AMETEK®
PROGRAMMABLE POWER

Sorensen
Asterion DC Series

Operation Manual

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Warranty Period: Five Years

Warranty Terms

AMETEK Programmable Power, Inc. ("AMETEK") provides this written warranty covering the Product stated above, and if the Buyer discovers and notifies AMETEK in writing of any defect in material or workmanship within the applicable warranty period stated above, then AMETEK may, at its option: repair or replace the Product; or issue a credit note for the defective Product; or provide the Buyer with replacement parts for the Product.

The Buyer will, at its expense, return the defective Product or parts thereof to AMETEK in accordance with the return procedure specified below. AMETEK will, at its expense, deliver the repaired or replaced Product or parts to the Buyer. Any warranty of AMETEK will not apply if the Buyer is in default under the Purchase Order Agreement or where the Product or any part thereof:

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- is damaged by modifications, alterations or attachments thereto which are not authorized by AMETEK;
- is installed or operated contrary to the instructions of AMETEK;
- is opened, modified, or disassembled in any way without AMETEK's consent; or
- is used in combination with items, articles or materials not authorized by AMETEK.

The Buyer may not assert any claim that the Products are not in conformity with any warranty until the Buyer has made all payments to AMETEK provided for in the Purchase Order Agreement.

Product Return Procedure

1. Request a Return Material Authorization (RMA) number from the repair facility (**must be done in the country in which it was purchased**):
   - **In the USA**, contact the AMETEK Repair Department prior to the return of the product to AMETEK for repair:
   - Telephone: 800-733-5427, ext. 2295 or ext. 2463 (toll free North America)
     858-450-0085, ext. 2295 or ext. 2463 (direct)
   - **Outside the USA**, contact the nearest Authorized Service Center (ASC). A full listing can be found either through your local distributor or our website, www.powerandtest.com, by clicking Support and going to the Service Centers tab.
2. When requesting an RMA, have the following information ready:
   - Model number
   - Serial number
   - Description of the problem

Note: *Unauthorized returns will not be accepted and will be returned at the shipper's expense.*

Note: *A returned product found upon inspection by AMETEK, to be in specification is subject to an evaluation fee and applicable freight charges.*

IMPORTANT SAFETY INSTRUCTIONS

Before applying power to the system, verify that your product is configured properly for your application.

WARNING!

Hazardous voltages might be present when covers are removed. Qualified personnel must use extreme caution when servicing this equipment. Circuitry, test points, and output voltages might be floating with respect to chassis ground. Do not touch electrical circuits and use appropriately rated test equipment. A safety ground wire must be connected from the chassis to the AC mains input when servicing this equipment.

WARNING!

This equipment contains ESD sensitive input/output connection ports. When installing equipment, follow ESD safety procedures. Electrostatic discharges might cause damage to the equipment.

Only *qualified personnel,* who understand and deal with attendant hazards in power supplies, can perform installation and servicing.

Ensure that the AC mains input ground is connected properly to the chassis safety ground connection. Similarly, other power ground lines, including those to application and maintenance equipment, *must* be grounded properly for both personnel and equipment safety. Always ensure that facility AC mains input is de-energized prior to connecting or disconnecting any cable.

In normal operation from the front panel, the operator does not have access to hazardous voltages within the chassis. However, depending on the application configuration, **HIGH VOLTAGES HAZARDOUS TO HUMAN SAFETY** might be normally generated on the output terminals. The user must ensure that the output power lines are labeled properly as to the safety hazards and that any possibility for inadvertent contact with hazardous voltages is eliminated.

Guard against risks of electrical shock during open cover checks by not touching any portion of the electrical circuits. Even when power is off, capacitors may retain an electrical charge. Use safety glasses during open cover checks to avoid personal injury by any sudden component failure.

Neither AMETEK Programmable Power Inc., San Diego, California, USA, or any of the subsidiary sales organizations, can accept any responsibility for personnel, material or inconsequential injury, loss or damage that results from improper use of the equipment and accessories.

SAFETY SYMBOLS

WARNING: Electrical Shock Hazard

HAZARD: Strong oxidizer

GENERAL WARNING/CAUTION: Read the accompanying message for specific information.

BURN HAZARD: Hot Surface Warning. Allow to cool before servicing.

DO NOT TOUCH: Touching some parts of the instrument without protection or proper tools could result in damage to the part(s) and/or the instrument.

TECHNICIAN SYMBOL: All operations marked with this symbol are to be performed by qualified maintenance personnel only.

ELECTRICAL GROUND: This symbol inside the instrument marks the central safety grounding point for the instrument.

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

ABOUT THIS MANUAL AND REGULATORY COMPLIANCE

This manual has been written for the Asterion DC Series of power supplies, which have been designed and certified to meet the Low Voltage, Electromagnetic Compatibility, and RoHS Directives per the requirements of the European Community.

These models have been designed and tested to meet the Electromagnetic Compatibility Directive 2014/30/EU, and the Low Voltage Directive 2014/35/EU. In addition, these models have been found compliant with FCC 47 CFR Part 15, Subpart B, 107(b) Class A, 109(g) Class A.

Since the Low Voltage Directive is to ensure the safety of the equipment operator, universal graphic symbols have been used both on the unit itself and in this manual to warn the operator of potentially hazardous situations (see Safety Instructions page).

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1 OVERVIEW

1.1 General Description

The Sorensen Asterion line of DC power supplies by AMETEK Programmable Power combines intelligence and flexibility to create an advanced platform of DC solutions. This easy-to-configure design features sophisticated technology for delivering high performance, programmable DC power. Its sleek design packs maximum power density into a low-profile form factor; with an intuitive touch screen interface placing that power at your fingertips. Centralized control and unparalleled modularity make Asterion the most adaptable platform on the market. Its groundbreaking capabilities set the standard for affordable, precision power supplies.

The Asterion DC Series is Digital Signal Processor (DSP) controlled and can be operated from the intuitive, easy-to-use front panel touchscreen or the Ethernet LXI, USB and RS232 standard control interfaces, as well as through the optional GPIB or EtherCAT control interface.

Figure 1-1. Asterion DC Series Power Supply, 1U Models

Figure 1-2. Asterion DC Series Power Supply, 2U Models

The touchscreen function group icons include a Dashboard, Output Programming Parameters, Measurements, Ramp and Triggers, Configuration, Control Interfaces, and System Settings. Function selection and parameter entry can be achieved either by direct selection from the touchscreen or by using the encoder selector button. The control resolution is adjusted by a dynamic rate change algorithm that combines the benefits of precise control over small parameter changes with quick sweeps through the entire range.

The Asterion DC Series is designed for testing today's complex electronics, including telecommunications and commercial electronics requiring low profile, light weight power supplies with high power density. Other applications include:

- Military and aerospace electronics test
- DC power simulation
- Commercial manufacturing and process control
- Research and development
- Automotive component and battery testing
- ATE applications

See Figure 1-3 for decoding the Asterion DC Series Model Number.

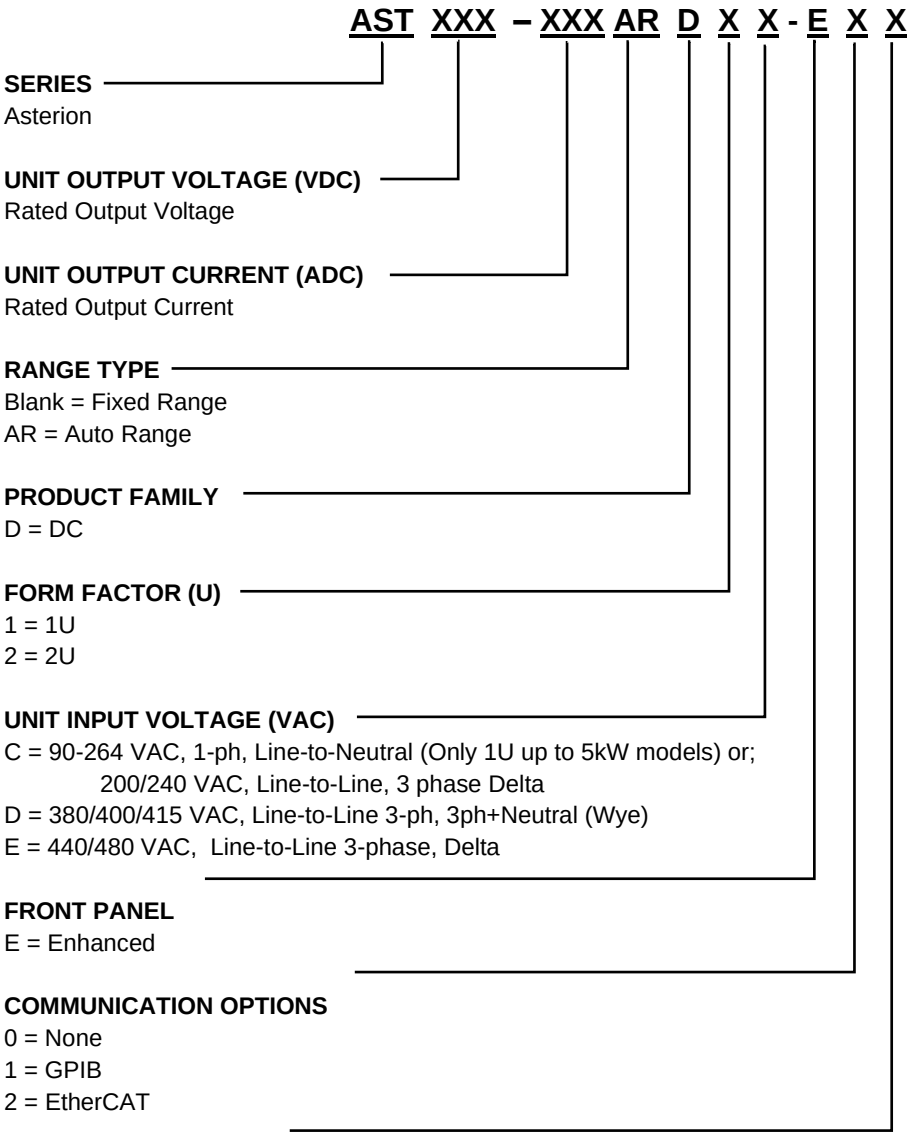

Figure 1-3. Asterion DC Series Model Number Decoding

1.2 Specifications

The following sections provide electrical, environmental, and physical specifications for the Asterion DC Series power supplies.

Unless otherwise noted, the specifications are valid under the following conditions:

a. Ambient temperature of 25 ± 5°C, after a 30-minute warm-up, and at fixed AC input line and load.

b. DC output into a resistive load.

c. Specifications values are valid from 5% of the full-scale value.

d. Stability is over an 8-hour period after a 30-minute warm up.

e. If remote sense is used then the output voltage accuracy, regulation and stability specifications are valid at the point where the remote sense leads are connected.

1.2.1 Output Current and Voltage Models

1.2.1.1 MODELS

Table 1-1. Available Model Voltage, Current and Power Ratings

1U-Models – Fixed Range			
	Power (kW)		
	1.7	3.4	5
Voltage (V)	Current (A)		
40	42	85	125
60	28	56	83
80	22	43	63
100	17	34	50
150	12	23	34
200	9	17	25
300	6	11	17
400	4.3	8.5	13
600	2.8	5.7	8.3

2U-Models 10kW -- Fixed Range	
	Power (kW)
	10
Voltage (V)	Current (A)
40	250
60	167
80	125
100	100
150	67
200	50
300	34
400	25
600	16.7

1U-Models – Auto Range			
	Power (kW)		
	1.7	3.4	5
Voltage (V)	Current (A)		
40	85	125	
60	42	85	125
60	56		
80	43	63	
200	17	34	50
400	6	12	18
600	5.7	8.3	

2U-Models 10kW -- Auto Range	
	Power (kW)
	10
Voltage (V)	Current (A)
60	250
200	100
400	34

1.2.1.2 AUTO RANGE

The auto ranging models feature expanded current and voltage range at the full output power level, enabling the ability to satisfy a wider testing need without requiring the purchase of additional models. Refer to Figure 1-1 and Figure 1-2.

The graph in Figure 1-2 shows the operational limits for the Auto Range Models. The **Red** line shows the maximum full-scale current for a given model, the **Green** line shows the maximum full-scale voltage for the model. The **Blue** curved section shows the models power limit. Operation into the **Red** shaded region is not possible.

Determination of the available voltage or current under your conditions can be calculated readily. As an Example, we will use the 5kW, 60V, 125A model (AST60-125AR).
This unit can provide up to 125A from 0 to 40V and voltage from 0 to 60V.
If you need to determine how much current you can obtain at a point on the power limit portion of the curve at 50V, you divide the models power limit by the desired output voltage. 5000W / 50V = 100A in this example. Determination of maximum voltage at a defined power is similar, divide the models power limit by the desired output current. As an example, If you require 85A, the maximum voltage would be:

5000W / 85A = 58.82V

A fixed range 5kW model with the same 60V output would only be able to supply 83A even at reduced voltages.

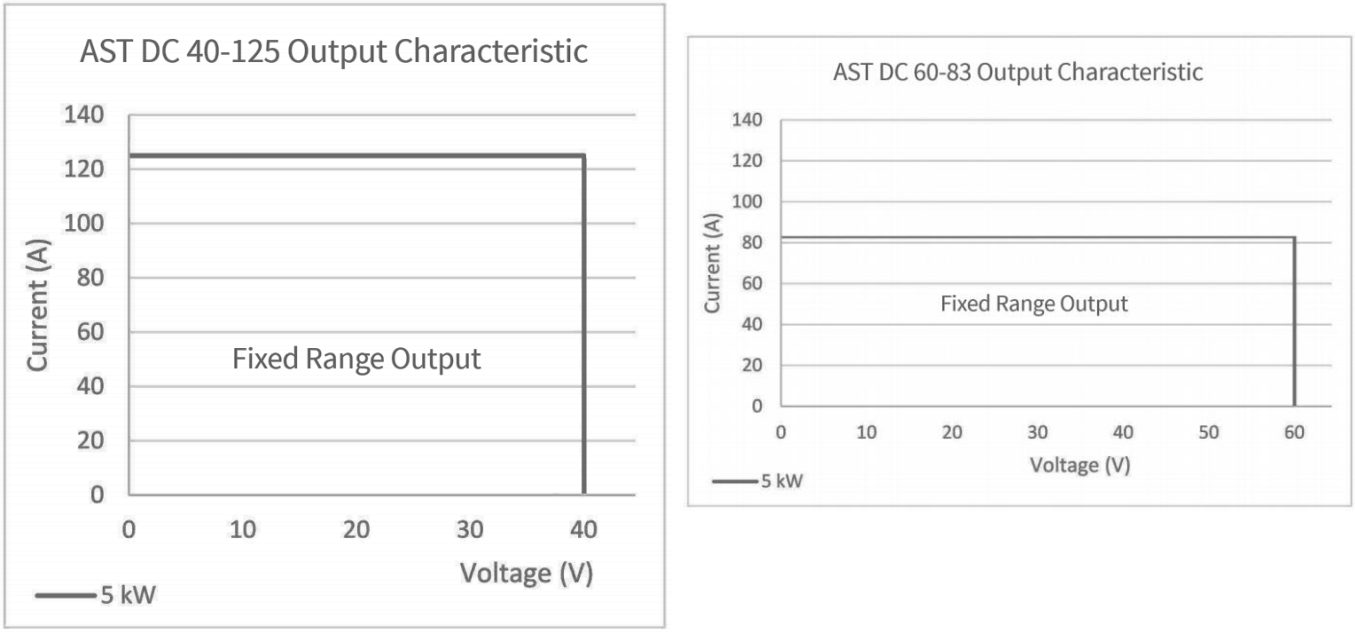

Figure 1-1. Fixed Range Models – 40V 125A and 60V 83A

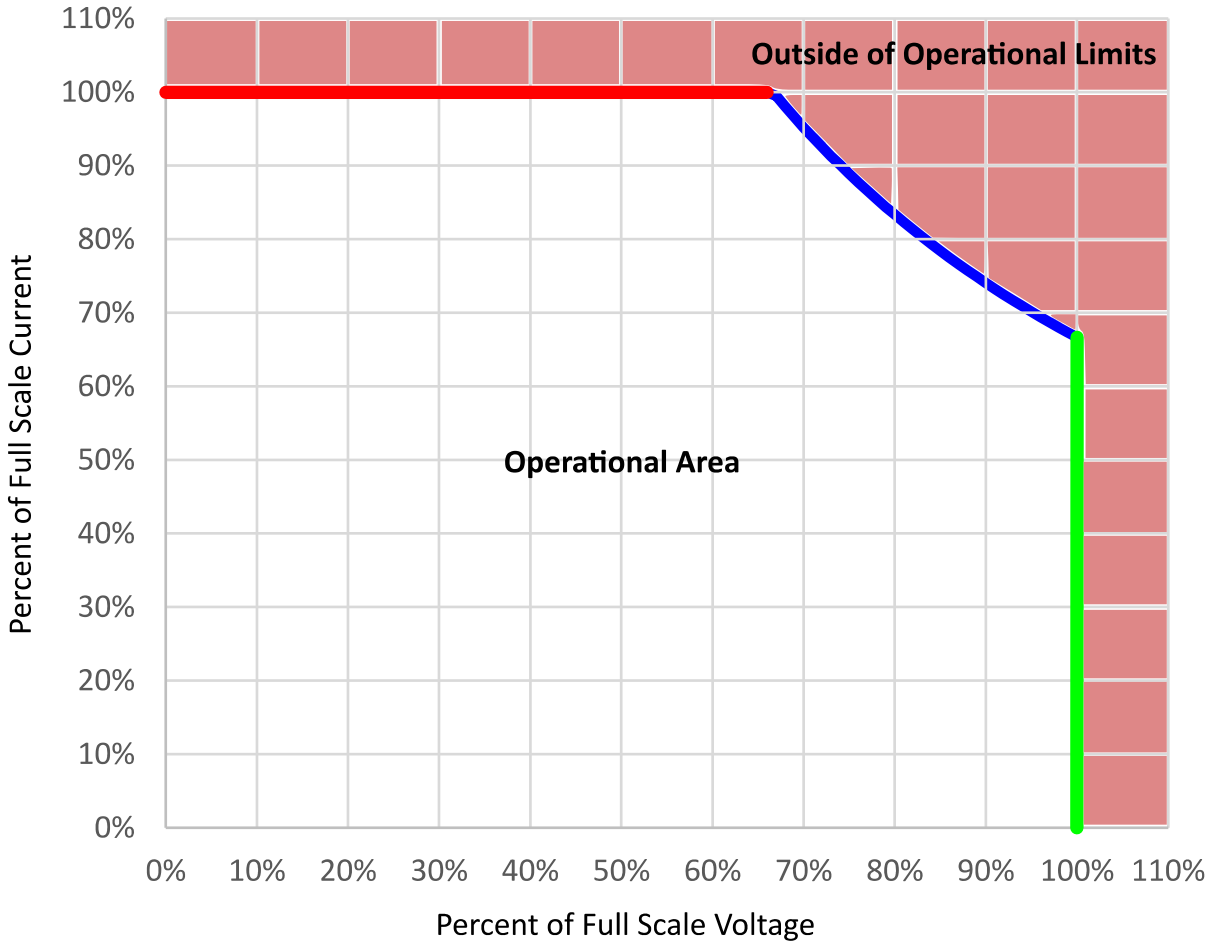

Figure 1-2. Auto range Models Characteristics

1.2.2 AC input specifications 1.7kW, 3.4kW and 5kW 1U Models

Input Voltage, Nominal Rating	1-Phase line-neutral: • Low Input Range: 100VAC-132VAC • High Input Range: 200VAC-240VAC (Only 1U up to 5kW Models) or 1-Phase /3 Phase Line-Line: 200VAC-240VAC (**Option C**) 3 Phase Line-Line: 380/400/415VAC (**Option D**) 3 Phase Line-Line: 380/400/415/440/480VAC (**Option E**)
Input Voltage, Operating Range	1-Phase line-neutral: • Low Input Range: 90-145 VAC • High Input Range: 180VAC-264VAC high input range 1-Phase / 3-Phase line-line: 90VAC-264VAC (**Option C**) 3-Phase line-line: 342VAC-456VAC (**Option D**) 3-Phase line-line: 342VAC-528VAC (**Option E**)
Current, maximum per phase	Refer to section 1.2.5 AC Input current
Input Frequency, Nominal Rating	DC or AC 50 Hz, 60 Hz, 400 Hz[2]
Input Frequency Range	DC or AC 47-63Hz, 360-440Hz[2]
Efficiency[1], typical	89% for 1.7 kW 1U Models 90% for 3.4 kW and 5 kW 1U Models
Power Factor[1], typical	0.98 for Single Phase Input and 0.94 for Three Phase Input for 5kW 1U Models; 0.92 Typical for 1.7 and 3.4kW 1U models.
Hold-Up Time[1], typical	≥10 ms
Inrush Current, max	Less than 50 A
1-PH Input Connections	2 wires + ground, Maximum voltage refer to selected option Input Voltage Operating Range in this table
3-PH Input Connections	3 wires + ground; delta configuration; maximum line-to-line refer to the selected optional Input Voltage Operating Range in this table
Isolation Voltage	1500VAC primary to earth, 3000VAC on primary to SELV and Hazardous secondary to SELV isolation barriers
THD Voltage	≤1%

1) Typical value at full load and nominal AC input voltage at 50/60 Hz input frequency.
2) Contact factory for 360-440Hz operation.

1.2.3 AC Input Specifications 10kW 2U models

Input Voltage Type	3 Phase, 3 Wire + Ground, Neutral not required, Delta connection or 3 Phase + Neutral (4 wire + Ground, WYE)
Input Voltage, Nominal Rating	3 Phase Line-Line: 200VAC-240VAC (**Option C**) 3 Phase Line-Line: 380/400VAC (**Option D**) 3 Phase Line-Line: 480VAC (**Option E**)
Input Voltage, Operating Range	3-Phase line-line: 180VAC-264VAC (**Option C**) 3 Phase Line-Line: 380/400/415VAC (**Option D**) 3 Phase Line-Line: 380/400/415/440/480VAC (**Option E**)
Input Current, Maximum with 3-Phase, 3-Wire + GND Input	Refer to section 1.2.5 AC Input current
Input Frequency, Nominal Rating	50 Hz, 60 Hz, 400 Hz[2]
Input Frequency Range	47-63 Hz, 360-440 Hz[2]
Efficiency[1], typical	91%
Power Factor[1], typical	0.94 for Three Phase Input Models
Hold-Up Time[1], typical	≥10 ms
Isolation Voltage	1500VAC primary to earth, 3000VAC on primary to SELV and Hazardous secondary to SELV isolation barriers
THD Voltage	≤1%
1) At full load and with AC input voltage of 208 V(RMS) and 50/60 Hz input frequency for 3- Phase, 3-Wire + Ground models. 2) Contact factory for 360-440Hz frequency operation.	

1.2.4 Output Power derating characteristics with AC input Voltage

	Model Size	Rated Output Power Model	1-Phase Low Input Range (90 -145 VAC)	1-Phase High Input Range (180-200VAC)	1-Phase High Input Range (200-264 VAC)	3-Phase (180 -264 VAC)	3-Phase (342 -440 VAC)	3-Phase (432 -528 VAC)
			Models with "C" Input				Models with "D" Input	Models with "E" Input
Output Power derating characteristics with AC input voltage	1U	1.7 kW	1.2 kW[1]	1.7 kW	1.7 kW	1.7 kW	1.7 kW	1.7 kW
		3.4 kW	1.2 kW[1,3]	3.0kW[3]	3.4 kW	3.4 kW	3.4 kW	3.4 kW
		5.0 kW	1.7 kW	3.4kW	3.4 kW[2]	5.0 kW	5.0 kW	5.0 kW
	2U	10.0kW	N/A	N/A	N/A	10.0kW	10.0kW	10.0kW

[1] Unit can operate at 1.7 kW if powered by greater than or equal to 20 A of input current inlet and ambient does not exceed 40°C.

[2] Unit can operate at 5 kW if powered by greater than or equal to 30 A of input current inlet and ambient does not exceed 40°C

[3] For 3.4kW performance at single phase operation for 90-145Vac or 180-200Vac limits, contact to factory for more details.

1.2.5 AC input current

	Model Size	Rated Output Power Model	1-Phase Low Input Range (90 -145 V AC)	1-Phase High Input Range (180-200VAC)	1-Phase High Input Range (200- 264 VAC)	3-Phase (180 -264 VAC)	3-Phase (342 - 440 VAC)	3-Phase (432 - 528 VAC)
Output Power derating characteristics with AC input voltage			Models with "C" Input				Models with "D" Input	Models with "E" Input
	1U	1.7 kW	14.4A[1]	11.7A	10A	6A	3.5A	3A
		3.4 kW	14.2A[1,3]	20A[3]	20A	12A	7A	5.8A
		5.0 kW	20A	23A	20A	17.8A	10A	8.5A
	2U	10.0kW	N/A	N/A	N/A	35A	20A	17A

[1] Unit can operate at 1.7 kW if powered by greater than or equal to 20 A of input current inlet and ambient does not exceed 40°C.

[2] Unit can operate at 5 kW if powered by greater than or equal to 30 A of input current inlet and ambient does not exceed 40°C

[3] For 3.4kW performance at single phase operation for 90-145Vac or 180-200Vac limits, contact to factory for more details.

CAUTION!

Due to Input voltage Line Dropping out of range or phase loss or drop out of range, 1U models will shut down output voltage and present fault massage on the display. After clearing fault massage, unit will continue operate within new reduced power limits. If source of failure back to limits, power cycle required to back to specified power limits. For 2U models, due to Input voltage Line Drop out of range or phase drop, output will shut down, display present fault massage and after hold-up time, unit will completely turn off.

1.2.6 Output Power derating characteristics with DC input Voltage

	Model Size	Rated Output Power Model	135-370 VDC (+/- 5%)	200-265 VDC (+/-5%)	265-370 VDC (+/-5%)	480-704Vdc (+/-5%)
Output Power derating characteristics with DC input voltage	1U	1.7 kW	1.7 kW	1.7 kW	1.7 kW	1.7 kW
		3.4 kW	1.7 kW	3.4 kW	3.4 kW	3.4 kW
		5.0 kW	1.7 kW	3.4 kW	5.0 kW	5.0 kW
	2U	10.0kW	N/A	N/A	N/A	10.0kW

1.2.7 DC Output Programming and Measurement Specifications

Programming & Readback (via Front Panel or Remote Digital Interface)	
Voltage Output programming accuracy	+/- 0.1% of rated output voltage
Current Output programming accuracy	+/- 0.2% of rated output current
Power Output programming accuracy	+/- 0.3% of rated output power
Overvoltage programming accuracy	+/- 1%, maximum, of rated output voltage
Voltage Output programming resolution	0.012% of full scale
Current Output programming resolution	0.012% of full scale
Power Output programming resolution	0.012% of full scale
Overvoltage programming resolution	0.1% of full scale
Voltage Output Measurement accuracy	+/- 0.1% of rated output voltage
Current Output Measurement accuracy	+/- 0.2% of rated output current
Power Output Measurement accuracy	+/- 0.3% of rated output power
Voltage Output Measurement resolution	0.012% of full scale
Current Output Measurement resolution	0.012% of full scale
Power Output Measurement resolution	0.012% of full scale
Overvoltage Response time	20 ms

1.2.8 DC Output Regulation Characteristics

Constant Voltage Mode	
Maximum line regulation	+/- 0.01% of rated voltage
Maximum load regulation	+/- 0.02% of rated voltage
Temperature Drift	+/- 100 PPM / degree Celsius
Stability	+/- 0.05% of rated voltage
Constant Current Mode	
Maximum line regulation	+/- 0.05% of rated current
Maximum load regulation	+/- 0.15% of rated current
Temperature Drift	+/- 100 PPM / degree Celsius
Stability	+/- 0.05% of rated current
Constant Power Mode	
Maximum line regulation	+/- 0.1% of rated power
Temperature Drift	+/- 100 PPM / degree Celsius
Stability	+/- 0.05% of rated power

1.2.9 Output Ripple and Noise Specifications

1.7kW Fixed Range Models (1U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
40	7	60
60	7	60
80	12	75
100	12	75
150	20	75
200	20	100
300	20	120
400	40	300
600	60	300

3.4kW Fixed Range Models (1U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
40	12	75
60	12	75
80	15	90
100	15	90
150	20	120
200	40	150
300	60	200
400	80	300
600	80	350

5kW Fixed Range Models (1U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
40	12	75
60	12	75
80	15	90
100	15	90
150	20	120
200	40	150
300	60	200
400	80	300
600	80	350

10kW Fixed Range Models (2U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
40	12	75
60	12	75
80	15	90
100	15	90
150	20	120
200	40	150
300	60	200
400	80	300
600	80	350

1.7kW Auto Range Models (1U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
40	12	75
60	12	75
80	15	90
200	20	100
400	40	300
600	60	300

3.4kW Auto Range Models (1U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
40	12	75
60	12	75
80	15	90
200	40	150
400	80	300
600	80	350

5kW Auto Range Models (1U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
60	12	75
200	40	150
400	80	300

10kW Auto Range Models (2U Chassis)

Rated Voltage (V)	Voltage Ripple & Noise RMS, mV[1]	Voltage Ripple & Noise PK-PK, mV[2]
60	12	75
200	40	150
400	80	300

[1)] RMS ripple/noise, over 20 Hz to 300 kHz bandwidth, is measured directly across the output terminals with the supply operating into full resistive load and nominal AC input line voltage.

[2)] PK-PK ripple/noise, over 20 Hz to 20 MHz bandwidth with the supply operating into a full resistive load and AC line voltage.

1.2.10 Output Transient specifications

1.7kW and 3.4kW Fixed Range Models (1U Chassis)

Rated Voltage (V)	Voltage &Current Rise Time (ms), Full load[1]	Voltage & Current Fall Time (ms), Full load[3]	Voltage Fall Time (ms), No load[4]	Transient response (ms)[5]
40	20	50	1200	1
60	20	50	1500	1
80	25	60	2600	1
100	25	60	2600	2
150	50	120	2900	2
200	75	150	3500	2
300	100	200	4600	2
400	100	200	4600	2
600	150	200	4800	2

1.7kW and 3.4kW Auto Range Models (1U Chassis)

Rated Voltage (V)	Voltage &Current Rise Time (ms), Full load[1]	Voltage & Current Fall Time (ms), Full load[3]	Voltage Fall Time (ms), No load[4]	Transient response (ms)[5]
40	20	50	1200	1
60	20	50	1500	1
80	25	60	2600	1
200	75	15	3500	2
400	100	200	4600	2
600	150	200	4800	2

5kW and 10kW Fixed Range Models

Rated Voltage (V)	Voltage &Current Rise Time (ms), Full load[1]	Voltage & Current Fall Time (ms), Full load[3]	Voltage Fall Time (ms), No load[4]	Transient response (ms)[5]
40	30	80	900	1
60	50	80	1000	1
80	50	100	1900	1
100	50	100	1900	2
150	50	100	2000	2
200	50	100	2500	2
300	50	100	3000	2
400	75	150	3000	2
600	100	150	3200	2

5kW and 10kW Auto Range Models

Rated Voltage (V)	Voltage &Current Rise Time (ms), Full load[1]	Voltage & Current Fall Time (ms), Full load[3]	Voltage Fall Time (ms), No load[4]	Transient response (ms)[5]
60	50	80	1000	1
200	50	100	2500	2
400	75	150	3000	2

[1)] Maximum time, from 0-100% of programming change from zero to rated output voltage with rated resistive load.

[2)] Maximum time, from 0-100% of programming change from zero to rated output voltage with No load.

[3)] Maximum time, from 100%-0 of programming change from rated output voltage to zero with rated resistive load.

[4)] Maximum time, from 100%-0 of programming change from rated output voltage to zero with No load

[5)] Typical time to recover within 0.5% of rated output voltage for load step of 10-90% of rated output current

1.2.11 Remote Sense

Maximum Line Drop Compensation[1]	40V Model	60V Model	80-600V Models		
	2V	3V	5V	5V	5V

Connection: Voltage accuracy/regulation specifications apply at the point where the remote sense leads are connected.

Line Drop Effect on Output: Rated output voltage applies at the rear panel output terminals, and line drop voltage subtracts from the voltage available at the load terminals.

CAUTION!

Due to Line Drop Compensation, if Remote Sense is disconnected from unit while the output is enabled, output voltage will rise a maximum of 10% of model's maximum rated voltage, before faulting.

1) Contact factory for additional information regarding higher voltage drop at remote sense operation. Virtual sense option available uppon request.

1.2.12 Remote Analog Programming Interface Characteristics

Function	Characteristics
Remote Analog Programming of Output Voltage, Current and Power	Independent Signal inputs for output voltage, current and power programming using External Analog Reference. Analog reference source is user selectable and can be a voltage, resistance or 4-20 mA source. Selected analog reference source can be used to program output voltage, current and power programming. Voltage as Reference Source: 0 V to user selectable maximum range (2 V to 10 V) for 0 to full scale rated Output[1] Resistance as Reference Source: 0 Ω to user selectable maximum range (2 kΩ to 10 kΩ) for 0 to full scale rated Output[1] Current as Reference Source: Fixed range from 4 mA to 20 mA for 0 to full scale rated Output Programming accuracy and linearity: ±1% of rated output
Remote Analog Programming of Overvoltage	Signal input for setting Overvoltage using External Analog Reference Voltage. Range: 0.25 V to user selectable maximum range (2 V to 10 V) for 5% to 110% of the full-scale Output Voltage. Programming accuracy and linearity: ±1% of full-scale output
Monitor Signals for the Output Voltage, Current and Power	Monitor Signals for the Output Voltage, Current and Power. Full Scale range: 0 V to 10 V corresponds to 0-100% full-scale output Minimum recommended Load: 100 kΩ, typical Maximum Load: 20 kΩ Monitor accuracy: ±1% of full-scale output
Remote ON/OFF	Control input for Output ON/OFF - Latching A TTL logic-low (or user-selected logic-high) at the Remote On/Off input latches the output in the protection shutdown state; this state can only be cleared by the remote digital interface SCPI command, “OUTPut:PROTection:CLEar." Remote circuit must sink up to 3 mA from 5 VDC to enable.
Isolated Remote ON/OFF Control	There are two types of isolated control inputs to turn ON/OFF power supply a) Isolated remote-control input for output on/off with an applied AC/DC voltage source. A positive (+) 6-120 VDC or an AC input of 12- 240 VAC will enable (turn-on) the output of the supply. b) Isolated remote-control input for output on/off with a logic signal: a logic-high, 5 VDC TTL/CMOS signals will enable (turn-on) the output of the supply, and a logic-low signal disables (turns off) the output Note: This control input is optically isolated from the output power negative terminal of the power supply (up to 500 VDC).
TRIGGER IN	Input signal, TTL active-high; provides external hardware triggering of voltage and current ramp functions. Signal connects to Open-anode of opto-isolator diode with internal 1kΩ series resistor internal to power supply. Voltage Rating: Maximum 24 V, Minimum -5V Low state 0.3 V max, High State 2.7 V min.

Function	Characteristics
TRIGGER OUT	Output signal, active-low; synchronization pulse of 10 ms when a change in the output occurs. There is an Option to feed User Power to the TRIGGER OUT signal. Internal to power supply, signal output is from driver with input connected to open-collector of opto-isolator transistor. Voltage Rating: Maximum 30 V, Minimum 4.5V for Active High, Current Maximum 0.5 A
FAULT	Output Signal, High state indicates fault state of the power supply. There is an Option to feed User Power to the FAULT signal. Internal to power supply, signal output is from driver with input connected to open-collector of opto-isolator transistor. Voltage Rating: Maximum 30 V, Minimum 4.5V for Active High, Current Maximum 0.5 A
User programmable digital inputs	Four digital inputs to the power supply. Two of the digital inputs can be used as enable signals for user programmable digital outputs. Signal connects to Open-anode of opto-isolator diode with internal 1kΩ series resistor internal to power supply. Voltage Rating: Maximum 24 V, Minimum -5V Low state 0.3 V max, High State 2.7 V min
User programmable digital outputs	Four digital outputs that can be enabled/ disabled from the power supply. Two digital outputs can be controlled by giving appropriate signals on User programmable digital inputs. There is an Option to feed User Power to these digital outputs. Voltage Rating: Min 4.5V or User fed voltage minus 1 V. User fed voltage can be of maximum 30 V. Current Maximum: 0.5 A
Auxiliary power output	Two Auxiliary power outputs of 15 V and 5 V. **(15V not available on 1U chassis models when not equipped with optional isolated analog interface.)** These auxiliary power outputs can be controlled from the power supply or by giving appropriate signals on the digital input enable pins provided for the same. Maximum current for each Auxiliary power output: 1 A
[1)] Unit is rated for +/- 1% Accuracy at 5V/10V for Voltage Programming, and 5kΩ/10kΩ for Resistive Programming	

1.2.13 Output Isolation

Negative Output Terminal	±600 V(PK), maximum, with respect to chassis ground.
Reference of standard Non-Isolated Analog programming and external user interface to output negative terminal	The standard Non-Isolated Analog programming and external user interface signals are referenced to the negative output terminal and, therefore, is not isolated from the output. **Not Applicable to 2U models. Isolated Interface is standard.**
Isolation of optional Isolated Analog programming and external user interface to output negative terminal	1000 V(PK), maximum; optional Isolated Analog programming and external user interface signals are galvanically isolated from negative output terminal; operation of Isolated Analog Interface signals should be at SELV safety voltage conditions to chassis ground.

1.2.14 Remote Control Digital Interface Characteristics

Interface	Characteristic
LAN (LXI)	Ethernet 10BASE-T and 100BASE-T over twisted-pair cables compliant with IEEE 802.3; Connector: 8P8C modular jack.
USB	Serial interface compliant to USB 2.0; Connector: Type-B receptacle.
RS-232C	Serial interface compliant to RS-232C; Protocol: data bits, 7 with parity and 8 without parity; stop bits, 2; baud rate, 9600 to 115200; handshake, CTS and RTS; Connector: Subminiature-D, 9-contact receptacle.
IEEE-488 (Option)	Parallel interface complies with IEEE-488.1, IEEE-488.2, and the SCPI command specification; command execution response time, 10 ms, typical; connector: IEEE-488.1 compliant.
ECAT (Option)	The **EtherCAT** protocol is optimized for process data and is transported directly within the standard IEEE 802.3. The protocol is standardized in IEC 61158 and is suitable for both hard and soft real-time computing requirements in automation technology.
Firmware Upgrade	Firmware can be upgraded through the LAN interface.

1.2.15 Protection Function Characteristics

Function	Characteristic
Output Overvoltage Protection (OVP)	Programmable to 110% of full-scale output voltage; exceeding OVP threshold results in shutdown of output.
Output Current Limit Protection	User-selectable fold back mode CV/CC/CP or CV or CC or CP models. In CV/CC/CP mode, output current or power is regulated to setpoint on reaching limit. In CV mode, on reaching current or power limits results in shutdown of output; In CC mode, on reaching voltage or power limits results in shutdown of output; In CP mode, on reaching voltage or current limits results in shutdown of output; In CV or CC or CP mode, shutdown delay on reaching the limit is programmable from 100 ms to 5 s.
AC Input Overcurrent Protection	Internal fuses in each phase for fault isolation; not user replaceable
AC Input Undervoltage Protection	Automatic shutdown for insufficient AC input voltage
AC Input Transient Protection	Protection to withstand EN61326-1, Class-A surge levels
Overtemperature Protection (OTP)	Internal temperature monitors cause shutdown of output if temperature thresholds are exceeded

1.2.16 Environmental Specifications

Parameter	Specification
Operating Temperature	0°C to 50°C (32° F to 104° F), 100% load
Storage Temperature	-30°C to 85°C (-22°F to 185° F)
Altitude	3000 m (10,000 ft), output current derating 2%/100m or $T_{ambient}$ 1ºC/100m above 2000m
Operating Humidity	20-90 %, non-condensing
Storage Humidity	10-95 %, non-condensing
Vibration	MIL-PRF-28800F, Class 3; 5-500 Hz per Paragraph 4.5.5.3.1
Shock	MIL-PRF-28800F, Class 3; 30G half-sine with 11ms duration per Paragraph 4.5.5.4.1
Transportation Integrity	ISTA 2A-2011 and ISTA 3B-2017 Test Procedures

1.2.17 Mechanical Specifications

Parameter	Specification
Dimensions	**1.7 kW to 5 kW, 1U Models:** H, 1.75” (44.45 mm); W (front panel), 19.0” (483mm); D, 24.0” (609.6mm); H, 1.75” (44.45 mm); W (chassis), 16.9” (483mm); D, 23.0” (584mm). **10 kW, 2U Models:** H, 3.47” (88.1 mm); W (front panel), 19.0” (483 mm); D, 23.0” (584 mm); H, 3.47” (88.1 mm); W (chassis), 16.9” (429.2 mm); D, 23.0” (584 mm).
Unit Weight	1.7 kW to 5 kW, 1U Models: 28 lbs (12.7 kg), maximum 10 kW, 2U Models: 42 lbs (19.1 kg), maximum
Shipping Weight	1.7 kW to 5 kW, 1U Models: 34 lbs (15.4 kg), maximum 10 kW, 2U Models: 60 lbs (27.2 kg), maximum
Chassis	Steel with plastic front panel
Chassis Finish	Galvanized Zinc, G90
Installation	Protective covers are provided for AC input and DC output; rackmount: per ANSI-EIA-310-D, with front panel mounting flange brackets and chassis provisions for mounting rack slides; slides and flange brackets/handles options available.
Cooling	Forced-air cooling; linear, variable fan speed control; air intake at front/sides and exhaust at rear. Other instruments can be mounted directly above or below.
Acoustic Noise	68 dBA, maximum; measured at 1 m with A-weighting.

1.2.18 Regulatory Agency Compliance

Parameter	Specification
EMC	CE marked for EMC Directive 2014/30/EU per EN 61326-1:2013 Class A for Emissions and Industrial Immunity levels as required.
Safety	NRTL certified for US and Canada to CAN/CSA-C22.2 No. 61010-1-12, UL 61010-1 Third Edition. CE marked for LVD Directive 2014/35/EU to EN 61010-1 Third Edition as required.
CE Mark LVD Categories	Installation Overvoltage Category II, Pollution Degree 2, Indoor use only.
RoHS	CE marked for RoHS Directive 2011/65/EU per EN IEC 63000:2018 as required.

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2 INSTALLATION

2.1 Inspection

Inspect the shipping carton for possible damage before unpacking the unit. Carefully unpack the equipment. Save all packing materials until inspection is complete. Verify that all items listed on the packing lists have been received. Visually inspect all exterior surfaces for dented or damaged exterior surfaces, and broken connectors, display, or controls. External damage might be an indication of internal damage.

If any damage is evident, immediately contact the carrier that delivered the unit and submit a damage report. Failure to do so could invalidate future claims. Direct repair issues to AMETEK Customer Service Department at 858-458-0223 (local) or 1-800-733-5427 (toll free in North America).

2.2 Contents of Shipment

Depending on the model, configuration, and options selected for your Asterion Series power source, the ship kit may include additional parts and accessories.

Minimum items included in the ship kits are shown in the tables below:

5330339-01R Ship Kit, 1U Low Voltage

Part Number	Description	Qty	MFG	MFG P/N
M550008-01	MANUAL, SORENSEN, CD ROM	1	AMETEK	M550008-01
856-390-03	CONN,3P,RCPT,9A,600V,NYLON	1	Molex	39-01-4031
856-390-00	CONN,CONT,18-24AWG,TERM,SKT	3	Molex	39-00-0182
893-004-41	TERM BLK,4P,41A,1KV,PLG,7.62MM	1	Phoenix Contact	1709173
9330665-01R	COVER, DC INPUT, 1U	1	AMETEK	9330665-01R
9330666-01R	COVER, DC OUTPUT, 1U	1	AMETEK	9330666-01R
MN-M04K-07	NUT M4X0.7 KEPS STEEL ZN PLATE	4	Any	M4 -0.7 KEPS Zinc Plated Steel
076022	WASHER, SPRING,3/8”(M8),BRONZE	2	Any	
111-260-16	WASHER,M8,8.4IDX16OD,FL,BRASS	2	Any	
112-055-90	NUT,M8X1.25,13MM,HEX HD,BRS	2	Any	
MS-M08H-4125	SCREW,M8 X 25MM,HEX HD,BRS	2	Any	

5330339-02R Ship Kit 1U High Voltage

Part Number	Description	Qty	MFG	MFG P/N
M550008-01	MANUAL, SORENSEN, CD ROM	1	AMETEK	M550008-01
856-390-08	CONN,8P,PLUG,600V,NYLON	1	Molex	39-01-2080
856-390-00	CONN,CONT,18-24AWG,TERM,SKT	8	Molex	39-00-0182
893-004-41	TERM BLK,4P,41A,1KV,PLG,7.62MM	1	Phoenix Contact	1709173
856-016-05	CONN,5P,PLUG,7.62mm	1	Phoenix Contact	1777862
9330665-01R	COVER, DC INPUT, 1U	1	AMETEK	9330665-01R
9330666-01R	COVER, DC OUTPUT, 1U	1	AMETEK	9330666-01R
MN-M04K-07	NUT M4X0.7 KEPS STEEL ZN PLATE	4	Any	M4 -0.7 KEPS Zinc Plated Steel
076022	WASHER, SPRING,3/8”(M8),BRONZE	2	Any	
111-260-16	WASHER,M8,8.4IDX16OD,FL,BRASS	2	Any	
112-055-90	NUT,M8X1.25,13MM,HEX HD,BRS	2	Any	

5330610-01R Ship Kit 2U Low Voltage

Part Number	Description	Qty	MFG	MFG P/N
M550008-01	MANUAL, SORENSEN, CD ROM	1	AMETEK	M550008-01
856-390-03	CONN,3P,RCPT,9A,600V,NYLON	1	Molex	39-01-4031
856-390-00	CONN,CONT,18-24AWG,TERM,SKT	3	Molex	39-00-0182
5330308-01R	KIT,RKMT BRKT & HDLS, 2U -DYN	1	AMETEK	5330308-01R
9330464-01R	COVER, INPUT PWR, 4U -AST	1	AMETEK	9330464-01R
893-004-41	TERM BLK,4P,41A,1KV,PLG,7.62MM	1	Phoenix Contact	1709173
5330565-01R	ASSY, CONN, 44P, DSUB	1	AMETEK	5330565-01R
109-346-00	STRAIN RELIEF,3/4 NPT,.25-.485	1	Heyco Products	3460
MN-M04K-07	NUT M4X0.7 KEPS STEEL ZN PLATE	6	Any	M4 -0.7 KEPS Zinc Plated Steel
MN-12PT-NNY	NUT,3/4,NPT,NYL	1	Heyco Products	8465
109-204-00	SCREWLOCK,4-40,NO HRDW,ST,ZN	2	Any	
9330608-01R	COVER,SAFETY,OUTPUT,2U DC -AST	1	AMETEK	9330608-01R

5330610-02R Ship Kit 2U High Voltage

Part Number	Description	Qty	MFG	MFG P/N
M550008-01	MANUAL, SORENSEN, CD ROM	1	AMETEK	M550008-01
856-390-03	CONN,3P,RCPT,9A,600V,NYLON	1	Molex	39-01-4031
856-390-00	CONN,CONT,18-24AWG,TERM,SKT	3	Molex	39-00-0182
5330308-01R	KIT,RKMT BRKT & HDLS, 2U -DYN	1	AMETEK	5330308-01R
9330464-01R	COVER, INPUT PWR, 4U -AST	1	AMETEK	9330464-01R
893-004-41	TERM BLK,4P,41A,1KV,PLG,7.62MM	1	Phoenix Contact	1709173
5330565-01R	ASSY, CONN, 44P, DSUB	1	AMETEK	5330565-01R
109-346-00	STRAIN RELIEF,3/4 NPT,.25-.485	1	Heyco Products	3460
MN-M04K-07	NUT M4X0.7 KEPS STEEL ZN PLATE	6	Any	M4 -0.7 KEPS Zinc Plated Steel
MN-12PT-NNY	NUT,3/4,NPT,NYL	1	Heyco Products	8465
109-204-00	SCREWLOCK,4-40,NO HRDW,ST,ZN	2	Any	
9330608-01R	COVER,SAFETY,OUTPUT,2U DC -AST	1	AMETEK	9330608-01R
856-016-05	CONN,5P,PLUG,7.62mm	1	Phoenix Contact	1777862
075072	SCREW,M3,.5X10MM,PAN HEAD,ZINC	4	Any	

Note: If any of these parts are missing, contact AMETEK Customer Service Department at 858-458-0223 (local) or 1-800-733-5427 (toll free).

Optional accessories:

1. AMETEK P/N: 5330201-01R: Rackmount slide kit; includes two slides with rack adapter brackets and mounting hardware.

2. AMETEK P/N: 890-524-01: Paralleling/Series Cable* (Requires two such cables to place one unit in parallel/series with another).

2.3 Mechanical Installation

The Asterion DC Series power source is designed for rackmount applications, there is an option for a rack mounted slide. Rack mounting requires installing the flange brackets with handles to the side of the chassis: using M4-0.7 x 6 mm Philips flat-head screws to mount the brackets to the chassis, and # 8-32 Philips flat-head screws to mount the handles to the brackets.

The unit is forced air cooled with internal fans drawing air in from the front and sides and exhausting at the rear. The front and rear of the unit must be kept clear of obstruction and clearance must be maintained to allow unimpeded airflow. The same consideration given to the side grilles will minimize internal temperature rise. Special consideration must be made to overall air flow characteristics, and the resultant internal heat rise, when a source is installed inside enclosed cabinets to avoid excessive heating and over-temperature problems. The temperature of the ambient air at the air intake should not exceed 50°C.

WARNING!

This unit is intended for installation in a protected environment. Exposure to conductive contaminants or corrosive compounds/gases that could be ingested into the chassis could result in internal damage. Install the power source in a temperature and humidity controlled indoor area.

CAUTION!

The power source should be provided with proper ventilation. The front and rear of the unit must be free of obstructions. To ensure proper airflow, a minimum 2" clearance from the rear air outlet is required.

CAUTION!

No user serviceable parts are inside; service is only to be performed by qualified personnel.

* Standard length is 1 foot. Contact factory for other length options.

2.4 Rack Mounting

The Asterion DC Series power source is designed for mounting in a standard 19-inch equipment rack that is compliant to ANSI/EIA-310-D. If other instrumentation is mounted in the rack adjacent to the unit, there is no need for additional clearance above or below the source. It should be supported in the rack using appropriate L-brackets or rackmount slides. Refer to for typical rackmount installation.
The rack mounting slide kit, part number **5330201-01R** consists of the following items:

Part Number	Description	MFG	Item #	Qty
105-510-24	RACK SLIDES,FRICTION,24 IN,SS	JONATHAN 510QD-24	1	2
9330325-01R	BRKT, RACKSLIDE -DYN	AMETEK	2	4
110-800-06	SCREW,8-32 X .375,PFH100,LK,SS	ANY	4	14
112EN04-01	NUT,8-32,W/CONE WASHER,KEP,CS	ANY	5	8
110GS04-08	SCREW,10-32 X .500,SEMS,PPH,CS	ANY	6	12
112gl04-01	NUT, 10-32, ZINC PL	ANY	7	12

Recommended rackmount kit installation instruction is as follows (Reference Figure 2-1. Rack mounting, 1U Models and Figure 2-2. Rack Mounting - 2U Chassis:

1. Install the chassis sections of the slides, part of item # **1**, on both sides of the power supply chassis with screws, item **#4**, (three on each side).
2. Install the brackets, item # **2**, to the cabinet sections of the slides, part of item **#1**, with screws, item **#4**, and nuts, item **#5**, (four on each side).
3. Adjust the location of the mounting brackets as required for the spacing of rack cabinet vertical rails utilized.
4. Mount the cabinet sections of the slides, part of item **#1**, (with brackets already installed) into the cabinet using appropriate hardware (e.g. the screws and nuts supplied, items **#6** and **#7**, or user-supplied bar-nuts, cage-nuts, clip-nuts, etc. appropriate to your cabinet rails), while ensuring that they are level, front to back and left to right, on the cabinet rails.
5. Insert extension sections of the slides, into cabinet slide sections. Insert power supply chassis with installed slide sections, into the extension slide sections.

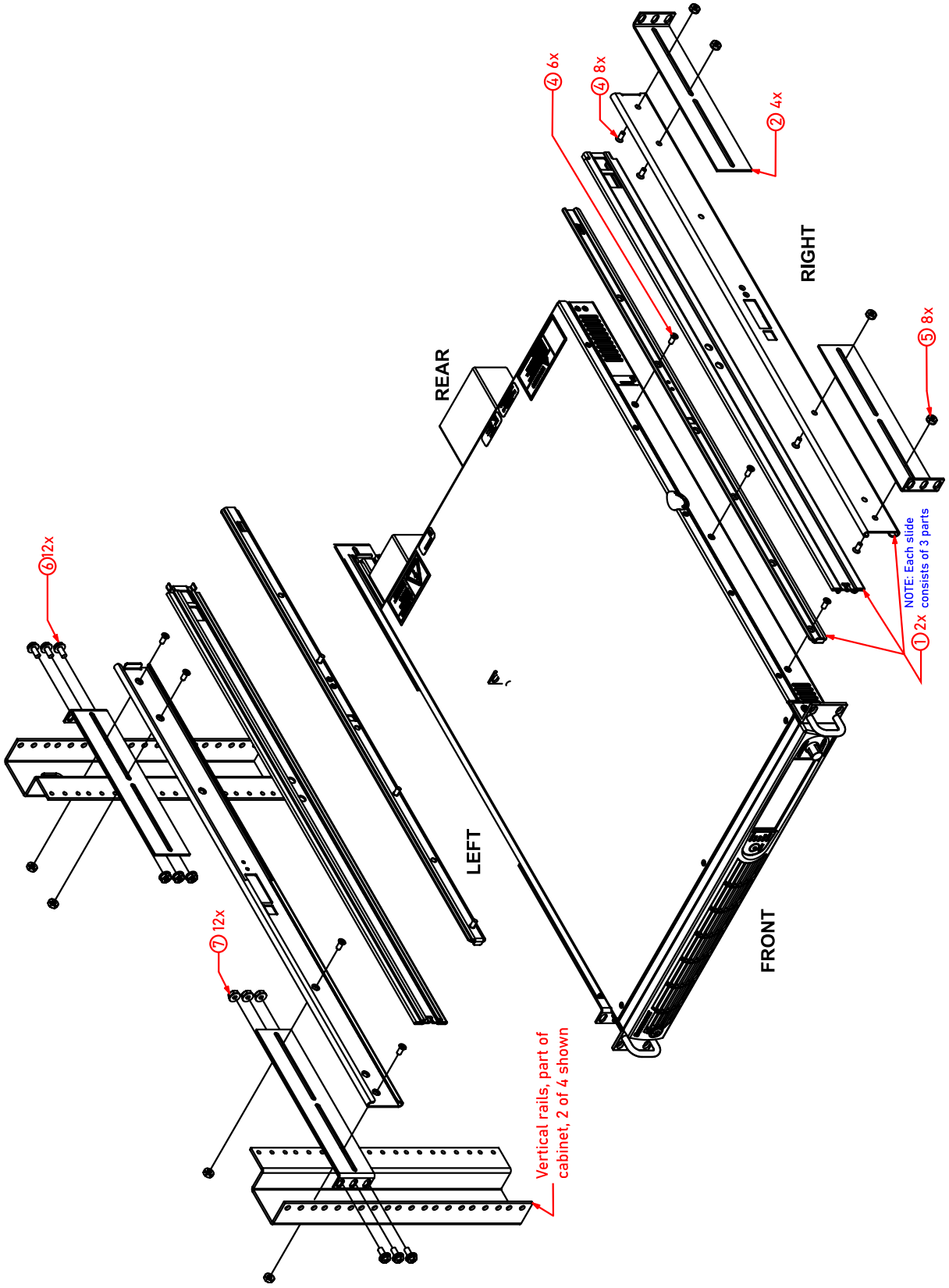


Figure 2-1. Rack mounting, 1U Models

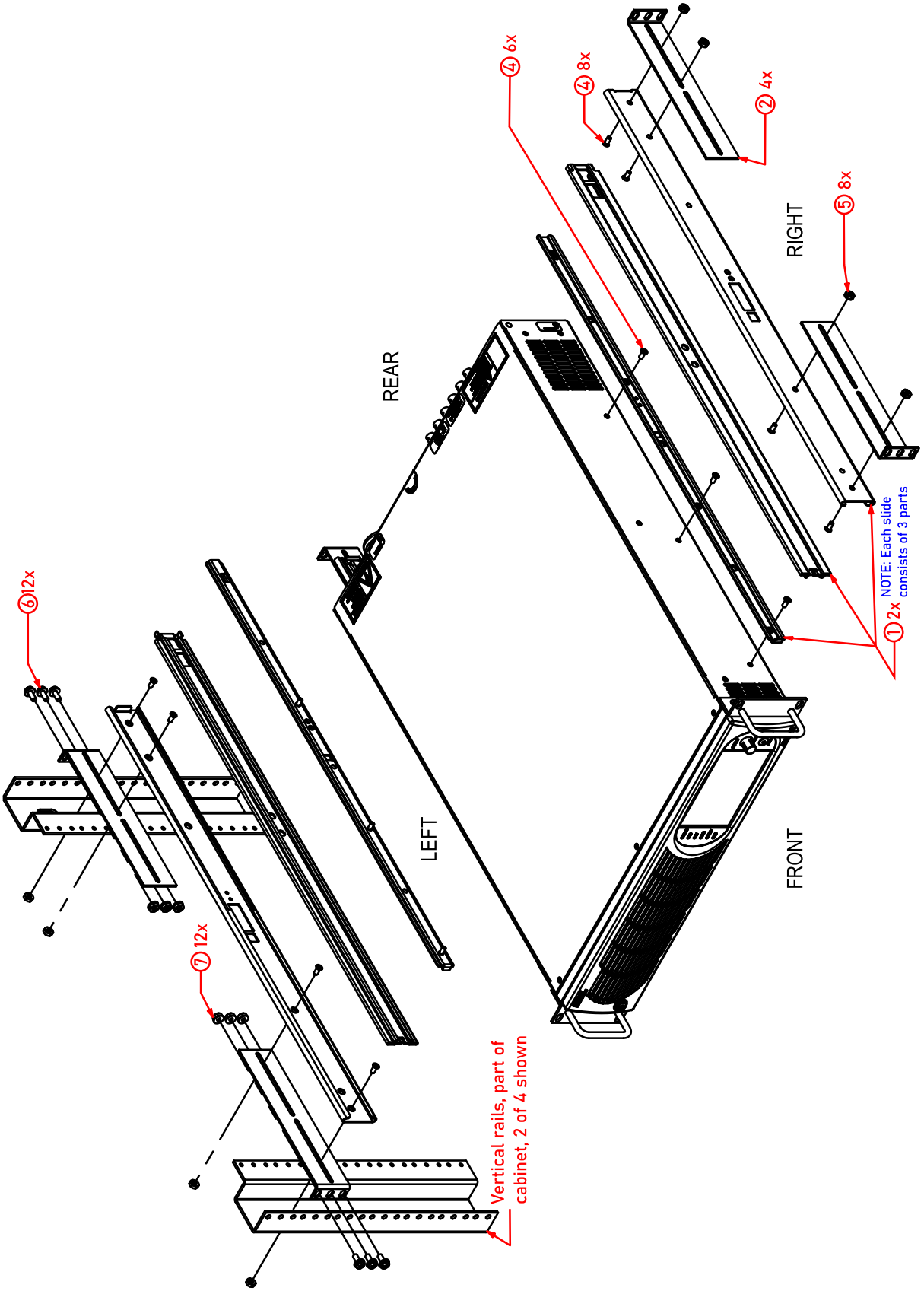


Figure 2-2. Rack Mounting - 2U Chassis

2.5 Chassis Removal from Rack

The slides have a front disconnect feature and lock at full extension. To disconnect and remove the chassis from the rack, depress the flat steel spring (located on the slides) inward, and pull the chassis forward. To return the chassis back into the rack from full extension, depress the flat steel spring (located on the slides) inward, and push the chassis back.

When the chassis is at full extension, the flat springs are located behind the front rack rails. Retract the springs with a flat blade screwdriver or similar device to release from lock-out or to remove the chassis from the rack.

2.6 Outline drawings

Figure 2-3. Installation Drawing, Enhanced (front panel version) 1U Models and Figure 2-4. Installation Drawing, Enhanced (front panel version) 2U Models show the outlines and overall dimensions for installation of the of the Asterion DC Series power sources.

Figure 2-5. Rear Panel View, 1U Models, Figure 2-6. Rear Panel View, 1U Models w/ EtherCAT Option, Figure 2-7. Rear Panel View, 1U Models w/ GPIB Option, and Figure 2-8. Rear Panel View, 2U Chassis show the rear panel views of the power sources and locations of the rear panel connectors.

Figure 2-9. Rear Panel Protective Cover Installation 1U Models and Figure 2-10. Rear Panel Protective Cover Installation 2U Models show the protective covers installation for the AC input and DC output terminations. The components comprising these covers are supplied in the ship kit.

CAUTION!

M4 0.7 KEPS nuts - Maximum tightening torque is 1.1Nm (10 lb-in.).

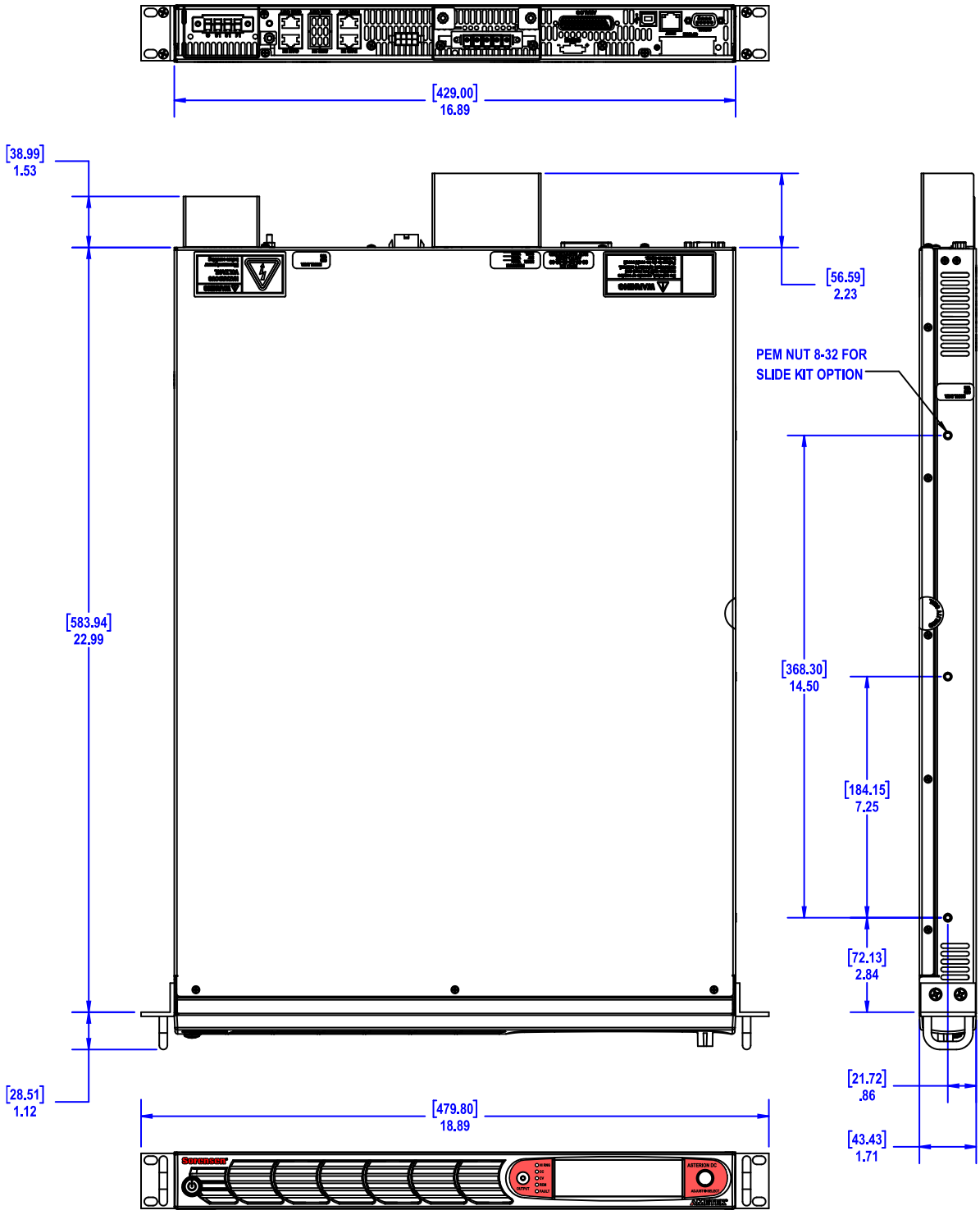


Figure 2-3. Installation Drawing, Enhanced (front panel version) 1U Models

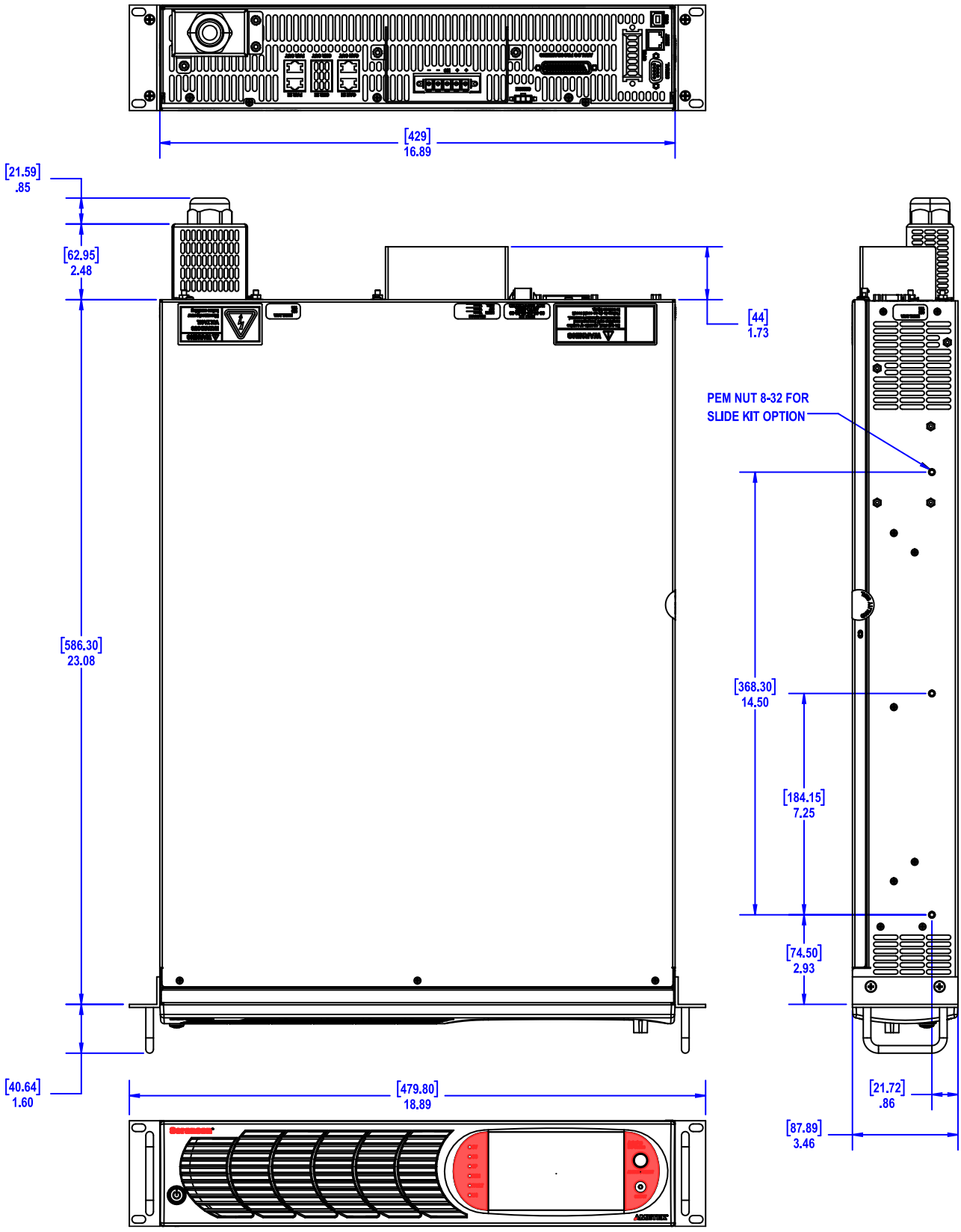


Figure 2-4. Installation Drawing, Enhanced (front panel version) 2U Models

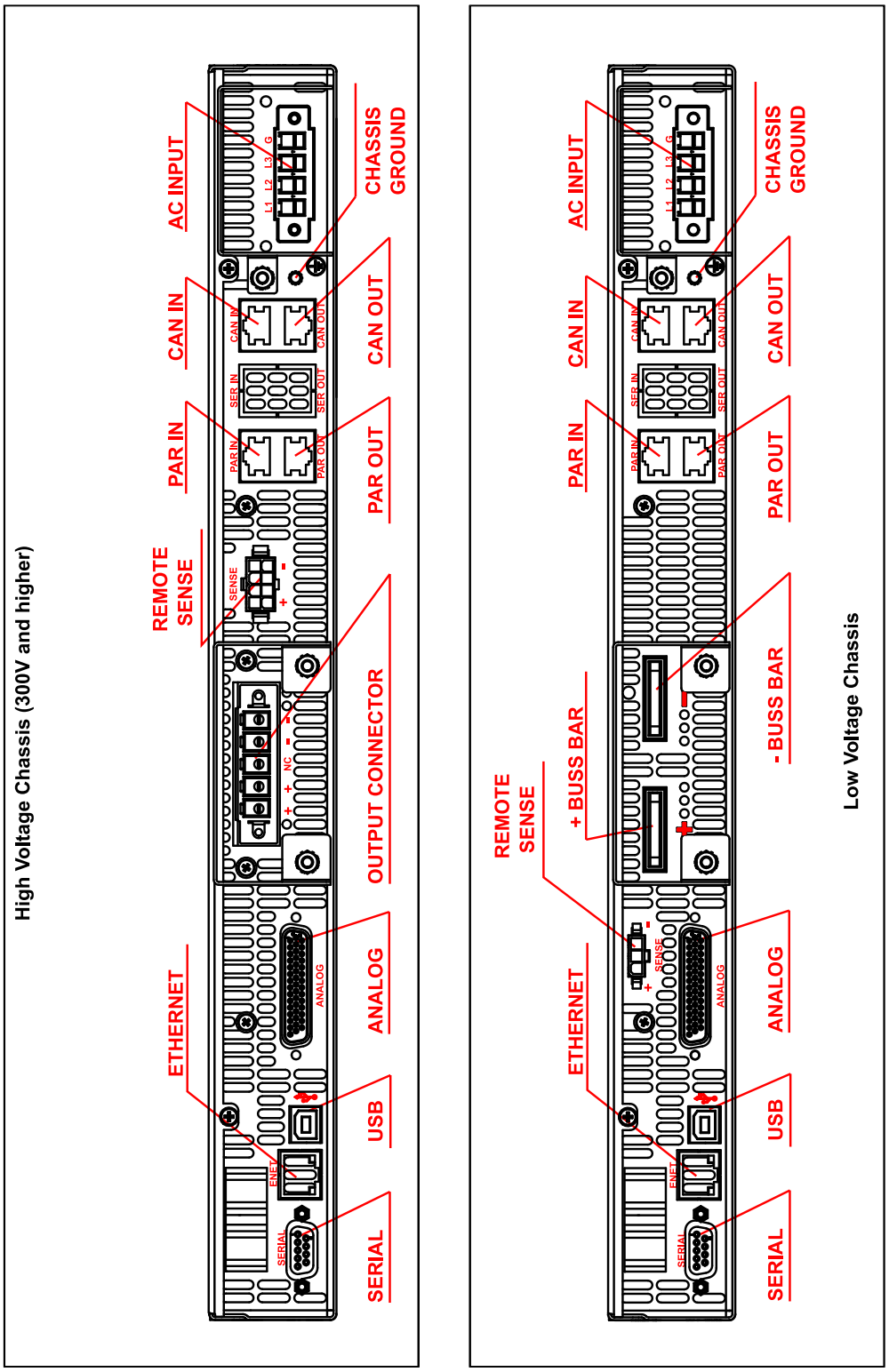


Figure 2-5. Rear Panel View, 1U Models

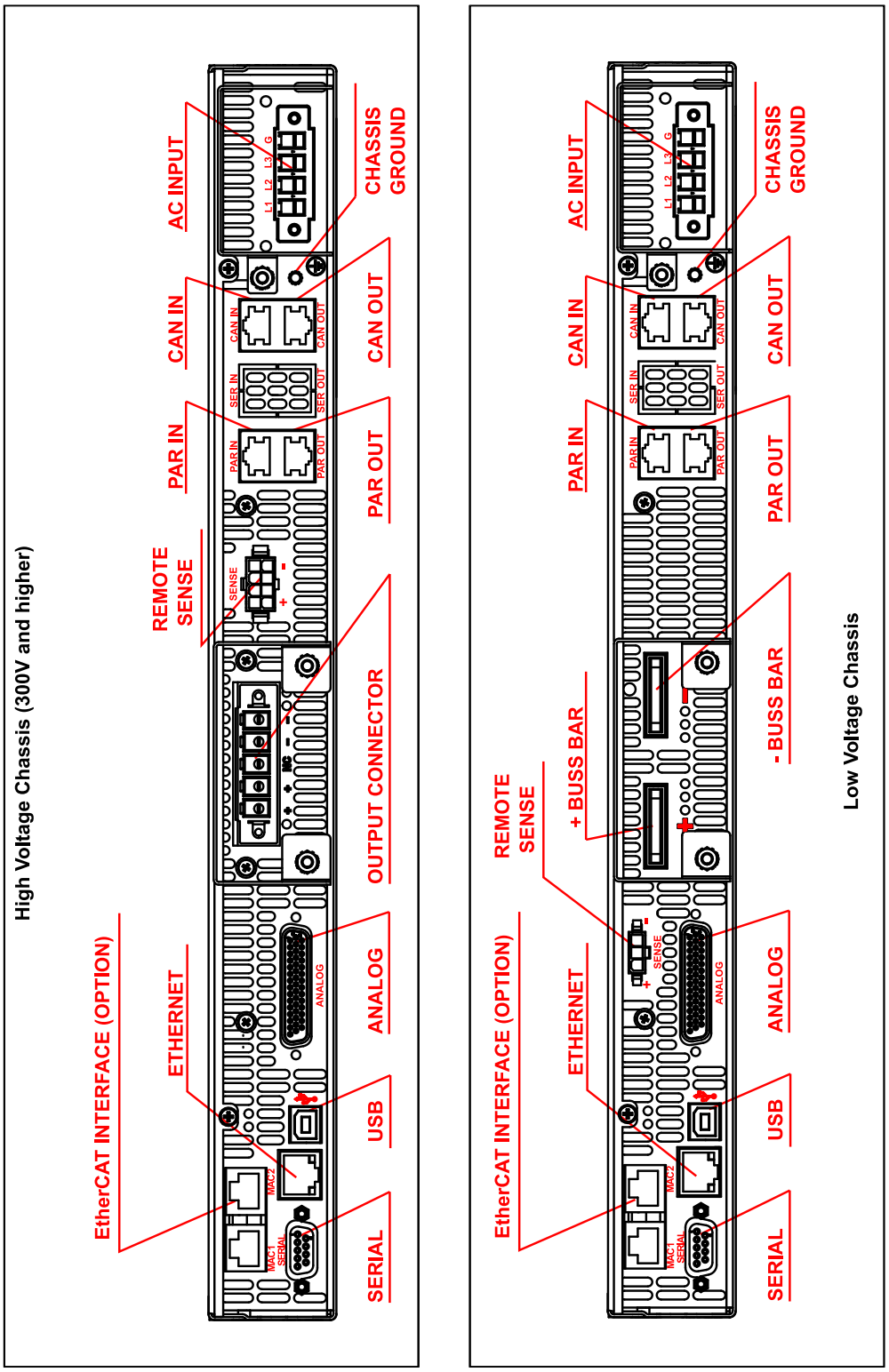


Figure 2-6. Rear Panel View, 1U Models w/ EtherCAT Option

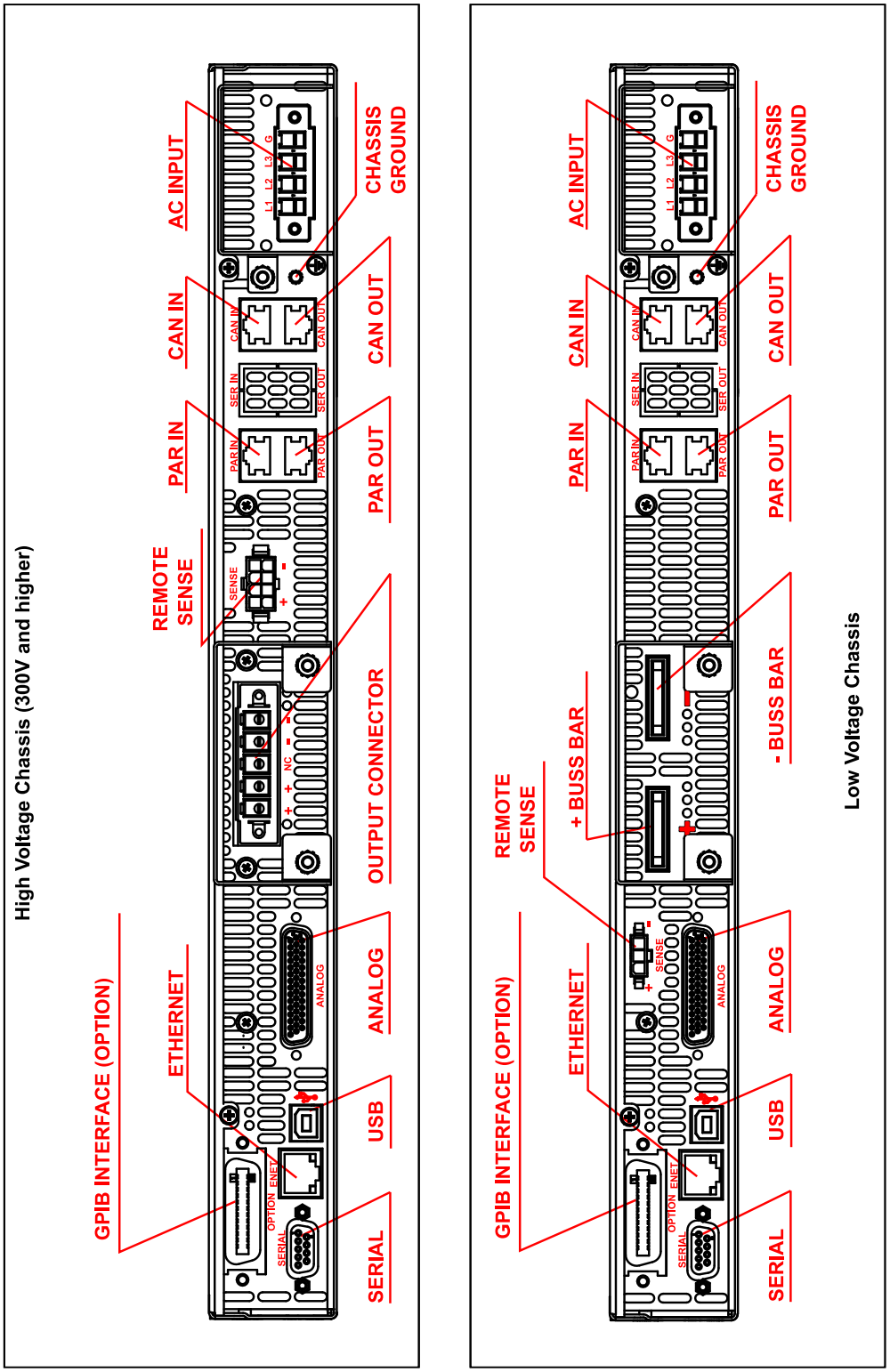


Figure 2-7. Rear Panel View, 1U Models w/ GPIB Option

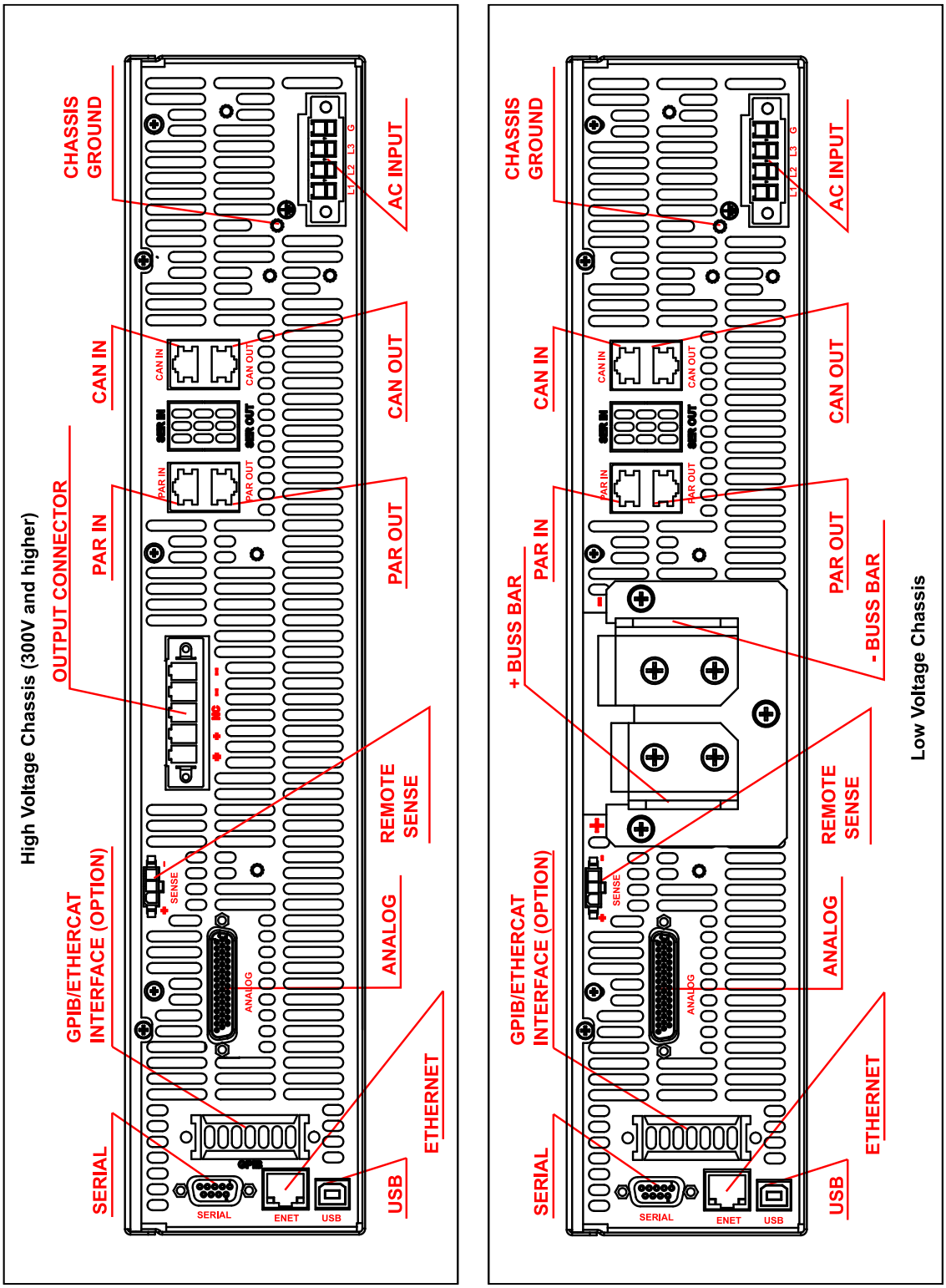


Figure 2-8. Rear Panel View, 2U Chassis

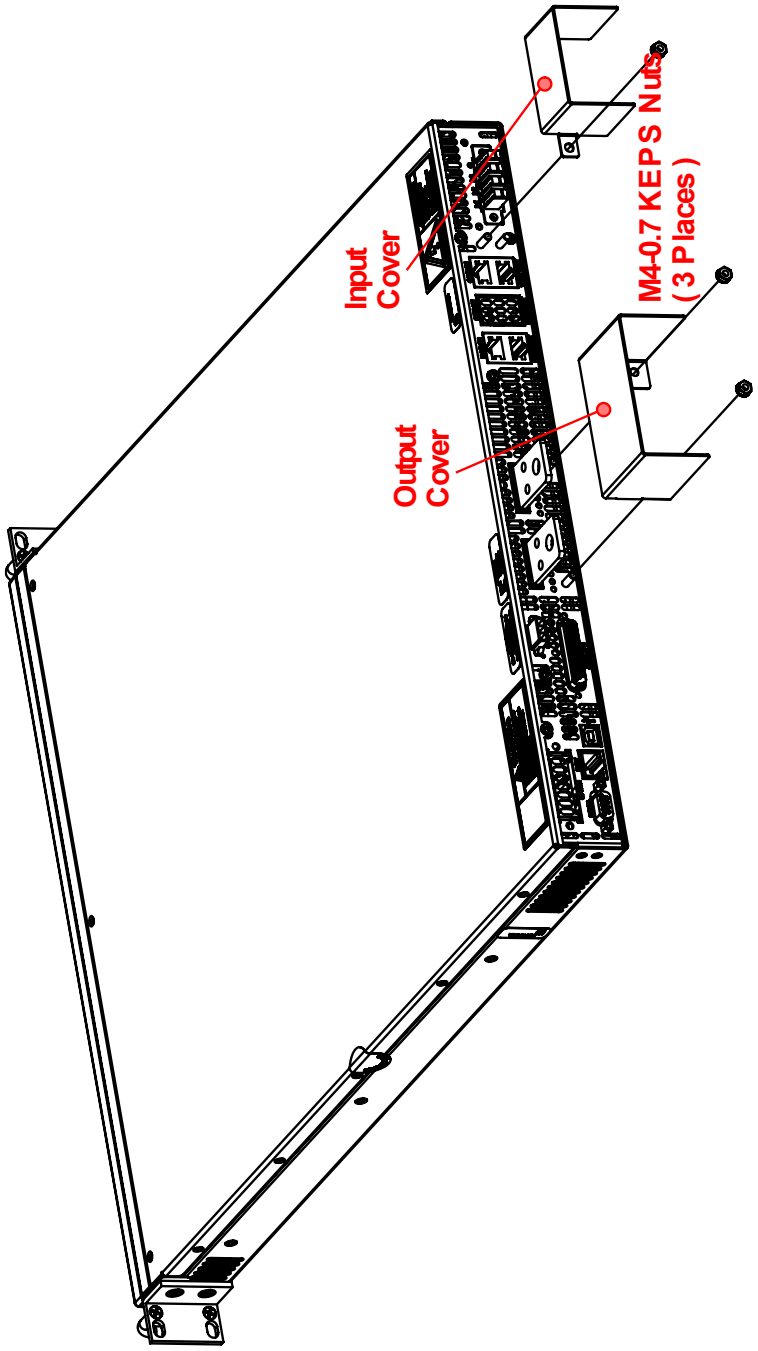


Figure 2-9. Rear Panel Protective Cover Installation 1U Models

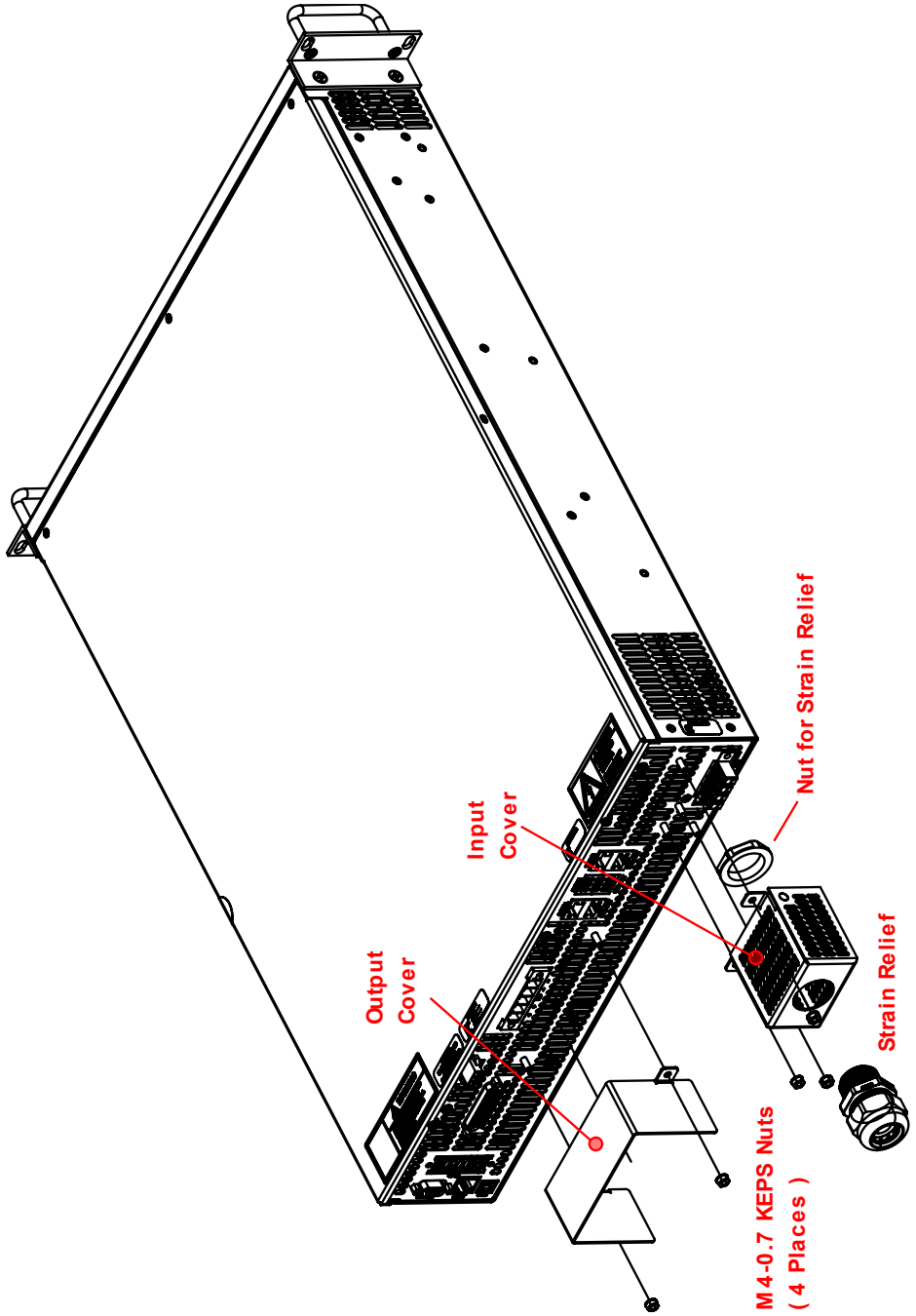


Figure 2-10. Rear Panel Protective Cover Installation 2U Models

2.7 Rear Panel Input/ Output Connections

Reference Figure 2-5. Rear Panel View, 1U Models, Figure 2-6. Rear Panel View, 1U Models w/ EtherCAT Option, Figure 2-7. Rear Panel View, 1U Models w/ GPIB Option for the rear panel view of the 1U model power source showing the location of the connectors and Figure 2-8. Rear Panel View, 2U Chassis . Table 2-1 provides details of the connectors located in the rear panel of the power source.

WARNING!

High voltage present at rear panel poses risk of electrical shock. The input and output covers maintain protection against hazardous voltages. Do not remove protective covers on AC input or DC output. Refer installation and servicing to qualified personnel.

WARNING!

The input and output voltages at the rear panel of the unit might be HAZARDOUS LIVE. When rack-mounting or panel-mounting the unit, suitable safeguards must be taken by the installer to ensure that HAZARDOUS LIVE voltages are not OPERATOR accessible. OPERATOR access should only be to the front panel of the unit.

WARNING!

A safety disconnect device for the AC mains input must be installed so that it is readily accessible to the user.

WARNING!

A properly sized input overcurrent protection device must be installed at the AC mains input, either a circuit breaker or fuse having a rating of 25% over the maximum AC input line currents listed in Table 0.

WARNING!

To prevent an electrical shock hazard, a safety ground wire must be connected from the safety ground stud on the rear panel to the AC mains ground.

CAUTION!

Under no condition should the negative output terminal exceed 600V to earth ground. Floating the negative output terminal subjects the internal control circuitry of the power supply to the same potential as present at the negative output terminal. In a unit with the standard Non-Isolated Analog Interface, the signals of 44 pin analog programming and external user interface connector, would float at the same potential as the negative output terminal. Damage might occur if the signals of the Non-Isolated Analog control connector are connected to an external ground referenced device, due to unintentional ground loop currents that this connection could generate. To correct ground loop problems, it is advised to use the optional Isolated Analog Interface to isolate the external signals from

the internal control circuitry of the supply. Refer to section 3.3.1 for additional information.

Connector	Function	Connection
L1 – AC, L2 – AC, L3 – AC, Chassis - GND	AC input power; see section 2.8	AC mains 3-phase input/ 1-phase input
Pos. Bus Bar, Neg. Bus Bar / Output Connector	DC output power; see section 2.10	User load
Remote Sense Connector	Remote voltage sensing; see section 2.11	Output load
Analog Interface and External User Control connector (J1)	User Control interface; see section 2.14.1	User controller
RS-232C connector	RS-232C connector for remote digital control; see section 2.14.2.	External digital interface
USB Connector	USB type B connector for remote digital control; see section 2.14.3.	External digital interface
Ethernet connector	Ethernet connector for remote digital control; see section 2.14.4.	External digital interface
MAC1 , MAC2 (EtherCAT) Option	Modular connection for Optional EtherCAT for remote digital control; see section 2.14.6	External digital interface
GPIB (IEEE-488) Option	GPIB (IEEE-488) Option connector for remote digital control; see section 2.14.5	External digital interface
CAN IN/OUT	Parallel operation; see Section 3.9.	Leader/Follower units
Parallel IN/OUT		

Table 2-1. Rear Panel Connectors

2.8 AC input power connection

1U models

The Asterion DC Series power source is designed to operate from 1-phase or 3-phase input power.

a) 1-phase, having 2 wire/3-wire plus ground, with nominal AC input voltage (line-line or line-neutral) of 100/115/230/240 VAC, and 50/60/400 Hz input frequency. The AC input voltage range is automatically selected by the unit at power-up; no user setup is required.

b) 3-Phase plus ground, with nominal AC input Line-Line voltage of 200/208/240/380/400/415/480 VAC, and 50/60/400 Hz input frequency.

Power factor correction (PFC) provides high power factor, minimizing the required input apparent power and current harmonic distortion. Refer to the specifications of

Section 1.2 for AC input current requirements, and derating of output power as a function of AC input voltage.

2U models

The Asterion Series power sources are available for 3-phase input power options as listed below

a) 3-Phase plus ground, with nominal AC input Line-Line voltage of 200/208/240/380/400/415/480VAC, and 50/60/400 Hz input frequency.

Power factor correction (PFC) provides high power factor, minimizing the required input apparent power and current harmonic distortion. Refer to the specifications of Section 1.2 for AC input current requirements, and derating of output power as a function of AC input voltage.

2.8.1 AC input overcurrent protection

The Asterion DC Series power source has fuses at the AC input for fault protection. These fuses are internal to the chassis and are not user accessible. They provide fault isolation in case a failure occurs of internal components or wiring. A suitable overcurrent protection device must be provided externally, within the system installation, to protect the external wiring and interconnects.

2.8.2 AC Input Safety Disconnect Device

The Asterion DC Series power source front panel POWER switch does not disconnect the AC input line from the unit. Ensure that an appropriately rated safety disconnect device is incorporated in the installation that will provide isolation from the AC input when the device is opened. The device could be a switch or circuit breaker, and must be located close to the unit, within reach of the operator, and clearly labeled as the disconnection device.

2.8.3 AC Input Connector

The AC input connector, AC INPUT, is located on the rear panel, along with the safety-ground stud. Figure 2-11. AC Input Connector Wiring shows the wire installation details. Table 2-2 shows the functions and connector pinout, and Table 2-3 lists the connector type.

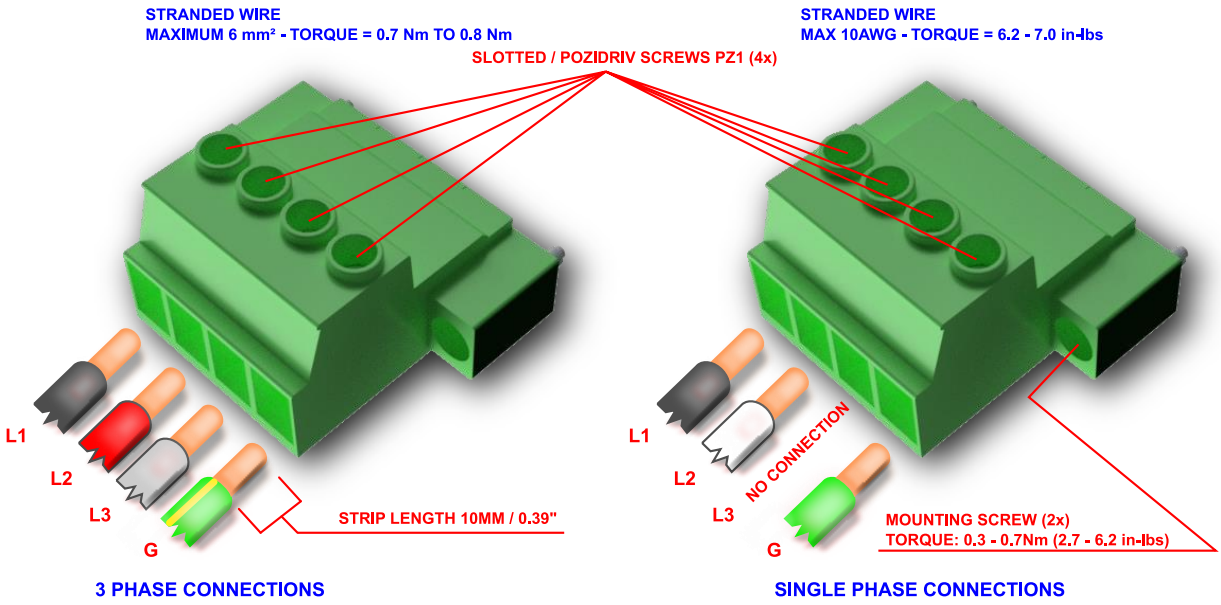


Figure 2-11. AC Input Connector Wiring

A 1-Phase input is connected to terminals L1/L2 or L2/L3 or L1/L3, while a 3-Phase input is connected to L1/L2/L3 (a connection to neutral is not utilized with 3-Phase input). The connector has compression terminals with female contacts. A ground connection must always be made to the utility earth protection ground using the AC Input connector pin or rear panel safety-ground stud.

Name	Type	Range	Function
AC INPUT L1	AC Input	90-264 VAC	Line-1 input from utility AC mains; For 1-Phase input, connect lines to terminals L1 and L2, or L2 and L3; or L1 and L3
AC INPUT L2	AC Input	90-264 VAC	Line-2 input from utility AC mains. For 1-Phase input, connect lines to terminals L1 and L2, or L2 and L3; or L1 and L3
AC INPUT L3	AC Input	90-264 VAC	Line-3 input from utility AC mains; For 1-Phase input, connect lines to terminals L1 and L2, or L2 and L3; or L1 and L3
GND	Safety Ground	N/A	Safety-Ground connection from utility earth protection-ground.

Table 2-2. AC Input Connector Pinout and Safety-Ground

Connector	Type
AC Input	Chassis connector header: Phoenix P/N 1708514; 4-position Mating connector: Phoenix P/N 1709173; compression terminals; housing retained to header with screws. Wire stripping length: 10 mm (0.39”) Tightening torque: 0.7 Nm, min (6.1 lb-in) to 0.8 Nm, max (7 lb-in) Wire cross section: 0.2 mm2, min (24 AWG) to 6 mm2, max (10 AWG). Refer to Phoenix P/N 1709173 manufacturer datasheet for the complete specifications of the Mating Connector.
Safety-Ground	Use the GND pin (G) provided in the input AC connector, or the Stud provided in the rear panel for Safety-Ground Connection. For using the rear panel M4-0.7 x 7 stud, nut tightening torque is 1.1 Nm (10 lb-in) max.

Table 2-3. AC Input Connector Type

CAUTION!

To prevent damage to the AC input mating connector, follow torque specifications, and, if a wire ferrule is used, ensure that it is properly sized and that it has been crimped with the appropriate ferrule crimping tool.

2.8.4 1-Phase AC Input Operation

Connect the utility AC mains wires to the rear panel AC input connector terminals, L1/L2, L2/L3, or L1/L3. Ensure that the voltage does not exceed 264 VAC. The power source does not require a neutral connection, so the input could be between any two lines that have a voltage that does not exceed 264 VAC. Use wires with ratings equal to or greater than the current rating listed in the specification Section. A ground wire must be connected from the rear panel safety-ground terminal or the rear panel safety ground stud to the utility power earth protection-ground.

2.8.5 3-Phase AC Input Operation

Connect the utility AC source wires to the rear panel AC input connector terminals, L1/L2/L3; **a neutral connection is not used**. Use wires with ratings equal to or greater than the current rating listed in the specifications Section.

CAUTION!

A ground wire must be connected from the rear panel safety-ground terminal or the rear panel safety ground stud to the utility power distribution earth protection-ground.

CAUTION!

Do not connect an AC voltage that is greater than 264 VAC, either line-to-neutral or line-to-line, for 1-Phase or 528VAC for 3-Phase inputs. Exceeding the maximum AC input voltage could result in damage to the unit.

2.9 DC input power connection

The Asterion DC Series power source is also designed to operate with a DC input. Any combination of L1, L2, and L3 on the input connector can be used for the positive and negative DC input. Reference Specification Section for Input Voltage Range.

2.10 DC output power connection

Output Power of the low voltage Asterion DC series is through bus bars (POS and NEG) reference Figure 2-13. DC Output Busbar and Figure 2-14.

High voltage models (300-400V) utilize a Phoenix connector with connection details provided in Figure 2-12. 300-400V Models DC Output Mating Connector.

Table 2-4 provides output power connection descriptions. Refer to Table 2-5 for input/output lug recommendations.

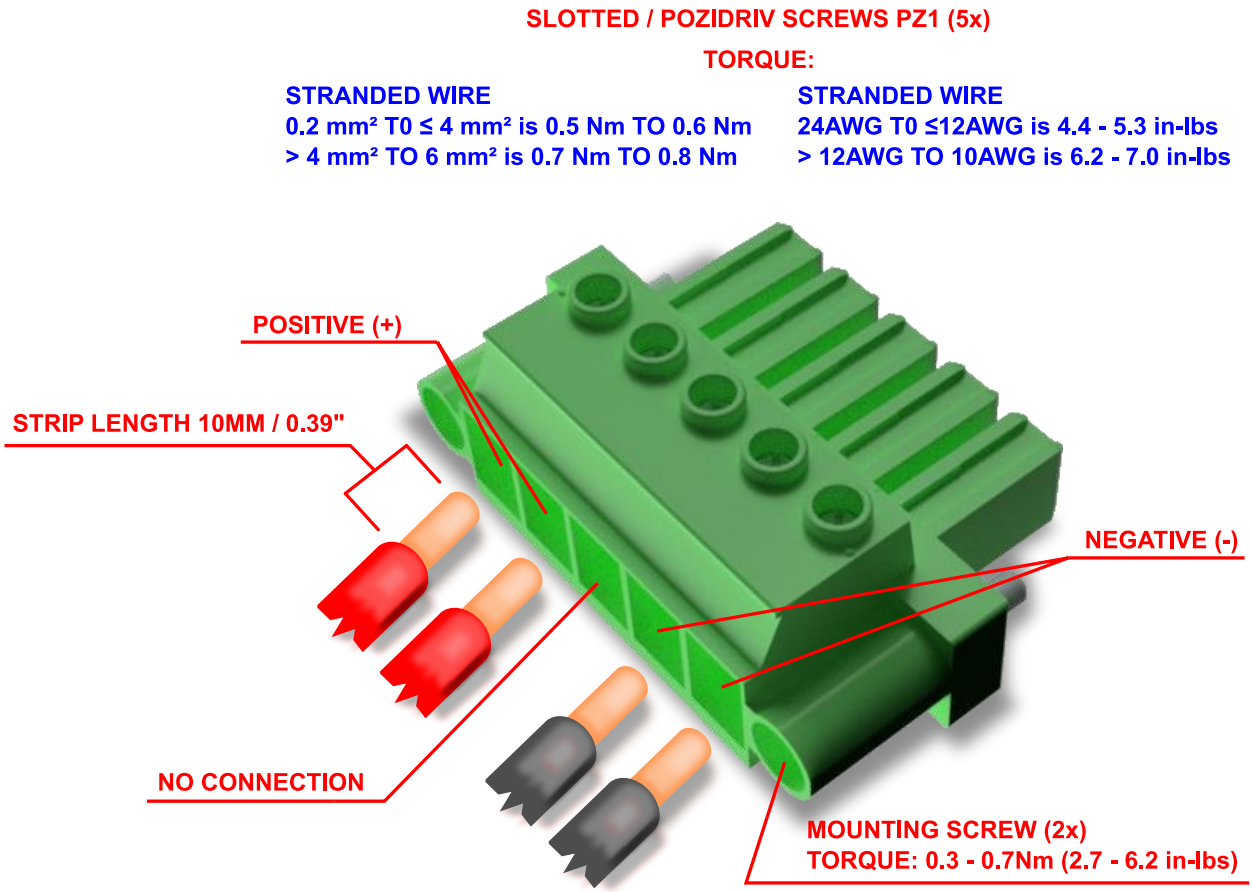


Figure 2-12. 300-400V Models DC Output Mating Connector

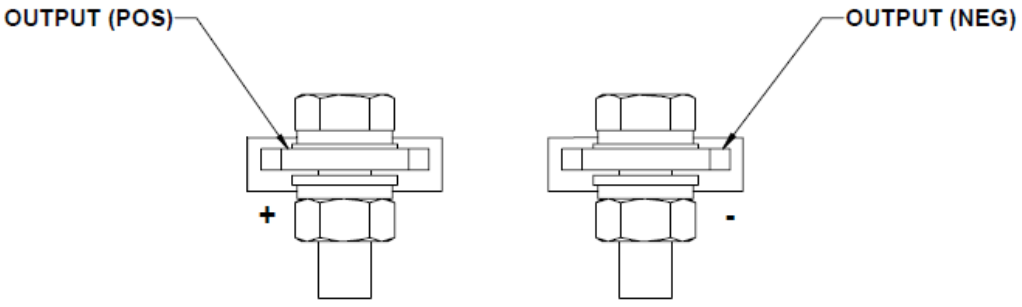


Figure 2-13. DC Output Busbar

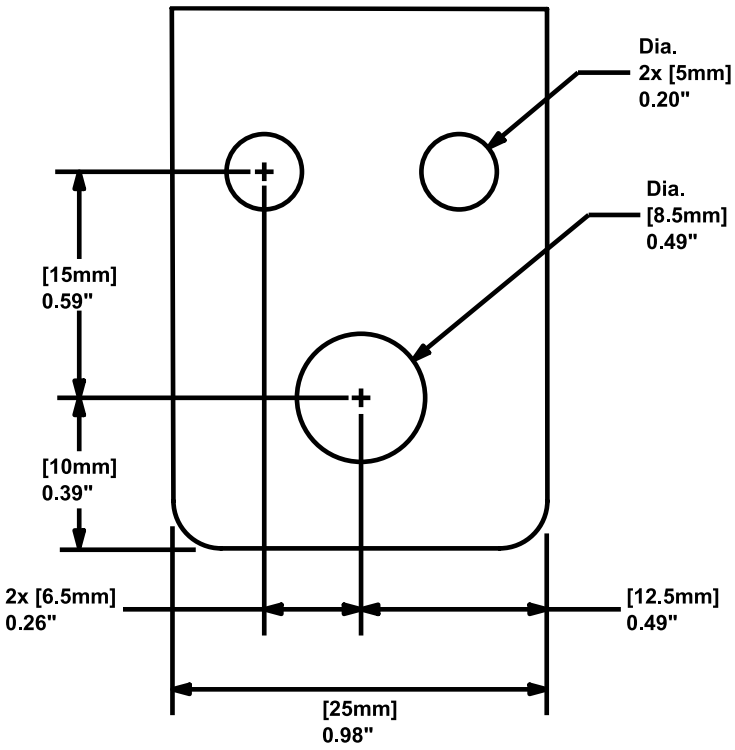


Figure 2-14. Bus Bar Dimensions

Power Supply Type	Connection Description
1.7 kW to 5 kW, 40V-200V models (1U)	Bus bars with holes for M8 bolts on each terminal (POS and NEG)
1.7 kW to 5 kW, 300V-400V models (1U)	Phoenix connector
10.0 kW 20-200V models (2U)	Bus bars with holes for 3/8” bolts on each terminal (POS & NEG)
10.0 kW 20-200V models (2U)	Phoenix connector

Table 2-4. DC Output Power Connections

Manufacturer	Low Current	High Current
Panduit	P, PV, or PN series, or equivalent	Standard stranded wire: LCA Series, or equivalent Flexible stranded wire: LCAX Series, or equivalent
Note: *Contact lug manufacturer for recommended crimping tool.*		

Table 2-5. Recommended Lugs

2.11 Remote Sense

The Remote Sense Connector is located on the rear panel. Figure 2-15 shows the connection to the supplied mating connector for the models equipped with a 3 pin sense connection, and Figure 2-16 for models with the 8 pin sense connection. Table 2-6 lists the connector type.

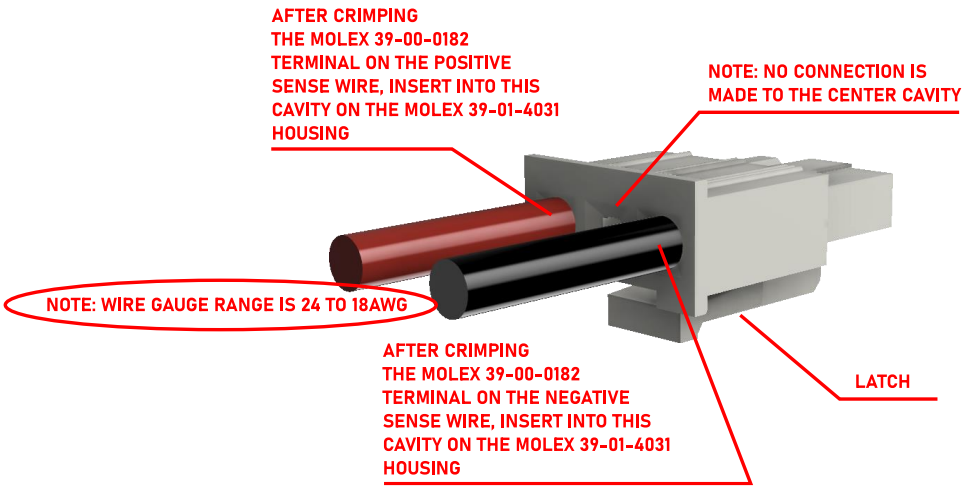


Figure 2-15. Remote Sense Connector - 3 Pin models

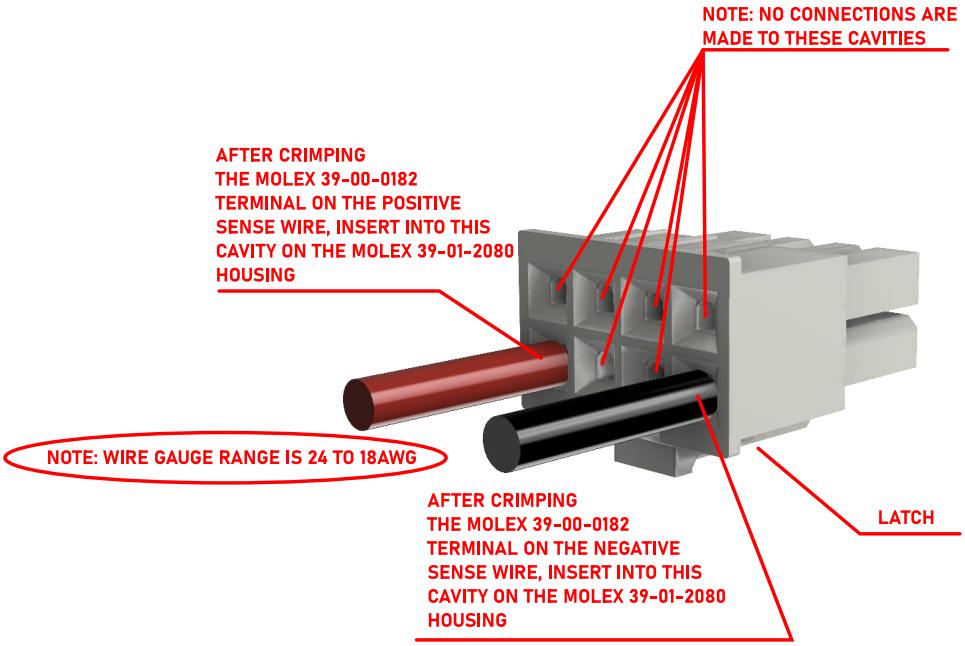


Figure 2-16. Remote Sense Connector - 8 Pin models

Connector	Mfg and Part Numbers
3 Pin Remote Sense Connector used on 1U Low Voltage Models and 2U High and Low Voltage Models	Mating connector AMETEK P/N, 856-390-03 Connector Manufacturer & P/N: Molex 39-01-4031 Crimp terminal AMETEK P/N, 856-390-00 Manufacturer & P/N: Molex 39-00-0182
8 Pin Remote Sense Connector used on 1U High Voltage Models	Mating connector AMETEK P/N, 856-390-08 Connector Manufacturer & P/N: Molex 39-01-2080 Crimp terminal AMETEK P/N, 856-390-00 Manufacturer & P/N: Molex 39-00-0182

Table 2-6. Remote Sense Connectors

Output voltage sensing is user-selectable to be either local sense or remote sense. Sensing provides the signal for measurement of the output voltage and determines the physical point where the output voltage is precisely regulated. Local sense is at the rear panel output connector, while remote sense is at the load, through a cable connection from the rear panel remote sense connector. Based on the user selection (local or remote) the corresponding sense signal is used by the controller as the voltage feedback for output regulation. Figure 2-15, and Figure 2-16 show the remote sense mating connector wiring.

Remote sensing is used to compensate for the voltage drop that occurs across the wires connecting the load to the output of the power source. A separate pair of wires is routed to measure the voltage at the terminals of the load where precise regulation of the output voltage is desired. The remote sense leads are connected at the remote sense connector on the rear panel; refer to Figure 2-17 for an example. Connect the terminal, Sense Positive (+), to the point at the load that is connected to the Output Positive terminal, and the terminal, Sense Negative (-), to the point at the load that is connected to Output Negative terminal.

On selecting the remote sense, if the difference between the remote sense and the local sense exceeds more than 5% of the rated output voltage, then the unit would go to fault state. The fault can arise due any of the following conditions.

1. The remote sense is selected and the remote sense wiring is not connected to the power supply.
2. The remote sense is connected in reverse polarity.
3. The load cable drop exceeds 5% of the rated output voltage.

Under remote sense fault condition, the output voltage will be programmed to zero.

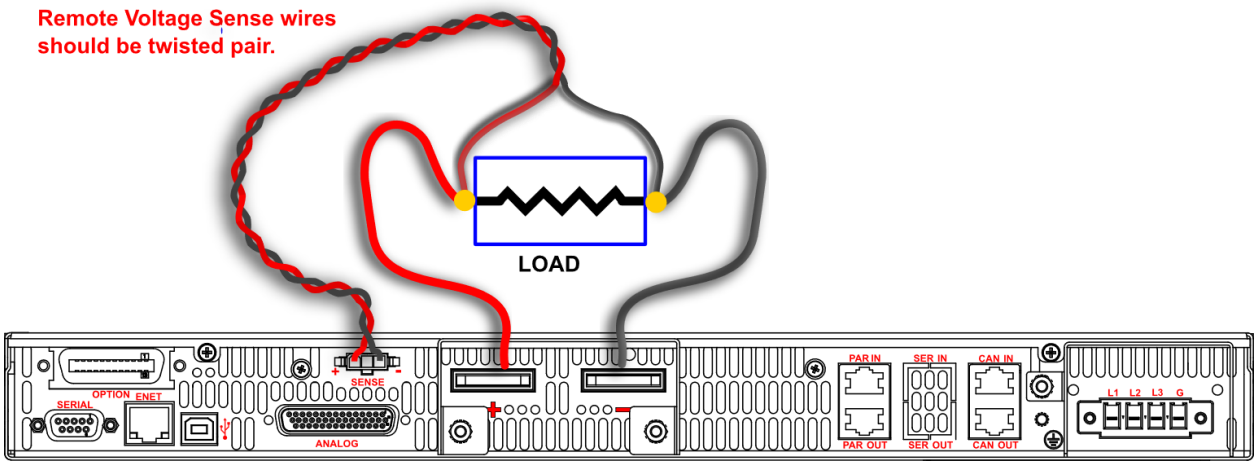


Figure 2-17. Remote Sense Connection Example

2.12 Wire Gauge Selection

Care must be taken to properly size all conductors for the input and output of the power source. This section provides guidance in the selection of wire size.

CAUTION!
Use wire with Class B or C stranding. Fine-stranded (flexible) wire should not be used unless crimp-on lugs or ferrules are utilized that are approved for fine-stranded cables.

2.12.1 Wire Size

The tables below will assist in determining the appropriate wire size for both the input and output connections. Table 2-7 gives minimum recommended wire size; these recommendations are for 30°C ambient, and for copper wire only. This table is derived from the National Electrical Code and is for reference only. Local laws and conditions may have different requirements. For higher ratings, wires can be paralleled; refer to the National Electrical Code for guidelines.

Size	Temperature Rating of Copper Conductor		
AWG	60°C	75°C	90°C
	Types: TW, UF	Types: RHW, THHW, THW, THWN, XHHW, USE, ZW	Types: TBS, SA, SIS, FEP, FEPB, MI, RHH, THHN, THHW, XHH, XHHW
	Current Rating, A(RMS)		
18	–	–	14
16	–	–	18
14	15	20	25
12	20	25	30
10	30	35	40
8	40	50	55
6	55	65	75
4	70	85	95
3	85	100	115
2	95	115	130
1	110	130	145
0	125	150	170
00	145	175	195
000	165	200	225
0000	195	230	260

Table 2-7. Minimum Wire Size

When determining the optimum cable specification for your power applications, the same engineering rules apply whether at the input or output of an electrical device. Therefore, this guide applies equally to the input cable and output cable for this power source and application loads. Power cables must be able to safely carry maximum load current without overheating or causing insulation degradation. It is important to power source performance to minimize IR (voltage drop) loss within the cable. These losses have a direct effect on the quality of power delivered to and from the power source and corresponding loads.

When specifying wire gauge, consider derating due to operating temperature at the wire location. Wire gauge current capability and insulation performance drops with the increased temperature developed within a cable bundle and with increased environmental temperature. Therefore, short cables with derating of gauge size and insulation properties are recommended for power source applications.

Be careful when using published commercial utility wiring codes. These codes are designed for the internal wiring of homes and buildings and accommodate the safety factors of wiring loss, heat, breakdown insulation, aging, etc. However, these codes consider that up to 5% voltage drop is acceptable. Such a loss directly detracts from

the performance specifications of this power source. Also, consider how the wiring codes apply to bundles of wire within a cable arrangement.

In high performance applications requiring high inrush/ transient currents, additional consideration is required. The cable wire gauge must accommodate peak currents developed at peak voltages, which might be up to five times the RMS current values. An underrated wire gauge adds losses, which alter the inrush characteristics of the application and thus the expected performance.

Table 2-8 presents wire resistance and resulting cable voltage drop at maximum rated current, with the wire at 20°C. Copper wire has a temperature coefficient of α = 0.00393Ω/°C at t1 = 20°C, so that at an elevated temperature, t2, the resistance would be R2 = R1 (1 + α (t2 - t1)).

The output power cables must be large enough to prevent the line voltage drop (total of both output wires) between the power source and the load from exceeding the remote sense capability as presented in the specification section. Calculate the voltage drop using the following formula:

Size, AWG	A(RMS), (90°C wire)	Ohms/100 Ft, (One Way)	Voltage Drop/100 Ft, (Column 2 x Column 3)
18	14	0.639	8.95
16	18	0.402	7.24
14	25	0.253	6.33
12	30	0.159	4.77
10	40	0.100	4.00
8	55	0.063	3.47
6	75	0.040	3.00
4	95	0.025	2.38
3	115	0.020	2.30
2	130	0.016	2.08
1	145	0.012	1.74
0	170	0.0098	1.67
00	195	0.0078	1.52
000	225	0.0062	1.40
0000	260	0.0049	1.27

Voltage Drop = 2 × distance-in-feet × cable-resistance-per-foot × current

Table 2-8. Wire Resistance and Voltage Drop, 20°C

2.13 Load Considerations

This section provides guidelines for incorporating protective diode networks at the output of the power supply to prevent damage while driving inductive loads or loads having stored energy that could be circulated back to the power supply.

2.13.1 Inductive and Stored-Energy Loads

To prevent damage to the power supply from inductive voltage kickback, connect an antiparallel diode (freewheel diode), rated at greater than the supplies output voltage and current) across the load: Connect the cathode to the positive terminal and the anode to negative. Where positive load transients, such as back EMF from a motor might occur, or stored energy is present such as a battery or large capacitance, a blocking diode in series with the output is recommended to protect the power supply. Refer to Figure 2-18.

CAUTION!

Series connected supplies must also use the freewheel diode to prevent reverse biasing the output stages in conditions where one of the supplies has been shut down.

The sense leads must not bypass the blocking diode. Reference Section 3.9.2 for details

2.13.1.1 BLOCKING AND ANTI-PARALLEL DIODES

Ensure that the chosen components are suitably rated for the inductance and energy to be dissipated. The Peak Reverse Voltage ratings should be a minimum of 2 times the Power Supply maximum output voltage. The Continuous Forward Current ratings should be a minimum of 1.5 times the power supply maximum output current. A heatsink may be required to dissipate the power caused by flow of current across the diodes forward voltage drop.

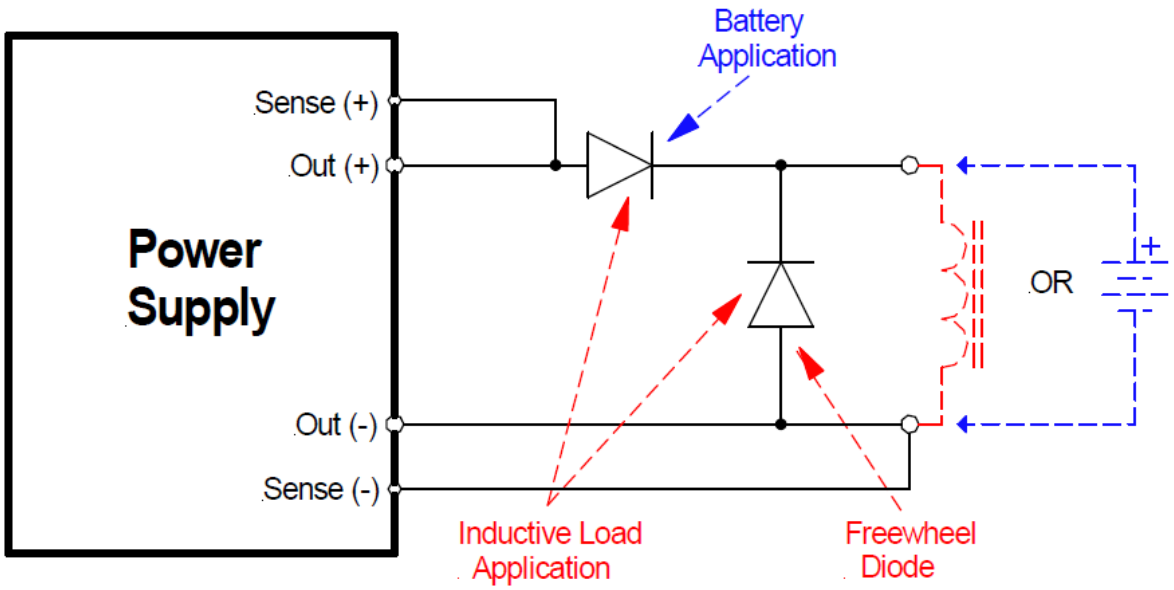


Figure 2-18. Diode Connections

2.14 Rear Panel User Interface Connectors

The rear panel contains the connectors for the remote analog and external user control interface, parallel unit connection interface and the digital communications interfaces (LAN, USB, RS-232C, and optional IEEE-488 or ECAT).

2.14.1 Remote Analog Programming Interface

The remote analog programming and External user control interface is located on the rear panel. Figure 2-19 shows the rear panel view of the connector, and Table 2-9 lists the connector type. Table 2-10 shows the functions and Table 2-11 shows the connector pinout.

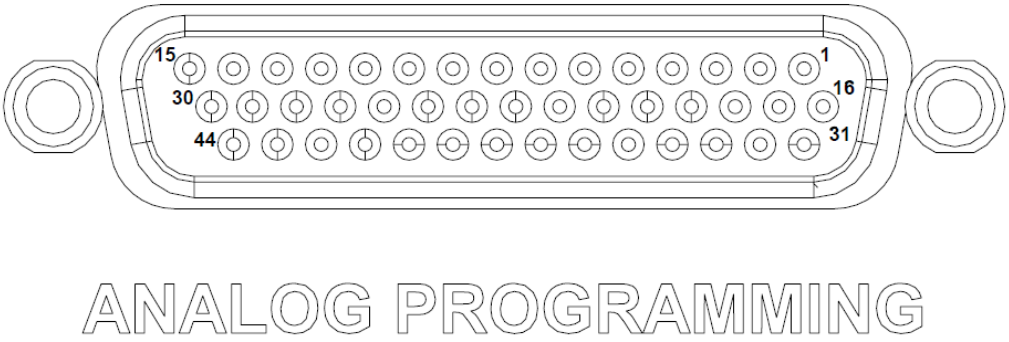


Figure 2-19. Remote Analog Programming Interface Connector

Connector	Type
Remote Analog programming and external user control interface	High-density, 44-socket, receptacle (female) Subminiature-D. Mating connector AMETEK P/N, 856-044-01 Mating Manufacturer P/N: NORCOMP 180-044-102L001 or equivalent

Table 2-9. Remote Analog Programming Interface Connector

Function	Characteristics
Remote Analog Programming of Output Voltage, Current and Power	Independent Signal inputs for output voltage, current and power programming using External Analog Reference. Analog reference source is user selectable and can be a voltage, resistance or 4-20 mA source. Selected analog reference source can be used to program output voltage, current and power programming. Voltage as Reference Source: 0 V to user selectable maximum range (2 V to 10 V) for 0 to full scale rated Output[12] Resistance as Reference Source: 0 kΩ to user selectable maximum range (2 kΩ to 10 kΩ) for 0 to full scale rated Output[12] Current as Reference Source: Fixed range from 4 mA to 20 mA for 0 to full scale rated Output Programming accuracy and linearity: ±1% of rated output
Remote Analog Programming of Overvoltage	Signal input for setting Overvoltage using External Analog Reference Voltage. Range: 0.25 V to user selectable maximum range (2 V to 10 V) for 5% to 110% of the full-scale Output Voltage. Programming accuracy and linearity: ±1% of full-scale output
Monitor Signals for the Output Voltage, Current and Power	Monitor Signals for the Output Voltage, Current and Power. Full Scale range: 0 V to 10 V corresponds to 0-100% full-scale output Minimum recommended Load: 100 kΩ, typical Maximum Load: 20 kΩ Monitor accuracy: ±1% of full-scale output
Remote ON/OFF	Control input for Output ON/OFF Switch/Relay contact closure or direct short-circuit from this terminal to signal return will enable (turn-on) the output of the supply Remote circuit must sink up to 3 mA from 5 VDC to enable.
Isolated Remote ON/OFF Control	There are two types of isolated control inputs to turn ON/OFF power supply a) Isolated remote-control input for output on/off with an applied AC/DC voltage source. A positive (+) 6-120 VDC or an AC input of 12- 240 VAC will enable (turn-on) the output of the supply. b) Isolated remote-control input for output on/off with a logic signal: a logic-high, 5 VDC TTL/CMOS signals will enable (turn-on) the output of the supply, and a logic-low signal disables (turns off) the output Note: These control inputs are optically isolated from the output power negative terminal of the power supply (up to 500 VDC).
TRIGGER IN	Input signal, TTL active-high; provides external hardware triggering of voltage and current ramp functions Signal connects to Open-anode of opto-isolator diode with internal 1kΩ series resistor internal to power supply Voltage Rating: Maximum 24 V, Minimum -5V Low state 0.3 V max, High State 2.7 V min.

Function	Characteristics
TRIGGER OUT	Output signal, active-low; synchronization pulse of 10 ms when a change in the output occurs. There is an Option to feed User Power to the TRIGGER OUT signal. Internal to power supply, signal output is from driver with input connected to open-collector of opto-isolator transistor Voltage Rating: Maximum 30 V, Minimum 4.5V for Active High, Current Maximum 0.5 A
FAULT	Output Signal, High state indicates fault state of the power supply. There is an Option to feed User Power to the FAULT signal. Internal to power supply, signal output is from driver with input connected to open-collector of opto-isolator transistor Voltage Rating: Maximum 30 V, Minimum 4.5V for Active High, Current Maximum 0.5 A
User programmable digital inputs	Four digital inputs to the power supply. Two of the digital inputs can be used as enable signals for user programmable digital outputs. Signal connects to Open-anode of opto-isolator diode with internal 1kΩ series resistor internal to power supply Voltage Rating: Maximum 24 V, Minimum -5V Low state 0.3 V max, High State 2.7 V min
User programmable digital outputs	Four digital outputs that can be enabled/ disabled from the power supply. Two digital outputs can be controlled by giving appropriate signals on User programmable digital inputs. There is an Option to feed User Power to these digital outputs. Voltage Rating: Min 4.5V or User fed voltage minus 1 V. User fed voltage can be of maximum 30 V. Current Maximum: 0.5 A
Auxiliary power output	Two Auxiliary power outputs of 15 V and 5 V. **(15V not available on 1U chassis models when not equipped with optional isolated analog interface.)** These auxiliary power outputs can be controlled from the power supply or by giving appropriate signals on the digital input enable pins provided for the same. Maximum current for each Auxiliary power output: 1 A
[12)] Unit is rated for +/- 1% Accuracy at 5V/10V for Voltage Programming, and 5kΩ/10kΩ for Resistive Programming	

Table 2-10. Remote Analog Programming Interface Functions

CAUTION!

If standard, Remote Non-Isolated Analog Interface programming is used, (**NOTE – Isolated is standard on 2U models – Non Isolated is not available**) the programming return (pins 12, 18, 22, 28, 29, 36, 40, and 41) are at the same potential as the negative output terminal of the power supply (**not isolated**). Proper connection should be made to signal returns with respect to input programming equipment. Improper connection might result in ground/return loops and, as a result, internal power supply damage might occur; output current could

	then flow by way of the external connection to the return (pins 12, 18, 22, 28, 29, 36, 40, and 41). Refer to Table 2-11 for pin details.

Note: In Non-Isolated Analog interface, the control signals Return is connected to Negative Output of the power supply. In Isolated Analog Interface Option, the control signals Return is isolated from Negative Output of the power supply.

Pin	Reference	Type	Functional Description
1	ON/OFF_HV	ISO HV	Isolated remote-control input for output on/off with an applied AC/DC voltage source. A positive (+) 6-120 VDC or an AC input of 12-240 VAC will enable (turn-on) the output of the supply. This control input is optically isolated from the output power negative terminal of the power supply (up to 500 VDC). Signal return is Pin 16 (RTN_HV).
2	Not Used	Not Used	Not Used
3	VPRG_ISOUR	ANALOG OUT	Current source of 1 mA for remote voltage programming using a resistance connected to signal return Pin 18: 0-5 kΩ or 0-10kΩ = 0-100% of full-scale output voltage.
4	VPRG_VSOUR/ VPRG_4-20mA_SOUR	ANALOG IN	Remote control input for voltage programming using a voltage source: 0-5 VDC or 0-10 VDC = 0-100% of full-scale output voltage. Do not exceed an input of 12 VDC. Signal return is Pin 18.
5	OVPPRG_VSOUR	ANALOG IN	Remote control input for overvoltage programming using a voltage source: 0-10 VDC = 0-110% of full-scale output voltage. Do not exceed an input of 12 VDC. Signal return is Pin 18.
6	VMON	ANALOG OUT	Monitor signal for output voltage: 0-10 VDC = 0-100% of full-scale output voltage. Minimum recommended load resistance is 100 kΩ and maximum load is 20kΩ. Circuit return is pin 22.
7	DIO_IN2	DIGITAL IN	User digital input, function to be assigned by user. Up to 24V capable, .3V max low, 2.7V min high.

Pin	Reference	Type	Functional Description
8	TRIG_IN	DIGITAL IN	User digital input, function to be assigned by user. Up to 24V capable, .3V max low, 2.7V min high.
9	DIO_IN1	DIGITAL IN	User digital input, function to be assigned by user. Up to 24V capable, .3V max low, 2.7V min high.
10	REV_RY_EN	DIGITAL IN	User digital input - enables high output on pin 38. Up to 24V capable, .3V max low, 2.7V min high.
11	OUT_RY_EN	DIGITAL IN	User digital input - enables high output on pin 37. Up to 24V capable, .3V max low, 2.7V min high.
12	RTN*	DIGITAL GND	Return for Pin 7, 8, 9, 10, 11, 12.
13	ESTOP	DIGITAL IN	Short to Pin 14 to permit operation. Internally tied to 5V through a 2.49k resistor.
14	RTN*	DIGITAL GND	Return for Pin 13 (ESTOP).
15	RTN_UPWR	POWER GND	Return for Pin 30 (USER_PWR).
16	RTN_HV	ISO GND	Return for Pin 1 (ON/OFF_HV) and Pin31 (ON/OFF_ISO).
17	Not Used	Not Used	Not Used
18	RTN_PRG*	ANALOG GND	Return for Pin 3, 4, 5, 19, 20, 33, 34. This control return is optically isolated from the output power negative terminal of the power supply (up to 600 VDC).
19	IPRG_VSOUR/ IPRG_4-20mA_SOUR	ANALOG IN	Remote control input for current programming using a voltage source: 0-5 VDC or 0-10 VDC = 0-100% of full-scale output current. Do not exceed an input of 12 VDC. Signal return is Pin 18.
20	IPRG_ISOUR	ANALOG OUT	Current source of 1 mA for remote current programming using a resistance connected to signal return Pin 18: 0-5 kΩ or 0-10kΩ = 0-100% of full-scale output current.
21	IMON	ANALOG OUT	Monitor signal for output current: 0-10 VDC = 0-100% of full-scale output current. Minimum recommended load resistance is 100 KΩ and maximum load is 20kΩ. Circuit return is pin 22.
22	MON_RTN*	ANALOG GND	Return for Pin 6, 21, 35.
23	Not Used	Not Used	Not USed

Pin	Reference	Type	Functional Description
24	TRIG_OUT	DIGITAL OUT	User digital output, cause to be assigned by user. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
25	DIO_OUT1	DIGITAL OUT	Output low for CV and high for CC. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
26	FAULT_OUT	DIGITAL OUT	High state indicates fault. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
27	DIO_OUT2	POWER OUT	Output low for CV or CC and high for CP. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
28	RTN_UPWR*	POWER GND	Return for Pin 24, 25, 26, 27.
29	RTN_AUX5*	POWER GND	Return for Pin 43 (5V_AUX).
30	USER_POWER	POWER IN	Optional- User can connect between 5V to 24V to control digital output/relay output voltage. If left unconnected, digital and relay outputs have 4.5V high states.
31	ON/OFF_ISO	DIGITAL IN	Isolated remote control input for output on/off with a logic signal: a logic-high, 3.3V to 24V signal will enable (turn-on) the output of the supply, and a logic-low signal disables (turns off) the output. This control input is optically isolated from the output power negative terminal of the power supply (up to 600 VDC). Signal return is Pin 16 (RTN_HV).
32	Not Used	Not Used	Not Used
33	PPRG_VSOUR/ PPRG_4-20mA_SOUR	ANALOG IN	Remote control input for power programming using a voltage source: 0-5 VDC or 0-10 VDC = 0-100% of full-scale output power. Do not exceed an input of 12 VDC. Signal return is Pin 18.

Pin	Reference	Type	Functional Description
34	PPROG_ISOUR	ANALOG OUT	Current source of 1 mA for remote power programming using a resistance connected to signal return Pin 18: 0-5 kΩ or 0-10kΩ = 0-100% of full-scale output power.
35	PMON	ANALOG OUT	Monitor signal for output power: 0-10 VDC = 0-100% of full-scale output power. Minimum recommended load resistance is 100 kΩ and maximum load is 20kΩ. Circuit return is pin 22.
36	RTN_UPWR*	OUTPUT GND	Return for Pin 37, 38.
37	OUT_RY_ON	POWER OUT	User digital output, cause to be assigned by user or state of pin 11. Output high state either min 5V or voltage on pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
38	REV_RY_ON	POWER OUT	User digital output, cause to be assigned by user or state of pin 10. Output high state either min 5V or voltage on pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
39	AUX5_EN	DIGITAL IN	Apply a high to enable output on pin 43 (5V_AUX). Up to 24V capable, 0.3V max low, 2.7V min high.
40	RTN*	DIGITAL GND	Return for Pin 39, 44.
41	RTN_AUX15*	POWER GND	Return for Pin 42.
42	15V_AUX	POWER OUT	15V for use by the user, 1A max current. **(15V_AUX not available on 1U chassis models when not equipped with optional isolated analog interface.)**
43	5V_AUX	POWER OUT	5V for use by the user, 1A max current.
44	AUX15_EN	DIGITAL IN	Apply a high to enable output on pin 42 (15V_AUX). Up to 24V capable, 0.3V max low, 2.7V min high. **(15V_AUX not available on 1U chassis models when not equipped with optional isolated analog interface.)**

Table 2-11. Remote Analog Programming Interface Connector Pin Out

* With the option, Remote Isolated Analog Interface control, the control signal return is isolated from the output power negative terminal.

2.14.2 RS-232C Serial Interface

RS-232C Figure 2-20, Table 2-12 and Table 2-13 for pin descriptions. The power source functions as Data Circuit-terminating Equipment (DCE). The cable connecting to the Data Terminal Equipment (DTE) should be straight-through (one-to-one contact connections). For EMC considerations a ferrite core can be added to the cable AMETEK P/N: 991-642-28, Manufacturer P/N: CS28B0642.

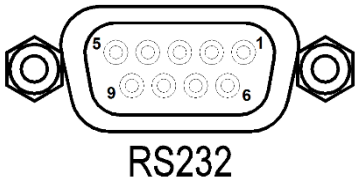


Figure 2-20. RS-232C Interface Connector

Connector	Type
RS-232C Interface	9-contact receptacle (female) Subminiature-D.

Table 2-12. RS-232C Interface Connector Type

Pin #	Name	DCE Signal	Direction
1	N/C	N/A	N/A
2	TxD	Transmit Data	Output
3	RxD	Receive Data	Input
4	N/C	N/A	N/A
5	Common	N/A	N/A
6	N/C	N/A	N/A
7	RTS	Request to Send	Input
8	CTS	Clear to Send	Output
9	N/C	N/A	N/A

Table 2-13. RS-232C Interface Connector Pinout

2.14.3 USB interface

USB remote control interface is made through a Series-B device connector located on the rear panel; refer to Figure 2-21 for view of connector, Table 2-14 for the connector type and Table 2-15 for pin descriptions. A standard USB cable between the Asterion Series power source and a computer should be used. For EMC considerations a ferrite core can be added to the cable AMETEK P/N: 991-642-28, Manufacturer P/N: CS28B0642.

CAUTION!
Connecting the power source to the computer controller through an USB hub is not recommended. The USB connection should be direct between the two devices.

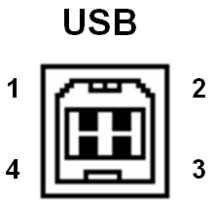


Figure 2-21. USB Interface Connector

Connector	Type
USB Interface	USB series-B type Connector

Table 2-14. USB Interface Connector Type

Pin #	Name	Description
1	N/C	No Connection
2	D-	Data -
3	D+	Data +
4	GND	Ground

Table 2-15. USB Interface Connector Pinout

2.14.4 LAN interface

A LAN connector (Ethernet 10BaseT/100BaseT) is located on the rear panel for remote control; refer to Figure 2-22 for view of connector, Table 2-16 for connector type and Table 2-17 for pin descriptions. A standard modular cable with an 8P8C modular plug should be used between the power source and a network hub. For a direct connection to a computer LAN card, a crossover cable with an 8P8C modular plug is required. The MAC Address (Media Access Control) of the Ethernet port is printed on a label on the chassis of the power source. For information on how to set up a network connection or a direct computer connection using the LAN interface, refer to the DC-Asterion Series Programming Manual P/N M330461-01 distributed on the CD, M550008-01. For EMC considerations a ferrite core can be added to the cable AMETEK P/N: 991-642-28, Manufacturer P/N: CS28B0642.

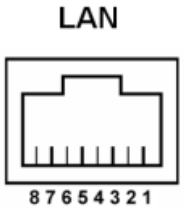


Figure 2-22. LAN Interface 8P8C Modular Connector

Connector	Type
LAN Interface	Standard RJ45 connector

Table 2-16. LAN Interface Connector Type

Pin #	Ethernet Signal	EIA/TIA 568A	EIA/TIA 568B Crossover
1	Transmit/Receive Data 0 +	White with green stripe	White with orange stripe
2	Transmit/Receive Data 0 -	Green with white stripe or solid green	Orange with white stripe or solid orange
3	Transmit/Receive Data 1 +	White with orange stripe	White with green stripe
4	Transmit/Receive Data 2 +	Blue with white stripe or solid blue	Blue with white stripe or solid blue
5	Transmit/Receive Data 2 -	White with blue stripe	White with blue stripe
6	Transmit/Receive Data 1 -	Orange with white stripe or solid orange	Green with white stripe or solid green
7	Transmit/Receive Data 3 +	White with brown stripe or solid brown	White with brown stripe or solid brown
8	Transmit/Receive Data 3 -	Brown with white stripe or solid brown	Brown with white stripe or solid brown

Table 2-17. LAN Interface 8P8C Modular Connector Pinout

2.14.5 GPIB Interface (Optional)

When equipped with this option, a GPIB connector (IEEE 488.2 GPIB) is located on the rear panel for remote control; refer to Figure 2-23 for view of connector, Table 2-18 for connector type and Table 2-19 for pin descriptions.

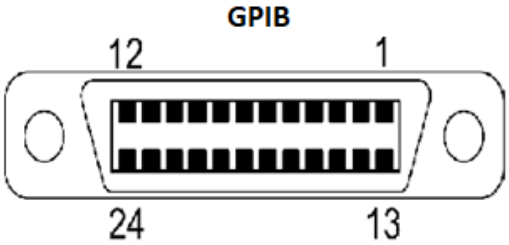


Figure 2-23. IEEE 488.2 GPIB interface Connector

Connector	Type
GPIB Interface	IEEE 488.2 GPIB standard connector

Table 2-18. GPIB Interface Connector Type

Pin #	Name	Description
1	DIO1	Data input/output bit
2	DIO2	Data input/output bit
3	DIO3	Data input/output bit
4	DIO4	Data input/output bit
5	EOI	End or Identify
6	DAV	Data valid
7	NRFD	Not ready for data
8	NDAC	Not data accepted
9	IFC	Interface clear
10	SRQ	Service request
11	ATN	Attention
12	SHIELD	SHIELD
13	DIO5	Data input/output bit
14	DIO6	Data input/output bit
15	DIO7	Data input/output bit
16	DIO8	Data input/output bit
17	REN	Remote enable
18	GND	(wire twisted with DAV)
19	GND	(wire twisted with NRFD)
20	GND	(wire twisted with NDAC)

Pin #	Name	Description
21	GND	(wire twisted with IFC)
22	GND	(wire twisted with SRQ)
23	GND	(wire twisted with ATN)
24	LOGIC GND	LOGIC GROUND

Table 2-19. GPIB Interface Connector Pinout

2.14.6 EtherCAT Interface (Optional)

EtherCAT (Ethernet for Control Automation Technology) is an open high-performance Ethernet-based fieldbus system. The development goal of EtherCAT was to apply Ethernet to automation applications which require short data update times (also called cycle times) with low communication jitter (for synchronization purposes) and low hardware costs.

The Asterion series power supplies have an optional EtherCAT interface that allows accessing most of the read and writing registers. The registers that are available are listed in Table 2-20. Registers Available - EtherCAT Interface

These write and read registers are linked to EtherCAT PDOs (Process Data Objects), which allow real time control of the power supply. Available PDOs are shown in Table 2-22. EtherCAT PDOs and Variables.

Write Registers	Read Registers
Command Vsetpoint Isetpoint Psetpoint	Status Fault_Bits Vmonitor Imonitor Pmonitor Existing_Modules Active_Modules Module_Status Module_Faults Module_Warnings Z_Output Z_Cable Vdrop_Cable Energy_Meter

Table 2-20. Registers Available - EtherCAT Interface

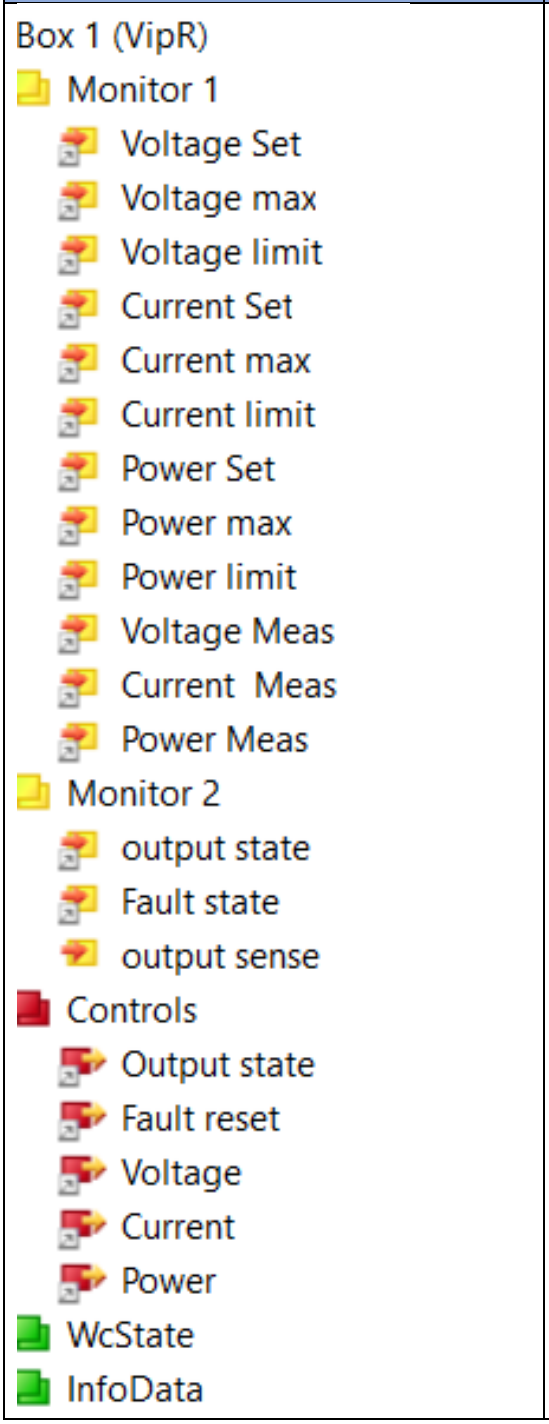
Table 2-20. Registers Available - EtherCAT Interface lists the command registers that must be set to operate the power supply from EtherCAT.

Bit	Value	Description
ON	1	To enable output.
FLOATING_POINT_ENABLED	1	Because the variable type of PDOs is set to floating point input.
DIGITAL PROGRAMMING MODE	1	To enable digital programming.

Table 2-21. Command Bits Required for EtherCAT Operation

EtherCAT Process Data Objects (PDOs) and variables are presented in Table 2-22. The variables in red (accompanied by down arrow) are Write Only. The variables in yellow (accompanied by up arrow) are Read only.

EtherCAT PDO Tree	EtherCAT PDO Variables



Name	Address	Data type
output_enable	%QD0	DWORD
reset_fault	%QD4	DWORD
voltage_setpoint	%QD8	REAL
current_setpoint	%QD12	REAL
power_setpoint	%QD16	REAL
voltage_monitor	%ID0	REAL
current_monitor	%ID4	REAL
power_monitor	%ID8	REAL
output_state	%ID12	DWORD
fault_state	%ID16	DWORD
voltage_set	%ID20	REAL
current_set	%ID24	REAL
power_set	%ID28	REAL
voltage_max	%ID32	REAL
current_max	%ID36	REAL
power_max	%ID40	REAL
volt_lim	%ID44	REAL
curr_lim	%ID48	REAL
pow_lim	%ID52	REAL

Table 2-22. EtherCAT PDOs and Variables

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3 OPERATION

3.1 Front Panel Display Menu and Functionality

3.1.1 Power-Up Screens

At initial power-on, the display shows the AST-DC Splash screen, Refer to Figure 3-1, followed by the Start-Up screen with the manufacturer, model number, serial number, firmware revisions and last calibration date, Refer to Figure 3-2, and finally the Dashboard screen, Refer to Figure 3-7.

Figure 3-1. Splash Screen

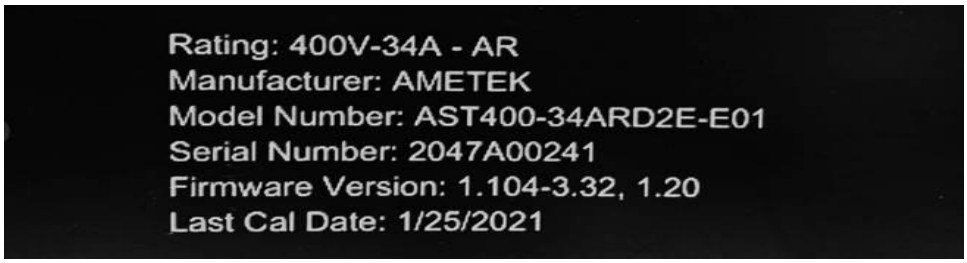


Figure 3-2. Power-On Screen Displaying Model & Version

If output is enabled in Power-ON Settings (PONS) screen, refer to Figure 3-17. Output State Setting and supply is in Local mode, a warning screen is shown, Refer to Figure 3-3, before the Dashboard Screen.

It warns the user that the output will be enabled at the end of 10 second countdown. The process can be aborted by pressing the ABORT button on the screen.

Once aborted, the output remains off until the user enables it with the Output On/Off button.

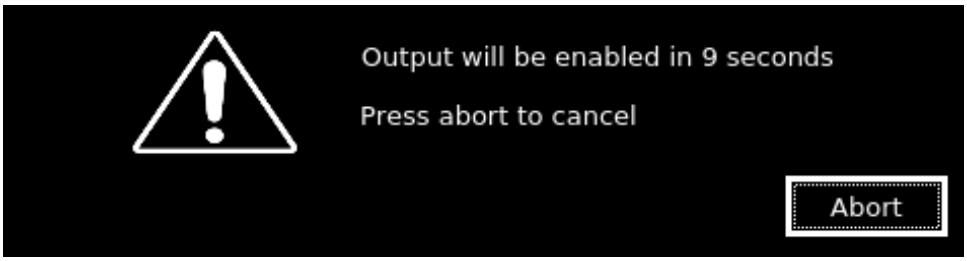


Figure 3-3. Output-Enabled Warning Screen

3.1.2 Home Screen Top-Level Menu

Selecting the Home icon or Up arrow will open the HOME screen. Each menu of a screen could be selected by tapping its associated selection-field box through the touch-screen, or by selecting it with the rotary encoder and depressing (clicking) the rotary encoder SELECT switch. Refer to Figure 3-4, Figure 3-5, Figure 3-6 and Table 3-1.

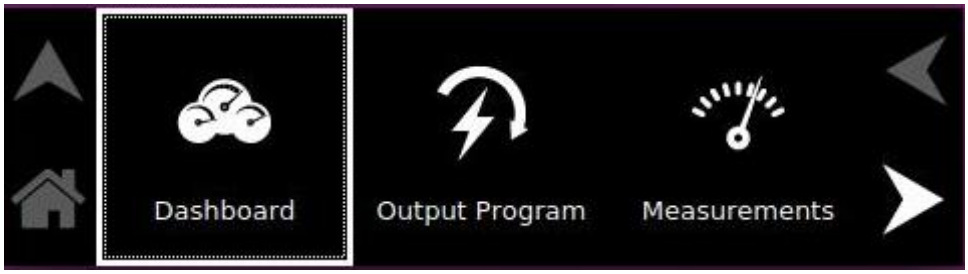


Figure 3-4. HOME Screen Menu 1

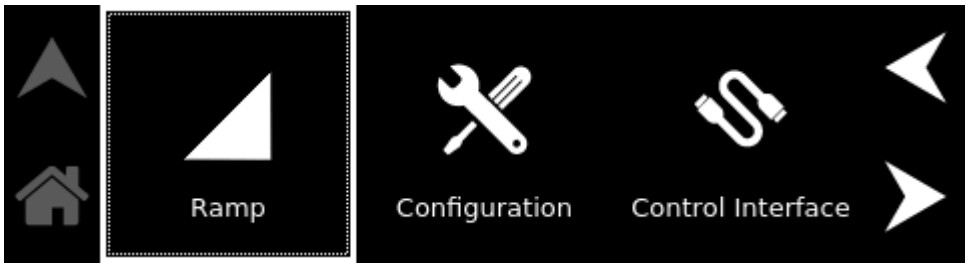


Figure 3-5. HOME Screen Menu 2

Figure 3-6. HOME Screen Menu 3

There are four virtual buttons visible on a screen: UP, LEFT, and RIGHT arrows, and HOME icon. Those buttons that are highlighted are active for the screen being displayed. The arrow buttons will scroll to the next page of the menu structure in the direction indicated. The HOME button will return to the previous home screen that has the top-level menu from which a sub-menu was entered. The HOME button is no longer functional once a home screen is entered.

Table 3-1 lists the top-level menu choices can be accessed through the touchscreen:

Top-Level Screen Menu	Menu Description
DASHBOARD	Provides setting and measurement of output parameters: voltage, current and power.
OUTPUT PROGRAM	Provides setting of voltage, current, power (applicable only in Constant Power Mode), Regulation Mode, Output state, and OVP (Over Voltage Protection).
MEASUREMENTS	Provides measurement of output parameters: Voltage, Current and Power.
CONFIGURATION	Provides setup of **P**ower **ON S**tates (PONS), User V/I limit, Total System Current, Profiles, Regulation mode and Measurement Settings.
CONTROL INTERFACE	Provides setup of remote digital interfaces: RS232, GPIB, LAN, Analog, EtherCAT, and USB.
SYSTEM SETTINGS	Provides display of firmware versions, selection of language, hardware parameter limits, brightness of the display, and default screen timeout.
RAMP	Provides setting of Voltage and Current Ramp.

Table 3-1. Home Screen Menu Content

3.1.2.1 NAVIGATING BETWEEN HOME SCREEN MENUS

Each menu in the Home Screen can be reached in one of two ways:

- Tapping selected menu on Home Screen of the front panel touchscreen.
- Scrolling to menu with the encoder and depressing the encoder switch.

Tapping the Up-arrow button will return to the previously selected screen menu. Tapping the HOME button will return to the Home Screen.

3.1.3 Dashboard Screen Top-Level Menu

The DASHBOARD screen top-level menu is used to change output parameters and simultaneously view output measurements. The most commonly used output parameters are in the DASHBOARD screen menu. The DASHBOARD screen is the default menu that is displayed after power-on, refer to Figure 3-7.

Refer to Section 3.1.2.1 for navigating to Dashboard Screen.

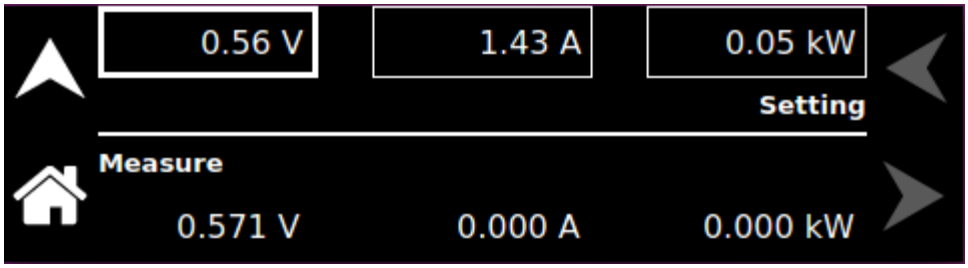


Figure 3-7. Dashboard Screen in CC/CV Mode

The following selections are available in the DASHBOARD screen top-level menu.

Entry	Description
Setting	
VOLTAGE	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
CURRENT	Programs the output current in amps. Real-time setting is possible using the rotary encoder.
POWER	Programs the power in constant power mode for power regulation in KW. Real-time setting is possible using the rotary encoder. **NOTE:** The unit will operate in Constant Power Mode if power limit is set.
Measure	
VOLTAGE	Displays the floating-point value of the DC output voltage in volts.
CURRENT	Displays the floating-point value of the DC output current in amps.
POWER	Displays the floating-point value of the DC output power in KW.

3.1.3.1 Real-Time Parameter Adjustment

The DASHBOARD screen menu provides the capability for output parameter entry that has real-time, immediate effect on the output. This allows manual adjustment of the output parameters where tuning of a value is desired. Enabling this function requires clicking on a parameter selection-field box with the encoder switch to select the parameter and display its selection-field highlighted and with a value entry window

(refer to Figure 3-8). The rotary encoder could then be used to continuously adjust the parameter value, up and down, as it is rotated. The value change takes immediate effect at the output.

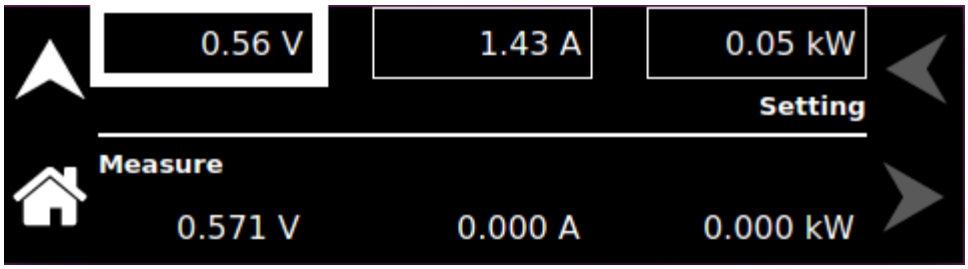


Figure 3-8. Real-Time, Immediate Output Parameter Adjustment

3.1.3.2 TOUCH-SCREEN NUMERIC KEYPAD

The touchscreen has a keypad that allows numeric value entry; refer to Figure 3-9. After scrolling through menus until a parameter selection-field box is highlighted (active), tapping the selection-field selects it. Afterwards, the keypad screen will be displayed. Tapping numerical value keys, the decimal point key, or the polarity key, selects them, while the back-arrow key erases the last entry. To enter a negative value, first enter the number then the minus sign. The selected values appear in the upper-left parameter window, and the cursor moves to the next available position. Tapping the OK key enters the value to have it take effect.

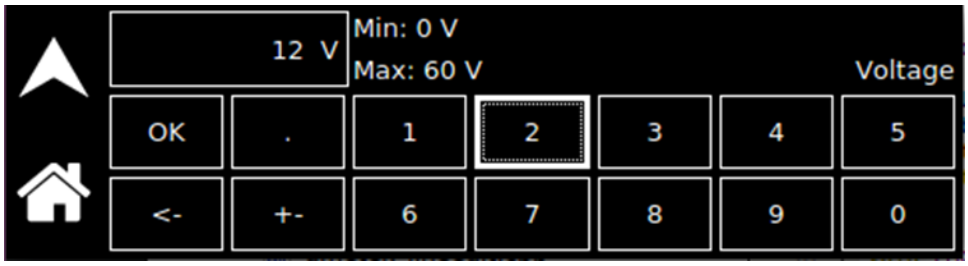


Figure 3-9. Touch-Screen Numeric Keypad

3.1.3.3 DEFAULT SCREEN

The Default screen provides measurement of the DC output voltage, current and power, refer to Figure 3-10. When in the Dashboard screen, and idle for an interval equal to a set time delay, the display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen; Refer to Section 3.1.3.3 (Default Screen).

Figure 3-10. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage and output current in various modes of operation as described in Section 3.1.3 (Dashboard Screen).

3.1.4 Output Program Screen

The OUTPUT PROGRAM screen provides setting of output related items such as individual output parameters, mode of regulation, and output state.

The top-level menus of the OUTPUT PROGRAM screen are shown in Figure 3-11. They could be reached in one of two ways:

1. Tapping the OUTPUT PROGRAM screen on Home Screen-1 of the front panel touch-screen.

2. Scrolling to the OUTPUT PROGRAM screen with the encoder and depressing the encoder switch.

The UP arrow button will return to the previously selected screen menu (in this case the HOME Screen-1). The HOME button will return to the home screen that has the top-level menu for the sub-menu being displayed; for the OUTPUT PROGRAM screen top-level menu, that is the HOME Screen-1.

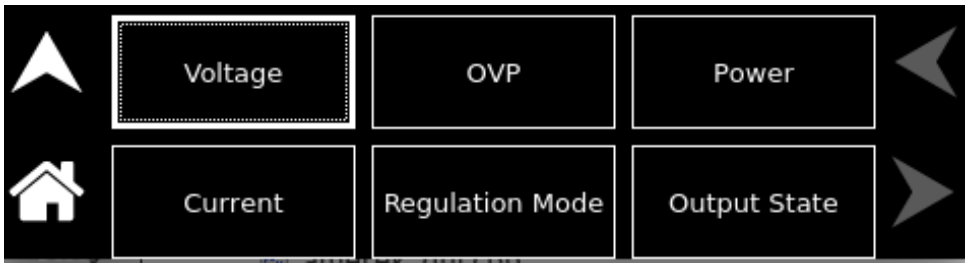


Figure 3-11. OUTPUT PROGRAM Screen Top-Level Menu

The following choices are available in the OUTPUT PROGRAM screen top-level menu. Functions that accept a numeric value require that the value is within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

Entry	Description
SETTINGS	
VOLTAGE	Programs the output voltage in Volts, refer to Figure 3-12.

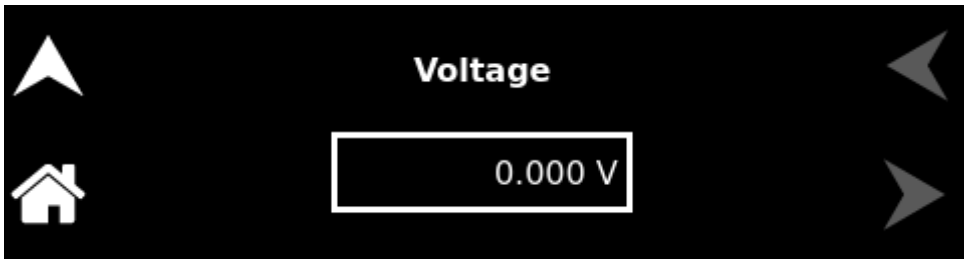


Figure 3-12. Voltage Setting

CURRENT Programs the output current in Amperes. The default is full-scale for the model, refer to Figure 3-13.

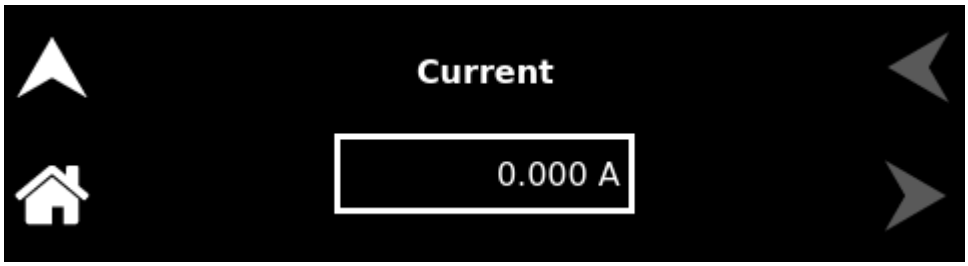


Figure 3-13. Current Setting

OVP Programs the Overvoltage Protection (OVP) threshold for the output voltage. Exceeding the OVP threshold will result in shutdown of the output and the output voltage programmed to zero, refer to Figure 3-14.

Figure 3-14. OVP Setting

REGULATION Selects options for regulation of the output voltage: CC/CV/CP, Constant Power, Constant Voltage and Constant Current. Also, there is option to set the Delay interval, refer to Figure 3-15.

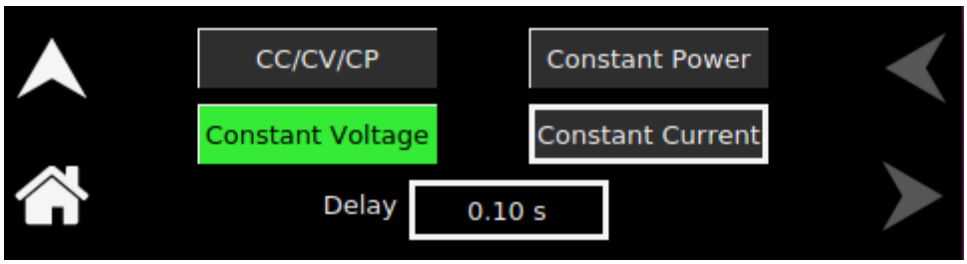


Figure 3-15. Regulation Setting

POWER Programs the power setting in kilo watts (KW), refer to Figure 3-16.

Figure 3-16. Power Setting

OUTPUT STATE Programs the output relay settings to ON or OFF state, refer to Figure 3-17.

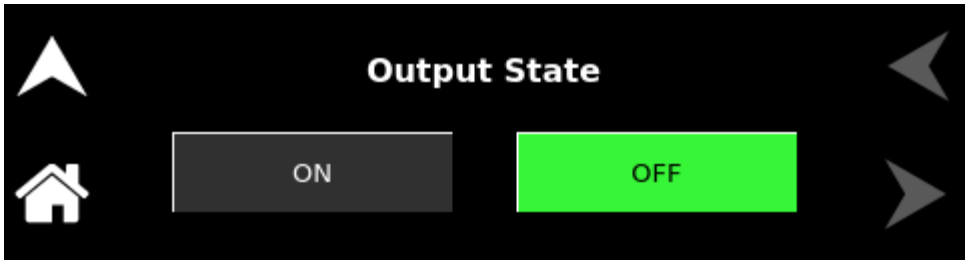


Figure 3-17. Output State Setting

3.1.5 Measurements Screen

The Measurements the floating-point value of the DC Output Voltage, Output Current and Output Power. the DC Output Voltage, Output Current and Output Power.

The Measurements screen is shown in refer to Figure 3-18. Refer to Section 3.1.2.1 for navigating to Measurements Screen.

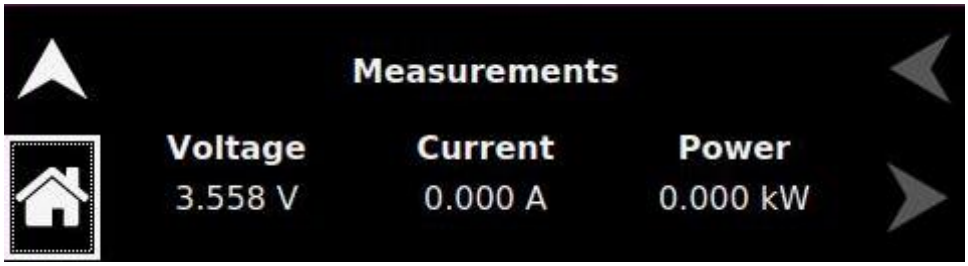


Figure 3-18. Measurements Screen

3.1.6 Ramp Screen

The Ramp Screen provides the functionality to create voltage and current Ramp.
The top-level menu of the Ramp screen is shown in refer to Figure 3-19 .
Refer to Section 3.1.2.1 for navigating to Ramp Screen.

Figure 3-19. Ramp Screen Top Level Menu

The following menus are available in the Ramp top-level menu: Voltage Ramp and Current ramp.

3.1.6.1 VOLTAGE RAMP

The Voltage Ramp menu allows to configure and execute voltage ramp, refer to Figure 3-20. The Voltage Ramp menu allows the selection of parameters such as **Volt**, **To Volt**, **Curr**, **Time** and **Trigger**.

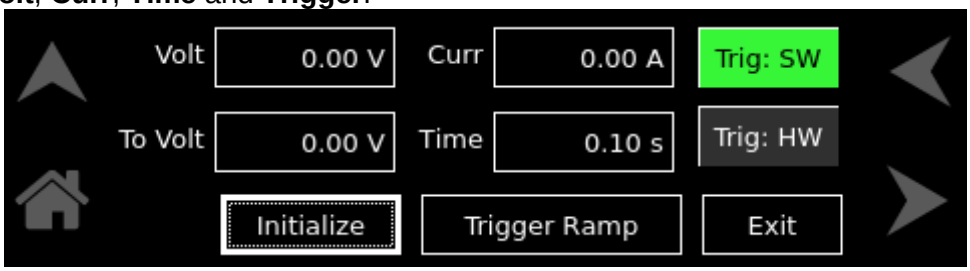


Figure 3-20. Voltage Ramp Screen

The Voltage Ramp menu has the following fields:

Entry	Description
Volt	Sets the start voltage for the ramp
To Volt	Sets the end voltage for the ramp.
Curr	Sets the Current limit for the ramp.
Time	Sets the time in seconds to reach from start volt to end volt.
Trigger	Sets the trigger mode for the ramp.
	In **SW** (Software) trigger mode, the ramp is generated as soon as the Trigger Ramp button is pressed.
	In **HW (Hardware)** trigger mode, the ramp will be generated when an active high pulse of 10ms is applied on the MOLEX connector pin-8 (TRIGGER_IN) and pin-12 (DIN_RTN). Refer to Table 3-2 for PIN details.
Initialize	Initializes the set Ramp parameters**.** Refer to Figure 3-21.
	Press **OK** to return.

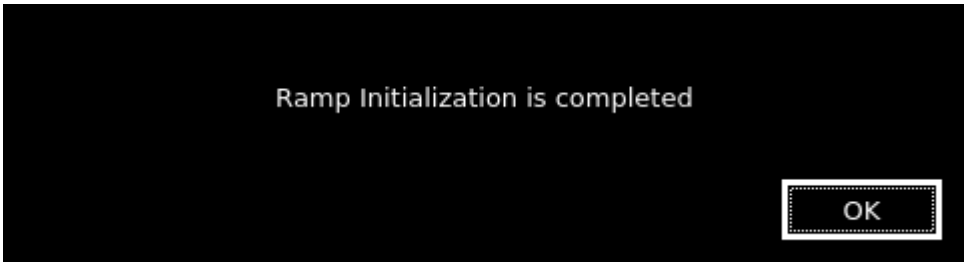


Figure 3-21. Ramp-Screen (Initialization)

Trigger Ramp Generates the ramp in **SW** trigger mode. **Trigger Ramp** button will only be enabled after **Initialize** button is pressed, Refer to Figure 3-22.

Figure 3-22. Voltage Ramp-Screen (SW Trigger)

Waiting for Trig This field is displayed after **Initialize** button is pressed in **HW** trigger Mode, refer to Figure 3-23. This shows that the supply is waiting for an active high pulse of 10ms on the MOLEX connector pin-8 (TRIGGER_IN) and pin-12 (DIN_RTN) to generate the Voltage Ramp. Refer to Table 3-2. Analog Programming Connector, Designations and Functions for PIN details.

Figure 3-23. Voltage Ramp-Screen (HW Trigger)

Abort In **SW** trigger mode, when **Trigger Ramp** button is pressed, **Trigger Ramp** button changes to **Abort** button.

In **HW** trigger mode, when external trigger is received, **Waiting for Trig** will change to **Abort** button**,** refer to Figure 3-24. Pressing the **Abort** button aborts the ramp.

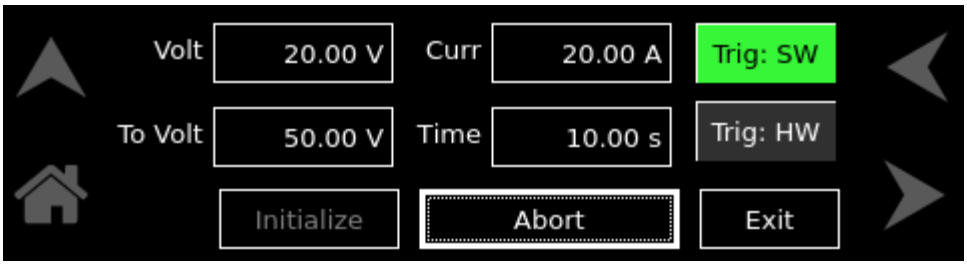


Figure 3-24. Voltage Ramp-Screen (Abort)

Exit Exits the Voltage Ramp sub menu and return to Ramp Screen Top level menu, refer to Figure 3-19.

NOTE: You cannot exit out of Voltage Ramp Screen using HOME and UP arrow, these buttons are disabled for the Voltage Ramp Screen; Refer to Figure 3-20.

Example 1: Creating a Voltage ramp using Software Trigger mode

- Set the **Volt** to 25V
- Set the **To Volt** to 50V
- Set the **Curr** to 20A
- Set the **Time** to 10s
- Select the Trigger mode as **SW** (software)
- Click on **Initialize**
- Click on **Trigger Ramp**
- Observe that **Trigger Ramp** button will change to **Abort** button
- Observe the voltage ramp signal using oscilloscope
- Clicking on the **Abort** button will abort the ramp.
- Clicking on the **Exit** button will exit the Voltage Ramp screen.

Example 2: Creating a Voltage ramp using Hardware Trigger mode

- Set the **Volt** to 25V
- Set the **To Volt** to 50V
- Set the **Curr** to 20A
- Set the **Time** to 10s
- Select the Trigger mode as **HW** (Hardware)
- Click on **Initialize**
- Observe that **Trigger Ramp** button will change to **Waiting for Trig**.
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-8 (TRIGGER_IN) and pin-12 (DIN_RTN) to generate the Voltage Ramp.
- Observe that **Waiting for Trig** will change to **Abort** button.
- Observe the voltage ramp signal using oscilloscope
- Clicking on the **Abort** button will abort the ramp.
- Clicking on the **Exit** button will exit the Voltage Ramp screen.

3.1.6.2 CURRENT RAMP

The Current Ramp menu allows to configure and execute current ramp, refer to Figure 3-25. The Current Ramp menu allows the selection of parameters such as Curr, To Curr, Volt, Time and Trigger.

Figure 3-25. Current Ramp Screen

The Current Ramp menu has the following fields:

Entry	Description
Curr	Sets the start current for the ramp
To Curr	Sets the end current for the ramp.
Volt	Sets the volt limit for the ramp.
Time	Sets the time in seconds to reach from start current to end current.
Trigger	Sets the trigger mode for the ramp. In **SW (Software)** trigger mode, the ramp is generated as soon as the Trigger Ramp button is pressed. In **HW (Hardware)** trigger mode, the ramp will be generated when an active high pulse of 10ms is applied on the MOLEX connector pin-8 (TRIGGER_IN) and pin-12 (DIN_RTN).
Initialize	Initializes the set Ramp parameters**.** Refer to Figure 3-21**.** Press **OK** to return.
Trigger Ramp	Generates the ramp in **SW** trigger mode. This will only be enabled after **Initialize** button is pressed, refer to Figure 3-26.

Figure 3-26. Current Ramp-Screen (SW Trigger)

Waiting for Trig This field is displayed after **Initialize** button is pressed in **HW** trigger Mode, refer to Figure 3-27. This shows that the supply is waiting for an active high pulse of 10ms on the MOLEX connector pin-8 (TRIGGER_IN) and pin-12 (DIN_RTN) to generate the Current Ramp. Refer to Table 3-2. Analog Programming Connector, Designations and Functions for PIN details.

Figure 3-27. Current Ramp-Screen (HW Trigger)

Abort In **SW** trigger mode, when **Trigger Ramp** button is pressed, it changes to **Abort** button.

In **HW** trigger mode, when external trigger is received, **Waiting for Trig** will change to **Abort** button**,** refer to Figure 3-28. Pressing the **Abort** button aborts the ramp.

Figure 3-28. Current Ramp-Screen (Abort)

Exit Exits the Current Ramp sub menu and return to Ramp Screen Top level menu, refer to Figure 3-19.

NOTE: You cannot exit out of Current Ramp Screen using HOME and UP arrow, these buttons are disabled for the Current Ramp Screen; Refer to Figure 3-25.

Example 1: Creating a Current ramp using Software Trigger mode

- Set the **Curr** to 10A
- Set the **To Curr** to 30A
- Set the **Volt** to 25V
- Set the **Time** to 10s
- Connect an appropriate load to the supply
- Select the Trigger mode as **SW** (software)
- Click on **Initialize**
- Click on **Trigger Ramp**
- Observe that **Trigger Ramp** button will change to **Abort** button
- Observe the current ramp signal using oscilloscope
- Clicking on the **Abort** button will abort the ramp.
- Clicking on the **Exit** button will exit the Current Ramp screen.

Example 2: Creating a Current ramp using Hardware Trigger mode

- Set the **Curr** to 10A
- Set the **To Curr** to 30A
- Set the **Volt** to 25V
- Set the **Time** to 10s
- Connect an appropriate load to the supply
- Select the Trigger mode as **HW** (Hardware)
- Click on **Initialize**
- Observe that **Trigger Ramp** button will change to **Waiting for Trig**.
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-8 (TRIGGER_IN) and pin-12 (DIN_RTN) to generate the Current Ramp.
- Observe that **Waiting for Trig** will change to **Abort** button.
- Observe the current ramp signal using oscilloscope
- Clicking on the **Abort** button will abort the ramp.
- Clicking on the **Exit** button will exit the Current Ramp screen.

3.1.7 Configuration Screen

The Configuration power on- settings (PONS), set-up of User V/I Limits, Output Sense, Measurement Settings and Aux Output.

The top-level menu of the Configuration screen is shown in Figure 3-29. Refer to Section 3.1.2.1 for navigating to Configuration Screen.

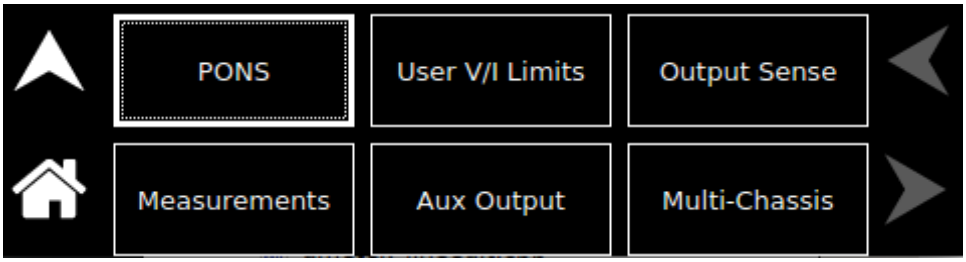


Figure 3-29. Configuration Screen Top-Level Menu

The following menus are available in the Configuration Screen top-level menu:

3.1.7.1 MULTI-CHASSIS

The **Mutli-Chassis** menu allows the user to switch between parallel and series mode. This option will be disabled on single chassis operation, refer to Figure 3-30. This option will be enabled when two or more chassis are connected, refer to Figure 3-31. For multiple chassis connection and operation refer to section 3.9.

Figure 3-30. Multi-Chassis Screen (Single Chassis)

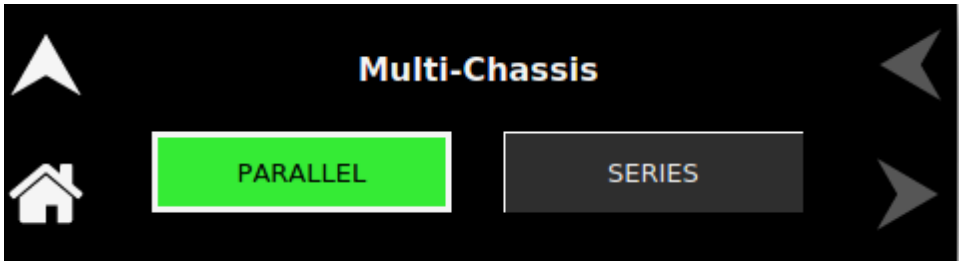


Figure 3-31. Multi-Chassis Screen (Multiple Chassis)

3.1.7.1.1 Parallel/Series Screen

This screen is displayed on the Follower unit when multiple units are connected in parallel or series, refer to Figure 3-32

Figure 3-32. Source in Follower Mode Screen

3.1.7.2 POWER ON SETTINGS (PONS)

The PONS Menu allows user to set the Power-ON values and setup of power supply, refer to Figure 3-33**,** Figure 3-34 and Figure 3-35.

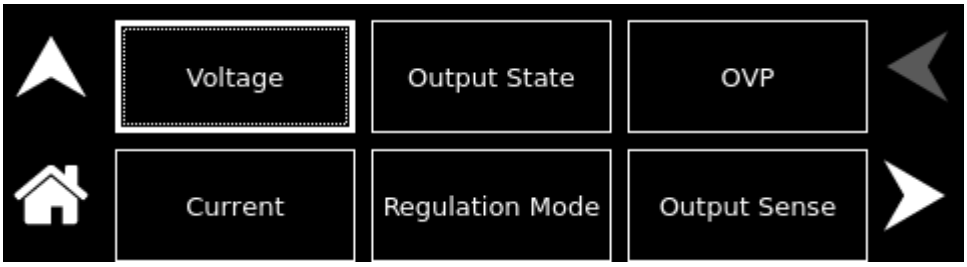


Figure 3-33. Power ON Settings Menu Screen 1

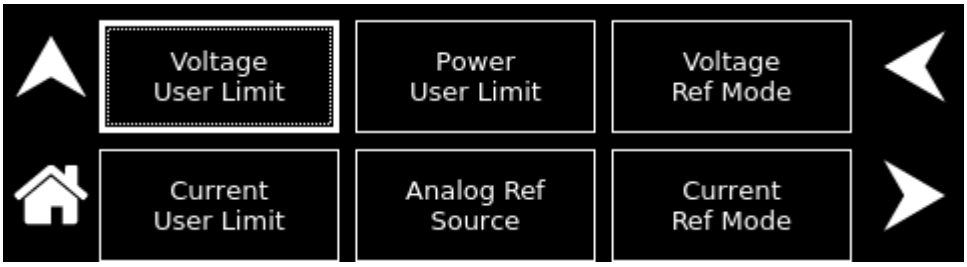


Figure 3-34. Power ON Settings Menu Screen 2

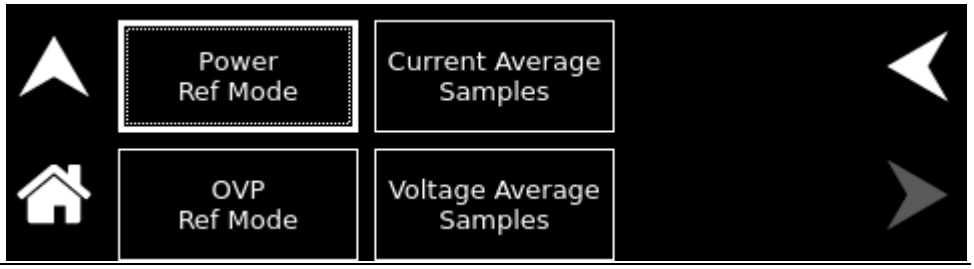


Figure 3-35. Power ON Settings Menu Screen 3

The Power ON Settings menu has the following fields:

Entry	Description
Voltage	Sets the power-on default voltage, refer to Figure 3-36.

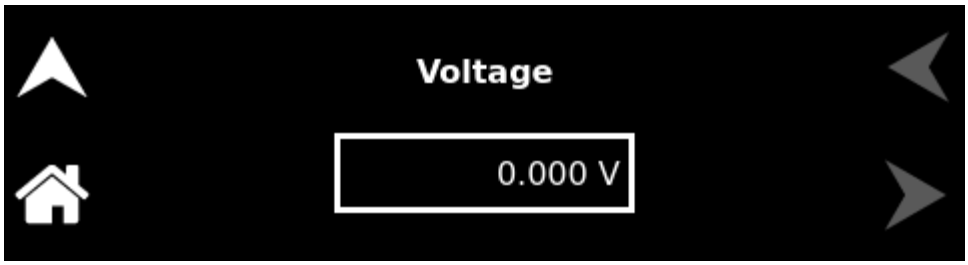


Figure 3-36. Power On Voltage Setting

Current	Sets the power-on default current, refer to Figure 3-37.

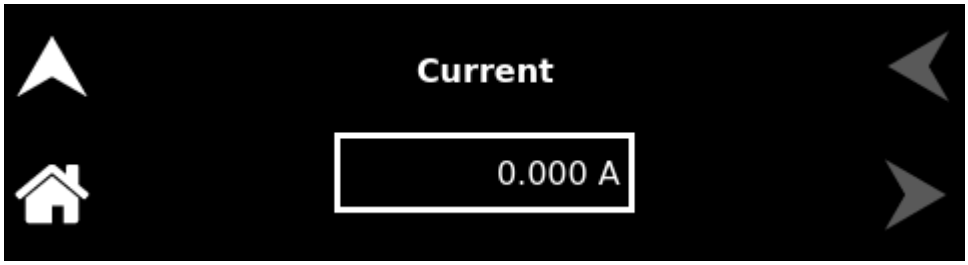


Figure 3-37. Power On Current Setting

Output State	Sets the default output enable condition at power on, refer to Figure 3-38. “ON” enables the output at next power on.

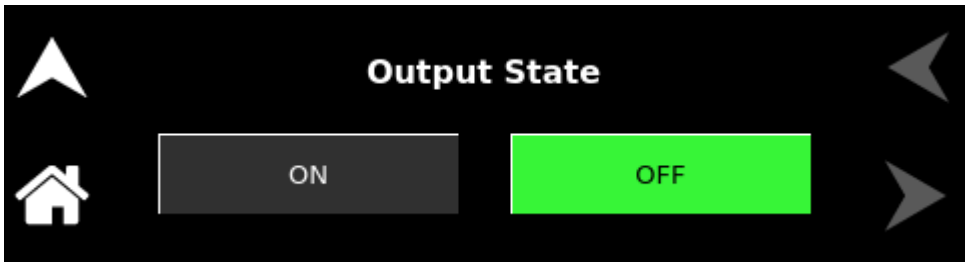


Figure 3-38. Power On Output Setting

Regulation Mode	Sets the power-on default value of the Regulation Mode, refer to Figure 3-39.

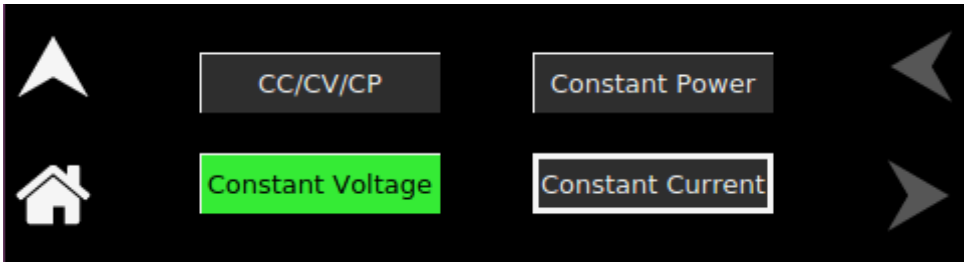


Figure 3-39. Regulation Mode

OVP Sets the power-on default value of the Over Voltage Protection, refer to Figure 3-40.

Figure 3-40. Power On OVP Setting

Output Sense The Output Sense menu allows user to set the output voltage sense of the unit to either Internal or External, refer to Figure 3-53. When External is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS (Remote Voltage Sense) connector.

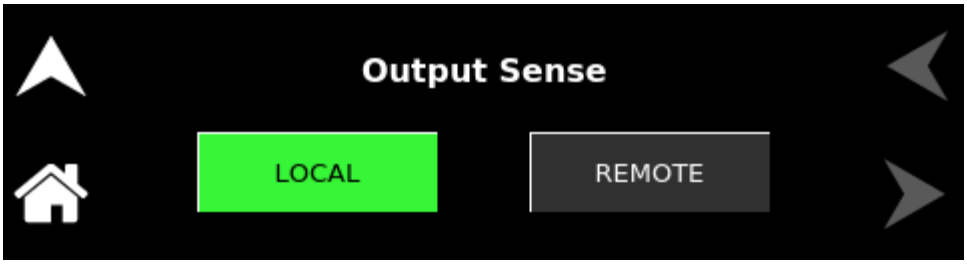


Figure 3-41. Output Sense Setting Screen

Voltage User Limit Sets the power-on default value of the voltage User limit, refer to Figure 3-42.

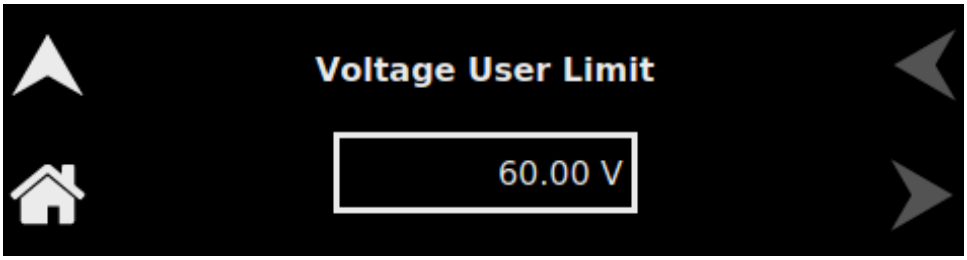


Figure 3-42. Voltage User Limit

Current User Limit Sets the power-on default value of the Current User Limit, refer to Figure 3-43.

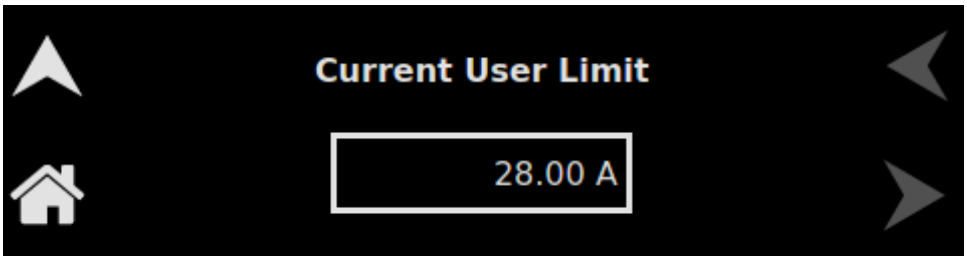


Figure 3-43. Current User Limit

Power User Limit Sets the power-on default value of the Power User Limit, refer to Figure 3-44.

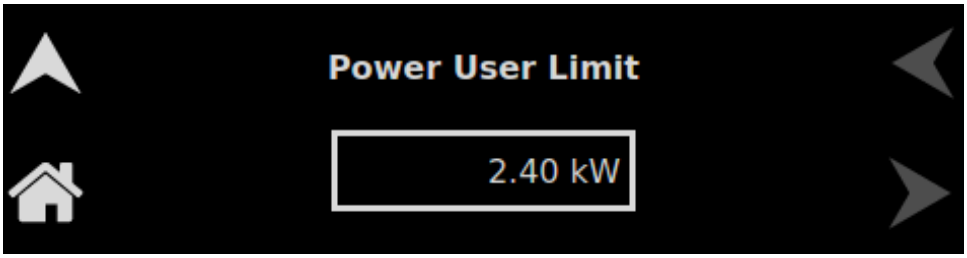


Figure 3-44. Power User Limit

Analog Ref. Source Sets the power-on default value of the Analog Reference Mode, refer to Figure 3-45. NOTE: Resistive and 4-20mA source is not applicable to external OVP programming.

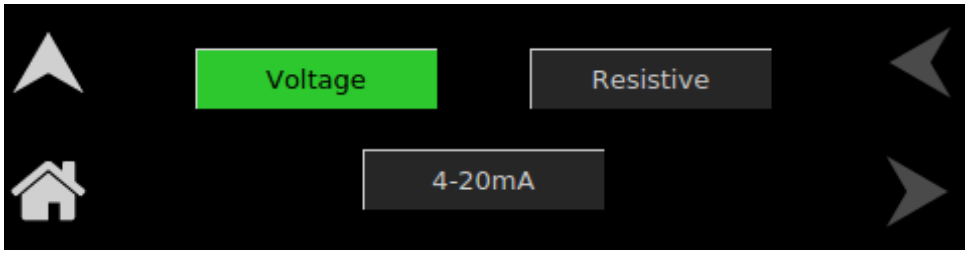


Figure 3-45. Analog Reference Mode

Voltage Ref. Mode Sets the power-on default value of the Voltage Reference Mode, refer to Figure 3-46. When external Ref. Source is selected as Resistive, FSC (Full Scale) unit will change to k Ohms. When external Ref. Source is selected as 4-20mA, FSC will not be applicable.

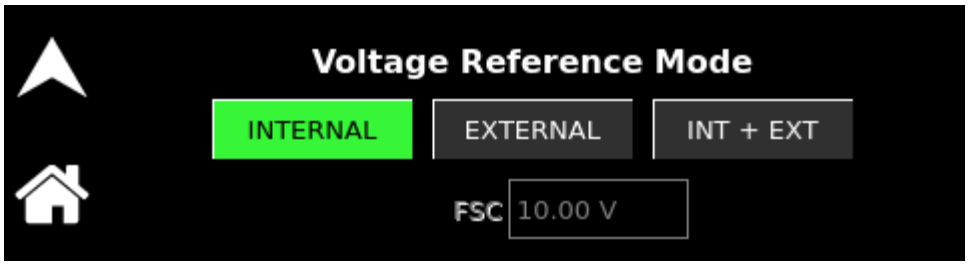


Figure 3-46. Voltage Reference Mode

Curr. Ref. Mode Sets the power-on default value of the Current Reference Mode, refer to Figure 3-47. When external Ref. Source is selected as Resistive, FSC (Full Scale) unit will change to k Ohms. When external Ref. Source is selected as 4-20mA, FSC will not be applicable.

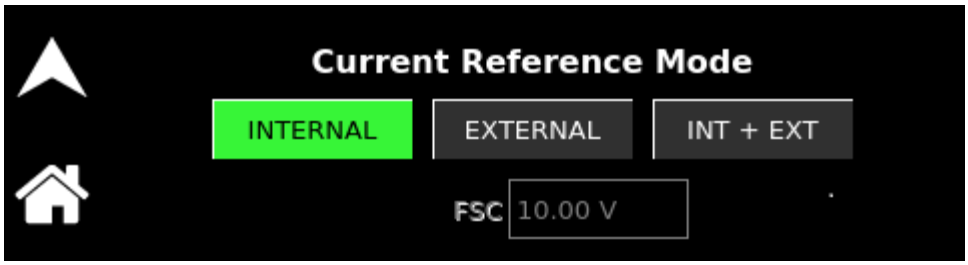


Figure 3-47. Current Reference Mode

Power Ref. Mode Sets the power-on default value of the Power Reference Mode, refer to Figure 3-48. When external Ref. Source is selected as Resistive, FSC (Full Scale) unit will change to k Ohms. When

external Ref. Source is selected as 4-20mA, FSC will not be applicable.

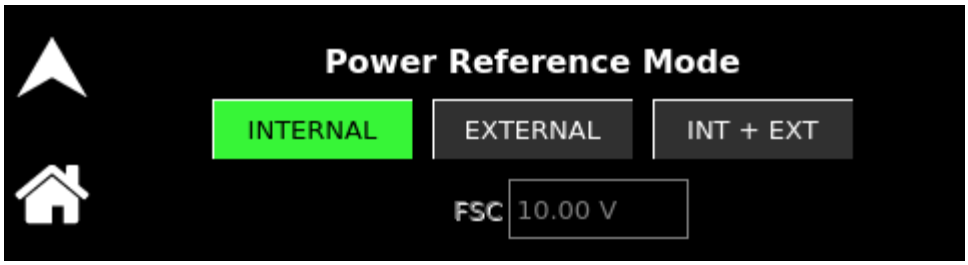


Figure 3-48. Power Reference Mode

OVP Ref. Mode Sets the power-on default value of the Over-voltage Reference Mode, refer to Figure 3-49. NOTE: Resistive and 4-20mA source is not applicable to external OVP programming.

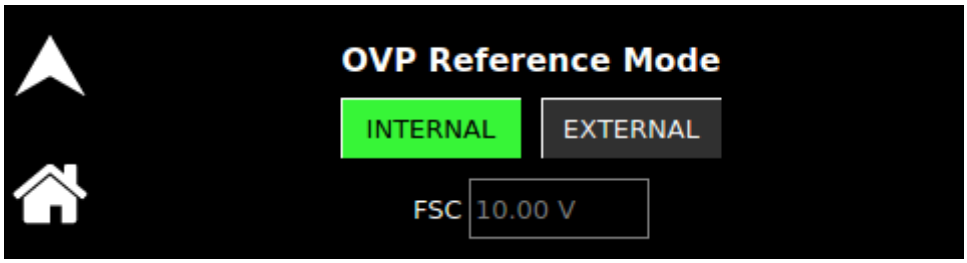


Figure 3-49. OVP Reference Mode

Voltage Average Samples Sets the power-on default value of the voltage average samples, refer to Figure 3-50.

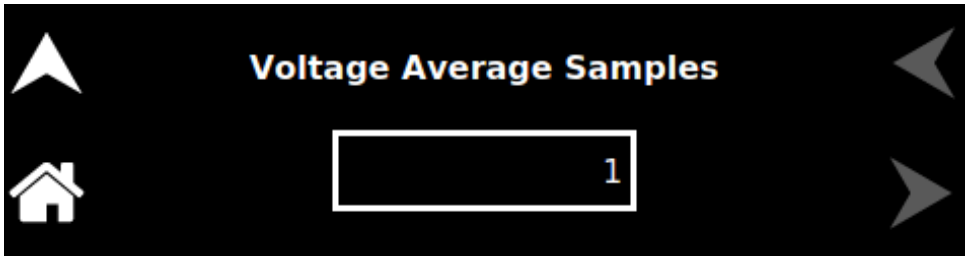


Figure 3-50. Voltage Average Samples

Current Average Samples Sets the power-on default value of the current average samples, refer to Figure 3-51.

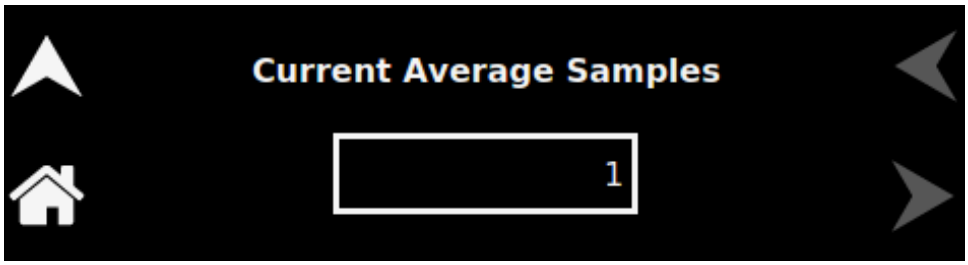


Figure 3-51. Current Average Samples

3.1.7.3 USER V/I LIMITS

The **User V/I Limits** menu allows to set the soft limits for output voltage and current to which the unit could be programmed using the front panel or remote digital interface; default is full scale, refer to Figure 3-52.

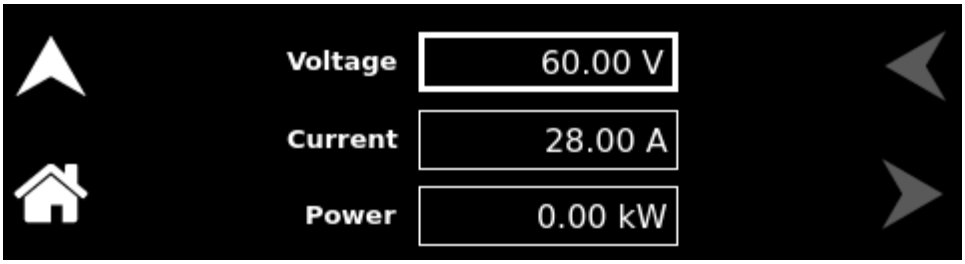


Figure 3-52. User V/I Limits Screen

The user limit prevents the supply from being inadvertently programmed above the user set limit, thus providing a method for protecting the load against damaging voltages, currents, and/or power levels. The User V/I Limits menu has the following fields:

Entry	Description
Voltage	Sets the upper user limit on the programmed output voltage.
Current	Sets the upper user limit on the programmed output current.
Power	Sets the upper user limit on the programmed output power.

3.1.7.4 OUTPUT SENSE

The **Output Sense** menu allows user to set the output voltage sense of the unit to either Internal or External, refer to Figure 3-53. When External is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS (Remote Voltage Sense) connector.

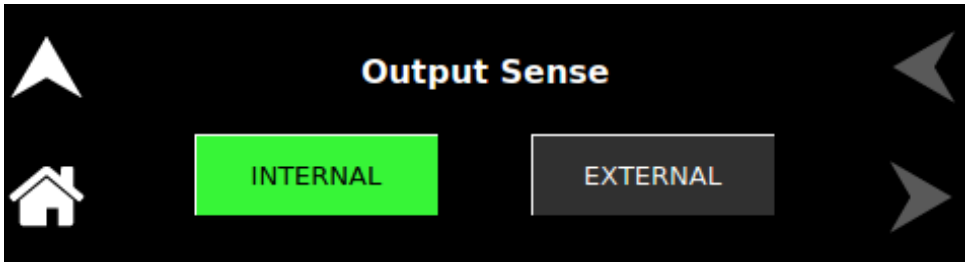


Figure 3-53. Output Sense Setting Screen

3.1.7.5 MEASUREMENTS SETTING

The **Measurement Settings** Menu sets the number of readings to average together to reduce noise in the readback. Refer to Figure 3-54.

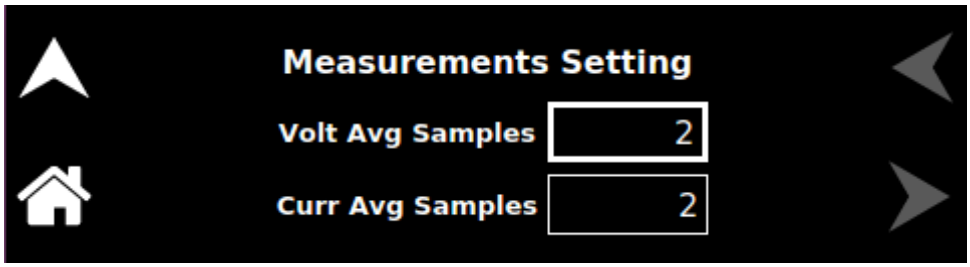


Figure 3-54. Measurement Settings Screen

The Measurement Settings menu has the following fields:

Entry	Description
Volt Avg Samples	Sets the number of voltage readings to average together to reduce noise in the voltage readback. Allows to set a value between 1 to 5. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.
Curr Avg Samples	Sets the number of current readings to average together to reduce noise in the current readback. Allows to set a value between 1 to 9. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

3.1.7.6 AUX OUTPUT

The **Auxiliary Output** Menu sets the 5V and 15V setting to **ON** or **OFF** state, refer to Figure 3-55.

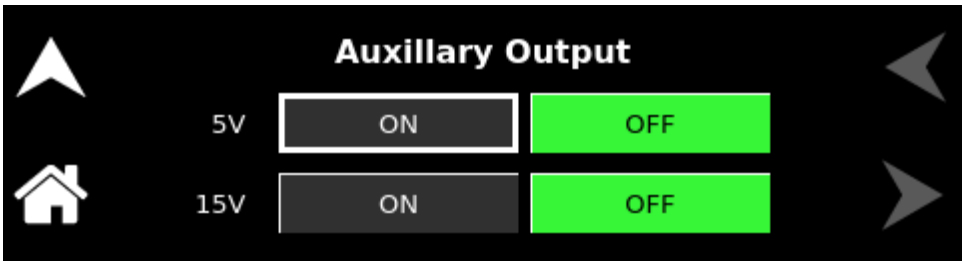


Figure 3-55. Auxiliary Settings Screen

The Auxiliary Settings menu has the following fields:

Entry	Description
5V	Sets the 5V Auxiliary Output to ON or OFF state. 5V will be available on the Analog Programming connector between Pin 43 (source) and Pin 29 (return).
15V	Sets the 15V Auxiliary Output to ON or OFF state. 15V will be available on the Analog Programming connector between Pin 42 (source) and Pin 41 (return). **(15V AUX not available on 1U chassis models when not equipped with optional isolated analog interface.)**

3.1.8 Control Interface Screen

The Control Interface screen provides the ability to configure the power source for remote control through the data communications interfaces. From control Interface screen, user can also configure Analog Programming feature to program the power supply parameters from external sources such as voltage, Resistance and 4-20mA. The top-level menu of the Control Interface screen is shown in Figure 3-56. Refer to Section 3.1.2.1 for navigating to Control Interface Screen.

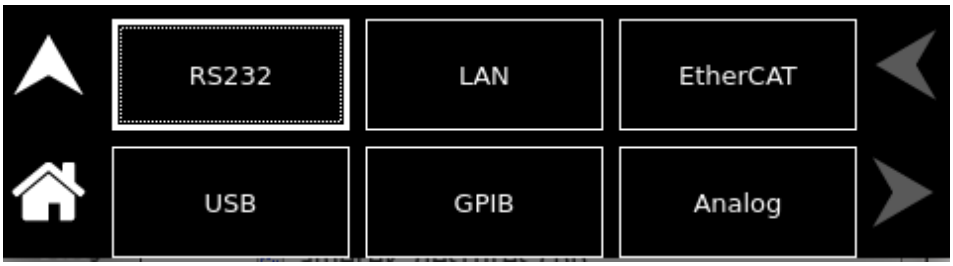


Figure 3-56. Control Interface Screen Top-Level Menu

The following menus are available in the Control Interface Screen top-level menu: RS232, LAN, Analog, USB, GPIB and E-CAT.

3.1.8.1 RS232

Entry	Description
RS232 Settings	Lists the configured Baud Rate, Stop Bits, Bits and Parity for the RS232 digital interface, refer to Figure 3-57 and Figure 3-58.

Figure 3-57. RS232 Home Screen

Figure 3-58. RS232 Setting Screen

RS232 Configure Use to configure the USB baud rate for the RS232 digital interface, refer to Figure 3-59.

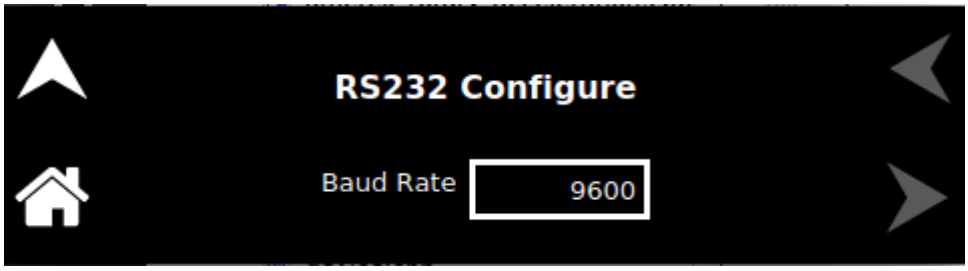


Figure 3-59. RS232 Configure Screen

3.1.8.2 LAN

Entry	Description
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 3-60.

Figure 3-60. LAN Screen

LAN SETTINGS: Lists the configuration settings of the LAN interface. Refer to Figure 3-61.

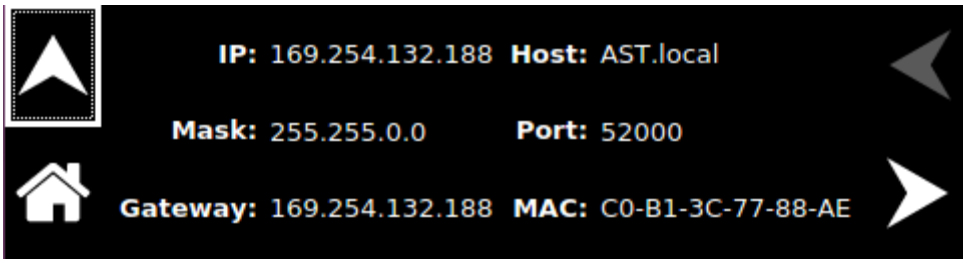


Figure 3-61. LAN Screen (Settings)

LAN CONFIGURE: Sets parameter values and controls operation of the LAN interface; refer to Figure 3-62.

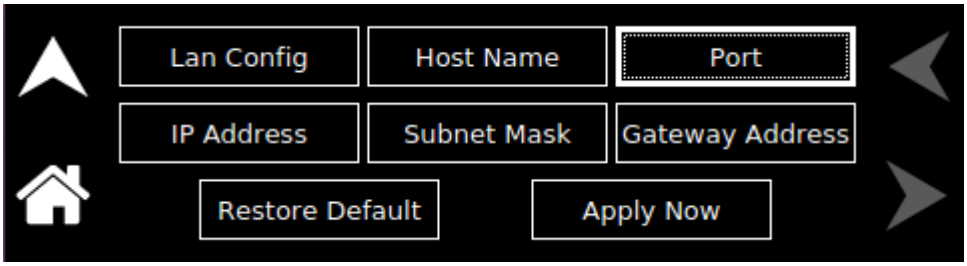


Figure 3-62. LAN Screen (Configure)

DHCP: Selects whether DHCP is enabled or disabled. Refer to Figure 3-63.

NOTE: When DHCP is selected, the IP address is assigned by the network DHCP server. If DHCP server fails to assign an IP address and Auto-IP is enabled, the unit gets an IP address in the range of 169.254.X.X. Where the X.X in the last two octets are randomly generated.

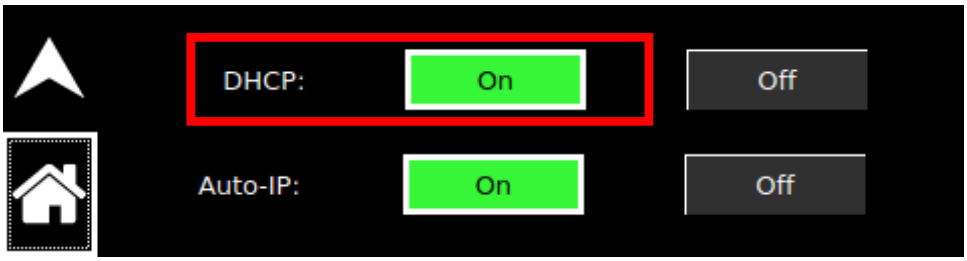


Figure 3-63. LAN Screen (DHCP)

Auto-IP: Enables or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 3-64.

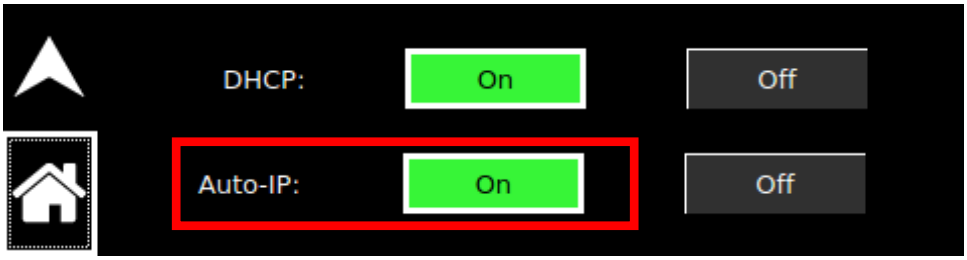


Figure 3-64. LAN Screen (Auto IP)

Host Name: Allows setting a unique alpha-numeric host name. Refer to Figure 3-65**.**

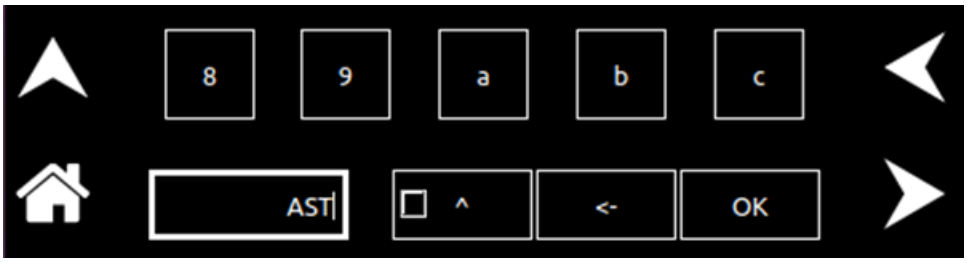


Figure 3-65. LAN Screen (Host Name)

Port: Sets the port number; the factory-default value is 52000. Refer to Figure 3-66**.**

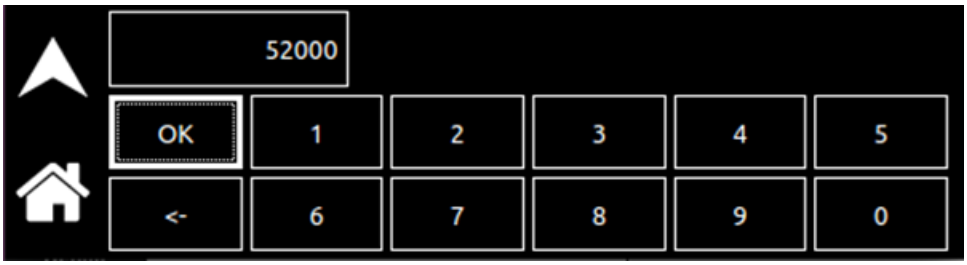


Figure 3-66. LAN Screen (Port)

IP Address: Sets the static IP address for the unit. Refer to Figure 3-67.

Figure 3-67. LAN Screen (IP Address)

Subnet Mask: Sets the subnet mask for use in static IP configuration. Refer to Figure 3-68.

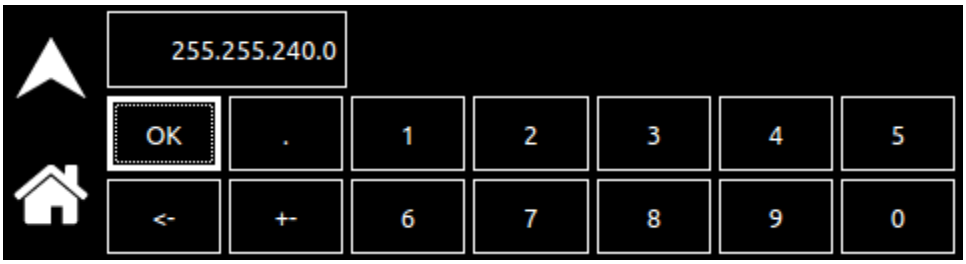


Figure 3-68. LAN Screen (Subnet Mask)

Gateway Address: Sets the gateway address for use in static IP configuration. Refer to Figure 3-69.

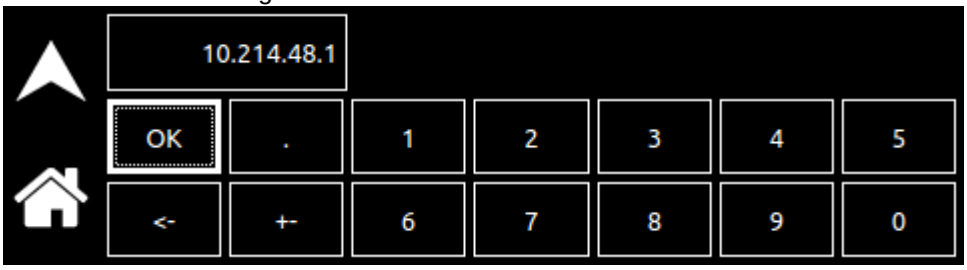


Figure 3-69. LAN Screen (Gateway Address)

NOTE: When DHCP is selected, the gateway address is assigned by the network DHCP server.

Restore Default: When Restore Default is pressed, a confirmation window will pop-up. After user confirmation, LAN settings will be set to factory Default. Refer to Figure 3-70.

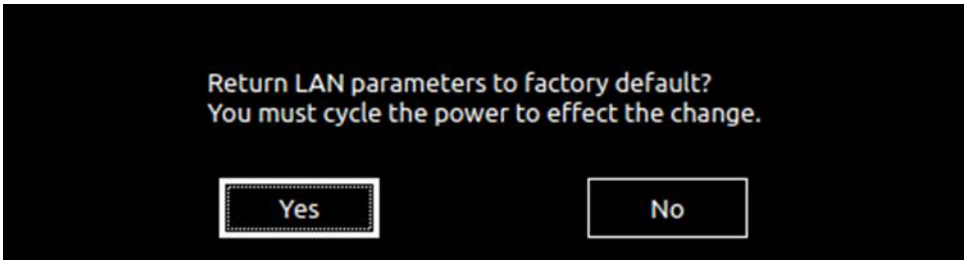


Figure 3-70. LAN Screen (Restore Default)

Apply Now: Applies the LAN settings to the supply. Refer to Figure 3-71.

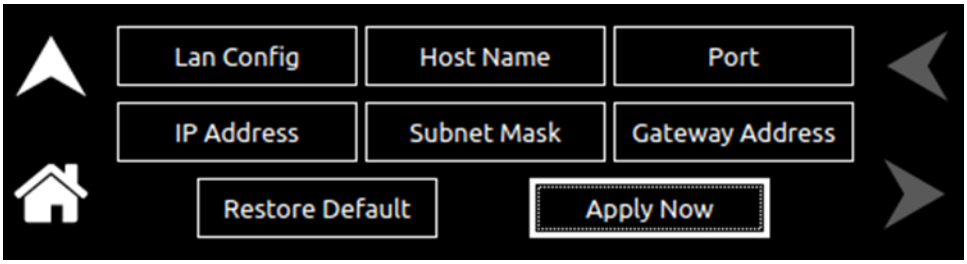


Figure 3-71. LAN Screen (Apply)

3.1.8.3 ETHERCAT

Entry	Description
EtherCAT	ENABLE Enables the EtherCAT communications interface. DISABLE Disables the EtherCAT communications interface.

Refer to Figure 3-72. EtherCAT Interface Enable / Disable

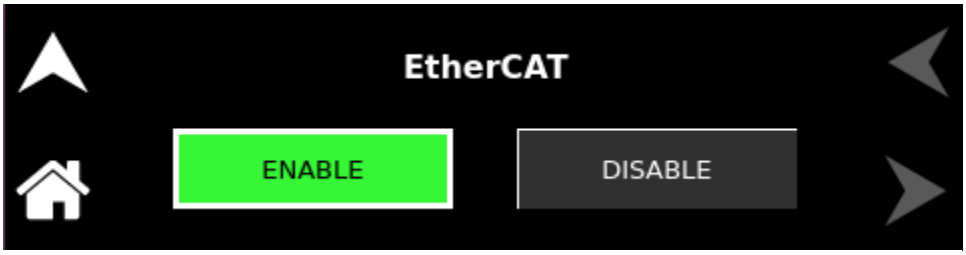


Figure 3-72. EtherCAT Interface Enable / Disable

3.1.8.4 ANALOG

Entry	Description

Analog Configures the Analog programming interface, refer to Figure 3-73.

Figure 3-73. Analog Screen

Analog Mode Settings: Lists the configuration settings of the Analog Programming interface. Refer Figure 3-74 and Figure 3-75.

Figure 3-74. Analog Mode Settings 1

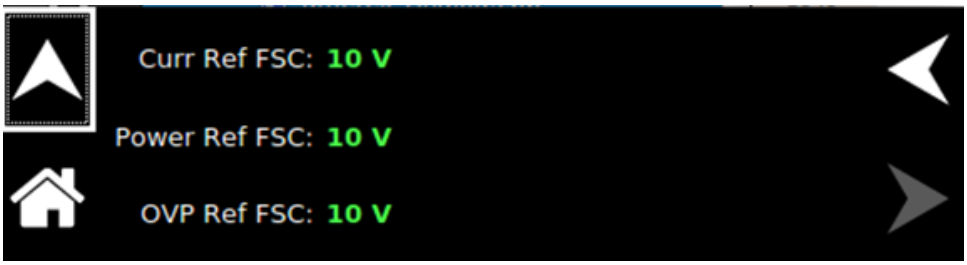


Figure 3-75. Analog Mode Settings Screen 2

Configure Analog mode: Sets parameter values and controls operation of the Analog Programming interface; refer to Figure 3-76**.**

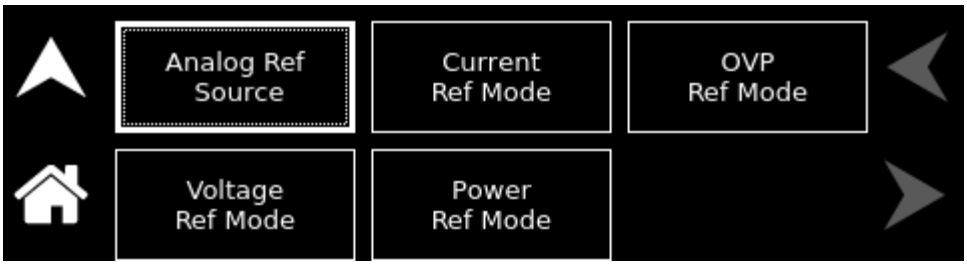


Figure 3-76. Configure Analog Mode Screen

Analog Ref Source: Configures the Analog Programming Reference Source. Refer to Figure 3-77**.**

Figure 3-77. Analog Reference Mode Screen

Voltage Ref Mode: Configures the Voltage Reference Mode, refer to Figure 3-78**.** When Voltage reference mode is selected as External, the Voltage setting field in Dashboard screen will be disabled and Voltage setting field in Dashboard will display equivalent voltage setting from external program source.

NOTE: When Analog Ref. Source is selected as Resistive, FSC (Full Scale) unit will change to k Ohms. When external Ref. Source is selected as 4-20mA, FSC will not be applicable.

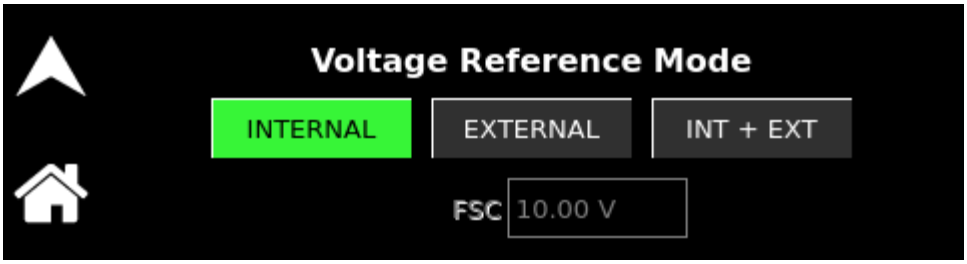


Figure 3-78. Voltage Reference Mode Screen

Current Ref Mode: Configures the Current Reference Mode, refer to Figure 3-79**.** When Current reference mode is selected as External, the Current setting field in Dashboard screen will be disabled and Current setting field in Dashboard will display equivalent current setting from external program source.

NOTE: When Analog Ref. Source is selected as Resistive, FSC (Full Scale) unit will change to k Ohms. When external Ref. Source is selected as 4-20mA, FSC will not be applicable.

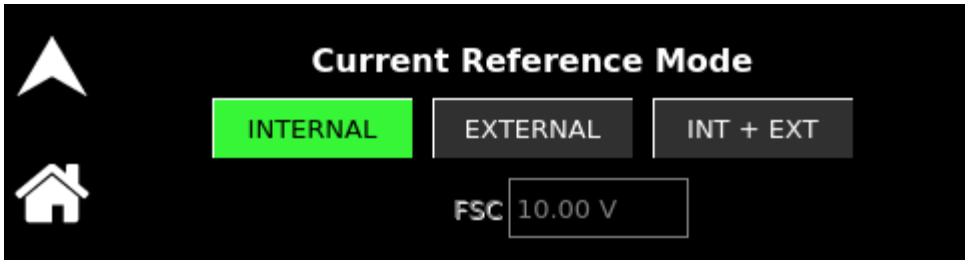


Figure 3-79. Current Reference Mode Screen

Power Ref Mode: Configures the Power Reference Mode, refer to Figure 3-80**.** When Power reference mode is selected as External, the Power setting field in Dashboard screen will be disabled and Power setting field in Dashboard will display equivalent power setting from external program source.

NOTE: When Analog Ref. Source is selected as Resistive, FSC (Full Scale) unit will change to k Ohms. When external Ref. Source is selected as 4-20mA, FSC will not be applicable.

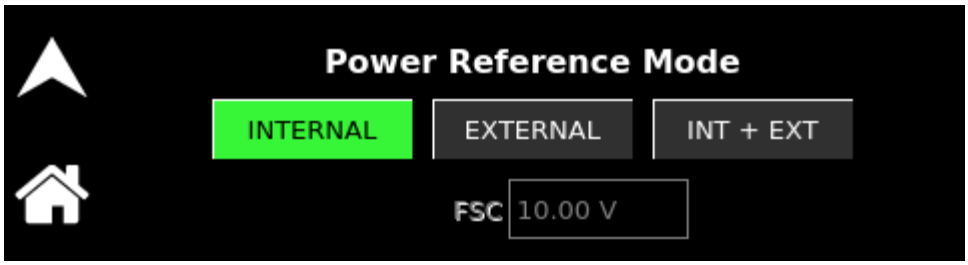


Figure 3-80. Power Reference Mode Screen

OVP Ref Mode: Configures the Over Voltage Protection Reference Mode, refer to Figure 3-81.

NOTE: Resistive and 4-20mA source is not applicable to external OVP programming.

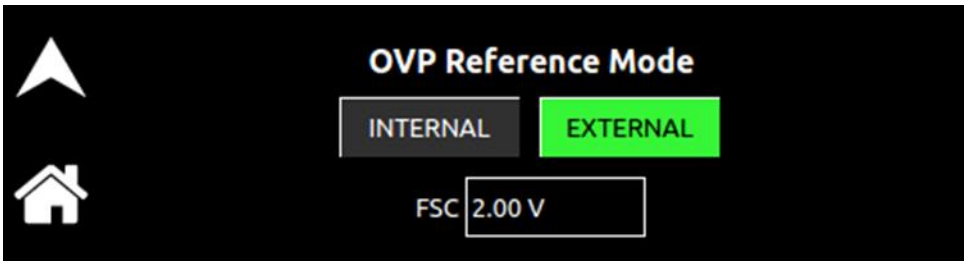


Figure 3-81. OVP Reference Mode Screen

3.1.8.5 GPIB

Entry	Description
GPIB	Sets the IEEE-488 Address; the default is 1. The address could be set from 1 through 30, refer to Figure 3-85. Also allows to turn On/Off the Power ON Service Request. Power On SRQ set to On causes a GPIB service request to be sent to the computer, when the Power Supply is turned on. Factory Default value for Power On SRQ is Off.

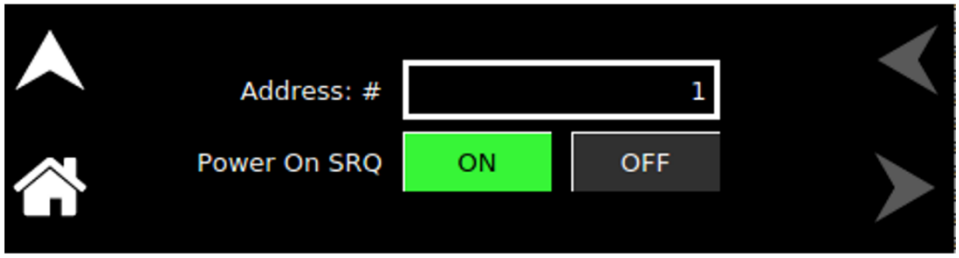


Figure 3-82. GPIB address setting Screen

3.1.8.6 USB

Entry	Description
USB	Lists the configured Baud Rate

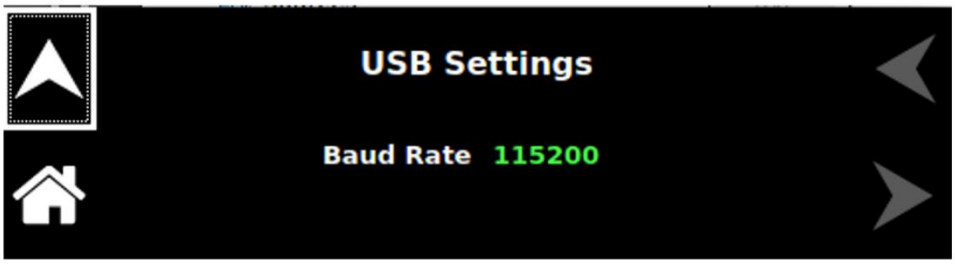


Figure 3-83. GPIB address setting Screen

3.1.9 System Settings Screen

The System Settings screen provides information on Firmware Version, Hardware Limits, LCD Brightness, Default Screen Timeout, Language Selection and allows to Reset the power supply to Factory Default settings and reset Parallel Chassis.

The top-level menu of the System Settings menu is shown in Figure Figure 3-84. Refer to Section 3.1.2.1 for navigating to System Settings Screen.

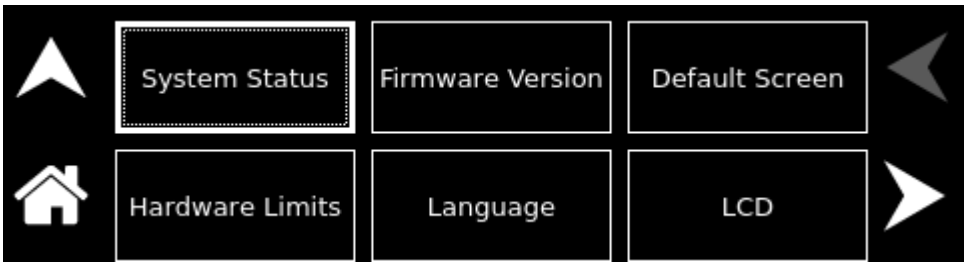


Figure 3-84. System Settings Screen Top-Level Menu 1

Figure 3-85. System Settings Screen Top-Level Menu 2

The following menus are available in the System Settings Screen top-level menu: Firmware Version, Hardware Limits, Language, LCD Brightness, Default Screen and Factory Default.

Entry	Description
System Status	Displays the present status of the power supply, status of input voltage connected to the power supply, and number of chassis. Refer to Figure 3-86.

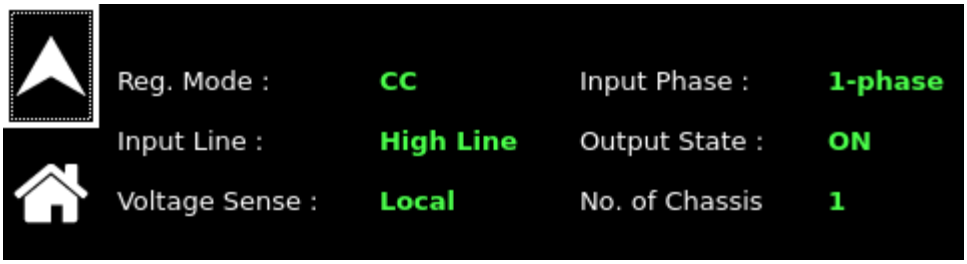


Figure 3-86. System Settings Screen (Status)

Firmware Version

Displays information about the configuration of the power source. It has information such as manufacturer, model number, serial number, firmware version and Last Calibration Date. This information helps identify the unit**.** Refer to Figure 3-87.

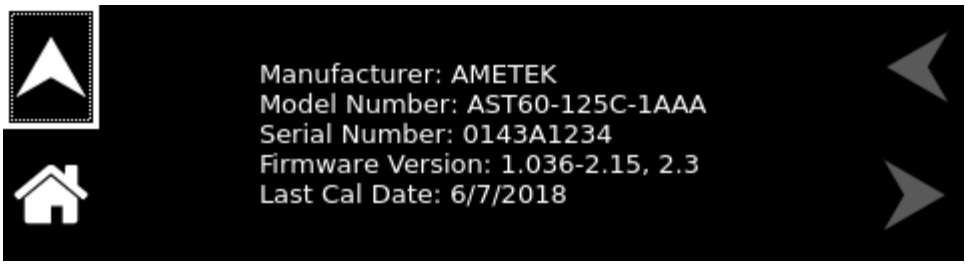


Figure 3-87. System Settings Screen (Version)

Hardware Limits Displays the hardware parameter limit values. Refer to Figure 3-88.

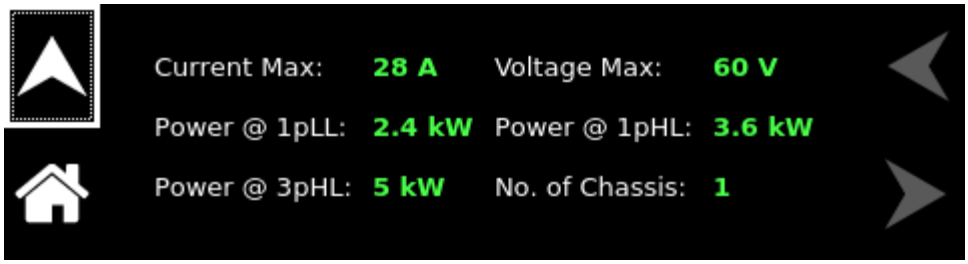


Figure 3-88. System Settings Screen (Hardware Limits)

Language Selects the language of the display menus: German, English, Spanish, French, Russian, Japanese, Chinese, or Korean. Refer to Figure 3-89.

Figure 3-89. System Settings Screen (Language)

LCD Brightness Sets the brightness of the LCD backlight, as a percentage of the maximum that is available; the default setting is 70%. Tapping on the Right or Left arrow buttons or selecting them with the encoder and clicking the encoder switch, will increment/decrement the brightness by 10%, respectively. Refer to Figure 3-90 and Figure 3-91.

LCD Calibration User Can calibrate the touchscreen with this utility for better accuracy of the Touch. Refer to Figure 3-90 and Figure 3-92. Follow the on screen guide to complete the calibration.

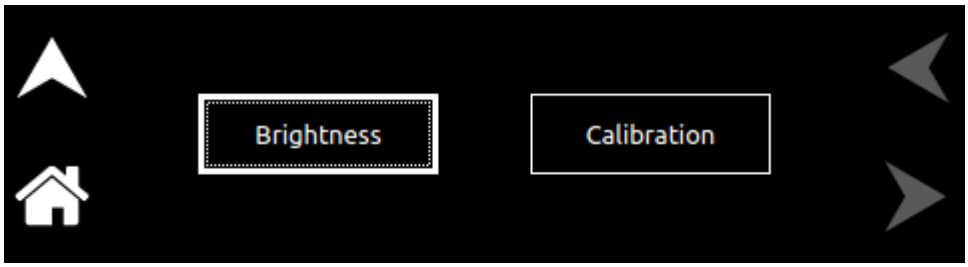


Figure 3-90. System Settings Screen (LCD Settings)

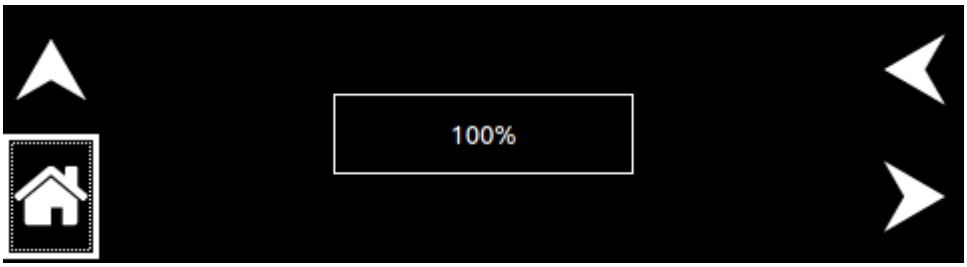


Figure 3-91. System Settings Screen (LCD Settings) Brightness

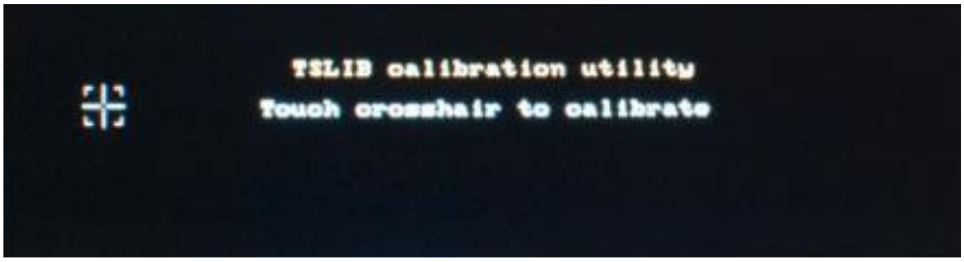


Figure 3-92. System Settings Screen (LCD Settings) Calibration

Default Screen Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 3-93. It allows to set the time out if the default screen is enabled.

Timeout Interval: Selects the time, in seconds, for how long Dashboard screen must be inactive before the Default screen is displayed.

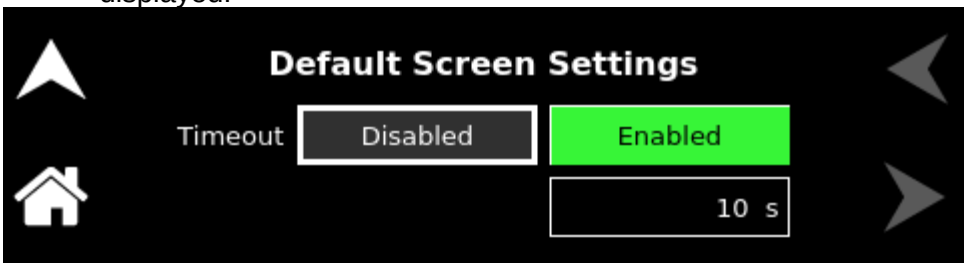


Figure 3-93. System Settings Screen (Default Screen Enabled)

Factory Default Sets the Power supply settings and values to its Default. This also resets the Remote Analog Programming settings to its default status. A confirmation window will pop-up when Factory Default is pressed. The power supply will reset to its default after user confirmation. Refer to Figure 3-94.

NOTE: This will not reset LAN configuration

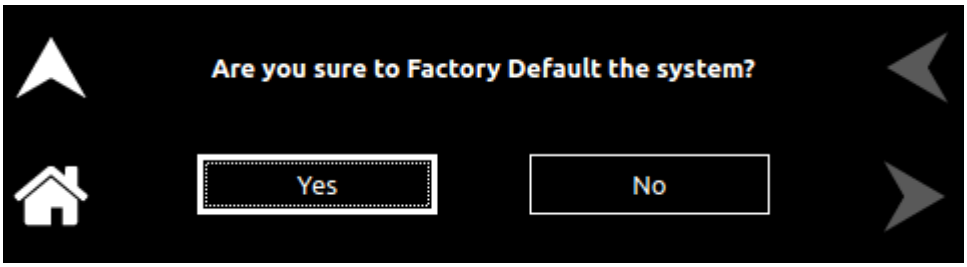


Figure 3-94. System Settings Screen (Factory Default)

Parallel Chassis Reset Resets the Parallel Chassis connection. Refer to Figure 3-95.

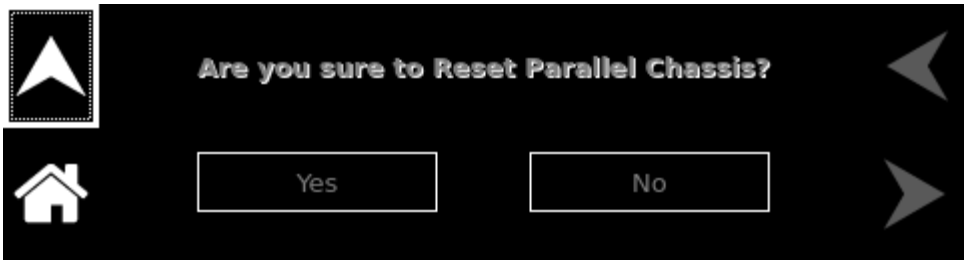


Figure 3-95. System Settings Screen (Parallel Chassis Reset)

3.1.10 Warning/Fault Screen

The following warning/Fault screen may appear during operation Refer to Figure 3-96: Pressing on View Faults will display all the Fault/Warning description with an option to clear the Fault.

These warnings indicate description of Faults which has occurred in a power module, such as an overtemperature, under voltage of AC input, or converter failure etc. These conditions might clear themselves, however, if they continue to occur after pressing the clear Fault, contact the factory for service assistance. Refer to Figure 3-97.

Figure 3-96. Fault Screen

Figure 3-97. OVP Warning Screen

3.1.10.1 OVP FAULT

OVP Fault occurs when the output voltage of the supply exceeds the OVP setting. When this occurs the output is disabled, and voltage and current output go to 0. To clear the display, press Clear Fault button. Refer to Figure 3-97. The display will return to Home Screen Menu, and the output will remain disabled.

Note: It is important to correct the condition that caused the OVP, prior to re-enabling the output.

3.1.11 Local/Remote Screen

This screen is displayed when operation is controlled by computer. Pressing Set Local from Local/Remote screen returns the supply to Local Mode and Home Screen menu is displayed. Refer to Figure 3-98.

Figure 3-98. Local/Remote Screen

3.2 Output Verification

3.2.1 Constant-Voltage Mode Operation

In Constant-Voltage mode operation, the output voltage is regulated at the programmed value while the output current varies with the load requirements. The voltage could be programmed either through the front panel or by the remote analog

voltage programming input. To verify operation in Constant-Voltage mode, follow these steps:

1. Ensure that there is no load connected to the output.
2. Ensure that the remote sense is connected to the output terminals.
3. Connect a digital voltmeter (DVM) across the rear panel positive and negative output terminals, observing the correct polarity. Make sure the DVM is in the DC voltage mode and the range is adequate to handle the full-scale voltage of the power supply.
4. Apply power to the AC mains input and turn on the power supply.
5. If the Power ON Settings (PONS) had previously been configured to be OFF, when the supply reaches the Dashboard Screen, enable the output by pressing the “Output On/Off”.
6. Use the Dashboard Screen to program the Voltage, Current and Power.
7. Program the Current to 10% of rated output by entering the value in the “Setting” section on the Dashboard Screen. Program the current above zero to enable supplying output current while in the constant-voltage mode.
8. On the Dashboard screen, rotate the rotary knob to select the “Voltage” text box in the “Setting” section. Press the rotary knob to highlight the voltage value. Rotate the rotary knob clockwise and observe both the voltage display in the “Measure” section on the Dashboard screen and output of the DVM begin to accelerate up. The output voltage should increase from 0 V to the maximum rated voltage of the supply. The voltage display in the “Measure” section on the Dashboard screen and DVM readings should track within the accuracies of the meter and the Dashboard.
9. Verify the front panel Constant Voltage Mode LED is on.
10. Program the Voltage and Current back to zero.
11. Turn the power supply off.

If Constant-Voltage mode operation did not function as indicated above, verify the setup and perform the check again. If the function continues to fail, contact the factory for assistance.

3.2.2 Constant-Current Mode Operation

In Constant-Current mode operation, the output current is regulated at the selected value while the output voltage varies with the load requirements. The current could be programmed either through the front panel or by the remote analog current

programming input. To verify operation in Constant-Current mode, follow these steps:

1. If the output had been previously energized, allow 5 minutes for the output capacitors to discharge. Connect a high current DC ammeter across the rear panel positive and negative output terminals, observing the correct polarity. Select wire leads of sufficient current carrying capacity and an ammeter range compatible with the units maximum rated output current.

   Note: Verification that the supply could source rated output current, without measuring the current with an ammeter, but using only the front panel meter, could be performed by shorting the output terminals together.

2. Turn on the power supply.
3. If the Power ON Settings (PONS) had previously been configured to be OFF, when the supply reaches the Dashboard Screen, enable the output by pressing the “Output On/Off”.
4. Use the Dashboard Screen to program the Voltage, Current and Power.
5. Program the Voltage to 10% of rated output by entering the in the “Setting” section on the Dashboard Screen. This programs the Voltage above zero to enable supplying output voltage while in the constant-current mode.
6. On the Dashboard screen, rotate the rotary knob to select the “Current” text box in the “Setting” section. Press the rotary knob to highlight the current value. Rotate the rotary knob clockwise and observe both the current display in the “Measure” section on the Dashboard screen and output of the DC ammeter begin to accelerate up. The output current should increase from 0 A to the maximum rated current of the supply. The current display in the “Measure” section on the Dashboard screen and DC ammeter readings should track within the accuracies of the meter and the Dashboard.
7. Verify the front panel Constant Current Mode LED is on.
8. Program the Voltage and Current back to zero.
9. Turn the power supply off.
10. Allow 5 minutes for the output capacitors to discharge and disconnect the ammeter or short from the output terminals.
11. If Constant-Current mode operation did not function as indicated above, verify the setup and perform the check again. If the function continues to fail, contact the factory for assistance.

3.2.3 Overvoltage Protection

The Overvoltage Protection (OVP) function allows the supply to shut down the output, if it were to exceed a preset voltage. This may be used to protect sensitive circuits or loads from damage caused by an excessive voltage on the output of the supply. The Overvoltage Protection (OVP) could be programmed either through the front panel or by the remote analog OVP programming input. To verify OVP operation, follow these steps:

1. Make sure there is nothing connected across the output terminals.
2. Turn on the power supply.
3. If the Power ON Settings (PONS) had previously been configured to be OFF, when the supply reaches the Dashboard Screen, enable the output by pressing the “Output On/Off”.
4. Use the Output Program Screen to program the Voltage, Current and OVP.
5. Program the Current to 10% of rated output (program the current above zero to enable supplying output current while in the constant-voltage mode).
6. The factory default setting is approximately 110% of the maximum rated output of the supply. On the Output Program screen, rotate the rotary knob to set the “OVP”. Press the rotary knob to highlight the OVP value. Rotate the rotary knob anti-clockwise until the OVP is programmed to about 80-90% of the maximum rated output voltage.
7. On the Dashboard screen, rotate the rotary knob to select the “Voltage” text box in the “Setting” section. Press the rotary knob to highlight the voltage value. Rotate the rotary knob clockwise and observe the voltage display in the “Measure” section on the Dashboard screen begin to accelerate up. When the output voltage exceeds the OVP trip point, the OVP warning screen will be displayed saying that the output tripped due to an OVP fault. Refer to Figure 3-80.
8. The Output State will be programmed to **OFF**, and the Voltage, Current, and OVP settings will retain their previous settings.
9. Press “Clear OVP” on OVP Warning screen and the fault screen will clear. The Dashboard screen will be displayed, and the output will remain disabled.
10. Using the Dashboard screen, program the OVP setting as appropriate for the application. If OVP is not used, then “OVP” programming may be set at maximum, approximately 110% of the rated output voltage of the supply.

11. If OVP mode did not function as indicated above, verify the setup and perform the check again. If the function continues to fail, contact the factory for assistance.

3.2.4 Constant-Power Mode

The Constant-Power Mode allows the supply to regulate the output to a constant power setting as opposed to the more common constant voltage or constant current modes of operation. (**Note:** Constant Power mode is intended primarily for loads with response times greater than approximately 10ms). While in this mode, the supply will continually adjust the voltage and current levels to attempt to maintain a constant power to the load. To provide additional protection for the load, voltage, and current limits may be set while in the Constant-Power mode. If the unit cannot regulate to the Constant Power setting due to load conditions, it will regulate either at the voltage or current limit depending on the load demand. Refer to Figure 3-99.

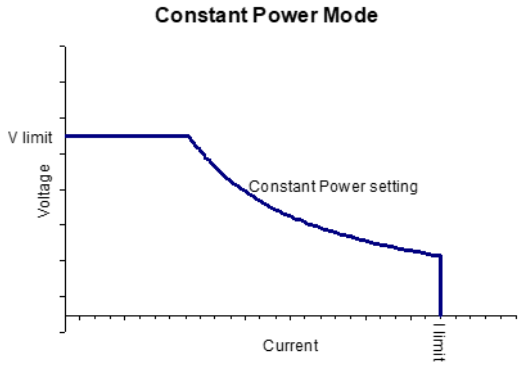


Figure 3-99. Constant-Power Example

3.3 Remote Analog Programming Connector

The Analog Control connector of the Remote Analog Interface on the rear panel allows the unit to be configured for different operating configurations: front panel (local) and remote programming of voltage, current, and OVP, voltage and current monitoring, output enable/disable, etc. Refer to Figure 3-100 for the connector pin-out diagram. The setup and operating requirements of each configuration are provided in Sections 3.4 through 3.8.

The Asterion DC also has the capability of providing summing of remote analog input with the set values on the front panel (or programmed values via the digital interface) for voltage, current and Power. This capability provides a means to modulate a set value with the signal on the voltage, current and Power analog input. If the user only

desires to control the unit with the analog input, all the front panel values (V/I/P) or digital settings should be set to zero.

CAUTION!

If standard, Remote Non-Isolated Analog Interface programming is used, the programming return (J1-6 and J1-24) is at the same potential as the negative output terminal of the power supply (not isolated). Proper connection should be made to signal returns with respect to input programming equipment. Improper connection might result in ground/return loops and, as a result, internal power supply damage might occur; output current could then flow by way of the external connection to the J1 common (J1-6 and J1-24). Refer to Table 3-2.

3.3.1 Remote Analog Isolated Interface Control (Option)

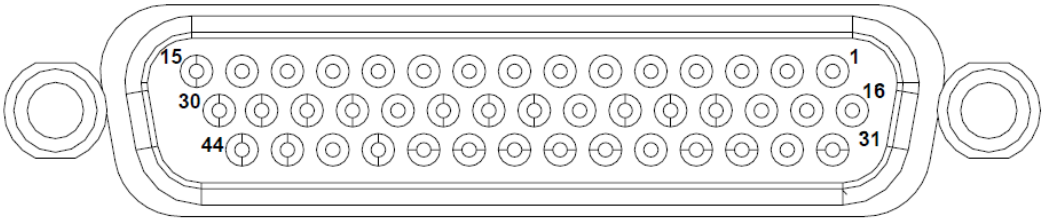
The Remote Isolated Analog Interface control uses the same Analog Control connector (J1) as the standard interface. This option fully isolates remote control signals and allows control of units not connected to a common ground. Control ground is isolated from output power (output negative terminal), which protects against potential damage from systems with high electrical noise or large ground loop currents.

Note: Some standard, Non-Isolated Analog Interface programming signals are not available with this option; see Table 3-2 for details.

CAUTION!

The Remote Isolated Analog Interface option is not intended to allow operation of the power supply at excessive voltages. Operation of Isolated Analog Interface signals should be at SELV safety voltage conditions to chassis ground. Refer to section 0 for maximum terminal voltages.

The standard Non-Isolated Analog programming and external user interface signals are referenced to the negative output terminal and, therefore, is not isolated from the output. **Not Applicable to 2U models. Isolated Interface is standard.**



ANALOG PROGRAMMING

Figure 3-100. Remote Analog Programming Connector Pin-Out

44 Pin Conn AMETEK P/N: 856-044-00

Pin	Reference	Type	Functional Description
1	ON/OFF_HV	ISO HV	Isolated remote-control input for output on/off with an applied AC/DC voltage source. A positive (+) 6-120 VDC or an AC input of 12- 240 VAC will enable (turn-on) the output of the supply. This control input is optically isolated from the output power negative terminal of the power supply (up to 500 VDC). Signal return is Pin 16 (RTN_HV).
2	Not Used	Not Used	Not Used
3	VPRG_ISOUR	ANALOG OUT	Current source of 1 mA for remote voltage programming using a resistance connected to signal return Pin 18: 0-5 kΩ or 0-10kΩ = 0-100% of full-scale output voltage.
4	VPRG_VSOUR/ VPRG_4-20mA_SOUR	ANALOG IN	Remote control input for voltage programming using a voltage source: 0-5 VDC or 0-10 VDC = 0-100% of full-scale output voltage. Do not exceed an input of 12 VDC. Signal return is Pin 18.
5	OVPPRG_VSOUR	ANALOG IN	Remote control input for overvoltage programming using a voltage source: 0-10 VDC = 0-110% of full-scale output voltage. Do not exceed an input of 12 VDC. Signal return is Pin 18.

Pin	Reference	Type	Functional Description
6	VMON	ANALOG OUT	Monitor signal for output voltage: 0-10 VDC = 0-100% of full-scale output voltage. Minimum recommended load resistance is 100 kΩ and maximum load is 20kΩ. Circuit return is pin 22.
7	DIO_IN2	DIGITAL IN	User digital input, function to be assigned by user. Up to 24V capable, .3V max low, 2.7V min high.
8	TRIG_IN	DIGITAL IN	User digital input - function to be assigned by user. Up to 24V capable, .3V max low, 2.7V min high.
9	DIO_IN1	DIGITAL IN	User digital input - function to be assigned by user. Up to 24V capable, .3V max low, 2.7V min high.
10	REV_RY_EN	DIGITAL IN	User digital input - enables high output on pin 38. Up to 24V capable, .3V max low, 2.7V min high.
11	OUT_RY_EN	DIGITAL IN	User digital input -, enables high output on pin 37. Up to 24V capable, .3V max low, 2.7V min high.
12	RTN	DIGITAL GND	Return for Pin 7, 8, 9, 10, 11, 12.
13	ESTOP	DIGITAL IN	Short to Pin 14 to permit operation. Internally tied to 5V through a 2.49k resistor.
14	RTN	DIGITAL GND	Return for Pin 13 (ESTOP).
15	RTN_UPWR	POWER GND	Return for Pin 30 (USER_PWR).
16	RTN_HV	ISO GND	Return for Pin 1 (ON/OFF_HV) and Pin31 (ON/OFF_ISO).
17	Not Used	Not Used	Not Used
18	RTN_PRG	ANALOG GND	Return for Pin 3, 4, 5, 19, 20, 33, 34. This control return is optically isolated from the output power negative terminal of the power supply (up to 600 VDC).
19	IPRG_VSOUR/ IPRG_4-20mA_SOUR	ANALOG IN	Remote control input for current programming using a voltage source: 0-5 VDC or 0-10 VDC = 0-100% of full-scale output current. Do not exceed an input of 12 VDC. Signal return is Pin 18.
20	IPRG_ISOUR	ANALOG OUT	Current source of 1 mA for remote current programming using a resistance connected to signal return Pin 18: 0-5 kΩ or 0-10kΩ = 0-100% of full-scale output current.

Pin	Reference	Type	Functional Description
21	IMON	ANALOG OUT	Monitor signal for output current: 0-10 VDC = 0-100% of full-scale output current. Minimum recommended load resistance is 100 KΩ and maximum load is 20kΩ. Circuit return is pin 22.
22	MON_RTN	ANALOG GND	Return for Pin 6, 21, 35.
23	Not Used	Not Used	Not Used
24	TRIG_OUT	DIGITAL OUT	User digital output - cause to be assigned by user. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
25	DIO_OUT1	DIGITAL OUT	Output low for CV and high for CC. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
26	FAULT_OUT	DIGITAL OUT	High state indicates fault. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
27	DIO_OUT2	POWER OUT	Output low for CV or CC and high for CP. Output high state either min 4.5V or voltage on Pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
28	RTN_UPWR	POWER GND	Return for Pin 24, 25, 26, 27.
29	RTN_AUX5	POWER GND	Return for Pin 43 (5V_AUX).
30	USER_POWER	POWER IN	Optional- User can connect between 5V to 24V to control digital output/relay output voltage. If left unconnected, digital and relay outputs have 4.5V high states.
31	ON/OFF_ISO	DIGITAL IN	Isolated remote-control input for output on/off with a logic signal: a logic-high, 3.3V to 24V signal will enable (turn-on) the output of the supply, and a logic-low signal disables (turns off) the output. This control input is optically isolated from the output power negative terminal of the power supply (up to 500 VDC). Signal return is Pin 16 (RTN_HV).
32	Not Used	Not Used	Not Used

Pin	Reference	Type	Functional Description
33	PPRG_VSOUR/ PPRG_4-20mA_SOUR	ANALOG IN	Remote control input for power programming using a voltage source: 0-5 VDC or 0-10 VDC = 0-100% of full-scale output power. Do not exceed an input of 12 VDC. Signal return is Pin 18. Note: Available only for isolated analog models
34	PPROG_ISOUR	ANALOG OUT	Current source of 1 mA for remote power programming using a resistance connected to signal return Pin 18: 0-5 kΩ or 0-10kΩ = 0-100% of full-scale output power.
35	PMON	ANALOG OUT	Monitor signal for output power: 0-10 VDC = 0-100% of full-scale output power. Minimum recommended load resistance is 100 kΩ and maximum load is 20kΩ. Circuit return is pin 22.
36	RTN_UPWR	OUTPUT GND	Return for Pin 37, 38.
37	OUT_RY_ON	POWER OUT	User digital output, cause to be assigned by user or state of pin 11. Output high state either min 5V or voltage on pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
38	REV_RY_ON	POWER OUT	User digital output, cause to be assigned by user or state of pin 10. Output high state either min 5V or voltage on pin 30 (USER_PWR) minus 1V, whichever is higher. Maximum current of 0.5A.
39	AUX5_EN	DIGITAL IN	Apply a high to enable output on pin 43 (5V_AUX). Up to 24V capable, 0.3V max low, 2.7V min high.
40	RTN	DIGITAL GND	Return for Pin 39, 44.
41	RTN_AUX15	POWER GND	Return for Pin 42.
42	15V_AUX	POWER OUT	15V for use by the user, 1A max current.
43	5V_AUX	POWER OUT	5V for use by the user, 1A max current.
44	AUX15_EN	DIGITAL IN	Apply a high to enable output on pin 42 (15V_AUX). Up to 24V capable, 0.3V max low, 2.7V min high.

Table 3-2. Analog Programming Connector, Designations and Functions

3.4 Remote Current Programming

Remote current programming can be summed with the front panel or digital setting; see Section 3.3. Remote current programming is used for applications that require the output current be programmed (controlled) from a remote instrument. An external resistance or external voltage source or external 4-20mA source may be used as a programming device. When using remote current programming, a shielded, twisted-pair cable is recommended to prevent noise interference to programming signals.

3.4.1 Remote Current Programming by Resistance

Analog Reference source is selected as Resistance from the front Panel. Refer to Figure 3-101. The resistance-programming default coefficient for output current is (100% rated output current) / 5 kΩ, with input at Pin 20 (IPRG_ISOUR) and return to Pin 18 (RTN_PRG). An internal current source, factory-set at 1 mA, from Pin 20 is utilized to drive the resistance. This produces a transfer function for output current, as follows:

I_{out} = R * (100% rated output current) / 5 kΩ), with R in kΩ

Full Scale current programming resistance can be modified from default 5kΩ to any other value, from 2 kΩ to 10 kΩ. Refer to Section 3.1.8.4. Then the transfer function for output current, as follows:

I_{out} = R * (100% rated output current) / FSC kΩ), with R in kΩ.

If multiple switches or relays are used to select resistors to program different current levels, make-before-break contacts are recommended since an open circuit (or resistance greater than what you have selected as the maximum resistance value (2k to 10k ohms) 10k ohms) will set the output to the full current your model can produce.

An open circuit between remote programming pins while in remote programming mode will output the full current value that your model is rated to produce. A short must be placed between these pins will set an output a value of zero.

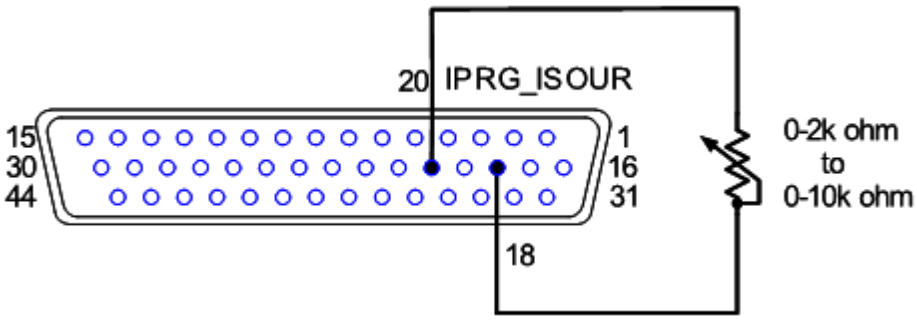


Figure 3-101. Remote Current Programming Using Resistance

3.4.2 Remote Current Programming by Voltage Source

The DC voltage source is connected between Pin 19 (IPRG_VSOUR) and the return Pin 18 (RTN_PRG) and Analog Reference source is selected as Voltage from the front Panel. Refer to Figure 3-102.

The Full-Scale voltage value can be modified to any voltage between 2V to 10V from front panel screen, refer to Section 3.1.8.4. Default FSC voltage value is 10V, where 10V corresponds to 100% output current. The corresponding voltage-programming coefficients for output current are (100% rated output current) / FSC VDC. This produces transfer functions for output current, as follows:

I_{out} = Vdc * (100% rated output current) / 10 VDC), with Vdc in volts, or

I_{out} = Vdc * (100% rated output current) / FSC VDC), with Vdc in volts.

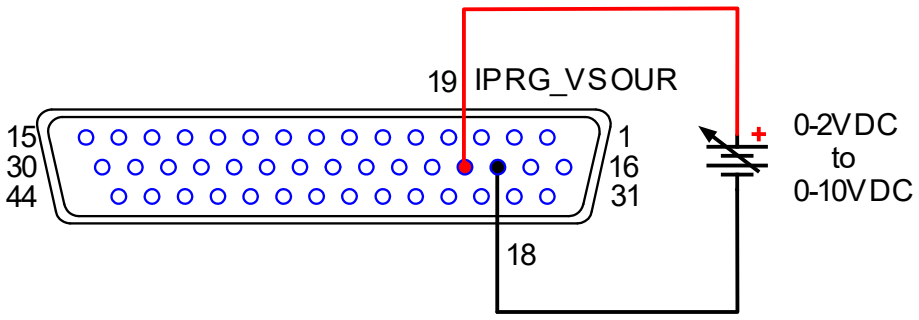


Figure 3-102. Remote Current Programming Using 0-2 to 0-10 VDC Source

3.4.3 Remote Current Programming by 4-20mA Source

A 4-20mA current source is connected between Pin 19 (IPRG_VSOUR) and the return Pin 18 (RTN_PRG) and select the Analog Reference Source as 4-20mA in front panel. Refer to Figure 3-103.

The transfer function for the output current will be as follows:

$$I_{out} = (I_{4\text{-}20}mA - 4)\ (100\%\ rated\ output\ current) / 16, \text{ with } I_{4\text{-}20}mA \text{ in mA}$$

Which produces 0A output current at 4mA and 100% rated output current at 20mA.

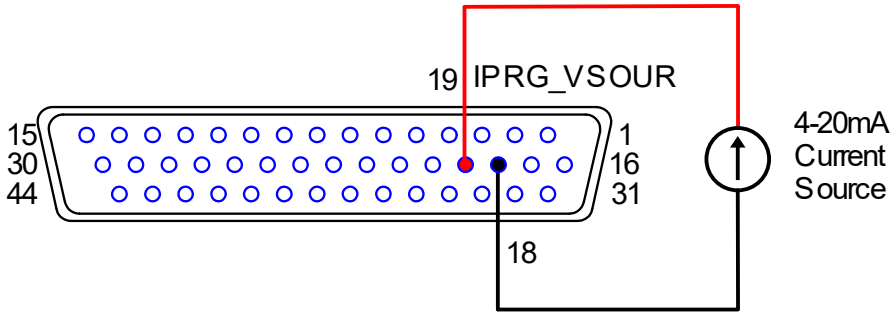


Figure 3-103. Remote Current Programming Using 4-20mA Source

3.5 Remote Voltage Programming

Remote voltage programming is summed with the front panel or digital setting; see Section 3.3. Remote voltage programming configuration is used for applications that require the output voltage be programmed (controlled) from a remote instrument. An external resistance or external voltage source or 4-20mA source may be used as a programming device. When using remote voltage programming, a shielded, twisted-pair cable is recommended to prevent noise interference to programming signals.

3.5.1 Remote Voltage Programming by Resistance

Analog Reference source is selected as Resistance from the front Panel. Refer to Figure 3-104. The resistance-programming default coefficient for output voltage is (100% rated output voltage) / 5 kΩ, with input at Pin 3 (VPRG_ISOUR) and return to Pin 18 (RTN_PRG). An internal current source, factory-set at 1 mA, from Pin 20 is utilized to drive the resistance. This produces a transfer function for output voltage, as follows:

$$V_{out} = R * (100\%\ rated\ output\ voltage) / 5\ k\Omega), \text{ with R in } k\Omega.$$

Full Scale voltage programming resistance can be modified from default 5kΩ to any other value, from 2 kΩ to 10 kΩ, refer to Section 3.1.8.4. Then the transfer function for output voltage, as follows:

V_{out} = R * (100% rated output voltage) / FSC kΩ), with R in kΩ.

An open circuit between remote programming pins while in remote programming mode will output the full rated unit value. A short must be placed between remote programming pins to output a value of zero.

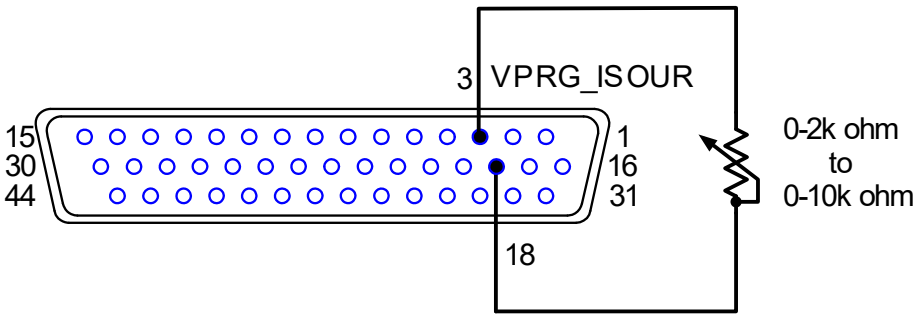


Figure 3-104. Remote Voltage Programming Using Resistance

3.5.2 Remote Voltage Programming by Voltage Source

The DC voltage source is connected between Pin 4 (VPRG_VSOUR) and the return Pin 18 (RTN_PRG) and Analog Reference source is selected as Voltage from the front Panel. Refer to Figure 3-105.

The Full-Scale voltage value can be modified to any voltage between 2V to 10V from front panel screen, refer to Section 3.1.8.4. Default FSC voltage value is 10V, where 10V corresponds to 100% output voltage. The corresponding voltage-programming coefficients for output voltage are (100% rated output voltage) / FSC VDC. This produces transfer functions for output voltage, as follows:

V_{out} = Vdc * (100% rated output voltage) / 10 VDC), with Vdc in volts, or

V_{out} = Vdc * (100% rated output voltage) / FSC VDC), with Vdc in volts.

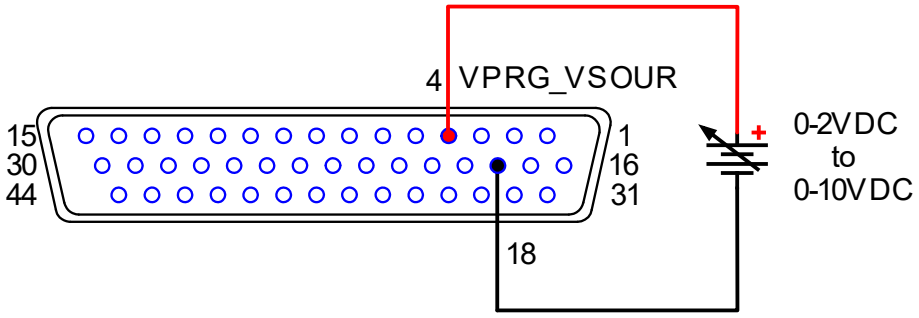


Figure 3-105. Remote Voltage Programming Using 0-10 VDC Source

3.5.3 Remote Voltage Programming by 4-20mA Source

A 4-20mA current source is connected between Pin 4 (VPRG_VSOUR) and the return Pin 18 (RTN_PRG) and select the Analog Reference Source as 4-20mA in front panel. Refer to Figure 3-106.
The transfer function for the output voltage will be as follows:

$V_{out} = (I_{4\text{-}20}mA - 4)$ (100% rated output voltage) / 16, with $I_{4\text{-}20}mA$ in mA

Which produces 0V output voltage at 4mA and 100% rated output voltage at 20mA.

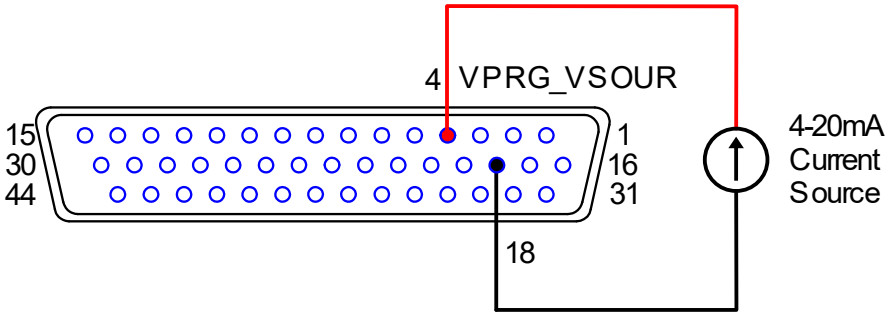


Figure 3-106. Remote Voltage Programming Using 4-20mA Source

3.6 Remote Power Programming

Remote power programming is summed with the front panel or digital setting; see Section 3.3. Remote power programming configuration is used for applications that require the output voltage be programmed (controlled) from a remote instrument. An external resistance or external voltage source or 4-20mA source may be used as a programming device. When using remote voltage programming, a shielded, twisted-pair cable is recommended to prevent noise interference to programming signals.

3.6.1 Remote Power Programming by Resistance

Analog Reference source is selected as Resistance from the front Panel. Refer to Figure 3-107. The resistance-programming default coefficient for output power is (100% rated output power) / 5 kΩ, with input at Pin 34 (PPRG_ISOUR) and return to Pin 18 (RTN_PRG). An internal current source, factory-set at 1 mA, from Pin 20 is utilized to drive the resistance. This produces a transfer function for output power, as follows:

P_{out} = R * (100% rated output power) / 5 kΩ), with R in kΩ.

Full Scale power programming resistance can be modified from default 5kΩ to any other value, from 2 kΩ to 10 kΩ. Refer to Section 3.1.8.4. Then the transfer function for output power, as follows:

P_{out} = R * (100% rated output power) / FSC kΩ), with R in kΩ.

An open circuit between remote programming pins while in remote programming mode will output the full rated unit value. A short must be placed between remote programming pins to output a value of zero.

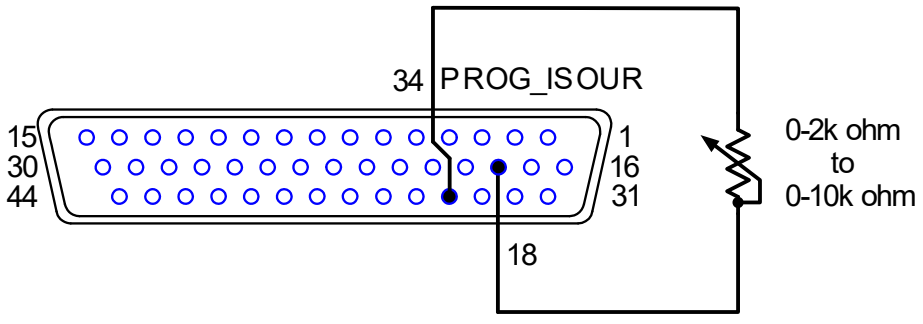


Figure 3-107. Remote Power Programming Using Resistance

3.6.2 Remote Power Programming by Voltage Source

The DC voltage source is connected between Pin 33 (PPRG_VSOUR) and the return Pin 18 (RTN_PRG) and Analog Reference source is selected as Voltage from the front Panel. Refer to Figure 3-108.

The Full-Scale voltage value can be modified to any voltage between 2V to 10V from front panel screen. Refer to Section 3.1.8.4. Default FSC voltage value is 10V, where 10V corresponds to 100% output power. The corresponding voltage-programming coefficients for output power are (100% rated output power) / FSC VDC. This produces transfer functions for output power, as follows:

P_{out} = Vdc * (100% rated output power) / 10 VDC), with Vdc in volts, or

P_{out} = Vdc * (100% rated output power) / FSC VDC), with Vdc in volts.

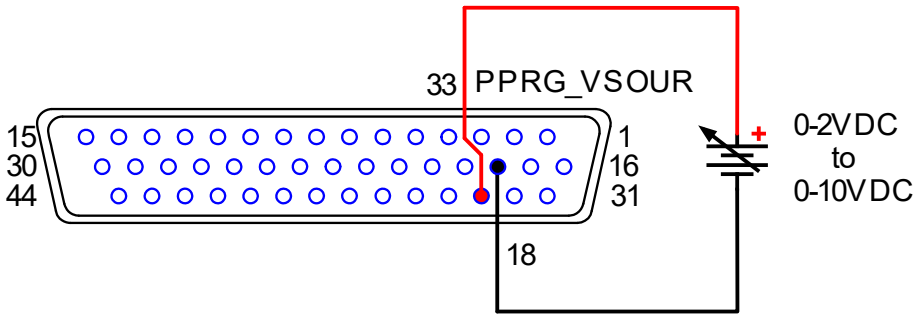


Figure 3-108. Remote Power Programming Using 0-10 VDC Source

3.6.3 Remote Power Programming by 4-20mA Source

A 4-20mA current source is connected between Pin 33 (PPRG_VSOUR) and the return Pin 18 (RTN_PRG) and select the Analog Reference Source as 4-20mA in front panel. Refer to Figure 3-109.
The transfer function for the output power will be as follows:

P_{out} = ($I_{4\text{-}20mA}$ – 4) (100% rated output power) / 16, with $I_{4\text{-}20mA}$ in mA

Which sets 0W output power at 4mA and 100% rated power at 20mA.

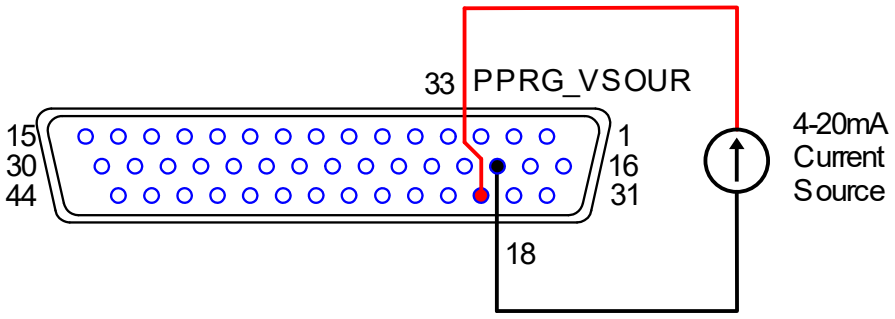


Figure 3-109. Remote Power Programming Using 4-20mA Source

3.7 Remote Overvoltage Programming

A remote DC voltage source can be connected externally between Pins 5 (OVPRG_VSOUR) and Pin 18 (RTN_PRG) to set the output overvoltage trip level. A 0-10 VDC signal equals 0-110% of rated output voltage. See Figure 3-110 for connection requirements. This full-scale programming voltage source range can be set to any value between 2V to 10VDC from front panel. Refer to Section 3.1.8.4.

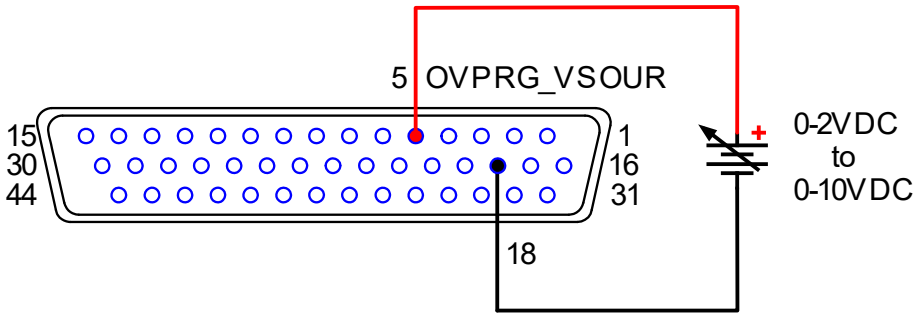


Figure 3-110. Remote Overvoltage Programming Using DC Voltage Source

3.8 Remote Output On/Off Control

Remote output on/off control may be accomplished by contact closure, or through an opto-isolated interface with external voltage sources, AC/DC or TTL/CMOS.

3.8.1 Remote Output ON/OFF by Contact Closure

Application of a contact closure between Pins 13 and Pin 14 will enable the output (if Output Enable is set from front panel or the SCPI Command for the output is set to ON). **Setting the Output ON/OFF input to OFF latches the output in the protection shutdown state; this state can only be cleared by the remote digital interface SCPI command, OUTPut:PROTection:CLEar or a power cycle.** See Figure 3-111 for connection requirements.

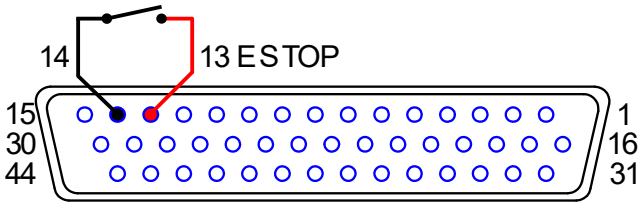


Figure 3-111. Remote Output On/Off Control by Contact Closure

3.8.2 Remote Output ON/OFF Control by External Source

Application of AC/DC voltage between Pins 1 and 16, or TTL/CMOS voltage (or user-selected logic-high) between Pins 31 and 16, will turn on the power supply; this interface is opto-isolated from circuit common. See Figure 3-112 and Figure 3-113 for connection requirements.

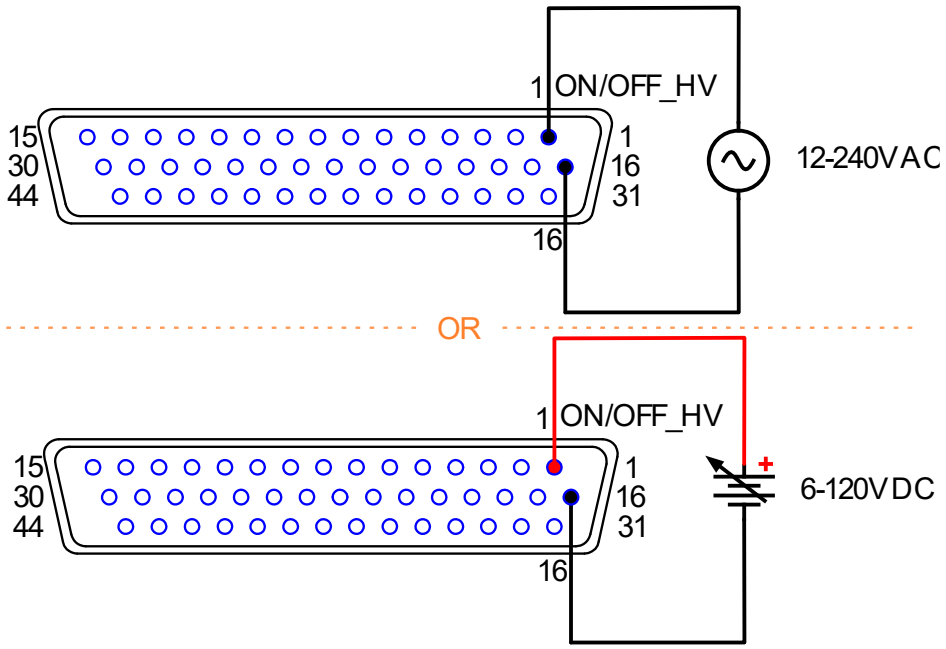


Figure 3-112. Remote Output On/Off Using Isolated AC or DC Source

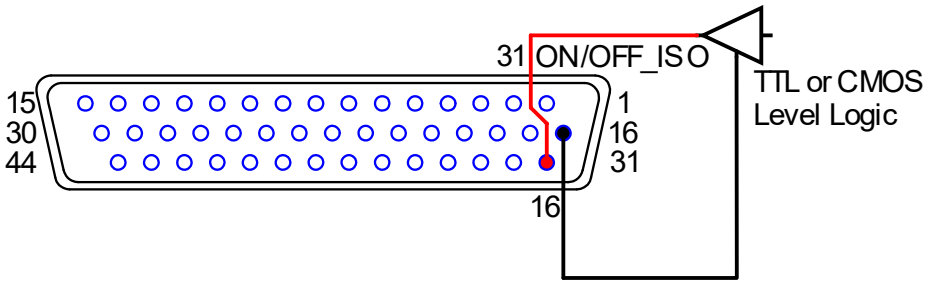


Figure 3-113. Remote Output On/Off Using Isolated TTL/CMOS Source

3.9 Parallel and Series Operation

Parallel and series modes of operation are used for applications requiring more current or voltage than is available from a single power supply. To meet the requirements for greater output current or voltage, up to five supplies could be connected in parallel, or up to two supplies could be connected in series.

3.9.1 Parallel Operation

Parallel operation is used to obtain a higher output current, the rated current sum of parallel supplies, using up to five power supplies. In order to connect supplies in parallel, refer to Section 3.1.7.1 and use a “Leader/Follower” wiring configuration as follows; refer to Figure 3-114. Parallel Connection - 3 Chassis and Figure 3-115. Parallel Connection - 2 Chassis

There are two separate modular connectors on the rear panel of each power supply, marked “PAR OUT” and “PAR IN”. Also, there are two separate modular connectors on the rear panel of each power supply, marked ‘CAN OUT” and “CAN IN".)

1. Programming, readback, and control is performed through the unit set as “Leader”.
2. Beginning with the power supply that is to function as the Leader, use an interface cable (890-524-01) to connect the PAR OUT connector on the designated Leader power supply to the PAR IN connector on the second, or Follower power supply. Repeat connection between Leader CAN OUT and Follower CAN IN. also using a 890-524-01 cable.
3. On the Follower power supply, use another interface cable to connect the PAR OUT connector to the PAR IN connector of the third Follower power supply. Continue these interconnections up to a maximum of 5 power supplies. Repeat connection between Follower 1 CAN OUT and Follower 2 CAN IN.
4. Connect the Positive output terminals of all the power supplies and the load.
5. Connect the Negative output terminals of all the power supplies and the load.
6. Confirm that there are no shorts between the Positive and Negative output terminals.
7. Referring to Figure 3-114, connect twisted-pair sense cables as follows; ensure that all twisted-pair cables are as short as possible:

All Follower units shall have twisted-pair cables from their sense terminals to their own output terminals.

For remote sense at the load, the Leader unit shall have a twisted-pair cable from its own sense terminals to the load terminals.

For remote sense at the output terminals (local sense connection), the Leader unit shall have a twisted-pair cable from its own sense terminals to the output terminals of its own chassis.

Note: The OVP circuit remains active for all units in parallel operation. If the units are set to different OVP levels, the paralleled system will trip according to the lowest setting. **For ease of use, adjust the OVP levels for the Followers to maximum and adjust the Leader OVP level to the desired setting.**

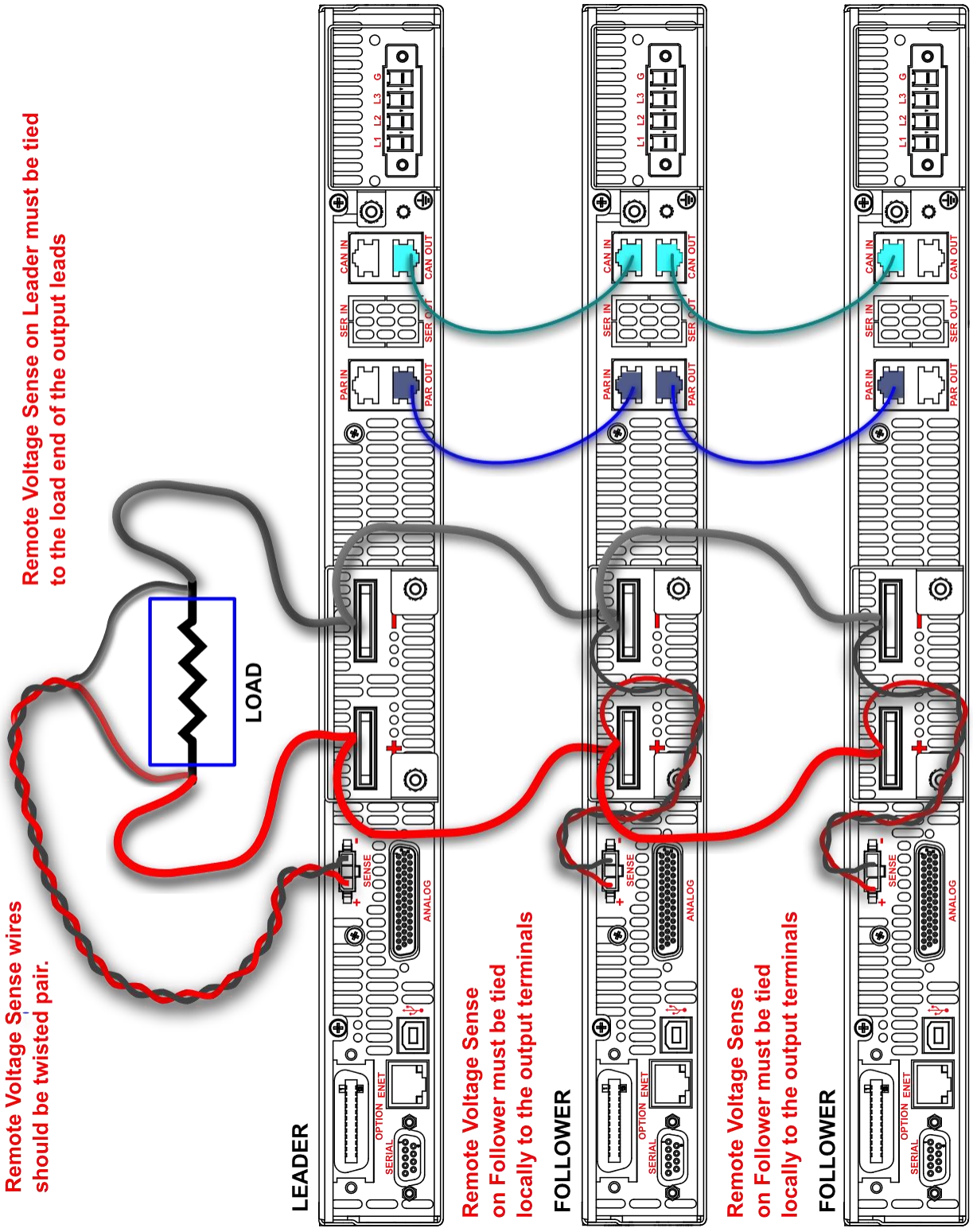


Figure 3-114. Parallel Connection - 3 Chassis

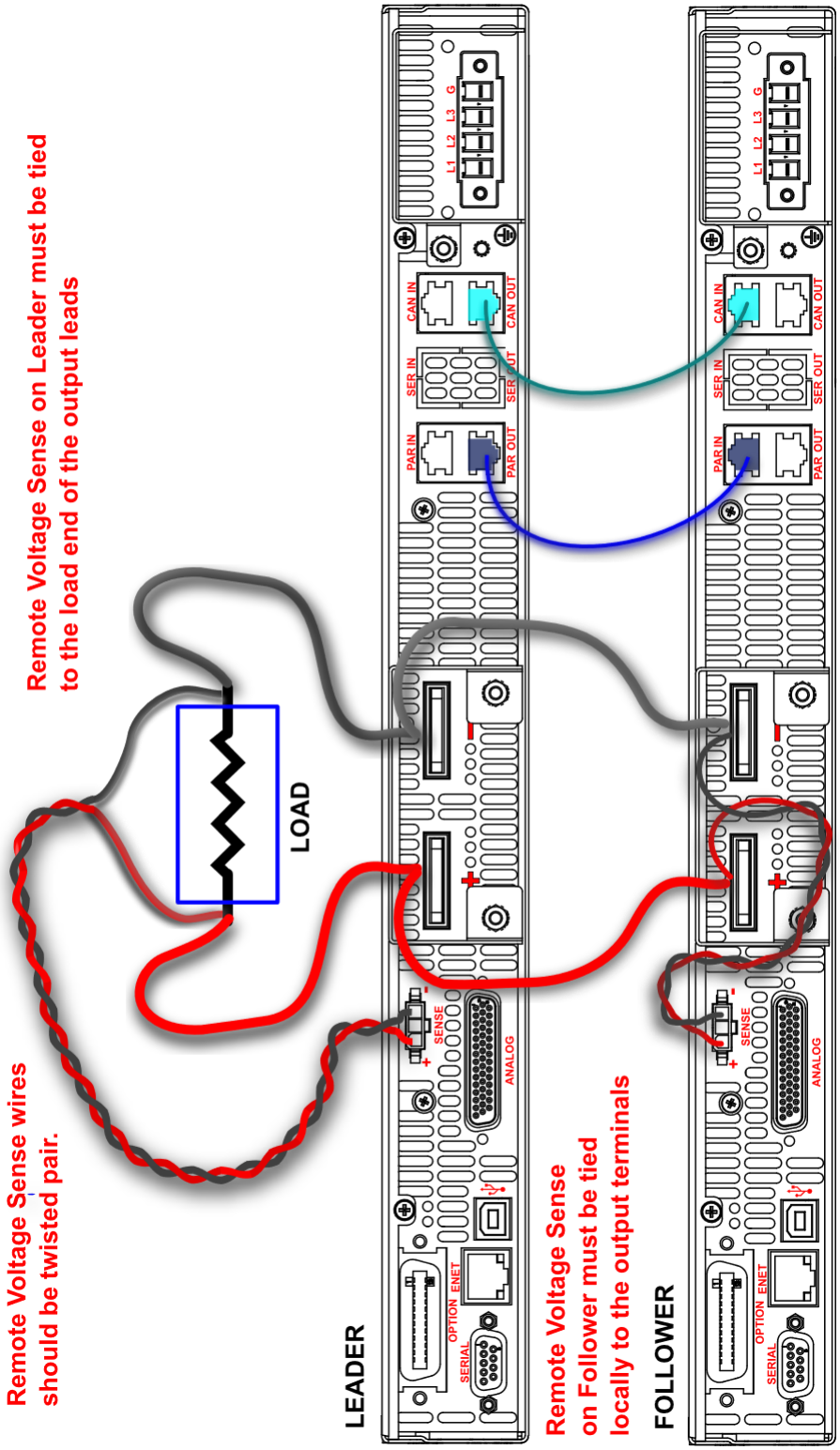


Figure 3-115. Parallel Connection - 2 Chassis

3.9.2 Series Operation

Series operation is used to obtain a higher aggregate output voltage, the rated voltage sum of the series supplies, using up to two power supplies. To connect two power supplies in series, refer to Section 3.1.7.1 and use a “Leader/Follower” wiring configuration as follows; refer to Figure 3-117. Series Connection. There are two separate modular connectors on the rear panel of each power supply, marked “PAR OUT” and “PAR IN”. Also, there are two modular connectors on the rear panel of each power supply, marked ‘CAN OUT” and “CAN IN".)

1. Programming, readback, and control is performed through the unit set as Leader.
2. Beginning with the power supply that is to function as the Leader, use an interface cable (890-524-01) to connect the PAR OUT connector on the designated Leader power supply to the PAR IN connector on the second power supply (Follower). Repeat connection between Leader CAN OUT and Follower CAN IN also using cable 890-524-0.
3. Connect the Positive output terminal of the Leader power supply to the positive terminal of the load.
4. Connect the Negative output terminal of the Leader power supply to the Positive output terminal secondary unit (Follower).
5. Connect the Negative output terminal of the secondary unit (Follower) to the negative terminal of the load.
6. Confirm that there are no shorts between the Positive and Negative output terminals.
7. Referring to Figure 3-117, connect twisted-pair sense cables as follows; ensure that all twisted-pair cables are as short as possible:

Both units (Leader and Follower) shall have twisted-pair cables from their sense terminals to their own output terminals.

Note:

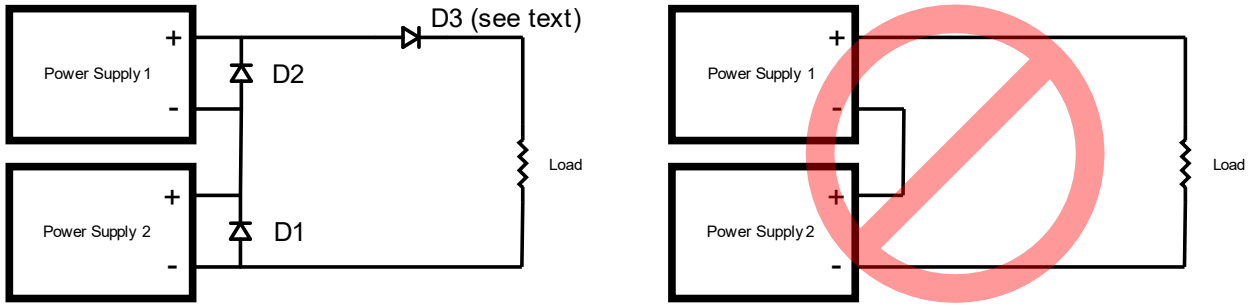
1. The maximum allowable current for a series string of power supplies is the rated output current of a single supply of the string.

2. Remote sensing **at the load** should **not** be used during series operation. Each power supply should have its remote sense leads connected to its own output terminals.

3. An anti-parallel diode (power diode capable of the maximum current of the series group, connected across the output, but reverse biased) is recommended to protect against sinking current into a supply should one supply be ON while another other is OFF, as shown in Figure 3-116. Series Connection with Anti-Parallel Diodes and Figure 3-117. Series Connection

4. Diode D3 shown in the figure is optional, if the load has stored energy such as a battery, capacitance, fuel cells, rotating motor. Refer to Section 2.13.

CAUTION!
Under no condition should the negative (–) output terminal of any power supply exceed 600 V to chassis (earth) ground. This is limited by the isolation and creepage/clearance distances internal to the power supply construction. If a higher output voltage range is required, contact the factory for availability.



Diodes used to prevent damage to power supply output. The damage can occur when one of the supplies is turned off resulting in a reverse bias on the output stage.

Figure 3-116. Series Connection with Anti-Parallel Diodes

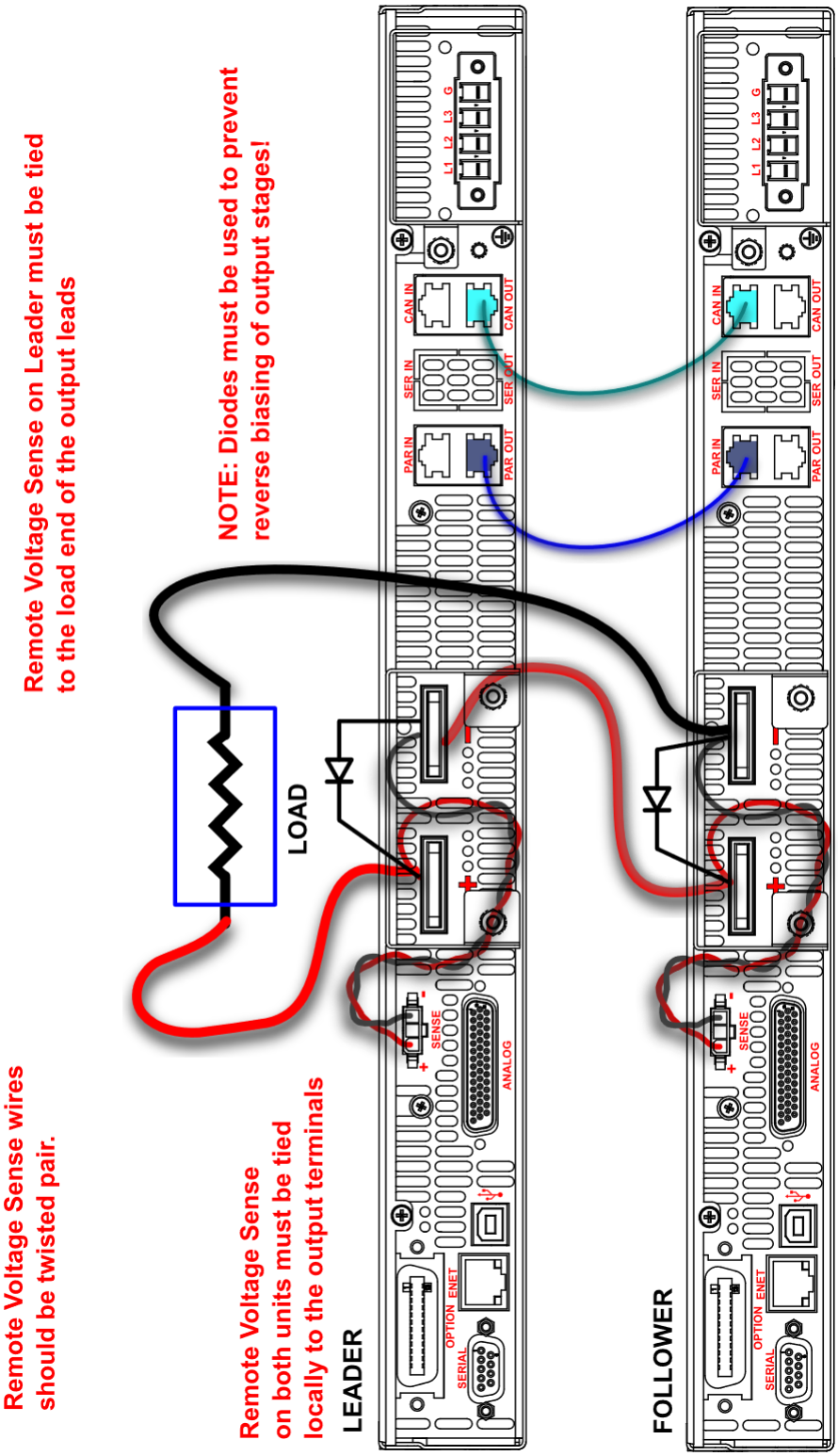


Figure 3-117. Series Connection

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4 CALIBRATION AND VERIFICATION

4.1 Introduction

This section provides calibration and verification procedures for the Asterion DC Series power supplies.

4.1.1 Calibration and Verification Cycle

Annual calibration and verification is a recommended practice. Calibrate only as needed. Reference Programming Manual for Calibration Procedure.

4.1.2 Digital programming and readback calibration

Refer to the Asterion DC programming manual for calibration of display readback and remote digital programming.

4.1.3 Analog control interface calibration (Standard and Isolated analog interface)

Refer to the Asterion DC programming manual for Analog Control interface calibration. Contact repair and maintenance service department for the same.

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5 MAINTENANCE

5.1 Introduction

This chapter contains preventive maintenance information for the Asterion DC Series power supplies.

WARNING!

All maintenance that requires removal of the cover of the unit should only be done by properly trained and qualified personnel. Hazardous voltages exist inside the unit. Disconnect the supply from the AC mains input before performing any maintenance. Service, fuse verification, and connecting of wiring to the chassis must be accomplished at least 5 *minutes* after AC input power has been removed with an external disconnect switch. Do not touch any circuits and/or terminals that are energized.

5.2 Preventive Maintenance

WARNING!

The OFF position of the front panel power switch does not remove AC input from internal circuits or input terminal blocks. Disconnect external AC input before servicing unit.

CAUTION!

For safe and continued operation of the Asterion DC Series, always operate the unit in a temperature and humidity controlled, indoor area. Exposure to conductive contaminants or corrosive compounds/gases that could be ingested into the chassis could result in internal damage. Keep the rear and sides of the unit free of obstructions to ensure proper ventilation.

No routine maintenance on the Asterion DC Series is required, aside from periodic cleaning of the unit and inspection, as required by the environmental operating conditions:

- Once a unit is removed from service, vacuum all air vents, including the front panel grill.
- Clean the exterior with a mild solution of detergent and water. Apply the solution onto a soft cloth, not directly to the surface of the unit. To prevent damage to materials, do not use aromatic hydrocarbons or chlorinated solvents for cleaning.
- Check external connections for integrity of insulation, loose contacts, and proper torque.
- If there is any evidence of short-circuits or arcing, overheating, or corrosion, contact the factory for recommended service.

5.3 Fuses

There are no user replaceable components in the power supply. Internal fuses are listed in Table 5-1. Fuses are sized for fault isolation; an open fuse might indicate that a circuit component has been damaged. Contact the factory for further assistance.

CAUTION!
To reduce the risk of fire or electrical shock, replace fuses only with the same type and rating.

Assembly	Reference	Rating	Manufacturer	Part No.
Distribution PWA	F2, F3	16 A, 600V	Littelfuse	0505016.MXP
Input EMI Filter PWA	F1, F2, F3	30 A, 600V	Bussmann	KTK-30

Table 5-1. Fuse Ratings

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