	DO NOT use	Not Used

17.6 Relay Digital IO

Bitmask	Trip Name	Details
0x0001	Unused	
0x0002	MCI Bit	Main Contactor Input. This input is wired to a normally open auxiliary contact on the main contactor to provide feedback to the relay on the contactor's state
0x0004	Unused	
0x0008	Unused	
0x0010	Unused	
0x0020	Unused	
0x0040	Unused	
0x0080	MCF Hardware Flag	Digital value from the dedicated Main Contactor Failure state latch
0x0100	Unused	
0x0200	Main Control Relay	Status of the Main Control Relay (MCR) output
0x0400	Circuit Breaker Relay	Status of the Circuit Breaker Relay (CBR) output
Others	Unused	

17.7 RTX Status

Bitmask	Trip Name	Details
0x0001	Parameter Errors	A parameter stored on the dongle is in error (see RTX Load Invalid Mask 1 and 2 for parameter details)
0x0002	Non RTX Dongle	The dongle inserted in the RTX is not a valid RTX Dongle
Others	Unused	

17.8 RTX Inputs

Bitmask	Trip Name	Details
0x0001	RTD1	RTD inputs can be used as digital inputs. In this mode they are resistance based with 120 Ω representing closed and 240 Ω open. Resistance values too far outside of these nominal values will result in the corresponding error bit being set
0x0002	RTD2	
0x0004	RTD3	
0x0008	RTD4	
0x0010	RTD5	
0x0020	Stop	Normally closed (1). Opens to cause RTX Stop
0x0040	Start	Normally open (0). Closes to request start
0x0080	PTC	Normally closed (1). Opens to cause PTC Trip
0x0100	RTD1 Error	For each input bit, there is a corresponding error bit. If at any time the RTX detects a problem with a given digital input, it will set the error bit
0x0200	RTD2 Error	
0x0400	RTD3 Error	
0x0800	RTD4 Error	
0x1000	RTD5 Error	
0x2000	Stop Error	
0x4000	Start Error	
0x8000	PTC Error	

17.9 Cassette Status

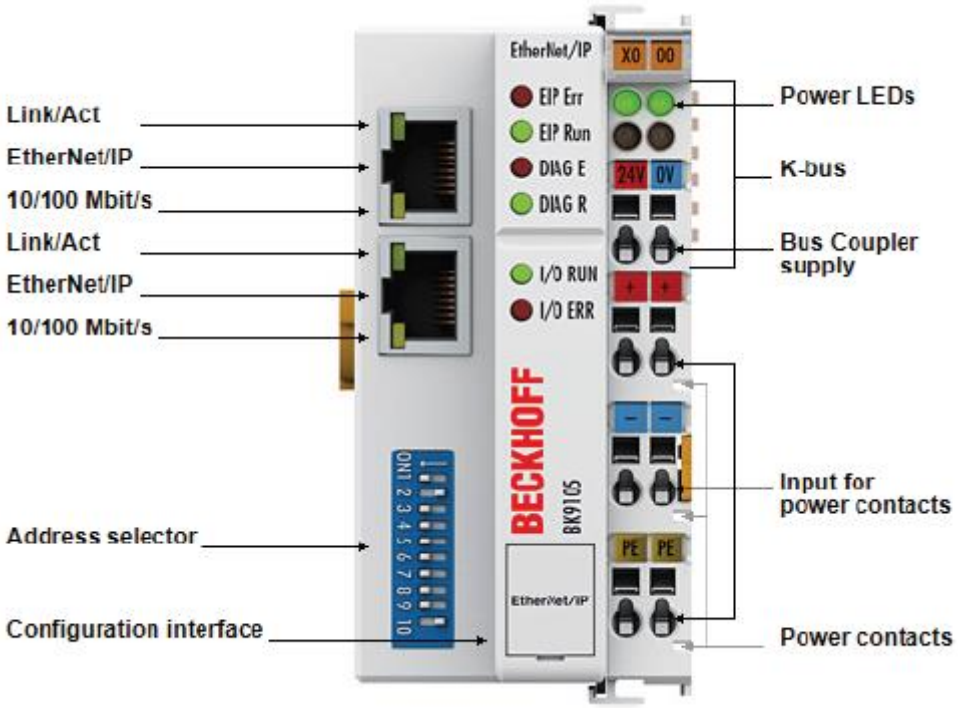
State ID	State Name
0	Power Up
1	Fixed Cassette
2	Cassette Offline
3	Calibration Required
4	Calibration Start
5	In Service
6	Arrived at service
7	In Earth
8	Arrived at Earth
9	In Earth Isolated
10	Drive to Service
11	Nudge to Service
12	Drive to Earth
13	Manual Drive Pos Pressed
14	Manual Drive Positive
15	Manual Drive Neg Pressed
16	Manual Drive Neg
17	Calibration Pos Deadtime
18	Calibration Drive Pos
19	Calibration Hit Limit Switch
20	Calibration Neg Deadtime

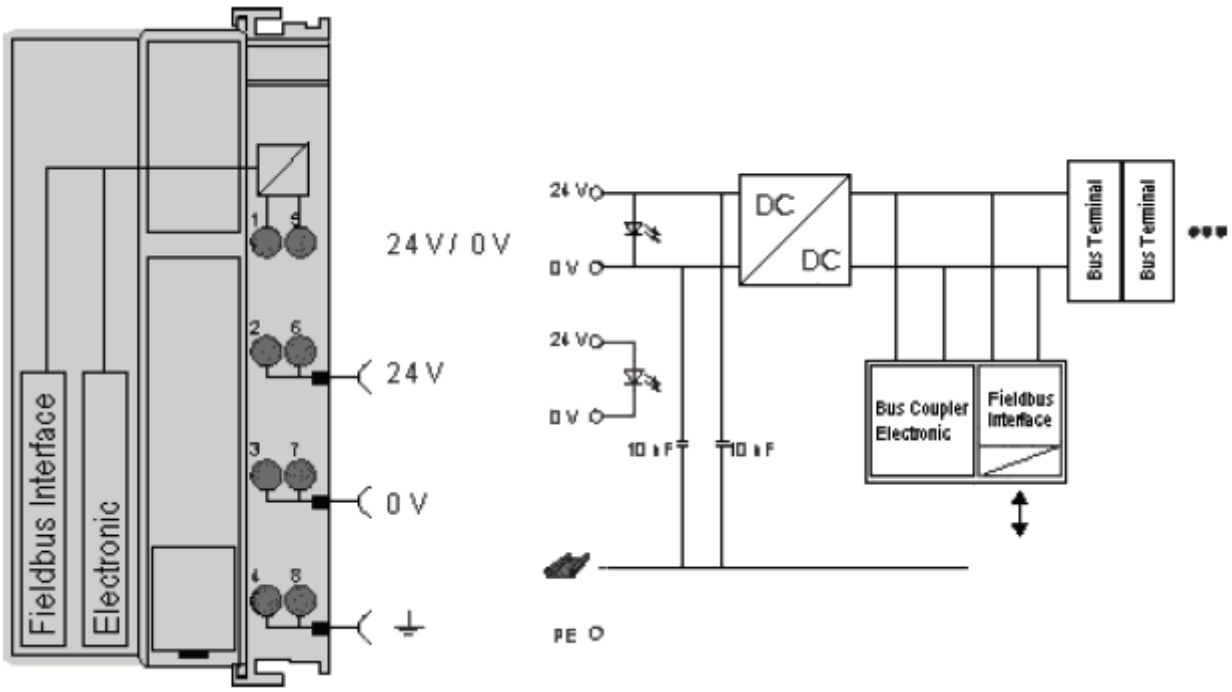
State ID	State Name
21	Calibration Drive Neg
22	Calibration Finished
23	Calibration Failed to Move from Limit Switch
24	Calibration Failed to Hit Limit Switch
25	Actuator Fault in Earth
26	Analog Earth Pos Discrepancy
27	Failed to reach target service
28	Failed to Move from Earth Fault
29	Cassette Return to earth
30	Service Limit Switch Fault Open
31	Isolation Test Failed
32	Actuator Fault in Service
33	Service Limit Switch Fault closed
34	Analog Service Pos Discrepancy
35	Failed to Move from service fault
36	Failed to reach target earth
37	Cassette return to service
38	Cassette return nudge to service
39	Earth Limit Switch Fault open
40	Earth Limit Switch Fault closed
41	Cassette in no man’s land

18 APPENDIX E: BECKHOFF Wiring Detail

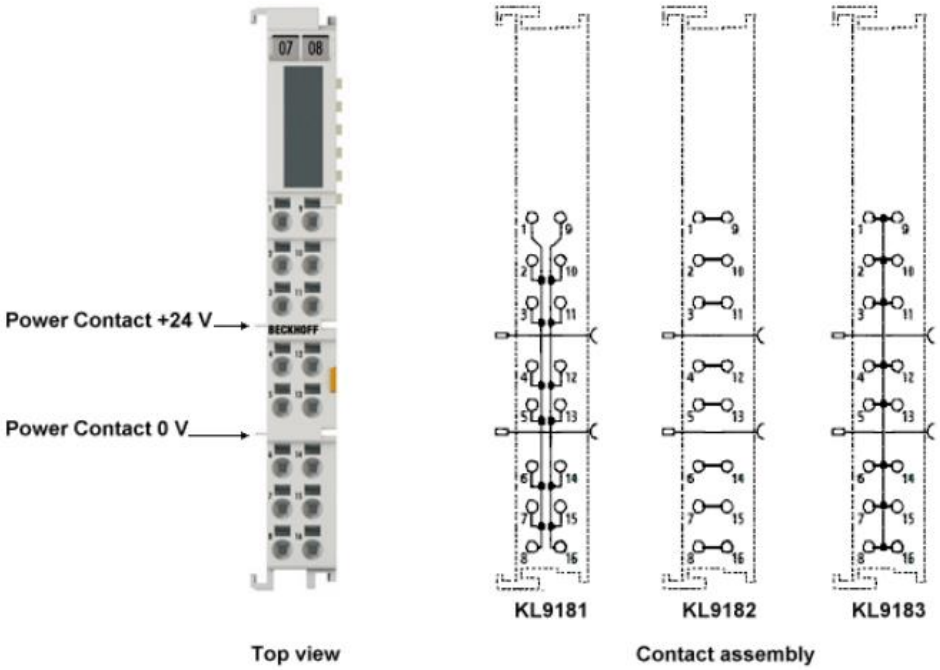
The below outlines the wiring requirements for each terminal module of the BECKHOFF IO blocks utilised in the PIP system. For the latest detail, please refer to the BECKHOFF user manuals.

BK9105 Bus Coupler



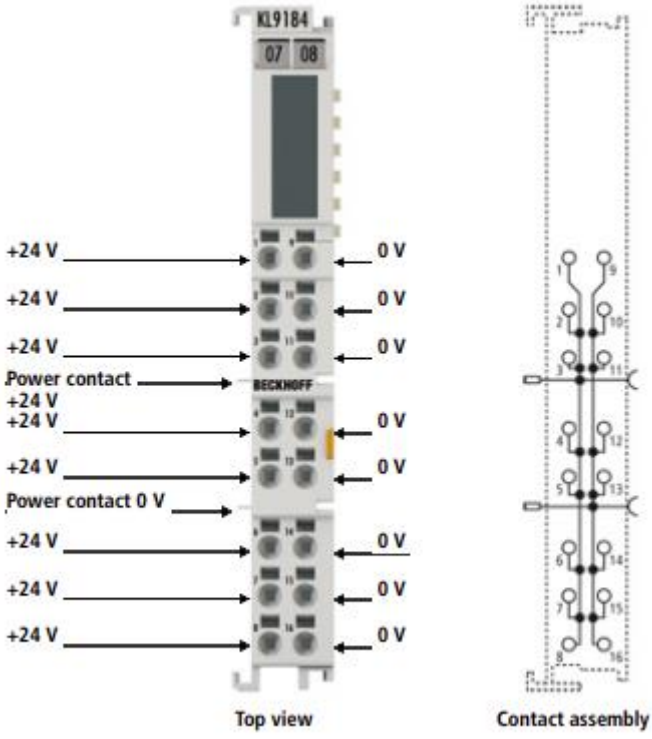


KL9181 (2x8 Terminals) / **KL9182** (8x2 Terminals) / **KL9181** (1x16 Terminals)



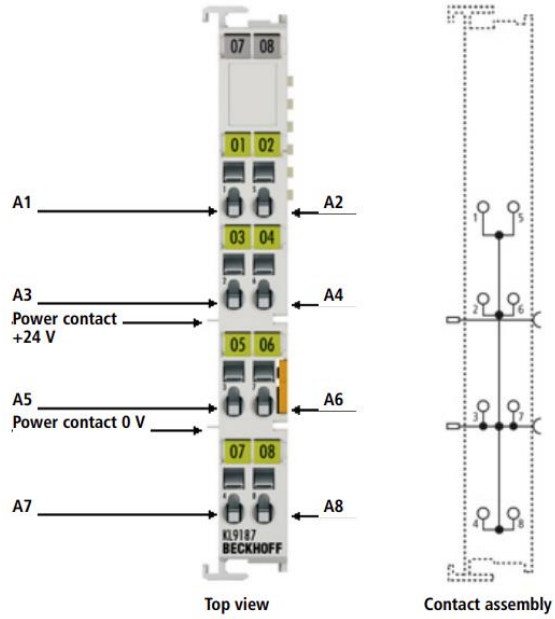
KL9184 (2x8 Potential Terminals):

- Pins 1-8 are common and connected to the 24 VDC rail.
- Pins 9-16 are common and connected to the 0 VDC rail.



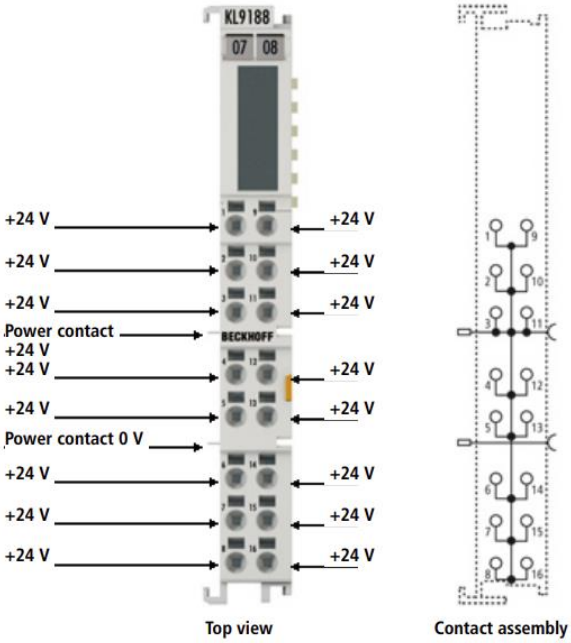
KL9187 (1x8 Potential Terminals):

- Pins 1-8 are common and connected to the 0 VDC rail.



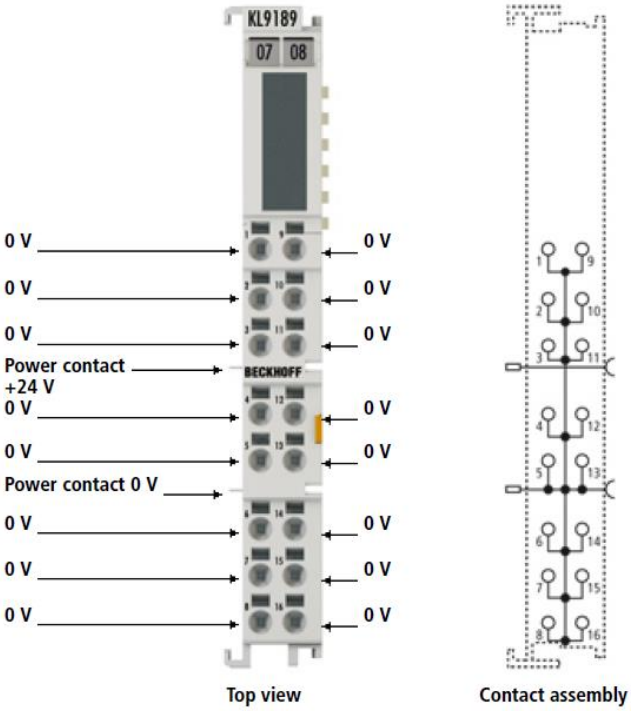
KL9188, these terminal sets may be used to simplify the wiring of all inputs to Slot 1 and 2:

- Pins 1-16 are common and pick up the 24 VDC rail.



KL9189, these terminal sets may be used to simplify the wiring of all outputs from Slot 3 and 4.

- Pins 1-16 are common and pick up the 0 VDC rail.



19 APPENDIX F: PIP Network Topology Examples

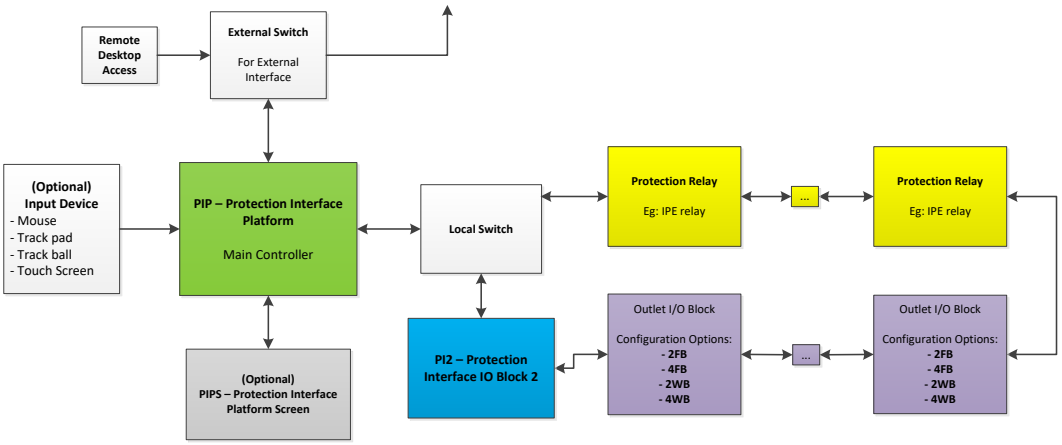


Figure 81: PIP Local Network Example 1

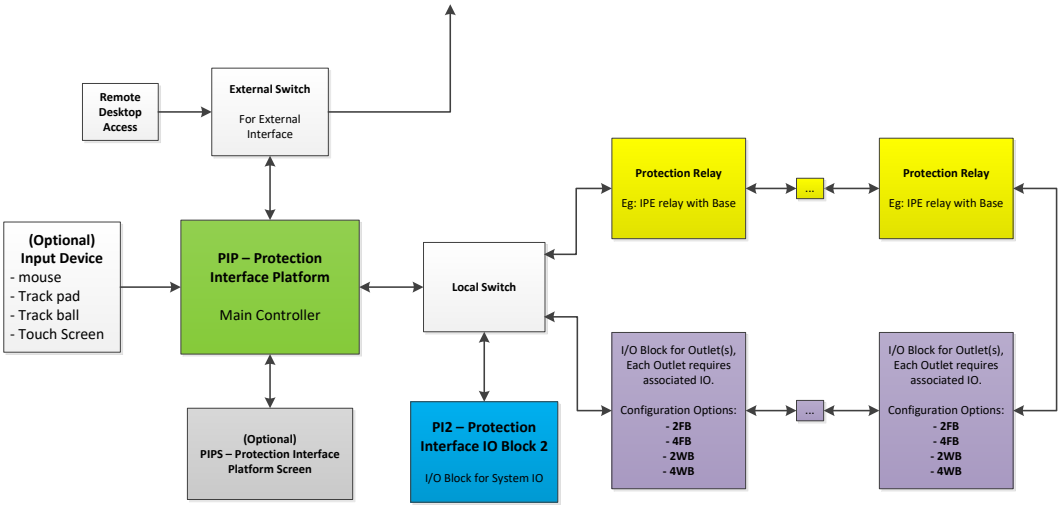


Figure 82: PIP Local Network Example 2

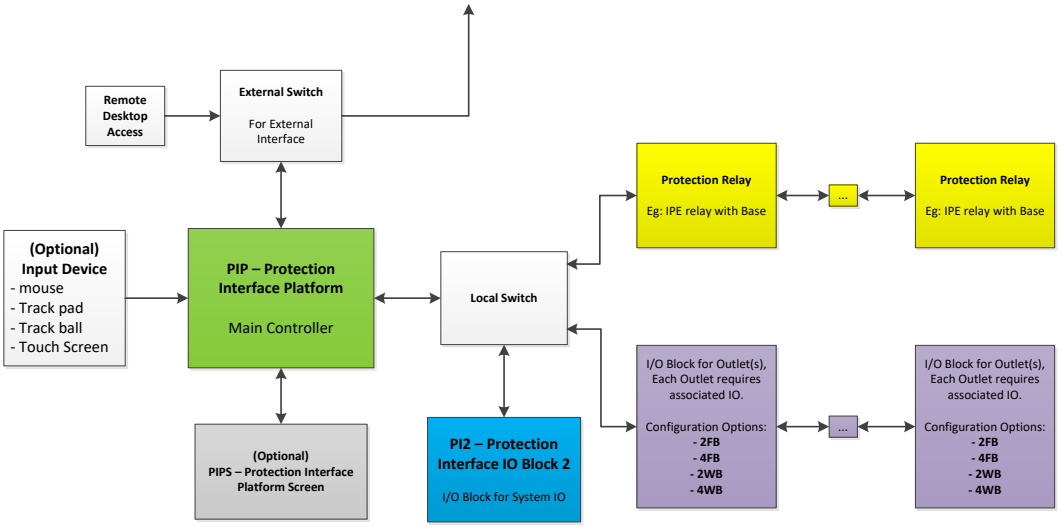


Figure 83: PIP Local Network Example 3

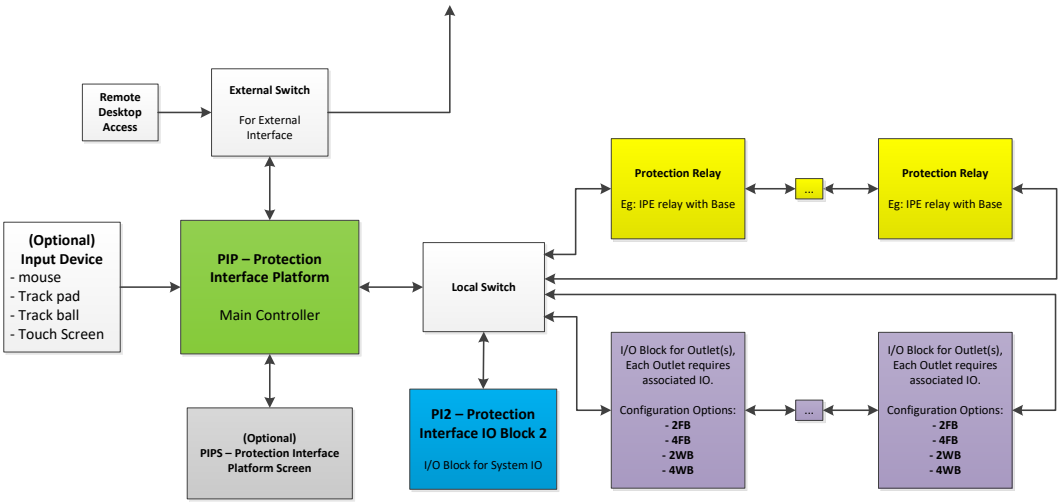


Figure 84: PIP Local Network Example 4

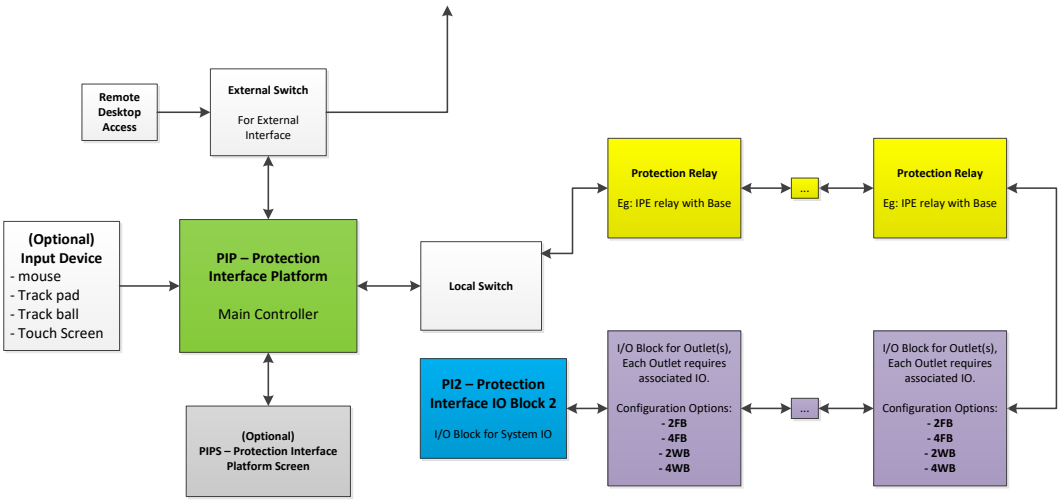


Figure 85: PIP Local Network Example 5

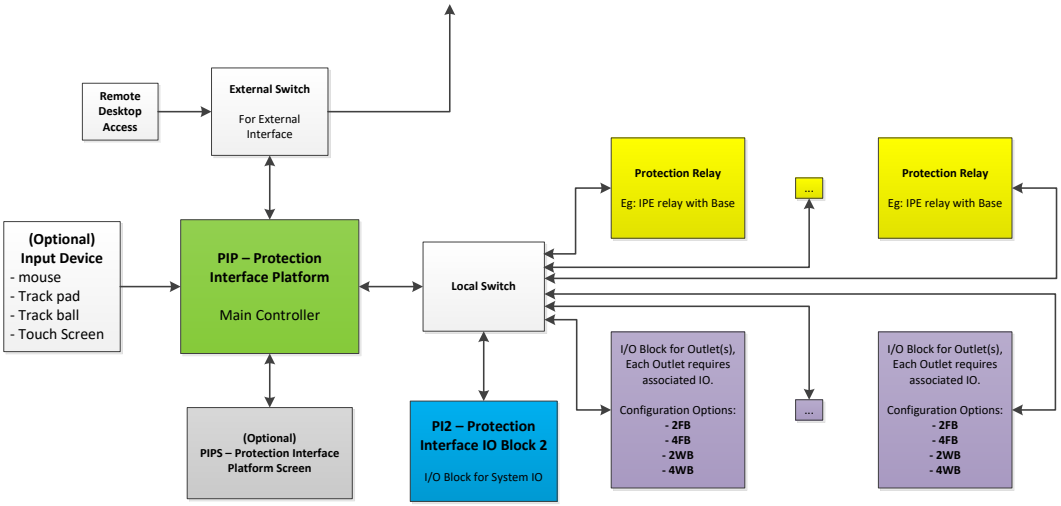


Figure 86: PIP Local Network Example 6

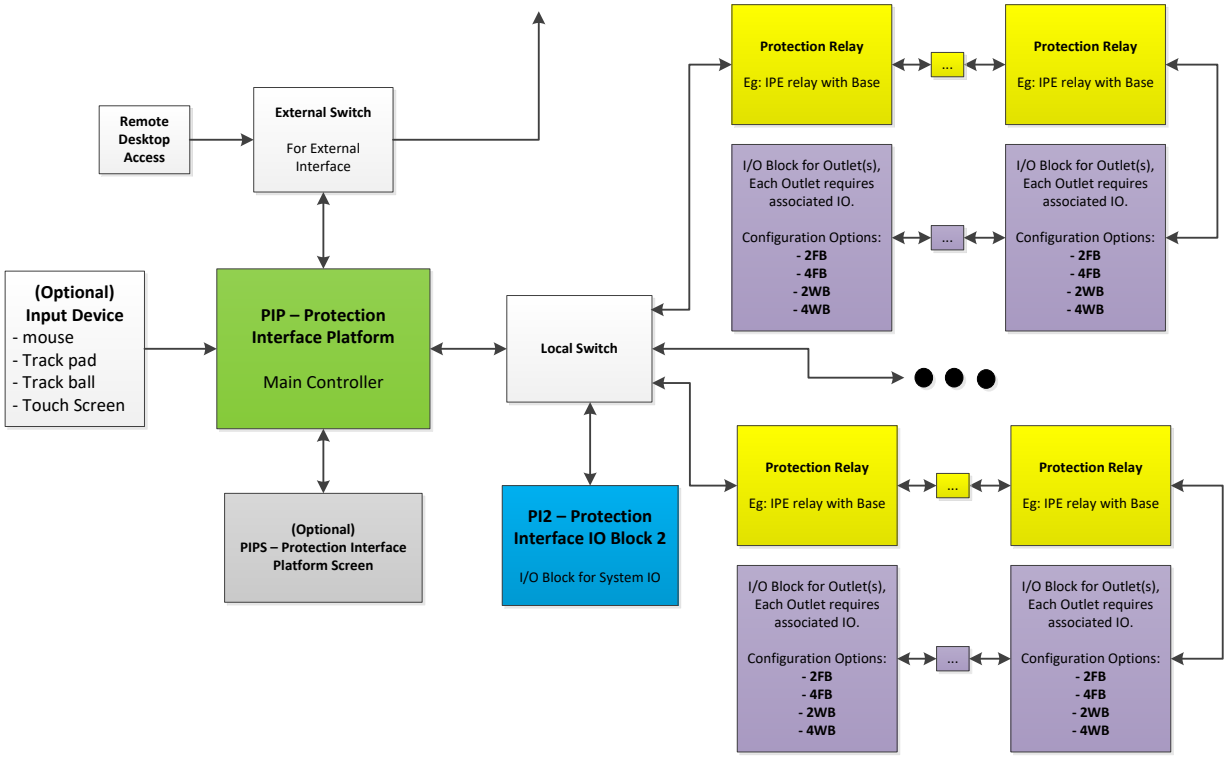


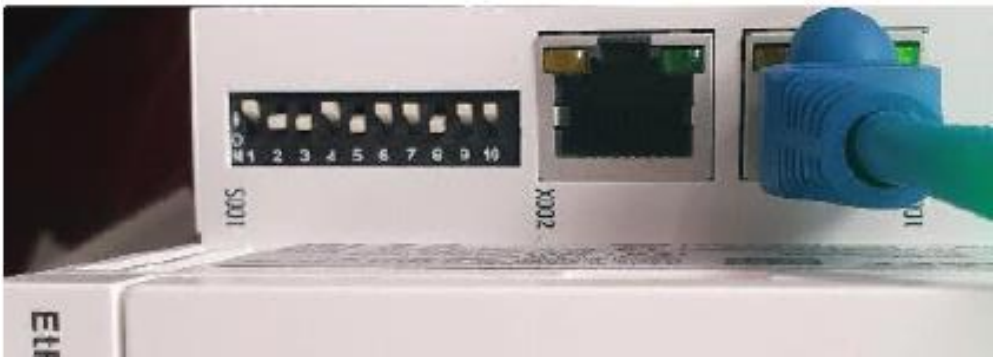
Figure 87: PIP Local Network Example 7

20 APPENDIX G: Group Feed Beckhoff IO Brick

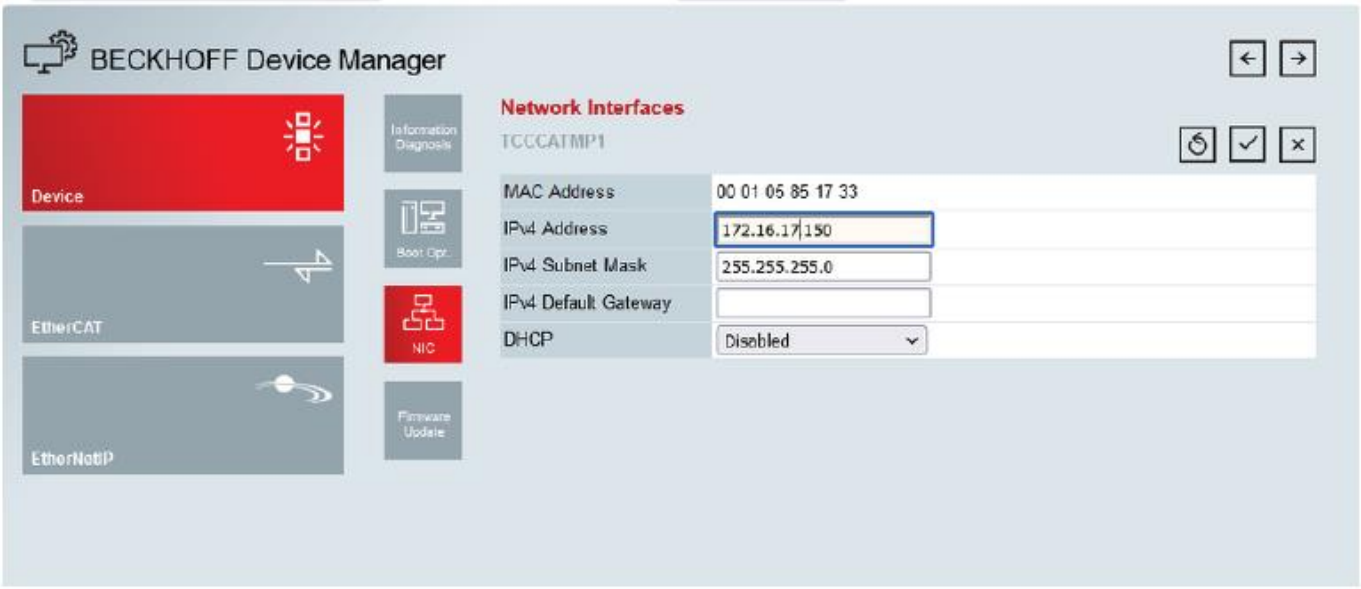
CAUTION!

Make sure to perform step 7 to make the settings persistent between power cycles.

1. Set the dip switches as displayed:



2. Connect an ethernet cable from the IO brick to your PC and configure a static IP for your ethernet interface to be in 192.168.1.x network.
3. In a web browser go to 192.168.1.150/Config. Use the credentials below
   - username: guest
   - password: 1
4. Go to Devices > NIC > IPv4 Address and set the IPv4 address to 172.16.17.150 (refer to image below)



5. Click apply (tick symbol) then the Refresh (Round Arrow)
6. Again configure a static IP for your ethernet interface now to be in 172.16.17.x network and go to 172.16.17.150/Config.
7. Now go to Devices > Boot Opt. and click the reboot button in the “Reboot Machine” section.