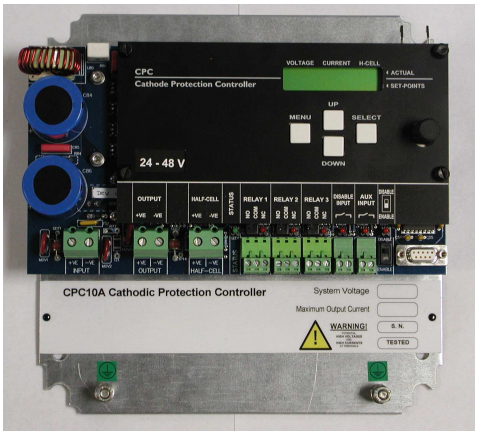
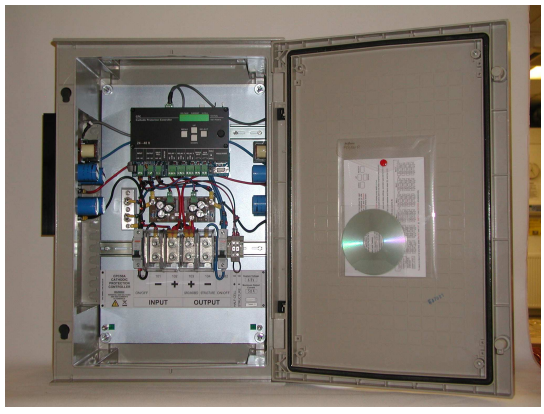
CPC10A / CPC25A / CPC50A

CATHODIC PROTECTION CONTROLLERS

PRODUCT MANUAL



CPC10 on Chassis Plate



CPC50 in GRP

1. Introduction

The CPC10A, CPC25A and CPC50A range of impressed current cathodic protection controllers, although primarily designed for PV systems, is capable of operating with any stable DC power source. The units are available in three output current versions: 10A, 25A and 50A and in three input voltage versions: 12V, 24V and 48V. High speed pulse width modulated switching technology is utilised to obtain high conversion efficiency, thus minimising costs in the solar system providing the power.

1.1. Cathodic Protection Features

The Cathodic Protection Controller can operate in one of three modes, automatically switching between these when user adjustable set-points are reached, as dictated by changing ground conditions. Each parameter is displayed on a digital LCD display:

Constant Voltage Control / Constant Current Control / Automatic Voltage Control (using feedback from a remote Half-Cell that senses true structure to pipe potential – supplied by others).

The Half-Cell Input Impedance is greater than 20MΩ (see Section 3.9.1 for more information).

1.2. Alarms & Diagnostics

Three Programmable Alarm Relays each of which can be programmed to respond to any of the following alarm functions: Common Alarm / High Output Current / Low Output Current / High Input Voltage / Low Input Voltage / Half-Cell Voltage (see Section 3.8.1 for more information).

Diagnostic features include a Programmable Interrupt Timer.

1.3. Auxiliary Inputs

The Controller features a Disable Input (see Section 3.4) and an Auxiliary Input (see Section 3.9.2).

1.4. Limitations of Use

Although the Cathodic Protection Controller should not be damaged by connection to a short circuit, the output waveform ceases to be smooth DC and meter readings may be inaccurate. The minimum recommended load resistance is 0.25Ω.

1.5. Health & Safety

Read this manual thoroughly BEFORE undertaking any work.

Potentially lethal voltages can be present at the terminals within the Controller. Capacitors, used in the smoothing circuits, can retain energy long after the unit has been isolated. Extreme care MUST be taken when performing any of the actions described in this manual.

Remove all metallic personal adornments from the hands, wrists and neck before commencing work on a live unit.

Ensure all tools are insulated.

Whenever a cable has to be disconnected it should be insulated with insulating tape and labelled to ensure correct reconnection.

1.6. Earthing

The Cathodic Protection Controller is part of a common positive system. Any charge controller connected to the input of the Cathodic Protection Controller must also be common positive.

The mounting plate and enclosure have not been linked to the common positive to prevent corrosion and must be separately earthed to provide lightning protection.

1.7. Control PCB Assembly – Lithium Battery

NOTE: Some versions of the Control PCB Assembly contain a 3V Lithium Battery which is held in a battery holder (located on the right hand top corner of the Control PCB Assembly). When transporting the PCB Assembly, the battery should be removed and inserted into a plastic bag so that no part of the PCB is live. This should be noted if wrapping the Control PCB Assembly in conductive plastic for shipment.

1.8. Unit Types, Weights and Dimensions

See Sections 1.11 to 1.15 for Unit General Arrangements

CPC Unit	Painted Steel Enclosure IP66		Stainless Steel Enclosure IP66		GRP (Polyester) Enclosure IP65	
CPC10A 10A Output	300 x 300 x 150mm		300 x 300 x 150mm		430 x 330 x 200mm	
CPC25A 25A Output	610 x 406 x 205mm		610 x 406 x 205mm		645 x 435 x 250mm	21Kg
CPC50A 50A Output	610 x 610 x 205mm		610 x 610 x 205mm		645 x 435 x 250mm	

1.9. Terminal Sizes and Cable Acceptance

The following table lists the terminal connections used across the range of CPC10A, CPC25A, CPC50A:

Connection	CPC10A	CPC25A	CPC50A
Input Terminals	$10mm^2$ PCB Screw Terminals	M8 Stud Terminals suitable For up to $120mm^2$ cable	M8 Stud Terminals suitable For up to $120mm^2$ cable
Output Terminals	$10mm^2$ PCB Screw Terminals	M8 Stud Terminals suitable For up to $120mm^2$ cable	M8 Stud Terminals suitable For up to $120mm^2$ cable
Half-Cell Terminals	$10mm^2$ PCB Screw Terminals	$6mm^2$ Din-Rail Terminals	$6mm^2$ Din-Rail Terminals
Alarm / Other Terminals	$2.5mm^2$ PCB 2-part Screw Terminals	$2.5mm^2$ PCB 2-part Screw Terminals	$2.5mm^2$ PCB 2-part Screw Terminals

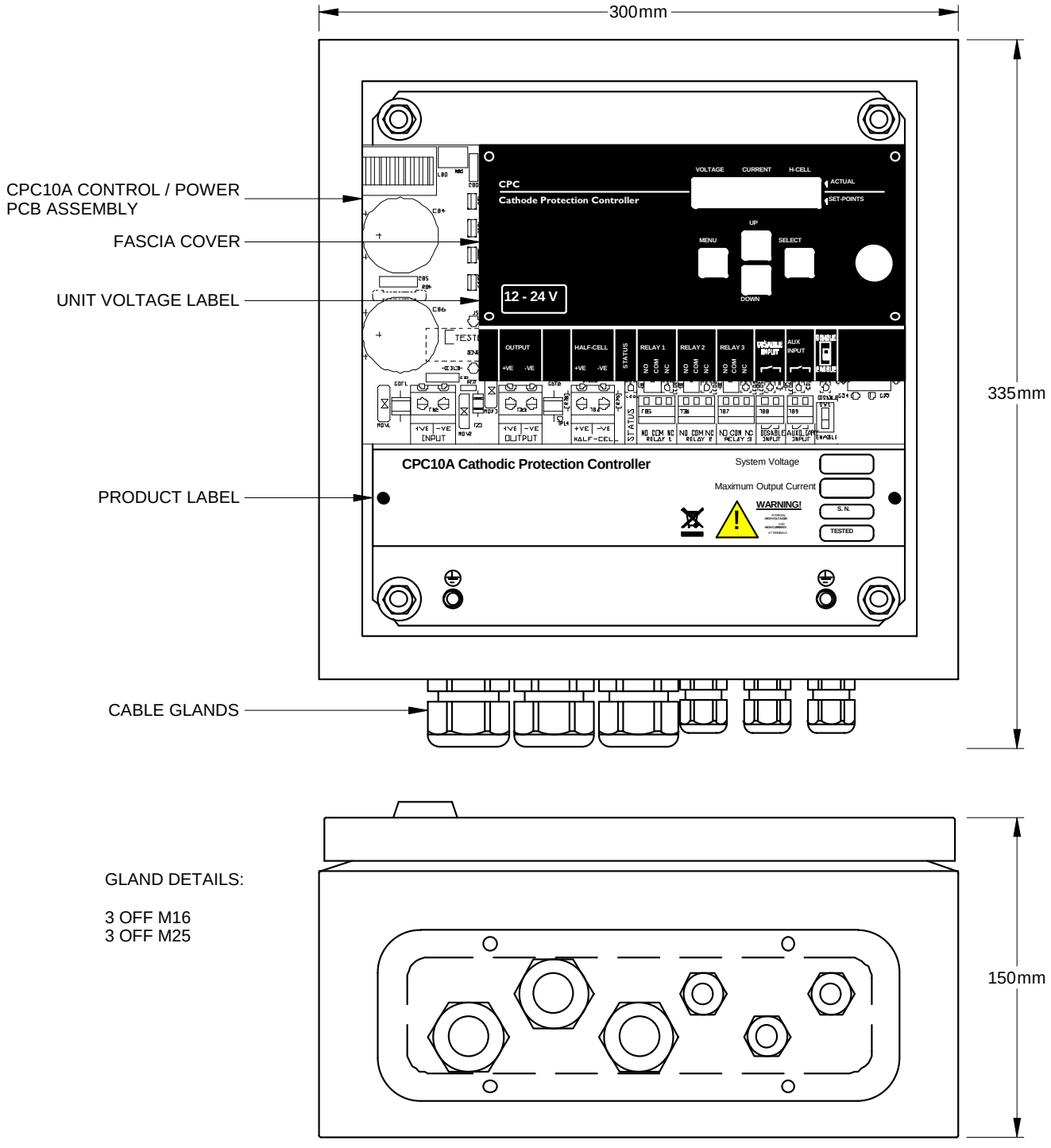
1.10. Gland Sizes and Cable Acceptance

The following nylon glands may be used across the range of CPC10A, CPC25A, CPC50A (see following pages for General Arrangements):

Gland Size	Material	Colour	Cable Size Outside Diameter
M16	Nylon	Light Grey	4.0 – 8.0mm
M20	Nylon	Light Grey	6.0 – 12.0mm
M25	Nylon	Light Grey	13.0 – 18.0mm
M32	Nylon	Light Grey	18.0 – 25.0mm

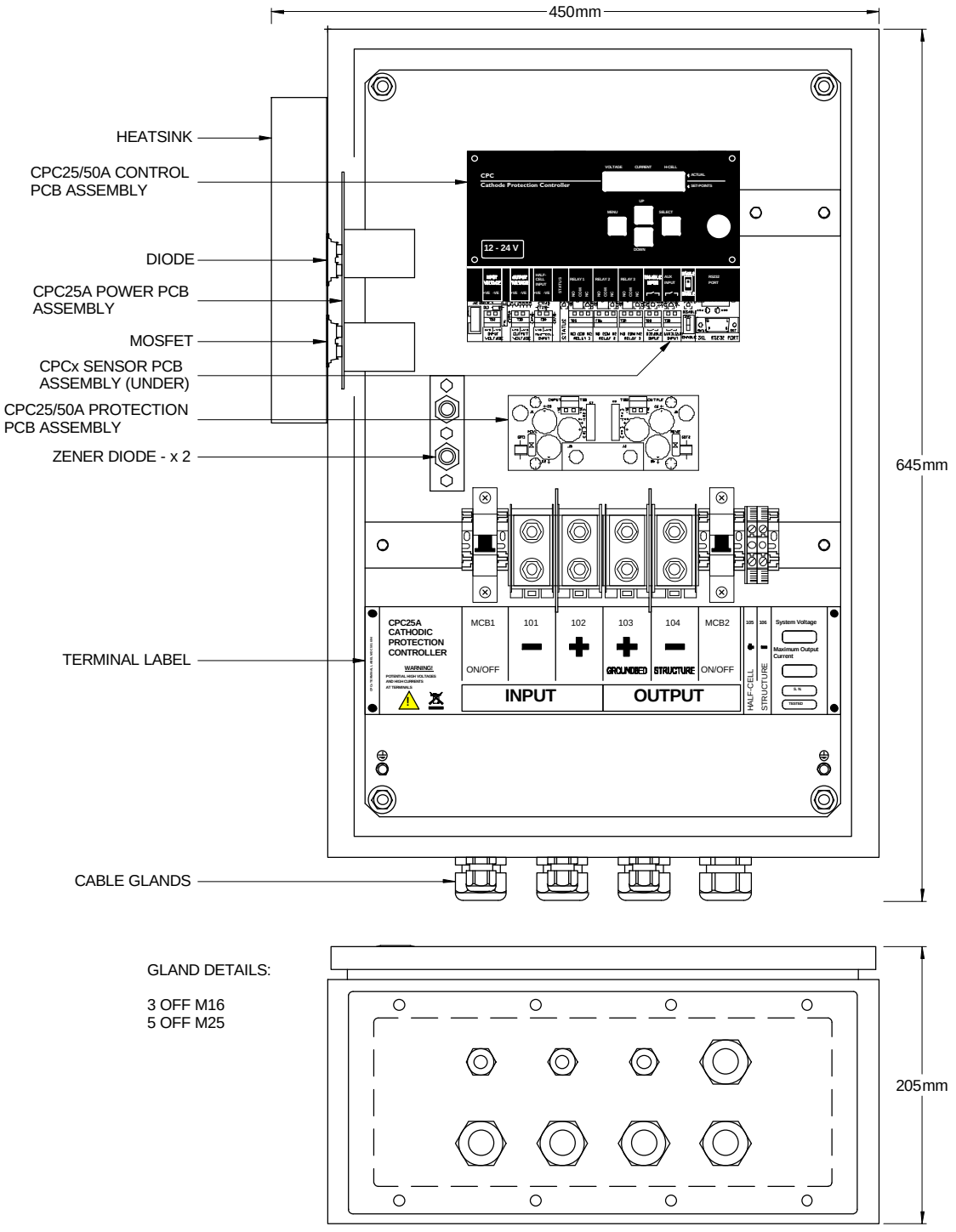
1.11. CPC10A – Painted/Stainless Steel Enclosure General Arrangement

Control PCB Assembly Micha Part Number	System Voltage	Control PCB Assembly Description
401 295	12V	CPC10A 12V Control/Power PCB Assembly
401 296	24-48V	CPC10A 24-48V Control/Power PCB Assembly
401 301	12V	CPC10A 12V Control/Power RS232/Data Log PCB Assembly
401 302	24-48V	CPC10A 24-48V Control/Power RS232/Data Log PCB Assembly



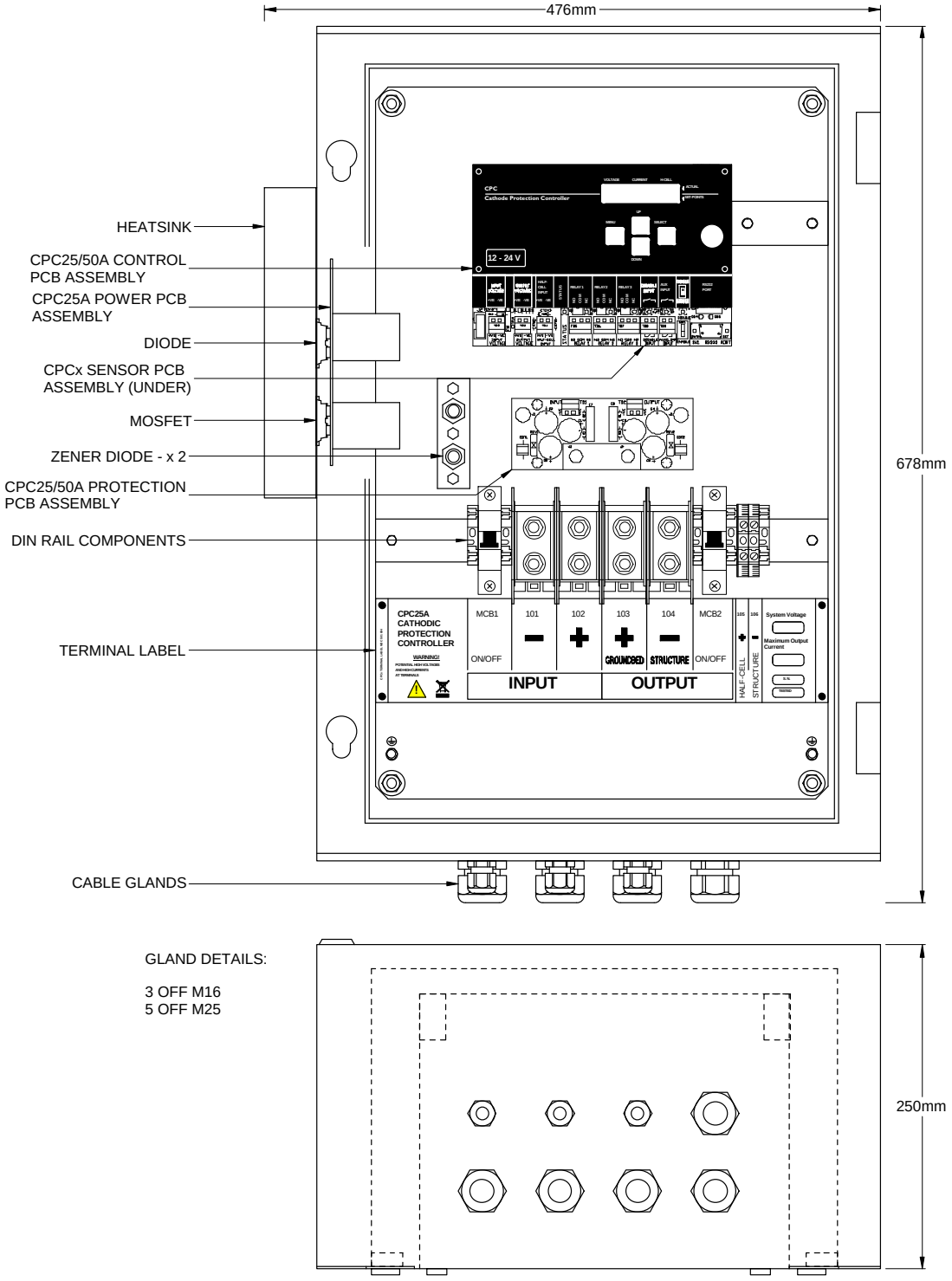
1.12. CPC25A – Painted/Stainless Steel Enclosure General Arrangement

Control PCB Assembly Micha Part Number	System Voltage	Control PCB Assembly Description
401 307	12V	CPC25/50A 12V Control PCB Assembly
401 308	24-48V	CPC25/50A 24-48V Control PCB Assembly
401 311	12-48V	CPC25A Power PCB Assembly
401 313	12-48V	CPC25/50A Protection PCB Assembly
401 370	12-48V	CPC25/50A Sensor PCB Assembly



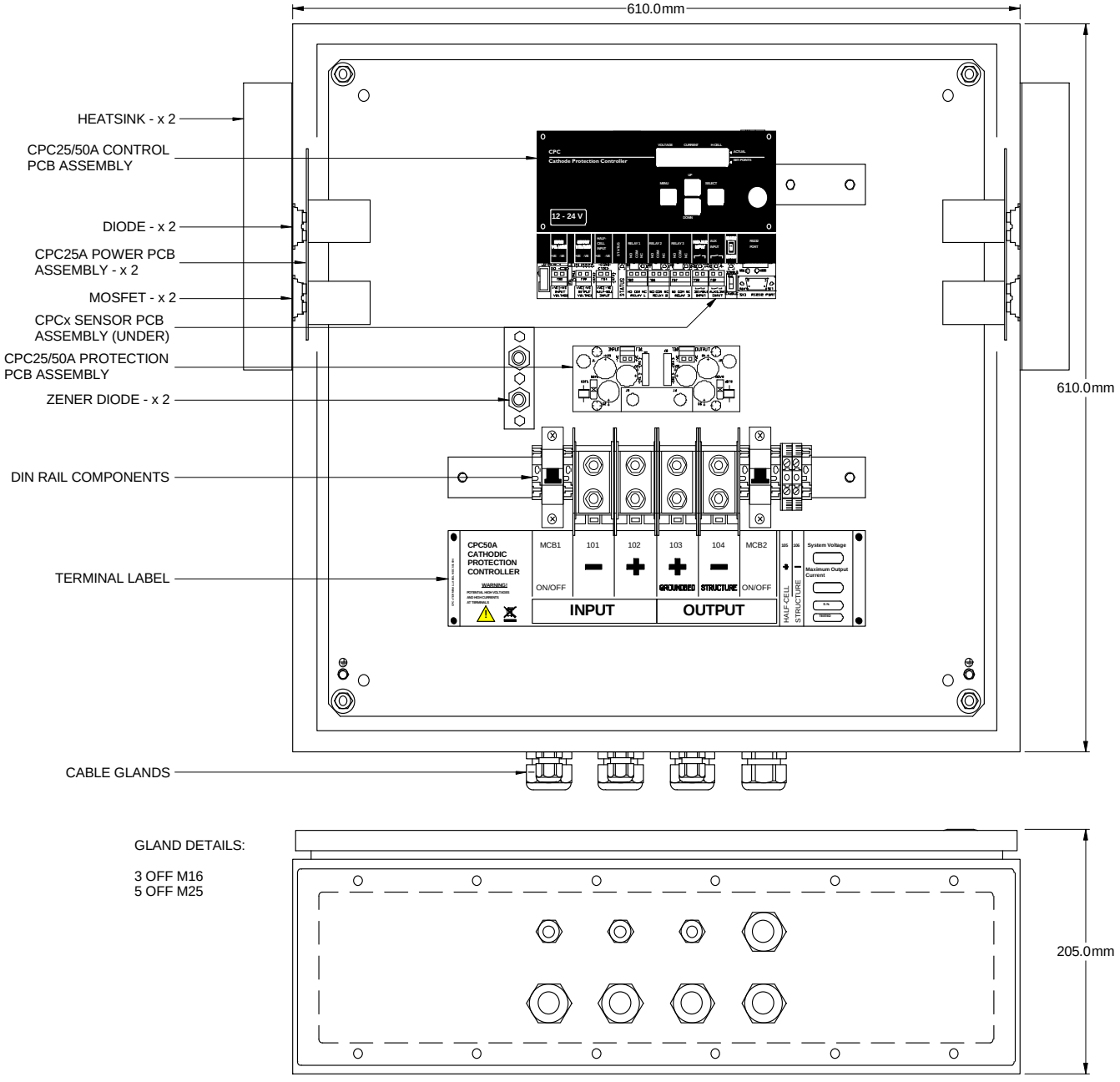
1.13. CPC25A – GRP (Glass Reinforced Polyester) Enclosure General Arrangement

Control PCB Assembly Micha Part Number	System Voltage	Control PCB Assembly Description
401 307	12V	CPC25/50A 12V Control PCB Assembly
401 308	24-48V	CPC25/50A 24-48V Control PCB Assembly
401 311	12-48V	CPC25A Power PCB Assembly
401 313	12-48V	CPC25/50A Protection PCB Assembly
401 370	12-48V	CPC25/50A Sensor PCB Assembly



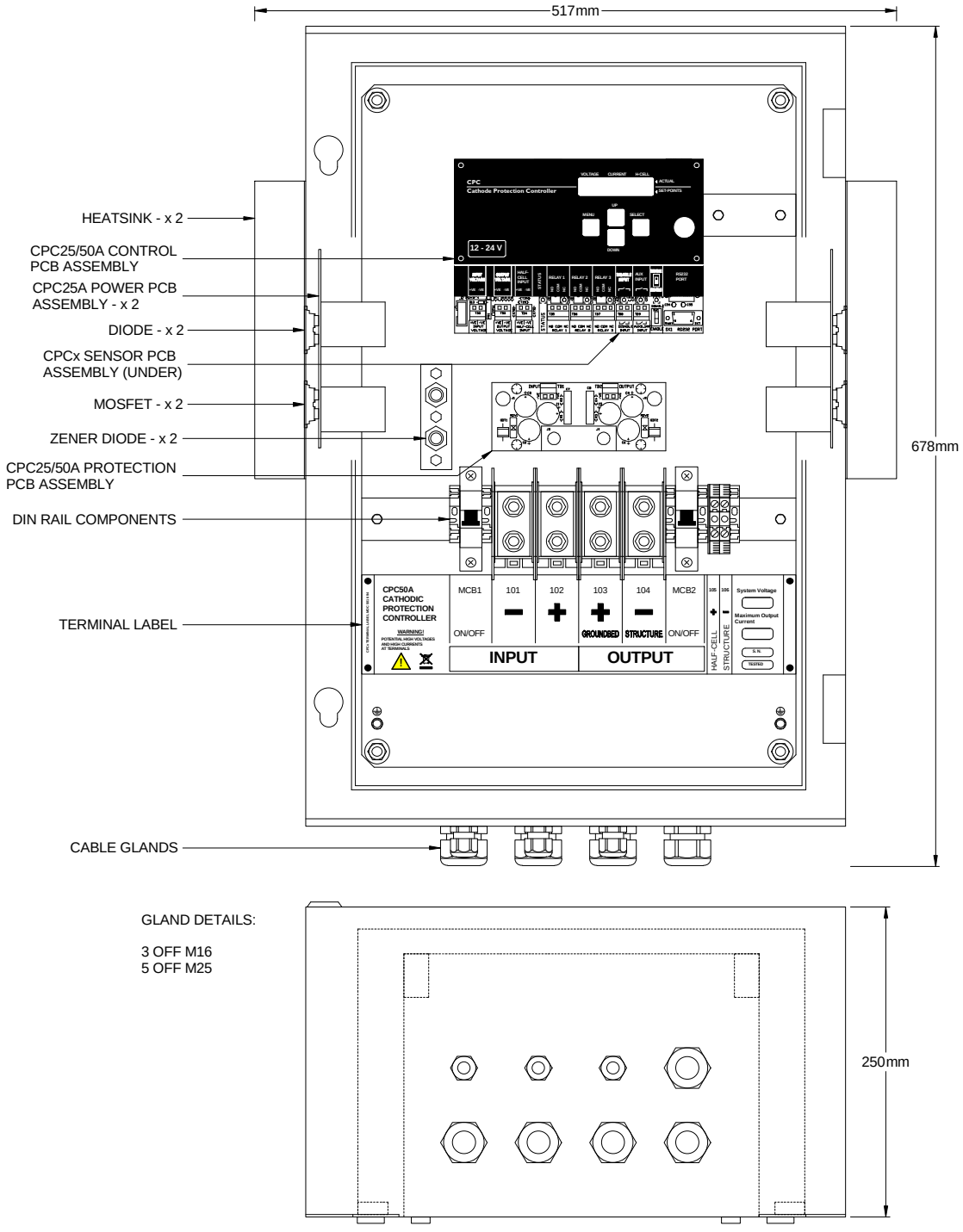
1.14. CPC50A - Painted/Stainless Steel Enclosure General Arrangement

Control PCB Assembly Micha Part Number	System Voltage	Control PCB Assembly Description
401 307	12V	CPC25/50A 12V Control PCB Assembly
401 308	24-48V	CPC25/50A 24-48V Control PCB Assembly
401 311	12-48V	CPC25A Power PCB Assembly
401 313	12-48V	CPC25/50A Protection PCB Assembly
401 370	12-48V	CPC25/50A Sensor PCB Assembly



1.15. CPC50A - GRP (Glass Reinforced Polyester) Enclosure General Arrangement

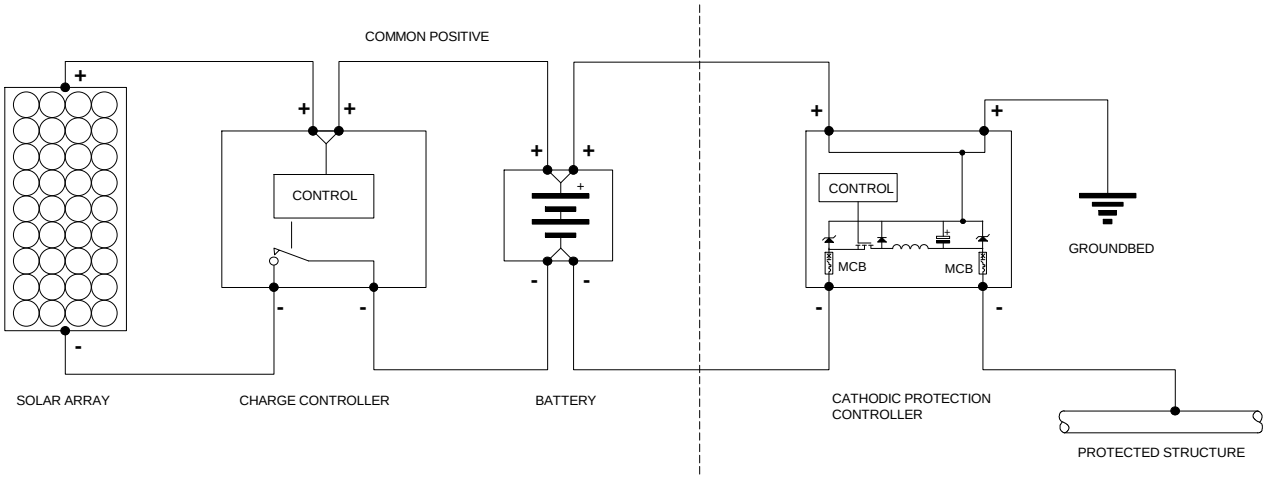
Control PCB Assembly Micha Part Number	System Voltage	Control PCB Assembly Description
401 307	12V	CPC25/50A 12V Control PCB Assembly
401 308	24-48V	CPC25/50A 24-48V Control PCB Assembly
401 311	12-48V	CPC25A Power PCB Assembly
401 313	12-48V	CPC25/50A Protection PCB Assembly
401 370	12-48V	CPC25/50A Sensor PCB Assembly



2. Installation

2.1. Recommended System Wiring for Cathodic Protection Systems

As a CP system works by passing current through 'ground', it is essential that the system Common (the Positive potential) is only grounded at the output of the CP Controller. If a ground connection is made at any other point in the system, it is possible that the CP Controller will not be able to monitor or control the output current and voltage correctly, particularly if a reference electrode is used.

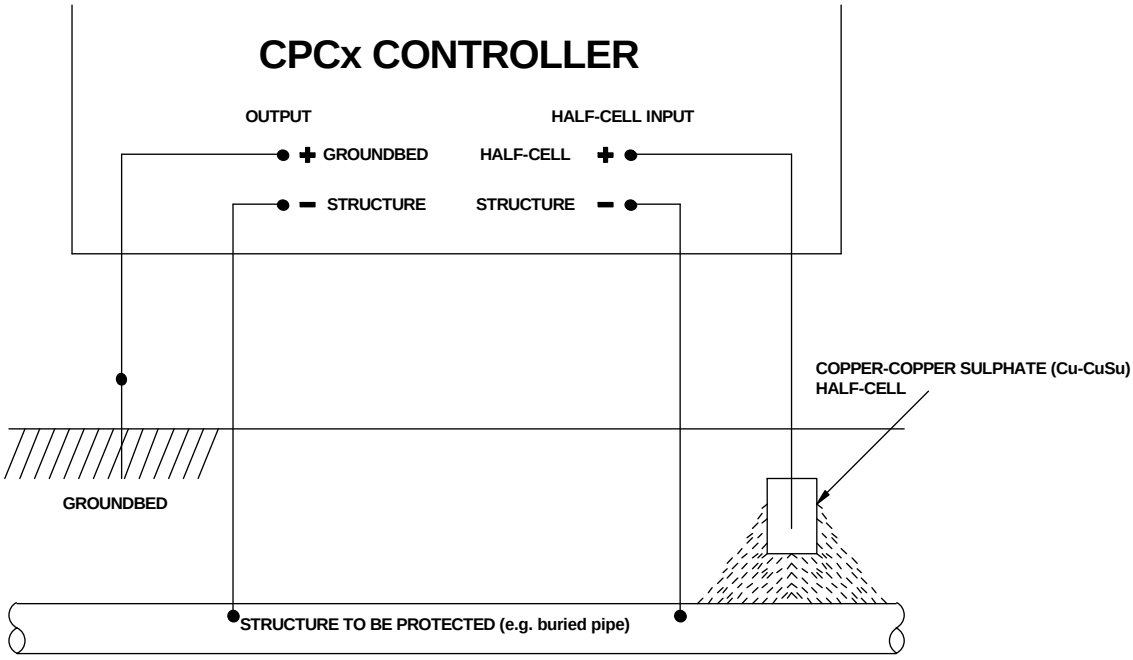


Grounding of Enclosures

The grounding of enclosures and structures is acceptable, but under no circumstances should a connection be made from the system common to a metal enclosure or structure otherwise the protective current is liable to have an adverse effect on these parts, and in some cases may accelerate corrosion.

2.2. Reference Electrode (Half-Cell)

2.2.1. The Reference Electrode is also referred to in this manual as the Hall-Cell. A diagram of how a Half-Cell should be connected is shown below. Note that for protection of the structure, the potential of the structure should be at a lower potential than the Groundbed. Although this may be considered a negative voltage, only the value of the Half-Cell voltage is shown on the display; i.e. if the connections have been made as shown below then the Structure connection to the Half-Cell input will be more negative than the Positive connection to the Half-Cell, and the value of that potential will be shown on the display.



2.3. Mounting and Position

The Cathodic Protection Controller should be installed using the four mounting feet provided and situated within 2 meters of the Charge Controller. Ensure that the fixing method employed is sturdy enough to support the weight of the unit. Position the unit so that it is shaded from direct sunlight, sheltered from extreme weather conditions and oriented so that the cable glands are pointing downwards. See the following pages for enclosure mounting details.

2.4. Electrical Connections

The electrical connections can be made to the Cathodic Protection Controller once the Charge Controller has been installed and commissioned. Before proceeding with any electrical connections, first ensure that the output MCB of the Charge Controller (if it has one) is in the OFF position.

2.4.1. Ensure the Enable/Disable switch on the CPC Control PCB Assembly is in the Disable position

2.4.2. CPC Unit terminal INPUT +VE connect to DC Power Source positive connection

2.4.3. CPC Unit terminal INPUT –VE connect to the DC Power Source negative connection

2.4.4. CPC Unit terminal OUTPUT +VE connect to the Groundbed

2.4.5. CPC Unit terminal OUTPUT –VE connect to the Structure to be protected

2.4.6. CPC Unit terminal HALF-CELL +VE connect to the Half-Cell positive terminal (if being used)

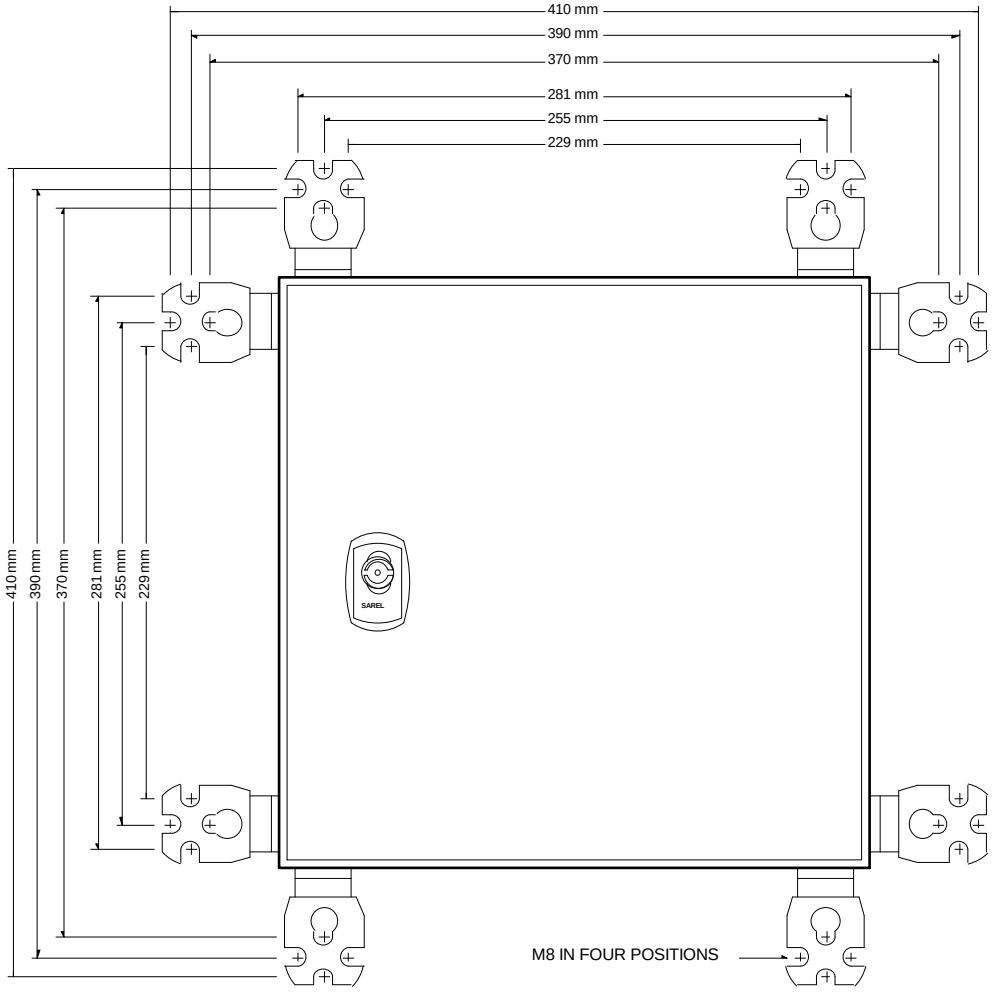
2.4.7. CPC Unit terminal HALF-CELL –VE connect to the Structure to be protected (if being used)

2.4.8. CPC Unit Alarm Relay Contacts: connect to external telemetry system as required

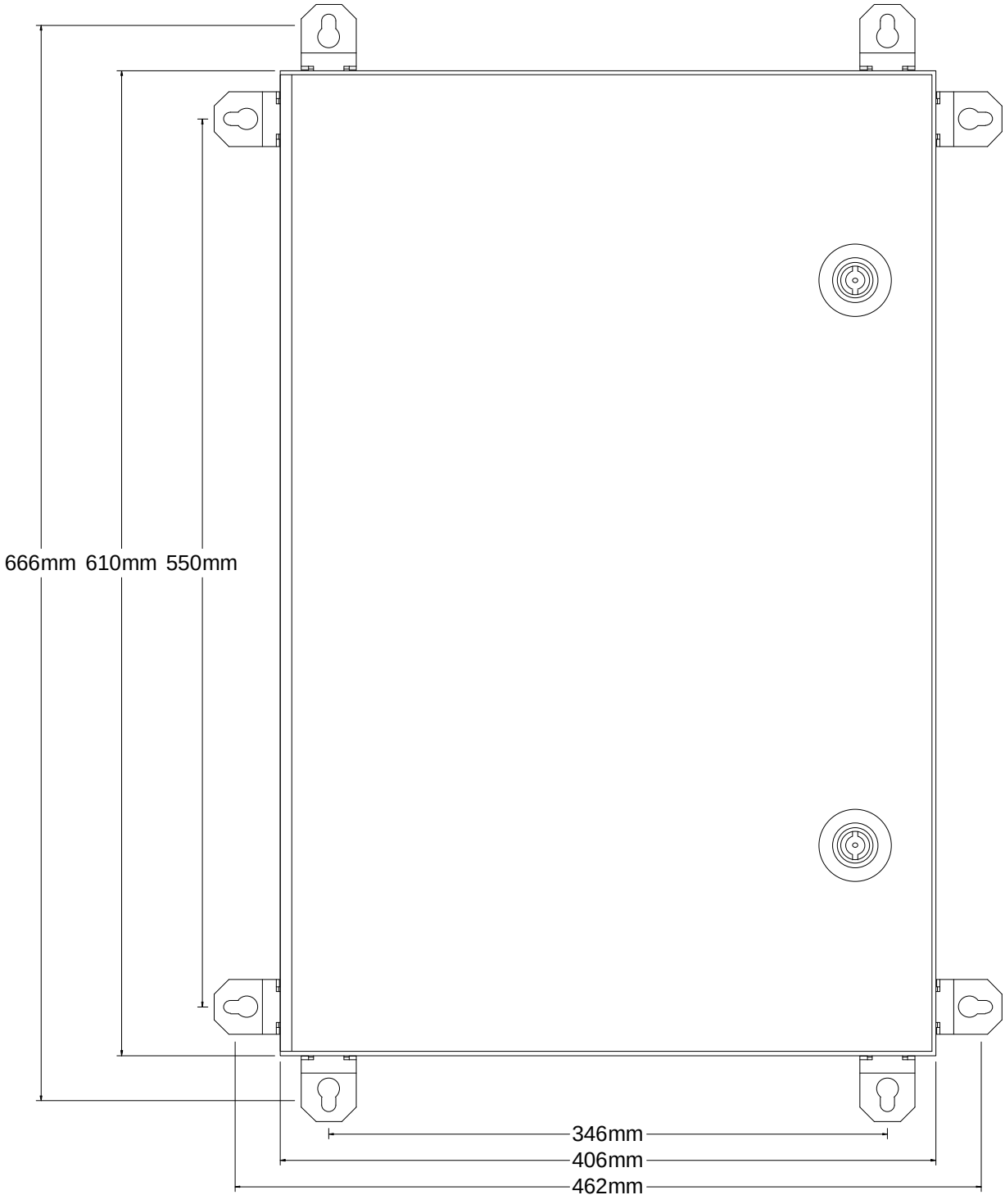
2.4.9. CPC Unit Disable Input Volt-free Contacts: connect to external telemetry system as required

2.4.10. CPC Unit Auxiliary Input Volt-free Contacts: connect to external telemetry system as required

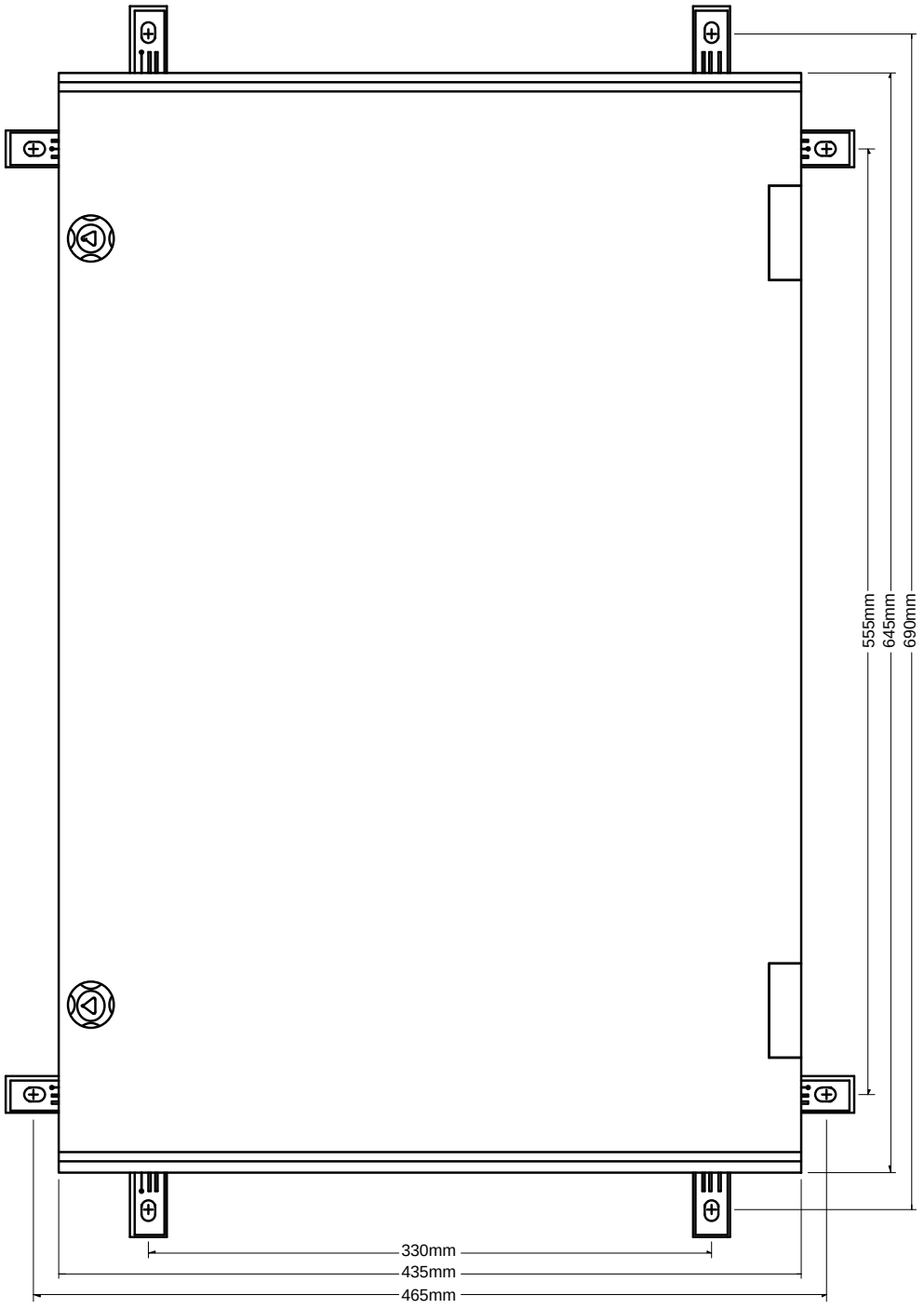
2.5. CPC10A Painted/Stainless Steel Enclosure Mounting



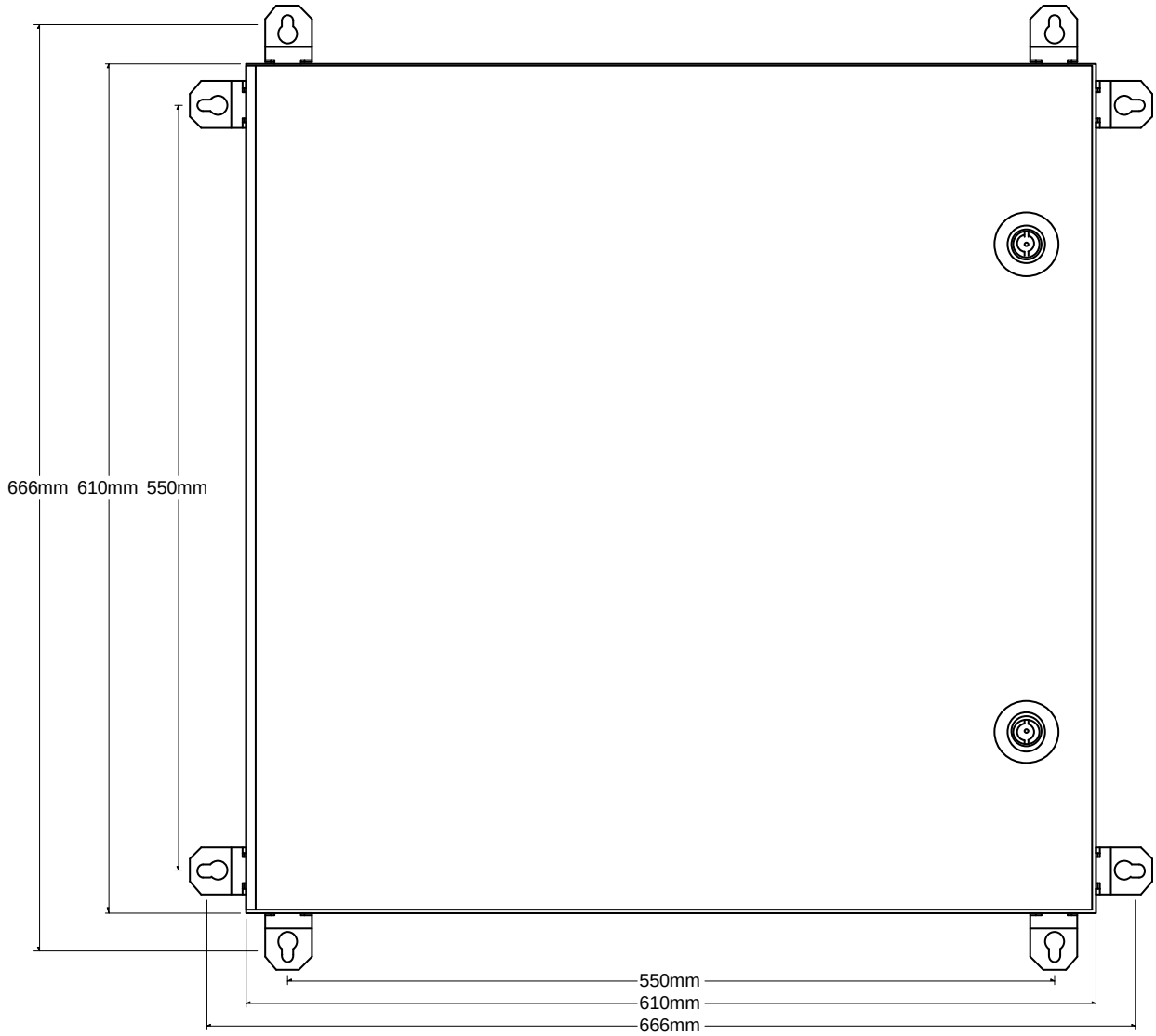
2.6. CPC25A Painted/Stainless Steel Enclosure Mounting



2.7. CPC25/50A GRP (Glass Reinforced Polyester) Enclosure Mounting



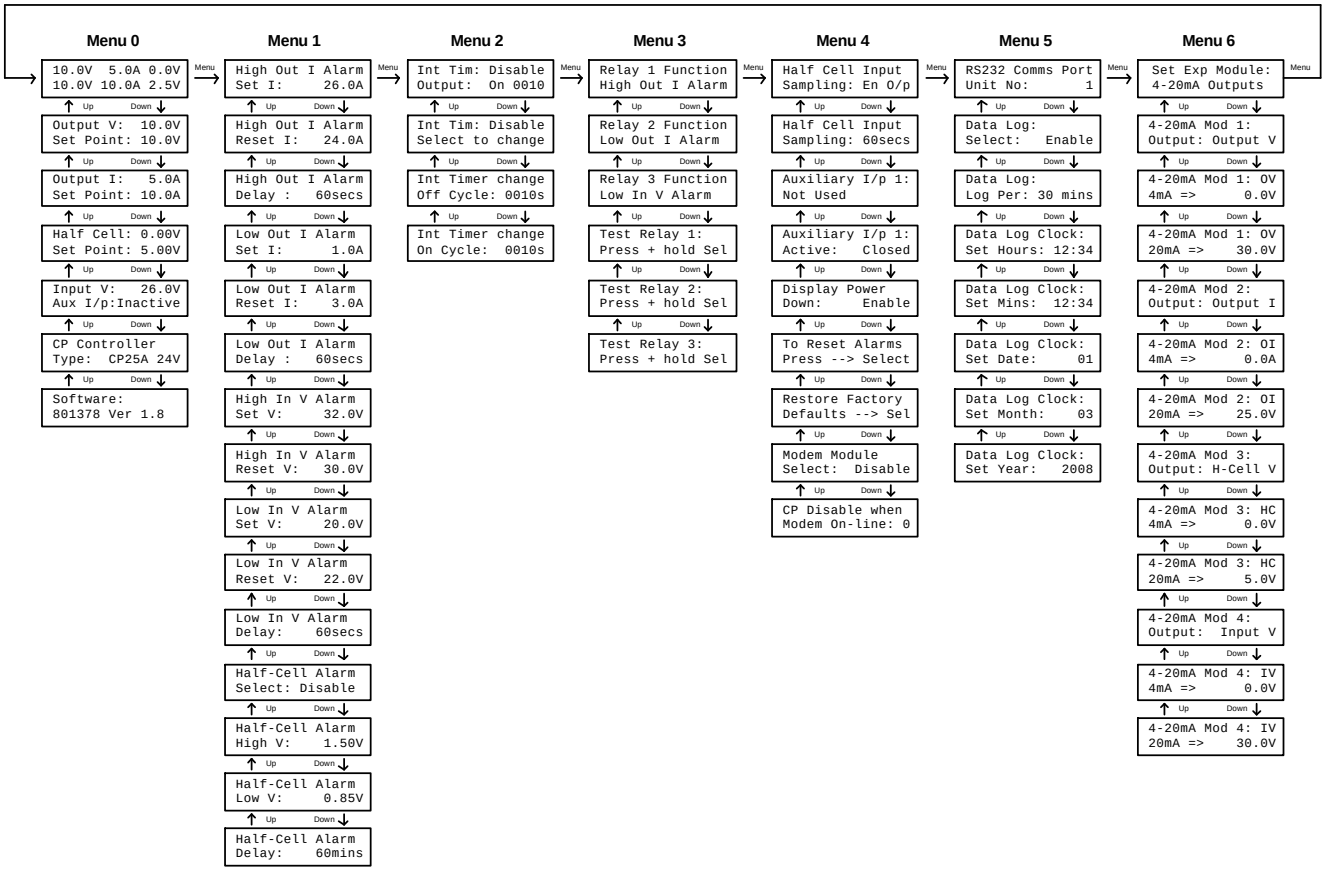
2.8. CPC50A Painted/Stainless Steel Enclosure Mounting



3. Operational Menus

The Cathodic Protection Controller uses a microprocessor to provide control and diagnostic features in the unit. A 2x16 alphanumeric LCD Display is used to indicate parameters and set-points as described below. The following diagram describes the various screens available to the user:

CPC Software Menu Guide:



3.1. Menu Navigation

Navigating the menus is done by using the Menu, Up and Down switches while the Select switch will activate various functions. Pressing Menu and Down together will take the user back to Menu 0 Screen 0 (Home).

Pressing the Menu switch at any screen in Menu 0 will change the display to show the top screen of Menu 1. In a similar manner, the user can move to Menus 2, 3 and 4 and back to Menu 0, by pressing the Menu switch repeatedly.

The Up and Down Switches will move the user up and down within a menu.

3.2. Parameter and Set-point Adjustment

At the appropriate screen, press Select and the parameter will flash. Use the Up and Down switches and/or the Rotary Encoder switch to select the desired value. Press Select again to accept and store the value in non-volatile memory.

3.3. Enable / Disable Switch

The Enable / Disable switch is provided on the CPC Control PCB Assembly and allows the user to Enable or Disable the output current as required by moving the switch to the appropriate position. If the switch is in the Disable position, a red LED illuminates as a warning. For normal CP operation the switch should be in the Enable position.

3.4. Disable Input

The unit has a Disable Input which may be connected to Volt-free contacts. When the contacts are closed, the CP Output will be Disabled and an associated LED will be illuminated.

3.5. Menu 0 – Status

Menu 0	Screen	Description
10.0V 5.0A 0.0V 10.0V 10.0A 2.5V	Screen 0 (Home)	Actual Values: Output Voltage / Output Current / Half-Cell Voltage Set points: Output Voltage / Output Current / Half-Cell Voltage
Output V: 10.0V Set Point: 10.0V	Screen 1	Output Voltage Actual Value Output Voltage Set-point (adjust set-point using this screen)
Output I: 5.0A Set Point: 10.0A	Screen 3	Output Current Actual Value Output Current Set-point (adjust set-point using this screen)
Half Cell: 0.00V Set Point: 2.50V	Screen 4	Half-Cell Voltage Actual Value Half-Cell Voltage Set-point (adjust set-point using this screen)
Input V: 26.0V Aux I/p:Inactive	Screen 5	Input Voltage Actual Value Auxiliary Input Status (Inactive or Active)
CP Controller Type: CPC25A 24V	Screen 6	CP Controller Identification Screen Shows CPC model and voltage
Software: 801378 Ver 1.7	Screen 7	Microcontroller Software Program Number and Version

3.5.1. Menu 0 Screen 0 (Home Screen)

The actual values are shown for indication only and are accurate to 2%.

Any active alarms will be displayed in sequence with the set points on the second line.

For more precise measurements of any value, use a calibrated DVM (and current probe for current).

3.5.2. Set-points

The Set-points are more easily adjusted using the rotary encoder control to the right of the four keypad switches. Care should be taken that either the Output Voltage Set-point or the Output Current Set-point is set to zero when power is first applied. Then the appropriate set-point may be increased and the Output Voltage and Current will increase in sympathy.

When configured as a Master Unit, Screen 3 will show the Master Current (MI) and Slave Current (SI) values as two figures on the first line. The Set-point being adjusted is the combined Output Current.

3.5.3. Input Voltage

The Input Voltage is shown on Menu 0 Screen 5. It is shown for indication only and is accurate to 2%.

3.5.4. Auxiliary Input Status

The unit has an Auxiliary input which may be connected to Volt-free contacts. The function of the Auxiliary Input may be programmed using Menu 4 Screen 2.

The Auxiliary Input Status is shown on Menu 0 Screen 5.

The sense of the operation of the volt-free contacts connected to the Auxiliary Input may also be programmed using Menu 4 Screen 3. The user may select which is considered to be the active state for the Auxiliary Input: i.e. the default is contacts closed = active state (if the external contacts are Normally Open), but it is possible to select contacts open = active state (if the external contacts are Normally Closed).

3.6. Menu 1 – Alarm Settings

Menu 1	Screen	Description
High Out I Alarm Set I: 26.0A	Screen 0	High Output Current Alarm: Alarm Trip Level (Defaults: CPC10A = 11.0A / CPC25A = 26.0A / CPC50A = 51.0A)
High Out I Alarm Reset I: 24.0A	Screen 1	High Output Current Alarm: Alarm Reset Level (Defaults: CPC10A = 9.0A / CPC25A = 24.0A / CPC50A = 49.0A)
High Out I Alarm Delay : 60secs	Screen 2	High Output Current Alarm: Delay before activation: 10 to 240 seconds (Default = 60 seconds)
Low Out I Alarm Set I: 1.0A	Screen 3	Low Output Current Alarm: Alarm Trip Level (Defaults: CPC10A = 0.5A / CPC25A = 1.0A / CPC50A = 1.0A)
Low Out I Alarm Reset I: 3.0A	Screen 4	Low Output Current Alarm: Alarm Reset Level (Defaults: CPC10A = 2.0A / CPC25A = 3.0A / CPC50A = 3.0A)
Low Out I Alarm Delay : 60secs	Screen 5	Low Output Current Alarm: Delay before activation: 10 to 240 seconds (Default = 60 seconds)
High In V Alarm Set I: 32.0V	Screen 6	High Input Voltage Alarm: Alarm Trip Level (Defaults: 12V Unit = 16.0V / 24V Unit = 32.0V / 48V Unit = 64.0V)
High In V Alarm Reset I: 30.0V	Screen 7	High Input Voltage Alarm: Alarm Reset Level (Defaults: 12V Unit = 15.0V / 24V Unit = 30.0V / 48V Unit = 60.0V)
Low In V Alarm Set I: 20.0V	Screen 8	Low Input Voltage Alarm: Alarm Trip Level (Defaults: 12V Unit = 10.0V / 24V Unit = 20.0V / 48V Unit = 40.0V)
Low In V Alarm Reset I: 22.0V	Screen 9	Low Input Voltage Alarm: Alarm Reset Level (Defaults: 12V Unit = 11.0V / 24V Unit = 22.0V / 48V Unit = 44.0V)
Low In V Alarm Delay : 60secs	Screen 10	Low Input Voltage Alarm: Delay before activation: 10 to 240 seconds (Default = 60 seconds)
Half-Cell Alarm Select: Disable	Screen 11	Half-Cell Voltage Alarm: Disable or Enable (Default = Disabled)
Half-Cell Alarm High V: 1.50V	Screen 12	Half-Cell Voltage Alarm: Alarm Trip Level Default = 1.50V
Half-Cell Alarm Low V: 0.85V	Screen 13	Half-Cell Voltage Alarm: Alarm Reset Level Default = 0.85V
Half-Cell Alarm Delay : 60mins	Screen 14	Half-Cell Voltage Alarm: Delay before activation: 10 to 240 minutes (Default = 60 minutes)

3.6.1. High Output Current Alarm (Screens 0-2)

If the CP output current exceeds the High Output Current Alarm Trip level for the High Output Current Alarm Delay period, then the High Output Current Alarm will be active. If the CP output current falls below the High Output Current Alarm Reset level then the High Output Current Alarm will be in-active. Any alarm relay and associated LED can be programmed to activate when this alarm function is active (see Menu 3).

3.6.2. Low Output Current Alarm (Screens 3-5)

If the CP output current falls below the Low Output Current Alarm Trip level for the Low Output Current Alarm Delay period, then the Low Output Current Alarm will be active. If the CP output current exceeds the Low Output Current Alarm Reset level then the Low Output Current Alarm will be in-active. Any alarm relay and associated LED can be programmed to activate when this alarm function is active (see Menu 3).

3.6.3. High Input Voltage Alarm (Screens 6, 7)

If the Input Voltage exceeds the High Input Voltage Alarm Trip level, then the High Input Voltage Alarm will be active. If the Input Voltage falls below the High Input Voltage Alarm Reset level then the High Input Voltage Alarm will be in-active. Any alarm relay and associated LED can be programmed to activate when this alarm function is active (see Menu 3).

3.6.4. Low Input Voltage Alarm (Screens 8-10)

If the Input Voltage falls below the Low Input Voltage Alarm Trip level for the Low Input Voltage Alarm Delay period, then the Low Input Voltage Alarm will be active. If the Input Voltage exceeds the Low Input Voltage Alarm Reset level then the Low Input Voltage Alarm will be in-active. Any alarm relay and associated LED can be programmed to activate when this alarm function is active (see Menu 3).

3.6.5. Half-Cell Voltage Alarm (Screens 11-14)

If the Half-Cell Voltage exceeds the Half-Cell High Voltage level for the Half-Cell Alarm Delay period, or if the Half-Cell Voltage falls below the Half-Cell Low Voltage level for the Half-Cell Alarm Delay period, then the Half-Cell Alarm will be active. If the Half-Cell Voltage is between the Half-Cell High Voltage level and the Half-Cell Low Voltage level then the Half-Cell Alarm will be in-active. Any alarm relay and associated LED can be programmed to activate when this alarm function is active (see Menu 3).

3.7. Menu 2 – Interrupt Timer

Menu 2	Screen	Description
`Int Tim: Disable` `Output:  On 0010`	Screen 0	Interrupt Timer Status: Disabled or Enabled (Default = Disabled) Output Status: On or Off (counter decrements during Timer operation)
`Int Tim: Disable` `Select to change`	Screen 1	Interrupt Timer Status: Disabled or Enabled Press the Select switch to change the status of the Interrupt Timer
`Int Timer change` `Off Cycle: 0010s`	Screen 2	Interrupt Timer Off Cycle time change: (Default = 10 seconds) Press Select and change each digit in turn as required
`Int Timer change` `On Cycle:  0010s`	Screen 3	Interrupt Timer On Cycle time change: (Default = 10 seconds) Press Select and change each digit in turn as required

3.7.1. Activating the Interrupt Timer

Navigate to the Interrupt Timer Enable/Disable Screen (Menu 2 Screen 1).

Press the Select switch to change the Interrupt Timer Status from Disable to Enable.

When the Interrupt Timer is Enabled the CP Output will be turned off for the Off Cycle Time and then turn on for the On Cycle Time repeatedly until the Interrupt Timer is Disabled.

When the Interrupt Timer turns the CP Output off, the Disable Input LED will illuminate.

The Interrupt Timer always starts with the Off Time (i.e. the CP Output is interrupted).

3.7.2. De-activating the Interrupt Timer

Navigate to the Interrupt Timer Enable/Disable Screen (Menu 2 Screen 1).

Press the Select switch to change the Interrupt Timer Status from Enable to Disable (or back).

The CP Output will return to the normal operation as set before the Interrupt Timer was Enabled.

3.7.3. Interrupt Timer – Changing the Off or On Cycle Times

Use the Select switch to select each digit in turn in order to change its value. Use the Up and Down switches to change the flashing digit. After all four digits have been selected in turn, press Select to accept the new value. No digit will flash and the new value is accepted.

3.7.4. Using the Auxiliary Input to Enable / Disable the Interrupt Timer

It is possible to use the Auxiliary Input to Enable and Disable the Interrupt Timer:

Navigate to Menu 4 Screen 2 and select the "Int Timer Enable" option. When this option is chosen, the Interrupt Timer will be Enabled when the Auxiliary Input is Active and it will be Disabled when the Auxiliary Input is In-active. The Off and On Cycle Times can only be programmed using the Menu 2 Screens 2 & 3 as normal.

Note: If the Interrupt Timer is controller by the Auxiliary Input then it is not possible to activate or de-activate the Interrupt Timer using the keypad in Menu 2 Screen 1.

3.8. Menu 3 – Alarm Relay Function and Test

Menu 3	Screen	Description
Relay 1 Function High Out I Alarm	Screen 0	Alarm Relay 1 Function: Set to desired function (Default = High Current Alarm)
Relay 2 Function Low Out I Alarm	Screen 1	Alarm Relay 2 Function: Set to desired function (Default = Low Current Alarm)
Relay 3 Function Low In V Alarm	Screen 2	Alarm Relay 3 Function: Set to desired function (Default = Low Input Voltage Alarm)
Test Relay 1: Press + hold Sel	Screen 3	Alarm Relay 1 Test: Press Select switch to test the Relay operation
Test Relay 2: Press + hold Sel	Screen 4	Alarm Relay 2 Test: Press Select switch to test the Relay operation
Test Relay 3: Press + hold Sel	Screen 5	Alarm Relay 3 Test: Press Select switch to test the Relay operation

3.8.1. Programming Relay Functions

Each Alarm Relay may be programmed to activate when any one of the following alarms or functions is active:

High out I Alarm = High Output Current Alarm

Low Out I Alarm = Low Output Current Alarm

Low In V Alarm = Low Input Voltage Alarm

Common Alarm = Any active Alarm

System Normal = No active Alarm

CP Output Status = Cathodic Protection Output Status

Auxiliary I/p 1 = Auxiliary Input Active

High In V Alarm = High Input Voltage Alarm

Half-Cell Alarm = Half-Cell Alarm

Interrupt Timer = Active when the CP Output is disabled due to the Interrupt Timer

3.8.2. Testing Relays

Each Alarm Relay may be tested for operation of the contacts and illumination of the associated LED using Menu 3 Screen 3-5.

3.9. Menu 4 – Miscellaneous

Display	Screen	Description
Half Cell Input Sampling: En O/p	Screen 0	Half Cell Sampling: when the measurement is made the user can choose to Enable the CP Output (Default) or Disable the CP Output.
Half Cell Input Sampling: 60s	Screen 1	Half Cell Sampling: the user can vary the time between sampling of the Half Cell from 10 to 240 seconds (Default = 60 seconds)
Auxiliary I/p 1: Not Used	Screen 2	Auxiliary Input Function: (Default = Not Used) Not Used / Int (Interrupt) Timer Enable / Disable output
Auxiliary I/p 1: Active: Closed	Screen 3	Auxiliary Input Volt-free Contact Function: Active Contact = Closed or Open (Default = Active Closed)
Display Power Down: Enable	Screen 4	LCD Display Power Down 240 seconds after last keypad switch press: Enabled (Default) = enable power down / Disabled = display always on
To Reset Alarms Press --> Select	Screen 5	Alarm Reset Press Select to reset any active alarms
Restore Factory Defaults --> Sel	Screen 6	Restore Factory Defaults Press Select to set all Set-Points back to factory default settings
Modem Module Select: Disable	Screen 7	Modem Module Select: Disable, Type x (x=1, 2 …)
CP Disable when Modem On-line: 0	Screen 8	CP Output Disable when modem On-line Option: 0 = CP Output Enabled / 1 = CP Output Disabled

3.9.1. Half-Cell (Reference Electrode) Sampling

Some Half-Cells (Reference Electrodes) require to be connected to electronics with an extremely high input impedance – typically 20M Ohms. It can be a major challenge to design a measurement circuit which will satisfy this requirement over years and in a hot and humid environment.

The CPC unit meets this requirement by using a high impedance measurement circuit which is only connected to the Half-Cell for a short period of time (typically milliseconds) and then is disconnected from the Half-Cell for most of the time: i.e. the CPC samples the Half-Cell Voltage every few seconds The CPC uses solid-state switching devices to sample the Half-Cell. The Sampling time can be adjusted using Menu 4 Screen 1.

Some manufacturers of Half-Cell's state that in order to take a true reading of the structure to soil potential, it is necessary to turn off the CP Output. The choice of turning off the CP Output or not when the Half-Cell is being sampled is a decision to be made based on the type of Half-Cell being used and any recommendations from the Half-Cell manufacturer. Since the Half-Cell voltage moves very slowly, the sampling time is set by the factory to once every 60 seconds (Menu 4 Screen 1).

3.9.2. Auxiliary Input to Enable / Disable the Interrupt Timer

It is possible to use the Auxiliary Input to Enable and Disable the Interrupt Timer – see section 3.7.4.

3.9.3. Auxiliary Input Volt-free Contact Function

The sense of the operation of the volt-free contacts connected to the Auxiliary Input may also be programmed using Menu 4 Screen 3.

3.9.4. LCD Display Power Down

To lengthen the life of the LCD Display it will be powered down 240 seconds after the last keypad switch press. The user may disable this feature (Menu 4 Screen 4).

3.9.5. Alarm Reset

Any active alarms can be reset by using this screen (Menu 4 Screen 5). Note that if any alarm situation is still valid, that alarm re-activate after the existing preset delay.

3.9.6. Modem Module Select

If a Modem module is used in the unit, this screen must be set to the correct Type. This is usually done by the manufacturer before shipping. For more details, contact the manufacturer.

3.9.7. CP Disable when Modem On-line

This option allows the CP Output to be Disabled when the communications Modem is On-line. It does not affect the CP output at any other time. This feature may be used for diagnostic purposes.

3.9.8. Restore Factory Defaults

Parameter Description	Factory Default Setting
Output Voltage Set-point	0.0V
Output Current Set-point	CPC10A = 10.0A / CPC25A = 25.0A / CPC50A = 50.0A
Half-Cell Voltage Set-point	5.0V
High Output Current Alarm Trip Level	CPC10A = 11.0A / CPC25A = 26.0A / CPC50A = 51.0A
High Output Current Alarm Reset Level	CPC10A = 9.0A / CPC25A = 24.0A / CPC50A = 49.0A
High Output Current Alarm Delay	60 seconds
Low Output Current Alarm Trip Level	CPC10A = 0.5A / CPC25A = 1.0A / CPC50A = 1.0A
Low Output Current Alarm Reset Level	CPC10A = 2.0A / CPC25A = 3.0A / CPC50A = 3.0A
Low Output Current Alarm Delay	60 seconds
High Input Voltage Alarm Trip Level	12V Unit = 16.0V / 24V Unit = 32.0V / 48V Unit = 64.0V
High Input Voltage Alarm Reset Level	12V Unit = 15.0V / 24V Unit = 30.0V / 48V Unit = 60.0V
Low Input Voltage Alarm Trip Level	12V Unit = 10.0V / 24V Unit = 20.0V / 48V Unit = 40.0V
Low Input Voltage Alarm Reset Level	12V Unit = 11.0V / 24V Unit = 22.0V / 48V Unit = 44.0V
Low Input Voltage Alarm Delay	60 seconds
Half-Cell Voltage Alarm: Enabled/Disabled	Disabled
Half-Cell Voltage Alarm Trip Level	1.50V
Half-Cell Voltage Alarm Reset Level	0.85V
Half-Cell Voltage Alarm Delay	60 minutes
Interrupt Timer: Enabled/Disabled	Disabled
Interrupt Timer Off Cycle Time	10 seconds
Interrupt Timer On Cycle Time	10 seconds
Alarm Relay 1 Function	High Current Alarm
Alarm Relay 2 Function	Low Current Alarm
Alarm Relay 3 Function	Low Input Voltage Alarm
Half Cell Input Sampling: Enable/Disable Output	Enable Output
Half Cell Input Sampling Period	60 seconds
Auxiliary Input Function	Not used
Auxiliary Input Volt-free Contact Function	Active Closed
LCD Display Power Down: Enabled/Disabled	Enabled
RS232 Communications Port Number	1
RS232 Response Type	Type 0
Data Logging: Enabled / Disabled	Enabled
Data Logging Period	30 minutes

3.10. Menu 5 – RS232 & Data Logging Menu

Display	Screen	Description
RS232 Comms Port Number: 1	Screen 0	RS323 Communications Port Number: (Default = 1) In a multi-controller environment each unit must have a different number
Data Log: Select: Enable	Screen 1	Data Log Status: Enable / Disable: Press Select to toggle the Data Logger Status (Default = Enable)
Data Log: Log Per: 30mins	Screen 2	Data Logging Period: Select from: 15 minutes / 30 minutes (Default) / 60 minutes
Data Log Clock: Set: Hours:12:34	Screen 3	Data Logging Clock: Set Hours
Data Log Clock: Set: Mins: 12:34	Screen 4	Data Logging Clock: Set Minutes
Data Log Clock: Set: Date: 01	Screen 5	Data Logging Clock: Set Date
Data Log Clock: Set: Month: 03	Screen 6	Data Logging Clock: Set Month
Data Log Clock: Set: Year: 2008	Screen 7	Data Logging Clock: Set Year

3.10.1. RS232 Communications Port

The RS232 Communications Port Number (Screen 0) must match the PC command in order for the unit to respond. If there is more than one controller with an RS232 Port in a system then each RS232 Port must be set with a unique number between 1 and 9.

3.10.2. Data Log Status

The CPC10A Controller can be supplied with or without an RS232 Port and Data Logging.

The CPC25A and CPC50A Controllers are supplied with an RS232 Port and Data Logging as standard.

NOTE: Controllers supplied with an RS232 Port and Data Logging have Data Logging enabled during factory testing. If the Controller's settings are reset to their Default values (see Section 3.9.6) Data Logging is enabled.

For units without an on-board RS232 Port and Data Logging, an RS232 Port & Data Logger DRM (Din Rail Module) may be connected. In these circumstances, the Data Log Status must be set to Enable (Screen 1) and the rest of the parameters (Screens 2-7) set as appropriate.

NOTE: When the Data Log Status is set to Disable, Screens 2 to 7 are not accessible. The Data Log Status should only be set to Enable if an RS232 Port and Data Logger is fitted.

CAUTION: For units that have an on-board RS232 Port and Data Logging, an RS232 Port & Data Logger DRM (Din Rail Module) must NOT be connected.

3.10.3. Data Log Records

The Data Log holds information about the operation of the Unit in non-volatile memory (i.e. the information is retained when power is lost).

The Data Log consists of various Data Records that are a "snapshot" of the operation of the unit and contain information such as: time, alarm status, interrupt timer status, output status, output voltage and current etc.

Timed Data Records:

The unit can be set to create a Timed Data Record every 15, 30 or 60 minutes.

The unit will create a Timed Data Record when power is applied to the unit.

The unit will create a Timed Data Record after the Data Log is cleared.

The unit can record up to 10,208 Timed Data Records.

Alarm Data Records:

The unit will create an Alarm Data Record when an Alarm changes state (either becomes active or in-active).

The unit will create an Alarm Data Record when the Interrupt Timer is started and stopped. (This is an 'advisory' warning only as some standard alarms - such as the Low Output Current Alarm - will NOT be activated.)

The unit can record up to 2048 Alarm Data Records

3.10.4. Data Log Memory

The Data Log Memory has a maximum size as stated above. The Data Log Memory acts as a First In First out (FIFO) type of memory. When the memory is full, new Data Records are written over the oldest records so the Data log contains the last so many days worth of data.

The table below states the nominal Data Log Memory Capacity based on 10,208 Timed Data Records:

Data Logging Period	15 minutes	30 minutes	60 minutes
Records per day	96 records per day	48 records per day	24 records per day
Memory Capacity	106 days	212 days	425 days

3.10.5. Data Log Downloading

The Data Log may be downloaded into a PC at any time.

The downloading operation does NOT erase the data in the Data Log, erasing the Data Log is a separate operation only available through the RS232 communications port.

3.11. Menu 6 – Set Expansion Module: 4-20mA (Optional Modules)

Display	Screen	Description
Set Exp Module: 4-20mA Outputs	Screen 0	Expansion Module Setting Menu Indentification
4-20mA Mod 1: Output: Output V	Screen 1	4-20mA Transducer Module – Address 1: Set the parameter to be represented
4-20mA Mod 1: OV 4mA => 0.0V	Screen 2	4-20mA Transducer Module – Address 1: Set the value of the parameter that will correspond to 4mA
4-20mA Mod 1: OV 20mA => 30.0V	Screen 3	4-20mA Transducer Module – Address 1: Set the value of the parameter that will correspond to 20mA
4-20mA Mod 2:	Screens 4-6	4-20mA Transducer Module – Address 2 Same setting screens
4-20mA Mod 3:	Screen 7-9	4-20mA Transducer Module – Address 3 Same setting screens
4-20mA Mod 4:	Screen 10-12	4-20mA Transducer Module – Address 4 Same setting screens

3.11.1. Parameters

The 4-20mA Transducer Modules can represent the following parameters in the CPC range:

Output Voltage / Output Current / Half-Cell Voltage / Input Voltage

3.11.2. Further Information

See the 4-20mA Transducer Module Data Sheet for more information.

3.12. Power Up and Configuration Screens

Display	Screen	Description
CP Controller Type: CPC25A 24V	Screen 0	Power Up Screen which is shown for 2 seconds after power up
Configure Unit Voltage: 24V	Screen 1	Configure Unit Voltage: 12V, 24V or 48V
Configure Unit Type: CPC25A	Screen 2	Configure Unit Type: CPC25A or CPC50A Note: CPC10A units cannot be changed
Configure RS232 Response: Type 0	Screen 3	Configure RS232 Response: (Default = Type 0) 0 = Standard / 1 = Custom
Configure Unit Type: Normal	Screen 4	Configure Unit Type: Normal / Master / Slave

3.12.1. Power Up Screen

The Power Up Screen is shown for 2 seconds after power is applied to the Unit.

To enter the Configuration Screens, the Menu and Select switches should be pressed and held down when the Power Up Screen is shown. When the first Configuration Screen is shown, the switches may be released.

Under normal circumstances (when the Menu and Select switches are not pressed) after showing the Power Up Screen for 2 seconds, the unit will automatically go to Menu 0 Screen 0.

3.12.2. Configuration Screens

IMPORTANT: The Configuration Screens should ONLY be used by authorised persons.

The Configuration Screens are intended to be used at time of manufacture to configure the software depending on Unit Voltage and Unit Type.

CAUTION: Setting the Configuration Screens incorrectly may cause incorrect operation.

WARNING: Setting the Configuration Screens incorrectly may result in damaging the unit.

3.12.3. Configure RS232 Communications Response

RS232 Response Type 0 should normally be selected. This is the standard setting.

RS232 Response Type 1 configures the unit to communicate in a way that is compatible with Micha Controller PN: 101103 and Micha Handheld Data Download Unit PN: 101406.

If the RS232 Response Type is changed, the Data Log MUST be cleared.

3.12.4. Configure Unit Type: Normal / Master / Slave

CPC50A Units only: For use in Master / Slave systems – one CPC50A must be configured as a Master and one CPC50A must be configured as a Slave.

4. CPC Operation

4.1. Preliminary Checks

Before applying power to the Cathodic Protection Controller ensure that:

(1) The CPC Enable/Disable switch is set to the Disable position

(2) The CP Input and Output MCBs (if fitted) are set to their OFF positions

4.2. Applying Power

Apply power to the Cathodic Protection Controller and turn on the Input MCB (if fitted).

Using a meter set on the 200VDC range, check that a voltage of approximately 12, 24 or 48V of the correct polarity is present across the INPUT +VE and -VE terminals of the Cathodic Protection Controller.

Ensure the Green Status LED (on the CPC Control PCB Assembly) is illuminated.

4.3. Checking the Output Set-points

To start with Constant Voltage Control:

Navigate to Menu 0 Screen 1 and set the Output Voltage Set-point = 0.0V (minimum)

Navigate to Menu 0 Screen 2 and set the Output Current Set-point = 10.0A. This is given as an example of the required output current – set it to the output current desired.

Navigate to Menu 0 Screen 3 and set the Half-Cell Voltage Set-point = 5.0V. Setting the Half-Cell Voltage at its maximum ensures that the half-cell control will not interfere with Constant Voltage Control.

4.4. Output MCB ON

Switch the Cathodic Protection Controller output MCB (if fitted) to its ON position and verify the LCD display indicates the following ± 0.3 (assuming there is no half-cell fitted):

Voltage	Current	H-Cell	
00.0V	00.0A	0.0V	Actual
00.0V	00.0A	0.0V	Set-Points

Note: If a Half-Cell (Reference Electrode) is fitted, the indication on the Half-Cell meter should match the structure to soil potential (as measured by a portable half-cell and meter).

Note: If a Half-Cell is not fitted, then ensure a wire link is fitted across the Half-Cell input terminals.

4.5. Constant Voltage Control

The Cathodic Protection Controller can now be set up to operate at the required level in the appropriate operating mode.

Voltage	Current	H-Cell	
00.0V	00.0A	0.0V	Actual
00.0V	10.0A	5.0V	Set-Points

Increase the Output Voltage Set-point (Menu 0 Screen 1). The voltage and current actual values should indicate an increase as the set-point is increased. The CP Controller is operating in Constant Voltage Mode (readings dependant on ground conditions – example shown is 0.75Ω):

Voltage	Current	H-Cell	
06.0V	08.0A	0.0V	Actual
06.0V	10.0A	5.0V	Set-Points

4.6. Constant Current Control

Continue to increase the Output Voltage Set-point (Menu 0 Screen 1) until the voltage and current actual values indicate no further increase. The current actual value should equal the current set-point value (e.g. 10A). The CP Controller is operating in Constant Current Mode (readings dependant on ground conditions – example shown is 0.75Ω):

Voltage	Current	H-Cell	
07.5V	10.0A	0.0V	Actual
16.0V	10.0A	5.0V	Set-Points

4.7. Automatic Half-Cell (Reference Electrode) Voltage Control

This is only applicable if there is a Half-Cell connected for automatic control.

Note: If no Half-Cell is fitted, a wire link should be fitted to short out the Half-Cell terminals.

With the unit operating in the Constant Current Control Mode, decrease the Half-Cell Voltage Set-point (Menu 0 Screen 3) until the Half-Cell Voltage Set-point indicates the required pipe-soil potential, e.g. 1V.

After some time (depending on ground conditions) the CP System will begin to polarise. To speed up the process, leave the unit operating in Constant Current Mode until the required structure to soil potential is achieved. As the structure potential increases towards the Half-Cell Voltage Set-point the CP output current will reduce and the Cathodic protection controller will then be working in Automatic Half-Cell Control Mode (readings dependant on ground conditions – example shown is 0.75Ω):

Voltage	Current	H-Cell	
07.5V	10.0A	1.0V	Actual
26.0V	20.0A	1.0V	Set-Points

5. Installation of PCB Assemblies

The following instructions should be carried out when installing/replacing any of the PCB Assemblies

5.1. CPC Control PCB Assembly

5.1.1. Ensure the output MCB (if one is fitted) is in its OFF position.

5.1.2. Isolate the input power (usually at the charge controller) to ensure no power is connected to the unit.

5.1.3. Remove the fascia over the CPC Control PCB Assembly by loosening the four plastic screws.

5.1.4. Ensure all the cables connected to the CPC Control PCB Assembly are clearly marked before disconnecting them. Disconnect all the connections to the CPC Control PCB Assembly.

5.1.5. Remove the PCB Assembly fixings and install the new CPCx Control PCB Assembly.

5.1.6. Reconnect all the connections to the CPC Control PCB Assembly.

5.1.7. Replace the fascia over the CPC Control PCB Assembly using the four plastic screws.

5.1.8. Reconnect the power to the unit.

6. Maintenance

The following maintenance schedule should be undertaken annually.

6.1. Equipment Required

1 x Digital Multimeter (DMM) complete with test probes

1 x Enclosure touch up paint (if required).

1 x Flathead screwdriver (5mm).

1 x Flathead screwdriver (3mm).

1 x small soft brush.

6.2. Procedure

6.2.1. Check the enclosure for flaws in the paint finish (if appropriate). Touch up any defects with appropriate touch up paint.

6.2.2. Ensure that the door gasket has not been attacked by pests resulting in a loss of weatherproofing.

6.2.3. Check all external cables for any signs of damage or deterioration of the outer sheath. Verify that cables are adequately secured and that all cable glands give a weatherproof seal.

6.2.4. Ensure that all the terminals in the unit are free from corrosion and that all terminals are tight.

6.2.5. Clean any small particles (e.g. sand, dust) from the enclosure using a small soft brush.

6.2.6. Ensure that the enclosure is shaded from direct sunlight and weathering at all times.

7. CPC50A Master / CPC50A Slave System

This section describes how to use two CPC50A Cathodic Protection Controllers in a Master / Slave Configuration to achieve a 100A Cathodic Protection System.

The system works by Configuring one CPC50A Controller as a Master and one CPC50A Controller as a Slave. When configured and connected together, the units will communicate with each other to exchange parameters and values.

Each CPC50A Controller has an RS232 port as standard, but to communicate with each other and with an external PC (locally or remote via a modem) each CPC50A Controller requires an RS232 to RS485 Converter Module. The RS485 communications hardware allows more than two devices to be connected together (i.e. two CPC50A units and a PC). The Micha Part Number and description is 101988 - RS232 to RS485 Converter Module.

The PC or local modem will also require a RS485 Communications Port.

NOTE: Master / Slave Operation requires Software 801378 Version 1.8 or higher.

7.1. Operation

When CPC50A Cathodic Protection Controllers are programmed as a Master Unit or a Slave Unit, then the operation of each unit changes as follows:

7.1.1. CPC50A Master Unit

The Master Unit controls the Output Voltage, Output Current and Half-Cell Voltage of the system by sending the appropriate parameters to the Slave Unit. The Master Unit displays the combined Output Current of both units on its home screen (having received the Output Current value back from the Slave Unit).

When adjustments are made to the Output Voltage, Output Current and Half-Cell Set-points of the system, these values are sent to the Slave Unit (in the case of the Output Current, half the value is sent to the Slave Unit). In addition, once a minute the Set-points are sent to the Slave Unit.

If the units are under Voltage Control, then both units will control independently at the set voltage.

If the units are under Current Control, then both units will control independently at half the set current.

If the units are under Half-Cell Voltage Control, then both units will control independently at the set voltage.

The Master Unit will provide the Alarm Functions for both units.

The Master Unit will control the Interrupt Timer for both units.

7.1.2. CPC50A Slave Unit

The Output Voltage Set-point, Output Current Set-point and Half-Cell Voltage Set-point are not adjustable by the keypad controls (the set-points are set by the Master Unit).

The Alarm Set-points are not adjustable by the keypad controls and the Alarms are disabled.

The Interrupt Timer is not adjustable by the keypad controls and the Interrupt Timer is disabled.

The Slave Unit displays the values that it is controlling (i.e. not the combined values).

7.2. RS485 Communication

The Master / Slave System uses RS485 communication to allow both CPC Controllers and a PC to communicate. Parameters are passed between the Master Unit and the Slave Unit once a second while the output set-points are being adjusted, and once every 5 seconds during normal use. This means that the Slave Unit Output Current value may take up to 5 seconds to appear on the Master Unit.

7.3. CPC50A Master / Slave Interconnection Cables

In order for a CPC50A Master / Slave System to communicate and function correctly the following connections are required between the units (the correct configurations are also required – see section 7.4):

7.3.1. CPC50A Master / Slave RS485 Interconnection

A 2-core screened cable is required to connect the RS485 Port connections from one unit to the other:

Core 1 = CPC50A Master RS485 Terminal "A" to CPC50A Slave RS485 Terminal "A"

Core 2 = CPC50A Master RS485 Terminal "B" to CPC50A Slave RS485 Terminal "B"

Screen = CPC50A Master RS485 Terminal "0V" to CPC50A Slave RS485 Terminal "0V"

Note: The RS485 connections are isolated from any other electrical part of the system.

7.3.2. CPC50A Master / Slave Interrupt Timer Interconnection

A 2-core cable is required to connect the Timer Interrupt function from Master to Slave:

Core 1 = CPC50A Master – Control PCB Assembly Relay 3 Alarm Terminal "NO" to CPC50A Slave – Control PCB Assembly Disable Input (either terminal)

Core 2 = CPC50A Master – Control PCB Assembly Relay 3 Alarm Terminal "COM" to CPC50A Slave – Control PCB Assembly Disable Input (either terminal)

Note: the reason a direct cable is required between the units is that serial communication between the units takes hundreds of milliseconds and would result in the CP outputs not being synchronised.

7.4. Software Configuration

The CPC50A Controllers are configured during the factory testing as normal stand alone units and must be re-configured as follows if required to be used in a CPC50A Master / Slave System:

7.4.1. CPC50A Power-Up Configurations

On power up enter the Configuration Screens (see Section 3.12).

One CPC50A must be set as a Master on Configuration Screen 4 (see Section 3.12.4).

One CPC50A must be set as a Slave on Configuration Screen 4 (see Section 3.12.4).

7.4.2. CPC50A Master

Note 1: when a CPC50A is Configured as a Master, the unit will automatically set the RS232 Comms Port Number = 1 and will not allow any change to the Port Number.

Note 2: when a CPC50A is Configured as a Master, the unit will automatically set the Relay 3 Alarm Function = Interrupt Timer. This means that when the Master Unit Timer Interrupt is active and turns off the CP output, the alarm relay will be active which will close the volt-free contact connected to the Slave Unit Disable Input and so turn off the Slave unit CP output.

7.4.3. CPC50A Slave

Note: when a CPC50A is Configured as a Slave, the unit will automatically set the RS232 Comms Port Number = 2 and will not allow any change to the Port Number.

8. CPC Spares

To identify the PCB Assemblies – see section 1.11 to 1.13.

8.1. CPC10A Spares List

Control PCB Assembly Part Number	System Voltage	Control PCB Assembly Description
401 295	12V	CPC10A 12V Control/Power PCB Assembly
401 296	24-48V	CPC10A 24-48V Control/Power PCB Assembly
401 301	12V	CPC10A 12V Control/Power RS232/Data Log PCB Assembly
401 302	24-48V	CPC10A 24-48V Control/Power RS232/Data Log PCB Assembly

8.2. CPC25A Spares List

Control PCB Assembly Part Number	System Voltage	Control PCB Assembly Description
401 307	12V	CPC25/50A 12V Control PCB Assembly
401 308	24-48V	CPC25/50A 24-48V Control PCB Assembly
401 311	12-48V	CPC25A Power PCB Assembly
401 313	12-48V	CPC25/50A Protection PCB Assembly
400 838	12-48V	CPC25/50A Sensor PCB Assembly
600 615	12-48V	CPC Protection Dual Zener Diode Assembly

8.3. CPC50A Spares List

Control PCB Assembly Part Number	System Voltage	Control PCB Assembly Description
401 307	12V	CPC25/50A 12V Control PCB Assembly
401 308	24-48V	CPC25/50A 24-48V Control PCB Assembly
401 311	12-48V	CPC25A Power PCB Assembly
401 313	12-48V	CPC25/50A Protection PCB Assembly
400 838	12-48V	CPC25/50A Sensor PCB Assembly
600 615	12-48V	CPC Protection Dual Zener Diode Assembly

9. Trouble Shooting Guide

Situation	Possible causes	Action
The display is inactive	The display powers down after 4 minutes from the last user switch press (this feature can be disabled – see section 3.9.4)	Press any front panel switch to activate the display
The display is inactive and the STATUS LED is not illuminated	The unit has no power	Ensure the input MCB is closed
The display is inactive and the STATUS LED is not illuminated	The unit has no power	Measure the input voltage at the terminals to verify that the unit has no power
The display is inactive and the STATUS LED is not illuminated	The unit has power – if the voltage available is 12V and the unit is rated 24-48V then the unit is incompatible with the voltage supply	Refer to system designer
The display is inactive and the STATUS LED is not illuminated	The unit has power – if the voltage available is 48V and the unit is rated 12-24V then the unit is incompatible with the voltage supply	Refer to system designer
There is no CP output voltage or current	The Enable/Disable switch is in the DISABLE position	Set the Enable/Disable switch to the ENABLE position
There is no CP output voltage or current	The Set-points of the unit are set so that there is no output	Reset the Set-points to the desired output
There is no CP output voltage or current	The Interrupt Timer is Active	This may be the correct operation of the unit
There is no CP output voltage or current	There is a closed contact wired across the DISABLE INPUT	This may be the correct operation of the unit
There is no CP output voltage or current	There is an active contact wired across the AUXILIARY INPUT and the unit is programmed to shutdown the output	This may be the correct operation of the unit
The Disable Input LED blinks every 60 seconds or so	The Half-Cell Input Sampling option has been set to Disable output – see section 3.9.1	This may be the correct operation of the unit
The Voltage and Current Output are not as expected	The Set-points of the unit will determine the maximum Voltage or Current allowed – they may need to be adjusted	This may be the correct operation of the unit
The Half-Cell Voltage does not change	The Half-Cell Input is sampled every 60 seconds or so – see section 3.9.1	This is the correct operation of the unit
An optional 4-20mA transducer output is always at 4mA	For calibration purposes, when the 4mA setting screen is visible, the transducer output is 4mA	This is the correct operation of the unit
An optional 4-20mA transducer output is always at 20mA	For calibration purposes, when the 20mA setting screen is visible, the transducer output is 20mA	This is the correct operation of the unit

9.1. LED Indication

Situation	Possible causes	Action
STATUS LED illuminated	Power On	This is the correct operation of the unit
RELAY 1 LED illuminated	Alarm Activated - Check Relay 1 Programmed Function	This indicates that the Programmed Alarm is Active
RELAY 2 LED illuminated	Alarm Activated - Check Relay 2 Programmed Function	This indicates that the Programmed Alarm is Active
RELAY 3 LED illuminated	Alarm Activated - Check Relay 3 Programmed Function	This indicates that the Programmed Alarm is Active
DISABLE INPUT LED illuminated	The CP Output is Disabled. This may be due to the Enable Switch being in the Disable position, or a closed contact across the Disable Input terminals or the Interrupt Timer being active.	This may be the correct operation of the unit
AUXILIARY INPUT LED illuminated	An external contact connected to the Auxiliary Input will illuminate the LED when the contact is closed	This is the correct operation of the unit
ENABLE / DISABLE Switch LED illuminated	The LED will be illuminated when the ENABLE / DISABLE Switch is in the Disable position	This is the correct operation of the unit

10.Software

10.1. Software History

Software Version	Date Released	Comments
801 378 Ver 1.0	3rd April 2007	First Production issue of CPC10A Software
801 378 Ver 1.1	6th Nov 2007	First Production issue of CPC10/25/50A Software Added RS232 Port / Data Logging / 4-20mA Transducer Modules
801 378 Ver 1.2	10th Jan 2008	Moved Configure Unit Voltage from Menu 4 to Power-Up Configuration Menu Changed Time Setting and other Upload Setting Communications protocol
801 378 Ver 1.3	11th Feb 2008	Fixed bug in RS232 EEPROM Test routine
801 378 Ver 1.4	11th March 2008	Changes to some Default settings Added RS232 Port Response Screen: Type 0 or 1
801 378 Ver 1.5	2nd April 2008	Added High Input Voltage Alarm in Menu 1 Added Half-Cell Voltage Alarm in Menu 1
801 378 Ver 1.6	7th April 2008	Added 1 second delay on activation of High Input Voltage Alarm to stop spurious alarms
801 378 Ver 1.7	23rd Sept 2008	Fixed Half-Cell sampling bug in software (relays were active all the time) Modified Half-Cell measurement to take 8 readings and average
801 378 Ver 1.8	5th May 2009	Master / Slave Operation and Communication added Interrupt Timer added to Relay Functions / Data Log Enabled as default option
801 378 Ver 2.0	16th June 2009	Modem Disable / Enable added to Menu 4 CP Disable when Modem On-line Option added to Menu 4

10.2. Installation / Replacement of the MCU

Ensure that anti-static precautions are taken to avoid damage to the Micro-controller when handling (i.e. touch a conductor that is connected to earth before carrying out the following):

Turn off all power to the CPC Controller by turning off the output MCB of the connected charge controller.

Remove the CPC Control PCB Fascia Cover using the four plastic thumbscrews. Identify the Microcontroller - IC21 (40 pin integrated circuit) on the PCB Assembly. Carefully lever out the Microcontroller presently located there by using a small flat screwdriver on both ends equally. Do this carefully.

Identify the device to be installed. Carefully handle the device without touching the legs of the device. NOTE the orientation of the semi-circular notch out of one end of the device. NOTE which end of IC21 has a notch in the PCB socket. Now insert the Microcontroller into the IC21 socket so that the notch in the device is at the same end as the notch in the socket. Before pressing down on the device to mate it fully in its socket, check that all pins are properly lined up with the pins in the PCB socket. Press the device fully into the socket and check that no leg has been bent or missed its socket.

Replace the CPC Control PCB Fascia Cover using the four plastic thumbscrews.

Restore power to the CPC Controller by turning on the output MCB (if fitted) of the connected charge controller.

