



IONPURE®

**DC3
Power Controller**

**600 VDC
15 Amps
with isolation**

**Operation
&
Maintenance
Manual**

**IP-MAN-DC3-1018-EN
Revision 1
October 2018**

Manual Covers Model #:

**IP-DC3PH600V-M1
(W2T827150)**

**IP-PB600V45A-1
(W2T847507)**

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Disclaimer Statement

The operation and maintenance manual should provide complete and accurate information to meet your operating and/or service requirements based on the information available at the time of publication. The information in this manual may not cover all operating details or variations or provide for all conditions in connection with installation, operation and maintenance. Should questions arise which are not answered specifically in this manual, contact your equipment supplier.

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Manual Revision History

Event	Date	Changes
Revision 0	October 2017	Original publication
Revision 1	October 2018	Updated Compliance section and Table A1 3.1.1 – Added AC current requirement, corrected AC voltage maximum 3.2.4 - Changed note from 24 W to 44 W 3.2.7 - Corrected terminal number reference 7.2, 7.3 – Corrected alarms sections

COMPLIANCE



LISTED

Listed 3L32 – Industrial Control Equipment
100 kA Short Circuit Current Rating
File Number E136219



2014/30/EU – Electromagnetic compatibility
2014/35/EU – Electrical equipment designed for use within certain voltage limits
IP 20
See EU Declaration of Conformity



Part 15 Subpart B
Class A Device



See Certificate of Conformance

EU Declaration of Conformity

We the undersigned manufacturer

*Evoqua Water Technologies
558 Clark Road
Tewksbury, MA, U.S.A.*

Certify and declare under our sole responsibility that the products:
W2T827150 (IP-DC3PH600V-M1) (Tested as DC3/IP-DC3PH600V-M1)

Conform to the following directives:

2014/35/EU (electrical equipment designed for use within certain voltage limits)

2014/30/EU (electromagnetic compatibility)

The unit conforms to the essential requirements of the above European Directive(s) using the relevant section(s) of the normalized standards and related documents shown below. In addition, it is certified to have been inspected and packaged in accordance to applicable drawings and test specifications per the ISO 9001/14001 standards.

EN 60947 – 4 - 3: 2014 Low-voltage switchgear and controlgear (electrical safety).

IEC 60947 – 4 – 1: 2012

- Clause 9.4.2 Immunity referencing IEC 60947-1: 2007/A1: 2010/A2: 2014, Clause 8.4.1, Table 23
 - o IEC 61000- 4 – 2: 2008
 - o IEC 61000- 4 – 3: 2006/A1: 2007/A2: 2010
 - o IEC 61000- 4 – 4: 2004/A1:2010
 - o IEC 61000- 4 – 5: 2005/AC1:2009
 - o IEC 61000- 4 – 6: 2013
 - o IEC 61000- 4 – 8: 2009
 - o IEC 61000- 4 – 11: 2004

IEC 60947 – 4 – 1: 2012, Clause 9.4.3 Emission

Referencing IEC 60947 – 1: 2007/A1: 2010/A2: 2014, Clause 7.3.3

European Standard EN 55011: 2009 + A1: 2010

FCC Part 15 Subpart B

Note 1: All power terminals must be populated as to keep the controller touch safe to comply with EN 60947-4-3.

Note 2: Controller must be mounted in a shielded enclosure to comply with EMC Directive 2014/30/EU.

Note 3: DCR controllers (W2T827122 and W2T827123) must have appropriate line and control power filter to comply with EN61000-6-2. The DC3 (W2T827150) contains the required filters and complies with EN61000-6-2.

The technical documentation file is located at

Evoqua Water Technologies LLC, 558 Clark Rd, Tewksbury MA, USA

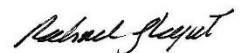
The authorized representative within the community is:

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Name and position of the person binding the manufacturer:

Rahoul Bhagat, Quality Assurance and Document Control



Documentation for the above component can be found on www.ionpure.com.

Should you need further assistance, please e-mail ionpure@evoqua.com. We value you as a customer and will accommodate you in whatever way to provide total satisfaction.

1 INTRODUCTION

1.1 Caution and Warning Messages

WARNING and CAUTION labels are used to attract attention to essential or critical information in this manual. The labels are located to the left of the associated messages. Caution and Warning messages will be located immediately before related text.



Warnings indicate condition, practices, or procedures that must be observed to avoid personal injury or fatalities.



Cautions indicate a situation that may cause damage or destruction of equipment or may pose a long-term health hazard.

Notes are also used to draw attention to information. Notes may be located before or after the related text.

NOTE: Notes are used to add information, state exceptions, and point out areas that may be of greater interest or importance.

1.2 General Description

The DC3 Power Controller for CEDI is a compact, high-performance microprocessor-based three-phase DC power controller designed to control resistive loads.

The DC3 is designed specifically as a component of a DC power supply system used with continuous electrodeionization (CEDI) modules manufactured by IONPURE®. This unit can be used with the MX, LX, and VNX lines of CEDI modules. This unit can also be used with the NEXED® lines of electrodialysis reversal (EDR) modules.

The DC3 is designed for operation in constant current mode. In constant current mode, the output current is maintained at the selected value, regardless of the load resistance, while the voltage varies. As the resistance increases, the required voltage also increases.

NOTE: When the required voltage reaches the maximum possible DC voltage (600 VDC), it cannot increase further. If the resistance continues to increase, the output current must decrease. (Ohm's Law: $I = V / R$)

The DC3 accepts a nominal input voltage of three-phase 380 VAC – 480 VAC (45 – 65 Hz), has a maximum output voltage of 600 Volts DC, and a maximum full frame current rating of 15 Amps DC. A separate 24 VDC power source (44 W per power controller) supplies the control electronics and maintains critical communications to your control system when the mains are absent.

Status LEDs make operation and troubleshooting simple. Configuration is through a simple DIP switch and rotary dial.

The controller has six selectable DC output current ranges: 0 – 2.5, 0 – 4.0, 0 – 6.6, 0 – 10.0, 0 – 13.2, and 0 – 15.0 amps. Each current range can be selected with an on-board DIP switch.

The power controller has input over-voltage protection, as well as heat sink over-temperature protection. Output over-current protection occurs automatically as a result of the unit's use as a programmable current source.

The unit's robust design allows for continuous full-frame current up to 50 °C (122 °F) and up to 1,830 meters (6,000 feet) altitude. Cooling is accomplished through equipped on-board fans, heat sink, and natural convection.

The on-board Modbus TCP fieldbus interface allows monitoring of line voltage, load voltage, load current, and temperature of the unit easily from an external display or PLC; reducing system installation costs.

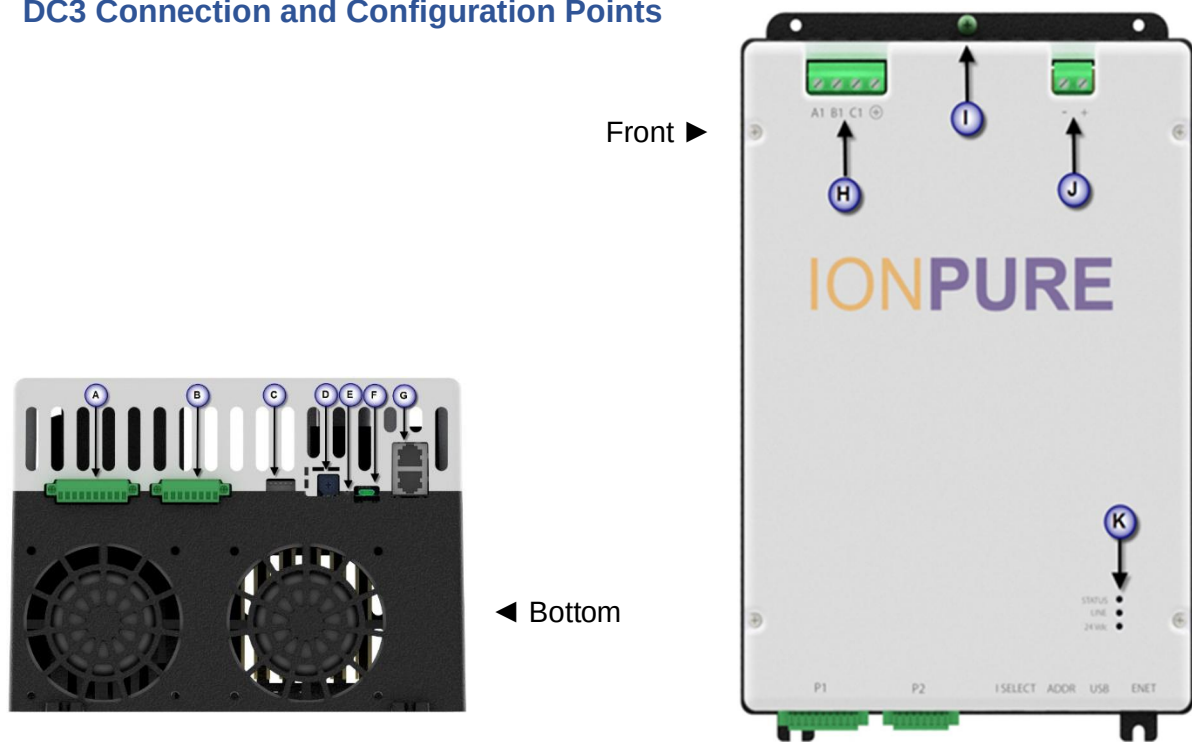
The DC output current can be adjusted by any one of following methods:

- An optional digital touch panel, Model No. IP-POWERDSP-TP (W2T829935), which can operate up to sixteen power controllers.
- On-board Modbus TCP fieldbus, which can operate unlimited power controllers.
- A 4 – 20 mA input signal from a remote process controller, such as a PLC.
- The power controller output can be turned on and off by a signal from a remote set of contacts. This feature allows the use of remote instrumentation, such as a flow switch, for turning off controller output.

The DC3 Power Controller is a component of the DC power supply used with Ionpure's CEDI modules. A complete DC power supply **must** include all of the following:

- DC3 power controller(s)
- A 24 VDC power source
- Circuit protection (fuses or circuit breakers)
- Controls and operator interface
- Enclosure with cooling

1.3 DC3 Connection and Configuration Points



Label	Name	Description
A	Command Connections (P1 connector)	24 VDC Input, Analog Input, Run/Stop signals, and Analog Retransmits
B	Relay Connections (P2 Connector)	2x Form C relay connections
C	Configuration DIP Switches	Set current scaling, and either constant current control, constant voltage control, or constant power control
D	Rotary Switch	Set Modbus TCP octet IP address
E	Reset	Reset processor externally to restore factory settings
F	Micro-USB Port	Connects to computer running Ionpure® Power Panel software. Allows updates of firmware and IP addresses and provides useful troubleshooting information
G	Modbus TCP Interface	Modbus TCP/IP digital interface allows daisy-chaining multiple controllers to either a display or PLC
H	AC Input	3Ø AC input connections with ground
I	Chassis Ground	Chassis Ground
J	DC Output	DC Output Connections
K	Indicator LEDs	LED indicators assist with diagnostics

2 INSTALLATION

2.1 Environment

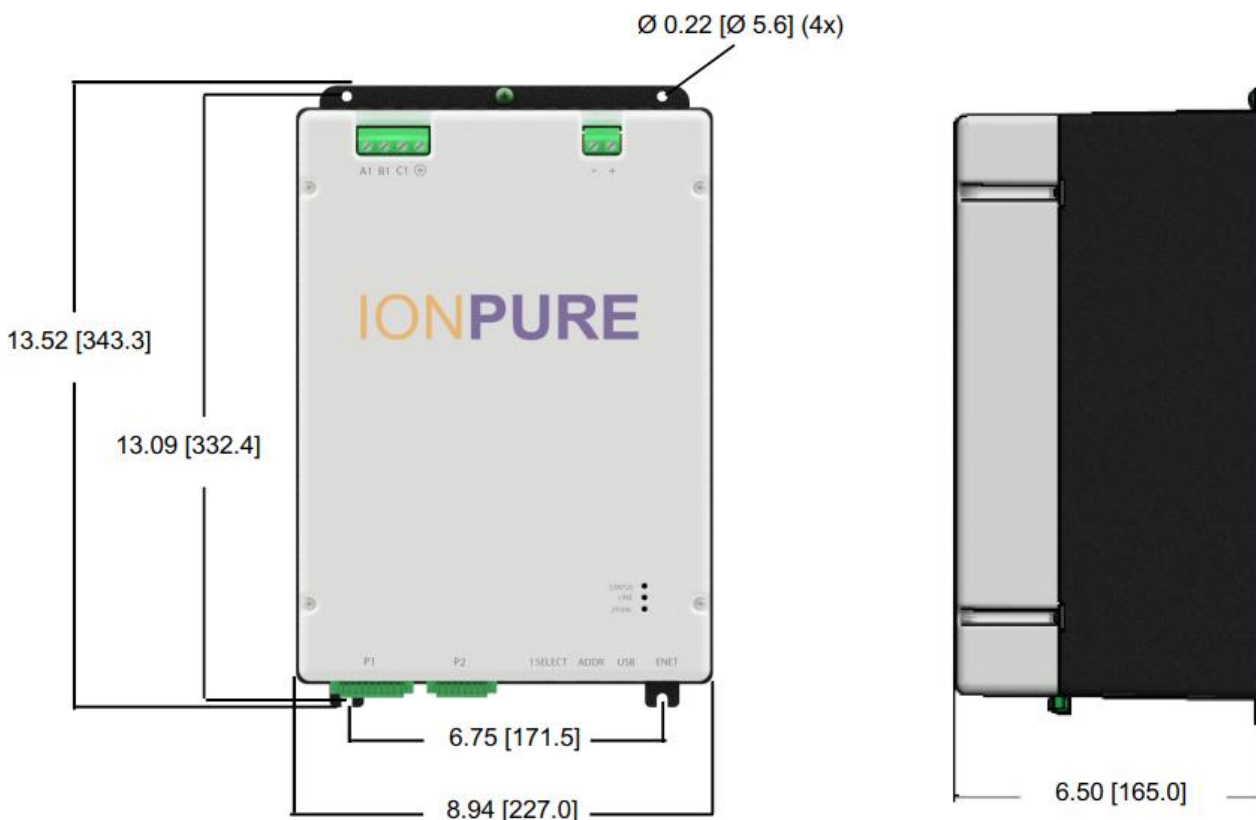


Electrostatic discharge can damage electronic components. Make contact with a grounded conductive pad and/or wear a grounded wrist strap when you handle the power controller.

The DC3 Power Controller is intended for mounting on a sub-panel inside an enclosure. The overall dimensions of IP-DC3PH600V-M1 are (also see full-size drawing in Appendix B):

- Height: 343.4 mm (13.52 inches)
- Width: 227.0 mm (8.94 inches)
- Depth: 165.0 mm (6.5 inches)
- Weight: 9.53 kg (21.0 pounds)

Use M5 or UNC 10-32 screws (not included). The location of the mounting slots is shown in Figure 2, located in Appendix B.



The environmental limits for operation are 0 to 50 °C (122 °F), at up to 95% relative humidity (non-condensing). An enclosure with at least an IP52/NEMA 12 rating is recommended. The DC3 contains a heat sink and on-board fans for cooling; however, the enclosure should also include a cooling fan that draws through ambient air (enter at side bottom, exhaust at opposite side top).

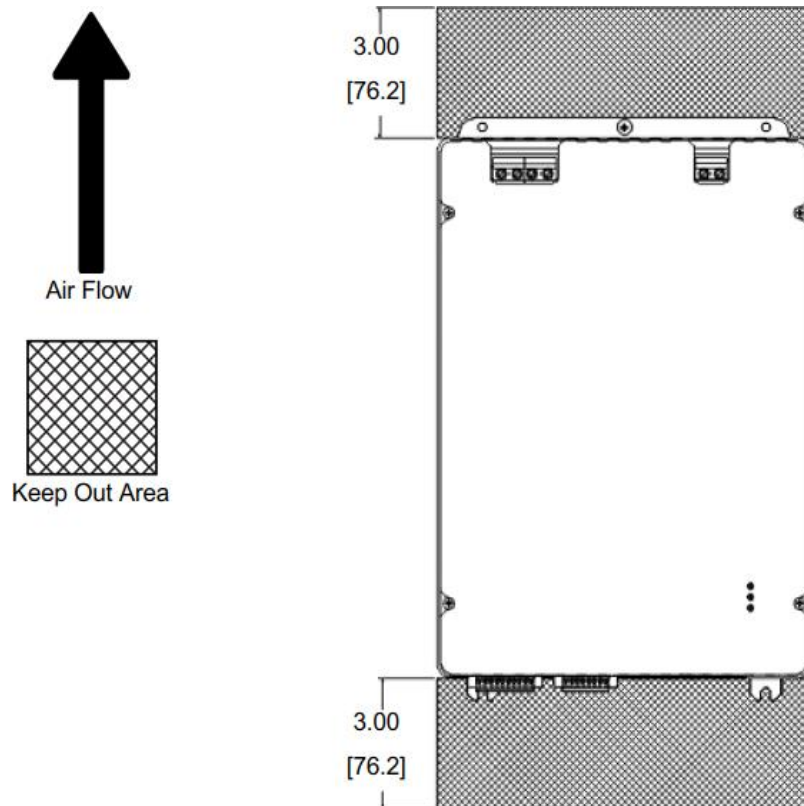
In installations where a water-resistant enclosure (IP56/NEMA 4) is necessary, cooling the interior of the enclosure is more difficult. Typical cooling methods include:

- Sizing the enclosure for a sufficient rate of heat transfer to the environment through the enclosure walls.
- Using an air-to-air or water-to-air heat exchanger.
- Installing an air conditioning unit.
- Using vortex cooling.

The maximum heat generated by each DC3 is approximately 450 watts at full power output (9 kW). Additional heat generation is expected from other equipment in the enclosure.

2.2 Mounting Considerations

Mount the power controllers vertically. The keep out area on the top and bottom are for air circulation. The top and bottom of the controller must have a minimum of 76.2 mm (3.00 inches) free from obstructions, as measured from the edge of the heatsink fins. Dimensions above are measured from the edge of the heatsink base.



2.3 AC Supply

The DC3 accepts a nominal input voltage of three-phase 380 VAC – 480 VAC (45 – 65 Hz), and draws a current of 20 amps at full load. Electrical schematics for typical installations are shown in Figures 3 and 4 in Appendix B.

2.4 Over-Current Protection



The DC3 does not have built-in fuses for the AC input. Over-current protection devices, such as circuit breakers or fuses, must be installed between the line supply and the AC input terminals, for example as shown in Figure 3, 4, and 5.

Consult applicable codes on sizing of upstream fuses or circuit breakers to protect the power controller. 1.25 times the maximum full load current of 20 amps is typical.



Do **NOT** install fuses or circuit breakers between the DC output of the DC3 and the CEDI or EDR module(s). Consult Ionpure/Nexed technical support for applications requiring polarity switching.

3 WIRING

Every Ionpure DC power controller is configured and tested before shipping. Once received, the unit is ready to install. The following sections will describe how to properly wire the unit with the recommended fusing. Site-specific configuration of switches is also explained.

For line and load connections, use copper conductors rated 75 °C (167 °F) minimum. See torque tables in Sections 3.1.1, 3.2.11 and C4 for proper tightening.



DC3 ties the DC negative terminal to chassis ground. Therefore, for safe and proper operation, this power controller must be grounded properly. Both the AC input connector and chassis must be tied to ground. Use 3 – 12 AWG wire.

NOTE: You must wire controllers to conform to the applicable local wiring codes.

3.1 High Voltage Connections

The AC voltage supplied to the power controller should be three-phase, can range from 380 VAC to 480 VAC, and must provide 20 amps at full load. The DC3 can accept wye or delta.



The DC3 can tolerate input voltage variations of - 15% +10% of the nominal values of 380 – 480 VAC, but should NOT be operated outside the range of 323 - 528 VAC, which may result in an Inhibit (Shutdown) Alarm.

AC and DC power connections must be made as described below. Figure B4 (in the Appendix) shows a basic illustration of these connections.

Terminal	Connection
A1, B1, C1	Three-phase AC input from line supply
GND	Earth ground inside panel enclosure
DC-	DC negative output to cathode of CEDI module
DC+	DC positive output to anode of CEDI module



The GND terminal of the power controller must be connected to earth ground (PE) inside the power supply enclosure.



Do NOT install fuses or circuit breakers between the DC output of the power controller and the CEDI or EDR module(s). Contact Ionpure/Nexed technical support for applications requiring polarity switching.



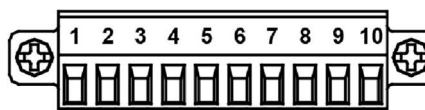
Do **NOT** install a jumper between terminals DC- and GND of the power controller, nor between the negative and ground terminals of the CEDI module. Doing so will drive the amplitude of the internal current feedback sensor and short it, which will damage the power controller.

3.1.1 Torque Specifications for High Voltage Connections

Recommended Tightening Torque for Line and Load Connectors	
Wire Size (AWG)	Torque
3 – 14	2.70 Nm (24 IN-LBS)

3.2 Low Voltage Connections

3.2.1 P1 (10 Pin Connector)



Terminal	Connection
P1-1	24 VDC Input – 24V-
P1-2	24 VDC Input – 24V+
P1-3	Analog Input – Ic+
P1-4	Analog Input – Ic-
P1-5	Analog Output – Im+
P1-6	Analog Output – Im-
P1-7	Analog Output – Vm+
P1-8	Analog Output – Vm-
P1-9	Enable Signal (Dry Contact) – Common
P1-10	Enable Signal (Dry Contact) – Run/Stop

3.2.2 Analog Signal Wiring Guidelines

Proper grounding and wiring of all electrical equipment is important to help ensure optimum operation of your system and to provide additional electrical noise protection for your application. Please follow these guidelines for your analog signal wiring:

- Ground connections of the power controller(s) and the analog signal processing equipment (e.g. PLC, panel meter, etc.) should be connected to the earth ground of the system.
- All ground wires should be as short as possible.

-
- Always use shielded twisted-pair cables for analog signals.
 - Connect only one end of the cable shield to earth ground.
 - Keep cable length as short as possible.
 - Keep signal wires as far away as possible from AC wires and rapidly switched DC wires. Place them in separate wire trays or ducts.
 - Follow other system grounding and wiring guidelines found in the manual of your analog signal processing equipment.
 - Use analog signal metering devices with differential inputs for improved noise immunity.

3.2.3 24 VDC Input (P1-1, P1-2)

A separate 24 VDC power source (minimum of 44 W per DC3) is required to supply the fans and control electronics and to maintain critical communications to your control system when the mains are absent.

3.2.4 Control of DC Output Current

It is necessary to provide a command signal to control the DC output current to the CEDI module.

Use **only one** of the following options to control the DC output current:

- Modbus TCP fieldbus, which can operate an unlimited number of power controllers (set via IP address).
- IONPURE Touch Panel, Model No. IP-POWERDSP-TP, which can operate up to sixteen power controllers. Use standard CAT-6 cables between units.
- A 4 – 20 mA input signal (Ic) from a remote process controller, such as a PLC, connected to P1-3 (Ic+) and P1-4 (Ic-). The analog signal corresponds to 0 - 100% of the selected DC output current range.

3.2.5 Analog Outputs

The analog outputs for the unit are listed below with associated connection information:

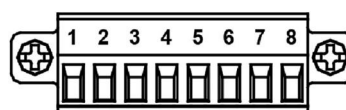
- A 4 – 20 mA output is provided for remote display of output voltage. The signal is available at P1-7 (Vm+) and P1-8 (Vm-) and is calibrated to correspond to 0 – 600 VDC.
- A 4 – 20 mA output is provided for remote display of output current. The signal is available at P1-5 (Im+) and P1-6 (Im-) and is calibrated to correspond to 0 – 100% of the selected DC output current range.

3.2.6 Remote On / Off (Enable Signal, P1-9, P1-10)

The DC output is switched on/off by a remote isolated non-powered (dry) contact connected to the terminals 9 and 10 on the P1 connector. A closed contact enables the power controller's DC output; an open contact shuts it off.

A possible implementation: flow switches on the feed, product and/or reject streams of the CEDI module or system, and an auxiliary contact of the motor starter of the RO or CEDI feed pump could be wired in series to the coil of a time-delay relay (to allow the flow signals to stabilize before activating). One of the relay contacts would be wired to the remote ON / OFF input to apply DC power to the module only when there is water flow.

3.2.7 P2 (8 Pin Connector)



Terminal	Connection
P2-1	N/A
P2-2	N/A
P2-3	Relay Output – N.O.
P2-4	Relay Output – Common
P2-5	Relay Output – N.C.
P2-6	Alarm Relay Output – N.O.
P2-7	Alarm Relay Output – Common
P2-8	Alarm Relay Output – N.C.

3.2.8 Output Status Relay

The output status relay provides a relay signal that indicates the status of the DC output. This signal can be used for remote status indication (e.g. Run / Standby status light). Connections are P2-3 (N.O), P2-4 (Common) and P2-5 (N.C).

3.2.9 Output Alarm Relay

The output alarm relay provides a relay signal that indicates an alarm. This signal can be used for remote status indication (e.g. alarm light). Connections are P2-6 (N.O), P2-7 (Common) and P2-8 (N.C).

3.2.10 Output Relay Specifications

Output Relay (Status and Alarm) Specifications	
Maximum Switching Voltage	220 VDC
	250 VAC
Maximum Switching Current	2 A
Maximum Switching Capacity	60 W, 62.5 VA
UL Contact Ratings	220 VDC / 0.24 A - 60 W
	125 VDC / 0.24 A - 30 W
	250 VAC / 0.25 A - 62.5 VA
	125 VAC / 0.50 A - 62.5 VA
	30 VDC / 2 A - 60 W

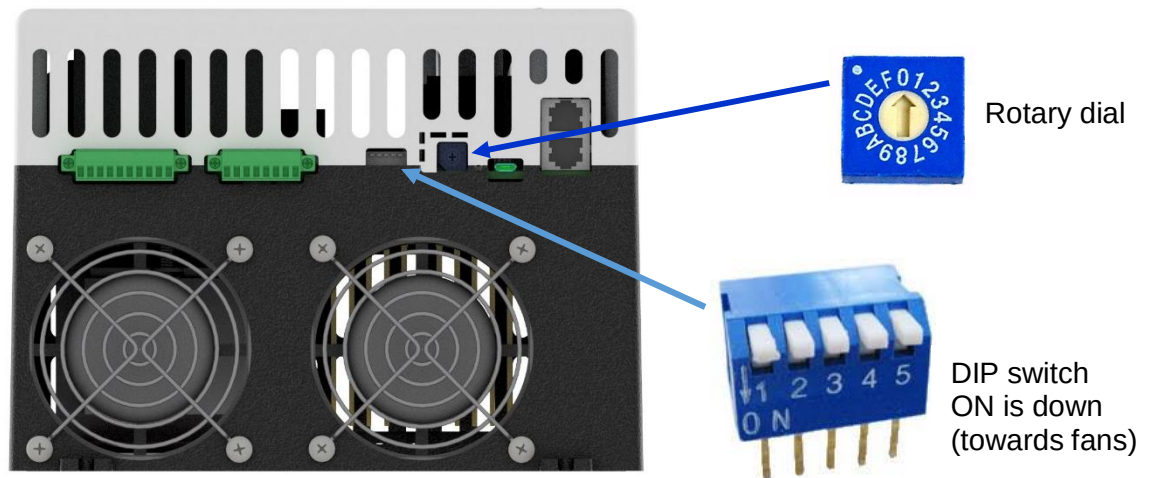
3.2.11 Torque Specifications for Low Voltage Connections

Recommended Tightening Torque for P1/P2 Connectors		
Number of wires	Wire Size (AWG)	Torque
1	16 – 26	0.34 Nm (3.0 IN-LBS)
2	20	0.34 Nm (3.0 IN-LBS)

3.3 Selector Switches

3.3.1 DIP Switch for Current Range, Feedback, and Modbus Selection

DC output current range, current/voltage feedback, and Modbus termination resistance are selected via a current range DIP switch, as shown below.



Current Range	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5
0.1 – 2.5			OFF	OFF	OFF
0.1 – 4.0			OFF	OFF	ON
0.1 – 6.6			OFF	ON	OFF
0.1 – 10.0			OFF	ON	ON
0.1 – 13.2			ON	OFF	OFF
0.1 – 15.0			ON	OFF	ON
Constant Current	OFF	OFF			
Constant Voltage	OFF	ON			
Constant Power	ON	OFF			

The default current setting is Constant Current mode at 13.2 Amps (OFF-OFF-ON-OFF-OFF).

Refer to Table A1 in Appendix A for correct current range settings (from column “Maximum Required DC Amps”).

3.3.2 Rotary Dial for Modbus TCP Octet Address

The rotary dial sets the Modbus TCP octet address for each power controller. The octet address value is the least significant nibble of the lowest octet. For example, a switch setting of 0 will mean the power controller will respond to requests with 192.168.0.100. The switch setting of F will respond to requests with 192.168.0.115.

Address	Connection
0	192.168.0.100
1	192.168.0.101
2	192.168.0.102
3	192.168.0.103
4	192.168.0.104
5	192.168.0.105
6	192.168.0.106
7	192.168.0.107
8	192.168.0.108
9	192.168.0.109
A	192.168.0.110
B	192.168.0.111
C	192.168.0.112
D	192.168.0.113
E	192.168.0.114
F	192.168.0.115

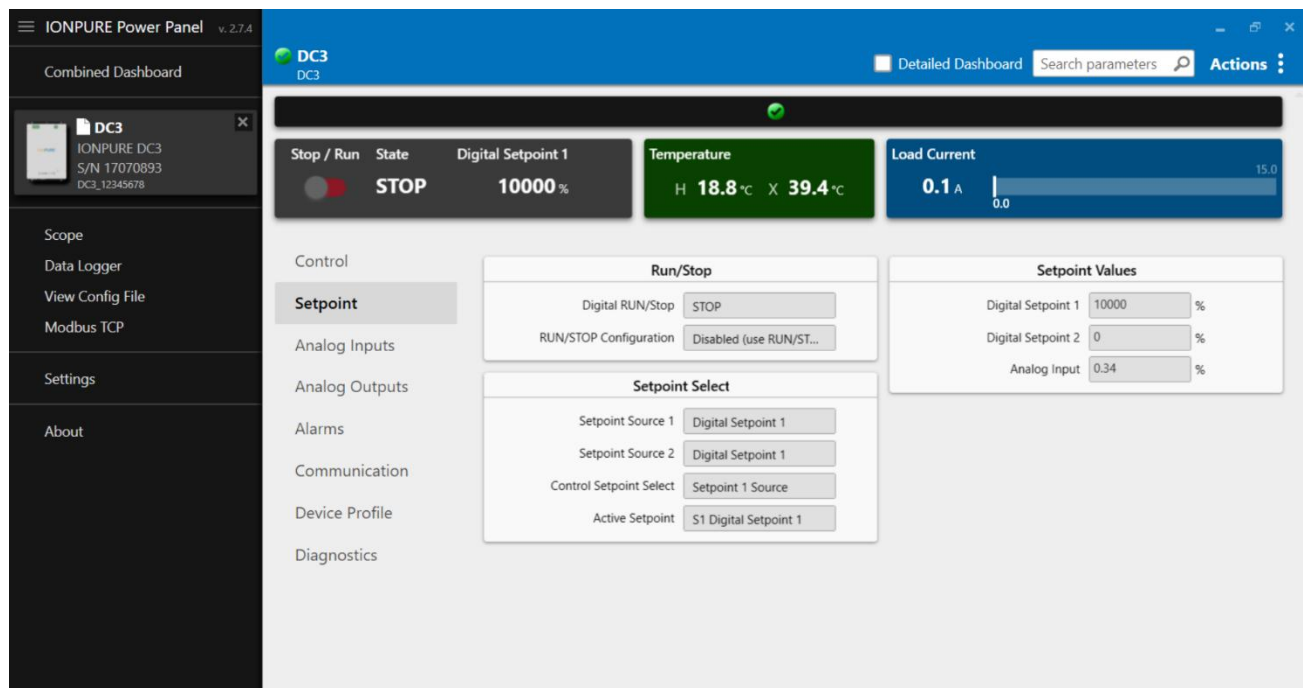
NOTE: When using the Ionpure Touch Panel Display, at least one connected DC3 **must** be set to switch position 0 (IP address 192.168.0.100) in order for the TP to properly communicate with the DC3(s). All connected DC3s must be given a unique identifying address, without any duplication.

4 USB

4.1 USB Interface and Power Panel Software

A micro-USB interface is standard on all power controllers for connecting the controller to the Ionpure Power Panel software application (available for registered users on lonpure.com).

This PC-based utility software assists with the installation, parameter setup, operation and troubleshooting of Ionpure DC3 and DCR power controllers. Possible uses are for updating device firmware and changing IP addresses.



4.2 Minimum PC Requirements

Minimum PC requirements for the Ionpure Power Panel Software are as follows:

- 1 GHz Single-Core Processor
- 1 GB RAM
- 100 MB of available hard disk space
- 1280 x 768 x 60 Hz Compatible Display Adapter
- Windows 7® (32/64 bit), Windows 8® (32/64 bit), or Windows 10® (32/64 bit) Operating Systems
- Microsoft®.NET Framework 4.0 – Client Profile

An instruction manual is not yet available for the Ionpure Power Panel software. For assistance, please contact your local Ionpure Technical Support representative.

5 OPERATION

5.1 Initial Startup – Example Procedure

The startup sequence depends on the design of the CEDI/EDR system. Please consult the Operation Manual for the CEDI or EDR system. The following startup procedure is only an example for a typical single module CEDI/EDR system with an electrical schematic as shown in Figure 3.

- Close the main disconnect switch (or circuit breaker) for the system.
- Open the appropriate valves and start the pretreatment equipment, such as the reverse osmosis (RO) system, upstream of the CEDI system.
- Adjust the flow rates through the module of the dilute and concentrate streams.
- Slowly increase the DC output current to the value calculated by the Ionpure/Nexed Projection Program. In constant current mode, the power controller will maintain the current at that setting if the required voltage to drive the current is lower than the maximum DC voltage available.
- Verify that the DC output is removed when the CEDI/EDR module flow is interrupted.



Operation with DC power on and insufficient water flow can cause irreparable damage to the CEDI or EDR module(s) and system.

During normal operation, no further attention to the power controller should be required.

5.2 Output Adjustment

The DC output current may need to be adjusted if there is a change in feed water conditions and/or flow rate.

6 INDICATOR LEDS



Troubleshooting should be performed by qualified personnel only. Safety procedures should be reviewed prior to working with the DC3 Power Controller.

The power controller status can be determined by looking at the LEDs on the front of the power controller. The LEDs will indicate normal operation or fault conditions. See chart below for LED color combinations, and the indicated operating condition.

24V LED	
Condition	LED Indication
+24VDC Present	Solid green
+24 VDC Wired Backwards	Solid red

LINE LED	
Condition	LED Indication
OK, in range	Solid Green
Inhibit alarm; under-voltage	Off
Inhibit alarm; over-voltage	Solid Red

STATUS LED	
Condition	LED Indication
Stop state; no faults	Off
RUN state; no faults and no alarms	Solid Green
Warning alarm: limiting (V, A, VA) and/or high temperature	Solid Orange
RUN state; no command signal	Flashing Green
RUN state; no load	Flashing Green
Inhibit alarm; fault state *	Solid Red
Inhibit alarm; over-temperature	Flashing Orange
Warning alarm; short-circuit	Alternating Red/Green
Invalid DIP switch setting; memory failure	Flashing Red

*Use Ionpure Power Panel Software to determine which fault condition is present.

7 TROUBLESHOOTING

7.1 Run / Stop State

If the power controller is not enabled for run state and is in stop state:

Possible Cause	Action
Low flow switch activated (open)	Check operation of flow switch. Check availability of feed water. Check upstream and downstream valves.
No jumper at on/off interlock input on power controller (if remote on/off interlock not used)	Install jumper.
Remote on / off interlock activated (open)	Check status of RO system, CEDI feed pump or other remote on/off interlock (system specific).

7.2 Warning Alarms

Warning alarms do not prevent DC output. The codes below refer to those displayed in the Ionpure Power Panel software.

7.2.1 Voltage Limit (warning code 1)

The power controller will not be allowed to exceed the Voltage Limit setting (Power Panel software “Control” screen). The Voltage Limit warning will self-clear when the output voltage is less than the Voltage Limit.

7.2.2 Current Limit (warning code 2)

The power controller will not be allowed to exceed the Current Limit setting (Power Panel software “Control” screen). The Current Limit warning will self-clear when the current is less than Current Limit setting.

7.2.3 Power Limit (warning code 4)

The power controller will not be allowed to exceed the Power Limit setting (Power Panel software “Control” screen). The Power Limit warning will self-clear when the current is less than Power Limit setting.

7.2.4 Heat Sink Over-Temperature (warning code 8)

A heat sink over-temperature warning is within 5 °C of the maximum temperature rating for the device. This alarm will only self-clear when the heat sink temperature returns to a temperature 5 °C below the maximum temperature rating for the device.

7.2.5 Transformer Over-Temperature (warning code 16)

A transformer over-temperature warning is within 5 °C of the maximum temperature rating for the device. This alarm will only self-clear when the transformer temperature returns to a temperature 5 °C below the maximum temperature rating for the device.

7.2.6 Open Load / No Load (warning code 32)

This occurs when the load (CEDI module) is not connected or if there is a lack of continuity in the wiring to the module.

7.2.7 Shorted Load / Output Short-Circuit (warning code 64)

This occurs when there is no resistance (short circuit) across the DC output terminals of the power supply.

7.3 Inhibit Alarms

Inhibit alarms prevent DC output. The codes below refer to those displayed in the Ionpure Power Panel software.

7.3.1 AC Line Under-Voltage (inhibit code 64)

The line voltage is not present or too low for the power controller to operate. Test AC voltage at line supply with multi-meter; confirm that it is greater than 380 VAC between line-to-line. If not, check fuses, contactor, breakers, and/or disconnects upstream of the controller.

7.3.2 AC Line Over-Voltage (inhibit code 32)

The line voltage is too high for the power controller to operate. Check AC voltage at line supply with multi-meter; confirm that it is less than 480 VAC between line-to-line.

7.3.3 Current Trip (inhibit codes 2 and 4)

The power controller has exceeded the Current Trip setting. This feature will shut the controller down and display an alarm. Reset the Current Trip by the Run/Stop jumper on P1 Connector, Pins 9 and 10.

7.3.4 Voltage Trip (inhibit code 16)

The power controller has exceeded the DC Output Voltage Trip setting. This feature will shut down the power controller and display an alarm. Reset the Voltage Trip by the Run/Stop jumper on P1 Connector, Pins 9 and 10.

7.3.5 Heat Sink Over Temperature (inhibit code 8)

7.3.6 Transformer Over Temperature (inhibit code 128)

The unit has exceeded the temperature rating for the device. Ensure that temperature inside enclosure during operation is less than 50°C. Check for obstructions preventing any fans from operating correctly. Check fan sizing, ambient temperature; possible need for air conditioning or vortex cooling. After cooling to a safe operating temperature, reset the Over Temperature by the Run/Stop jumper on P1 Connector, Pins 9 and 10.

7.3.7 Loss of Inductor Fan (inhibit code 128)

This is usually due to an undersized 24 VDC control power source, or undersized wire from the 24 VDC power source to the DC3. Shut down and address the control power issue, then restart the DC3.

7.3.8 I/O Power Supply Failure (inhibit code 1024)

This error is uncommon but represents a component failure. Turn off the +24 VDC control power, then re-apply it. If the fault continues to appear, contact Ionpure for additional assistance.

7.4 Alarm Reset Methods

7.4.1 Cycle 24 VDC control power off / on.

7.4.2 Reset button (switch) on bottom of DC3 next to micro USB port (see 1.3.5).

7.4.3 From Power Panel Software,  drop-down box.

7.4.4 Toggle Run/Stop either digitally or from RUN (Enable) switch (3.2.7).

APPENDIX A DESIGN CONSIDERATIONS

A.1 Fuses and Circuit Breakers

- Over-current protection devices (fuses or a circuit breaker) must be installed between the line supply and the AC input of the power controller, sized in accordance with applicable electrical codes. There are no special requirements for fuse speed.
- Do **NOT** install fuses or circuit breakers between the DC output of the power controller and the CEDI module. Doing so might eventually cause damage to the power controller.

A.2 Enclosure

- Sizing: the width and height will depend on size and number of components inside the enclosure. There should be at least 76.2 mm (3.00 in.) of clearance from the top and bottom of the power controller to allow proper air flow.
- Cooling: the power controller will dissipate a maximum of 450 watts in the form of heat at full-load. The panel enclosure should have proper ventilation to ensure the power controllers operate at a temperature no higher than 50 °C (122 °F).

A.3 Contactor (Optional)

- A contactor can be installed downstream of the over-current protection devices (fuses or breakers) to completely remove AC power to the power controller. This might be desired for emergency stop and/or manual override implementation, but should not be used for routine enabling/disabling of DC output.
- Power to the CEDI module must be enabled / disabled using the remote on / off input of the power controller, as described in Section 3.2.6.

Table A1: DC Volts and Amps Required for One IONPURE CEDI Module

Module Type	Maximum Required DC Volts	Maximum Required DC Amps
LX04 EU, X & Z	27	6
LX10 EU, X & Z	67	6
LX18 EU, X & Z	120	6
LX24 EU, X & Z	160	6
LX30 EU, X & Z	200	6
LX45 EU, X & Z	300	6
LX04HI	50	10
LX10HI	125	10
LX18HI	225	10
LX24HI	300	10
LX30HI	375	10
LX45HI	600	10
VNX28EP	300	6.6
VNX55-E	300	13.2
VNX55-EP	300	13.2
VNX55-EX	300	13.2
VNX15CDIT	600	6.6
VNX30CDIT	600	13.2
VNX55HH	600	10
VNX-Max	600	7
VNX-Mini	480	7
MX30	27	2.5
MX60	53	2.5
MX125	106	2.5
MX250	213	2.5
MX500	426	2.5

Table A1 has been updated according to Ionpure Technical Bulletin *IPTB-2018-02 Changes in DC Voltage Requirements*.

Table A2: DC Volts and Amps Required for One NEXED EDR Module

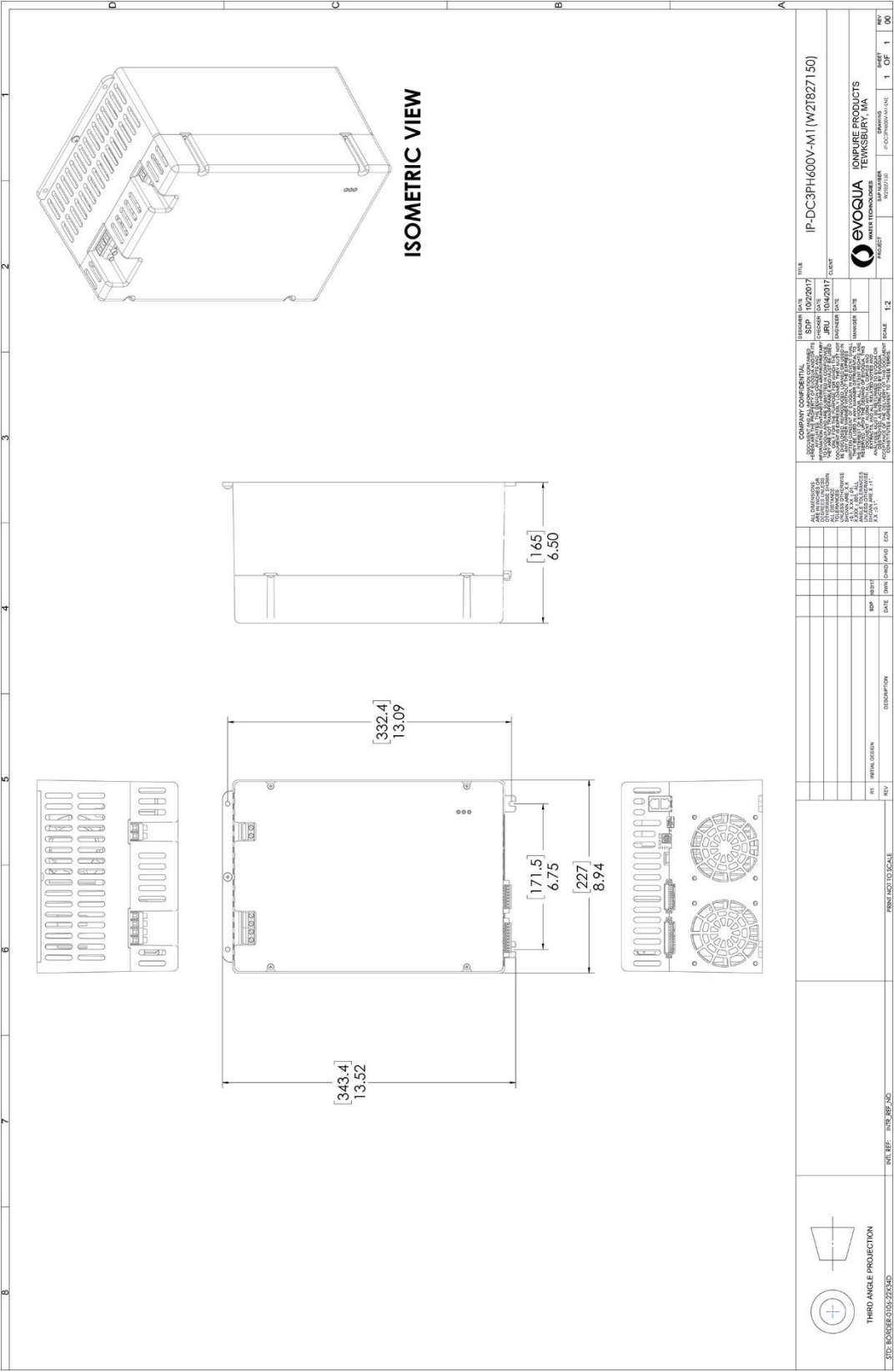
Module Type (ED)	Maximum Required DC Volts	Maximum Required DC Amps
NEXED3	600	20
NEXED6	600	20
NEXED12	600	20

APPENDIX B ENGINEERING DOCUMENTS AND DRAWINGS

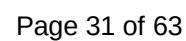
Engineering Drawings included in this section:

- Figure B1: Full-scale dimensional drawing for IP-DC3PH600V-M1
- Figure B2: Electrical schematic of a typical single-module Installation
- Figure B3: Electrical schematic of a typical multi-module Installation
- Figure B4: DC3 Electrical connections

Figure B1: Full-Scale Dimensional Drawing for IP-3PH600V-M1



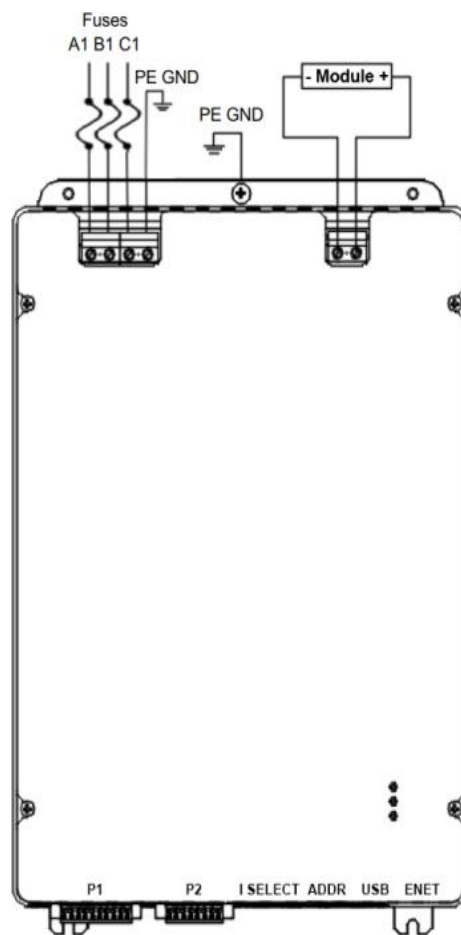
IP-MAN-DC3-1018-EN.pdf (REV. 1)



IP-MAN-DC3-1018-EN.pdf (REV. 1)



Figure B4: DC3 Electrical Connections



APPENDIX C PARALLELING ACCESSORY

C.1 General Description

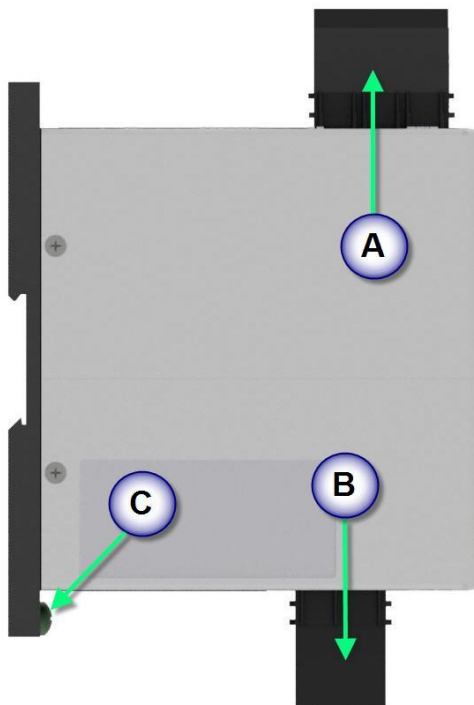
Ionpure Parallel Board (IP-PB600V45A-1) is an accessory to the DC3 Power Controller (IP-DC3PH600V-M1) that allows for the convenient paralleling of up to (3) DC3 Power Controllers to one module. The Parallel Board allows for a power throughput of up to 15 amps per DC3 Power Controller for a combined load of 45 Amps at 600 VDC.

The Parallel Board can be either panel mounted or mounted via DIN rail to suit your electrical enclosure's requirements.

The robust design of the Parallel Board accessory allows for continuous full-frame current up to 50° C at 6,000 ft. altitude. Cooling is accomplished via natural convection, no external power supply is required.



C.2 Points of Interest



(A) DC+ Input

(3) DC+ input connections, rated for 15 Amps each.

(B) DC+ Output

DC+ output connections, rated for 45 Amps.

(C) Chassis Ground

Chassis ground.

C.3 Mounting Dimensions and Considerations

For mounting, use M5 screws or UNC10-32 screws (not included), and/or DIN rail. Mount device vertically. The keep out area on the top and bottom is for air circulation. The top and bottom of the unit must have a minimum of 76.2 mm (3.00 in.) free from obstructions as measured from the edge of the base. Dimensions above are measured from the edge of the base.

Figure 1: Mounting Dimensions for IP-PB600V45A-1

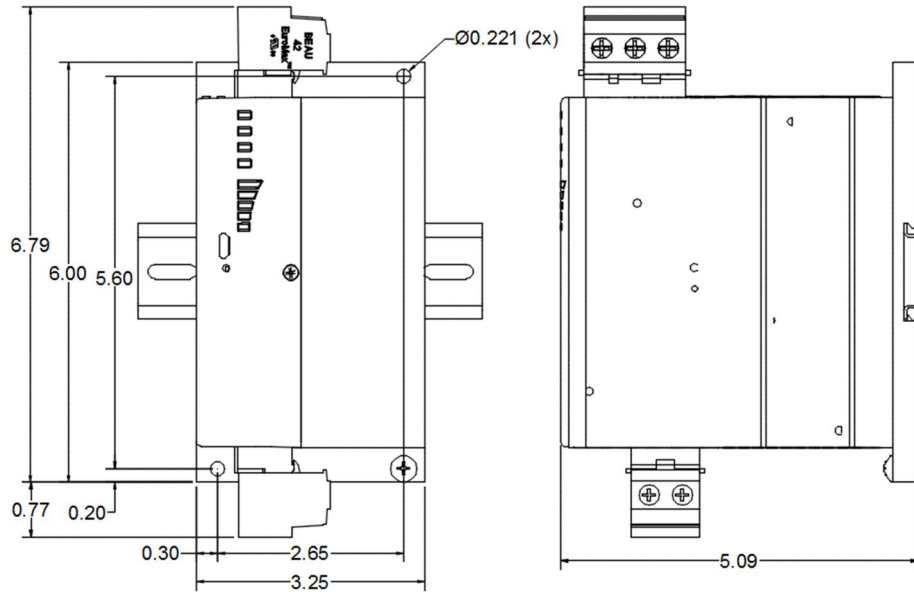
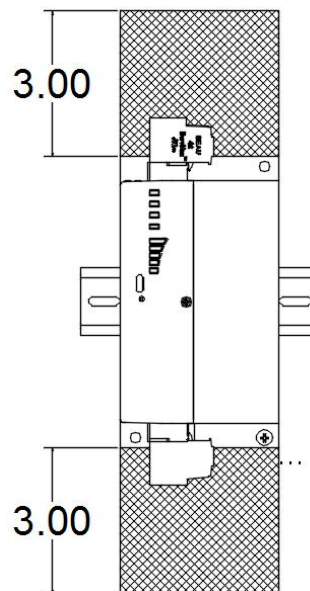


Figure 2: Mounting Considerations for IP-PB600V45A-1



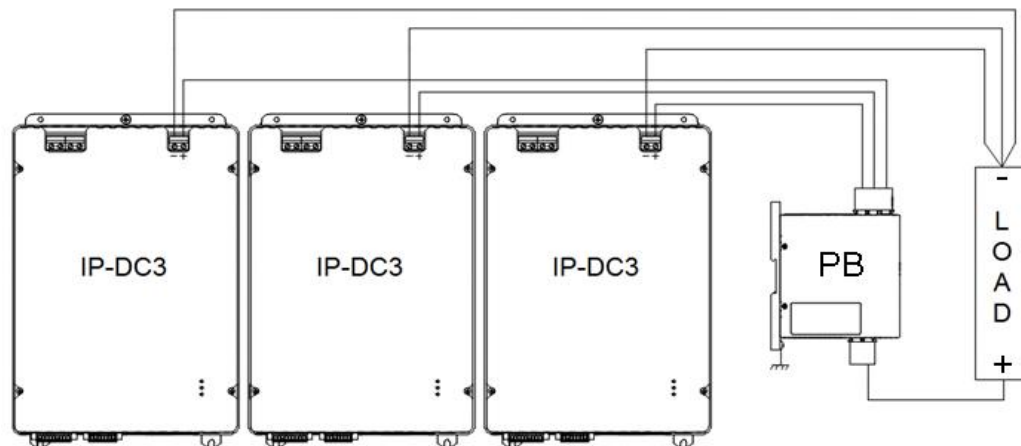
C.4 Wiring

For wiring the connections use copper conductors rated 75°C minimum. See torque specification below for proper tightening.

Recommended Tightening Torque for Paralleling Board Connectors	
Wire Size (AWG)	Torque
3 - 14	2.70 Nm (24 IN-LBS)

C.5 Connections

Connect the DC+ output of each DC3 Power Controller to A1, B1, and/or C1 input of the Parallel Board. The DC+ output (labelled +) connects to the positive terminal of the load (module). The DC- output of each DC3 is connected to the DC- of the load.



APPENDIX D MODBUS TCP FIELDBUS INTERFACE AND PARAMETER LIST

The DC3 is the Modbus TCP server. The client would be the PLC or computer.

The destination port used for Modbus TCP is **502**, the source port is random assigned/used by the client.

The Ethernet cable can be connected physically to either connector on the DC3.

SP 1 Feedback Type

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: N/A

Minimum: 1

Maximum: 3

Default: 2

Selections:

1	=	Load Voltage
2	=	Load Current
3	=	Load Power

Feedback Type selects what the control loop uses for feedback.

NOTE: Load Current (2) is the only selection. Future releases will have this selected via the DIP switch to allow either Load Voltage or Load Current

SP 3 Control Mode

Units: N/A

Minimum: 0

Maximum: 1

Default: 1

Selections:

0	=	Open Loop
1	=	Closed Loop

When Open Loop is selected the control loop does not use feedback to control the output, but sets the output directly proportional to the setpoint. Closed loop sets the output so that the feedback matches the setpoint.

SP 4 Ramp Up Time

Units: seconds

Minimum: 0.0

Maximum: 600.0

Default: 0.0

The ramp up time sets the time for the controller to command the output from zero (0) to the Full Scale feedback value. When the time is set to zero, the ramp is disabled so the controller uses just the control loop response SP-6.

When the time is non-zero the ramp is used whenever the setpoint change is greater than 10% of the full scale feedback value.

SP 5 Ramp Down Time

Units: seconds

Minimum: 0.0

Maximum: 600.0

Default: 0.0

The ramp down time sets the time for the controller to command the output from the Full Scale feedback value to zero (0). When the time is set to zero, the ramp is disabled so the controller uses just the control loop response SP-6.

When the time is non-zero the ramp is used whenever the setpoint change is greater than 10% of the full scale feedback value.

SP 6 Control Loop Response

Units: N/A

Minimum: 50 (Tau $\approx$ 50 ms)Maximum: 500 (Tau $\approx$ 500 ms)Default: 100 (Tau $\approx$ 100 ms)

Control Loop Response sets the control loop gain which affects the controller's response to changes in the load and power source, along with changes to the setpoint. The times above are estimates and may vary depending on load and power source characteristics.

SP 8 Full Scale Voltage

Units: Volts DC

Minimum: 10

Maximum: 600

Default: 600

Full Scale Voltage is used to scale the Meter analog output signal for the Meter output used to represent Load Voltage (Default for Meter output 2).

SP 9 Full Scale Current

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: Amps DC

Minimum: 2.5

Maximum: 15.0

Default: 15.0 (determined by the DIP switch setting at power-up/reset)

Full Scale Current is set to the maximum allowable output current commanded by the setpoint. This value is set by the DIP switch during initialization following power-up or reset. This value is also used to scale the Meter analog output signal for the Meter output used to represent Load Current (Default for Meter output 1).

SP 10 Full Scale Power

Units: Watts

Minimum: 25

Maximum: 10000

Default: 9000

Full Scale Power is used to scale the Meter analog output signal for a Meter output used to represent Load Power.

SP 11 Voltage Limit

Units: Volts DC

Minimum: 10.0

Maximum: 640.0

Default: 600.0

Voltage Limit is used to set the maximum allowable output voltage. The controller will not allow the output voltage to be higher than this setting.

SP 12 Current Limit

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: Amps DC

Minimum: 0.5

Maximum: 18.0

Default: 16.5 (determined by the DIP switch setting at power-up/reset)

Current Limit sets the absolute maximum output current allowed by the controller. This value is set by the DIP switch during initialization following power-up or reset. The value set for current limit is 110% of the Full Scale current value.

SP 15 Power Limit

Units: Watts

Minimum: 26

Maximum: 10500

Default: 9000

Power Limit sets the absolute maximum output power allowed by the controller.

SP 16 Relay 1 Alarm Mask

Units: N/A

Minimum: 0 = 0000000000000000 = 0x0000

Maximum: 65535 = 1111111111111111 = 0xFFFF

Default: 0 = 0000000000000000 = 0x0000

BIT Definitions:

BIT 15 =	TBD
BIT 14 =	Over Temperature shutdown
BIT 13 =	Current Trip
BIT 12 =	High Temperature warning
BIT 11 =	TBD
BIT 10 =	Output Voltage too High
BIT 9 =	Power Limiting
BIT 8 =	Current Limiting
BIT 7 =	Voltage Limiting
BIT 6 =	Digital RUN Enable is set = request to RUN
BIT 5 =	Input Voltage too High
BIT 4 =	Input Voltage too Low
BIT 3 =	TBD
BIT 2 =	TBD
BIT 1 =	Fan Loss
BIT 0 =	TBD

Relay 1 Alarm mask determines the alarm events that will energize the on-board relay. When a bit is set to 1 and the corresponding event occurs the relay will energize.

SP 17 Relay 2 Alarm Mask

Units: N/A

Minimum: 0 = 0000000000000000 = 0x0000

Maximum: 65535 = 1111111111111111 = 0xFFFF

Default: 25648 = 0110010000110000 = 0x6430

BIT Definitions:

BIT 15 =	TBD
BIT 14 =	Over Temperature shutdown
BIT 13 =	Current Trip
BIT 12 =	High Temperature warning
BIT 11 =	TBD
BIT 10 =	Output Voltage too High
BIT 9 =	Power Limiting
BIT 8 =	Current Limiting
BIT 7 =	Voltage Limiting
BIT 6 =	Digital RUN Enable is set = request to RUN
BIT 5 =	Input Voltage too High
BIT 4 =	Input Voltage too Low
BIT 3 =	TBD
BIT 2 =	TBD
BIT 1 =	Fan Loss
BIT 0 =	TBD

Relay 2 Alarm mask is not used since this PCB revision only has one relay.

SP 20 Over-current Trip Retry setting

Units: Retry count

Minimum: 0

Maximum: 3

Default: 0 [disabled]

Use the Over-current Trip Retry setting (SP-20) to allow the controller to automatically clear the fault and restart after an over-current trip fault event. This parameter sets the number of times the controller will retry after an over-current trip event. The controller will latch into fault state after attempting the number of retries set by this parameter.

SP 21 Auto Retry Enable

Units: N/A

Minimum: 0

Maximum: 1

Default: 1

Selections:

0 = Disable

1 = Enable

When set to “Enable” (1) and an Input Over-voltage event occurs at the same time as an Over-current Trip event the controller will automatically “Retry” back into RUN state = fire the output.

SP 26 High Voltage shutdown threshold

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: Volts DC

Minimum: 150

Maximum: 930

Default: 800

This is the Input Voltage high threshold. If the input voltage reaches this threshold the controller output immediately shuts down. When the input voltage drops below this threshold the output will turn back ON after ½ second.

SP 27 Low Voltage shutdown threshold

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: Volts DC

Minimum: 435

Maximum: 550

Default: 435

This is the Input Voltage low threshold. If the input voltage drops to this threshold the controller output immediately shuts down. When the input voltage rises above this threshold the output will turn back ON after ½ second.

SP 85 Relay 1 System Alarm Mask

Units: N/A

Minimum: 0 = 0000000000000000 = 0x0000

Maximum: 65535 = 1111111111111111 = 0xFFFF

Default: 16 = 0000000000010000 = 0x0010

BIT Definitions:

BIT 15 =	TBD
BIT 14 =	TBD
BIT 13 =	TBD
BIT 12 =	TBD
BIT 11 =	TBD
BIT 10 =	TBD
BIT 9 =	TBD
BIT 8 =	TBD
BIT 7 =	TBD
BIT 6 =	RUN Enable via switch input
BIT 5 =	In RUN State
BIT 4 =	Output is ON = Generating Power
BIT 3 =	Watchdog Timeout
BIT 2 =	Memory Error
BIT 1 =	Communications Error
BIT 0 =	Processor Trap encountered

Relay 1 System Alarm mask determines the system events that will energize the on-board relay. When a bit is set to 1 and the corresponding event occurs the relay will energize. (Relay 1 is by default the “Output ON” relay)

SP 86 Relay 2 System Alarm Mask

Units: N/A

Minimum: 0 = 0000000000000000 = 0x0000

Maximum: 65535 = 1111111111111111 = 0xFFFF

Default: 0 = 0000000000000000 = 0x0000

BIT Definitions:

BIT 15 =	TBD
BIT 14 =	TBD
BIT 13 =	TBD
BIT 12 =	TBD
BIT 11 =	TBD
BIT 10 =	TBD
BIT 9 =	TBD
BIT 8 =	TBD
BIT 7 =	TBD
BIT 6 =	RUN Enable via switch input
BIT 5 =	In RUN State
BIT 4 =	Output is ON = Generating Power
BIT 3 =	Watchdog Timeout
BIT 2 =	Memory Error
BIT 1 =	Communications Error
BIT 0 =	Processor Trap encountered

Relay 2 System Alarm mask is not used since this PCB revision only has one relay.

SP 90 Analog Input Type

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: N/A

Minimum: 1

Maximum: 2

Default: 2 [Current]

Selections:

1	=	Voltage Input
2	=	Current Input

Analog Input type is used to inform the controller about the type of signal that is connected to the analog input terminals. Set to voltage if the signal is 0 to 10 volts. Set to current if the signal is 0 to 20 ma.

NOTE: This PCB supports only a current input signal, therefore this value should remain set for Current.

SP 91 Analog Input Lo Command

Units: V, ma

Minimum: -5.00

Maximum: 25.00

Default: 4.00

This sets the analog input signal level that corresponds to the command value set by SP-92 Analog Input Lo Output.

SP 92 Analog Input Lo Output

Units: % (Based on **Full Scale** Value for the **Feedback Type** selected)

Minimum: 0.00

Maximum: 125.00

Default: 0.00

This sets the commanded percent, of the Full Scale feedback value for the Feedback Type selected, that corresponds to the signal level set by SP-91 Analog Input Lo Command.

SP 93 Analog Input Hi Command

Units: V, ma

Minimum: -5.00

Maximum: 25.00

Default: 20.00

This sets the analog input signal level that corresponds to the command value set by SP-94 Analog Input Hi Output.

SP 94 Analog Input Hi Output

Units: % (Based on **Full Scale** Value for the **Feedback Type** selected)

Minimum: 0.00

Maximum: 125.00

Default: 100.00

This sets the commanded percent, of the Full Scale feedback value for the Feedback Type selected, that corresponds to the signal level set by SP-93 Analog Input Hi Command.

SP 100 Digital Setpoint 1 [RAM]

Units: % (Based on **Full Scale** Value for the **Feedback Type** selected)

Minimum: 0

Maximum: 10000 = 100%

Default: 0

This sets the commanded percent, of the Full Scale feedback value for the Feedback Type selected, used as the control loop setpoint when Digital Setpoint 1 is selected as the Setpoint source (SEE SP-102, SP-103, & SP-104)

SP 101 Digital Setpoint 2 [RAM]

Units: % (Based on **Full Scale** Value for the **Feedback Type** selected)

Minimum: 0

Maximum: 10000 = 100%

Default: 0

This sets the commanded percent, of the Full Scale feedback value for the Feedback Type selected, used as the control loop setpoint when Digital Setpoint 2 is selected as the Setpoint source (SEE SP-102, SP-103, & SP-104)

SP 102 Setpoint 1 Source

Units: N/A

Minimum: 1

Maximum: 3

Default: 1

Selections:

- | | | |
|---|---|--------------------|
| 1 | = | Analog Input |
| 2 | = | Digital Setpoint 1 |
| 3 | = | Digital Setpoint 2 |

This determines the setpoint that the control loop will use when SP-104 Control Setpoint Select is set to 1 = Setpoint 1 source.

SP 103 Setpoint 2 Source

Units: N/A

Minimum: 1

Maximum: 3

Default: 2

Selections:

- | | | |
|---|---|--------------------|
| 1 | = | Analog Input |
| 2 | = | Digital Setpoint 1 |
| 3 | = | Digital Setpoint 2 |

This determines the setpoint that the control loop will use when SP-104 Control Setpoint Select is set to 2 = Setpoint 2 source.

SP 104 Control Setpoint Select

Units: N/A

Minimum: 1

Maximum: 2

Default: 1

Selections:

1 = Setpoint 1 source

2 = Setpoint 2 source

This determines the Setpoint Source that is used as the setpoint for the control loop (SEE SP-103 & SP-104)

SP 108 Network Timeout SetpointUnits: % (Based on **Full Scale** Value for the **Feedback Type** selected)

Minimum: 0

Maximum: 10000 = 100%

Default: 0

This sets the commanded percent, of the Full Scale feedback value for the Feedback Type selected, used as the control loop setpoint when SP-128 Network Timeout Action is set to 2 = use Network Timeout Setpoint and the Heartbeat timer (SEE SP-125) expires resulting in a Network Timeout event.

SP 111 I/O Power Supply Failure Inhibit Enable

Units: N/A

Minimum: 0

Maximum: 1

Default: 1

Selections:

0 = Disable (ignore the power supply failure)

1 = Enable (cause Fault State = shutdown)

When SP-111 is set to Enable (1) and the I/O Power supply fails, an inhibit alarm will be indicated and the controller will transition to FAULT state which will shut down the output. If controlling with a digital setpoint and digital run/stop, the FAULT state shut down can be disabled by setting this parameter to Disable (0). The inhibit alarm will still be present, however the controller will not be put into FAULT state when disabled.

SP 125 Communications Heartbeat Time

Units: sec

Minimum: 0

Maximum: 65535

Default: 0 (disabled)

Communications Heartbeat Time sets the interval, in seconds, that the controller will wait for a Modbus TCP message packet before indicating communication timeout, and executing the selected Timeout Action set by SP-128.

NOTE: A value of 0 seconds disables the Heartbeat timer, therefore no timeout will occur.

SP 126 IP Address base HI

Units: N/A

Minimum: 0 (0. 0)

Maximum: 65535 (255.255)

Default: 49320 (192.168)

This sets the two most significant octets of the controller's base IP Address

SP 127 IP Address base LO

Units: N/A

Minimum: 0 (0. 0)

Maximum: 65520 (255.240)

Default: 64 (0.100)

This sets the two least significant octets of the controller's base IP Address

NOTE: The value used by the controller for the last octet is determined by the value set for this parameter (SP-127) and the rotary switch setting on the PCB.

SP 128 Network Timeout Action

Units: N/A

Minimum: 0

Maximum: 2

Default: 0

Selections:

0	=	NONE, continue
1	=	STOP, fault shutdown
2	=	Use Network Timeout setpoint (SP-108)

This setting determines how the controller will react to a network timeout event that occurs when the Heartbeat timer expires waiting for a Modbus TCP packet.

A setting of 0 = NONE will result in no action: the controller will indicate the timeout, but continue to operate as before.

A setting of 1 = STOP will result in the controller immediately transitioning to FAULT shutdown state with the output power OFF when a timeout occurs.

When this parameter is set to 2 the controller will use the Network Timeout Setpoint (SP-108) immediately after a timeout occurs, until the timeout is cleared by the reception of another Modbus TCP packet.

SP 129 Digital RUN/Stop [RAM]

Units: N/A

Minimum: 0

Maximum: 1

Default: 0

Selections:

0	=	STOP
1	=	RUN

This may be used to command the controller into RUN or STOP state via digital communications (USB or Ethernet/Modbus TCP). This parameter is used in conjunction with the RUN/STOP switch input on the P1 connector (PIN 9).

NOTE: SEE SP-132 Digital RUN/Stop configuration as SP-132 determines how this parameter is used along with the hardwired RUN/STOP input (P1-9).

SP 132 Digital RUN/Stop configuration

Units: N/A

Minimum: 0

Maximum: 2

Default: 1

Selections:

- | | | |
|---|---|---|
| 0 | = | Disabled (use RUN/STOP switch only) |
| 1 | = | Only Digital Setpoints (with switch closed) |
| 2 | = | Digital & Analog setpoints (with switch closed) |

This selects how SP-129 Digital RUN/Stop is used.

A setting of 0 will ignore SP-129 and only use the RUN/STOP switch input (P1-9)

With a setting of 1 (default), when an analog setpoint is in use only the hardwired RUN/STOP switch input (P1-9) will be used, and when a digital setpoint is in use by the controller both SP-129 Digital RUN/Stop and the RUN/STOP switch input (P1-9) will be used.

NOTE: With ALL selections the hardwired RUN/STOP terminal (P1-9) must be connected to common (P1-8) in order to put the controller into RUN state. If the RUN/STOP terminal (P1-9) is left unwired the controller can not be put into RUN state.

SP 140 Meter 1 Output Type

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: N/A

Minimum: 1

Maximum: 2

Default: 2

Selections:

- | | | |
|---|---|----------------|
| 1 | = | Voltage Output |
| 2 | = | Current Output |

Meter 1 Output Type sets the type of signal generated by the controller for the Meter 1 Output (P2-1 P2-2).

The signal is scaled with SP-142 through SP-145.

NOTE: Only Current (0 to 20 ma) is available on this PCB

SP 141 Meter 1 Signal Select

Units: N/A

Minimum: 1

Maximum: 5

Default: 2

Selections:

1	=	Load Voltage
2	=	Load Current
3	=	Load Power
4	=	Load Resistance
5	=	Direct Out (SP-146)

This determines what the Meter 1 Output signal represents.

SP 142 Meter 1 Command Lo ValueUnits: % (Based on **Full Scale** Value for the **Signal** selected)

Minimum: 0.00

Maximum: 100.00

Default: 0.00

This sets the value, in percent of the Full Scale, corresponding to the selection for SP-141 Meter 1 Signal Select that generates the output signal set by SP-143 Meter 1 Signal Lo Output.

SP 143 Meter 1 Signal Lo Output

Units: V, ma

Minimum: 0.00

Maximum: 20.00

Default: 0.00

This sets the output signal level generated for Meter 1 out corresponding to the value determined by SP-142 Meter 1 Command Lo Value.

SP 144 Meter 1 Command Hi ValueUnits: % (Based on **Full Scale** Value for the **Signal** selected)

Minimum: 0.00

Maximum: 100.00

Default: 100.00

This sets the value, in percent of the Full Scale, corresponding to the selection for SP-141 Meter 1 Signal Select that generates the output signal set by SP-145 Meter 1 Signal Hi Output.

SP 145 Meter 1 Signal Hi Output

Units: V, ma

Minimum: 0.00

Maximum: 20.00

Default: 20.00

This sets the output signal level generated for Meter 1 out corresponding to the value determined by SP-144 Meter 1 Command Hi Value.

SP 146 Meter 1 Out Direct

Units: V, ma

Minimum: 0.00

Maximum: 20.00

Default: 0.00

Use this parameter to set the Meter output signal level when SP-141 Meter 1 Signal Select is set to 5 = Direct out.

SP 147 Meter 2 Output Type

*** READ ONLY, MFG UNLOCK CODE REQUIRED FOR WRITE ACCESS ***

Units: N/A

Minimum: 1

Maximum: 2

Default: 2

Selections:

- | | | |
|---|---|----------------|
| 1 | = | Voltage Output |
| 2 | = | Current Output |

Meter 2 Output Type sets the type of signal generated by the controller for the Meter 2 Output (P2-3 P2-4). The signal is scaled with SP-149 through SP-152.

NOTE: Only Current (0 to 20 ma) is available on this PCB

SP 148 Meter 2 Signal Select

Units: N/A

Minimum: 1

Maximum: 5

Default: 1

Selections:

- | | | |
|---|---|---------------------|
| 1 | = | Load Voltage |
| 2 | = | Load Current |
| 3 | = | Load Power |
| 4 | = | Load Resistance |
| 5 | = | Direct Out (SP-153) |

This determines what the Meter 2 Output signal represents.

SP 149 Meter 2 Command Lo Value

Units: % (Based on **Full Scale** Value for the **Signal** selected)

Minimum: 0.00

Maximum: 100.00

Default: 0.00

This sets the value, in percent of the Full Scale, corresponding to the selection for SP-148 Meter 2 Signal Select that generates the output signal set by SP-150 Meter 2 Signal Lo Output.

SP 150 Meter 2 Signal Lo Output

Units: V, ma

Minimum: 0.00

Maximum: 20.00

Default: 0.00

This sets the output signal level generated for Meter 3 out corresponding to the value determined by SP-149 Meter 2 Command Lo Value.

SP 151 Meter 2 Command HI Value

Units: % (Based on **Full Scale** Value for the **Signal** selected)

Minimum: 0.00

Maximum: 100.00

Default: 100.00

This sets the value, in percent of the Full Scale, corresponding to the selection for SP-148 Meter 2 Signal Select that generates the output signal set by SP-152 Meter 2 Signal HI Output.

SP 152 Meter 2 Signal HI Output

Units: V, ma

Minimum: 0.00

Maximum: 20.00

Default: 20.00

This sets the output signal level generated for Meter 2 out corresponding to the value determined by SP-151 Meter 2 Command HI Value.

SP 153 Meter 2 Out Direct

Units: V, ma

Minimum: 0.00

Maximum: 20.00

Default: 0.00

Use this parameter to set the Meter output signal level when SP-148 Meter 2 Signal Select is set to 5 = Direct out.

SP 154 Load Resistance Maximum (for Retransmit scaling)

Units: Ohm

Minimum: 0.00

Maximum: 650.00

Default: 100.00

Set the value for this parameter to the approximate maximum expected resistance of the load when the selection for one of the Meter outputs (SP-141, SP-148) is set for Load Resistance. This value equates to the Meter n Signal HI Output value (SP-145, SP-152).

MP 200 Active Setpoint

Units: N/A

Minimum: 1

Maximum: 6

Representation:

1	=	S1 Analog Input
2	=	S1 Digital Setpoint 1
3	=	S1 Digital Setpoint 2
4	=	S2 Analog Input
5	=	S2 Digital Setpoint 1
6	=	S2 Digital Setpoint 2

MP 202 Analog Input

Units: %, Based on Full Scale Values

Representation: **SXXX.XX**

MP 203 Analog Input Command Value

Units: Amps or Volts (corresponding to Feedback type selected)

Representation: **SXXX.X**

MP 204 Analog Input Signal

Units: V, ma

Representation: **SXX.XX**

MP 210 Inhibit Alarm Status

Units: N/A

Minimum: 0000000000000000 = 0

Maximum: 0000001111111111 = 1023

Representation: 0 = not-active, 1 = active

Bit

MSB	15	=	not used
	14	=	not used
	13	=	not used
	12	=	not used
	11	=	not used
	10	=	I/O Power Supply Failure (Analog Input)
	9	=	Loss of Inductor Fan
	8	=	not used
	7	=	Transformer Over Temperature
	6	=	Input Voltage Low
	5	=	Input Voltage High
	4	=	Output Voltage High
	3	=	Heatsink Over Temperature
	2	=	Over Current Trip (PWM Fault output over current)
	1	=	Over Current Trip (PWM Fault input over current)
LSB	0	=	not used

MP 211 Controller Status

Units: N/A

Minimum: 0

Maximum: 3

Representation:

0	=	Disabled
1	=	Enabled
2	=	Diagnostic
3	=	Calibration

MP 212 Warning Alarm Status

Units: N/A

Minimum: 00000000 = 0

Maximum: 11111111 = 255

Representation: 0 = not-active, 1 = active

Bit

MSB	7	=	not used
	6	=	Shorted Load/Output Short Circuit
	5	=	Open Load/No Load
	4	=	Transformer High Temperature
	3	=	Heatsink High Temperature
	2	=	Power Limit
	1	=	Current Limit
LSB	0	=	Voltage Limit

MP 213 Digital I/O Status

Units: N/A

Minimum: 000000000 = 0

Maximum: 111111111 = 511

Representation: 0 = open/not-active, 1 = closed/active

Bit

MSB	8	=	Inductor Fan is ON
	7	=	not used
	6	=	not used
	5	=	Relay 2
	4	=	Relay 1
	3	=	not used
	2	=	not used
	1	=	GP I/O
LSB	0	=	Run/Stop-Reset

MP 214 Load Current DIP Switch Status

Units: N/A

Representation: 0 = open/not-active, 1 = closed/active

<u>Bit</u>			
MSB	7	=	not used
	6	=	not used
	5	=	not used
	4	=	SW5
	3	=	SW4
	2	=	SW3
	1	=	SW2
LSB	0	=	SW1

MP 215 Load Current Selection (in use)

Units: Amps

Representation: XX.X

MP 216 Meter Output 1 Signal

Units: V, ma

Representation: SXX.XX

MP 217 Meter Output 2 Signal

Units: V, ma

Representation: SXX.XX

MP 218 Load Current DIP Switch Selection (live)

Units: Amps

Representation: XX.X

MP 220 Input Voltage

Units: Volts

Representation: SXXX.X

MP 221 Load Voltage

Units: Volts

Representation: SXXX.X

MP 222 Load Current

Units: Amps

Representation: SXX.X

MP 223 Load Resistance

Units: Ohms

Representation: XXX.XX

MP 224 Heatsink Temperature

Units: °C

Representation: XXX.X

MP 225 Input Current

Units: Amps

Representation: SXX.X

MP 226 Peak Input Current

Units: Amps

Representation: SXXX.X

MP 227 Transformer Temperature

Units: °C

Representation: XXX.X

MP 245 Load Power (HI word)

MP 246 Load Power (LO word)

Units: Watts

Representation: XXXXX.X

MP 247 Reserved

MP 248 Controller State

Units: N/A

Minimum: 0

Maximum: 3

Representation:

0	=	STOP
1	=	RUN
2	=	FAULT
3	=	FAULT RESET

MP 249 Output Command

Units: %

Representation: XX.X

MP 250 Command Reference (HI word)

MP 251 Command Reference (LO word)

Units: Volts, Amps, Watts

Representation: XXXXX.X

MP 252 Feedback (HI word)

MP 253 Feedback (LO word)

Units: Volts, Amps, Watts

Representation: SXXXXX.X

MP 254 Control Loop Error (HI word)
MP 255 Control Loop Error (LO word)

Units: Volts, Amps, Watts

Representation: **SXXXXX.X**

MP 257 Integral Compensation

Units: PWM counts

Representation: **SXXX**

MP 307 Power-up Count

Units: Counts

Representation: **XXXXX**

The number of times the card has been Powered up.

MP 308 Low Power Count

Units: Counts

Representation: **XXXXX**

The number of times the card has detected a low power supply voltage without losing power altogether.

MP 309 In Service time (HI word)

MP 310 In Service time (LO word)

Units: Second

Representation: **XXXXXXXXXX**

The number of seconds the card has had power applied.

NOTE: In Service time is stored to non-volatile memory every hour

MP 319 IP Address switch selection

Units: N/A (Range: 0 to 15)

Representation: **XX**

The value set by the rotary switch on the PCB

MP 320 IP Address (HI word)

MP 321 IP Address (LO word)

Units: N/A

Representation: **XXXXXXXXXX (4 bytes = XXX.XXX.XXX.XXX)**

Example: 3232235620 = C0A80064_h = 192.168.0.100

MP 326 Ethernet Status

Units: N/A

Minimum: 0000000000000000 = 0

Maximum: 1111111111111111 = 65535

Representation:

Bit

MSB	15	=	not used
	14	=	not used
	13	=	not used
	12	=	not used
	11	=	not used
	10	=	IP Address conflict detected = "OFF Line"
	9	=	Packet transmission error detected
	8	=	Packet reception error detected
	7	=	Heartbeat Timer timeout
	6	=	Heartbeat Timer active
	5	=	IP Address is OK = "On Line"
	4	=	TCP Connection 2 established
	3	=	TCP Connection 1 established
	2	=	Link2 = Port 2 cable is connected
	1	=	Link1 = Port 1 cable is connected
LSB	0	=	Ready

MP 327 EE Calibration bits, stored HI (MSW)**MP 328 EE Calibration bits, stored LO (LSW)**

Units: ADC Bits

Representation: XXXXXXXXXX

MP 329 Live Calibration bits in (HI word)**MP 330 Live Calibration bits in (LO word)**

Units: ADC Bits

Representation: XXXXXXXXXX

MP 331 Firmware ID

Units: N/A

Minimum: 0

Maximum: 32767

MP 332 Firmware Version

Units: N/A

Representation: XX.XX

** Full with MP-333 Minor Revision appended **

Minimum: 0.00.01

Maximum: 99.99.99

MP 333 Minor Revision (appended to Firmware Version)

Units: N/A

Representation: **XX**

Maximum: 99

MP 335 Misc Status

Units: N/A

Minimum: 0000000000000000 = 0

Maximum: 0000000011111011 = 251

Representation:

<u>Bit</u>			
MSB	15	=	not used
	14	=	not used
	13	=	not used
	12	=	not used
	11	=	not used
	10	=	not used
	9	=	not used
	8	=	not used
	7	=	not used
	6	=	Trace is ON, Collecting data
	5	=	not used
	4	=	Trace is Enabled, waiting for trigger
	3	=	Waiting for the Enter Key during Initialization
	2	=	USER Unlock, Access Code successfully entered
	1	=	not used
LSB	0	=	MFG Unlock, Access Code successfully entered

MP 336 EEPROM Status

Units: N/A

Minimum: 0000000000000000 = 0

Maximum: 0001011111111111 = 6143

Representation:

Bit

MSB	15	=	not used
	14	=	not used
	13	=	EEPROM SP Definition Table update required
	12	=	EEPROM is write protected
	11	=	Backup User SP V-Table checksum Failure
	10	=	not used
	9	=	not used
	8	=	Repair Record checksum Failure
	7	=	Error Code Record checksum Failure
	6	=	MFG Data Table checksum Failure
	5	=	Calibration Data Table checksum Failure
	4	=	not used
	3	=	MFG SP V-Table checksum Failure
	2	=	User SP V-Table checksum Failure
	1	=	Blank, Initialization Required
LSB	0	=	Read/Write Failure

MP 349 Firmware Update Code

Units: N/A

Representation: XXXXX

MP 370 Network Heartbeat timer

Units: Seconds

Representation: XXXXX

MP 379 Bootloader Version

Units: N/A

Representation: XX.XX

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