AMETEK®
PROGRAMMABLE POWER

P/N M587351-01
Revision C
August 2025
Copyright © 2025
AMETEK Programmable Power
All rights reserved

Sorensen

Mi-BEAM Series

Operation Manual

This page intentionally left blank

About AMETEK

AMETEK Programmable Power, Inc., a unit of AMETEK Electronic Instruments Group (a division of AMETEK, Inc.), is a global leader in the design and manufacture of precision, programmable power supplies for R&D, test and measurement, process control, power bus simulation and power conditioning applications across diverse industrial segments. Offering bench-top supplies to rack-mounted industrial power subsystems, AMETEK Programmable Power is the proud manufacturer of Elgar, Sorensen, California Instruments, and Amrel brand power supplies and electronic loads.

AMETEK, Inc. is a leading global manufacturer of electronic instruments and electromechanical devices with annualized sales of $6.9 billion. The company has over 21,000 colleagues working at more than 150 manufacturing facilities and nearly 150 sales and service centers in the United States and 30 other countries around the world.

Trademarks

AMETEK is a registered trademark of AMETEK, Inc.

Other trademarks, registered trademarks, and product names are the property of their respective owners and are used herein for identification purposes only.

Notice of Copyright

Mi-BEAM Series Operation Manual © 2025, AMETEK Programmable Power, Inc.,
All rights reserved.

Exclusion for Documentation

UNLESS SPECIFICALLY AGREED TO IN WRITING, AMETEK PROGRAMMABLE POWER, INC. (“AMETEK”)

(a) MAKES NO WARRANTY AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF ANY TECHNICAL OR OTHER INFORMATION PROVIDED IN ITS MANUALS OR OTHER DOCUMENTATION.

(b) ASSUMES NO RESPONSIBILITY OR LIABILITY FOR LOSSES, DAMAGES, COSTS OR EXPENSES, WHETHER SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR INCIDENTAL, WHICH MIGHT ARISE OUT OF THE USE OF SUCH INFORMATION. THE USE OF ANY SUCH INFORMATION WILL BE ENTIRELY AT THE USER’S RISK.

(c) IF THIS MANUAL IS IN ANY LANGUAGE OTHER THAN ENGLISH, ALTHOUGH STEPS HAVE BEEN TAKEN TO MAINTAIN THE ACCURACY OF THE TRANSLATION, THE ACCURACY CANNOT BE GUARANTEED. APPROVED AMETEK CONTENT IS CONTAINED WITH THE ENGLISH LANGUAGE VERSION, WHICH IS POSTED AT WWW.PROGRAMMABLEPOWER.COM.

Date and Revision

August 2025, Revision C

Document Part Number

M587351-01

Contact Information

Telephone: 800 733 5427 (toll free in North America)
858 450 0085 (direct)
Fax: 858 458 0267
Email: sales.ppd@ametek.com
service.ppd@ametek.com
Web: www.programmablepower.com

Product Family: Mi-BEAM Series Power Supply
Warranty Period: 5 Years

Warranty Terms

AMETEK provides the following warranty for the product listed above ("Product"): If a defect in materials or workmanship is discovered and reported in writing within the applicable warranty period, AMETEK, at its discretion, will:

1. Repair or replace the defective Product,
2. Issue a credit note for the defective Product, or
3. Provide replacement parts for the defective Product.

The Buyer is responsible for returning the defective Product or parts to AMETEK at their own expense, following the specified return procedure. AMETEK will cover the costs of delivering the repaired or replaced Product or parts back to the Buyer.

4. The Product is damaged due to misuse, accident, negligence, or failure to maintain it as required by AMETEK's specifications.
5. The Product is modified, altered, or combined with unauthorized attachments.
6. The Product is installed or operated contrary to AMETEK's instructions.
7. The Product is opened, modified, or disassembled without AMETEK's prior written consent.
8. The Product is used with items, articles, or materials not authorized by AMETEK.

The Buyer may not make any warranty-related claims unless all payments under the Purchase Order Agreement have been completed.

Product Return Procedure

- Request a Return Material Authorization (RMA) number from the repair facility (**must originate in the country in which it where it was purchased**):
- **In the USA**, contact the AMETEK Customer Service 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 United States**, contact the nearest Authorized Service Center (ASC). A full listing can be found either through your local distributor, or on our website, www.programmablepower.com, by tapping the Support button or going to the Service Centers tab.
- 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 the 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 Alternating current (AC) mains input when servicing this equipment.

CAUTION!

This equipment contains Electrostatic discharge (ESD) sensitive input or output connection ports. When installing equipment, follow ESD safety procedures. ESD might cause damage to the equipment.

Only qualified personnel, who deal with attendant hazards in power supplies, are allowed to perform installation and servicing.

Ensure that the AC input power line ground is connected properly to the unit safety ground chassis. Similarly, other AC power ground lines, including those for application and maintenance equipment, must be grounded properly for both personnel safety and equipment protection.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting any cable.

In normal operation, the operator does not have access to hazardous voltages within the chassis. However, depending on the user's application configuration, HIGH VOLTAGES HAZARDOUS TO HUMAN SAFETY may be normally generated on the output terminals. The customer/user must ensure that the output power lines are labeled properly as to the safety hazards and that any inadvertent contact with hazardous voltages is prevented.

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 and protective clothing during open cover checks to avoid personal injury by any sudden component failure.

AMETEK Programmable Power Inc., San Diego, California, USA, or any of the subsidiary sales organizations, cannot 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

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.

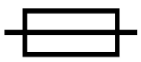
TECHNICIAN SYMBOL: All operations marked with this symbol are to be performed by qualified maintenance personnel only.

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

STANDBY (SUPPLY): Equipment is in standby mode and still have an active power supply. Disconnect before servicing.

OFF (SUPPLY): Power supply is OFF.

ON (SUPPLY): Power supply is ON.



FUSE: Risk of electrical shock or hazard. Disconnect power and use only the specified fuse type and rating.

ALTERNATING CURRENT (AC): AC is present. Avoid contact with live parts to prevent electric shock. Disconnect power before servicing.

DIRECT CURRENT (DC): DC is present. Avoid contact with live parts to prevent electric shock. Disconnect power before servicing.

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 Federal Communications Commission (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 Modular Intelligent-Bidirectional Energy Amplified (Mi-BEAM) Series of power supplies, which have been designed and certified to meet the Low Voltage Directive, Electromagnetic Compatibility, and Restriction of Hazardous Substances in Electrical and Electronic Equipment (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 to be 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. Refer to the Important Safety Instructions.

CONTENTS

1 INTRODUCTION 1-1

1.1 GENERAL DESCRIPTION 1-2

1.2 KEY BENEFITS 1-3

1.2.1 SIMPLE OPERATION 1-3

1.2.2 CONFIGURATIONS 1-3

1.2.3 REMOTE CONTROL 1-3

1.3 TESTING APPLICATIONS 1-3

1.3.1 BATTERY SIMULATION 1-3

1.3.2 BATTERY TESTING 1-3

1.3.3 SOLAR INVERTER TESTING 1-4

2 SPECIFICATIONS 2-5

2.1 OPERATING MODES 2-5

2.2 VIRTUAL PANELS FOR REMOTE CONTROL 2-9

2.3 OUTPUT POWER 2-10

2.4 OUTPUT VOLTAGE AND CURRENT RATINGS 2-10

2.5 AUTO RANGING OUTPUT VOLTAGE AND CURRENT V/I CHARACTERISTICS 2-11

2.6 RESOLUTION SPECIFICATIONS 2-15

2.7 DC OUTPUT PROGRAMMING, READBACK AND REGULATION SPECIFICATIONS(1)(2) 2-15

2.8 eLOAD RESISTANCE PROGRAMMING RANGE 2-16

2.9 REMOTE SENSE 2-17

2.10 USER-DEFINED SLEW RATE CONTROL CHARACTERISTICS 2-17

2.11 TRANSIENT SPECIFICATIONS – VOLTAGE REGULATION OPERATION 2-17

2.12 TRANSIENT SPECIFICATIONS – CURRENT REGULATION OPERATION 2-18

2.13 OUTPUT VOLTAGE RIPPLE AND NOISE - VOLTAGE REGULATION OPERATION 2-19

2.14 AC INPUT SPECIFICATIONS 2-19

2.15 OPERATIONAL CHARACTERISTICS 2-20

2.16 FRONT PANEL CONTROLS OR INDICATORS 2-22

2.17 REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE AND ISOLATED ANALOG INTERFACE CHARACTERISTICS 2-24

2.18 EXTERNAL RELAY CONTROL SIGNAL CONNECTOR 2-30

2.19 REMOTE CONTROL DIGITAL INTERFACE CHARACTERISTICS 2-31

2.20 PROTECTION FUNCTION CHARACTERISTICS 2-31

2.21 OUTPUT ISOLATION 2-33
2.22 ENVIRONMENTAL SPECIFICATIONS 2-34
2.23 MECHANICAL SPECIFICATIONS 2-34
2.24 REGULATORY AGENCY COMPLIANCE 2-35
2.25 REAR PANEL CONNECTORS 2-35

3 INSTALLATION 3-39

3.1 UNPACKING AND INSPECTION 3-39
3.1.1 CONTENTS OF SHIPMENT 3-39
3.2 MECHANICAL INSTALLATION 3-41
3.2.1 RACK MOUNTING 3-41
3.3 CHASSIS REMOVAL FROM RACK 3-43
3.4 OUTLINE DRAWINGS 3-43
3.5 REAR PANEL PROTECTIVE COVERS 3-44
3.5.1 INPUT PROTECTIVE COVERS 3-44
3.5.2 OUTPUT PROTECTIVE COVERS 3-45
3.5.3 REMOTE SENSE COVER 3-47
3.6 REAR PANEL INPUT/OUTPUT CONNECTIONS 3-47
3.7 AC INPUT POWER CONNECTION 3-49
3.7.1 AC INPUT OVERCURRENT PROTECTION 3-50
3.7.2 AC INPUT SAFETY DISCONNECT DEVICE 3-50
3.7.3 AC INPUT CONNECTOR 3-50
3.7.4 CONNECTING AC INPUT HIGH LINE (380V – 480 V) 3-52
3.7.5 CONNECTING AC INPUT LOW LINE (200V – 240 V) 3-54
3.8 DC OUTPUT CONNECTION 3-55
3.8.1 CONNECTING DC OUTPUT 3-56
3.9 REMOTE SENSE CONNECTION 3-58
3.9.1 NOISE AND IMPEDANCE EFFECTS 3-59
3.9.2 REMOTE SENSE 3-59
3.10 WIRE GAUGE SELECTION 3-60
3.10.1 WIRE SIZE 3-60
3.11 PARALLEL INTERFACE IN AND OUT 3-63
3.12 REAR PANEL USER INTERFACE CONNECTORS 3-63
3.12.1 REMOTE EXTERNAL USER CONTROL INTERFACE 3-64
3.12.2 REMOTE INHIBIT SIGNAL 3-70
3.12.3 REMOTE ANALOG PROGRAMMING 3-72
3.12.4 EXTERNAL RELAY CONTROL SIGNAL CONNECTOR 3-85
3.12.5 RS-232C SERIAL INTERFACE 3-86
3.12.6 USB INTERFACE 3-86

3.12.7 LAN INTERFACE 3-87
3.12.8 GPIB INTERFACE (Optional) 3-88

4 INTERFACING MI-BEAM POWER SUPPLY WITH ACTIVE SOURCE OR LOAD 4-91

4.1 INSTRUCTIONS FOR SAFE OPERATION BEFORE LOAD INTERFACING 4-91

4.2 INTERFACING Mi-BEAM TO AN ACTIVE SOURCE OR LOAD 4-92

4.2.1 INTERFACING USING MI-BEAM ISOLATION CHASSIS 4-92
4.2.2 INTERFACING Mi-BEAM USING USER ISOLATION BOX 4-93

5 OPERATING MODES 5-97

5.1 BIDIRECTIONAL MODE 5-97
5.2 SOURCE MODE 5-99
5.3 eLOAD MODE 5-101
5.4 BATTERY SIMULATION MODE 5-103
5.5 BATTERY TEST MODE 5-104
5.6 PHOTOVOLTAIC SIMULATOR 5-105

6 FRONT PANEL 6-107

6.1 FRONT PANEL CONTROLS AND INDICATORS 6-107
6.2 FRONT PANEL DISPLAY NAVIGATION 6-108
6.3 BASIC FRONT PANEL OPERATION 6-109

6.3.1 FRONT PANEL TOUCH-SCREEN DISPLAY 6-109
6.3.2 TOUCH-SCREEN NUMERIC KEYPAD 6-111
6.3.3 ROTARY ENCODERS 6-112

6.4 FRONT PANEL DISPLAY MENU AND FUNCTIONALITY 6-113

6.4.1 POWER-UP SCREENS 6-113
6.4.2 HOME SCREEN TOP-LEVEL MENU 6-114

7 BIDIRECTIONAL MODE OPERATION 7-119

7.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION 7-119

7.1.1 IDENTIFY THE UUT PORT TYPE 7-119
7.1.2 CONFIGURING MI-BEAM FOR CURRENT TYPE UUT 7-119
7.1.3 EXAMPLE: TESTING OF DC CHARGER USING CV/CC (DEFAULT) REGULATION SETTING 7-126
7.1.4 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT 7-127
7.1.5 EXAMPLE: TESTING OF BATTERY PACK USING CC/CV (DEFAULT) REGULATION SETTING 7-134

7.2 FRONT PANEL OPERATION 7-135

7.2.1 DASHBOARD SCREEN TOP-LEVEL MENU 7-136
7.2.2 OUTPUT PROGRAM SCREEN 7-146
7.2.3 MEASUREMENTS SCREEN 7-159

7.2.4 RAMP SCREEN 7-160
7.2.5 CONFIGURATION SCREEN 7-178
7.2.6 CONTROL INTERFACE SCREEN 7-216
7.2.7 OPERATING MODE 7-228
7.2.8 SYSTEM SETTINGS SCREEN 7-229
7.2.9 SYSTEM FAULTS SCREEN 7-232

7.3 PARALLEL OPERATION 7-233
7.3.1 SETTING UP PARALLEL OPERATION 7-233

8 SOURCE MODE OPERATION 8-236

8.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION 8-236
8.1.1 IDENTIFY THE UUT PORT TYPE 8-236
8.1.2 CONFIGURING MI-BEAM FOR CURRENT TYPE UUT 8-236
8.1.3 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT 8-243

8.2 FRONT PANEL OPERATION 8-250
8.2.1 DASHBOARD SCREEN TOP-LEVEL MENU 8-250
8.2.2 OUTPUT PROGRAM SCREEN 8-261
8.2.3 MEASUREMENTS SCREEN 8-273
8.2.4 RAMP SCREEN 8-274
8.2.5 CONFIGURATION SCREEN 8-292
8.2.6 CONTROL INTERFACE SCREEN 8-332
8.2.7 OPERATING MODE 8-344
8.2.8 SYSTEM SETTINGS SCREEN 8-344
8.2.9 SYSTEM FAULTS SCREEN 8-348

8.3 PARALLEL OPERATION 8-349
8.3.1 SETTING UP PARALLEL OPERATION 8-349

9 ELOAD MODE OPERATION 9-352

9.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION 9-352
9.1.1 IDENTIFY THE UUT PORT TYPE 9-352
9.1.2 CONFIGURING MI-BEAM FOR CURRENT TYPE UUT 9-352
9.1.3 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT 9-359

9.2 FRONT PANEL OPERATION 9-367
9.2.1 DASHBOARD SCREEN TOP-LEVEL MENU 9-367
9.2.2 OUTPUT PROGRAM SCREEN 9-379
9.2.3 MEASUREMENTS SCREEN 9-394
9.2.4 RAMP SCREEN 9-394
9.2.5 CONFIGURATION SCREEN 9-413
9.2.6 CONTROL INTERFACE SCREEN 9-456

9.2.7 OPERATING MODE 9-469
9.2.8 SYSTEM SETTINGS SCREEN 9-469
9.2.9 SYSTEM FAULTS SCREEN 9-473
9.3 PARALLEL OPERATION 9-474
9.3.1 SETTING UP PARALLEL OPERATION 9-474
10 PV SIMULATOR MODE OPERATION 10-476
10.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION 10-476
10.1.1 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT 10-476
10.2 FRONT PANEL OPERATION 10-480
10.2.1 DASHBOARD SCREEN TOP-LEVEL MENU 10-480
10.2.2 OUTPUT PROGRAM SCREEN 10-493
10.2.3 MEASUREMENTS SCREEN 10-504
10.2.4 CONFIGURATION SCREEN 10-504
10.2.5 CONTROL INTERFACE SCREEN 10-548
10.2.6 OPERATING MODE 10-557
10.2.7 SYSTEM SETTINGS SCREEN 10-558
10.2.8 SYSTEM FAULTS SCREEN 10-562
10.3 PARALLEL OPERATION 10-563
10.3.1 SETTING UP PARALLEL OPERATION 10-563
11 BATTERY SIMULATOR MODE OPERATION 11-565
11.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION 11-565
11.1.1 CONFIGURING CURRENT TYPE UUT 11-565
11.2 FRONT PANEL OPERATION 11-567
11.2.1 DASHBOARD SCREEN TOP-LEVEL MENU 11-568
11.2.2 OUTPUT PROGRAM SCREEN 11-575
11.2.3 MEASUREMENTS SCREEN 11-576
11.2.4 CONFIGURATION SCREEN 11-576
11.2.5 CONTROL INTERFACE SCREEN 11-591
11.2.6 OPERATING MODE 11-600
11.2.7 SYSTEM SETTINGS SCREEN 11-600
11.2.8 SYSTEM FAULTS SCREEN 11-604
11.3 PARALLEL OPERATION 11-605
11.3.1 SETTING UP PARALLEL OPERATION 11-605
12 BATTERY TEST MODE OPERATION 12-607
12.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION 12-607
12.2 FRONT PANEL OPERATION 12-608
12.2.1 DASHBOARD SCREEN TOP-LEVEL MENU 12-608

12.2.2 OUTPUT PROGRAM SCREEN 12-612
12.2.3 MEASUREMENTS SCREEN 12-615
12.2.4 CONFIGURATION SCREEN 12-615
12.2.5 CONTROL INTERFACE SCREEN 12-628
12.2.6 OPERATING MODE 12-637
12.2.7 SYSTEM SETTINGS SCREEN 12-637
12.2.8 SYSTEM FAULTS SCREEN 12-641
12.3 PARALLEL OPERATION 12-642
12.3.1 SETTING UP PARALLEL OPERATION 12-642
13 CALIBRATION 13-645
13.1 CALIBRATION EQUIPMENT 13-645
13.2 CALIBRATION PROCEDURES 13-645
13.2.1 PREPARATION FOR CALIBRATION 13-645
13.2.2 LOCAL SENSE VOLTAGE PROGRAMMING CALIBRATION 13-646
13.2.3 REMOTE SENSE VOLTAGE PROGRAMMING CALIBRATION 13-648
13.2.4 CURRENT PROGRAMMING CALIBRATION 13-650
14 ERROR MESSAGES AND SYSTEM FAULTS 14-653
14.1 ERROR MESSAGES 14-653
14.2 SYSTEM FAULTS 14-655
14.2.1 OUTPUT REGULATION FAULTS 14-663
14.2.2 MODULE FAULTS 14-665
14.2.3 TEMPERATURE FAULTS DETAILS 14-669
15 MAINTENANCE 673
15.1 PREVENTIVE MAINTENANCE 673
15.2 FUSES 674
ACRONYMS 675

LIST OF TABLES

Table 2-1. AC High Line and Low Line Power Configuration 2-10
Table 2-2. Output Voltage and Current Ratings 2-10
Table 2-3. Front Panel Resolution Specifications 2-15
Table 2-4. DC Output Programming, Readback and Regulation Specifications .. 2-16
Table 2-5. eLoad Maximum and Minimum Resistance Programming Range 2-16
Table 2-6. Remote Sense Voltage Adjustment Parameters 2-17
Table 2-7. Slew Rate Control Characteristics 2-17
Table 2-8. Transient Specifications for Voltage Regulation Operation 2-18
Table 2-9. Transient Specifications for Current Regulation Operation 2-19
Table 2-10. Output Voltage Ripple and Noise for Voltage Regulation Operation 2-19
Table 2-11. AC Input Specifications 2-20
Table 2-12. Operational Characteristics 2-22
Table 2-13. Front Panel Controls or Indicators 2-23
Table 2-14. Remote Isolated User Control and Analog Interface 2-30
Table 2-15. Remote Control Digital Interface 2-31
Table 2-16. Protection Function Characteristics 2-33
Table 2-17. Output Isolation 2-33
Table 2-18. Environmental Specifications 2-34
Table 2-19. Mechanical Specifications 2-35
Table 2-20. Regulatory Agency Compliance 2-35
Table 2-21. Rear Panel Connectors 2-36
Table 3-1. Contents of Shipment 3-40
Table 3-2 . Rack Mounting Slide Kit 3-42
Table 3-3: Rear Panel Connectorpara 3-49
Table 3-4: AC Input Connector Pinout and Safety-Ground 3-52
Table 3-5: AC Input Connector Type 3-52
Table 3-6. Circuit Breaker – High Line 3-53
Table 3-7. Circuit Breaker – Low Line 3-55
Table 3-8. DC output Connector 3-55
Table 3-9. Remote Sense Connector Type 3-58
Table 3-10. Minimum Wire Size 3-61
Table 3-11. Wire Resistance and Voltage Drop, 20°C 3-63
Table 3-12: External User Control Interface connector Type 3-64
Table 3-13: External User Control Interface Characteristics 3-67
Table 3-14: External User Control Interface Pin Out details 3-70
Table 3-15. RS-232C Interface Connector Type 3-86
Table 3-16. RS-232C Interface Connector Pinout 3-86
Table 3-17. USB Interface Connector Type 3-87
Table 3-18. USB Interface Connector Pinout 3-87
Table 3-19: LAN Interface Connector Type 3-88

Table 3-20. LAN Interface 8P8C Modular Connector Pinout 3-88
Table 3-21. GPIB Interface Connector Type 3-89
Table 3-22. GPIB Interface Connector Pinout 3-89
Table 4-1. Power Supply Output Capacitance 4-95
Table 6-1. Front Panel Controls and Indicators 6-108
Table 6-2. Modes of Rotary Encoder 6-113
Table 6-3. Home Screen Menu Content 6-116
Table 6-4. Default Screen – Conditions and Color 6-116
Table 7-1. Applicable Options – CV/CC 7-120
Table 7-2. Applicable Options – CV/CP 7-122
Table 7-3. Applicable Options – CV- Ser. Res 7-123
Table 7-4. Applicable Options – CV 7-125
Table 7-5. Applicable Options – CC/CV 7-128
Table 7-6. Applicable Options – CC/CP 7-130
Table 7-7. Applicable Options – CP/CC 7-132
Table 7-8. Applicable Options – CC 7-133
Table 7-10. Dashboard screen top-level menu- CV/CP Mode 7-140
Table 7-11. Dashboard screen top-level menu- CV-Ser. Res Mode 7-141
Table 7-12. Dashboard screen top-level menu – CC and CC/CV 7-142
Table 7-13. Dashboard screen top-level menu- CP/CC Mode 7-143
Table 7-14. Dashboard screen top-level menu- CC/CP Mode 7-144
Table 7-15. Output Program Settings in CV/CC and CV Mode 7-149
Table 7-16. Output Program Settings in CV-Ser. Res 7-153
Table 7-17. Output Program Settings in CC/CV, CC/CP and CC Mode 7-156
Table 7-18. Output Program Settings in CP/CC Mode 7-159
Table 7-19. Voltage Ramp 7-167
Table 7-20. Current ramp 7-176
Table 7-21. Regulation Settings 7-180
Table 7-22. Regulation Settings 7-181
Table 7-23. Regulation Settings 7-193
Table 7-24. Regulation Setting 7-194
Table 7-25. PONS Output Program Settings –CV/CC, CV/CP and CV 7-197
Table 7-26. PONS Output Program Settings 7-201
Table 7-27. PONS Output Program Settings 7-203
Table 7-28. PONS Output Program Settings 7-205
Table 7-29. PONS Configuration mode 7-215
Table 7-30. Measurement Average Sample 7-216
Table 7-31. System Settings Screen 7-228
Table 7-32. System Settings Screen 7-232
Table 8-1. Applicable Options – CV/CC 8-237
Table 8-2. Applicable Options – CV Ser. Res 8-238

Table 8-3. Applicable Options – CV/CP 8-240
Table 8-4. Applicable Options – CP/CV 8-241
Table 8-5. Applicable Options – CV 8-243
Table 8-6. Applicable Options – CC/CV 8-244
Table 8-7. Applicable Options – CC/CP 8-246
Table 8-8. Applicable Options – CP/CC 8-247
Table 8-9. Applicable Options – CC 8-249
Table 8-10. Dashboard screen top-level menu Voltage CV and CV/CC 8-254
Table 8-11. Dashboard screen top-level menu Voltage CP/CV 8-255
Table 8-12. Dashboard screen top-level menu- CV-Ser. Res Mode 8-256
Table 8-13. Dashboard screen top-level menu – CC, CC/CV and CC/CP 8-258
Table 8-14. Dashboard screen top-level menu – CP/CC 8-259
Table 8-15. Output Program Settings in CV/CC, CV/CP and CV Mode 8-263
Table 8-16. Output Program Settings in CV Ser. Res Mode 8-265
Table 8-17. Output Program Settings in CP/CV 8-268
Table 8-18. Output Program Settings in CC/CV, CC/CP and CC mode 8-270
Table 8-19. Output Program Settings CP/CC mode 8-273
Table 8-20. Voltage Ramp 8-281
Table 8-21. Current ramp 8-290
Table 8-22. Regulation Settings 8-294
Table 8-23. Regulation Settings 8-295
Table 8-24. Regulation Settings 8-308
Table 8-25. Regulation Setting 8-310
Table 8-26. PONS Output Program Settings – CV/CC, CV/CP and CV 8-312
Table 8-27. PONS Output Program Settings 8-314
Table 8-28. PONS Output Program Settings 8-316
Table 8-29. PONS Output Program Settings 8-318
Table 8-30. PONS Output Program Settings 8-321
Table 8-31. PONS Configuration mode 8-331
Table 8-32. Measurement Average Samples Settings menu 8-332
Table 8-33. System Setting Screen 8-343
Table 8-34. System Setting Screen 8-347
Table 9-1. Applicable Options – CV/CC 9-353
Table 9-2. Applicable Options – CR/CV 9-354
Table 9-3. Applicable Options – CV/CP 9-356
Table 9-4. Applicable Options – CP/CV 9-357
Table 9-5. Applicable Options – CV 9-359
Table 9-6. Applicable Options – CC/CV 9-360
Table 9-7. Applicable Options – CC/CP 9-362
Table 9-8. Applicable Options – CP/CC 9-363
Table 9-9. Applicable Options – CR/CC 9-365

Table 9-10. Applicable Options – CC 9-366
Table 9-12. Dashboard screen top-level menu- CR/CV Mode 9-372
Table 9-13. Dashboard screen top-level menu Voltage CP/CV 9-373
Table 9-14. Dashboard screen top-level menu – CC/CV, CC/CP and CC 9-375
Table 9-15. Dashboard screen top-level menu – CP/CC 9-376
Table 9-16. Dashboard screen top-level menu- CR/CC Mode 9-378
Table 9-17. Output Program Settings in CV/CC and CV Mode 9-381
Table 9-18. Output Program Settings in CP/CV 9-384
Table 9-19. Output Program Settings in CR/CV Mode 9-386
Table 9-20. Output Program Settings in CC/CV, CC/CP and CC mode 9-389
Table 9-21. Output Program Settings CP/CC mode 9-391
Table 9-22. Output Program Settings in CR/CC Mode 9-394
Table 9-23. Voltage Ramp 9-402
Table 9-24. Current ramp 9-411
Table 9-25. Regulation Settings 9-415
Table 9-26. Regulation Settings 9-416
Table 9-27. Regulation Settings 9-431
Table 9-28. Regulation Setting 9-432
Table 9-29. PONS Output Program Settings – CV/CC, CV/CP and CV 9-434
Table 9-30. PONS Output Program Settings 9-437
Table 9-31. PONS Output Program Settings 9-439
Table 9-32. PONS Output Program Settings 9-441
Table 9-33. PONS Output Program Setting 9-443
Table 9-34. PONS Output Program Settings 9-445
Table 9-35. PONS Configuration mode 9-455
Table 9-36. Measurement Average Samples Settings menu 9-456
Table 9-37. System Setting Screen 9-469
Table 9-38. System Setting Screen 9-473
Table 10-1. PVSIM mode Selection Setting – Front Panel Support 10-481
Table 10-2. Dashboard screen top-level menu (Oper. Type - Steady State, Oper. Mode – Standard and Curve Type - SNL) 10-483
Table 10-3. Dashboard screen top-level menu – Static Test Type 10-485
Table 10-4. Dashboard screen top-level menu – Dynamic Test Type 10-486
Table 10-5. Dashboard screen top-level menu (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type - Userdefined) 10-487
Table 10-6. Dashboard screen top-level menu (Oper. Type – Profile, Curve Type – Array) 10-488
Table 10-7. Dashboard screen top-level menu (Oper. Type – Profile and Curve Type - SNL) 10-490
Table 10-8. Dashboard screen top-level menu (Oper. Type - Profile and Curve Type - EN50530 and Test Type – Static/Dynamic) 10-492
Table 10-9. Output Program screen 10-495

Table 10-10. Output Program screen 10-497
Table 10-11. Output Program screen 10-500
Table 10-12. Output Program screen 10-501
Table 10-13. Output Program screen 10-502
Table 10-14. Output Program screen 10-504
Table 10-15. PVSIM mode Selection Setting – Front Panel Support 10-505
Table 10-16. PVSIM Mode Selection Settings 10-510
Table 10-17. Screen 1 and 2 – Profile Settings 10-514
Table 10-18. PONS Configuration mode 10-522
Table 10-19. Measurement Average Samples 10-523
Table 10-20. EN50530 Configuration 10-526
Table 10-21. PONS Configuration mode 10-532
Table 10-22. Measurement Average Samples 10-533
Table 10-23. PONS Configuration mode 10-540
Table 10-24. Measurement Average Samples 10-541
Table 10-25. PONS Configuration mode 10-547
Table 10-26. Measurement Average Samples 10-548
Table 10-27. System Setting Screen 10-557
Table 10-28. System Setting Screen 10-561
Table 11-1. Dashboard screen top-level menu – (BATSIM Profile Type – Battery) 11-570
Table 11-2. Status 11-571
Table 11-3. Dashboard screen top-level menu (BATSIM Profile Type – Table) 11-572
Table 11-4. Status 11-573
Table 11-5. Output Program screen 11-575
Table 11-6. BATSIM Profile Type Settings 11-577
Table 11-7. BATSIM Cut-Off Condition Settings 11-578
Table 11-8. Screen 1 and 2 – Profile Settings 11-581
Table 11-9. PONS Configuration mode 11-590
Table 11-10. Measurement Average Samples 11-591
Table 11-11. System Setting Screen 11-600
Table 11-12. System Setting Screen 11-604
Table 12-1. Dashboard screen top-level menu 12-610
Table 12-2. Status 12-610
Table 12-3. Output Program screen 12-615
Table 12-4. BATSIM Cut-Off Condition Settings 12-618
Table 12-5. Profile Settings Screen 12-620
Table 12-6. PONS Configuration mode 12-628
Table 12-7. Measurement Average Samples 12-628
Table 12-8. System Setting Screen 12-637

Table 12-9. System Setting Screen 12-641
Table 13-1. Calibration Equipment 13-645
Table 14-1. Error Messages 14-654
Table 14-2. System Fault Messages 14-663
Table 14-3. Output Regulation Faults 14-664
Table 14-4. Module Faults 14-669
Table 14-5. Temperature Faults 14-672
Table 15-1. Fuse Ratings 674
Table 15-1. Acronyms 676

LIST OF FIGURES

Figure 1-1. Mi-BEAM Series 1-1
Figure 1-2. Model Number Decoding 1-2
Figure 2-1. Bi-directional mode of operation 2-6
Figure 2-2. Power supply mode of operation 2-6
Figure 2-3. eLoad mode of operation 2-7
Figure 2-4. Battery simulation-charge mode 2-8
Figure 2-5. Battery simulation-discharge mode 2-8
Figure 2-6. Battery simulation-charge mode 2-9
Figure 2-7. Solar Array Simulation 2-9
Figure 2-8. Setup for connecting multiple power supplies through Virtual Panels 2-10
Figure 2-9. V/I Characteristics of Auto-ranging models 2-14
Figure 2-10. Front panel 2-24
Figure 2-11. Mi-BEAM Isolation Chassis block diagram 2-30
Figure 2-12. Rear Panel Connectors with GPIB option 2-37
Figure 3-1. Rack mounting 3-43
Figure 3-2: Installation Drawing 3-44
Figure 3-3. AC Input Protective Cover 3-45
Figure 3-4. Rear Panel DC Protective covers 3-46
Figure 3-5. Remote sense cover 3-47
Figure 3-6: Rear Panel View 3-48
Figure 3-7. AC Input Connector 3-52
Figure 3-8. AC Input Connection 3-54
Figure 3-9. DC Output Bus Bar 3-56
Figure 3-10. Bus Bar Dimension 3-56
Figure 3-11. DC output Connection 3-57
Figure 3-12. Remote Sense connector 3-58
Figure 3-13: Remote Sense Connection 3-60
Figure 3-14. External User Control Interface connector 3-64
Figure 3-15. Analog Control connector 3-72
Figure 3-16. Remote Voltage Programming by Voltage source 3-73
Figure 3-17. Remote Over Voltage Programming by Voltage source 3-73
Figure 3-18. Remote Voltage Programming by Current Source 3-74
Figure 3-19. Remote Current Programming by Voltage Source 3-75
Figure 3-20. Remote Current Programming by Current Source 3-76
Figure 3-21. Voltage Monitor 3-77
Figure 3-22. Current Monitor 3-77
Figure 3-23. Dio Output 1 3-78
Figure 3-24. Dio Output 2 3-79
Figure 3-25. SOURCE/SINK Output 3-80

Figure 3-26. TRIG_OUT 3-80
Figure 3-27. DIO_ON/OFF_STAT 3-81
Figure 3-28. DIO_CC/CV_OUT 3-81
Figure 3-29. DIO_FAULT_OUT 3-82
Figure 3-30. TRIG_IN 3-82
Figure 3-31. DIO_OUTPUT_ON/OFF 3-83
Figure 3-32. Digital IN 1 3-83
Figure 3-33. Digital IN 2 3-84
Figure 3-34. Digital IN 3 3-84
Figure 3-35. Remote Inhibit Active Voltage 3-85
Figure 3-36. Remote Inhibit Contact Closure 3-85
Figure 3-37. RS-232C Interface Connector 3-86
Figure 3-38. USB Interface Connector 3-87
Figure 3-39. LAN Interface 8P8C Modular Connector 3-88
Figure 3-40. GPIB interface Connector 3-89
Figure 4-1. Interfacing Mi-BEAM with UUT with Mi-BEAM Isolation chassis 4-93
Figure 4-2. Mi-BEAM connected to an active source or load though an isolation box 4-94
Figure 4-3. Timing diagram showing operation of pre-charge and isolating contactor of Mi-BEAM 4-96
Figure 5-1. Two-quadrant (Bi-directional) operation 5-97
Figure 5-2. Bi-directional mode of operation 5-99
Figure 5-3. Single quadrant (Source) operation 5-99
Figure 5-4. Power supply mode of operation 5-101
Figure 5-5. Single quadrant (eLoad) operation 5-101
Figure 5-6. eLoad mode of operation 5-103
Figure 5-7. Battery simulation-charge mode 5-104
Figure 5-8. Battery simulation-discharge mode 5-104
Figure 5-9. Battery test mode 5-105
Figure 5-10. Solar Array Simulation 5-105
Figure 6-1. Front Panel 6-107
Figure 6-2. Stylus Pen 6-110
Figure 6-3. HOME Screen with Dashboard Highlighted 6-110
Figure 6-4. DASHBOARD Screen Menu with Voltage Selection-Field Active 6-111
Figure 6-5. Touch-Screen Numeric Keypad 6-112
Figure 6-6. Rotary Encoder 6-113
Figure 6-7. Splash Screen 6-114
Figure 6-8. Power-On Screen Displaying Model & Version 6-114
Figure 6-9. Home Screen for Bidirectional Mode, Source Mode and eLoad Mode 6-115
Figure 6-10. Home Screen for PVSIM, BATSIM and BATTEST Mode 6-115

Figure 6-11. Dashboard Screen (Output State – OFF, Fault – NO and Power Direction – NA) 6-117
Figure 6-12. Dashboard Screen (Output State – OFF, Fault – YES and Power Direction – NA) 6-117
Figure 6-13. Dashboard Screen (Output State – ON, Fault – NO and Power Direction – NEGATIVE) 6-118
Figure 6-14. Dashboard Screen (Output State – ON, Fault – NO and Power Direction – POSITIVE) 6-118
Figure 7-1. Current Type UUT 7-119
Figure 7-2. Voltage Type UUT 7-127
Figure 7-3. Home Screen Top-Level Menu 7-136
Figure 7-4. Regulation Settings – Voltage programming type 7-137
Figure 7-5. Regulation Settings – Current programming type 7-137
Figure 7-6. Dashboard Screen in CV/CC Mode 7-137
Figure 7-7. Dashboard Screen in CV Mode 7-138
Figure 7-8. Dashboard Screen in CV/CP Mode 7-139
Figure 7-9. Dashboard Screen in CV-Ser. Res Mode 7-140
Figure 7-10. Dashboard Screen in CC/CV Mode 7-141
Figure 7-11. Dashboard Screen in CC Mode 7-142
Figure 7-12. Dashboard Screen in CP/CC Mode 7-143
Figure 7-13. Dashboard Screen in CP/CC Mode 7-144
Figure 7-14. Real-Time, Immediate Output Parameter Adjustment 7-145
Figure 7-15. Default Screen 7-146
Figure 7-16. Output Program Screen – CV/CC, CV/CP and CV 7-146
Figure 7-17. Voltage setting screen 7-147
Figure 7-18. Positive Current limit setting screen 7-147
Figure 7-19. Negative Current limit setting screen 7-148
Figure 7-20. Positive Power Limit setting screen 7-148
Figure 7-21. Negative Current limit setting screen 7-149
Figure 7-22. Output State Settings 7-149
Figure 7-23. Output Program Screen 7-150
Figure 7-24. Voltage Setting 7-150
Figure 7-25. Series Resistance Setting 7-151
Figure 7-26. Voltage High Setting 7-151
Figure 7-27. Voltage Low Setting 7-151
Figure 7-28. Positive Current Limit 7-152
Figure 7-29. Negative Current limit setting screen 7-152
Figure 7-30. Positive Power Limit 7-153
Figure 7-31. Negative Power limit setting screen 7-153
Figure 7-32. Output State 7-153
Figure 7-33. Output Program Screen of CC/CV, CC/CP and CC mode 7-154
Figure 7-34. Current Setting 7-154

Figure 7-35. Voltage High Setting 7-155
Figure 7-36. Voltage Low Settings 7-155
Figure 7-37. Positive Power Limit 7-156
Figure 7-38. Negative Power Limit 7-156
Figure 7-39. Output State Settings 7-156
Figure 7-40. Output Program Screen of CP/CC mode 7-157
Figure 7-41. Power Setting 7-157
Figure 7-42. Voltage High Setting 7-158
Figure 7-43. Voltage Low Settings 7-158
Figure 7-44. Positive Power Limit 7-158
Figure 7-45. Negative Power Limit 7-159
Figure 7-46. Output State Settings 7-159
Figure 7-47. Measurements Screen 7-160
Figure 7-48. Voltage Ramp Screen 7-160
Figure 7-49. From Voltage 7-161
Figure 7-50. To Voltage 7-161
Figure 7-51. Software Trigger Mode 7-162
Figure 7-52. Hardware Trigger Mode 7-162
Figure 7-53. Time 7-163
Figure 7-54. Set Limits – CV/CC, CV/CP and CV 7-163
Figure 7-55. Set Limits – CV – Ser.Res 7-163
Figure 7-56. Initializing 7-164
Figure 7-57. Trigger Ramp 7-165
Figure 7-58. Abort 7-165
Figure 7-59. Status – IDLE 7-165
Figure 7-60. Status – Initializing 7-166
Figure 7-61. Status – Waiting for Trigger 7-166
Figure 7-62. Status – Running 7-166
Figure 7-63. Status – Aborted 7-167
Figure 7-64. Status- Completed 7-167
Figure 7-65. Current Ramp Screen 7-169
Figure 7-66. From Current 7-169
Figure 7-67. To Current 7-170
Figure 7-68. SW Mode 7-170
Figure 7-69. HW Mode 7-171
Figure 7-70. Time 7-171
Figure 7-71. Set Limits - CC/CV, CC/CP and CC 7-171
Figure 7-72. Set Limits - CP/CC 7-172
Figure 7-73. Initializing 7-172
Figure 7-74. Trigger Ramp 7-173
Figure 7-75. Abort – SW 7-173

Figure 7-76. Status – IDLE 7-174
Figure 7-77. Status - Initializing 7-174
Figure 7-78. Status – Waiting for Trigger 7-175
Figure 7-79. Status – Running 7-175
Figure 7-80. Status – Aborted 7-175
Figure 7-81. Status- Completed 7-176
Figure 7-82. Current Ramp - CP/CC 7-176
Figure 7-83. Configuration Screen Top-Level Menu 7-178
Figure 7-84. Regulation Settings – CV/CC, CV/CP, CV-Ser. Res and CV 7-179
Figure 7-85. Delay Screen 7-180
Figure 7-86. Regulation Settings – CC/CV, CP/CC, CC/CP and CC 7-180
Figure 7-87. Delay Screen 7-181
Figure 7-88. Slew Rate Settings 7-182
Figure 7-89. Slew Rate Settings – Current (CC/CV, CC/CP and CC) 7-183
Figure 7-90. Slew Rate Settings – Power (CP/CC) 7-184
Figure 7-91. Protection Settings 7-185
Figure 7-92. External Relay Settings 7-185
Figure 7-93. User Limit Settings- CV/CC, CV/CP, CV-Ser.Res and CV 7-186
Figure 7-94. User Limit Settings- CC/CV, CC/CP and CC 7-186
Figure 7-95. User Limit Settings- Current (CP/CC) 7-187
Figure 7-96. Output Sense Settings 7-187
Figure 7-97. PONS Main Screen – CV/CC 7-188
Figure 7-98. PONS Main Screen – CV-Ser. Res 7-188
Figure 7-99. PONS Main Screen – CV/CP 7-189
Figure 7-100. PONS Main Screen – CV 7-189
Figure 7-101. PONS Main Screen – CC/CV 7-190
Figure 7-102. PONS Main Screen – CP/CC 7-190
Figure 7-103. PONS Main Screen – CC/CP 7-191
Figure 7-104. PONS Main Screen - CC 7-191
Figure 7-105. PONS Operating Mode Settings 7-191
Figure 7-106. PONS regulation Settings 7-192
Figure 7-107. Delay Screen 7-193
Figure 7-108. PONS regulation Settings 7-193
Figure 7-109. Delay Screen 7-194
Figure 7-110. Pons Output Program mode – CV/CC and CV 7-195
Figure 7-111. PONS Voltage Settings 7-195
Figure 7-112. PONS Positive Current Limit Settings 7-196
Figure 7-113. PONS Positive Current Limit Settings 7-196
Figure 7-114. PONS Positive Power Limit Setting 7-196
Figure 7-115. PONS Negative Power Limit Setting 7-197
Figure 7-116. Pons Output Program mode – CV -Ser. Res 7-197

Figure 7-117. PONS Voltage Settings 7-198
Figure 7-118. PONS Series resistance setting 7-198
Figure 7-119. PONS Voltage high limit setting 7-199
Figure 7-120. PONS Voltage low limit setting 7-199
Figure 7-121. PONS **Positive Current Limit** ***Settings*** 7-199
Figure 7-122. PONS Negative Current Limit Setting 7-200
Figure 7-123. PONS Positive Power Limit Settings 7-200
Figure 7-124. PONS Negative Power Limit Setting 7-201
Figure 7-125. Pons Output Program mode – CC/CV, CC/CP and CC 7-201
Figure 7-126. PONS Current Setting 7-201
Figure 7-127. PONS Voltage High Setting 7-202
Figure 7-128. PONS Voltage Low Settings 7-202
Figure 7-129. PONS Positive Power Limit 7-202
Figure 7-130. PONS Negative Power Limit 7-203
Figure 7-131. Pons Output Program mode – CC/CP 7-203
Figure 7-132. PONS Power Setting 7-204
Figure 7-133. PONS Voltage High Setting 7-204
Figure 7-134. PONS Voltage Low Settings 7-204
Figure 7-135. PONS Positive Current Limit 7-205
Figure 7-136. PONS Negative Current Limit 7-205
Figure 7-137. PONS Configuration mode 7-206
Figure 7-138. PONS Protection Settings 7-206
Figure 7-139. PONS Slew Rate Settings – Voltage 7-207
Figure 7-140. PONS Slew Rate Settings – Current(CC/CV, CV/CP and CC) 7-208
Figure 7-141. Slew Rate Settings – Power (CP/CC) 7-208
Figure 7-142. PONS User Limit Settings - Voltage 7-208
Figure 7-143. PONS User Limit Settings – Current (CC/CV, CC/CP and CC) 7-209
Figure 7-144. User Limit Settings- Current (CP/CC) 7-209
Figure 7-145. PONS External Relay Settings 7-209
Figure 7-146. PONS Output Sense Settings 7-210
Figure 7-147. PONS Measurement Average Samples 7-210
Figure 7-148. PONS remote Inhibit 7-211
Figure 7-149. AC Input Line Settings 7-212
Figure 7-150. PONS Analog Screen 7-212
Figure 7-151. PONS Analog Mode Settings 7-212
Figure 7-152. PONS Configure Analog Mode Settings 7-213
Figure 7-153. PONS Voltage Reference Mode 7-213
Figure 7-154. Dashboard Screen – Voltage (EXT) 7-213
Figure 7-155. Output Program Screen – Voltage (EXT) 7-214
Figure 7-156. PONS Voltage Reference Mode – Resistive 7-214
Figure 7-157. PONS Current Reference Mode 7-215

Figure 7-158. Dashboard Screen – Current (EXT) 7-215
Figure 7-159. PONS OVP Reference Mode 7-215
Figure 7-160. Measurement Average Samples 7-216
Figure 7-161. Control Interface Screen Top-Level Menu 7-217
Figure 7-162. LAN Screen 7-217
Figure 7-163. LAN Settings 7-218
Figure 7-164. Configure LAN 7-218
Figure 7-165. LAN Screen – DHCP 7-218
Figure 7-166. LAN Screen - Auto -IP 7-219
Figure 7-167. LAN Screen - IP Address 7-219
Figure 7-168. LAN Screen - Subnet Mask 7-220
Figure 7-169. LAN Screen - Gateway Address 7-220
Figure 7-170. LAN Screen -Port 7-221
Figure 7-171. MAC Address 7-221
Figure 7-172. LAN Screen - Host Name 7-221
Figure 7-173. LAN Screen – Apply 7-222
Figure 7-174. LAN Screen - Applying LAN Settings 7-222
Figure 7-175. RS232 Screen -Settings 7-223
Figure 7-176. RS232 Screen -Configure 7-223
Figure 7-177. Baud Rate Selection 7-223
Figure 7-178. PONS Remote Inhibit 7-224
Figure 7-179. Analog Screen 7-225
Figure 7-180. Analog Mode Settings 7-225
Figure 7-181. Configure Analog Mode Settings 7-225
Figure 7-182. Voltage Reference Mode 7-226
Figure 7-183. Dashboard Screen – Voltage (EXT) 7-226
Figure 7-184. Output Program Screen – Voltage (EXT) 7-226
Figure 7-185. Voltage Reference Mode – Resistive 7-227
Figure 7-186. Current Reference Mode 7-227
Figure 7-187. Dashboard Screen – Current (EXT) 7-227
Figure 7-188. OVP Reference Mode 7-228
Figure 7-189. USB Setting 7-228
Figure 7-190. Operating Mode 7-229
Figure 7-191. System Settings Screen 7-229
Figure 7-192. System Status 7-230
Figure 7-193. Hardware Limits 7-230
Figure 7-194. System Details 7-230
Figure 7-195. Firmware Version 7-231
Figure 7-196. LCD 7-231
Figure 7-197. Default Screen Settings - Enabled 7-231
Figure 7-198. Default Screen Settings - Disabled 7-232

Figure 7-199. Factory Default 7-232
Figure 7-200. System Faults 7-233
Figure 7-201. No Fault Occurred Screen 7-233
Figure 7-202. Parallel Connection 7-235
Figure 8-1. Current Type UUT 8-236
Figure 8-2. Voltage Type UUT 8-243
Figure 8-3. Home Screen Top-Level Menu 8-250
Figure 8-4. Regulation Settings – Voltage 8-251
Figure 8-5. Regulation Settings – Current 8-251
Figure 8-6. Dashboard Screen in Voltage CV/CC Regulation setting 8-252
Figure 8-7. Dashboard Screen in Voltage CV/CP Regulation setting 8-252
Figure 8-8. Dashboard Screen in Voltage CV Regulation setting 8-253
Figure 8-9. Dashboard Screen in Voltage CP/CV Regulation setting 8-254
Figure 8-10. Dashboard Screen in CV-Ser. Res Regulation setting 8-255
Figure 8-11. Dashboard Screen in Current CC/CV Regulation setting 8-257
Figure 8-12. Dashboard Screen in Current CC/CP Regulation setting 8-257
Figure 8-13. Dashboard Screen in Current CC Regulation setting 8-257
Figure 8-14. Dashboard Screen in Current CP/CC Regulation setting 8-259
Figure 8-15. Real-Time, Immediate Output Parameter Adjustment 8-260
Figure 8-16. Default Screen 8-260
Figure 8-17. Output Program Screen of CV/CC, CV/CP and CV mode 8-261
Figure 8-18. Voltage setting screen 8-261
Figure 8-19. Positive Current limit setting screen 8-262
Figure 8-20. Positive Power limit setting screen 8-262
Figure 8-21. Output State Settings 8-263
Figure 8-22. Output Program Screen of CV Ser. Res mode 8-263
Figure 8-23. Voltage Setting 8-264
Figure 8-24. Series Resistance Setting 8-264
Figure 8-25. Positive Current Limit 8-264
Figure 8-26. Voltage Low Setting 8-265
Figure 8-27. Positive Power Limit 8-265
Figure 8-28. Output State 8-265
Figure 8-29. Output Program Screen of CP/CV mode 8-266
Figure 8-30. Power Settings 8-266
Figure 8-31. Volt High Setting 8-267
Figure 8-32. Voltage Low Setting 8-267
Figure 8-33. Pos. Current Limit Setting 8-267
Figure 8-34. Output State 8-268
Figure 8-35. Output Program Screen of CC/CV,CC/CP and CC mode 8-268
Figure 8-36. Current Setting 8-269
Figure 8-37. Voltage High Setting 8-269

Figure 8-38. Voltage Low Settings 8-269
Figure 8-39. Positive Power Limit 8-270
Figure 8-40. Output State Settings 8-270
Figure 8-41. Output Program Settings in CP/CC mode 8-271
Figure 8-42. Power Settings 8-271
Figure 8-43. Volt High Setting 8-272
Figure 8-44. Volt Low Setting 8-272
Figure 8-45. Pos. Current Limit Setting 8-272
Figure 8-46. Output State 8-273
Figure 8-47. Measurements Screen 8-273
Figure 8-48. Voltage Ramp Screen 8-274
Figure 8-49. From Voltage 8-274
Figure 8-50. To Voltage 8-275
Figure 8-51. Software Trigger Mode 8-275
Figure 8-52. Hardware Trigger Mode 8-276
Figure 8-53. Time 8-276
Figure 8-54. Set Limits – CV/CC and CV 8-276
Figure 8-55. Set Limits – CV – Ser.Res 8-277
Figure 8-56. Set Limits – CV/CP 8-277
Figure 8-57. Initializing 8-278
Figure 8-58. Trigger Ramp 8-278
Figure 8-59. Abort 8-279
Figure 8-60. Status – IDLE 8-279
Figure 8-61. Status – Initializing 8-280
Figure 8-62. Status – Waiting for Trigger 8-280
Figure 8-63. Status – Running 8-280
Figure 8-64. Status – Aborted 8-281
Figure 8-65. Status- Completed 8-281
Figure 8-66. Voltage ramp – CP/CV 8-283
Figure 8-67. Current Ramp Screen 8-283
Figure 8-68. From Current 8-284
Figure 8-69. To Current 8-284
Figure 8-70. SW Mode 8-285
Figure 8-71. HW Mode 8-285
Figure 8-72. Time 8-286
Figure 8-73. Set Limits - CC/CV, CC/CP and CC 8-286
Figure 8-74. Initializing 8-287
Figure 8-75. Trigger Ramp 8-287
Figure 8-76. Abort – SW 8-288
Figure 8-77. Status – IDLE 8-288
Figure 8-78. Status - Initializing 8-289

Figure 8-79. Status – Waiting for Trigger 8-289
Figure 8-80. Status – Running 8-289
Figure 8-81. Status – Aborted 8-290
Figure 8-82. Status- Completed 8-290
Figure 8-83. Current Ramp - CP/CC 8-292
Figure 8-84. Configuration Screen Top-Level Menu 8-292
Figure 8-85. Regulation Settings – CV/CC, CV-Ser. Res, CV/CP, CP/CV and CV 8-293
Figure 8-86. Delay Screen 8-294
Figure 8-87. Regulation Settings – CC/CV,CC/CP, CP/CC, and CC 8-294
Figure 8-88. Delay Screen 8-295
Figure 8-89. Slew Rate Settings - Voltage (CV/CC, CV-Ser.Res, CV/CP and CV) 8-296
Figure 8-90. Slew Rate Settings – Power (CP/CV) 8-297
Figure 8-91. Slew Rate Settings – Current (CC/CV, CC/CP and CC) 8-298
Figure 8-92. Slew Rate Settings – Power (CP/CC) 8-299
Figure 8-93. Protection Settings 8-299
Figure 8-94. External Relay Settings 8-300
Figure 8-95. User Limit Settings- Voltage (CV/CC, CV-Ser.Res, CV/CP and CV) 8-300
Figure 8-96. User Limit Settings- Voltage (CP/CV) 8-301
Figure 8-97. User Limit Settings- Current (CC/CV, CC/CP and CC) 8-301
Figure 8-98. User Limit Settings- Current (CP/CC) 8-302
Figure 8-99. Output Sense Settings 8-302
Figure 8-100. PONS Main Screen – CV/CC 8-303
Figure 8-101. PONS Main Screen – CV-Ser. Res 8-303
Figure 8-102. PONS Main Screen – CV/CP 8-304
Figure 8-103. PONS Main Screen – CP/CV 8-304
Figure 8-104. PONS Main Screen - CV 8-304
Figure 8-105. PONS Main Screen – CC/CV 8-305
Figure 8-106. PONS Main Screen – CC/CP 8-305
Figure 8-107. PONS Main Screen – CP/CC 8-306
Figure 8-108. PONS Main Screen – CC 8-306
Figure 8-109. PONS Operating Mode Settings 8-307
Figure 8-110. PONS regulation Settings 8-307
Figure 8-111. Delay Screen 8-308
Figure 8-112. PONS regulation Settings 8-309
Figure 8-113. Delay Screen 8-310
Figure 8-114. Pons Output Program mode – CV/CC, CV/CP and CV 8-310
Figure 8-115. PONS Voltage Settings 8-311
Figure 8-116. PONS Positive Current Limit Settings 8-311

Figure 8-117. PONS Positive Power Limit Setting 8-311
Figure 8-118. Pons Output Program mode – CV -Ser. Res 8-312
Figure 8-119. PONS Voltage Settings 8-312
Figure 8-120. PONS Series Resistance *Settings* 8-313
Figure 8-121. PONS Positive Current Limit Settings 8-313
Figure 8-122. PONS Voltage Low *Settings* 8-313
Figure 8-123. PONS Positive Power Limit Setting 8-314
Figure 8-124. Pons Output Program mode – CP/CV 8-314
Figure 8-125. Power Settings 8-315
Figure 8-126. Voltage High Setting 8-315
Figure 8-127. Voltage Low Setting 8-315
Figure 8-128. Pos. Current Limit Setting 8-316
Figure 8-129. Pons Output Program mode –CC/CV, CC/CP and CC 8-316
Figure 8-130. Current Setting 8-317
Figure 8-131. Voltage High Setting 8-317
Figure 8-132. Voltage Low Settings 8-317
Figure 8-133. Positive Power Limit 8-318
Figure 8-134. Output State Settings 8-318
Figure 8-135. Pons Output Program mode – CP/CC 8-319
Figure 8-136. PONS Power Settings 8-319
Figure 8-137. PONS Voltage High Setting 8-320
Figure 8-138. PONS Volt Low Setting 8-320
Figure 8-139. PONS Pos. Current Limit Setting 8-321
Figure 8-140. PONS Configuration mode 8-321
Figure 8-141. PONS Protection Settings 8-321
Figure 8-142. PONS Slew Rate Settings – Voltage (CV/CC, CV-Ser.Res, CV/CP and CV) 8-322
Figure 8-143. PONS Slew Rate Settings – Current (CC/CV, CC/CP and CC) 8-323
Figure 8-144. PONS Slew Rate Settings – Power (CP/CV and CP/CC) 8-323
Figure 8-145. PONS User Limit Settings- Current (CC/CV, CC/CP and CC) 8-324
Figure 8-146. PONS User Limit Settings – Voltage (CV/CC, CV-Ser.Res, CV/CP and CV) 8-324
Figure 8-147. PONS User Limit Settings – Power (CP/CV and CP/CC) 8-324
Figure 8-148. PONS External Relay Settings 8-325
Figure 8-149. PONS Output Sense Settings 8-325
Figure 8-150. PONS Measurement Average Samples 8-326
Figure 8-151. PONS remote Inhibit 8-327
Figure 8-152. AC Input Line Settings 8-327
Figure 8-153. PONS Analog Screen 8-327
Figure 8-154. PONS Analog Mode Settings 8-328
Figure 8-155. PONS Configure Analog Mode Settings 8-328

Figure 8-156. PONS Voltage Reference Mode 8-329
Figure 8-157. Dashboard Screen – Voltage (EXT) 8-329
Figure 8-158. Output Program Screen – Voltage (EXT) 8-329
Figure 8-159. PONS Voltage Reference Mode – Resistive 8-330
Figure 8-160. PONS Current Reference Mode 8-330
Figure 8-161. Dashboard Screen – Current (EXT) 8-330
Figure 8-162. PONS OVP Reference Mode 8-331
Figure 8-163. Measurement Average Samples 8-331
Figure 8-164. Control Interface Screen Top-Level Menu 8-332
Figure 8-165. LAN Screen 8-333
Figure 8-166. LAN Settings 8-333
Figure 8-167. Configure LAN 8-334
Figure 8-168. LAN Screen – DHCP 8-334
Figure 8-169. LAN Screen - Auto -IP 8-335
Figure 8-170. LAN Screen - IP Address 8-335
Figure 8-171. LAN Screen - Subnet Mask 8-335
Figure 8-172. LAN Screen - Gateway Address 8-336
Figure 8-173. LAN Screen -Port 8-336
Figure 8-174. MAC Address 8-336
Figure 8-175. LAN Screen - Host Name 8-337
Figure 8-176. LAN Screen – Apply 8-337
Figure 8-177. LAN Screen - Applying LAN Settings 8-337
Figure 8-178. RS232 Screen -Settings 8-338
Figure 8-179. RS232 Screen -Configure 8-338
Figure 8-180. Baud Rate Selection 8-339
Figure 8-181. PONS remote Inhibit 8-340
Figure 8-182. Analog Screen 8-340
Figure 8-183. Analog Mode Settings 8-340
Figure 8-184. Configure Analog Mode Settings 8-341
Figure 8-185. Voltage Reference Mode 8-341
Figure 8-186. Dashboard Screen – Voltage (EXT) 8-341
Figure 8-187. Output Program Screen – Voltage (EXT) 8-342
Figure 8-188. Voltage Reference Mode – Resistive 8-342
Figure 8-189. Current Reference Mode 8-342
Figure 8-190. Dashboard Screen – Current (EXT) 8-343
Figure 8-191. OVP Reference Mode 8-343
Figure 8-192. USB Setting 8-343
Figure 8-193. Operating Mode Settings 8-344
Figure 8-194. System Settings Screen 8-344
Figure 8-195. System Status 8-345
Figure 8-196. Hardware Limits 8-345

Figure 8-197. System Details 8-345
Figure 8-198. Firmware Version 8-346
Figure 8-199. LCD 8-346
Figure 8-200. Default Screen Settings - Enabled 8-347
Figure 8-201. Default Screen Settings – Disabled 8-347
Figure 8-202. Factory Default 8-347
Figure 8-203. System Faults 8-348
Figure 8-204. No Fault Occurred Screen 8-348
Figure 8-205. Parallel Connection 8-350
Figure 9-1. Current Type UUT 9-352
Figure 9-2. Voltage Type UUT 9-360
Figure 9-3. Home Screen Top-Level Menu 9-367
Figure 9-4. Regulation Settings – Voltage 9-368
Figure 9-5. Regulation Settings – Current 9-368
Figure 9-6. Dashboard Screen in Voltage CV/CC Regulation setting 9-369
Figure 9-7. Dashboard Screen in Voltage CV/CP Regulation setting 9-369
Figure 9-8. Dashboard Screen in Voltage CV Regulation setting 9-370
Figure 9-9. Dashboard Screen in CR/CV Regulation setting 9-371
Figure 9-10. Dashboard Screen in Voltage CP/CV Regulation setting 9-372
Figure 9-11. Dashboard Screen in Current CC/CV Regulation setting 9-374
Figure 9-12. Dashboard Screen in Current CC/CP Regulation setting 9-374
Figure 9-13. Dashboard Screen in Current CC Regulation setting 9-374
Figure 9-14. Dashboard Screen in Current CP/CC Regulation setting 9-376
Figure 9-15. Dashboard Screen in CR/CV Regulation setting 9-377
Figure 9-16. Real-Time, Immediate Output Parameter Adjustment 9-378
Figure 9-17. Default Screen 9-379
Figure 9-18. Output Program Screen of CV/CC and CV mode 9-380
Figure 9-19. Voltage setting screen 9-380
Figure 9-20. Negative Current limit setting screen 9-381
Figure 9-21. Negative Power limit setting screen 9-381
Figure 9-22. Output State Settings 9-381
Figure 9-23. Output Program Screen of CP/CV mode 9-382
Figure 9-24. Power Setting 9-382
Figure 9-25. Volt High Limit Setting 9-383
Figure 9-26. Volt Low Limit Setting 9-383
Figure 9-27. Negative Current Limit Setting 9-383
Figure 9-28. Output State 9-384
Figure 9-29. Output Program Screen of CV Ser. Res mode 9-384
Figure 9-30. Series Resistance Setting 9-385
Figure 9-31. Voltage High Limit Setting 9-385
Figure 9-32. Voltage Low Limit Setting 9-385

Figure 9-33. Negative Current limit setting screen 9-386
Figure 9-34. Negative Power limit setting screen 9-386
Figure 9-35. Output State 9-386
Figure 9-36. Output Program Screen of CC/CV, CC/CP and CC mode 9-387
Figure 9-37. Current Setting 9-387
Figure 9-38. Voltage High Setting 9-388
Figure 9-39. Voltage Low Setting 9-388
Figure 9-40. Negative Power Limit 9-388
Figure 9-41. Output State Settings 9-389
Figure 9-42. Output State Settings in CP/CC 9-389
Figure 9-43. Power Settings 9-390
Figure 9-44. Voltage High Limit Setting 9-390
Figure 9-45. Voltage Low Limit Setting 9-390
Figure 9-46. Negative Current Limit Setting 9-391
Figure 9-47. Output State 9-391
Figure 9-48. Output Program Screen of CR/CC mode 9-392
Figure 9-49. Series Resistance Setting 9-392
Figure 9-50. Voltage High Limit Setting 9-392
Figure 9-51. Voltage Low Limit Setting 9-393
Figure 9-52. Negative Current limit setting screen 9-393
Figure 9-53. Negative Power limit setting screen 9-393
Figure 9-54. Output State 9-394
Figure 9-55. Measurements Screen 9-394
Figure 9-56. Voltage Ramp Screen 9-395
Figure 9-57. From Voltage 9-395
Figure 9-58. To Voltage 9-396
Figure 9-59. Software Trigger Mode 9-396
Figure 9-60. Hardware Trigger Mode 9-397
Figure 9-61. Time 9-397
Figure 9-62. Set Limits – CV/CC, CV/CP and CV 9-397
Figure 9-63. Set Limits – CR/CV 9-398
Figure 9-64. Initializing 9-398
Figure 9-65. Trigger Ramp 9-399
Figure 9-66. Abort 9-399
Figure 9-67. Status – IDLE 9-400
Figure 9-68. Status – Initializing 9-400
Figure 9-69. Status – Waiting for Trigger 9-401
Figure 9-70. Status – Running 9-401
Figure 9-71. Status – Aborted 9-401
Figure 9-72. Status- Completed 9-402
Figure 9-73. Voltage ramp – CP/CV 9-404

Figure 9-74. Current Ramp Screen 9-404
Figure 9-75. From Current 9-405
Figure 9-76. To Current 9-405
Figure 9-77. SW Mode 9-405
Figure 9-78. HW Mode 9-406
Figure 9-79. Time 9-406
Figure 9-80. Set Limits - CC/CV, CC/CP and CC 9-407
Figure 9-81. Set Limits – CR/CC 9-407
Figure 9-82. Initializing 9-408
Figure 9-83. Trigger Ramp 9-408
Figure 9-84. Abort – SW 9-409
Figure 9-85. Status – IDLE 9-409
Figure 9-86. Status - Initializing 9-410
Figure 9-87. Status – Waiting for Trigger 9-410
Figure 9-88. Status – Running 9-410
Figure 9-89. Status – Aborted 9-411
Figure 9-90. Status- Completed 9-411
Figure 9-91. Current Ramp - CP/CC 9-413
Figure 9-92. Configuration Screen Top-Level Menu 9-413
Figure 9-93. Regulation Settings – CV/CC, CR/CV, CV/CP, CP/CV and CV 9-414
Figure 9-94. Delay Screen 9-415
Figure 9-95. Regulation Settings – CC/CV, CR/CC, CP/CC, CC/CP and CC 9-415
Figure 9-96. Delay Screen 9-416
Figure 9-97. Slew Rate Settings – Voltage (CV/CC, CV/CP and CV) 9-417
Figure 9-98. Slew Rate Settings – Voltage (CP/CV) 9-418
Figure 9-99. Slew Rate Settings – Current (CC/CV and CC) 9-419
Figure 9-100. Slew Rate Settings – Current (CP/CV) 9-420
Figure 9-101. Slew Rate Settings – CR/CV and CR/CC 9-421
Figure 9-102. Protection Settings 9-421
Figure 9-103. Isolation Relay 9-422
Figure 9-104. User Limit Settings- Voltage (CV/CC, CV/CP and CV) 9-422
Figure 9-105. User Limit Settings- Power Low Limit (CP/CV) 9-423
Figure 9-106. User Limit Settings- Current (CC/CV, CC/CP and CC) 9-423
Figure 9-107. User Limit Settings- Power Low Limit (CP/CC) 9-424
Figure 9-108. User Limit Settings- CR/CV and CR/CC 9-424
Figure 9-109. Output Sense Settings 9-425
Figure 9-110. PONS Main Screen – CV/CC 9-425
Figure 9-111. PONS Main Screen – CR/CV 9-426
Figure 9-112. PONS Main Screen – CP/CV 9-426
Figure 9-113. PONS Main Screen – CV/CP 9-427
Figure 9-114. PONS Main Screen - CV 9-427

Figure 9-115. PONS Main Screen – CC/CV 9-427
Figure 9-116. PONS Main Screen – CP/CC 9-428
Figure 9-117. PONS Main Screen – CC/CP 9-428
Figure 9-118. PONS Main Screen – CR/CC 9-428
Figure 9-119. PONS Main Screen – CC 9-429
Figure 9-120. PONS Operating Mode Settings 9-429
Figure 9-121. PONS regulation Settings 9-430
Figure 9-122. Delay Screen 9-431
Figure 9-123. PONS regulation Settings 9-431
Figure 9-124. Delay Screen 9-432
Figure 9-125. Pons Output Program mode – CV/CC and CV 9-433
Figure 9-126. PONS Voltage Settings 9-433
Figure 9-127. PONS Negative Current Limit Settings 9-434
Figure 9-128. PONS Negative Power Limit Setting 9-434
Figure 9-129. Pons Output Program mode – CR/CV 9-435
Figure 9-130. Series Resistance Setting 9-435
Figure 9-131. Voltage High Limit Setting 9-436
Figure 9-132. Voltage Low Limit Setting 9-436
Figure 9-133. Negative Current limit setting screen 9-436
Figure 9-134. Negative Power limit setting screen 9-437
Figure 9-135. Pons Output Program mode – CP/CV 9-437
Figure 9-136. PONS Power Setting 9-438
Figure 9-137. Voltage High Limit Setting 9-438
Figure 9-138. Voltage Low Limit Setting 9-438
Figure 9-139. Negative Current Limit Setting 9-439
Figure 9-140. Pons Output Program mode –CC/CV and CC 9-439
Figure 9-141. Current Setting 9-440
Figure 9-142. Voltage High Setting 9-440
Figure 9-143. Voltage Low Setting 9-440
Figure 9-144. Positive Power Limit 9-441
Figure 9-145. Pons Output Program mode – CP/CC 9-441
Figure 9-146. Power Settings 9-442
Figure 9-147. Volt High Setting 9-442
Figure 9-148. Volt Low Setting 9-442
Figure 9-149. Negative Current Limit Setting 9-443
Figure 9-150. PONS Output Program – CR/CC 9-443
Figure 9-151. Series Resistance Setting 9-444
Figure 9-152. Voltage High Limit Setting 9-444
Figure 9-153. Voltage Low Limit Setting 9-444
Figure 9-154. Negative Current limit setting screen 9-445
Figure 9-155. Positive Power limit setting screen 9-445

Figure 9-156. PONS Configuration mode 9-446
Figure 9-157. PONS Protection Settings 9-446
Figure 9-158. PONS Slew Rate Settings – Voltage (CV/CC, CR/CV CV/CP and CV) 9-447
Figure 9-159. PONS Slew Rate Settings – Current (CC/CV, CC/CP, CR/CC and CC) 9-448
Figure 9-160. PONS Slew Rate Settings – Power (CP/CV and CP/CC) 9-448
Figure 9-161. PONS External Relay Settings 9-448
Figure 9-162. PONS User Limit Settings- Voltage (CV/CC, CV/CP and CV) 9-449
Figure 9-163. PONS User Limit Settings – Current (CC/CV, CC/CP and CC) 9-449
Figure 9-164. PONS User Limit Settings- Power (CP/CV and CP/CC) 9-449
Figure 9-165. User Limit Settings- CR/CV and CR/CC 9-450
Figure 9-166. PONS Output Sense Settings 9-450
Figure 9-167. PONS Measurement Average Samples 9-450
Figure 9-168. PONS remote Inhibit 9-451
Figure 9-170. PONS Analog Screen 9-452
Figure 9-171. PONS Analog Mode Settings 9-452
Figure 9-172. PONS Configure Analog Mode Settings 9-453
Figure 9-173. PONS Voltage Reference Mode 9-453
Figure 9-174. Dashboard Screen – Voltage (EXT) 9-453
Figure 9-175. Output Program Screen – Voltage (EXT) 9-454
Figure 9-176. PONS Voltage Reference Mode – Resistive 9-454
Figure 9-177. PONS Current Reference Mode 9-455
Figure 9-178. Dashboard Screen – Current (EXT) 9-455
Figure 9-179. PONS OVP Reference Mode 9-455
Figure 9-180. Measurement Average Samples 9-456
Figure 9-181. Control Interface Screen Top-Level Menu 9-457
Figure 9-182. LAN Screen 9-457
Figure 9-183. LAN Settings 9-458
Figure 9-184. Configure LAN 9-458
Figure 9-185. LAN Screen – DHCP 9-458
Figure 9-186. LAN Screen - Auto -IP 9-459
Figure 9-187. LAN Screen - IP Address 9-459
Figure 9-188. LAN Screen - Subnet Mask 9-460
Figure 9-189. LAN Screen - Gateway Address 9-460
Figure 9-190. LAN Screen -Port 9-461
Figure 9-191. MAC Address 9-461
Figure 9-192. LAN Screen - Host Name 9-461
Figure 9-193. LAN Screen – Apply 9-462
Figure 9-194. LAN Screen - Applying LAN Settings 9-462
Figure 9-195. RS232 Screen -Settings 9-463

Figure 9-196. RS232 Screen -Configure 9-463
Figure 9-197. Baud Rate Selection 9-463
Figure 9-198. PONS remote Inhibit 9-464
Figure 9-199. Analog Screen 9-465
Figure 9-200. Analog Mode Settings 9-465
Figure 9-201. Configure Analog Mode Settings 9-465
Figure 9-202. Voltage Reference Mode 9-466
Figure 9-203. Dashboard Screen – Voltage (EXT) 9-466
Figure 9-204. Output Program Screen – Voltage (EXT) 9-466
Figure 9-205. Voltage Reference Mode – Resistive 9-467
Figure 9-206. Current Reference Mode 9-467
Figure 9-207. Dashboard Screen – Current (EXT) 9-468
Figure 9-208. OVP Reference Mode 9-468
Figure 9-209. USB Setting 9-468
Figure 9-210. Operating Mode Settings 9-469
Figure 9-211. System Settings Screen 9-470
Figure 9-212. System Status 9-470
Figure 9-213. Hardware Limits 9-470
Figure 9-214. System Details 9-471
Figure 9-215. Firmware Version 9-471
Figure 9-216. LCD 9-472
Figure 9-217. Default Screen Settings- Enabled 9-472
Figure 9-218. Default Screen Settings- Disabled 9-472
Figure 9-219. Factory Default 9-473
Figure 9-220. System Faults 9-473
Figure 9-221. No Fault Occurred Screen 9-474
Figure 9-222. Parallel Connection 9-475
Figure 10-1. Voltage Type UUT 10-476
Figure 10-2. Home Screen Top-Level Menu 10-480
Figure 10-3. PVSIM mode Selection Setting 10-481
Figure 10-4. Dashboard Screen (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type - SNL) 10-482
Figure 10-5. EN50530 Test Type Settings - Static 10-483
Figure 10-6. EN50530 Test Type Settings- Dynamic 10-484
Figure 10-7. EN50530 Test Type Settings 10-484
Figure 10-8. Dashboard Screen in Static Test Type 10-485
Figure 10-9. Dashboard Screen in Dynamic Test Type 10-486
Figure 10-10. Dashboard Screen, Curve Type (Oper. Type -Steady State, Oper. Mode - Standard and Curve Type - Userdefined) 10-487
Figure 10-11. Dashboard Screen (Oper. Type – Profile and Curve Type – Array) 10-488

Figure 10-12. Dashboard Screen (Oper. Type – Profile and Curve Type – SNL) 10-489
Figure 10-13. EN50530 Test Type Settings - Static 10-490
Figure 10-14. EN50530 Test Type Settings – Dynamic 10-490
Figure 10-15. Dashboard Screen (Oper. Type – Profile, Test type – Static and Curve Type – EN50530) 10-491
Figure 10-16. Dashboard Screen (Oper. Type – Profile, Test Type – Dynamic and Curve Type – EN50530) 10-491
Figure 10-17. Real-Time, Immediate Output Parameter Adjustment 10-492
Figure 10-18. Default Screen 10-493
Figure 10-19. Output Program Screen (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type – SNL) 10-494
Figure 10-20. Irradiance Setting 10-494
Figure 10-21. Temperature Setting 10-495
Figure 10-22. Output State Settings 10-495
Figure 10-23. Output Program Screen (Curve type – EN50530 and Test type - Static) 10-496
Figure 10-24. Rated Power Setting 10-496
Figure 10-25. Rated Voltage Setting 10-497
Figure 10-26. Output State Settings 10-497
Figure 10-27. Output Program Screen 10-498
Figure 10-28. Irradiance Setting 10-498
Figure 10-29. Temperature Setting 10-499
Figure 10-30. Rated Power Setting 10-499
Figure 10-31. Rated Voltage Setting 10-499
Figure 10-32. Output State Settings 10-500
Figure 10-33. Output Program Screen (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type - User) 10-500
Figure 10-34. Output State Settings 10-501
Figure 10-35. Output Program Screen (Oper. Type – Array) 10-502
Figure 10-36. Output State Settings 10-502
Figure 10-37. Output Program Screen (Oper. Type – Profile and Curve Type – SNL or EN50530) 10-503
Figure 10-38. Output State Settings 10-504
Figure 10-39. Measurement Screen 10-504
Figure 10-40. PVSIM mode Selection Setting 10-505
Figure 10-41. PVSIM Mode Selection Settings (Oper. Type -Steady State, Oper. Mode- Standard and Curve type – SNL) 10-506
Figure 10-42. PVSIM Mode Selection Settings (Oper. Type -Steady State, Oper. Mode- Standard and Curve type – EN50530) 10-506
Figure 10-43. PVSIM Mode Selection Settings (Oper. Type -Steady State, Oper. Mode- Standard and Curve type – User) 10-507

Figure 10-44. PVSIM Mode Selection Settings (Oper. Type -Profile or Oper. Mode - Array) 10-507
Figure 10-45. PVSIM Mode Selection Settings (Oper. Type -Steady State and Oper. Mode - Array) 10-508
Figure 10-46. PVSIM Mode Selection Settings (Oper. Type -Profile and Curve Type - SNL) 10-508
Figure 10-47. PVSIM Mode Selection Settings (Oper. Type -Profile and Curve Type – EN50530) 10-509
Figure 10-48. Configuration Screen (Curve Type – SNL or User) 10-510
Figure 10-49. Curve Selection Settings - Upload button enabled (Curve Type - SNL) 10-511
Figure 10-50. Curve Selection 10-511
Figure 10-51. Alpha - numeric keypad 10-512
Figure 10-52. Curve Settings 10-513
Figure 10-53. Curve Setting - Fill factor enabled 10-513
Figure 10-54. Curve Setting - Screen 2 10-514
Figure 10-55. Curve Selection Settings - Upload button enabled 10-515
Figure 10-56. Curve Setting - Upload Disabled and Delete Option 10-515
Figure 10-57. Curve Selection Settings - Upload button disabled (Curve Type - User) 10-516
Figure 10-58. Protection Settings 10-516
Figure 10-59. External Relay Settings 10-517
Figure 10-60. Output Sense Settings 10-517
Figure 10-61. PONS – Main Screen 10-518
Figure 10-62. PONS Operating Mode Settings 10-518
Figure 10-63. PONS Configuration mode 10-519
Figure 10-64. PONS Protection Settings 10-519
Figure 10-65. PONS Slew Rate Settings – Voltage 10-520
Figure 10-66. PONS Output Sense Settings 10-520
Figure 10-67. PONS Measurement Average Samples 10-520
Figure 10-68. PONS remote Inhibit 10-521
Figure 10-69. AC Input Line Settings 10-522
Figure 10-70. Measurement Average Samples 10-522
Figure 10-71. Configuration Screen (Curve Type – EN50530) 10-523
Figure 10-72. Configuration Screen 10-524
Figure 10-73. EN50530 Configuration (Tech. Type – cSi) 10-524
Figure 10-74. EN50530 Configuration (Tech. Type – Thin Filim) 10-525
Figure 10-75. cSi and Thin Filim Technology Coefficients 10-525
Figure 10-76. Protection Settings 10-527
Figure 10-77. External Relay Settings 10-527
Figure 10-78. Output Sense Settings 10-528
Figure 10-79. PONS – Main Screen 10-528

Figure 10-80. PONS Operating Mode Settings 10-529
Figure 10-81. PONS Configuration mode 10-529
Figure 10-82. PONS Protection Settings 10-530
Figure 10-83. PONS Slew Rate Settings – Voltage 10-530
Figure 10-84. PONS Output Sense Settings 10-530
Figure 10-85. PONS Measurement Average Samples 10-531
Figure 10-86. PONS remote Inhibit 10-532
Figure 10-87. AC Input Line Settings 10-532
Figure 10-88. Measurement Average Samples 10-533
Figure 10-89. Configuration Screen (Oper. Type – Steady State and Oper. Mode – Array) 10-534
Figure 10-90. Protection Settings 10-534
Figure 10-91. External Relay Settings 10-535
Figure 10-92. Output Sense Settings 10-535
Figure 10-93. PONS – Main Screen 10-536
Figure 10-94. PONS Operating Mode Settings 10-536
Figure 10-95. PONS Configuration mode 10-537
Figure 10-96. PONS Protection Settings 10-537
Figure 10-97. PONS Slew Rate Settings – Voltage 10-538
Figure 10-98. PONS Output Sense Settings 10-538
Figure 10-99. PONS Measurement Average Samples 10-538
Figure 10-100. PONS remote Inhibit 10-539
Figure 10-101. AC Input Line Settings 10-540
Figure 10-102. Measurement Average Samples 10-540
Figure 10-103. Configuration Screen (Oper. Type – Profile and Curve type – SNL or EN50530) 10-541
Figure 10-104. Protection Settings 10-542
Figure 10-105. External Relay Settings 10-542
Figure 10-106. Output Sense Settings 10-543
Figure 10-107. PONS – Main Screen 10-543
Figure 10-108. PONS Operating Mode Settings 10-544
Figure 10-109. PONS Configuration mode 10-544
Figure 10-110. PONS Protection Settings 10-545
Figure 10-111. PONS Slew Rate Settings – Voltage 10-545
Figure 10-112. PONS Output Sense Settings 10-545
Figure 10-113. PONS Measurement Average Samples 10-546
Figure 10-114. PONS remote Inhibit 10-547
Figure 10-115. AC Input Line Settings 10-547
Figure 10-116. Measurement Average Samples 10-548
Figure 10-117. Control Interface Screen Top-Level Menu 10-549
Figure 10-118. LAN Screen 10-549

Figure 10-119. LAN Settings 10-550
Figure 10-120. Configure LAN 10-550
Figure 10-121. LAN Screen – DHCP 10-551
Figure 10-122. LAN Screen - Auto -IP 10-551
Figure 10-123. LAN Screen - IP Address 10-552
Figure 10-124. LAN Screen - Subnet Mask 10-552
Figure 10-125. LAN Screen - Gateway Address 10-553
Figure 10-126. LAN Screen -Port 10-553
Figure 10-127. MAC Address 10-553
Figure 10-128. LAN Screen - Host Name 10-554
Figure 10-129. LAN Screen – Apply 10-554
Figure 10-130. LAN Screen - Applying LAN Settings 10-554
Figure 10-131. RS232 Screen -Settings 10-555
Figure 10-132. RS232 Screen -Configure 10-555
Figure 10-133. Baud Rate Selection 10-556
Figure 10-134. PONS remote Inhibit 10-557
Figure 10-135. USB Setting 10-557
Figure 10-136. Operating Mode 10-558
Figure 10-137. System Settings Screen 10-558
Figure 10-138. System Status 10-559
Figure 10-139. Hardware Limits 10-559
Figure 10-140. System Details 10-559
Figure 10-141. Firmware Version 10-560
Figure 10-142. LCD 10-560
Figure 10-143. Default Screen Settings 10-561
Figure 10-144. System Settings Screen - Default Screen Disabled 10-561
Figure 10-145. Factory Default 10-561
Figure 10-146. System Faults 10-562
Figure 10-147. No Fault Occurred Screen 10-562
Figure 10-148. Parallel Connection 10-564
Figure 11-1. Current Type UUT 11-565
Figure 11-2. Home Screen Top-Level Menu 11-568
Figure 11-3. Configuration Screen 11-568
Figure 11-4. Dashboard Screen (BATSIM Profile Type – Battery) 11-569
Figure 11-5. Dashboard Screen (BATSIM Profile Type – Battery) 11-571
Figure 11-6. Real-Time, Immediate Output Parameter Adjustment 11-574
Figure 11-7. Default Screen 11-574
Figure 11-8. Output Program Screen 11-575
Figure 11-9. Output State Settings 11-575
Figure 11-10. Measurement Screen 11-576
Figure 11-11. Configuration Screen Top-Level Menu 11-576

Figure 11-12. BATSIM Profile Type Setting 11-577
Figure 11-13. BATSIM Cut-Off Condition Settings 11-578
Figure 11-14. BATSIM Configuration Settings - Battery 11-579
Figure 11-15. Profile Selection 11-579
Figure 11-16. Alpha - numeric keypad 11-580
Figure 11-17. Cut- Off Conditions Settings 11-581
Figure 11-18. Cut- Off Conditions Settings 11-581
Figure 11-19. BATSIM Configuration Settings - Upload option 11-582
Figure 11-20. Total Battery Pack Values – Battery 11-582
Figure 11-21. BATSIM Configuration Settings - Upload Disabled and Delete option 11-583
Figure 11-22. BATSIM Configuration Settings - Table 11-583
Figure 11-23. Total Battery Pack Values – Table 11-584
Figure 11-24. Protection Settings 11-584
Figure 11-25. Isolation relay 11-585
Figure 11-26. Output Sense Settings 11-585
Figure 11-27. PONS – Main Screen 11-586
Figure 11-28. PONS Operating Mode Settings 11-586
Figure 11-29. PONS Configuration mode 11-587
Figure 11-30. PONS Protection Settings 11-587
Figure 11-31. PONS External Relay Settings 11-588
Figure 11-32. PONS Slew Rate Settings – Voltage 11-588
Figure 11-33. PONS Output Sense Settings 11-589
Figure 11-34. PONS Measurement Average Samples 11-589
Figure 11-35. PONS remote Inhibit 11-590
Figure 11-36. AC Input Line Settings 11-590
Figure 11-37. Measurement Average Samples 11-591
Figure 11-38. Control Interface Screen Top-Level Menu 11-592
Figure 11-39. LAN Screen 11-592
Figure 11-40. LAN Settings 11-593
Figure 11-41. Configure LAN 11-593
Figure 11-42. LAN Screen – DHCP 11-593
Figure 11-43. LAN Screen - Auto -IP 11-594
Figure 11-44. LAN Screen - IP Address 11-594
Figure 11-45. LAN Screen - Subnet Mask 11-595
Figure 11-46. LAN Screen - Gateway Address 11-595
Figure 11-47. LAN Screen -Port 11-596
Figure 11-48. MAC Address 11-596
Figure 11-49. LAN Screen - Host Name 11-596
Figure 11-50. LAN Screen – Apply 11-597
Figure 11-51. LAN Screen - Applying LAN Settings 11-597

Figure 11-52. RS232 Screen -Settings 11-598
Figure 11-53. RS232 Screen -Configure 11-598
Figure 11-54. Baud Rate Selection 11-598
Figure 11-55. PONS remote Inhibit 11-599
Figure 11-56. USB Setting 11-600
Figure 11-57. Operating Mode 11-600
Figure 11-58. System Settings Screen 11-601
Figure 11-59. System Status 11-601
Figure 11-60. Hardware Limits 11-601
Figure 11-61. System Details 11-602
Figure 11-62. Firmware Version 11-602
Figure 11-63. LCD 11-603
Figure 11-64. Default Screen Settings 11-603
Figure 11-65. System Settings Screen - Default Screen Disabled 11-603
Figure 11-66. Factory Default 11-604
Figure 11-67. System Faults 11-604
Figure 11-68. No Fault Occurred Screen 11-605
Figure 11-69. Parallel Connection 11-606
Figure 12-1. Voltage Type UUT 12-607
Figure 12-2. Home Screen Top-Level Menu 12-608
Figure 12-3. Dashboard Screen 12-609
Figure 12-4. Real-Time, Immediate Output Parameter Adjustment 12-611
Figure 12-5. Default Screen 12-611
Figure 12-6. Output Program Screen 12-612
Figure 12-7. Initial Capacity Setting 12-612
Figure 12-8. Charge Voltage Setting 12-613
Figure 12-9. Charge Current Setting 12-613
Figure 12-10. Discharge Voltage Setting 12-614
Figure 12-11. Discharge Current Setting 12-614
Figure 12-12. Output State Settings 12-614
Figure 12-13. Measurement Screen 12-615
Figure 12-14. Configuration Screen Top-Level Menu 12-616
Figure 12-15. Battery Operating Type Settings 12-616
Figure 12-16. Charge Stop Condition Settings 12-617
Figure 12-17. Discharge Stop Condition Settings 12-618
Figure 12-18. BATSIM Configuration Settings - Battery 12-618
Figure 12-19. Profile Selection 12-619
Figure 12-20. Alpha - numeric keypad 12-619
Figure 12-21. Cut- Off Conditions Settings 12-620
Figure 12-22. BATSIM Configuration Settings - Upload option 12-621

Figure 12-23. BATSIM Configuration Settings - Upload Disabled and Delete option 12-621
Figure 12-24. Protection Settings 12-622
Figure 12-25. Isolation Relay 12-622
Figure 12-26. Output Sense Settings 12-623
Figure 12-27. PONS – Main Screen 12-623
Figure 12-28. PONS Operating Mode Settings 12-624
Figure 12-29. PONS Configuration mode 12-624
Figure 12-30. PONS Protection Settings 12-625
Figure 12-31. PONS External Relay Settings 12-625
Figure 12-32. PONS Output Sense Settings 12-626
Figure 12-33. PONS Measurement Average Samples 12-626
Figure 12-34. PONS remote Inhibit 12-627
Figure 12-35. AC Input Line Settings 12-627
Figure 12-36. Measurement Average Samples 12-628
Figure 12-37. Control Interface Screen Top-Level Menu 12-629
Figure 12-38. LAN Screen 12-629
Figure 12-39. LAN Settings 12-630
Figure 12-40. Configure LAN 12-630
Figure 12-41. LAN Screen – DHCP 12-630
Figure 12-42. LAN Screen - Auto -IP 12-631
Figure 12-43. LAN Screen - IP Address 12-631
Figure 12-44. LAN Screen - Subnet Mask 12-632
Figure 12-45. LAN Screen - Gateway Address 12-632
Figure 12-46. LAN Screen -Port 12-633
Figure 12-47. MAC Address 12-633
Figure 12-48. LAN Screen - Host Name 12-633
Figure 12-49. LAN Screen – Apply 12-634
Figure 12-50. LAN Screen - Applying LAN Settings 12-634
Figure 12-51. RS232 Screen -Settings 12-635
Figure 12-52. RS232 Screen -Configure 12-635
Figure 12-53. Baud Rate Selection 12-635
Figure 12-54. PONS remote Inhibit 12-636
Figure 12-55. USB Setting 12-637
Figure 12-56. Operating Mode 12-637
Figure 12-57. System Settings Screen 12-638
Figure 12-58. System Status 12-638
Figure 12-59. Hardware Limits 12-639
Figure 12-60. System Details 12-639
Figure 12-61. Firmware Version 12-639
Figure 12-62. LCD 12-640

Figure 12-63. Default Screen Settings 12-640
Figure 12-64. System Settings Screen - Default Screen Disabled 12-640
Figure 12-65. Factory Default 12-641
Figure 12-66. System Faults 12-641
Figure 12-67. No Fault Occurred Screen 12-642
Figure 12-68. Parallel Connection 12-643

This page intentionally left blank

1 INTRODUCTION

This operational manual describes the installation, operation, calibration, and service of the Mi-BEAM Series power supply models with true extended autoranging output. Representing the latest generation, these models deliver precise output with high accuracy, low disturbance, and fast transient response. With extensive programmability and a user-friendly interface, the power supply offers a rich feature set and functionality, including source and sink capabilities allowing bidirectional power transfer, a simplified color touch screen, remote operation through virtual panels, the fastest and cleanest power available, and built-in islanding detection.

Figure 1-1. Mi-BEAM Series

1.1 GENERAL DESCRIPTION

The Mi-BEAM Series power supply is a one-step solution for testing and validation of various green energy applications such as batteries, battery chargers, motor drives, electric vehicle drives, and solar photovoltaic inverters. These power supplies provide both source and sink characteristics, allowing bidirectional power transfer.

The Mi-BEAM Series power supply is a high-density supply of 37 kilowatts (kW) in a 4U full-rack size. There are three power variants available at 12 kW, 25 kW, and 37 kW. These products are offered with an extended wide range of voltage and current models. The extended wide range channels provide an expanded current and voltage range at the full output power level, enabling the ability to satisfy a wider range of test needs without requiring the purchase of additional models.

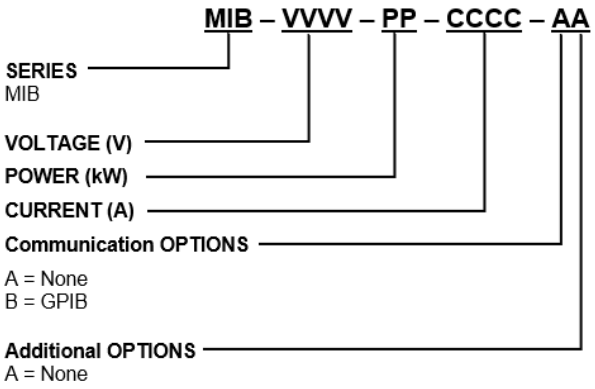
The Mi-BEAM Series is Digital Signal Processor (DSP) controlled and can be operated from the user-friendly front panel touchscreen or through Ethernet LAN Extensions for Instrumentation (LXI), Universal Serial Bus (USB), RS-232 standard control interfaces, as well as through the optional General-Purpose Interface Bus (GPIB) control interfaces.

The Mi-BEAM Series power supply can be operated using a computer application called 'Virtual Panels'. Virtual Panels allows the user to remotely control the Mi-BEAM Series, log data, and monitor the instrument. User can perform all operations using Virtual Panels control just as they would directly with the unit's front panel.

This source comes with Isolated Analog Programming Inputs and Monitor Outputs for output voltage and current. Output is provided with external user I/O for Remote Inhibit, Remote ON/OFF, Status, and Trigger functions.

Additionally, the instrument provides control interface connectors for parallel operation. This feature enables the user to connect and control up to a maximum of 32 power supply units, thereby enabling power levels up to 1200 kW. Refer to Figure 1-2 for decoding of the Mi-Beam Series model number.

Voltage	Power	Current
600V	12kW	50A
600V	25kW	100A
600V	37kW	150A
1500V	25kW	50A
1500V	37kW	50A
2000V	25kW	50A
2000V	37kW	50A



Model Number Example:

MIB-2000-37-0050-AA = Mi-BEAM, 2000V output, 37kW, 50A Output, No Options

Figure 1-2. Model Number Decoding

1.2 KEY BENEFITS

1.2.1 SIMPLE OPERATION

The Mi-Beam Series can be operated entirely from its menu-driven front panel touchscreen. The full-color touch display shows menus, setup data, control and monitor the Output Programming Parameters, Supervisory and Set Point limits, Measurements, and System Settings. Additionally, a variety of standard communication interfaces are available including; LAN, USB, RS-232C and Optional GPIB IEEE-488 interface. This allows the instrument to be easily integrated into an automated test system, providing the fastest and cleanest power up to 2000V, with bidirectional output current capabilities ranging from ±4,800 A to 1.2 MW in a parallel system.

1.2.2 CONFIGURATIONS

The Mi-Beam Series offers three output voltage models 600V, 1500V, and 2000VDC, all within a 4U rack height chassis. The system features full DC source and sink capabilities with power levels ranging from 12 kW to 37 kW. The Mi-Beam Series is fully scalable up to 1.2 MW with parallel systems, and it achieves a regenerative efficiency of 95%. This ability expands the user's test coverage and makes it more versatile power supply.

1.2.3 REMOTE CONTROL

Standard RS-232C, USB, and LAN, along with optional IEEE-488 remote control interfaces, allow programming of all instrument functions from an external computer. The popular Standard Commands for Programmable Instruments (SCPI) command protocol is used for programming.

1.3 TESTING APPLICATIONS

1.3.1 BATTERY SIMULATION

In an era where energy storage technologies are rapidly advancing, the Mi-Beam series offers a robust battery simulation solution that replicates the electrical characteristics of various batteries. This flexibility allows engineers to dynamically adjust the battery parameters, streamlining the development and testing of Battery Management Systems (BMS) for Electric Vehicles (EVs) and renewable energy applications.

1.3.2 BATTERY TESTING

To ensure the reliability and longevity of energy storage systems, battery testing is essential. The Mi-Beam series excels in simulating charge and discharge cycles, delivering detailed insights into battery performance and efficiency. With its programmable features, users can perform wide variety of charging and discharging profiles, enabling comprehensive evaluations of battery health and lifecycle across diverse operating conditions.

1.3.3 SOLAR INVERTER TESTING

With the increasing focus on renewable energy, thorough testing of solar inverters is essential for maximizing system performance. The Mi-BEAM series is designed to emulate different PV panel and array characteristics. This PV array simulator replicates MPPT and various real-world PV array conditions, including EN50530 and Sandia SAS models, to ensure comprehensive inverter testing.

2 SPECIFICATIONS

This chapter provides the electrical, environmental, and physical specifications for the Mi-BEAM 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; fixed AC input line and load.

b) DC output into a resistive load.

c) Specifications values are valid from 10% 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.

2.1 OPERATING MODES

The Mi-BEAM Series power supply supports the following modes of operations. Refer to the Chapter 5 for further details regarding the operational modes.

a) Bidirectional Mode:

The Mi-BEAM Series power supply supports two quadrant operation i.e. the power supply can act as source or sink. The current from the Mi-BEAM power supply to the Unit under test (UUT) is considered as positive and the current from UUT to the Mi-BEAM power supply is considered as negative.

Bi-directional (bi-DIR) mode supports voltage and current programming types, and they are described below,

• **Voltage:** In this programming type Mi-BEAM power supply regulates voltage. Various regulation settings are available in the voltage programming type (CV/CC, CV- Ser. Res, CV/CP and CV), and foldback operation will be performed based on the selected regulation settings. Refer to Section 5.1.

• **Current:** In this programming type Mi-BEAM power supply regulates current. Various regulation settings are available in the current programming type (CC/CV, CC/CP, CP/CC and CC), and foldback operation will be performed based on the selected regulation settings. Refer to Section 5.1.

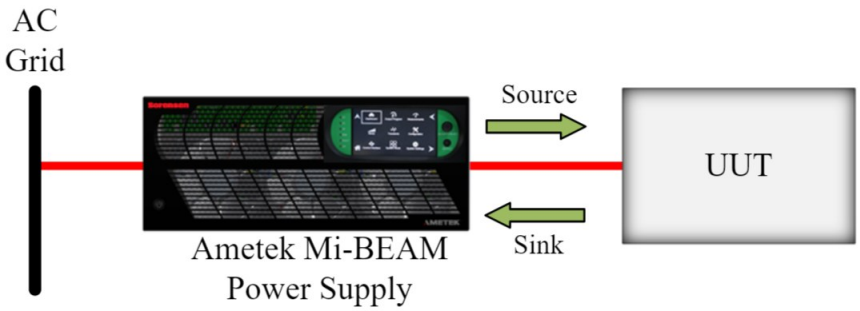


Figure 2-1. Bi-directional mode of operation

b) Source mode:

This mode provides single quadrant operation, i.e. the power is supplied to the UUT from Mi-Beam Power supply. The direction of the current is always positive (only positive limits for current and power will be applicable) and power transfer is always from the Mi-BEAM Series power supply to the UUT.

Source mode supports voltage and current programming types, and they are described below,

- **Voltage:** In this programming type Mi-BEAM power supply regulates voltage. Various regulation settings are available in the voltage programming type (CV/CC, CV/CP, CP/CV, CV-Ser. Res and CV), and foldback operation will be performed based on the selected regulation settings. Refer to Section 5.2.

- **Current:** In this programming type Mi-BEAM power supply regulates. Various regulation settings are available in the current programming type (CC/CV, CC/CP, CP/CC and CC), and foldback operation will be performed based on the selected regulation settings. Refer to Section 5.2.

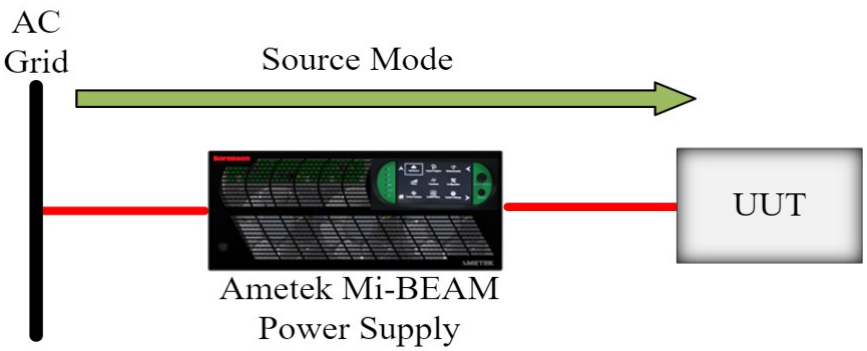


Figure 2-2. Power supply mode of operation

c) eLoad Mode:

This mode provides negative quadrant operation, i.e., power is drawn from the UUT to the AC grid through the Mi-BEAM power supply. The direction of current is always negative (only negative limits for current and power will be applicable) and power transfer is always from UUT to Mi-BEAM power supply.

Electronic Load (eLoad) supports voltage and current programming types, and they are described below,

- **Voltage:** In this programming type Mi-BEAM power supply regulates voltage. Various regulation settings are available in the voltage programming type (CV/CC, CV/CP, CR/CV, CP/CV and CV), and foldback operation will be performed based on the selected regulation settings.

- **Current:** In this programming type Mi-BEAM power supply regulates current. Various regulation settings are available in the current programming type (CC/CV, CC/CP, CR/CC, CP/CC and CC), and foldback operation will be performed based on the selected regulation settings.

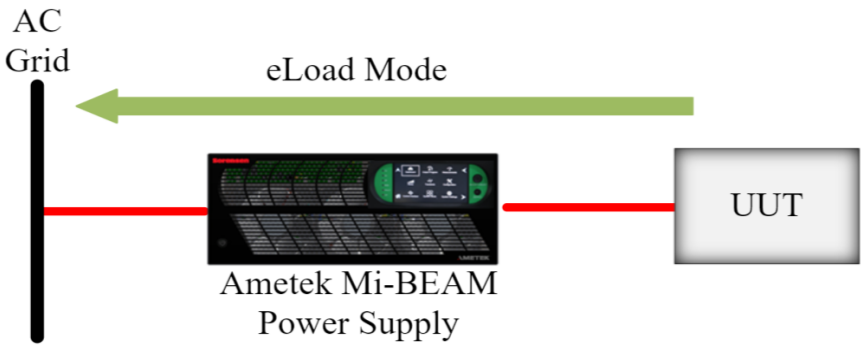


Figure 2-3. eLoad mode of operation

d) Battery Simulation Mode:

The Mi-BEAM power supply series supports simulating battery characteristics in both charge and discharge conditions. Seamless dynamic transitions from charge to discharge and vice versa are possible. The unit has a feature to enter various parameters to simulate real-world battery characteristics.

In Battery simulation (BATSIM) mode, various programming types are supported, and they are described below,

- **Battery Simulation-Charge Mode:** In this mode Mi-BEAM power supply regulates the voltage to simulate battery charge characteristics and direction of the current is negative. Depending upon the current injected by the battery charger (UUT) the instantaneous SoC is calculated, and the output voltage is varied as per the battery characteristics defined by the user.

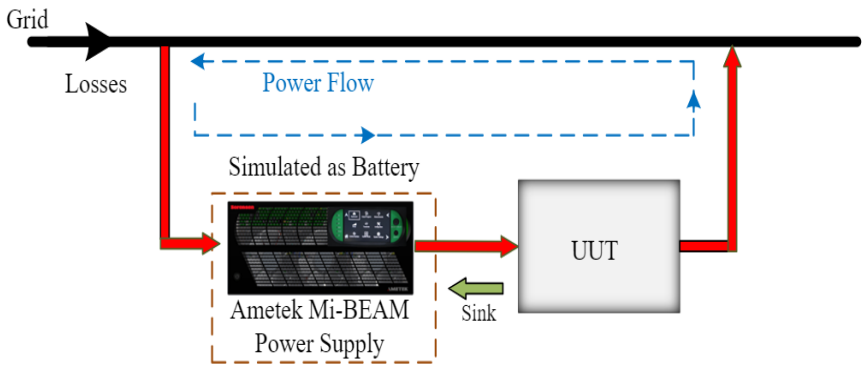


Figure 2-4. Battery simulation-charge mode

- **Battery Simulation-Discharge Mode:** The Mi-BEAM Series power supply regulates the voltage to simulate battery discharge characteristics and direction of the current is positive. Depending upon the current drawn by the UUT, the instantaneous SoC is calculated, and the output voltage is varied as per the battery characteristics defined by the user.

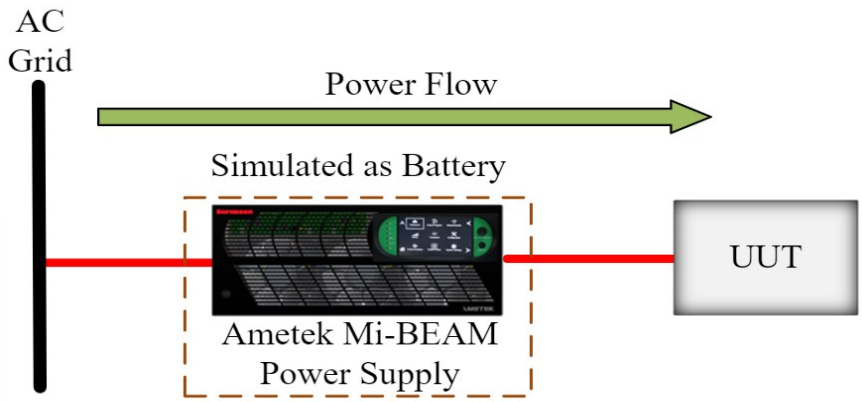


Figure 2-5. Battery simulation-discharge mode

e) Battery Test Mode:

The battery to be tested is the UUT wherein the Mi-BEAM Series power supply is made to operate as per the charge or discharge characteristics defined by the user to test the battery. The Battery Testing (BATTEST) mode supports seamless dynamic transition from charge to discharge and vice versa. Users can create multiple charging and discharging profiles which can be sequenced to achieve the required battery test conditions.

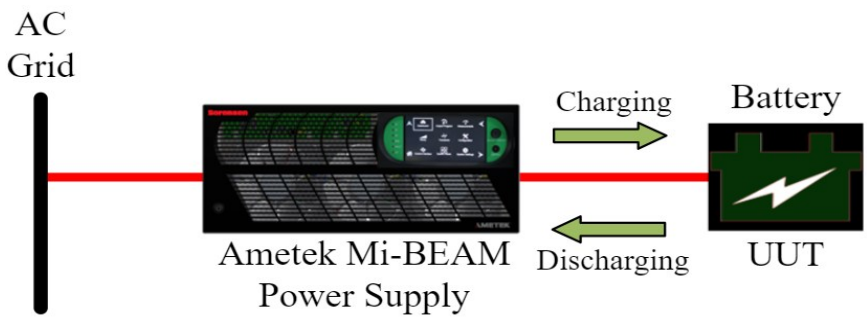


Figure 2-6. Battery simulation-charge mode

f) Solar Photovoltaic (PV) Simulator:

The Mi-BEAM Series power supply operates in a 'current programming type with Constant Current/Constant Voltage (CC/CV) regulation setting,' following the Photovoltaic (PV) array I/V characteristics set by the user. The PV array simulator (PVSIM) simulates Maximum Power Point Tracking (MPPT) and various real-world PV array scenarios for testing PV inverters.

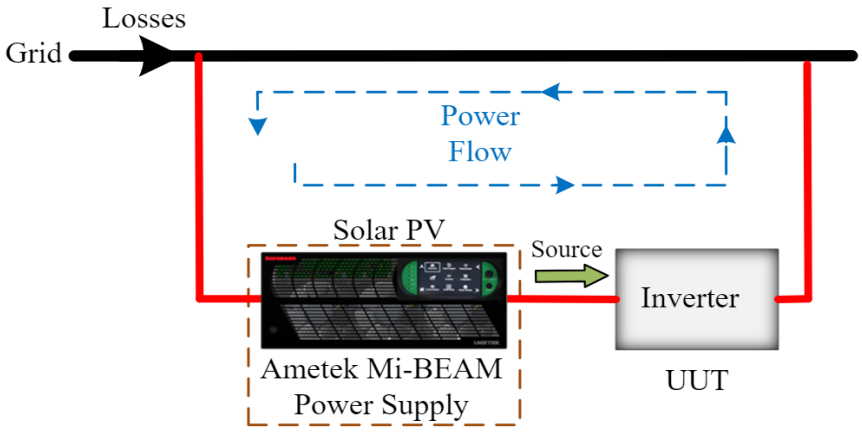


Figure 2-7. Solar Array Simulation

2.2 VIRTUAL PANELS FOR REMOTE CONTROL

The Virtual Panel is a Windows-based Graphical User Interface (GUI) application designed for the remote control of power supply. It allows for the programming and monitoring of Mi-BEAM power supplies remotely. Virtual Panels can be connected to a standalone unit or to the Leader unit of a paralleled chassis' through USB, LAN, RS232, or GPIB.

Virtual Panels also allows communication with multiple power supplies through a LAN interface, connected from a PC through an Ethernet switch. This functionality allows for the programming and operation of multiple power supplies through a single GUI interface. Up to 32 chassis can be operated simultaneously with one GUI. Refer to Figure 2-8 for the setup of connecting multiple power supplies through virtual panels.

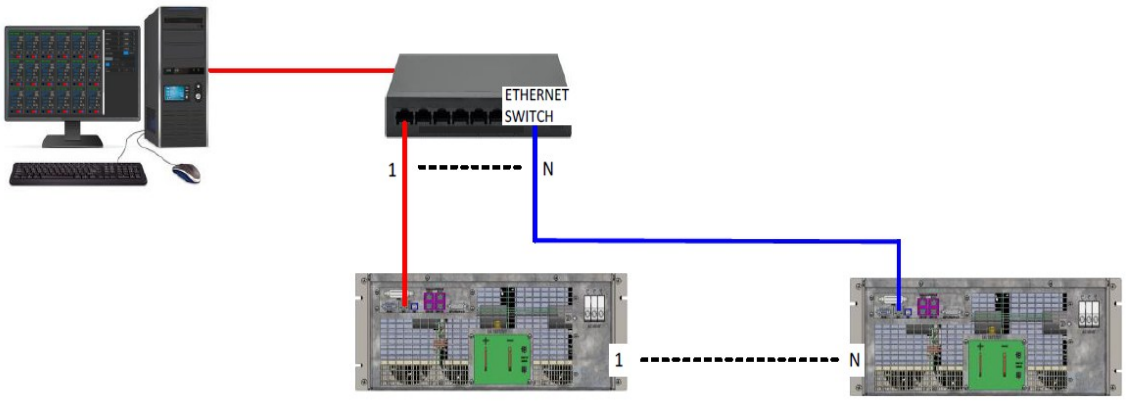


Figure 2-8. Setup for connecting multiple power supplies through Virtual Panels

2.3 OUTPUT POWER

The Mi-Beam Series power supply offers different output power configurations to meet user needs. The available output power configurations of the Mi-Beam Series are as follows:

MODEL	POWER (FOR AC INPUT HIGH LINE)[1]	POWER (FOR AC INPUT LOW LINE)[2]
Mi-BEAM Series	12 kW, 25 kW, 37 kW	6 kW, 12 kW, 18 kW
[1] ***AC Input High Line:*** *Nominal High Line Input range is 380 to 480 Volts Alternating Current (VAC).* [2] ***AC Input Low Line:*** *Nominal Line input range is 200 to 240 VAC.*		

Table 2-1. AC High Line and Low Line Power Configuration

2.4 OUTPUT VOLTAGE AND CURRENT RATINGS

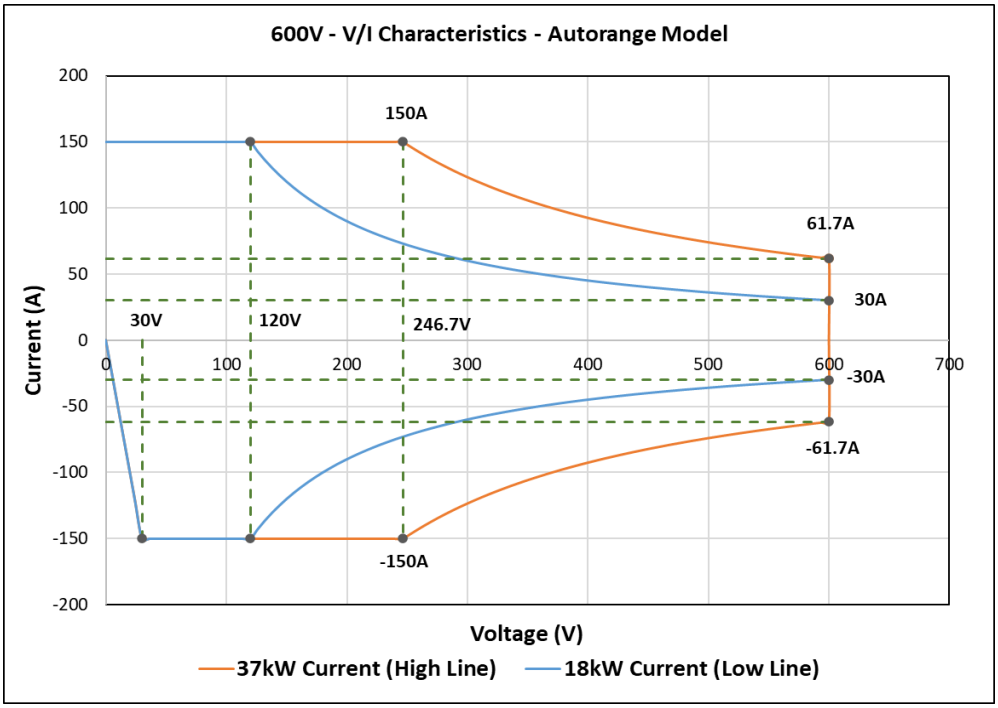
Output voltage and current ratings are offered with Auto Ranging characteristics. The Auto Ranging feature provides an expanded current range at the full output power level, enabling the ability to satisfy a wider range of testing needs without requiring the purchase of additional models.

POWER	HIGH LINE	12 kW	25 kW	37 kW
	LOW LINE	6 kW	12 kW	18 kW
Voltage (V)		Rated Current (A)		
600		50	100	150
1500		--	50	50
2000		--	50	50

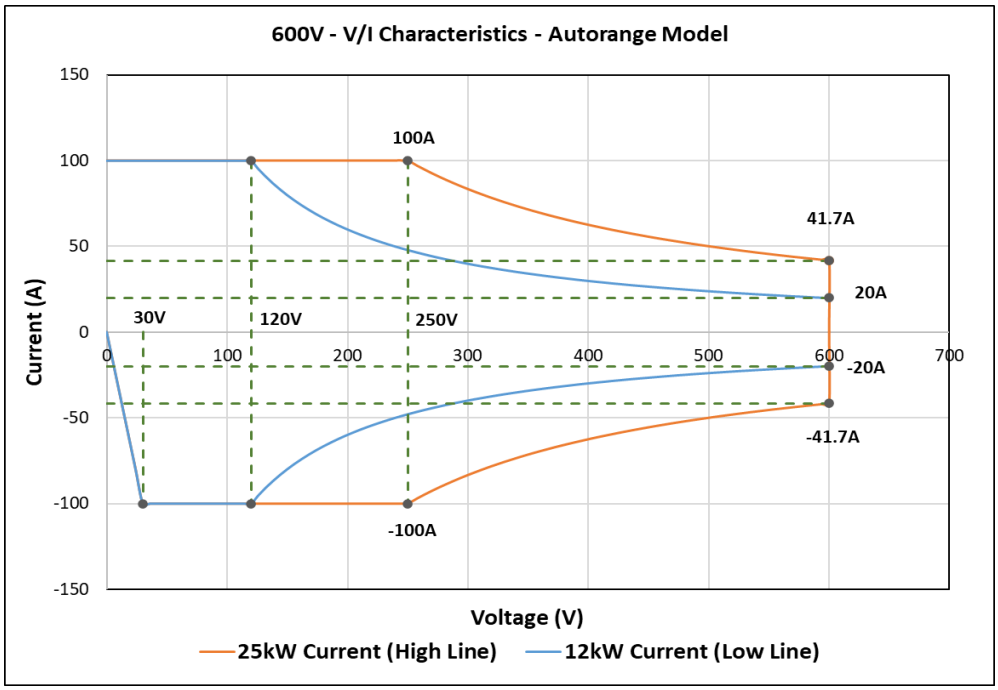
Table 2-2. Output Voltage and Current Ratings

2.5 AUTO RANGING OUTPUT VOLTAGE AND CURRENT V/I CHARACTERISTICS

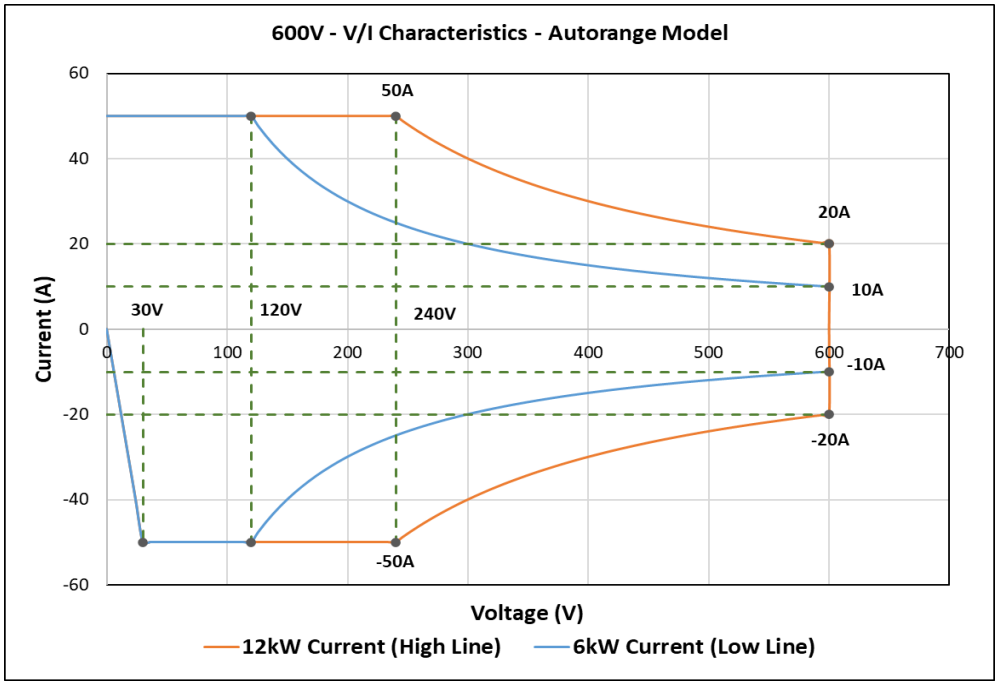
For rated power ratings, the auto-ranging models offer an expanded current range, enabling them to meet a broader spectrum of testing requirements. Refer to Figure 2-9 for the different V/I characteristics of the auto-ranging models.



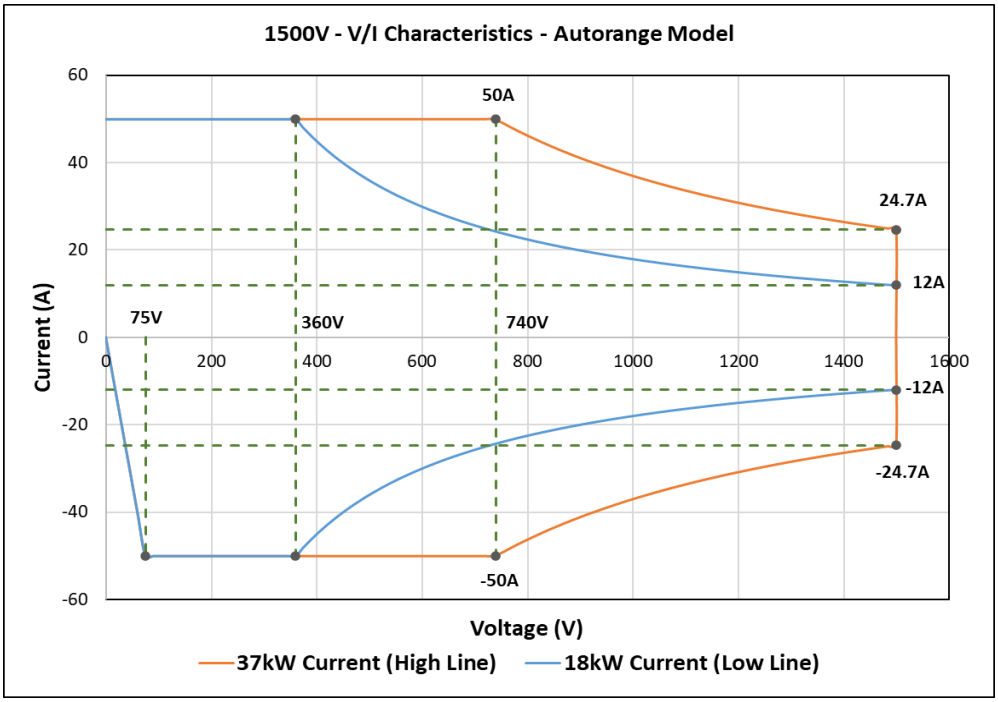
600V 37kW 150A Model



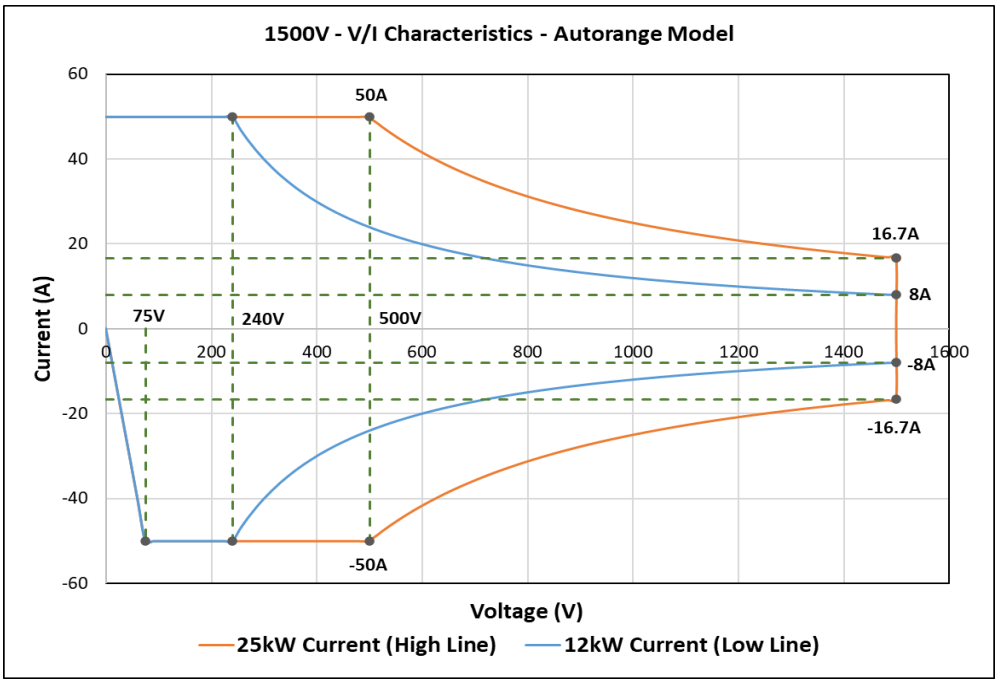
600V 25kW 100A Model



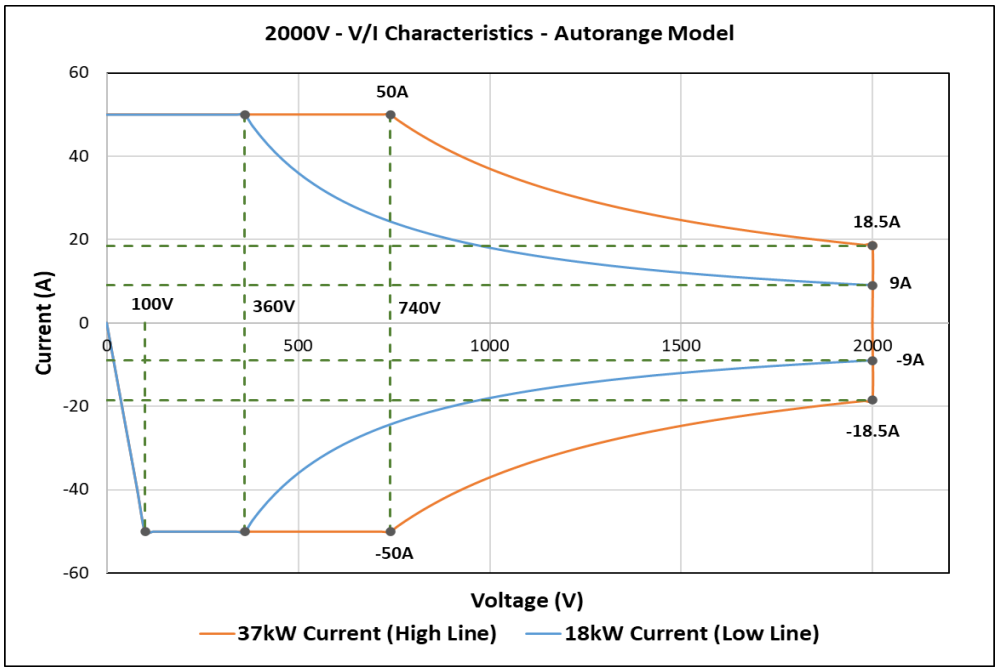
600V 12kW 50A Model



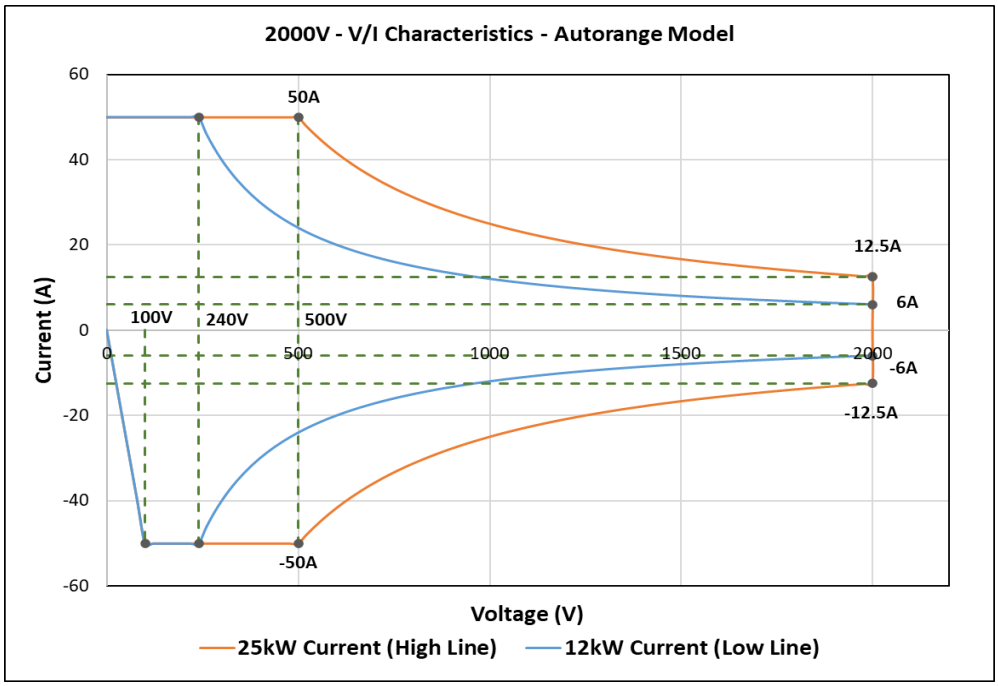
1500V 37kW 50A Model



1500V 25kW 50A Model



2000V 37kW 50A Model



2000V 25kW 50A Model

Figure 2-9. V/I Characteristics of Auto-ranging models

2.6 RESOLUTION SPECIFICATIONS

The Mi-Beam device features outstanding resolution capabilities for both programming and readback functions. These resolution values demonstrate its ability to precisely measure and control output parameters with high accuracy, as detailed below:

RESOLUTION	REMOTE DIGITAL INTERFACE	FRONT PANEL
Voltage output programming set resolution	0.002% of full scale	5 Digits
Current output programming set resolution	0.002% of full scale	5 Digits
Power output programming set resolution	0.01% of full scale	5 Digits
Overvoltage programming set resolution	0.1% of full scale	5 Digits
Voltage output readback set resolution	0.002% of full scale	5 Digits
Current output readback set resolution	0.002% of full scale	5 Digits
Power output readback set resolution	0.01% of full scale	5 Digits

Table 2-3. Front Panel Resolution Specifications

2.7 DC OUTPUT PROGRAMMING, READBACK AND REGULATION SPECIFICATIONS(1)(2)

This section provides an overview of the parameters and specifications for programming and readback accuracy through the front panel or remote digital interface, along with the DC regulation characteristics in both constant voltage and constant current modes, ensuring optimal performance and reliability.

PROGRAMMING & READBACK ACCURACY THROUGH FRONT PANEL OR REMOTE DIGITAL INTERFACE	
PARAMETERS	**ACCURACY AND RESPONSE TIME SPECIFICATIONS**
Voltage output programming accuracy	± 0.1% of rated output voltage
Current output programming accuracy	± 0.4% of rated output current
Power output programming accuracy	± 0.75% of rated output power
Overvoltage programming accuracy	± 1%, maximum, of rated output voltage
Voltage output readback accuracy	± 0.1% of rated output voltage
Current output readback accuracy	± 0.4% of rated output current
Power output readback accuracy	± 0.75% of rated output power
Overvoltage response time	20 milliseconds (ms)
DC Regulation Characteristics- Constant Voltage Mode	
Maximum line regulation	± 0.01% of rated voltage
Maximum load regulation	± 0.02% of rated voltage
Temperature Drift	± 0.02% of rated voltage/degree Celsius
Stability	± 0.05% of rated voltage
DC Regulation Characteristics- Constant Current Mode	
Maximum line regulation	± 0.05% of rated current
Maximum load regulation	± 0.08% of rated current

Temperature Drift	± 0.03% of rated voltage/degree Celsius
Stability	± 0.05% of rated current
(1) *Output voltage accuracy, regulation and stability specifications are valid at the point where the remote sense leads are connected. In the unit remote sense mode to be selected using front panel or the digital interface.* (2) *Regulation is measured with the rated power.*	

Table 2-4. DC Output Programming, Readback and Regulation Specifications

2.8 eLOAD RESISTANCE PROGRAMMING RANGE

An electronic load maintains a constant resistive load by setting a specific resistance value. This enables precise testing of power supplies, batteries, and other devices under various load conditions to ensure reliable performance. At a specified operating voltage, the minimum and maximum resistance can be calculated as follows:

a) Minimum Resistance: Minimum resistance is determined by dividing the operating voltage of the UUT by the maximum current at that voltage.

$$Minimum\ resistance = \frac{Operating\ UUT\ Voltage}{Maximum\ current\ at\ the\ operating\ voltage}$$

b) Maximum Resistance: Maximum resistance is determined by dividing the operating voltage of the UUT by 1.6% of the rated current.

$$Maximum\ resistance = \frac{Operating\ UUT\ Voltage}{0.016\ \times Rated\ Current}$$

POWER	**HIGH LINE**	**12 KW**		**25 KW**		**37 KW**	
	LOW LINE	**6 KW**		**12 KW**		**18 KW**	
Voltage (V)	**Minimum Operating Voltage for Maximum Current (V)**	**Minimum Resistance (1) (Ω)**	**Maximum Resistance (2) (Ω)**	**Minimum Resistance (1) (Ω)**	**Maximum Resistance (2) (Ω)**	**Minimum Resistance (1) (Ω)**	**Maximum Resistance (2) (Ω)**
600	30	0.6	750	0.3	375	0.2	250
1500	75	--	--	1.5	1875	1.5	1875
2000	100	--	--	2	2500	2	2500
(1) *Minimum resistance value in this table is calculated at minimum operating voltage. The minimum resistance value changes for each of the operating voltage and is calculated using the formula mentioned above.* (2) *Maximum resistance value in this table is calculated at maximum operating voltage. The maximum resistance value changes for each of the operating voltage and is calculated using the formula mentioned above.*							

Table 2-5. eLoad Maximum and Minimum Resistance Programming Range

2.9 REMOTE SENSE

The remote sense feature is designed to enhance the accuracy of voltage regulation by compensating for voltage drops in the load leads. This is particularly important in high-power applications, where even small voltage drops can significantly affect performance. Remote sense terminals are installed at the output to monitor the voltage directly at the load point. The remote sense compensation is as follows:

PARAMETER	DESCRIPTION
Allowed Line drop Voltage	2% of the rated output voltage.
Connection	Voltage accuracy specifications apply at the point where the remote sense leads are connected.
Line Drop Effect on Output	There would be increased voltage equivalent to the line drop voltage at the terminals of the Power Supply.

Table 2-6. Remote Sense Voltage Adjustment Parameters

2.10 USER-DEFINED SLEW RATE CONTROL CHARACTERISTICS

The maximum rate at which the Mi-BEAM Series can respond to a change in set value is determined based on the user-defined voltage. The slew rate during voltage and current regulation operations are recorded as follows:

SLEW RATE CONTROL CHARACTERISTICS		
MODELS (V)	**VOLTAGE REGULATION OPERATION (V/ms) (1)(2)**	**CURRENT REGULATION OPERATION (A/ms) (3)(4)**
600	20	50
1500	50	25
2000	66	17

(1) *Maximum rate of change of output voltage at rated load current.*
(2) *In voltage regulation mode, the maximum slew rate of load current should not exceed specified maximum current slew rate.*
(3) *Maximum rate of change of output current at rated output voltage.*
(4) *In current regulation mode, the maximum slew rate of load voltage should not exceed specified maximum voltage slew rate.*

Table 2-7. Slew Rate Control Characteristics

2.11 TRANSIENT SPECIFICATIONS – VOLTAGE REGULATION OPERATION

The transient specification of a system is a critical performance characteristic, as it determines the speed and accuracy with which the system responds to changing parameters. The specified

transient characteristics assume that the load changes in such a way that the output voltage does not exceed the maximum slew rate defined in the Section 2.10. Based on the models, the transient specification in voltage regulation is recorded as follows:

TRANSIENT SPECIFICATIONS – VOLTAGE REGULATION OPERATION				
MODEL (V)	**VOLTAGE RISE TIME (MS), FULL LOAD (1)(3)**	**VOLTAGE FALL TIME (MS), FULL LOAD (2)(3)**	**VOLTAGE FALL TIME (MS), NO LOAD (4)**	**TRANSIENT RESPONSE (MS) (5)(6)**
600	30	30	50	1
1500	30	30	50	1
2000	30	30	50	1

(1) Measured from 10%-90% of the output voltage change at rated resistive load - typical.
(2) Measured from 90%-10% of the output voltage change at rated resistive load - typical.
(3) In voltage regulation mode the maximum slew rate of load current should not exceed specified maximum current slew rate.
(4) Measured from 90%-10% of output rated voltage at No load – typical.
(5) Typical time to recover within 0.75% of rated output voltage for load change of 50-100% of rated output current. Refer to maximum allowed slew rate given in Section 2.10.
(6) Typical overshoot and undershoot during the 50% load change would be within 10% of the rated voltage.

Table 2-8. Transient Specifications for Voltage Regulation Operation

2.12 TRANSIENT SPECIFICATIONS – CURRENT REGULATION OPERATION

The transient specification of a system is a critical performance characteristic, as it determines the speed and accuracy with which the system responds to changing parameters. The specified transient characteristics assume that the load changes in such a way that the output current does not exceed the maximum slew rate defined in the Section 2.10. Based on the models, the transient specification in current regulation is recorded as follows:

TRANSIENT SPECIFICATIONS – CURRENT REGULATION OPERATION			
MODEL (V)	**CURRENT RISE TIME (ms), FULL LOAD (1)(3)**	**CURRENT FALL TIME (ms), FULL LOAD (2)(3)**	**TRANSIENT RESPONSE (ms) (4)(5)**
600	1	1	0.5
1500	1	1	0.5
2000	1	1	0.5

(1) Measured from 10%-90% of the output current change at constant rated voltage regulated by UUT - typical.
(2) Measured from 90%-10% of the output current change at constant rated voltage regulated by UUT - typical.
(3) In current regulation mode the maximum slew rate of load voltage should not exceed specified maximum voltage slew rate.
(4) Typical time to recover within 0.75% of rated average output current for load change of 50-100% of rated output voltage.

TRANSIENT SPECIFICATIONS – CURRENT REGULATION OPERATION			
MODEL (V)	CURRENT RISE TIME (ms), FULL LOAD (1)(3)	CURRENT FALL TIME (ms), FULL LOAD (2)(3)	TRANSIENT RESPONSE (ms) (4)(5)
(5) *Typical overshoot and undershoot during the 50% output voltage change would be within 10% of the rated current.*			

Table 2-9. Transient Specifications for Current Regulation Operation

2.13 OUTPUT VOLTAGE RIPPLE AND NOISE - VOLTAGE REGULATION OPERATION

The output voltage ripple and noise refer to the variations and disturbances in the output voltage of a power supply. Based on the voltage regulation operation, the ripple and noise root mean square (RMS) and peak-to-peak (Pk-Pk) values are recorded as follows:

RATED OUTPUT VOLTAGE (V)	VOLTAGE RIPPLE & NOISE RMS, mV (1)	VOLTAGE RIPPLE & NOISE PK-PK, mV (2)
600	120	500
1500	360	1500
2000	360	1500

(1) *RMS ripple or noise, over 20 Hertz (Hz) to 300 kilohertz (kHz) bandwidth, is measured directly across the output terminals with the supply operating into 90% of rated resistive load and nominal AC input line voltage.*

RMS ripple is calculated using the below formula,
Vrms1 = RMS ripple measured when output is OFF
Vrms2 = RMS ripple measured with full load
Effective RMS = $\sqrt{((Vrms2)^2 – (Vrms1)^2)}$

(2) *PK-PK ripple or noise, over 20 Hz to 20-megahertz (MHz) bandwidth with the supply operating into 90% of rated resistive load and nominal AC input line voltage.*

PK-PK ripple is calculated using the below formula,
Vpk-pk1 = PK-PK ripple measured when output is OFF
Vpk-pk2 = PK-PK ripple measured with full load
Effective PK-PK = Vpk-pk2 – Vpk-pk1

Table 2-10. Output Voltage Ripple and Noise for Voltage Regulation Operation

2.14 AC INPUT SPECIFICATIONS

The AC input specifications for the Mi-Beam series ensure optimal performance and compatibility with standard power supply, enabling reliable operation. The specifications are provided below:

PARAMETER	DESCRIPTION	
Input Voltage Nominal range	AC Input Low Line: 3 phase, 3 wire + Ground (Gnd).	AC Input High Line: 3 phase, 3 wire + Gnd.

PARAMETER	DESCRIPTION	
	Low Line Nominal rating range: 200 to 240 VAC, 3 Phase, Line-Line (1)	High Line Nominal rating: 380 to 480 VAC, 3 Phase, Line-Line
Input Voltage, Operating range	AC Input Low Line: 3 phase, 3 wire + Gnd.	AC Input High Line: 3 phase, 3 wire + Gnd.
	Low Line Operating rating range: 180 to 264 VAC, 3 Phase, Line-Line (1)	High Line Operating rating: 342 to 528 VAC, 3 Phase, Line-Line
Input Current, Maximum RMS	AC Input Current Low Line: 3 phase, 3 wire + Gnd.	AC Input Current High Line: 3 phase, 3 wire + Gnd.
	64 A at 180 VAC Line-Line	70 A at 342 VAC Line-Line
Efficiency	AC Input Low Line: 3 phase, 3 wire + Gnd.	AC Input High Line: 3 phase, 3 wire + Gnd.
	93-95% (2)	93-95% (3)
Inrush Current, typical (4)	AC Input Low Line: 3 phase, 3 wire + Gnd.	AC Input High Line: 3 phase, 3 wire + Gnd.
	100 A at 180 VAC Line-Line	110 A at 342 VAC Line-Line
Input Frequency, Nominal Rating	50 Hz, 60 Hz	
Input Frequency Range	47 Hz to 53 Hz, 57 Hz to 63 Hz	
Power Factor (5), typical	3-Phase: 0.99; active Power factor-controlled input rectifier	
Isolation Test Voltage(6)	2100 VAC Input to Ground	

(1) For Low Line AC input voltage output power is derated to 50%.
(2) Typical value at full load 18 kW output and nominal AC input voltage of 208 VAC L-L at 50/60 Hz input frequency.
(3) Typical value at full load 37 kW output and nominal AC input voltage of 480 VAC L-L at 50/60 Hz input frequency.
(4) Not including EMI filter inrush less than 200 us.
(5) Measured at full load at rated three phase nominal AC input voltage of:
***a)** 380 VAC, 400 VAC, 480 VAC L-L for input High Line*
***b)** 208 VAC L-L for input Low Line.*
(6) Isolation test conducted only in factory.

Table 2-11. AC Input Specifications

2.15 OPERATIONAL CHARACTERISTICS

The specific features and performance parameters that define how a product functions under various conditions. These characteristics provide detailed information about the capabilities and limitations of the device, ensuring it meets the required performance standards. The operational characteristics for the Mi-Beam series are listed below. Refer to the Chapter 5 for more details.

PARAMETER	CHARACTERISTICS
Bidirectional Mode	The power can flow from power supply to UUT and vice versa (2 quadrant operation). This mode has 'Voltage' and 'Current' programming types and supported regulation settings are: **a)** Voltage (programming type) – CV, CV/CC, CV/CP, CV-SER-RES **b)** Current (programming type) – CC, CC/CV, CC/CP, CP/CC.
Source Mode	The power can flow only from the power supply to UUT. This mode has 'Voltage' & 'Current' programming types and supported regulation settings: **a)** Voltage (programming type) – CV, CV/CC, CV/CP, CP/CV, CV-SER-RES **b)** Current (programming type) – CC, CC/CV, CC/CP, CP/CC.
eLoad Mode	The power flow is from output of the power supply to the Input AC-Grid. This mode has 'Voltage' & 'Current' programming types and supported regulation settings: **a)** Voltage (programming type) – CV, CV/CC, CR/CV, CP/CV, CV/CP **b)** Current (programming type) – CC, CC/CV, CR/CC, CP/CC, CC/CP.
Battery Simulation Mode	This is an optional module; different battery characteristics can be simulated. The user can choose either from built in battery models of commonly used battery types or customized battery models. The required characteristics of charge and discharge operation can be fine-tuned using various battery parameters including the ability to import Voltage vs SOC data. Allows seamless dynamic transition from charge to discharge and vice versa.
Battery Testing Mode	This is an optional module; the required charge or discharge characteristics is applied to the UUT by the power supply. Users can create multiple charging and discharging profiles which can be sequenced to achieve the required battery test conditions. Allows seamless dynamic transition from charge to discharge and vice versa.
Solar PV Array Simulator Mode	This is an optional module; the PV curve of a solar array is applied by the power supply by operating in source-current (CC/CV) mode to the UUT such as an inverter. PV array simulator simulates MPPT and various real-world PV array scenarios for testing the inverter. Includes EN50530 and Sandia SAS models.
Automotive Standard Testing	Pre-defined test sequences for partial compliance in accordance with LV 123 and LV 148 within the slew rate limitations specified for the supply. Tests such as injecting high frequency voltage ripple would require additional equipment.
Drive Train Testing	Drive trains can be tested by operating the power supply in bi-DIR mode. The power supply is used to analyze the characteristics of the drive with the ability to regenerate power back to AC Grid during braking of the drive train. Includes V-I characteristics programming to support standardized drive cycle tests.
Front Panel Controls	Enhance front panel touch display for the unit enables control and programming of output. Organized menus to support Output Programming, Measurements, Power ON Settings, Communication Controls & System Settings, External Analog interface, Voltage and Current ramp functions.
Voltage Ramp	Voltage Ramp could be generated with a programmable Dwell, Start and End Voltage set points. Dwell time could be set to 1 ms minimum and 9999s

PARAMETER	CHARACTERISTICS
	maximum. Maximum slew to be limited as per the slew rate specifications of the output model.
Current Ramp	Current Ramp could be generated with a programmable Dwell, Start and End Current set points. Dwell time could be set to 1 ms minimum and 9999s maximum. Maximum slew to be limited as per the slew rate specifications of the output model.
List/ Waveform generation Function	List function allows the user to set up the supply to automatically run a series of voltage and current mode operations. This is especially useful for setting up the supply to test compliance standards or unburdening the test computer in automated testing applications. Through RS-232, IEEE-488 or Ethernet, an external computer can trigger the list. Up to 50 lists may be stored, with each list containing up to 50 individual steps. With an extensive list of step functions such as ramping and looping, the user can define a variety of test sequences.
Fault Identification	On-board diagnostics identify when the power supply has experienced a fault.
Programming Command Set	SCPI compliant command set and same could be used with all the communication interfaces (USB, RS232, Ethernet, IEEE-488).
Graphical User Interface (Virtual Panel)	Virtual panels allow programming and monitoring of Mi-BEAM power supply remotely. GUI supports all the operational modes such as bi-Directional, Source, eLoad, Battery Simulation, Battery Test and Solar Array Simulation. GUI also supports Output Programming, Measurements, Power ON Settings, Communication Controls & System Settings, External Analog interface, Voltage and Current ramp functions, List/Waveform generation function, Data Logging function.
Software Drivers	IVI-C and IVI-COM, LabVIEW drivers provided for user programming.
GPIB interface, Option	Parallel interface complies with IEEE-488.1, IEEE-488.2, and the SCPI command specification.
Parallel Operation	Similar rated chassis' can be paralleled. Outputs to be hardwired to the load from the relevant paralleled output terminals. Up to 32 similar rating units can be paralleled.
Analog Programming	Provides Isolated Analog interface to program output.
Calibration	Calibration interval is 1 year; calibration is firmware-based through the SCPI commands using communication interface or Virtual Panels.

Table 2-12. Operational Characteristics

2.16 FRONT PANEL CONTROLS OR INDICATORS

The front panel controls and indicators are designed for clear and intuitive operation. This series includes three distinct unit types, each tailored to meet specific operational needs. The controls and indicators are strategically placed to ensure ease of use and efficient monitoring, enhancing overall functionality and user experience. The unit types and their corresponding controls and indicators are listed below. For further clarification, please refer to Figure 2-10.

UNIT TYPE	CONTROLS OR INDICATORS
Standalone Unit with Enhanced Touchscreen Display	Touch-Panel, Thin Film Transistor (TFT) color Liquid-crystal display (LCD) display with menu-based control. Display size: 4U models, 3.9 in. (99.06 mm) diagonal Rotary encoder for menu navigation and parameter adjustment and entry, with integrated selection switch. **a)** POWER switch: turns unit on or off. **b)** OUTPUT switch turns output on or off. **c)** OUTPUT LED: integrated into the OUTPUT switch; indicates that the output of the unit has been turned on. **d)** CV LED: indicates that the unit is in constant-voltage mode and the output voltage is being regulated. **e)** CC LED: indicates that the unit is in constant-current mode and the output current is being regulated. **f)** CP LED: indicates that the unit is in constant-power mode and the output power is being regulated. **g)** REM LED: indicates that the unit is under control of the remote digital interface. **h)** FAULT LED: indicates that an internal fault has been detected, and the output has been shut down. **i)** LXI LED: LXI status annunciation.
Standalone Unit with ATE Front Panel	**a)** POWER switch: turns unit on/off. **b)** POWER LED: integrated into the POWER switch; indicates that the AC input power is turned on to the unit. **c)** OUTPUT LED: integrated into the OUTPUT switch; indicates that the output of the unit has been turned on. **d)** CV LED: indicates that the unit is in constant-voltage mode and the output voltage is being regulated. **e)** CC LED: indicates that the unit is in constant-current mode and the output current is being regulated. **f)** CP LED: indicates that the unit is in constant-power mode and the output power is being regulated. **g)** FAULT LED: indicates that an internal fault has been detected, and the output has been shut down. **h)** LXI LED: LXI status annunciation.
FOLLOWER Units	**a)** POWER switch: Turns unit ON/OFF. **b)** POWER LED: integrated into the POWER switch; indicates that the AC input power is turned on to the unit. **c)** OUTPUT LED: integrated into the OUTPUT switch; indicates that the output of the unit has been turned on. **d)** FAULT LED: indicates that an internal fault has been detected, and the output has been shut down.

Table 2-13. Front Panel Controls or Indicators

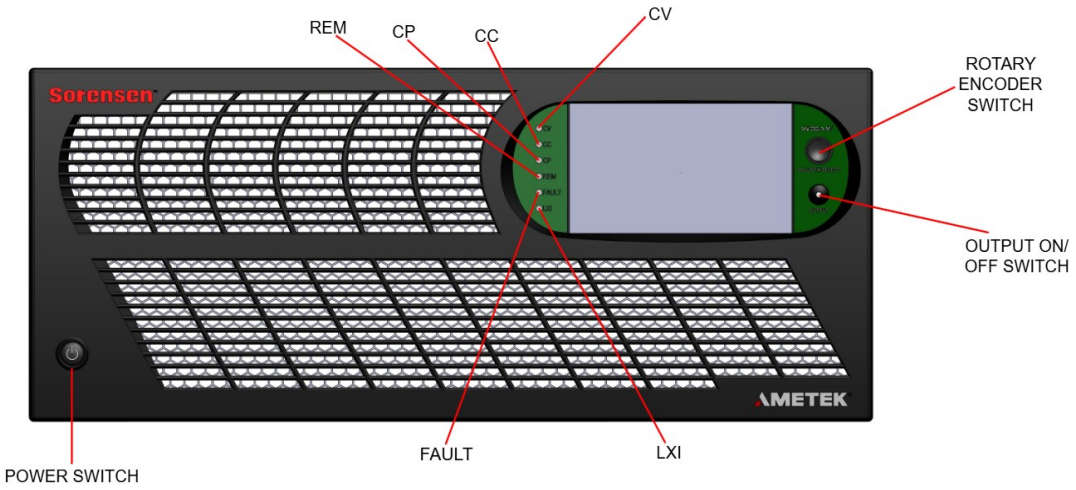


Figure 2-10. Front panel

2.17 REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE AND ISOLATED ANALOG INTERFACE CHARACTERISTICS

The Remote Isolated External User Control I/O Signal Interface allows for remote control using various digital signals and can interface with a wide range of external control systems, offering flexibility and supporting multiple communication protocols for versatile integration. It provides electrical isolation for control signals, preventing interference and enhancing safety. Similarly, the Isolated Analog Interface ensures high accuracy in analog signal processing with minimal noise and distortion. It electrically isolates analog signals to prevent interference, supports analog inputs and outputs corresponding to output voltage and current, and is designed to withstand harsh industrial environments, ensuring reliable performance. The functions and characteristics of the Remote Isolated External User Control I/O Signal Interface and the Isolated Analog Interface for the Mi-Beam series are listed below.

NOTE: Mi-BEAM power supply provides 26-Pin Digital I/O interface connector for Trigger, Status output, Remote ON/OFF and Inhibit. All the signals in this interface are isolated from the output negative.

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
Remote Inhibit Input – Contact Closure - Open	Opening the Switch or Relay contact between this terminal and signal return will turn OFF the output. Switch or Relay closure or direct short from this terminal to signal return would turn-on the output. Remote inhibit can be configured in three modes;

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
	a) Latch: after reclosing the contact, user needs to clear the fault and turn ON the output. **b)** Live: after reclosing the contact, user can turn ON the output. **c)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 milliampere (mA) from 5 volts direct current (VDC) to enable.
Remote Inhibit Input – Contact Closure - Close	Closing the Switch or Relay contact between this terminal and signal return will turn OFF the output. Switch or Relay opening would turn ON the output. Remote inhibit can be configured in three modes; **a)** Latch: after reclosing the contact, user can clear the fault and turn ON the output. **b)** Live: after reclosing the contact, user needs to turn ON the output. **c)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 mA from 5 VDC to enable.
Remote Inhibit Input – Active Source – High	An active voltage source high signal from this terminal to signal return will Turn OFF the output of power supply. Remote inhibit can be configured in three modes; **a)** Latch: after removing the active voltage source, user can clear the fault and turn ON the output. **b)** Live: after removing the active voltage source, user can turn ON the output. **c)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 mA from 5 VDC to enable.
Remote Inhibit Input – Active Source – Low	An active voltage source low signal from this terminal to signal return will Turn OFF the output of power supply. Remote inhibit can be configured in three modes; **a)** Latch: after removing the active voltage source low signal, user needs to clear the fault and turn ON the output. **b)** Live: after removing the active voltage source, user can turn ON the output. **c)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 mA from 5 VDC to enable.
Trigger In(1)	TTL compatible Input signal, active-high pulse of 100 μs; detects external hardware trigger at falling edge of the pulse for voltage, current ramp and Transient List functions. Signal connects to Open-anode of opto-isolator diode with internal 1 kΩ series resistor internal to power supply.

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
	Voltage Rating: Maximum 24 V, Minimum -5 V Low state: 0.3 V max, High State 2.7 V min
Trigger Out(1)	Output signal, active-high; synchronization pulse of 100 μs. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Current Sink Current: 50 mA
CC/CV status Output	Output signal, High state indicates Constant Current mode operation and Low state indicates Constant Voltage mode operation. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Current Sink Current: 50 mA
Output ON/OFF Status	Output signal, High state indicates Output is ON and Low state indicates Output is OFF. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to the common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Sink Current: 50 mA
FAULT Status	Output Signal, High state indicates fault state of the power supply. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to the common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Current Sink Current: 50 mA
ISOLATED ANALOG PROGRAMMING FEATURES	
Remote Analog Programming of Output Voltage (1)	Independent Signal inputs for output voltage programming using External Analog Reference. Analog reference source is user selectable and can be a voltage or resistance. User can select the reference source and range as given below; **a)** Voltage as Reference Source**:** 0 V to user selectable maximum range (5 V to 10 V) for 0 to full scale rated Output. **b)** Resistance as Reference Source**:** 0 Ω to user selectable maximum range (5 kΩ to 10 kΩ) for 0 to full scale rated Output. Programming accuracy and linearity: ±1% of rated output
Remote Analog Programming of Output Current (2)	Independent Signal inputs for output current programming using External Analog Reference.

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
	Analog reference source is user selectable and can be a voltage or resistance. User can select the reference source and range as given below; **a)** Voltage as Reference Source**:** User selectable range of (-5 V to +5 V) or (-10 V to +10 V) for 0 to full scale rated Output. **b)** Resistance as Reference Source**:** 0 Ω to user selectable maximum range (5 kΩ to 10 kΩ) for 0 to full scale rated Output. This is applicable only in source mode. Programming accuracy and linearity: ±1% of rated output
Monitor Signals for the Output Voltage and Output Current	Monitor Signals for the Output Voltage and Current. 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 and linearity: ±1% of full-scale output
Remote Analog Programming of Overvoltage [(2)]	Signal input for setting Overvoltage using External Analog Reference Voltage. Range: 0.25 V to user selectable maximum range (5 V to 10 V) for 5% to 110% of the full-scale Output Voltage. Programming accuracy and linearity: ±1% of full-scale output.
[(1)] Trigger IN and Trigger OUT signals can be used during Ramp and Transient List functionality only. *[(2)] Unit can be operated in remote analog programming in Bi-directional, Source and Eload modes only.*	

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
1	VPRG_VOLT	Input	0 to 10V	Independent Signal inputs for output voltage programming using External Analog Reference. In this, the reference is a voltage source: 0 V to user selectable maximum range (5 V to 10 V) for 0 to full scale rated output voltage.
2	VPRG_CURR	Input	0 to 10 kΩ	Independent Signal inputs for output voltage programming using External Analog Reference. In this, the reference is resistance source: 0 Ohm to user selectable maximum range (5 kΩ to 10 kΩ) for 0 to full scale rated output voltage.
3	IPRG_VOLT	Input	-10 to +10 V	Independent Signal inputs for output current programming using External Analog Reference. In this, the reference is a voltage source: -10 V to +10 V for 0 to full scale rated output current.
4	IPRG_CURR	Input	0 to 10 kΩ	Independent Signal inputs for output current programming using External Analog Reference. In this, the reference

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
				is resistance source: 0 Ohm to user selectable maximum range (5 kΩ to 10 kΩ) for 0 to full scale rated output current (available only in Source mode).
5	OVPRG_VOLT	Input	0 to 10V	Remote Analog Programming of Overvoltage. Signal input for setting Overvoltage using External Analog Reference Voltage. 0.25 V to user selectable maximum range (2 V to 10 V) for 5% to 110% of the full-scale Output Voltage.
6	GND_ISOSELV	Return	NA	Ground for programming Signals
7	VMON	Output	0 to 10V	Monitor Signals for the Output Voltage
8	IMON	Output	-10 to +10V	Monitor Signals for the Output Current
9	GND_ISOSELV	Return	NA	Ground for Monitor Signals
10	DIO_OUT1	Output	0 to 30 V	Open collector transistor output for user programming
11	DIO_OUT2	Output	0 to 30 V	Open collector transistor output for user programming
12	SOUR/SINK_OUT	Output	0 to 30 V	Open collector transistor output. Collector is connected to the 26-pin connector. Status signal to communicate the direction of current flow. **a)** Low – indicates power transfer is from power supply to UUT. **b)** High – indicates power transfer is from UUT to Power supply.
13	TRIG_OUT	Output	0 to 30 V	Active-high; synchronization pulse of 100 μs. Open collector transistor output. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector.
14	DIO_ON/OFF_STAT	Output	0 to 30 V	High state indicates Output is ON and Low state indicates Output is OFF. ON/OFF-Open collector transistor output, Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector.
15	DIO_CC/CV_OUT	Output	0 to 30 V	CC/CV status- open collector configuration. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
				pin of the interface connector. High state indicates Constant Current mode operation and Low state indicates Constant Voltage mode operation.
16	DIO_FAULT_OUT	Output	0 to 30 V	Fault status- open collector configuration. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector. Open collector configuration. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector. High state indicates fault state of the power supply.
17	RTN	Return	NA	Return for digital signals
18	RTN	Return	NA	Return for digital signals
19	TRIG_IN	Input	0 to 24 V	TTL compatible Input signal, active-high pulse of 100 µs; detects external hardware trigger at falling edge of the pulse for voltage, current ramp, and Transient List functions. Signal connects to Open-anode of opto-isolator diode with internal 1kΩ series resistor internal to power supply.
20	DIO_OUTPUT_ON/OFF	Input	0 to 24 V	Remote-control input for output on/off with a logic signal: a logic-high, 2.7-24 VDC TTL/CMOS signals will enable (turn-on) the output of the supply, and a logic-low signal disables (turns off) the output.
21	Digital_IN-1	Input	-5 to 24 V	Remote-control input with a logic signal.
22	Digital_IN-2	Input	-5 to 24 V	Remote-control input with a logic signal.
23	Digital_IN-3	Input	-5 to 24 V	Remote-control input with a logic signal.
24	Remote_Inhibit_Active_Voltage	Input	-5 to 24 V	Remote-control input for output on/off with a logic signal. User can select the signal condition (LOW/HIGH) to turn OFF output.
25	Remote_Inhibit_Contact_Closure	Input	-5 to 24 V	Switch or Relay contact is used to turn OFF the output. User can select the switch or relay position (Open/Close) to turn OFF the output.
26	RTN	Return	NA	Ground return

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
NOTE: All the signals are safety isolation SELV-rated, referenced to chassis.				

Table 2-14. Remote Isolated User Control and Analog Interface

2.18 EXTERNAL RELAY CONTROL SIGNAL CONNECTOR

Mi-BEAM Series power supply has an 8-Pin interface connector to provide output isolation and negative voltage polarity detection, when interfaced with the Mi-BEAM isolation chassis.

Mi-BEAM isolation chassis must be purchased separately along with the interfacing cable. Refer to the block diagram for interfacing the UUT with Mi-BEAM series power supply along with Mi-BEAM isolation chassis.

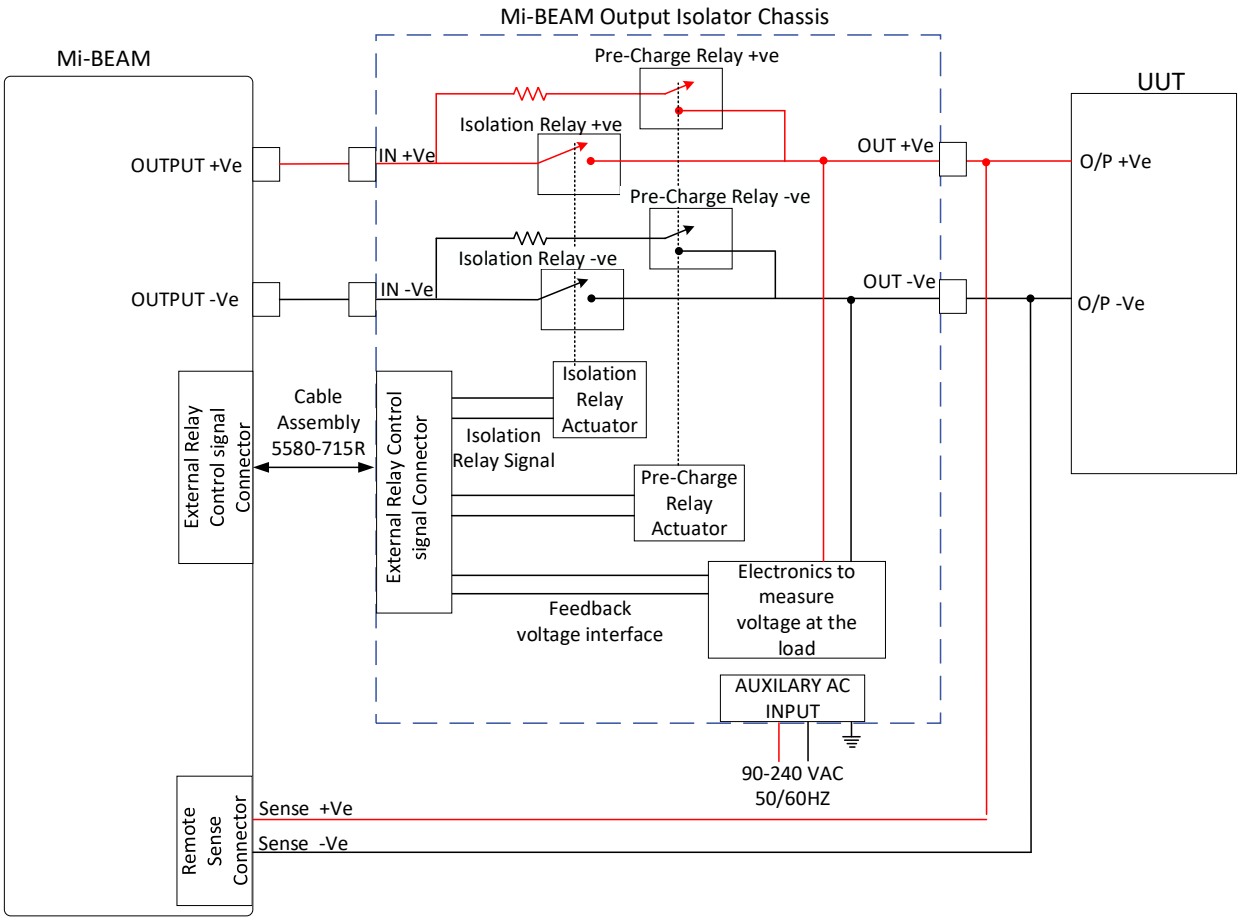


Figure 2-11. Mi-BEAM Isolation Chassis block diagram

Items required are,

- Mi-BEAM Isolation Chassis;

- 5580714-01R (Rated Voltage and Current: 2000V, 1000A)
- Cable Assembly (5580715-01R).

2.19 REMOTE CONTROL DIGITAL INTERFACE CHARACTERISTICS

The features and capabilities of the digital interfaces used for remote control of a device. These interfaces allow for communication and control between the device and external systems or controllers. The remote-control digital interface characteristics in the Mi-BEAM are listed below.

INTERFACE	CHARACTERISTIC
LAN	Ethernet LXI Complaint 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 (Optional)	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.
Firmware Upgrade	Firmware could be upgraded through the LAN interface using Firmware Update Tool.

Table 2-15. Remote Control Digital Interface

2.20 PROTECTION FUNCTION CHARACTERISTICS

The features and capabilities of a system designed to safeguard equipment and ensure safe operation under various conditions. The protection functions in the Mi-BEAM are listed below.

FUNCTION	CHARACTERISTICS
Output Overvoltage Protection (OVP)	Programmable to 110% of full-scale output voltage; exceeding OVP threshold results in shutdown of output.
Output Positive Overcurrent Protection (+ve OCP) (1)	Programmable to 120% of full-scale output Positive current; exceeding Positive OCP threshold results in shutdown of output.
Output Negative Overcurrent Protection (-ve OCP) (2)	Programmable to 120% of full-scale output Negative current; exceeding Negative OCP threshold results in shutdown of output.
Output Current Limit Protection	User-selectable regulation settings,

FUNCTION	CHARACTERISTICS
	a) Bi-DIR Mode: • Voltage (programming type) – CV, CV/CC, CV-SER-RES, CV/CP • Current (programming type) – CC, CC/CV, CC/CP, CP/CC. **b) Source Mode:** • Voltage (programming type) – CV, CV/CC, CV/CP, CP/CV, CV-SER-RES • Current (programming type) – CC, CC/CV, CC/CP, CP/CC. **c) eLoad Mode:** • Voltage (programming type) – CV, CV/CC, CR/CV, CP/CV, CV/CP • Current (programming type) – CC, CC/CV, CR/CC, CP/CC, CC/CP. ○ In **CV/CC** mode, regulates voltage, on reaching the current limit power supply regulates the limit reached, on reaching the power limit results in shutdown of output. ○ In **CV/CP** mode, regulates voltage, on reaching the power limit power supply regulates the limit reached, on reaching the current limit results in shutdown of output. ○ In **CC/CV** mode, regulates current, on reaching the voltage limit power supply regulates the limit reached, on reaching the power limit results in shutdown of output. ○ In **CC/CP** mode, regulates current, on reaching the power limit power supply regulates the limit reached, on reaching the voltage limit results in shutdown of output. ○ In **CP/CC** mode, regulates power, on reaching the current limit power supply regulates the limit reached, on reaching the voltage limit results in shutdown of output. ○ In **CP/CV** mode, regulates power, on reaching the voltage limit power supply regulates the limit reached, on reaching the current limit results in shutdown of output. ○ In **CR/CC** mode, regulates resistance, on reaching the current limit power supply regulates the limit reached, on reaching the voltage & power limit results in shutdown of output. ○ In **CR/CV** mode, regulates resistance, on reaching the voltage limit power supply regulates the limit reached, on reaching the current & power limit results in shutdown of output. ○ In **CV** mode, regulates voltage, on reaching current or power limits results in shutdown of output.

FUNCTION	CHARACTERISTICS
	○ In **CC** mode, regulates voltage, on reaching voltage or power limits results in shutdown of output. ○ In **CV-SER-RES** mode, regulates voltage, on reaching voltage or current or power limits results in shutdown of output. In all the regulation settings, 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.
Islanding Detection	In sink mode, the loss of input AC grid is detected by built-in islanding detection feature. Thus, accidental islanding formation with the regenerative load is avoided.
AC Input Transient Protection	Protection to withstand EN61326-1, Surge testing to industrial test levels.
Overtemperature Protection (OTP)	Internal temperature monitors cause shutdown of output if temperature thresholds are exceeded.
(1) This is applicable in Bi-Directional, Source, PV Simulator, Battery Simulator and Battery Test operating modes. *(2) This is applicable in Bi-Directional, eload, Battery Simulator and Battery Test operating modes.*	

Table 2-16. Protection Function Characteristics

2.21 OUTPUT ISOLATION

The Table 2-17 outlines the output isolation details for the Mi-Beam series, covering both the unit's rated output voltage and various other rated output voltage conditions. The specific isolation details are provided below.

UNIT RATED OUTPUT VOLTAGE	400 V < RATED OUTPUT VOLTAGE ≤ 2000 V
Output terminal Chassis Earth (1)	1428 V_{RMS} / ±2000 V_{peak}
Output terminal Positive to (+Ve) to Negative (-Ve)	V_{peak} = 110% of output rated voltage
Isolated Analog interface Signals and External User Control I/O interface to Output Negative terminal	±2000 V_{peak}, maximum; 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) The output terminal positive to chassis earth voltage is the sum of the output terminal negative to chassis earth voltage and operating output voltage. At any operating condition, the output terminals to chassis earth voltage should not exceed the given limit.	

Table 2-17. Output Isolation

2.22 ENVIRONMENTAL SPECIFICATIONS

The environmental conditions and requirements that a product, system, or process must meet ensure that the product or system can operate effectively within its intended environment and comply with relevant environmental regulations. The environmental characteristics are listed below.

PARAMETER	SPECIFICATION
Operating Temperature	0°C (32°F) to 40°C (104°F)
Storage Temperature	-25°C (-13°F) to 65°C (149°F)
Altitude	2000 m (6,600 ft)
Operating Humidity	20-80 %, non-condensing
Relative 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; 20G half-sine with 11 ms duration per Paragraph 4.5.5.4.1.
Transportation Integrity	ISTA Test Procedure 1B

Table 2-18. Environmental Specifications

2.23 MECHANICAL SPECIFICATIONS

The mechanical requirements and characteristics that a product, system, or component must meet ensure that the mechanical aspects of the product are designed and manufactured to perform reliably and safely under expected conditions. The mechanical specifications are listed below.

PARAMETER	SPECIFICATION
Dimensions	**a)** H, 6.97 in (177 mm); W (front panel), 18.9 in (480 mm); D, 27.56 in (700 mm-enclosure only); **b)** H, 6.97 in (177 mm); W (Chassis), 16.9 in (429 mm); D, 27.56 in (700 mm- enclosure only).
Unit Weight	**a)** For 37kW 600V, 1500V, 2000V models and 25kW for 1500V and 2000V – 62kgs **b)** For 25kW 600V model – 50kgs **c)** For 12kW 600V model – 38kgs
Shipping Weight	**a)** For 37kW 600V, 1500V, 2000V models & 25kW for 1500V & 2000V – 90kgs **b)** For 25kW 600V model – 78kgs **c)** For 12kW 600V model – 66kgs
Chassis Material	Steel with plastic front panel
Chassis Finish	Steel electroplated

PARAMETER	SPECIFICATION
Installation	Protective covers are provided for AC input and DC output. Rackmount: per ANSI-EIA-310-D, with front panel mounting flanges and chassis provisions for mounting rack slides; slides option available.
Cooling	Force-air cooling; linear, variable fan speed control; air intake at front/sides and exhaust at rear.
Acoustic Noise	**a)** 61 A-weighted decibels (dBA), at idle fan speed; measured at 1 m (3.28 ft) with A-weighting. **b)** 76 dBA, at maximum fan speed; measured at 1 m (3.28 ft) with A-weighting.

Table 2-19. Mechanical Specifications

2.24 REGULATORY AGENCY COMPLIANCE

The following Table 2-20 provides the regulatory agency compliance details for the various parameters and their specifications for the Mi-Beam series.

PARAMETER	SPECIFICATION
EMC	CE marked for EMC Directive 2014/30/EU per EN61326-1:2021, Class-A for emissions and immunity as required.
Safety	NRTL marked for US and Canada to CAN/CSA-C22.2 No. 61010-1-12, UL 61010-1 Third Edition. CE marked for LVD compliance 2014/35/EU to EN 61010-1 Third Edition as required for the EU CE mark.
CE Mark LVD Categories	Installation Overvoltage Category: II; Pollution Degree: 2, IP20 Indoor uses only.
RoHS	CE marked for compliance with RoHS3 EU Directive 2015/863/EU for Restriction of Hazardous Substances in Electrical and Electronic Equipment.

Table 2-20. Regulatory Agency Compliance

2.25 REAR PANEL CONNECTORS

The various ports and interfaces located on the back of a device allow it to interface with other systems and peripherals. The rear panel connectors in the Mi-BEAM are categorized into three, which are listed below.

CONNECTOR	DESCRIPTION
AC Input	3-Phase AC input: connector terminals; Unit side connector: compression terminals, Phoenix P/N 3073571 Mating Connector, Cable Lug
Safety-Ground	M6 x 0.7 chassis stud

CONNECTOR	DESCRIPTION
DC Output (+Ve and -Ve) (For 600-2000V Models)	DC Output terminal; Unit side connector: Copper bus bar - 35mm height & 5mm thickness with M6 x1mm threaded hole.
Remote Sense (S+) & (S-)	Unit side connector: compression terminals, Phoenix P/N 1995499, x2 numbers (for S+ and S-) Mating Connector, Phoenix P/N 1840366, x2 numbers (for S+ and S-)
Isolated External User Control I/O interface	User control signal interface connector; safety isolation SELV-rated, referenced to chassis; Unit side connector: high-density, 26-contact, female D-Type, Norcomp P/N 181-026-213R531 Mating connector, Norcomp P/N 180-026-103L001
Parallel Interface	One number of 15P – 2PORT DB15 male and female connectors; safety isolation SELV-rated, referenced to chassis. This interface is used for the leader-follower parallel operation of the Mi-BEAM Series power supply.
External Relay Control Signal Connector	User control external relay signal interface connector; safety isolation SELV-rated, referenced to chassis; Unit side connector: Molex 430200800 Mating connector: Molex 430250800
LAN Interface	Ethernet 10 BASE-T and 100 BASE-T; safety isolation SELV-rated, referenced to chassis; connector: 8P8C modular jack.
USB Interface	Serial interface to USB 2.0; safety isolation SELV-rated, referenced to chassis; connector: Type-B.
RS-232 Interface	Serial interface to RS-232C; safety isolation SELV-rated, referenced to chassis; connector: Subminiature-D, 9-contact receptacle.
IEEE-488 Interface (Optional)	Parallel interface to IEEE-488.1, IEEE-488.2, and SCPI; safety isolation SELV-rated, referenced to chassis; connector: IEEE-488.1 compliant.
Parallel Interface	One number of 15P – 2PORT DB15 male and female connectors; safety isolation SELV-rated, referenced to chassis. This interface is used for the leader-follower parallel operation of the Mi-BEAM Series power supply. **a)** **1Feet** (0.304 m) Cable - **890-015-01** (CABLE,15P, D-SUB, M/F, SHLD,1FT (0.304 m)) **b)** **5Feet** (1.52 m) Cable - **890-015-02** (CABLE,15P, D-SUB, M/F, SHLD,5FT (1.52 m))

Table 2-21. Rear Panel Connectors

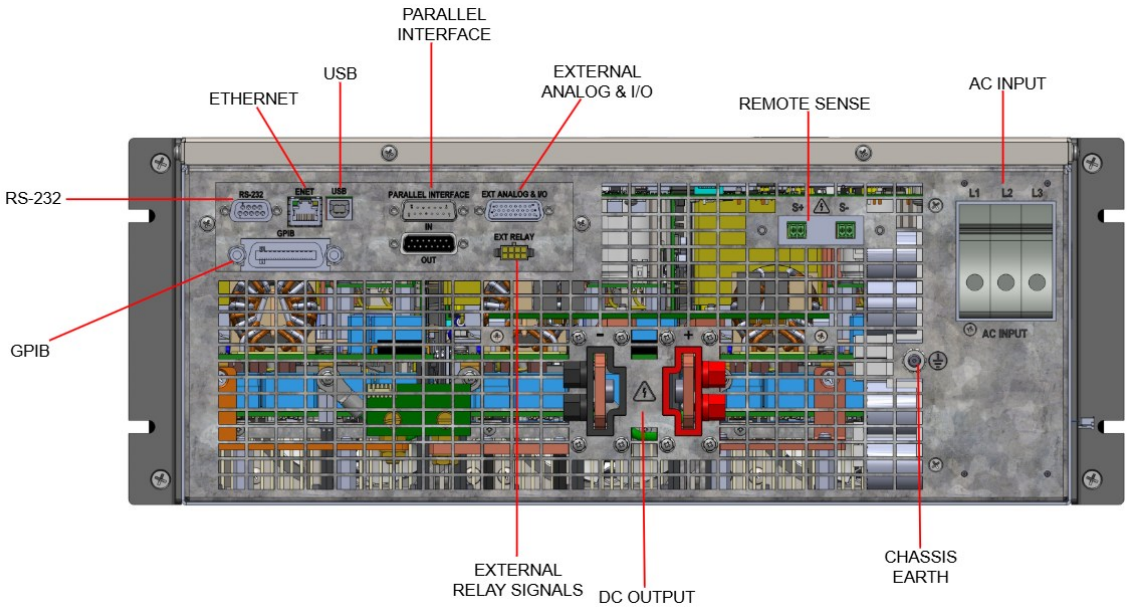


Figure 2-12. Rear Panel Connectors with GPIB option

This page intentionally left blank

3 INSTALLATION

This chapter provides detailed instructions for the safe and proper installation of the Mi-BEAM Series power supply models. It covers the necessary steps to ensure optimal performance and longevity of the equipment. The following information will help prevent damage to the unit and ensure compliance with safety standards.

3.1 UNPACKING AND INSPECTION

Inspect the shipping carton for possible damage before unpacking the unit. Carefully unpack the equipment. Save all packing materials until the inspection is complete. Ensure that all items listed on the packing slips have been received. Visually inspect all exterior surfaces for broken knobs, connectors, or displays. Inspect for dented or damaged exterior surfaces. External damage may 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 Customer Service at 858-458-0223 (local) or 1-800-733-5427 (toll-free in North America).

CAUTION!

A minimum of two people are required to carry the unit from the package using the attached lifting straps, as it weighs up to 137 lbs. (62 kg).

Make sure the location (floor) in which the Mi-BEAM Series unit(s) will be installed can support the weight of the unit(s).

3.1.1 CONTENTS OF SHIPMENT

Depending on the model, configuration, and options available for the user's Mi-BEAM Series power supply, the ship kit may include additional parts and accessories.

Minimum items included in the ship kit:

1. Remote Sense Mating Connector, Refer to Item 1 in Table 3-1.
2. Protective cover and grommet for DC output and remote sense, Refer to Item 2 in Table 3-1.
3. Protective cover for AC input, Refer to Item 3 in Table 3-1.

4. KEPS Steel Nut and Screw and washers for installing AC Input, DC output and Remote sense protective covers, Refer to Item 4 in Table 3-1.

5. Analog programming Mating connector, Refer to Item 5 in Table 3-1.

6. Certificate of Conformance, Refer to Item 6 in Table 3-1.

7. EMI ferrite cores for AC input and DC output connection cables Refer to Item 7 in Table 3-1

8. Stylus pen for the front panel operation Refer to Item 8 in Table 3-1

ITEM NUMBER	PART NUMBER	DESCRIPTION	QTY	MFG	MFG P/N
1	893-160-28	TERM BLK 2P,8A,160V, PCB MNT	2	Phoenix Contact	1840366
2	9580380-01R	COVER, SAFETY, SENSE O/P,4U-DC RGN	1	AMETEK	9580380-01R
	9580289-01R	COVER,SAFETY,DC O/P,NEG,4U-DC RGN	1	AMETEK	9580289-01R
	9580289-02R	COVER,SAFETY,DC O/P,POS,4U-DC RGN	1	AMETEK	9580289-02R
	109-505-10	GROMMET,5ID,10OD,TPE	2	JACOB GmbH	G505-1016-00
3	9580336-01R	COVER, SAFETY, AC INPUT,4U-DC RGN	1	AMETEK	9580336-01R
4	9580614-01R	SCREW, M4X8MM, INSUL, POS,4U-Mi BEAM	2	AMETEK	9580614-01R
	76011	WASHER,M6,FLAT,12MM OD,SS	4	Any	NA
	76012	WASHER,M6,SPLIT LOCK,11.8MM OD,SS	4	Any	NA
	9580614-02R	SCREW, M4X8MM, INSUL, NEG,4U-Mi BEAM	2	AMETEK	9580614-02R
	082000B	LOCKNUT, M3 x 0.5 MM (0.019 IN.) THD, STL, ZINC, W/T WASHER	6	Any	NA
	75162	SCREW,M6 X 16MM,PAN HD,ZN	2	Any	NA
	110-901-28	SCREW,M6 X 16MM,SKT HD,ZN	2	Any	NA
5	856-103-26	CONN,26P, D-SUB HD PLUG, PNL MNT	1	Norcomp	180-026-103L001
6	152546	CERTIFICATE OF CONFORMANCE	1	NA	NA
7	995-336-43	CORE,FERRITE,CBL,43R,2ODX1.5H	2	FAIR-RITE PRODUCTS CORP	2643626202
8	881-800-00	STYLUS PEN,RESISTIVE TOUCH,VM800	1	FTDI/ BRIDGETEK	VA-FC-STYLUS1

Table 3-1. Contents of Shipment

NOTE: If any parts are missing, please reach out to AMETEK Customer Service at 858-458-0223 (local) or 1-800-733-5427 (toll-free).

Optional accessories:

K580351-01R: Rackmount slide kit; includes two slides with rack adapter brackets and mounting hardware.

3.2 MECHANICAL INSTALLATION

The Mi-BEAM Series power supply is designed for rackmount applications, there is an option for a rack mounted slide. 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 40°C (104°F).

WARNING!

This unit is intended for installation in a protected environment. Exposure to conductive contaminants, corrosive compounds or gases that could be ingested into the chassis could result in internal damage. To reduce the risk of fire or electrical shock, install the Mi-BEAM Series unit in a temperature and humidity controlled indoor area.

CAUTION!

The power supply 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 in. (50.8 mm) clearance from the rear air outlet is required.

CAUTION!

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

3.2.1 RACK MOUNTING

The Mi-BEAM Series power supply is designed for mounting in a standard 19 in. (482.6 mm) 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 Figure 3-1 for typical rackmount installation. The rack mounting slide kit, part number K580351-01R consists of the following items:

PART NUMBER	DESCRIPTION	MFG	ITEM #	QTY
105-140-22	RACK SLIDES,140LBS,22 IN,SS	JONATHAN 370QD-22	1	2
9580805-01R	BRKT,RACK SLIDE,4U-Mi-BEAM	AMETEK	2	4
110-800-06	SCREW,8-32 X .375, PFH100, LK, SS	ANY	4	15
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
112GI04-01	NUT, 10-32, ZINC PL	ANY	7	12

Table 3-2 . Rack Mounting Slide Kit

NOTE: Remove the lifting straps from the unit before assembling the rack slides.

NOTE: Item **#1** consists of three parts (item **#1A**, item **#1B** and item **#1C**) as shown in Figure 3-1.

Recommended rackmount kit installation instruction is as follows:

a) Install the slide sections item **#1** (supplied as part of item **#1**) on both sides of the power supply chassis with screws, item **#4** (three on one side and four on the other).

b) Install the brackets, item **#2**, to the cabinet sections of the slides, item **#1C** (supplied as part of item **#1**), with screws, item **#4**, and nuts, item **#5** (four on each side).

c) Adjust the location of the mounting brackets as required for the rack cabinet vertical rails utilized.

d) Mount the cabinet sections of the slides, item **#1C**, (with brackets already installed) into the cabinet using appropriate hardware (e.g., the screws and nuts supplied, item **#6** and item **#7**, or user-supplied bar-nuts, cage-nuts, clip-nuts), while ensuring that they are level, front to back and left to right, on the cabinet rails.

e) Insert adjustable side sections, item **#1B** (supplied as part of item **#1**), into cabinet slide sections, item **#1C.** Insert power supply chassis with installed slide sections, item **#1A**, into the adjustable slide sections, item **#1B**.

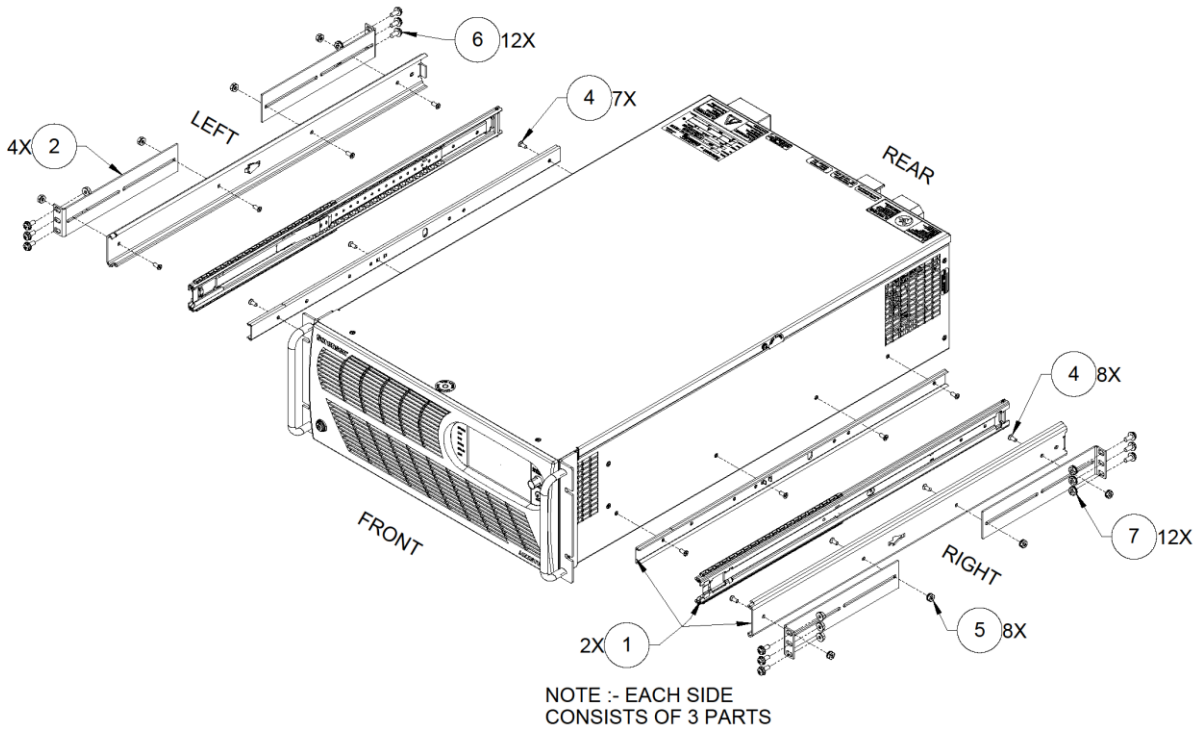


Figure 3-1. Rack mounting

3.3 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.

3.4 OUTLINE DRAWINGS

Figure 3-2 shows the outlines and overall dimensions for installation of the Mi-BEAM Series power supply without relay option.

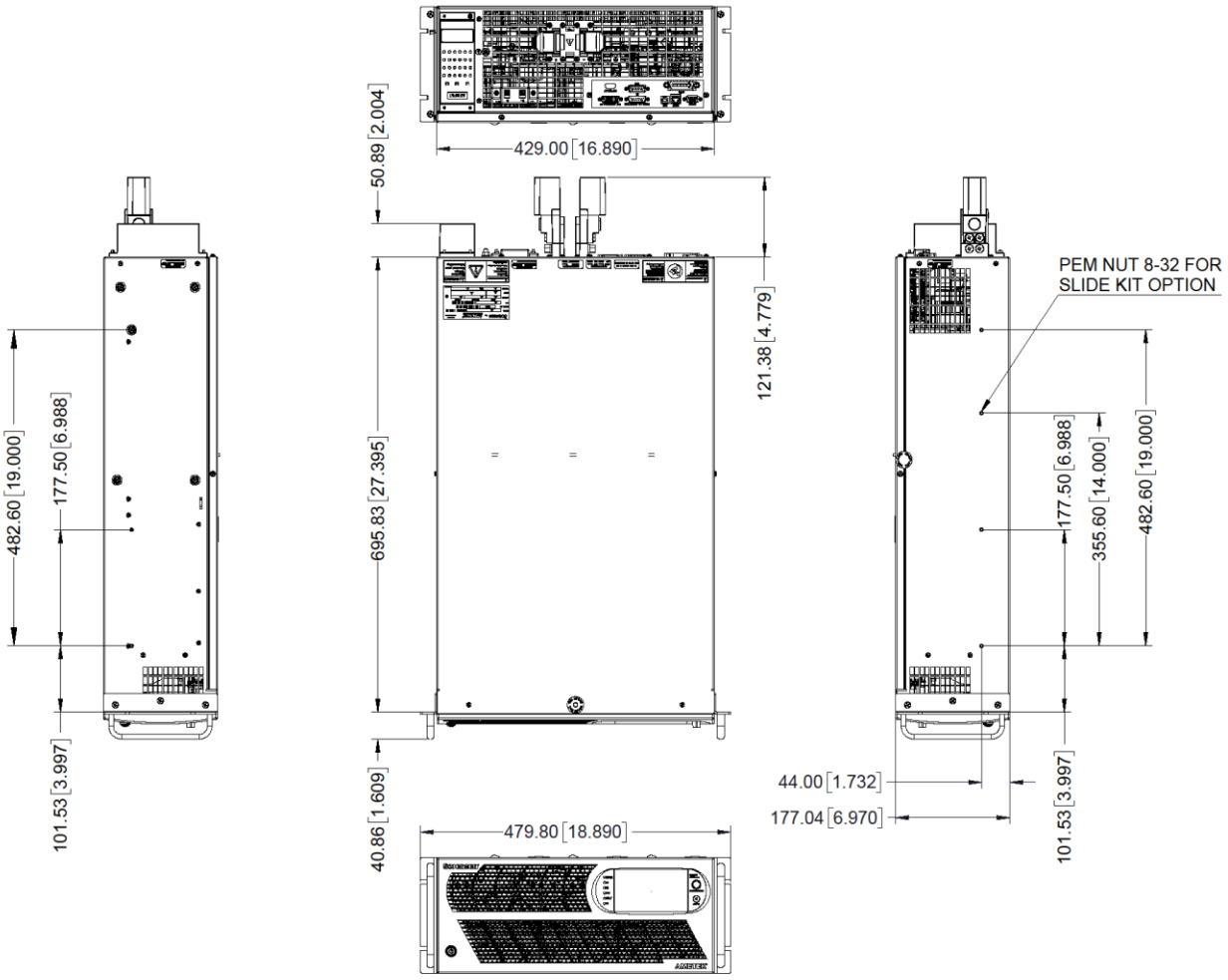


Figure 3-2: Installation Drawing

Figure 3-3 and Figure 3-4 shows the installation of the rear panel protective covers for the AC input and DC Output terminations. The components comprising these covers are supplied in the ship kit. Figure 3-6 shows the rear panel view of the power supply and the location of the connectors.

3.5 REAR PANEL PROTECTIVE COVERS

3.5.1 INPUT PROTECTIVE COVERS

Protective covers are provided for the rear panel AC input connector. They are installed to studs on the rear panel, as shown in Figure 3-3, using M3 X 0.5 KEPS-nuts with a maximum tightening torque of 0.8 Nm (7 lb-in). The components comprising the covers are supplied in the ship kit.

CAUTION!
M3 0.5 KEPS nuts - Maximum tightening torque is 0.8 Nm (7 lb-in.).

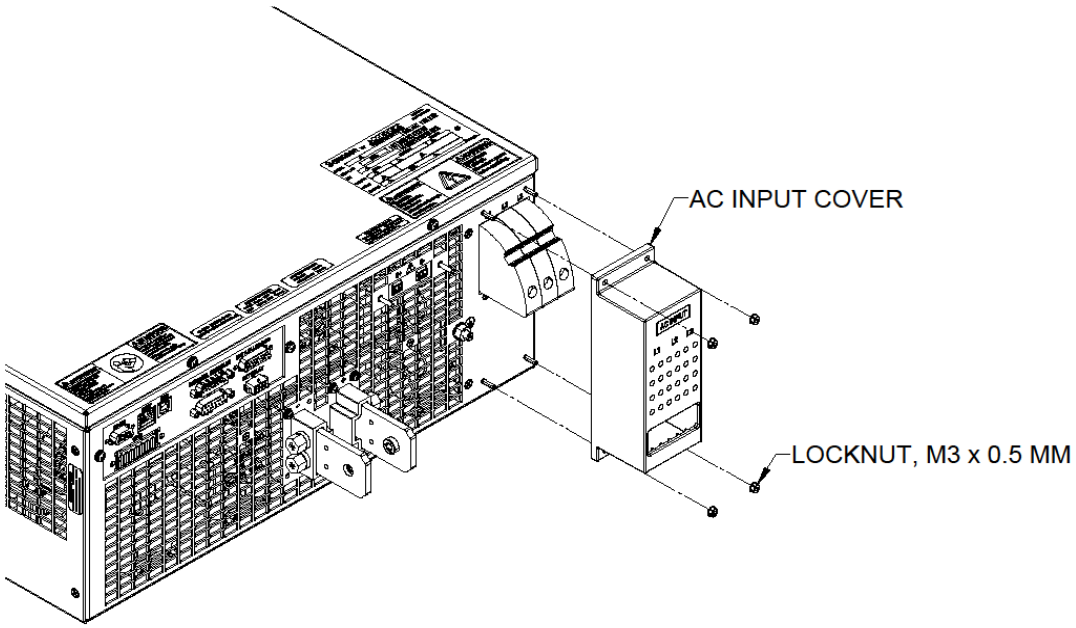


Figure 3-3. AC Input Protective Cover

3.5.2 OUTPUT PROTECTIVE COVERS

Protective covers are provided for the rear panel DC output connector. Install safety cover P/N: 9580289-01R on the positive bus bar and P/N: 9580289-02R on the negative bus bar, securing each with an M4 × 8 mm screw, refer to Figure 3-4. The components comprising the covers are supplied in the ship kit.

NOTE: Use red color M4 × 8 mm screw for positive bus bar protective cover installation and black color M4 × 8 mm screw for negative bus bar protective cover installation.

CAUTION!
M4 × 8 mm screw - Maximum tightening torque is 0.8 Nm (7 lb-in.).

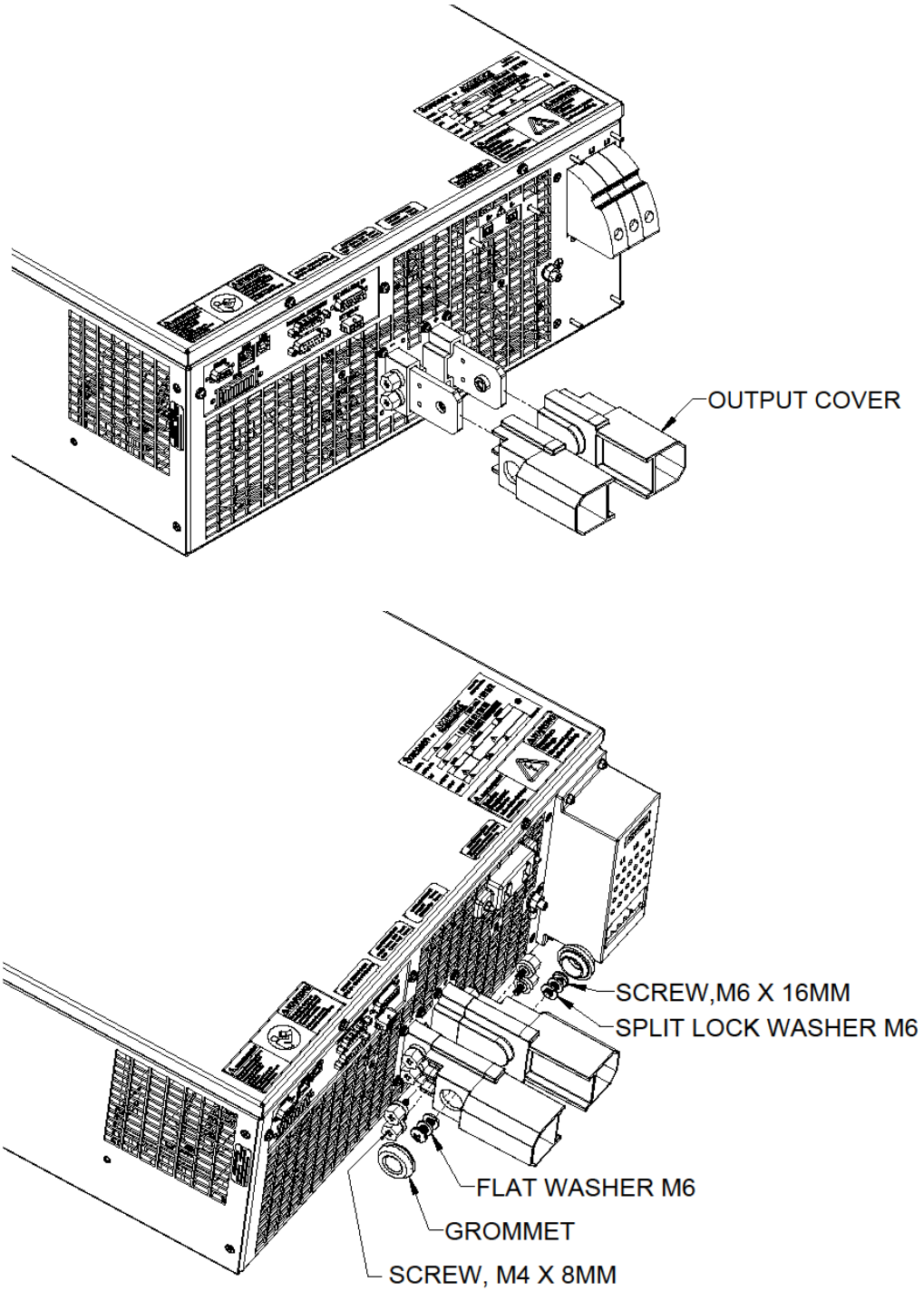


Figure 3-4. Rear Panel DC Protective covers

3.5.3 REMOTE SENSE COVER

Protective covers are provided for the rear panel remote sense connections. They are installed to studs on the rear panel, as shown in Figure 3-5, using M3 X 0.5 KEPS-nuts with a maximum tightening torque of 0.8 Nm (7 lb-in). The components comprising the covers are supplied in the ship kit.

CAUTION!
M4 × 8 mm screw - Maximum tightening torque is 0.8 Nm (7 lb-in.).

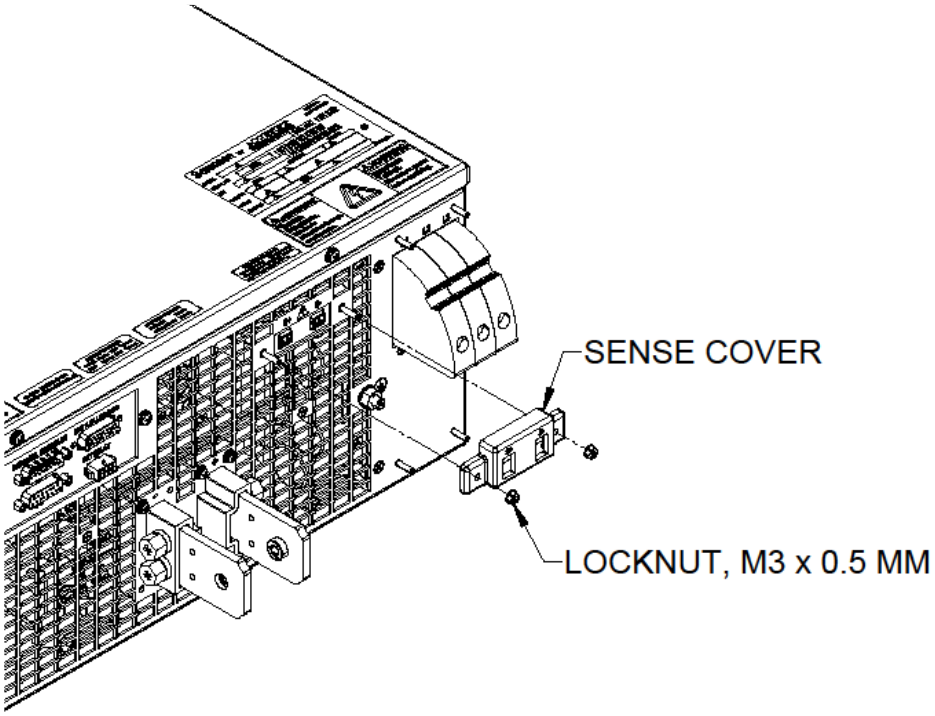


Figure 3-5. Remote sense cover

3.6 REAR PANEL INPUT/OUTPUT CONNECTIONS

Figure 3-6 shows the rear panel view of the power supply and locations of the rear panel connector. Table 3-3 provides details of the connectors located in the rear panel of the power supply.

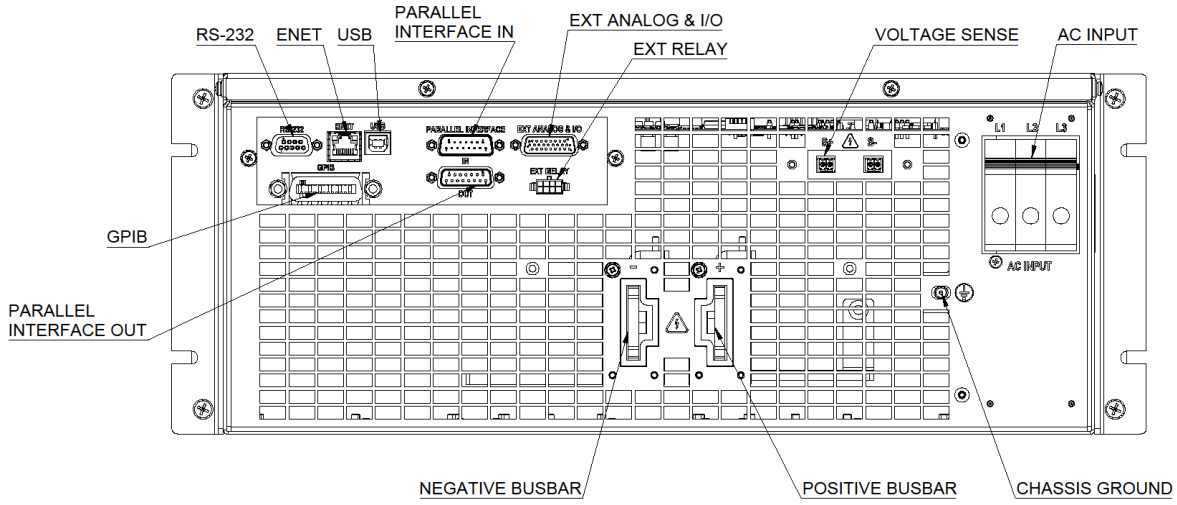


Figure 3-6: Rear Panel View

	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 2-2.
	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. The signals of analog programming and external user interface connector are isolated from the output terminals of the power supply.

CONNECTOR	FUNCTION	CONNECTION
L1 – AC, L2 – AC, L3 – AC, Chassis - GND	AC input power; see Section 3.7.	AC mains 3-phase input
DC Output and Remote Sense Connector	DC output power and Remote voltage sensing; see Section 3.9.	Output load
RS-232C connector	RS-232C connector for remote digital control; see Section 3.12.5.	External digital interface
USB Connector	USB type B connector for remote digital control; see Section 3.12.6.	External digital interface
Ethernet connector	Ethernet connector for remote digital control; see Section 3.12.7.	External digital interface
External Analog & I/O	Remote isolated external user control I/O signal interface and isolated analog interface; see Section 3.12.1.	External User controller & I/O
Ext Relay	External relay control signal connector; see Section 3.12.4.	External Relay connector
Parallel In and Out	Paralleling Mi-BEAM power supply; see Section 3.11	External digital interface

Table 3-3: Rear Panel Connectorpara

3.7 AC INPUT POWER CONNECTION

The Mi-BEAM Series power supply is designed to operate from 3-phase input power, having 3-wire, with nominal AC input voltage (refer to Table 2-11), and 50/60 Hz input frequency.

The factory default AC input Line is configured to High Line. In order to operate the unit with low line input, turn ON the unit with low line input and configure the AC input Line to Low line (refer to Section 7.2.5.7). On the next power cycle unit can be operated in Low Line.

The unit operates with high power factor, minimizing the required input apparent power and current harmonic distortion. Refer to the specifications of Section 2 for AC input current requirements, and derating of output power as a function of AC input voltage.

3.7.1 AC INPUT OVERCURRENT PROTECTION

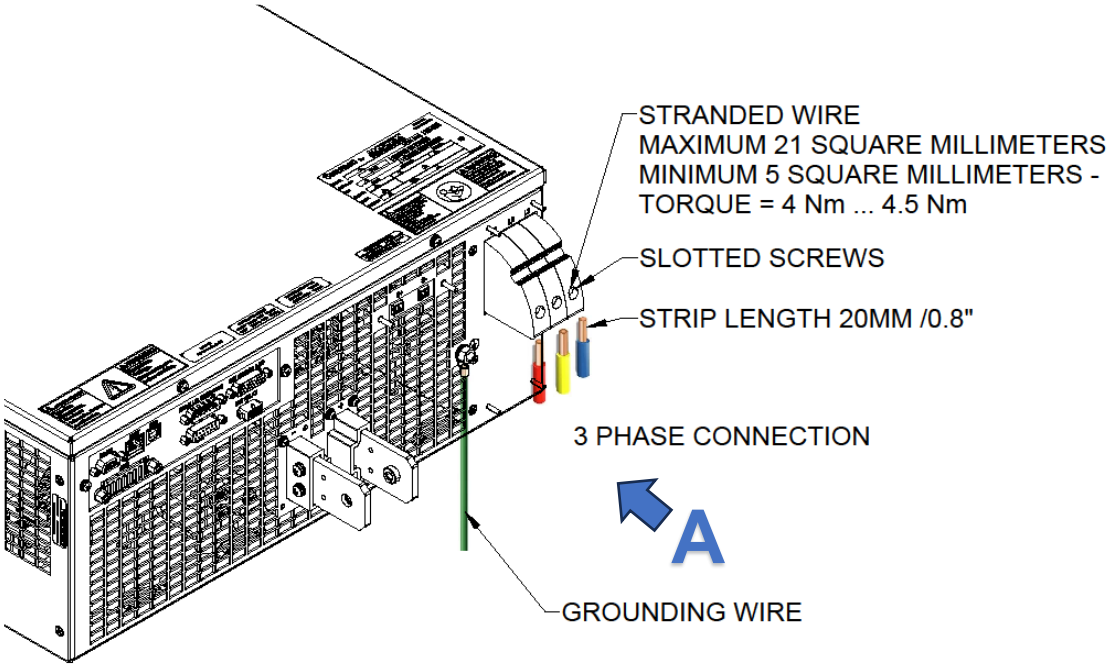
The Mi-BEAM Series power supply has fuses at the AC input for fault protection. These fuses are internal to the chassis and are not user accessible. They provide fault isolation in case a failure occurs with internal components or wiring. A suitable overcurrent protection device must be provided externally,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

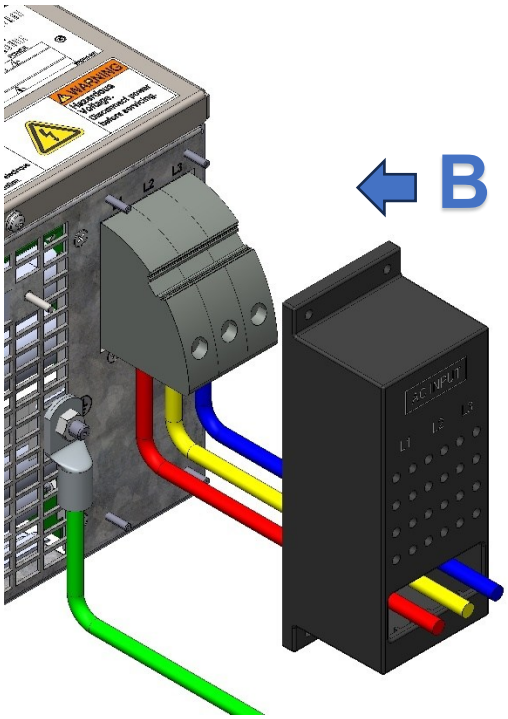
3.7.2 AC INPUT SAFETY DISCONNECT DEVICE

The Mi-BEAM Series power supply's 'Power' switch available in the front panel 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 circuit breaker, and must be located close to the unit, within reach of the operator, and clearly labeled as the disconnection device.

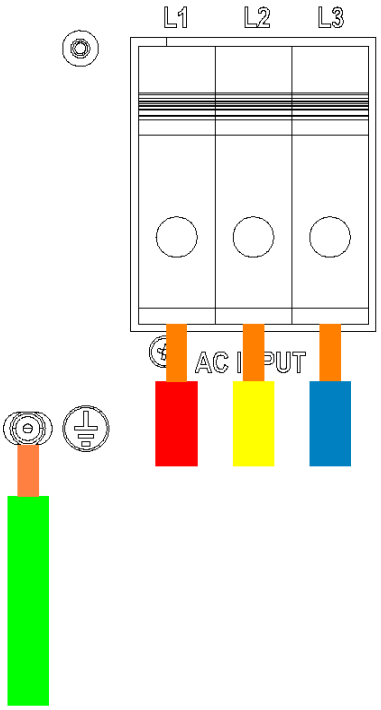
3.7.3 AC INPUT CONNECTOR

The AC input is located on the rear panel, along with the chassis ground stud. Refer to the Figure 3-7. Table 3-4 details the functions and connector pinout, and Table 3-5 lists the connector type.





AC Input Connector – View A



AC Input Connector – View B

Figure 3-7. AC Input Connector

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 rear panel Chassis ground stud. Figure 3-7 shows the AC input connector wiring.

NAME	TYPE	FUNCTION
L1	AC Input	Line-1 input from utility AC mains;
L2	AC Input	Line-2 input from utility AC mains;
L3	AC Input	Line-3 input from utility AC mains;
CHASSIS GROUND	Safety Ground	Safety-Ground connection from utility earth protection-ground.

Table 3-4: AC Input Connector Pinout and Safety-Ground

CONNECTOR	TYPE
AC Input	Chassis connector header: Phoenix P/N 3073571; 3-position, compression terminals; Wire striping length: 20 mm (0.8 in.). Tightening torque: 4 Nm (35 lb-in) min to 4.5 Nm (39 lb-in) max. Wire cross section: 4 mm^2 (12 AWG) min to 25 mm^2 (4 AWG) max. Refer to Phoenix P/N 3073571 manufacturer datasheet for the complete specifications of the connector.
Chassis Ground	Stud provided in the rear panel for Safety-Ground Connection. For using the rear panel M6 stud, nut tightening torque is 4.2Nm (3 lb-in) max.

Table 3-5: 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.

3.7.4 CONNECTING AC INPUT HIGH LINE (380V – 480 V)

CAUTION!

Do not connect an AC input voltage that is greater than 528 VAC line-to-line. Exceeding the maximum AC input voltage could result in damage to the unit.

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!
For High Line AC input ensure the AC input voltage is between 342 to 528VAC throughout the operation.

Connecting AC input - High Line is as follows:

NOTE: The factory default AC input Line is configured to High Line, Refer to Section 7.2.5.7.4 for PONS AC Input line configuration.

a) Confirm that the line-to-line voltage from the AC source is within the range of 342 to 528 VAC.

b) Ensure the circuit rating of the operating model. Refer to Table 3-6.

MODEL POWER (kW)	OUTPUT POWER	INPUT VOLTAGE/INPUT POWER	CIRCUIT BREAKER
12	12 kW	3PH 380-480 VAC L-L/16kVA	32A-380V
25	25 kW	3PH 380-480 VAC L-L/29kVA	56A-380V
37	37 kW	3PH 380-480 VAC L-L/41kVA	84A-380V

Table 3-6. Circuit Breaker – High Line

c) Use wires rated for current equal to or greater than the values specified in Table 3-10.

d) Insert the AC source connection wires through the safety cover (P/N: 9580336-01R). Refer to Figure 3-8.

e) Connect the utility AC source wires to the rear panel AC input connector terminals L1, L2, L3. Refer to Figure 3-8.

f) After completing the connections, install the safety cover onto the unit using M3 × 0.5 mm locknuts to ensure proper protection and compliance with safety standards. Refer to Figure 3-3.

g) Connect a ground wire from the rear panel chassis ground stud to the utility power distribution earth protection ground. Refer to Figure 3-8.

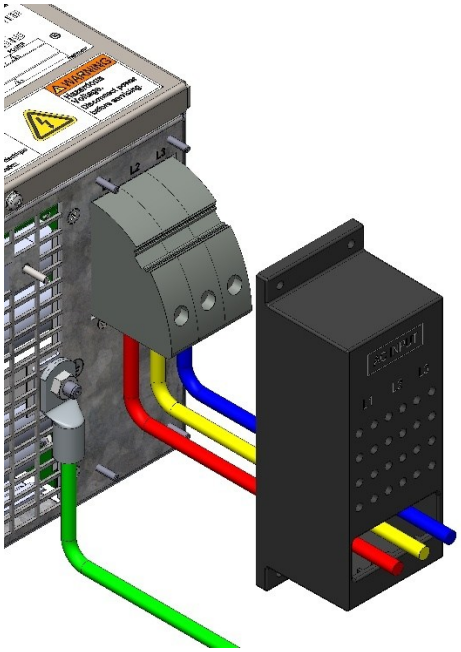


Figure 3-8. AC Input Connection

3.7.5 CONNECTING AC INPUT LOW LINE (200V – 240 V)

CAUTION!
Do not connect an AC input voltage that is greater than 528 VAC line-to-line. Exceeding the maximum AC input voltage could result in damage to the unit.

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!
For Low Line AC input ensure the AC input voltage is between 180 to 264VAC throughout the operation.

Connecting AC input - Low Line is as follows:

NOTE: In Low Line operation, the unit supports only 50% derated power. Refer to Section 2.3.

NOTE: The factory default AC input Line is configured to High Line. In order to operate the unit with low line input, turn ON the unit with low line input and configure the AC input Line to Low line (refer to Section 7.2.5.7). On the next power cycle unit can be operated in Low Line.

a) Confirm that the line-to-line voltage from the AC source is within the range of 180 to 264 VAC.

b) Ensure the circuit rating of the operating model. Refer to Table 3-7.

MODEL POWER (kW)	OUTPUT POWER	INPUT VOLTAGE/INPUT POWER	CIRCUIT BREAKER
12	12 kW	3PH 200-240 VAC L-L/8kVA	30A-200V
25	25 kW	3PH 200-240 VAC L-L/15kVA	53A-200V
37	37 kW	3PH 200-240 VAC L-L/21kVA	80A-200V

Table 3-7. Circuit Breaker – Low Line

c) Use wires rated for current equal to or greater than the values specified in Table 3-10.

d) Insert the AC source connection wires through the safety cover (P/N: 9580336-01R). Refer to Figure 3-8.

e) Connect the utility AC source wires to the rear panel AC input connector terminals L1, L2, L3. Refer to Figure 3-8.

f) After completing the connections, install the safety cover onto the unit using M3 × 0.5 mm locknuts to ensure proper protection and compliance with safety standards. Refer to Figure 3-3.

g) Connect a ground wire from the rear panel chassis ground stud to the utility power distribution earth protection ground. Refer to Figure 3-8.

3.8 DC OUTPUT CONNECTION

Output Power of the Mi-BEAM Series power supply is through positive and negative bus bars.

Connector	Description
DC Output (+Ve and -Ve)	DC Output terminal; Unit side connector: Copper bus bar - 35mm height & 5mm thickness with M6 x1mm threaded hole

Table 3-8. DC output Connector

WARNING!

Before handling the DC output connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live DC output can result in fatal electric shock and may cause death.

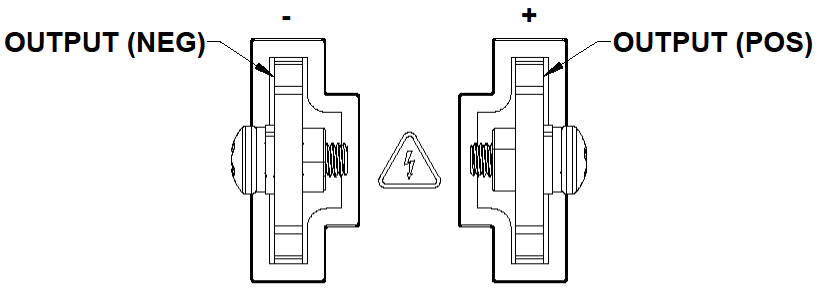


Figure 3-9. DC Output Bus Bar

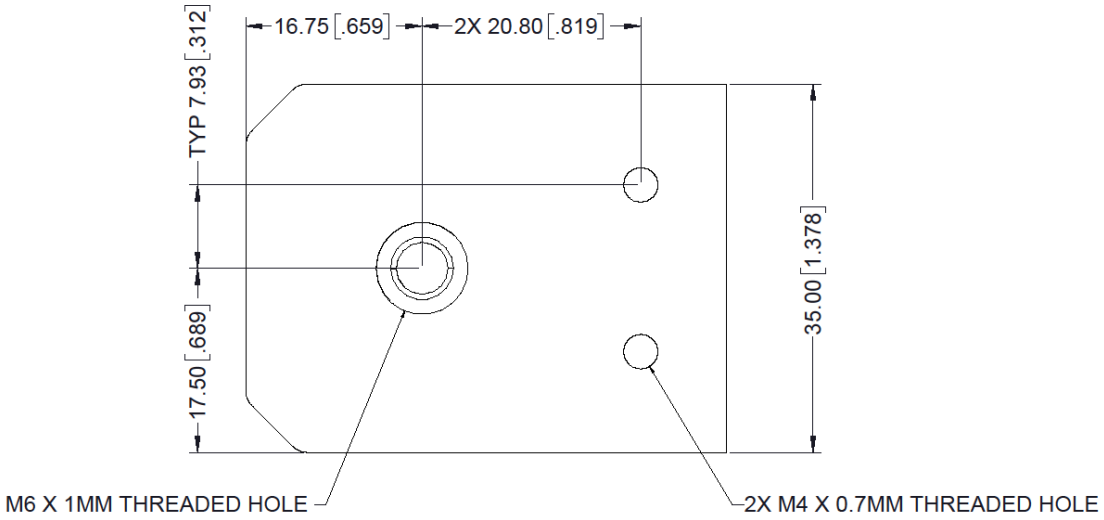


Figure 3-10. Bus Bar Dimension

3.8.1 CONNECTING DC OUTPUT

WARNING!
Before handling the DC output connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live DC output can result in fatal electric shock and may cause death.

Connecting DC Output is as follows:

a) Connect the safety cover (P/N: 9580380-01R) securely over the remote sense terminals using M3 × 0.5 mm locknuts.

b) Verify and ensure that both the positive and negative DC output bus bars are fully de-energized for safe handling.

c) Install the safety cover (P/N: 9580289-01R) on the positive bus bar and the safety cover (P/N: 9580289-02R) on the negative bus bar, securing each with an M4 × 8 mm screw. Refer to Figure 3-11.

d) Once the covers are properly installed, connect the positive and negative wires to their respective terminals on the bus bars using M6 × 16 mm screws. Refer to Figure 3-11.

e) Install grommets (P/N: 109-505-10) on both the positive and negative sides for safety. Refer to Figure 3-11.

NOTE: Use red color M4 × 8 mm screw for positive protective cover installation and black color M4 × 8 mm screw for negative protective cover installation.

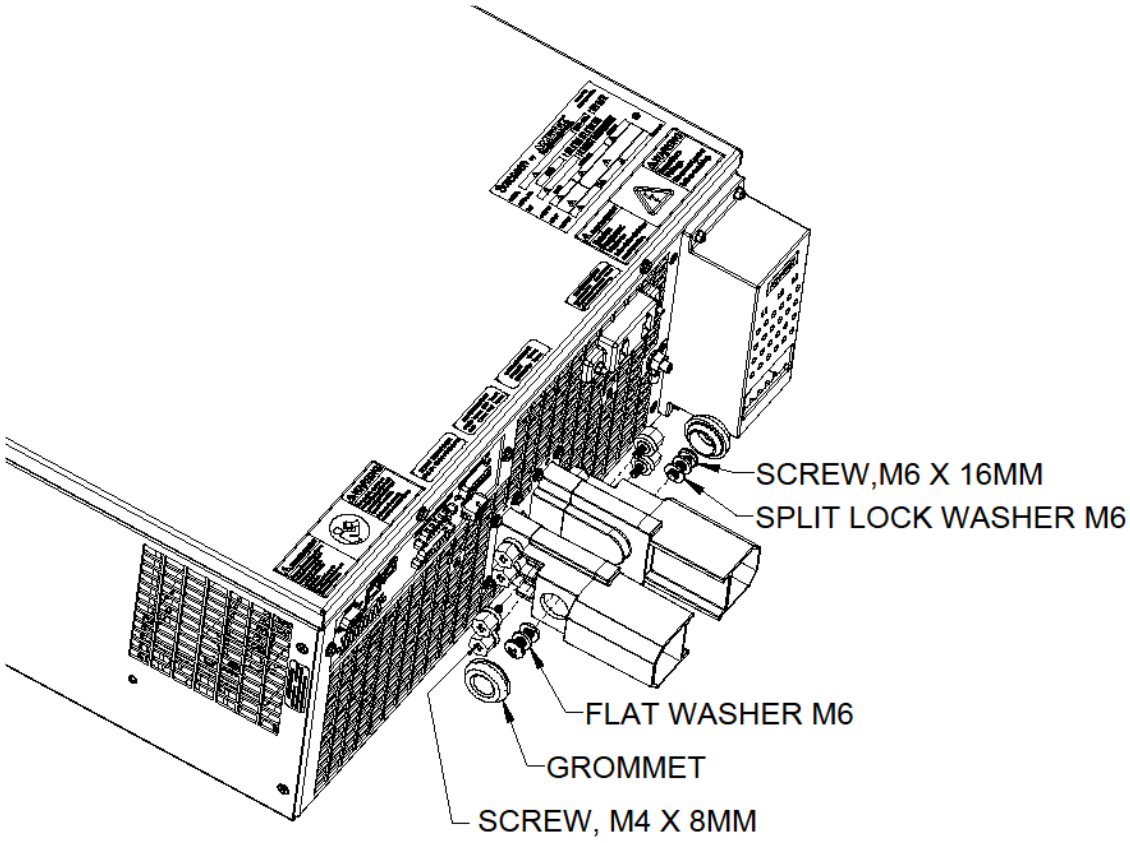


Figure 3-11. DC output Connection

3.9 REMOTE SENSE CONNECTION

WARNING!
Before handling the remote sense connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live remote sense connector can result in fatal electric shock and may cause death.

The remote sense connector is located on the rear panel. Figure 3-12 shows the rear panel view of the connector and Table 3-9 lists the connector type.

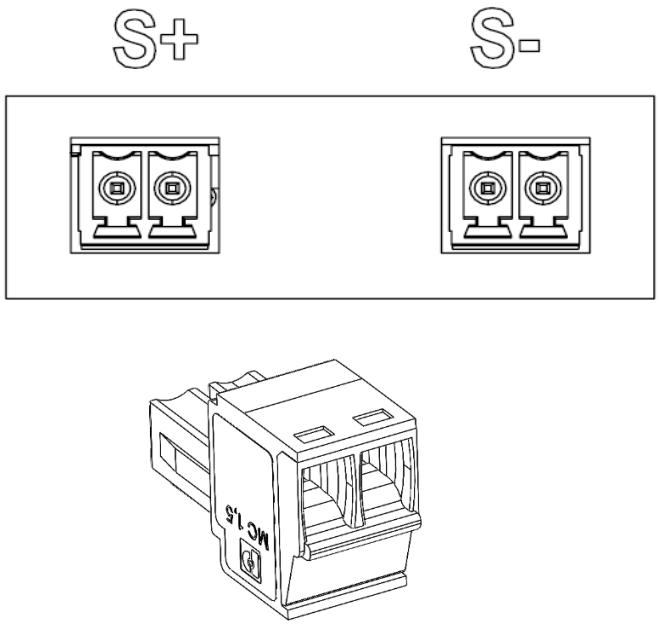


Figure 3-12. Remote Sense connector

CONNECTOR	TYPE
Remote Sense	Unit side connector: compression terminals, Phoenix P/N 1731471, x2 numbers (for S+ and S-) Mating Connector, Phoenix P/N 1840366, x2 numbers (for S+ and S-).

Table 3-9. Remote Sense Connector Type

3.9.1 NOISE AND IMPEDANCE EFFECTS

WARNING!
Before handling the remote sense connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live remote sense connector can result in fatal electric shock and may cause death.

To minimize noise pickup or radiation from load circuits, remote sense wires should be twisted pair and have minimum lead length. Shielding of the sense leads may be necessary in high noise environments. Even if noise is not a concern, the load and remote sense wires should be twisted pairs to reduce coupling between them, which could impact the stability of the output amplifier. Twisting the load wires provides an additional benefit in reducing the parasitic inductance of the cable. This improves the dynamic response characteristics at the load by maintaining low source impedance at high frequencies. If connectors are utilized for the power and sense leads, consideration of routing is necessary to minimize coupling between the leads. Ensure that the connector terminals for the sense leads are in adjacent contact locations and minimize the physical loop area of the untwisted portions.

3.9.2 REMOTE SENSE

WARNING!
Before handling the remote sense connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live remote sense connector can result in fatal electric shock and may cause death.

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 3-12, show the remote sense Connector.

Remote sensing is used to compensate for the voltage drop that occurs across the wires connecting the load to the output of the power supply. 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 3-13 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 2% of the rated output voltage, then the unit would go to fault state. The fault can arise due any of the following conditions.

a) The remote sense is selected, and the remote sense wiring is not connected to the power supply.
b) The remote sense is connected in reverse polarity.
c) The load cable drop exceeds 2% of the rated output voltage.

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

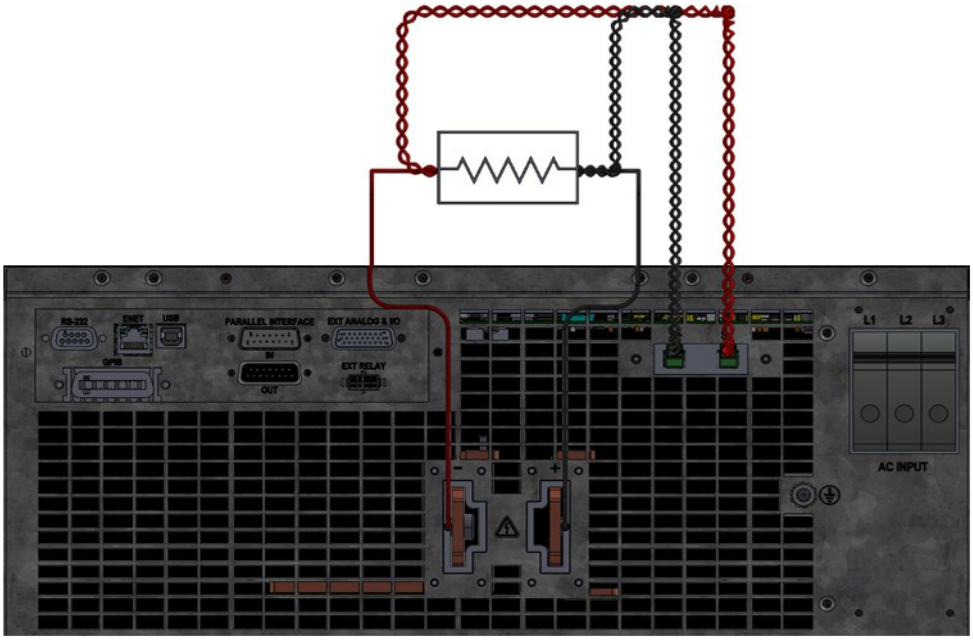


Figure 3-13: Remote Sense Connection

3.10 WIRE GAUGE SELECTION

This section provides guidance on selecting the appropriate wire size. Care must be taken to properly size all conductors for the input and output of the power supply.

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

3.10.1 WIRE SIZE

The tables below will assist in determining the appropriate wire size for both the input and output connections. Table 3-10 gives minimum recommended wire size; these recommendations are for 30°C (86° F) 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 (140°F)	75°C (158°F)	90°C (176°F)
	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	NA	NA	14
16	NA	NA	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 3-10. Minimum Wire Size

When determining the optimum cable specification for the user's power applications, the same engineering rules apply whether at the input or output of an electrical device. Thus, this guide applies equally to the AC input cable and DC output cable for this power supply 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 supply 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 instruments 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. Thus, short cables with generously derated gauge and insulation properties are recommended for power supply 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 quality performance specifications of this Mi- Beam power supply. Also, consider how the wiring codes apply to bundles of wire within a cable arrangement.

In high performance applications requiring high inrush or transient currents, additional consideration is required. The cable wire gauge must accommodate peak currents developed at peak voltages, which might be up to ten times the average current values. An underrated wire gauge adds losses, which alter the inrush characteristics of the application and thus the expected performance. Table 3-10 details the resistance of wires and the voltage drop in cables when operating at their maximum rated current, with the wire temperature set at 20°C (68° F). For copper wire, the temperature coefficient of resistance is alpha (α) = 0.00393 Omega (Ω)/°Celsius (C) at 20°C (68° F) (t1). As the temperature rises to a new value (t2), the resistance of the wire increases. This change in resistance can be calculated using the following formula:

$$R2 = R1\ (1 + \alpha\ (\mathrm{t2}\ -\ \mathrm{t1}))$$

Where R1 is the resistance at the reference temperature t1.

NOTE: If the temperature value is in Fahrenheit, convert the omega value from Celsius to Fahrenheit by dividing by the conversion factor of 1.8.

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

$$\text{Voltage Drop} = 2\ \times \text{Distance in feet}\ \times \text{Cable resistance per foot}\ \times \text{Current}$$

SIZE, AWG	A(RMS), (90°C WIRE)	OHMS/100 FT (30.4 M), (ONE WAY)	VOLTAGE DROP/100 FT (30.4 M), (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

Table 3-11. Wire Resistance and Voltage Drop, 20°C

3.11 PARALLEL INTERFACE IN AND OUT

The Parallel IN and OUT ports allow multiple MI-Beam power supply units of the same model to operate in parallel. Use only the following shielded 15-pin D-sub-M/F cables:

a) 1Feet (0.304 m) Cable - 890-015-01 (CABLE,15P, D-SUB, M/F, SHLD,1FT (0.304 m))
b) 5Feet (1.52 m) Cable - 890-015-02 (CABLE,15P, D-SUB, M/F, SHLD,5FT (1.52 m))

Remote analog control is not supported in parallel mode. Refer to Section 7.3.1 for more details related to Mi-Beam parallel operation.

3.12 REAR PANEL USER INTERFACE CONNECTORS

The rear panel contains the connectors for the remote analog and discrete-digital control interfaces, the digital communications interfaces (LAN, USB and RS-232C and optional GPIB IEEE-488), and the external interface.

3.12.1 REMOTE EXTERNAL USER CONTROL INTERFACE

The Remote External user control interface is located on the rear panel. Figure 3-14 shows the rear panel view of the connector, and Table 3-12 lists the connector type. Table 3-13 shows the functions and Table 3-14 shows the connector pinout.

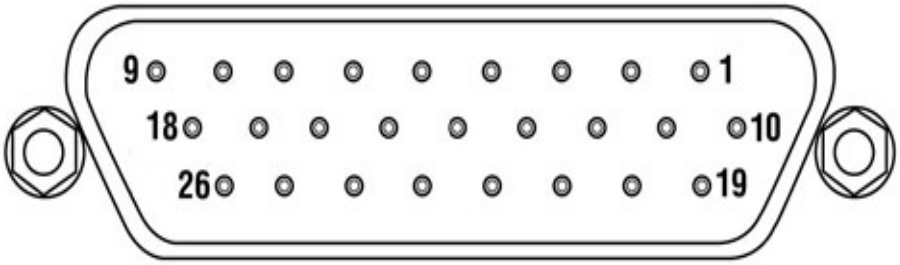


Figure 3-14. External User Control Interface connector

CONNECTOR	TYPE
Remote External User Control Interface	High-density, 26-contact, female D-Type, Norcomp P/N 181-026-213R531 Mating connector, Norcomp P/N 180-026-103L001

Table 3-12: External User Control Interface connector Type

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
Remote Inhibit Input – Contact Closure - Open	Opening the Switch or Relay contact between this terminal and signal return will turn OFF the output. Switch or Relay closure or direct short from this terminal to signal return would turn-on the output. Remote inhibit can be configured in three modes; **d)** Latch: after reclosing the contact, user needs to clear the fault and turn ON the output. **e)** Live: after reclosing the contact, user can turn ON the output. **f)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 milliampere (mA) from 5 volts direct current (VDC) to enable.
Remote Inhibit Input – Contact Closure - Close	Closing the Switch or Relay contact between this terminal and signal return will turn OFF the output. Switch or Relay opening would turn ON the output. Remote inhibit can be configured in three modes; **d)** Latch: after reclosing the contact, user can clear the fault and turn ON the output. **e)** Live: after reclosing the contact, user needs to turn ON the output. **f)** OFF: inhibit function would be disabled.

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
	Remote circuit must sink up to 10 mA from 5 VDC to enable.
Remote Inhibit Input – Active Source – High	An active voltage source high signal from this terminal to signal return will Turn OFF the output of power supply. Remote inhibit can be configured in three modes; **a)** Latch: after removing the active voltage source, user can clear the fault and turn ON the output. **b)** Live: after removing the active voltage source, user can turn ON the output. **c)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 mA from 5 VDC to enable.
Remote Inhibit Input – Active Source – Low	An active voltage source low signal from this terminal to signal return will Turn OFF the output of power supply. Remote inhibit can be configured in three modes; **a)** Latch: after removing the active voltage source low signal, user needs to clear the fault and turn ON the output. **b)** Live: after removing the active voltage source, user can turn ON the output. **c)** OFF: inhibit function would be disabled. Remote circuit must sink up to 10 mA from 5 VDC to enable.
Trigger In(1)	TTL compatible Input signal, active-high pulse of 100 μs; detects external hardware trigger at falling edge of the pulse for voltage, current ramp and Transient List functions. Signal connects to Open-anode of opto-isolator diode with internal 1 kΩ series resistor internal to power supply. Voltage Rating: Maximum 24 V, Minimum -5 V Low state: 0.3 V max, High State 2.7 V min
Trigger Out(1)	Output signal, active-high; synchronization pulse of 100 μs. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Current Sink Current: 50 mA
CC/CV status Output	Output signal, High state indicates Constant Current mode operation and Low state indicates Constant Voltage mode operation. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Current Sink Current: 50 mA

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
Output ON/OFF Status	Output signal, High state indicates Output is ON and Low state indicates Output is OFF. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to the common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Sink Current: 50 mA
FAULT Status	Output Signal, High state indicates fault state of the power supply. Open collector transistor output, Collector is connected to the 26-pin connector. The emitter point of transistor is connected to the common return pin of the interface connector. Voltage Rating: Maximum 30 V, Minimum 3 V for Active High, Current Sink Current: 50 mA
ISOLATED ANALOG PROGRAMMING FEATURES	
Remote Analog Programming of Output Voltage (1)	Independent Signal inputs for output voltage programming using External Analog Reference. Analog reference source is user selectable and can be a voltage or resistance. User can select the reference source and range as given below; **a)** Voltage as Reference Source**:** 0 V to user selectable maximum range (5 V to 10 V) for 0 to full scale rated Output. **b)** Resistance as Reference Source**:** 0 Ω to user selectable maximum range (5 kΩ to 10 kΩ) for 0 to full scale rated Output. Programming accuracy and linearity: ±1% of rated output
Remote Analog Programming of Output Current (2)	Independent Signal inputs for output current programming using External Analog Reference. Analog reference source is user selectable and can be a voltage or resistance. User can select the reference source and range as given below; **a)** Voltage as Reference Source**:** User selectable range of (-5 V to +5 V) or (-10 V to +10 V) for 0 to full scale rated Output. **b)** Resistance as Reference Source**:** 0 Ω to user selectable maximum range (5 kΩ to 10 kΩ) for 0 to full scale rated Output. This is applicable only in source mode. Programming accuracy and linearity: ±1% of rated output
Monitor Signals for the Output Voltage and Output Current	Monitor Signals for the Output Voltage and Current. 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 and linearity: ±1% of full-scale output

REMOTE ISOLATED EXTERNAL USER CONTROL I/O SIGNAL INTERFACE	
FUNCTION	**CHARACTERISTICS**
Remote Analog Programming of Overvoltage [2]	Signal input for setting Overvoltage using External Analog Reference Voltage. Range: 0.25 V to user selectable maximum range (5 V to 10 V) for 5% to 110% of the full-scale Output Voltage. Programming accuracy and linearity: ±1% of full-scale output.
[1] Trigger IN and Trigger OUT signals can be used during Ramp and Transient List functionality only. *[2] Unit can be operated in remote analog programming in Bi-directional, Source and Eload modes only.*	

Table 3-13: External User Control Interface Characteristics

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
1	VPRG_VOLT	Input	0-10V	Independent Signal inputs for output voltage programming using External Analog Reference. In this, the reference is a voltage source: 0 V to user selectable maximum range (5 V to 10 V) for 0 to full scale rated output voltage.
2	VPRG_CURR	Input	0 - 10 kOhm	Independent Signal inputs for output voltage programming using External Analog Reference. In this, the reference is resistance source: 0 Ohm to user selectable maximum range (5 kOhm to 10 kOhm) for 0 to full scale rated output voltage.
3	IPRG_VOLT	Input	-10 to +10V	Independent Signal inputs for output current programming using External Analog Reference. In this, the reference is a voltage source: -10 V to +10 V for 0 to full scale rated output current.
4	IPRG_CURR	Input	0 - 10 kOhm	Independent Signal inputs for output current programming using External Analog Reference. In this, the reference is resistance source: 0 Ohm to user selectable maximum range (5 kOhm to 10 kOhm) for 0 to full scale rated output current (available only in Source mode).

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
5	OVPRG_VOLT	Input	0-10V	Remote Analog Programming of Overvoltage. Signal input for setting Overvoltage using External Analog Reference Voltage. 0.25 V to user selectable maximum range (2 V to 10 V) for 5% to 110% of the full-scale Output Voltage.
6	GND_ISOSELV	Return	NA	Ground for programming Signals
7	VMON	Output	0-10V	Monitor Signals for the Output Voltage
8	IMON	Output	-10 to +10V	Monitor Signals for the Output Current.
9	GND_ISOSELV	Return	NA	Ground for Monitor Signals
10	DIO_OUT1	Output	0-30 V	Open collector transistor output for user programming
11	DIO_OUT2	Output	0-30 V	Open collector transistor output for user programming
12	SOUR/SINK_OUT	Output	0-30 V	Open collector transistor output. Collector is connected to the 26-pin connector. Status signal to communicate the direction of current flow. Low – indicates power transfer is from power supply to UUT. High – indicates power transfer is from UUT to Power supply.
13	TRIG_OUT	Output	0-30 V	Open collector transistor output. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector. Active-high; synchronization pulse of 100 µs.
14	DIO_ON/OFF_STAT	Output	0-30 V	ON/OFF-Open collector transistor output, Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector. High state indicates

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
				Output is ON and Low state indicates Output is OFF
15	DIO_CC/CV_OUT	Output	0-30 V	CC/CV status- open collector configuration. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector. High state indicates Constant Current mode operation and Low state indicates Constant Voltage mode operation.
16	DIO_FAULT_OUT	Output	0-30 V	Fault status- open collector configuration. Collector is connected to the 26-pin connector. Emitter point of transistor is connected to common return pin of the interface connector. High state indicates fault state of the power supply
17	RTN	Return	NA	Return for digital signals
18	RTN	Return	NA	Return for digital signals
19	TRIG_IN	Input	0 to 24 V	TTL compatible Input signal, active-high pulse of 100 µs; detects external hardware trigger at falling edge of the pulse for voltage, current ramp, and Transient List functions. Signal connects to Open-anode of opto-isolator diode with internal 1kΩ series resistor internal to power supply.
20	DIO_OUTPUT_ON/OFF	Input	0 to 24 V	Remote-control input for output on/off with a logic signal: a logic-high, 2.7-24 VDC TTL/CMOS signals will enable (turn-on) the output of the supply, and a logic-low signal disables (turns off) the output
21	Digital_IN-1	Input	-5 to 24 V	Remote-control input with a logic signal
22	Digital_IN-2	Input	-5 to 24 V	Remote-control input with a logic signal

PIN	REFERENCE	TYPE	RANGE	FUNCTIONAL DESCRIPTION
23	Digital_IN-3	Input	-5 to 24 V	Remote-control input with a logic signal
24	Remote_Inhibit_Active_Voltage	Input	-5 to 24 V	Remote-control input for output on/off with a logic signal
25	Remote_Inhibit_Contact_Closure	Input	-5 to 24 V	Switch/Relay contact closure or direct short from this terminal to signal return is required to Turn ON/OFF the power supply. Opening the contact would shut down the output.
26	RTN	Return	NA	Ground return
NOTE: All the signals are safety isolation SELV-rated, referenced to chassis.				

Table 3-14: External User Control Interface Pin Out details

CAUTION!
All the three channels signal returns (Pin 17, 18 and 26) are shorted internally. Applying a voltage potential between them would damage the power supply.

CAUTION!
External User Control interface signals are isolated from negative output terminal; Isolation voltage is rated for ±600 VRMS, maximum; operation of Isolated Analog Interface signals should be at SELV safety voltage conditions to chassis ground.

3.12.2 REMOTE INHIBIT SIGNAL

The Remote Inhibit signal, Pin-24 for Remote inhibit Active Voltage and Pin-25 for Remote inhibit Contact Closure, can be used to enable or disable the output of the power supply.

The following types can be selected:

a) Contact Closure: The remote inhibit type can be set to ‘Contact Closure’ using SCPI command;

```
OUTP: REM: INHIBIT: TYPE 0
```

Contact closure has two remote inhibit states, it can be either ‘OPEN’ or ‘CLOSE’

- **OPEN:** When the inhibit state is selected to ‘OPEN’, open path from this signal to the return signal shuts down the power supply output. The remote inhibit state can be set to ‘Open’ using SCPI command;

```
OUTP: REM: INHIBIT: STATE 0
```

- **CLOSE:** When the inhibit state is selected to ‘CLOSE’ a switch/relay contact closure or a direct short from this terminal to signal return shuts down the power supply output. The remote inhibit state can be set to ‘Close’ using SCPI command;

```
OUTP: REM: INHIBIT: STATE 1
```

b) Active Source: The remote inhibit type can be set to ‘Active Source’ using SCPI command;

```
OUTP: REM: INHIBIT: TYPE 1
```

Active source has two remote inhibit states, it can be either ‘LOW’ or ‘HIGH’.

- **LOW:** When the inhibit state is selected to ‘LOW’ an active voltage source low from this terminal to signal return shuts down the power supply output. The remote inhibit state can be set to ‘LOW’ using SCPI command;

```
OUTP: REM: INHIBIT: STATE 0
```

- **HIGH:** When the inhibit state is selected to ‘HIGH’, an active voltage source high from this terminal to signal return shuts down the power supply output. The remote inhibit state can be set to ‘HIGH’ using SCPI command;

```
OUTP: REM: INHIBIT: STATE 1
```

The remote inhibit mode can be changed using SCPI command;

```
OUTP: REM: INHIBIT: MODE <mode>.
```

The default mode for Remote Inhibit is OFF.

a) LATCH: The Remote Inhibit input latches the output in the protection shutdown state. This state can only be cleared by the remote digital interface SCPI command, `*CLS`.
The remote inhibit mode can be set to ‘Latching’ using SCPI command;

```
OUTP: REM: INHIBIT: MODE LATCHING.
```

b) LIVE: The output state follows the state of the Remote Inhibit input. The remote inhibit mode can be set to ‘live’ using SCPI command;

```
OUTP: REM: INHIBIT: MODE LIVE
```

c) OFF: The power supply ignores the Remote Inhibit input. The remote inhibit mode can be set to ‘OFF’ using SCPI command;

```
OUTP: REM: INHIBIT: MODE OFF
```

For additional information on programming the Remote Inhibit function, refer to the Mi-Beam Programming Manual. Refer to AMETEK Programmable Power website, www.programmablepower.com, to download latest version.

3.12.3 REMOTE ANALOG PROGRAMMING

The remote analog programming is located on the rear panel. Figure 3-14 shows the rear panel view of the connector, and Table 3-12 lists the connector type. Table 3-13 shows the functions and Table 3-14 shows the connector pinout.

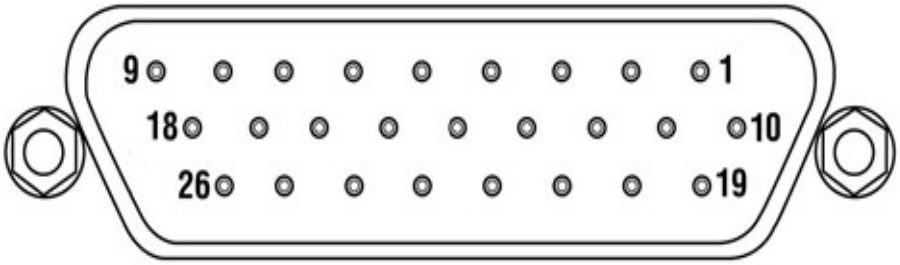


Figure 3-15. Analog Control connector

3.12.3.1 REMOTE VOLTAGE PROGRAMMING

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 can 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.

a) Remote Voltage Programming by Voltage Source

Programs the output voltage of the supply by external voltage reference source. Refer to Control Interface chapter to configure the power supply to program output voltage by external reference source using front panel screen or refer to the programming manual P/N: M587352-01.

- **Power supply configuration to program output voltage by voltage source:**

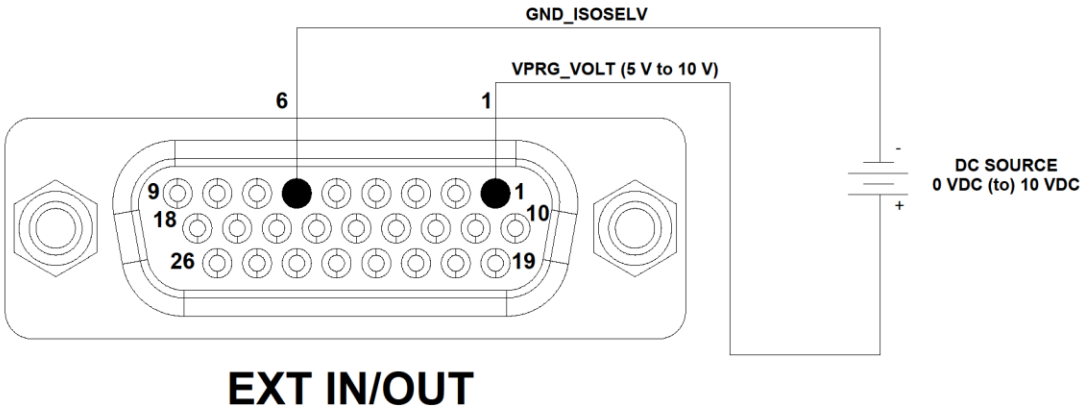


Figure 3-16. Remote Voltage Programming by Voltage source

The DC voltage source is connected between Pin 1 (VPRG_VOLT), ground Pin 6 (GND_ISOSELV) and the 'Analog Reference source' is selected as 'Voltage' from the front Panel. Refer to Figure 3-16.

The Full-Scale voltage value can be modified to any voltage between 5V to 10V from front panel screen or by the digital interface SCPI Command. 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. The equation for output voltage set from analog programming is as follows:

$$\text{Vout} = Vdc \times (100\% \text{ rated output voltage} / \text{ FSC VDC}), \text{with Vdc in volts.}$$

b) Remote Over Voltage Programming by Voltage Source

Programs the output over voltage protection limit of the supply by external voltage reference source. Refer to Control Interface chapter to configure the power supply to program output overvoltage by external reference source using front panel screen or refer to the programming manual P/N: M587352-01.

- **Power supply configuration to program output overvoltage by voltage source:**

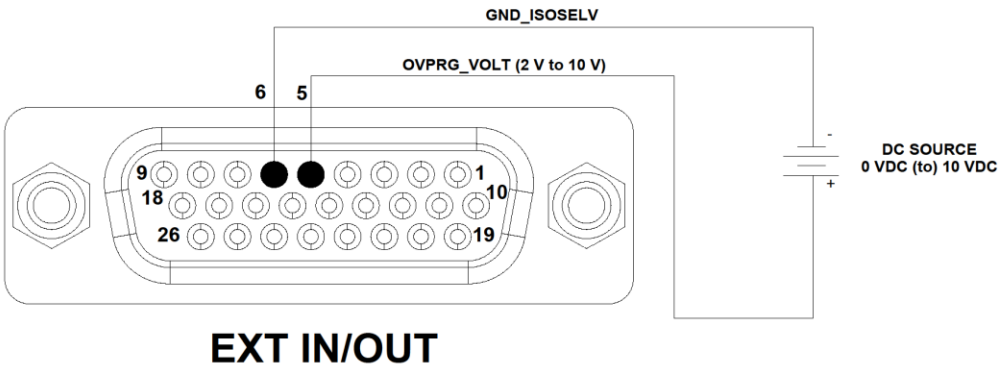


Figure 3-17. Remote Over Voltage Programming by Voltage source

The DC voltage source is connected between Pin 5 (OVPRG_VOLT), ground Pin 6 (GND_ISOSELV) and the 'Analog Reference source' is selected as 'Over Voltage' from the front Panel. Refer to Figure 3-17.

The Full-Scale voltage value for overvoltage programming can be modified to any voltage between 5 V to 10 V from the front panel screen or by using the digital interface SCPI Command. The default FSC voltage value is 10 V, where 10 V corresponds to 110% of the rated output voltage. The equation for overvoltage set from analog programming is as follows:

$$\text{OVP} = Vdc \times (110\% \text{ rated output voltage} / \text{ FSC VDC}), \text{with Vdc in volts}$$

c) Remote Voltage Programming by Current Source

Programs the output voltage of the supply by current reference source. Refer to Control Interface chapter to configure the power supply to program output voltage by external reference source using front panel screen or refer to the programming manual P/N: M587352-01.

- **Power supply configurations to program output voltage by current source:**

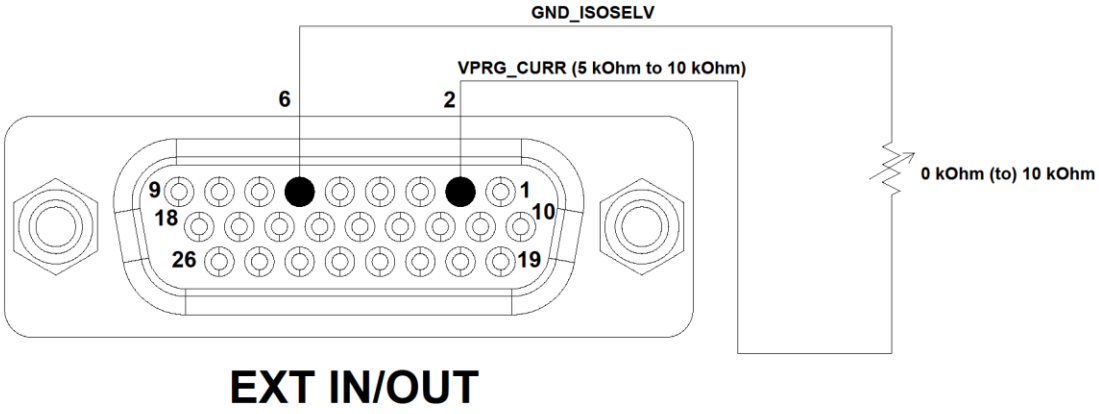


Figure 3-18. Remote Voltage Programming by Current Source

The programmable resistor is connected between Pin 2 (VPRG_CURR), ground Pin 6 (GND_ISOSELV) and the 'Analog Reference source' is selected as 'Current' from the front Panel. Refer to figure 3-18.

The Full-Scale value for voltage programming can be modified to any value between 5 kΩ to 10 kΩ from the front panel screen or by using the digital interface SCPI Command. The default FSCR value is 10 kΩ, where 10 kΩ corresponds to 100% of the rated output voltage. The equation for voltage set from analog programming current source is as follows

$$\text{Vout} = R \times (100\% \text{ rated output voltage} / \text{ FSC k}\Omega), \text{with R in kilo ohms.}$$

3.12.3.2 REMOTE CURRENT PROGRAMMING

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 can 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.

a) Remote Current Programming by Voltage Source

Programs the output current of the supply by external voltage reference source. Refer to Control Interface chapter to configure the power supply to program output current by external reference source using front panel screen or refer to the programming manual P/N: M587352-01.

- **Power supply configurations to program output current by voltage source:**

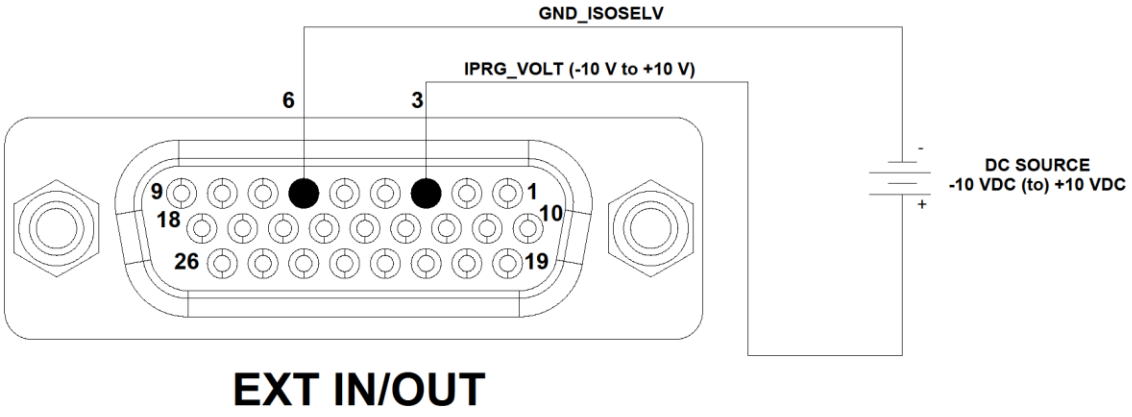


Figure 3-19. Remote Current Programming by Voltage Source

The DC voltage source is connected between Pin 3 (IPRG_VOLT), ground Pin 6 (GND_ISOSELV) and the 'Analog Reference source' is selected as 'Resistive' from the front Panel. Refer to Figure 3-19.

The Full-Scale voltage value can be modified to any voltage between 5V to 10V from front panel screen or by the digital interface SCPI Command. Default FSC voltage value is 10V, where 10V corresponds to 100% output current and -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:

$$\text{Iout} = Vdc \times (100\% \text{ rated output current/FSC VDC}), \text{with Vdc in volts.}$$

b) Remote Current Programming by Current Source

Programs the output current of the supply by external current reference source. Refer to Control Interface chapter to configure the power supply to program output current by external reference source using front panel screen or refer to the programming manual P/N: M587352-01.

- **Power supply configurations to program output current by current source:**

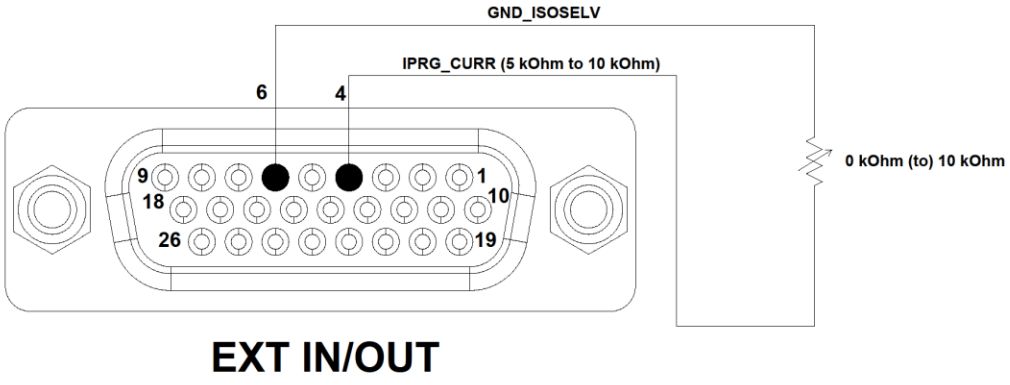


Figure 3-20. Remote Current Programming by Current Source

The programmable resistor is connected between Pin 4 (IPRG_CURR), ground Pin 6 (GND_ISOSELV) and the 'Analog Reference source' is selected as 'Current' from the front Panel. Refer to Figure 3-20.

The Full-Scale value for current programming can be modified to any value between 5 kΩ to 10 kΩ from the front panel screen or by using the digital interface SCPI Command. The default FSCR value is 10 kΩ, where 10 kΩ corresponds to 100% of the rated output current. The equation for current set from analog programming current source is as follows

$$\text{Iout} = R \times (100\%\ \text{rated output current}/\ \text{FSC k}\Omega), \text{with R in kilo ohms.}$$

NOTE: Remote current programming by current source is applicable only when operating source mode.

3.12.3.3 VOLTAGE MONITOR (VMON)

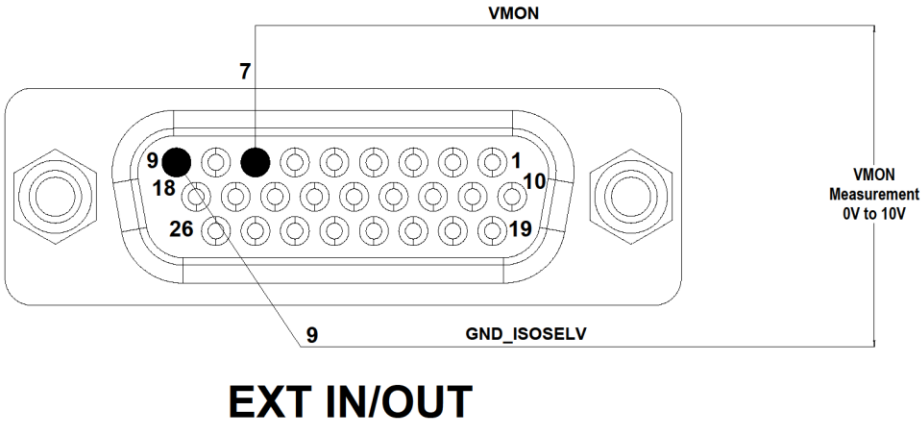


Figure 3-21. Voltage Monitor

Voltage Monitor provides functionality to monitor the scaled down output voltage of the power supply. Scaled down Output voltage could be monitored at VMON terminal of analog programming connector. Measurement of output voltage from 0 to 100% of full scale rated output corresponds to 0 to 10V.

3.12.3.4 CURRENT MONITOR (IMON)

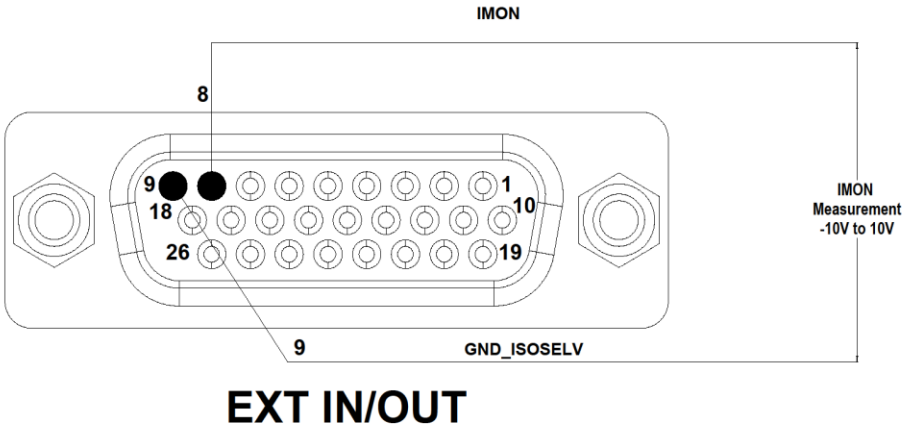


Figure 3-22. Current Monitor

Current Monitor provides functionality to monitor the scaled down output current of the power supply. Scaled down Output current could be monitored at IMON terminal of analog programming connector. Measurement of output current -100% to 100% of full-scale rated output corresponds to -10V to 10V.

3.12.3.5 DIO OUTPUT 1

Open collector transistor output for user programming.

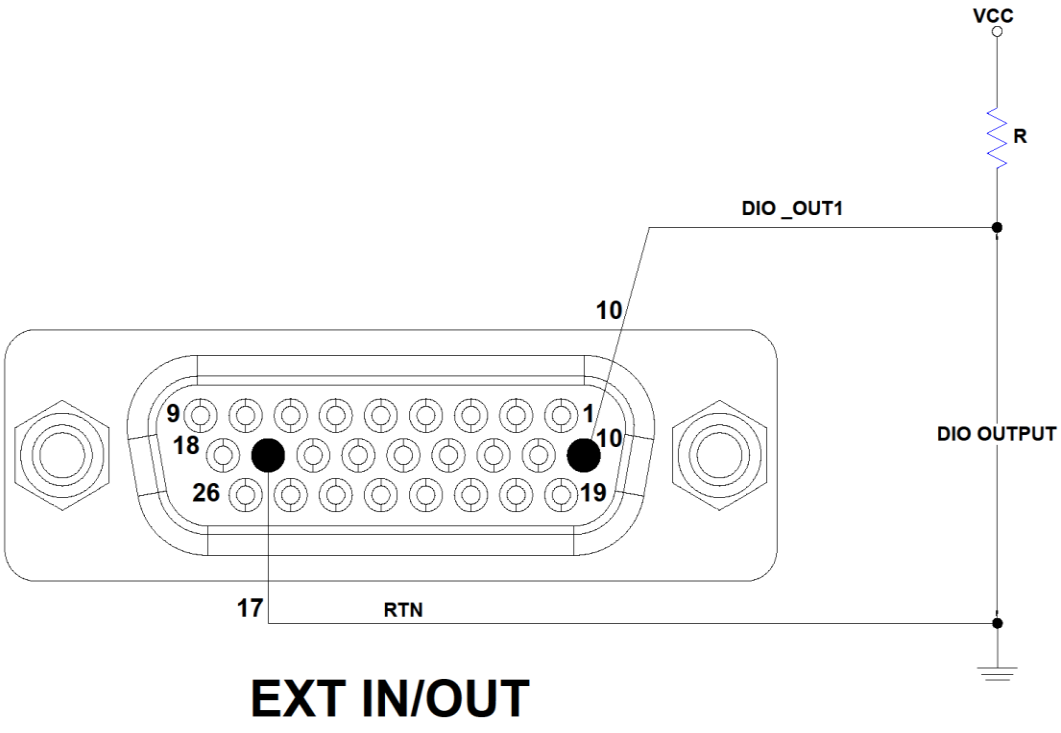


Figure 3-23. Dio Output 1

3.12.3.6 DIO OUTPUT 2

Open collector transistor output for user programming

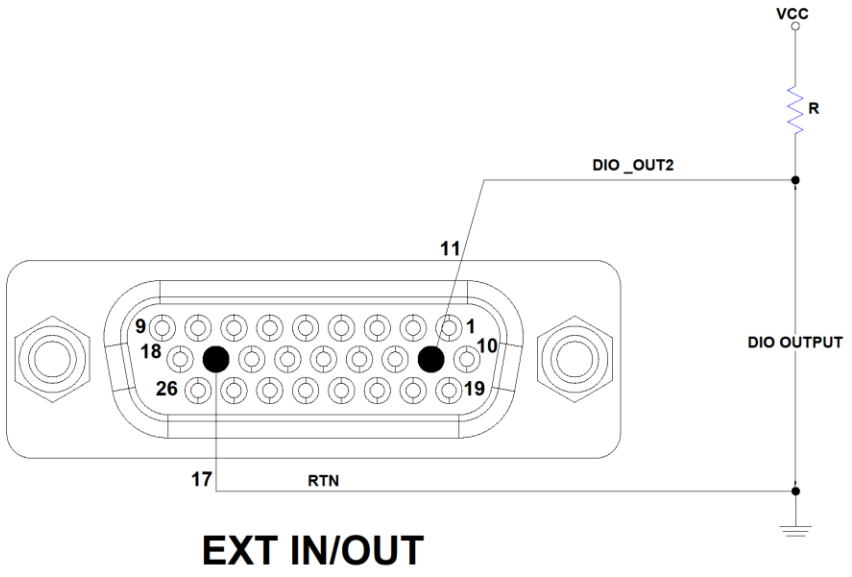


Figure 3-24. Dio Output 2

3.12.3.7 SOUR/SINK OUTPUT

The open collector transistor output has its collector connected to the 26-pin connector, while the pin-12 (SOUR/SINK_OUT) is connected to the common return pin-17 (RTN) of the interface connector. Status signal to communicate the direction of current flow.

a) Low – indicates power transfer is from power supply to UUT.

b) High – indicates power transfer is from UUT to Power supply.

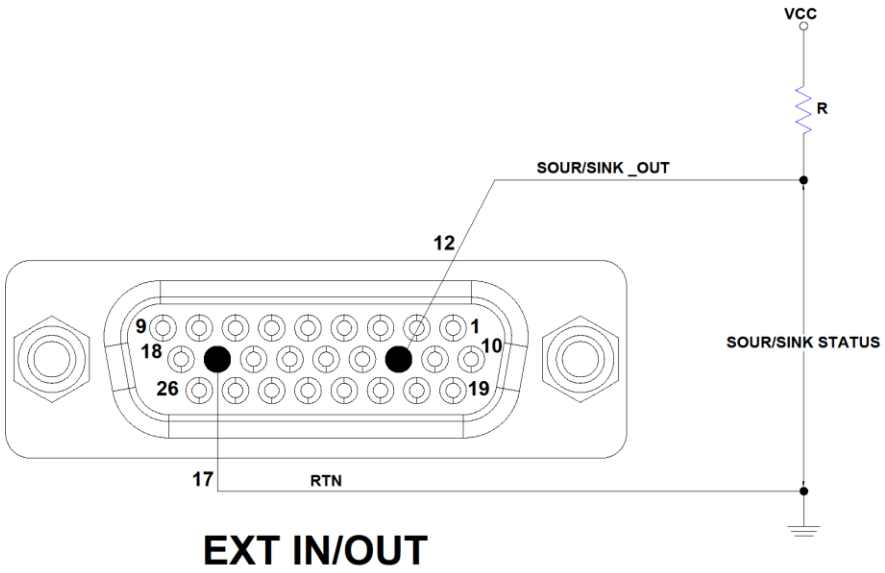


Figure 3-25. SOURCE/SINK Output

3.12.3.8 TRIGGER OUT FUNCTION (TRIG_OUT)

The open collector transistor output has its collector connected to the 26-pin connector, while the emitter pin-13 (TRIG_OUT) and pin-17 (RTN) is common return of the interface connector. It provides an active-high synchronization pulse of 100 µs.

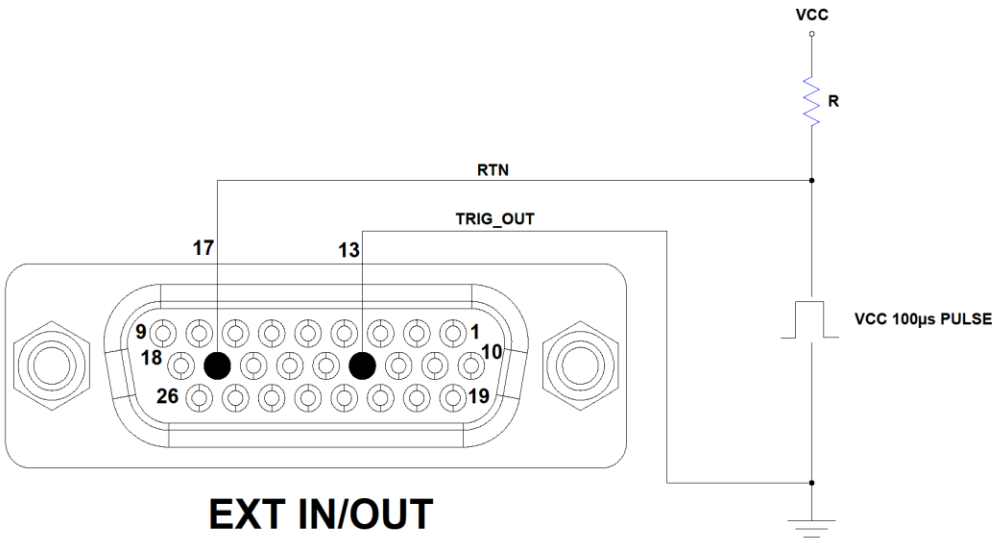


Figure 3-26. TRIG_OUT

3.12.3.9 DIO ON/OFF STATUS (DIO_ON/OFF_STAT)

The open collector transistor output has its collector connected to the 26-pin connector, while the emitter Pin-14 (DIO_ON/OFF_STAT) and Pin-17 (RTN) is common return

of the interface connector. When the output is in a high state, it indicates that the output is ON, and when the output is in a low state, it indicates that the output is OFF.

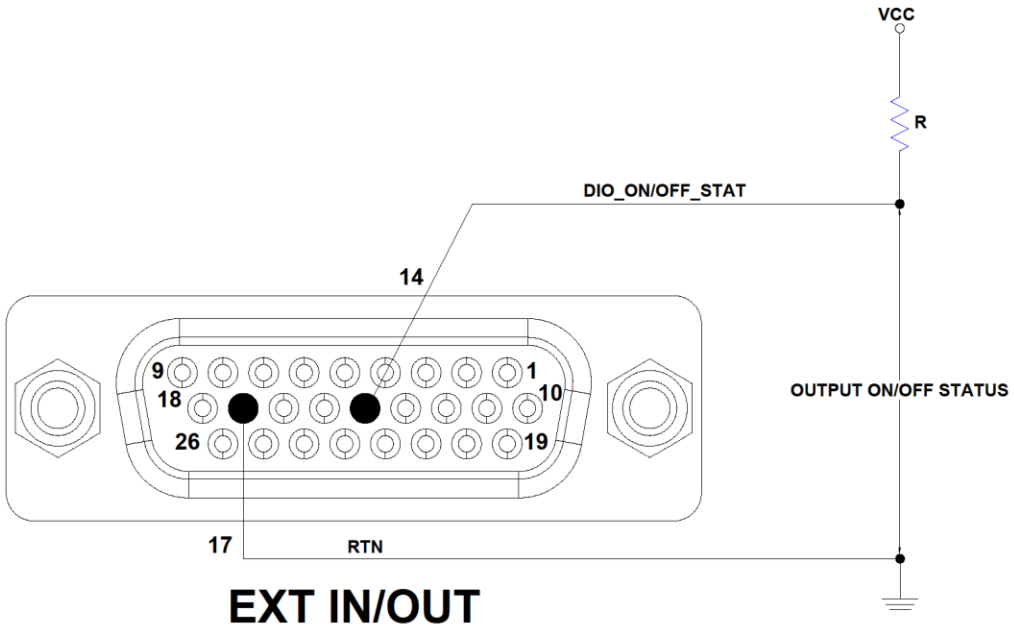


Figure 3-27. DIO_ON/OFF_STAT

3.12.3.10 DIO CC/CV OUTPUT (DIO_CC/CV_OUT)

The open collector configuration has its collector connected to the 26-pin connector, while the emitter Pin-15 (DIO_CC/CV_OUT) of the transistor is connected to the common return Pin-17 (RTN) of the interface connector. A high state indicates Constant Current mode operation, and a low state indicates Constant Voltage mode operation.

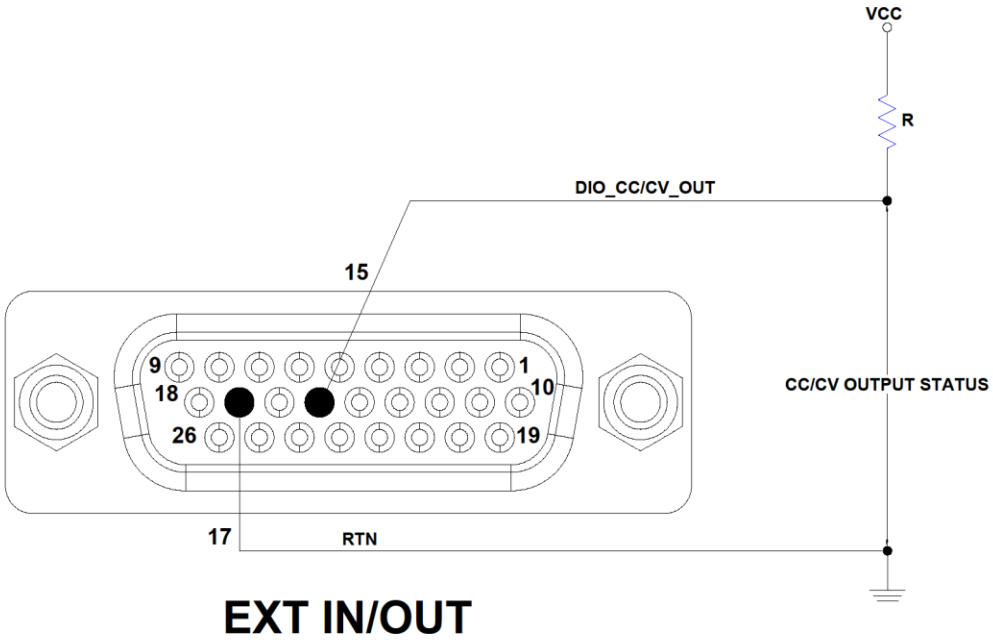


Figure 3-28. DIO_CC/CV_OUT

3.12.3.11 DIO FAULT OUTPUT (DIO_FAULT_OUT)

The open collector configuration has its collector connected to the 26-pin connector, while the emitter Pin-16 (DIO_FAULT_OUT) of the transistor is connected to the common return Pin-17 (RTN) of the interface connector. A high state indicates a fault state of the power supply.

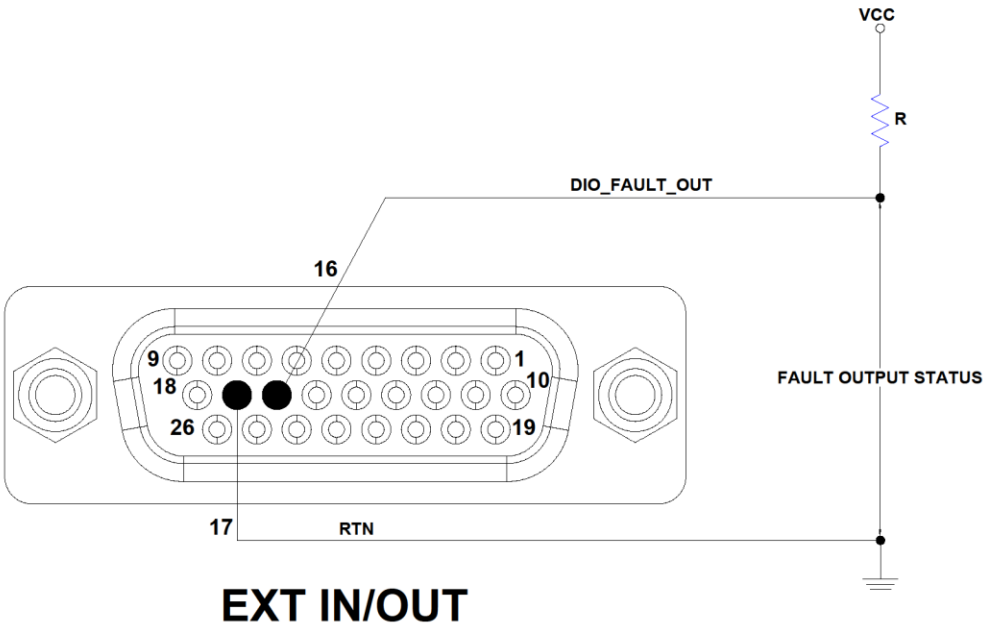


Figure 3-29. DIO_FAULT_OUT

3.12.3.12 TRIGGER IN FUNCTION (TRIG_IN)

The TTL-compatible input signal is an active-high pulse of 100 µs. This signal detects an external hardware trigger to Pin-19 (TRIG IN) and Pin-17 (RTN) at the falling edge of the active-high pulse for voltage, current ramp, and transient list functions. The signal connects to the open anode of the opto-isolator diode, which has an internal 1 kΩ series resistor within the power supply.

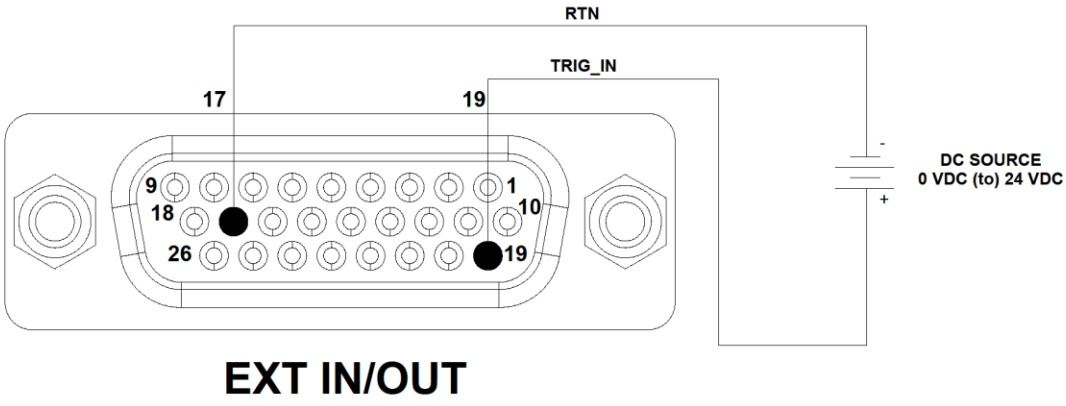


Figure 3-30. TRIG_IN

3.12.3.13 DIO OUTPUT ON/OFF (DIO_OUTPUT_ON/OFF)

The remote-control input for output ON/OFF operates with a logic signal. A logic-high signal, 2.7-24 VDC TTL/CMOS, connected to Pin-20 (DIO_OUTPUT_ON/OFF) and Pin-17 (RTN), will enable the output of the supply, while a logic-low signal will disable the output.

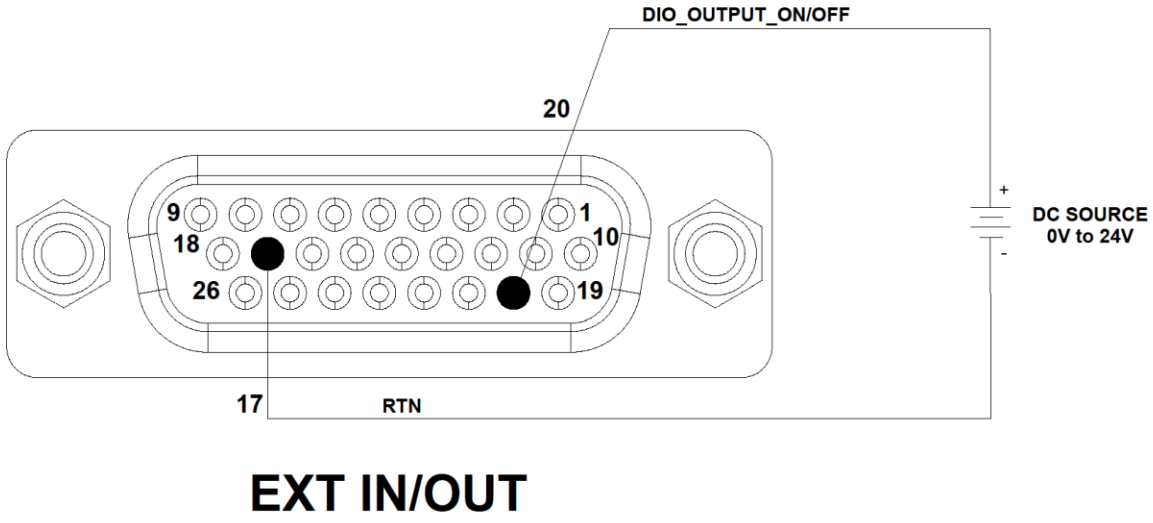


Figure 3-31. DIO_OUTPUT_ON/OFF

3.12.3.14 DIGITAL IN 1

Remote-control input with a logic signal.

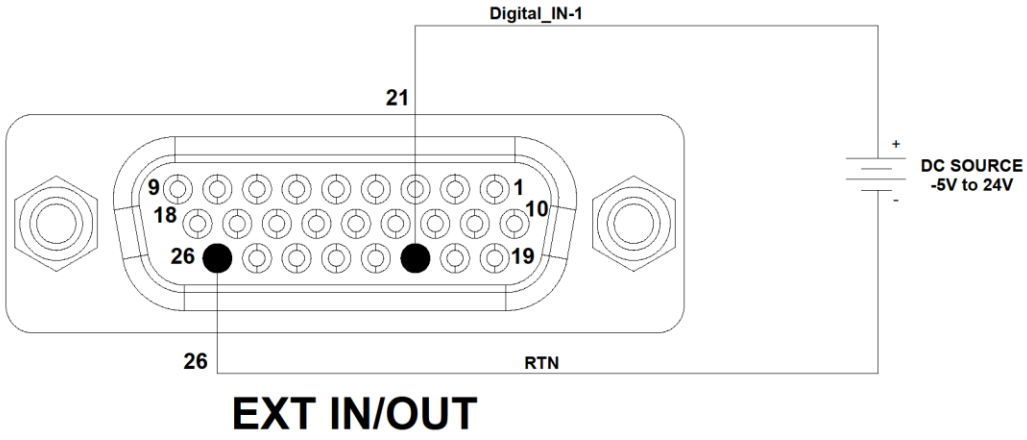


Figure 3-32. Digital IN 1

3.12.3.15 DIGITAL IN 2

Remote-control input with a logic signal.

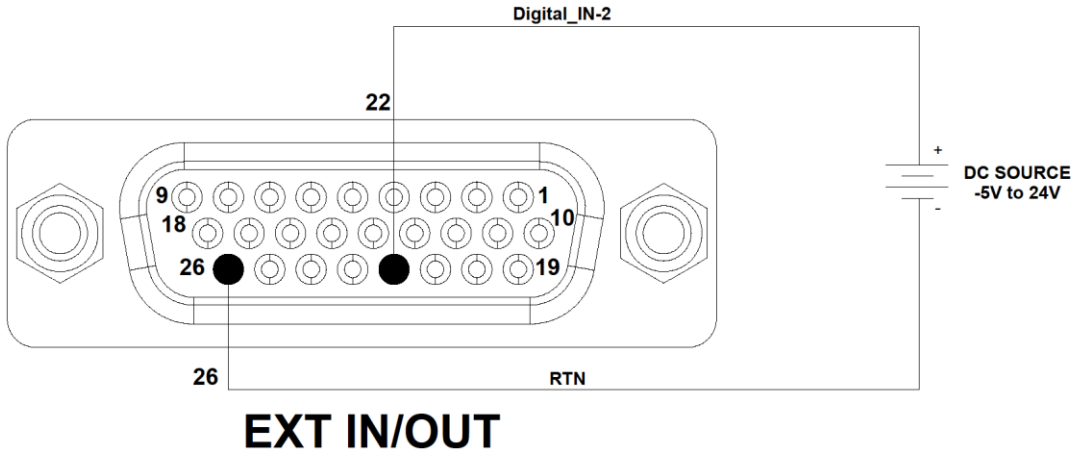


Figure 3-33. Digital IN 2

3.12.3.16 DIGITAL IN 3

Remote-control input with a logic signal.

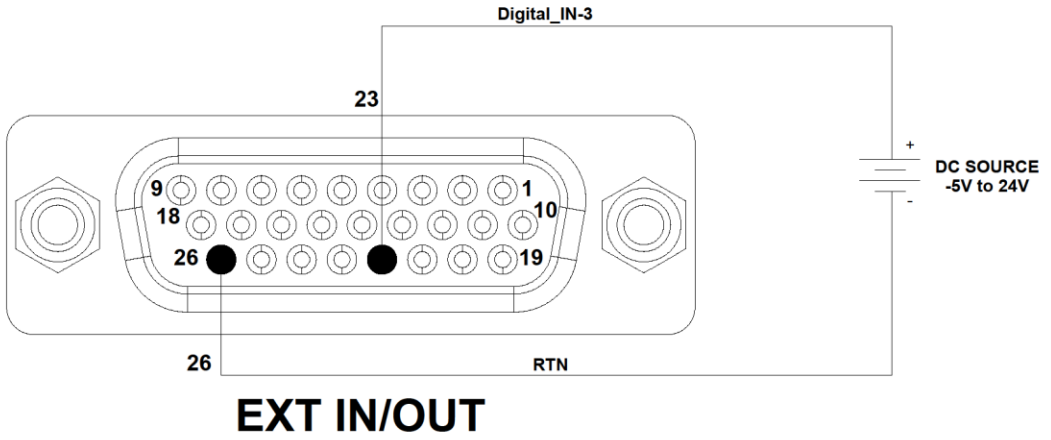


Figure 3-34. Digital IN 3

3.12.3.17 REMOTE INHIBIT ACTIVE VOLTAGE

For details related to the Remote Inhibit active voltage, refer to Section 3.12.2.

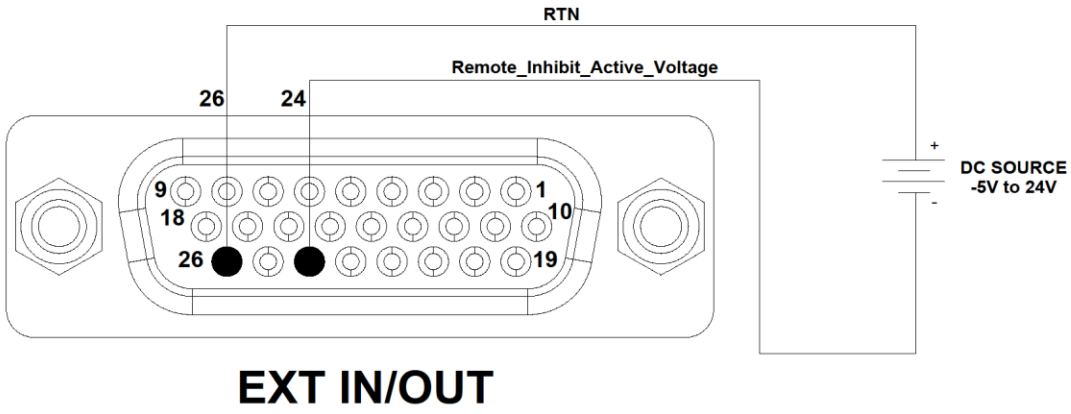


Figure 3-35. Remote Inhibit Active Voltage

3.12.3.18 REMOTE INHIBIT CONTACT CLOSURE

For details related to the Remote Inhibit contact closure, refer to Section 3.12.2.

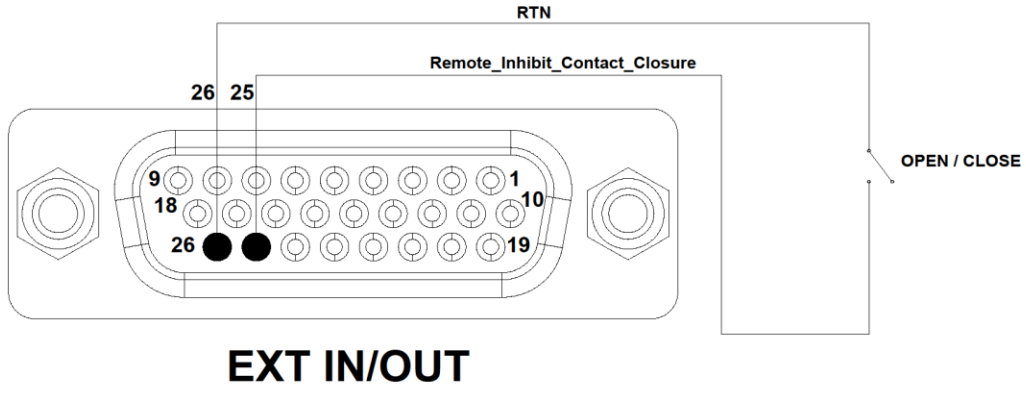


Figure 3-36. Remote Inhibit Contact Closure

3.12.4 EXTERNAL RELAY CONTROL SIGNAL CONNECTOR

Mi-BEAM Series power supply provides 8-Pin interface connector for relay operation. An 8-pin Molex connector (430200800) located at the rear panel provides external auxiliary control signals to increase the user's operating control of the supply. The mating receptacle is Molex 430250800 with 8 terminals. Refer to Section 2.18.

3.12.5 RS-232C SERIAL INTERFACE

RS-232C Figure 3-37, Table 3-15 for connector type and Table 3-16 for pin descriptions. The power supply 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.

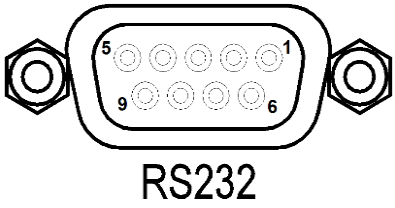


Figure 3-37. RS-232C Interface Connector

CONNECTOR	TYPE
RS-232C Interface	9-contact receptacle (female) Subminiature-D.

Table 3-15. 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 3-16. RS-232C Interface Connector Pinout

3.12.6 USB INTERFACE

USB remote control interface is made through a Series-B device connector located on the rear panel; refer to Figure 3-38 for view of connector, Table 3-17 for the connector type and Table 3-18 for pin descriptions. A standard USB cable between the Mi-BEAM Series power supply 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 supply to the computer controller through an USB hub is not recommended. The USB connection should be direct between the two devices.

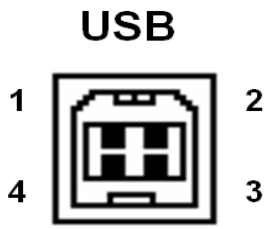


Figure 3-38. USB Interface Connector

CONNECTOR	TYPE
USB Interface	USB series-B type Connector

Table 3-17. USB Interface Connector Type

PIN #	NAME	DESCRIPTION
1	N/C	No Connection
2	D-	Data -
3	D+	Data +
4	GND	Ground

Table 3-18. USB Interface Connector Pinout

3.12.7 LAN INTERFACE

A LAN connector (Ethernet 10BaseT/100BaseT) is located on the rear panel for remote control; refer to Figure 3-39 for view of connector, Table 3-19 for connector type and Table 3-20 for pin descriptions. A standard modular cable with an 8P8C modular plug should be used between the power supply 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 supply. For information on how to set up a network connection or a direct computer connection using the LAN interface.

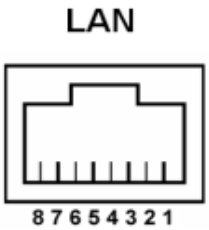


Figure 3-39. LAN Interface 8P8C Modular Connector

CONNECTOR	TYPE
LAN Interface	Standard RJ45 connector

Table 3-19: 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 3-20. LAN Interface 8P8C Modular Connector Pinout

3.12.8 GPIB INTERFACE (Optional)

A GPIB connector is located on the rear panel for remote control; refer to Figure 3-40 for rear view of connector, Table 3-21 for connector type and Table 3-22 for pin descriptions.

Figure 3-40. GPIB interface Connector

CONNECTOR	TYPE
GPIB Interface	PCB D-Sub Connectors, Receptacle, Cable-to-Board, 24 Position TE Connectivity P/N: 5554923-1

Table 3-21. GPIB Interface Connector Type

PIN #	GPIB SIGNAL	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- Identity
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	Tied to Digital Ground
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	Digital Ground
19	GND	Digital Ground
20	GND	Digital Ground
21	GND	Digital Ground
22	GND	Digital Ground
23	GND	Digital Ground
24	GND	Digital Ground

Table 3-22. GPIB Interface Connector Pinout

This page intentionally left blank

4 INTERFACING Mi-BEAM POWER SUPPLY WITH ACTIVE SOURCE OR LOAD

4.1 INSTRUCTIONS FOR SAFE OPERATION BEFORE LOAD INTERFACING

The safety instructions must be strictly followed to ensure safe and reliable operation of the Mi-BEAM power supply before interfacing with load.

WARNING!

Before handling the DC output connector of the Mi-BEAM power supply, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live DC output can result in fatal electric shock and may cause death.

CAUTION!

Failure to follow the instructions mentioned in this chapter may result in serious equipment damage or personal injury.

a) Make sure the following voltages are zero before making any connections or touching the terminals of the Mi-BEAM power supply:

- Positive (+ve) terminal to Negative (-ve) terminal
- Positive (+ve) terminal to Chassis
- Negative (-ve) terminal to Chassis.

NOTE: It is possible for the positive (+ve) or negative (-ve) terminal to have high voltage with respect to chassis ground even when the Mi-BEAM power supply display shows 0 V.

b) Make sure that the Mi-BEAM power supply is grounded, this can be done by connecting the utility earth protection ground to rear panel Chassis ground.

WARNING!

Operating the unit without a proper protective earth (PE) connection can result in a serious electric shock hazard, including risk of fatal injury and may cause death.

c) Make sure that the positive (+ve) terminal of the Mi-BEAM power supply is connecting to the positive (+ve) terminal of the UUT, and the negative (-ve) terminal to the negative (-ve) terminal of the UUT.

NOTE: Interchanging the terminal connection and operating may damage the Mi-BEAM internal power circuits.

CAUTION!

Reversing the polarity and operating the unit will result in severe internal damage to the Mi-BEAM power supply.

d) Make sure that all protection and regulation limits are properly configured before initiating an operation:

- Overvoltage Protection (OVP)
- Overcurrent Protection (OCP)
- Regulation limits
    - **Example**: In case of CV regulation setting ensure that the current and power limits are set correctly.

4.2 INTERFACING Mi-BEAM TO AN ACTIVE SOURCE OR LOAD

4.2.1 INTERFACING USING MI-BEAM ISOLATION CHASSIS

It is preferred to use Mi-BEAM isolation chassis along with the Mi-BEAM power supply while interfacing with active source or load, this provides output isolation and negative voltage polarity detection.

Mi-BEAM isolation chassis must be purchased separately along with the interfacing cable. Refer to the block diagram for interfacing the UUT with Mi-BEAM series power supply along with Mi-BEAM isolation chassis.

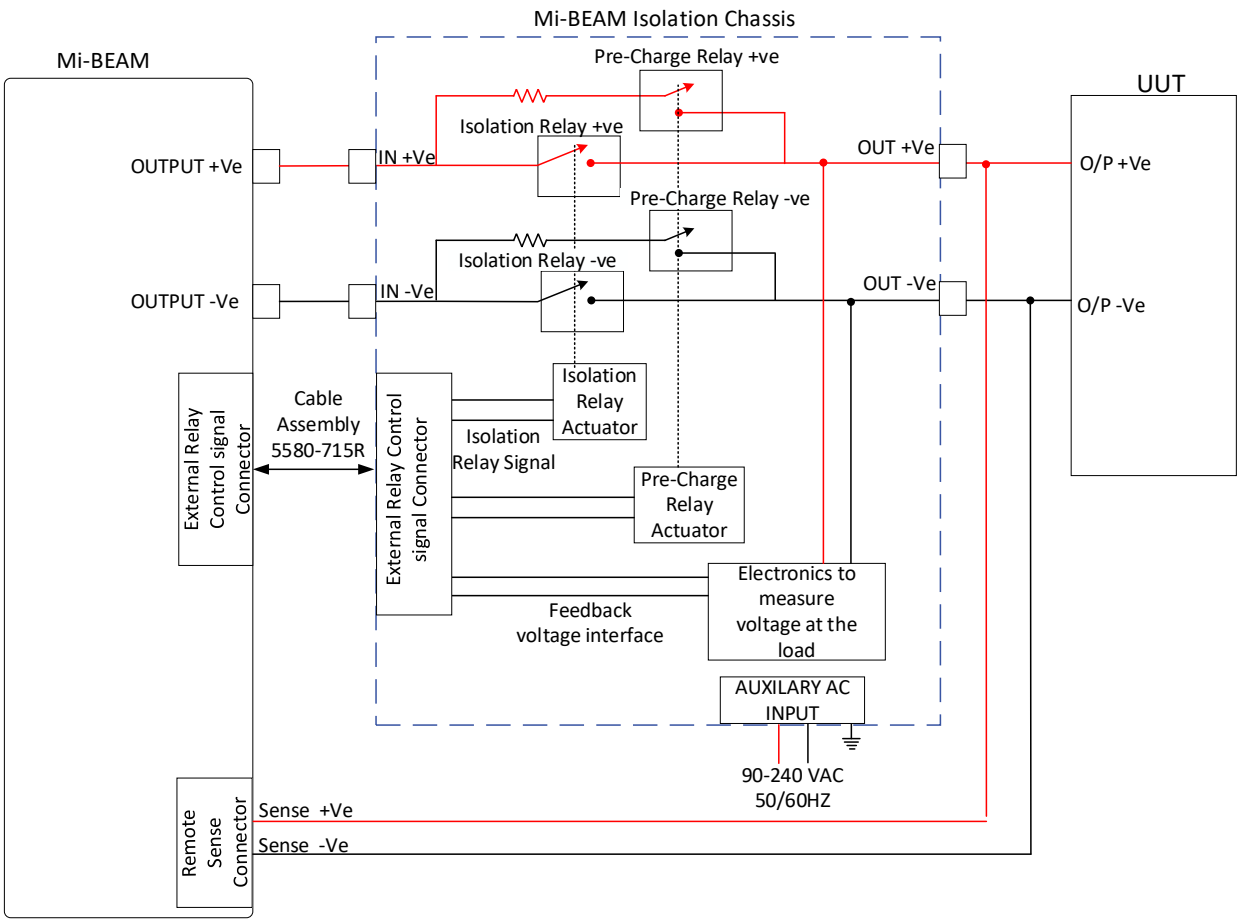


Figure 4-1. Interfacing Mi-BEAM with UUT with Mi-BEAM Isolation chassis

Items required are,

- Mi-BEAM Isolation Chassis;
  - 5580714-01R (Rated Voltage and Current: 2000V, 1000A)

- Cable Assembly (5580715-01R)

4.2.2 INTERFACING Mi-BEAM USING USER ISOLATION BOX

It is always better to discharge the output voltage of both Mi-BEAM power supply and UUT before circuit closure between the two for operation. In most cases, it is required to perform circuit closure when either Mi-BEAM or UUT or both units are having terminal voltage.

Example – Interfacing Mi-BEAM to a Battery;

When a battery is used as a load, a terminal voltage is always present. Therefore, the circuit must be closed in a charged condition. In such cases, an additional isolation box is required between the Mi-BEAM power supply and the UUT to ensure smooth interfacing.

The isolation box contains a pre-charge contactor with a series resistance and an isolation contactor. The pre-charge contactor ensures the smooth charging of output-side capacitors, preventing a high dV/dt across them, which would otherwise result in a large inrush current.

Refer to Figure 4-2 for the connection diagram used to interface Mi-BEAM power supply to an active source or load.

The control signals for the pre-charge contactors on both the positive and negative sides can be the same, and likewise, the control signals for the isolation contactors on both sides can also be common.

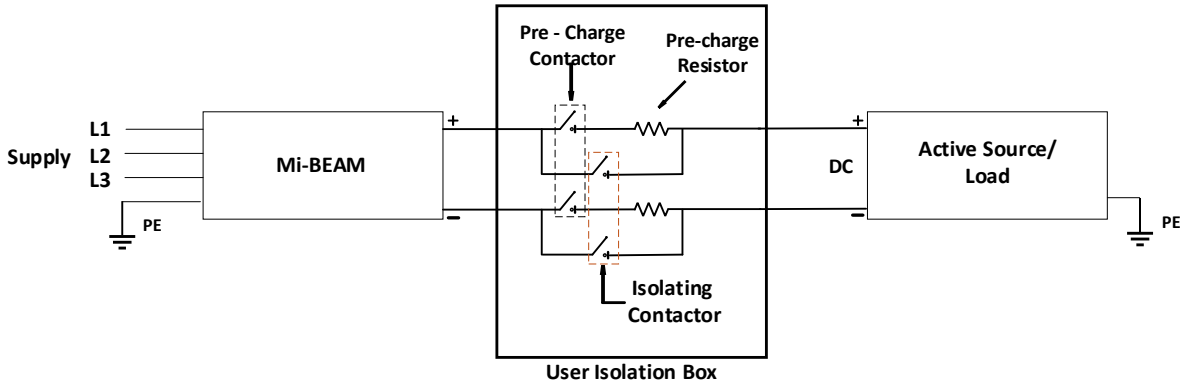


Figure 4-2. Mi-BEAM connected to an active source or load though an isolation box

Pre-charge resistance calculation:

- $Pre-charge\ Resistance\ (\Omega)\ on\ the\ positive\ terminal$

$$= \frac{Rated\ Voltage\ of\ Mi-BEAM\ Power\ Supply\ (V)}{RatedCurrentofMi-BEAMPowerSupply(A)\times 2}$$

- $Pre-charge\ Resistance\ (\Omega)\ on\ the\ negative\ terminal$

$$= \frac{Rated\ Voltage\ of\ Mi-BEAM\ Power\ Supply\ (V)}{RatedCurrentofMi-BEAMPowerSupply(A)\times 2}$$

Example:

For the Mi-BEAM power supply model **MIB-2000-0037-0050-AA**:

- **Rated Voltage** = 2000 V
- **Rated Current** = 50 A

$$Pre-charge\ Resistance\ on\ the\ positive\ terminal = \frac{2000\ (V)}{50\ (A)\times 2} = 20\ (\Omega)$$

$$Pre-charge\ Resistance\ on\ the\ negative\ terminal = \frac{2000\ (V)}{50\ (A) \times 2} = 20\ (\Omega)$$

Typical Pre-charge resistor wattage can be around 150 to 200 Watts, this can be divided across the positive and negative terminal.

- Pre-charge resistor wattage on the positive terminal can be around 75 to 100 Watts.
- Pre-charge resistor wattage on the negative terminal can be around 75 to100 Watts.

NOTE: Always verify the rated voltage and current before the calculation.

Pre-charge time calculation:

Typical pre-charge time will be around 4 to 5 times of RC time constant, where 'R' is pre-charge resistance and 'C' is the output capacitance of the Mi-BEAM power supply.

Refer to Table 4-1 for Mi-BEAM power supply output capacitance.

Output Capacitance (µF) (± 20 %)			
Output Voltage (V)	Output Power		
	12kW	25kW	37kW
600	360 µF	360 µF	360 µF
1500	-	40 µF	40 µF
2000	-	40 µF	40 µF

Table 4-1. Power Supply Output Capacitance

4.2.2.1 CONNECTING THE UUT TO MI-BEAM

a) Close the pre-charge contactors of the isolation box simultaneously (using either the same or separate control inputs). This will initiate voltage equalization between the Mi-BEAM power supply and the UUT.

b) Once the pre-charging process is complete, the terminal voltages of both the Mi-BEAM and the UUT will be equalized.

c) Close both the isolation contactors simultaneously (using either the same or separate control inputs) to establish a direct connection between the Mi-BEAM power supply and the UUT.

d) Open the pre-charge contactors simultaneously (using either the same or separate control inputs)

e) The units can then be turned ON sequentially, and regular operation can be started.

4.2.2.2 LOAD DISCONNECTION

a) Turn OFF the output of both the Mi-BEAM and the UUT and ensure that the load current is zero.

b) Open both isolation contactors to disconnect the Mi-BEAM from the UUT. The operation of isolation box is shown with a timing diagram, refer to Figure 4-3.

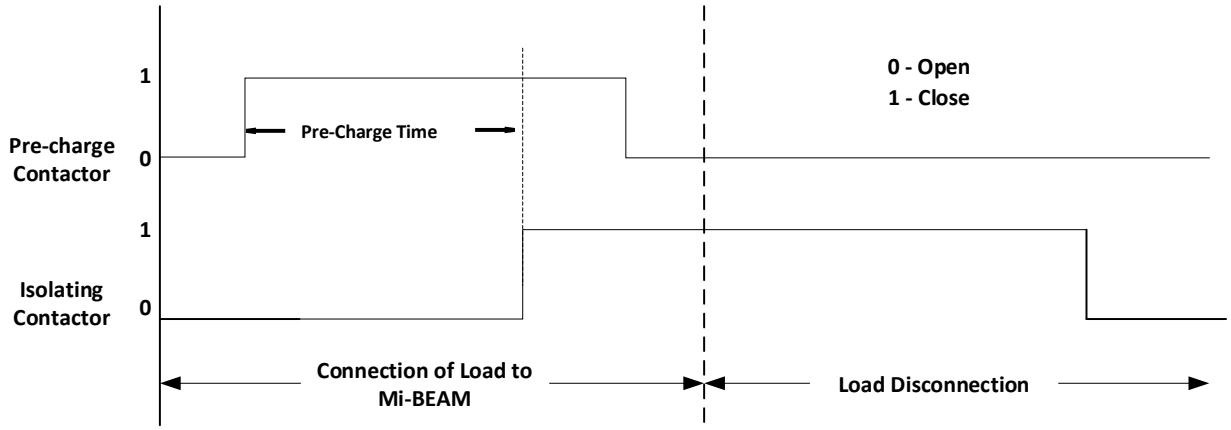


Figure 4-3. Timing diagram showing operation of pre-charge and isolating contactor of Mi-BEAM

5 OPERATING MODES

This chapter provides detailed instructions on the various operating modes supported by the Mi-BEAM Series power supply. Designed for versatile and reliable performance across a wide range of applications, the Mi-BEAM Series ensures precise and efficient power delivery through its advanced control features. The Mi-BEAM Series supports the following modes of operations.

5.1 BIDIRECTIONAL MODE

The Mi-BEAM Series power supply supports two-quadrant operation as shown in Figure 5-1. In this, the convention is that current flowing from the Mi-BEAM power supply to the UUT is designated as positive, while current flowing from the UUT to the Mi-BEAM power supply is designated as negative.

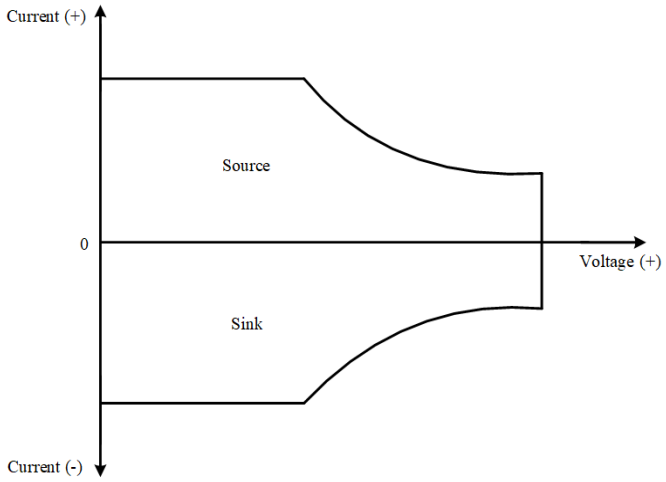


Figure 5-1. Two-quadrant (Bi-directional) operation

In this mode, the Mi-BEAM Series power supply can either function as source or sink power, as shown in Figure 5-2.

Bi-directional mode supports various programming types as described below:

a) Voltage: In this programming type Mi-BEAM power supply regulates voltage. Foldback operation will be performed based on the regulation setting selected. Various regulation settings in voltage programming type are described below,

- **Constant Voltage/Constant Current (CV/CC):** In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the set current limit value. On reaching the power limit (positive or negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage Series Resistance (CV – Ser Res):** In this setting, user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive or negative) or power limit (positive or negative) or voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage/Constant Power (CV/CP):** In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the set power limit value. On reaching the current limit (positive or negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage (CV):** In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (positive or negative) or power limit (positive or negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

b) Current: In this programming type Mi-BEAM power supply regulates current. Depending on the chosen regulation setting, a fold-back operation will be executed. Various regulation settings in current programming type are described below,

- **Constant Current/Constant Voltage (CC/CV):** In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the set voltage limit value. On reaching the power limit (positive or negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Current/Constant Power (CC/CP):** In this regulation setting, output current is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the set power limit value. On reaching the voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Power/Constant Current (CP/CC):** In this regulation setting, output power is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the set current limit value. On reaching the voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Current (CC):** In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive or negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

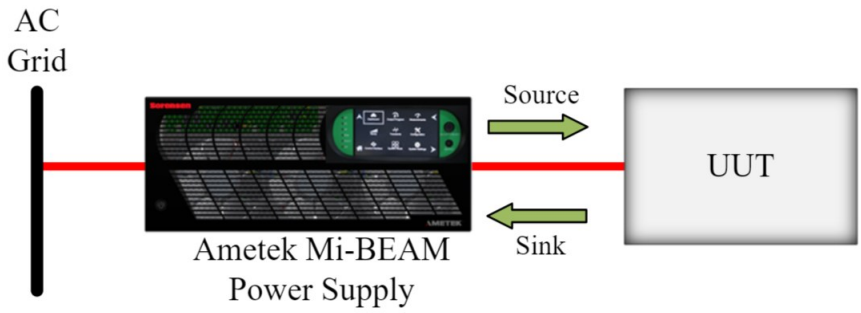


Figure 5-2. Bi-directional mode of operation

5.2 SOURCE MODE

In source mode operation, power supply supports single quadrant operation as shown in Figure 5-3. In this specification, the direction of current is always positive (positive limits for current and power will be applicable) and power transfer is always from the Mi-BEAM Series power supply to the UUT.

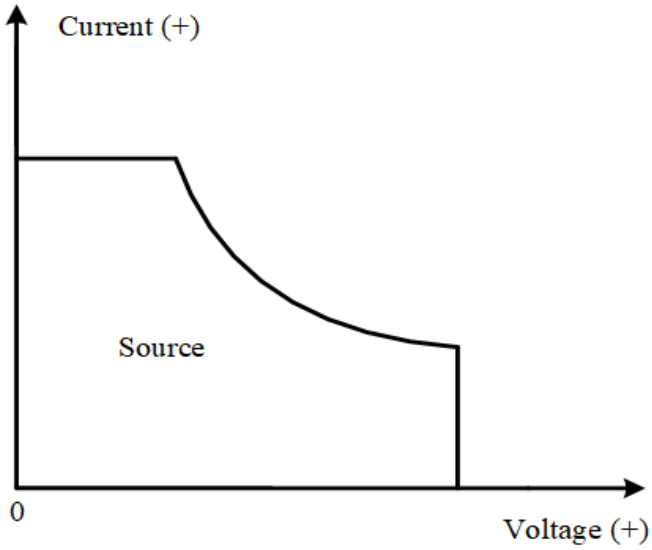


Figure 5-3. Single quadrant (Source) operation

In this mode, the Mi-BEAM Series power supply can function as a source, as shown in Figure 5-4.

Source mode supports various programming types as described below:

a) Voltage: In this programming type Mi-BEAM power supply regulates voltage. Foldback operation will be performed based on the regulation setting selected. Various regulation settings in voltage programming type are described below,

- **Constant Voltage/Constant Current (CV/CC):** In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the set current limit value. On reaching the power limit (positive), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage/Constant Power (CV/CP):** In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the set power limit value. On reaching the current limit (positive), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Power/Constant Voltage (CP/CV):** In this regulation setting, output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the set voltage limit value. On reaching the current limit (positive), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage Series Resistance (CV – Ser Res):** In this setting, user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive) or power limit (positive) or voltage limit (low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage (CV):** In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (positive) or power limit (positive), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

b) Current: In this programming type Mi-BEAM power supply regulates current. Depending on the chosen regulation setting, a fold-back operation will be executed. Various regulation settings in current programming type are described below,

- **Constant Current/Constant Voltage (CC/CV):** In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the set voltage limit value. On reaching the power limit (positive), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Current/Constant Power (CC/CP):** In this regulation setting, output current is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the set power limit value. On reaching the voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Power/Constant Current (CP/CC):** In this regulation setting, output power is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the set current limit value. On reaching the voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Current (CC):** In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

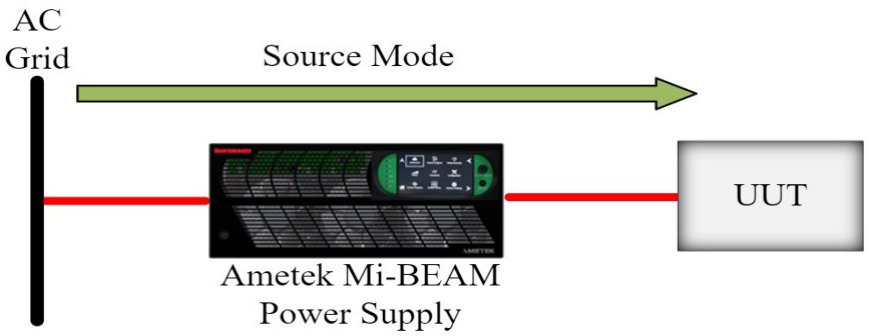


Figure 5-4. Power supply mode of operation

5.3 eLOAD MODE

In eLoad mode operation, power supply supports single quadrant operation as shown in Figure 5-5. In this specification, the direction of current is always negative (negative limits for current and power will be applicable) and power transfer is always from UUT to Mi-BEAM power supply.

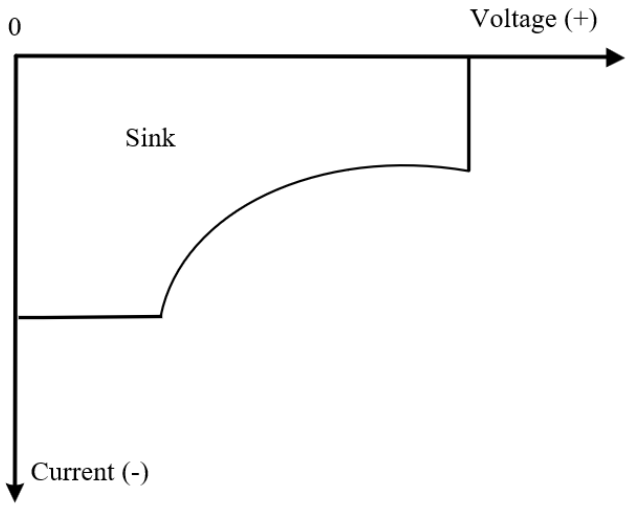


Figure 5-5. Single quadrant (eLoad) operation

In this mode, the Mi-BEAM Series power supply can function as a sink, as shown in Figure 5-6. eLoad mode supports various programming types as described below:

a) Voltage: In this programming type Mi-BEAM power supply regulates voltage. Foldback operation will be performed based on the regulation setting selected. Various regulation settings in voltage programming type are described below,

- **Constant Voltage/Constant Current (CV/CC):** In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the set current limit value. On reaching the power limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage/Constant Current (CV/CP):** In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the set power limit value. On reaching the current limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Resistance/Constant Voltage (CR/CV):** In this regulation setting, output resistance is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the set voltage limit value. On reaching the current limit (negative) or power limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Power/Constant Voltage (CP/CV):** In this regulation setting, output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the set voltage limit value. On reaching the current limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Voltage (CV):** In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (negative) or power limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

b) Current: In this programming type Mi-BEAM power supply regulates current. Depending on the chosen regulation setting, a fold-back operation will be executed. Various regulation settings in current programming type are described below,

- **Constant Current/Constant Voltage (CC/CV):** In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the set voltage limit value. On reaching the power limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Current/Constant Voltage (CC/CP):** In this regulation setting, output current is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the set power limit value. On reaching the voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Resistance/Constant Current (CR/CC):** In this regulation setting, output resistance is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the set current limit value. On reaching the voltage limit (high or low)

or power limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Power/Constant Current (CP/CC):** In this regulation setting, output power is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the set current limit value. On reaching the voltage limit (high or low), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

- **Constant Current (CC):** In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (negative), Mi-BEAM will detect it as a foldback fault and output will be turned OFF.

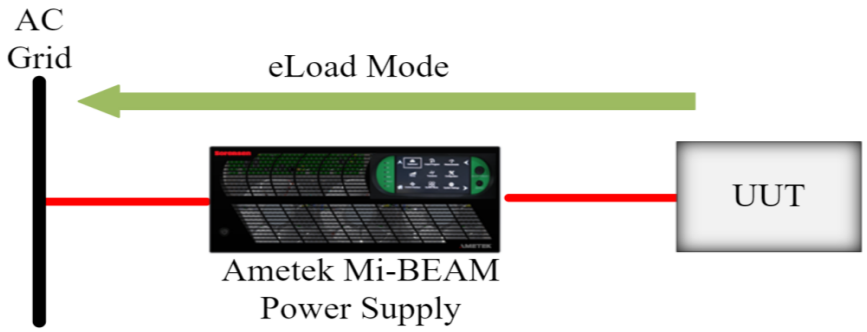


Figure 5-6. eLoad mode of operation

5.4 BATTERY SIMULATION MODE

The Mi-BEAM Series power supply is equipped to simulate battery characteristics under both charging and discharging conditions. It supports seamless dynamic transitions between these states, ensuring accurate replication of real-world battery behavior. Users can input various parameters to customize the simulation to specific needs.

Battery simulation during charge and discharge conditions is described below,

a) Battery Simulation-Charge Mode: The Mi-BEAM Series power supply regulates voltage to simulate battery charge characteristics, with the current direction being negative. Based on the current injected by the UUT (battery charger), the instantaneous SoC is calculated. The output voltage is varied as per the battery characteristics defined by the user. The Mi-BEAM Series power supply functioning in battery simulation charge mode is shown in Figure 5-7.

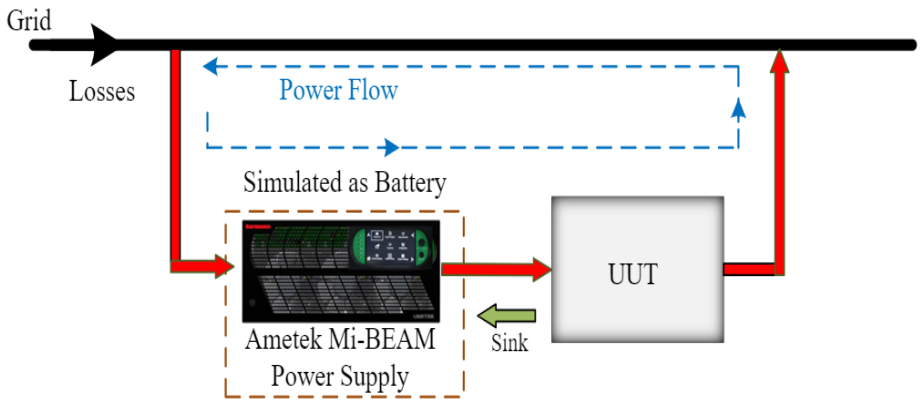


Figure 5-7. Battery simulation-charge mode

b) Battery Simulation-Discharge Mode: The Mi-BEAM Series power supply regulates voltage to simulate battery charge characteristics, with the current direction being positive. Based on the current drawn by the UUT, the instantaneous SoC is calculated. The output voltage is varied as per the battery characteristics defined by the user. The Mi-BEAM Series power supply functioning in battery simulation discharge mode is shown in Figure 5-8.

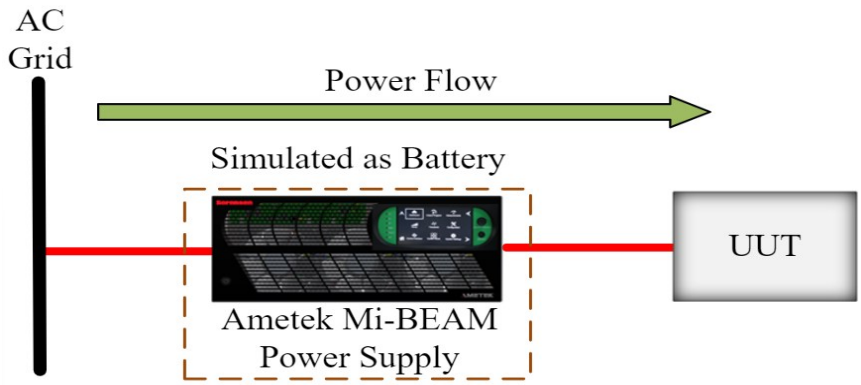


Figure 5-8. Battery simulation-discharge mode

5.5 BATTERY TEST MODE

The Mi-BEAM Series power supply is equipped to test battery characteristics under both charging and discharging conditions. The battery needs to be tested is considered here as the UUT. The power supply operates according to user-defined charge and discharge characteristics to test the battery. This mode supports seamless transitions between the two states. Users can create multiple charging and discharging profiles, which can be sequenced to achieve the required battery test conditions. The Mi-BEAM Series power supply functioning in battery test mode is shown in Figure 5-9.

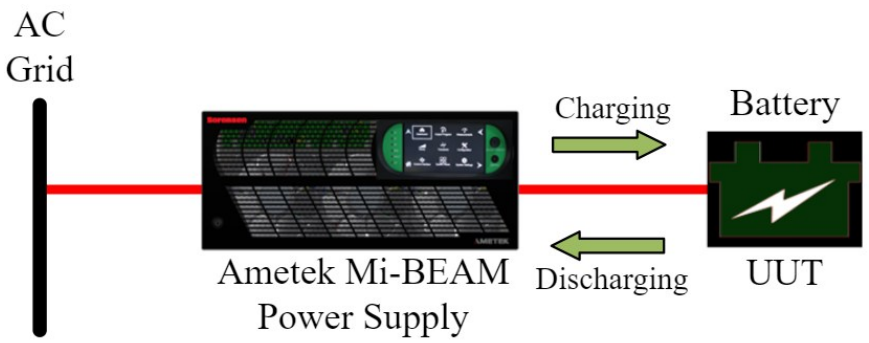


Figure 5-9. Battery test mode

5.6 PHOTOVOLTAIC SIMULATOR

The Mi-BEAM Series power supply is designed to test various aspects of photovoltaic systems under controlled conditions, operating in a 'current programming type CC/CV regulation setting' that follows the PV array I/V characteristics set by the user. In this mode, the PV curve of a solar array is applied by the power supply by operating in source-current mode to the UUT such as an inverter. The PV array simulator simulates MPPT and various real-world PV array scenarios for testing the inverter, including compliance with EN50530 and Sandia SAS models. The Mi-BEAM Series power supply functioning in solar array simulator mode is shown in Figure 5-10.

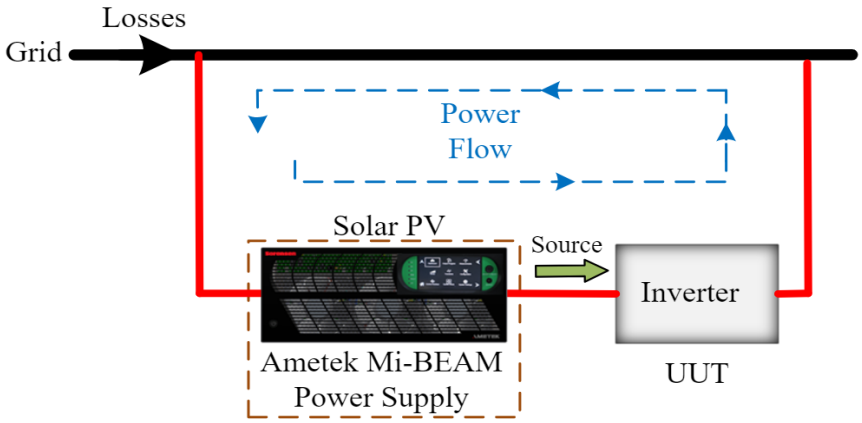


Figure 5-10. Solar Array Simulation

This page intentionally left blank

6
FRONT PANEL

This chapter offers basic instructions on the front panel operations of the Mi-BEAM Series power supply. Engineered for user-friendly interaction and precise control, the Mi-BEAM Series front panel allows for seamless navigation and adjustment of settings. The intuitive design ensures efficient and accurate management of power delivery, catering to a wide array of application needs. The following section provides information of the controls, indicators, and the front panel menu functionalities for the operation of the power supply.

6.1 FRONT PANEL CONTROLS AND INDICATORS

Figure 6-1 shows a view of the front panel and Table 6-1 below shows the reference switches, indicators, and functional descriptions of the Enhanced front panel.

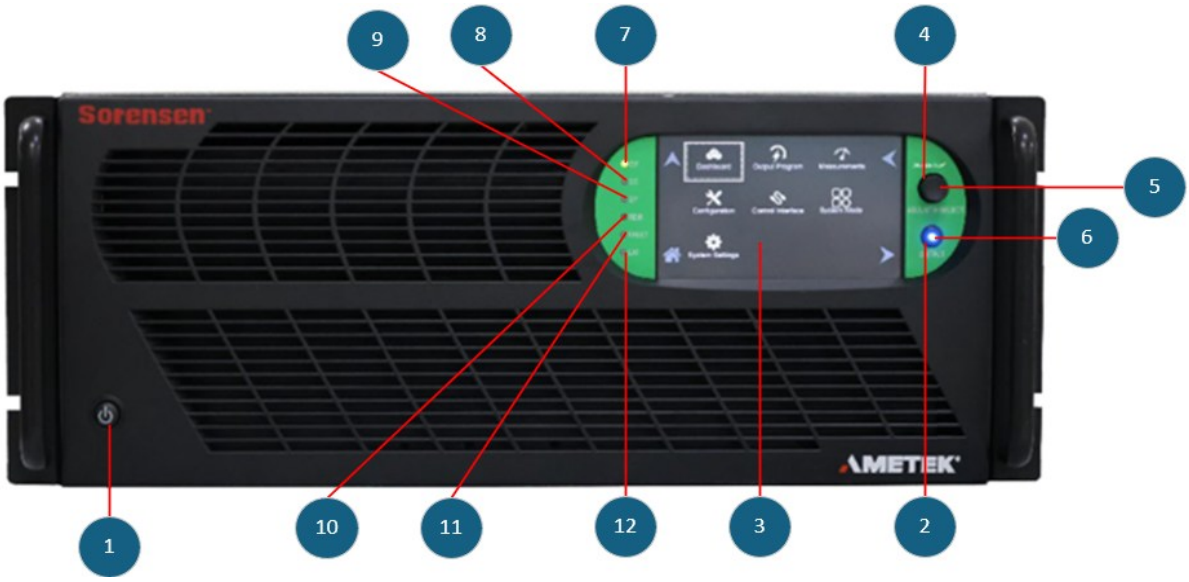


Figure 6-1. Front Panel

WARNING!
The power-up factory default state is output enabled, where the output will be energized at the settings of voltage and current.

ITEM	REFERENCE	FUNCTIONAL DESCRIPTION
CONTROLS: TO NAVIGATE THROUGH DIFFERENT MODES AND SETTINGS		
1	ON/OFF Switch	Two–position pushbutton switch turns the source on and off. **WARNING!** The OFF position does not remove AC input from internal circuits. Disconnect all external AC input before servicing the unit.
2	OUTPUT Switch	Momentary switch that toggles the output power ON/OFF, and closes/opens the output isolation relay.
3	Display	TFT color graphics display with backlight and pressure-actuated touchscreen; menu-driven settings and functions.
4	Rotary Encoder	Navigates between and within screens; scrolls through functions and selects numerical values; adjusts output parameters in real-time.
5	Rotary Encoder Switch	Momentary-action switch that selects functions and enters numerical values.
LED MODE INDICATORS: TO INDICATES THE ACTIVE MODE		
6	Output	Output is turned on; the indicator is integral to the OUTPUT switch.
7	CV	All output phases of the power supply are presently in Constant-Voltage mode, and the output voltage is regulated.
8	CC	At least one of the output phases of the power supply is presently in Constant-Current mode, and the output current of that output is regulated.
9	CP	At least one of the output phases of the power supply is presently in Constant-Power mode, and the output current of that output is regulated.
10	REM	The source is presently controlled by the remote digital interface. If the RS-232C, USB, or LAN interface is used, the REM state can be enabled by the external controller using the SCPI command, `SYST: REM.` If the optional IEEE-488 (GPIB) interface is used, this indicator will be illuminated whenever the REM line (REM ENABLE) line is asserted by the IEEE-488 controller. Any time the REM LED is lit, the front panel control of the unit is disabled. To regain control through the front panel, the external controller must send the SCPI command, `SYST: LOC.`
11	Fault	A fault condition has occurred; the output is shut down, the isolation relay is open, and the output voltage is programmed to zero.
12	LXI	LXI status annunciation, LED will illuminate red when network connection is not present/Lost. Same LED blinks green when identifying the device through web page. On successful connection LED would be OFF.

Table 6-1. Front Panel Controls and Indicators

6.2 FRONT PANEL DISPLAY NAVIGATION

The selection of the output characteristics and adjusting the output parameters through the front panel display could be accomplished using the DASHBOARD screen (refer Figure 6-9 and Figure

6-10) or the OUTPUT PROGRAM screen. The selection and adjustment of items could be done using either the touchscreen or rotary encoder:

a) Using the touchscreen or rotary encoder, navigate (refer to Section 6.3.2 and Section 6.3.3) to the HOME Screen and select the OUTPUT PROGRAM screen. Within the OUTPUT PROGAM screen, select the parameter, and adjust its value.

b) The DASHBOARD screen provides an alternate means of adjusting the primary parameters, voltage, current, and power, in the same menu. It is also located on HOME Screen. It has the additional functionality of real-time adjustment of the parameters as the encoder is rotated. Refer to Section 6.3.3.

6.3 BASIC FRONT PANEL OPERATION

The Mi-Beam power supply provides extensive functionality and programmability, which could be exercised through the front panel, and the remote analog or digital control interface. This section provides basic details such as Navigation, Menu selection, Rotary encoder and Soft numeric keyboard which are common to all screens.

The Mi-Beam Series power supply is shipped from the factory configured for front panel (local) voltage/current/OVP control, and with the remote sense not connected (default to internal local voltage sensing at chassis output terminals). The remote sense leads must be connected externally by the user to achieve performance specifications. The Analog Control connector is supplied with a mating connector which has the remote output ON/OFF control signals jumpered to allow the output to be enabled.

WARNING!

When the power supply is initially powered on, it defaults to an output-enabled state. A warning screen will display a 10-second countdown timer before the output is energized. During this countdown, the output voltage and current are set to zero, the OVP is set to maximum, and the Output State is OFF. After the 10-second timer elapses, the Output State will switch to ON.

6.3.1 FRONT PANEL TOUCH-SCREEN DISPLAY

The front panel display of the Mi-Beam Series power supply allows the user to select various menus required to configure and operate the unit. Navigation through the various menus can be done using the touchscreen display or the rotary encoder. Tapping the display screen or clicking with the encoder on any menu or function will enter that menu or execute that function.

The touchscreen utilizes resistive, pressure-actuated technology, which depends on pressure being applied to the top surface of the screen to detect the position of input. A fingertip, fingernail, or stylus pen can be used. Refer to Figure 6-2.

NOTE: Do not use a hard or sharp tip, such as a ball-point pen or mechanical pencil.

Figure 6-2. Stylus Pen

CAUTION!
Damage or scratching of the touchscreen could occur if excessive pressure is applied to the surface or if objects with hard or sharp tips are used.

The present cursor position is always shown with a selection-box that has a highlighted border around a field. Some screens have multiple pages, as indicated by the highlighted Arrow icons located on the right side of the screen. Tapping an Arrow or selecting it with the rotary encoder and clicking the switch, scrolls the screen to the next page. Tapping on the HOME icon which is in the left side of the screen will exit that screen and return to the HOME screen. Refer to Figure 6-3 respectively.

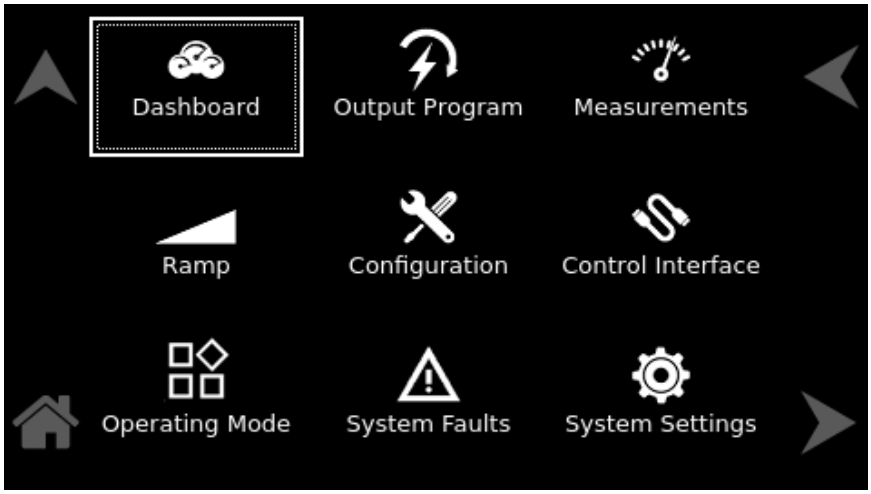


Figure 6-3. HOME Screen with Dashboard Highlighted

Parameters that are adjustable have selection-fields where values can be entered. The active parameter selection field is highlighted with a border; refer to Figure 6-4, which shows the Dashboard Menu with the voltage selection field active. Tapping the selection field box selects that parameter for adjustment, and the screen changes to a numeric keypad that allows value entry, refer to Figure 6-5.

Figure 6-4. DASHBOARD Screen Menu with Voltage Selection-Field Active

6.3.2 TOUCH-SCREEN NUMERIC KEYPAD

The touchscreen has a keypad that allows numeric value entry; refer to Figure 6-5. After scrolling through menus until a parameter selection field box is highlighted, tap the selection field to select it. Afterwards, the keypad screen will be displayed. Tap numerical value keys, the decimal point key, or the polarity key to select 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. Tap the OK key after entering the value to take effect.

NOTE: Functions that accept a numeric value require the value to be within the allowed range. Otherwise, an error will be generated, and the value will not be accepted.

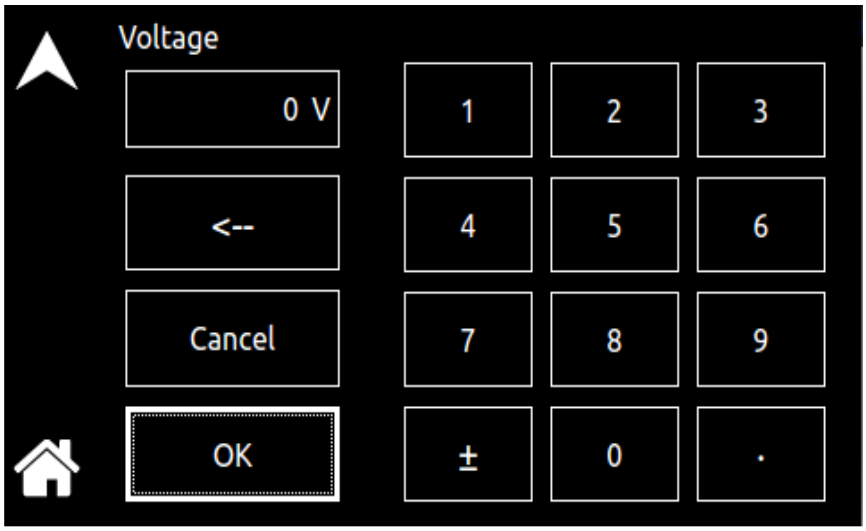


Figure 6-5. Touch-Screen Numeric Keypad

6.3.3 ROTARY ENCODERS

The rotary encoder provides an alternative method for navigating the display. It is used to select functions, change parameter values, and perform setup. Additionally, it allows movement between menu screens and between editable items within an individual menu screen.

The rotary encoder is located on the front panel and provides continuous adjustment in both clockwise and counterclockwise directions; refer to Figure 6-6. Turning the encoder knob allows sequential scrolling through each menu or function on the screen; the item that is active has its selection field-box highlighted. To select a choice, depress the encoder knob to engage the encoder momentary switch. The rotary encoder can operate in one of two distinct modes:

MODE	DESCRIPTION
NAVIGATE	The rotary encoder can be used to scroll through menu screen functions and settings. The selected (active) item will be outlined in a highlighted selection-field box. As the encoder is rotated, the highlighted box will be scrolled through all items on a screen that could be selected, refer Figure 6-3.
ADJUST/SELECT	After scrolling to a function, depress the rotary encoder knob to select it. Clicking on a selection button will change its state (ON or OFF), and clicking on a function or menu will select it and navigate to a screen that allows further value entry. Parameter values, such as voltage and current, are adjusted by selecting the parameter (clicking on it) to enable the selection field (refer to Figure 6-4). If a parameter has been selected whose value can be adjusted, and the encoder switch is depressed, a screen will be displayed with a parameter selection field highlighted that has a value entry window. The

MODE	DESCRIPTION
	rotary encoder can then be used to continuously adjust the parameter value up and down as the encoder is rotated. Click the encoder a second time to enter the value. If the OUTPUT switch is ON, the output parameter will change when the encoder is clicked. The DASHBOARD screen menu allows for real-time adjustment of output parameters. The values of these parameters change immediately as the rotary encoder is turned. If the OUTPUT switch is on, the output parameter will change as the encoder is rotated. Refer to Section 6 of the DASHBOARD screen menu for a description of the parameters that can be adjusted in real-time. The rotary encoder can also be used with the numeric keypad to enter values. After selecting a parameter using the touchscreen, the numeric keypad will be displayed; refer to Figure 6-6. The rotary encoder can be used to select any of the items on the numeric keypad by scrolling through them and clicking on them with the encoder switch to select them. The active value is identified on the screen with a highlighted field-box, and the entered decimal places are shown in the upper-left window. The cursor moves to the next available position as values are entered. After the desired decimal places are entered sequentially, the OK key is clicked to execute the final value and to take effect.

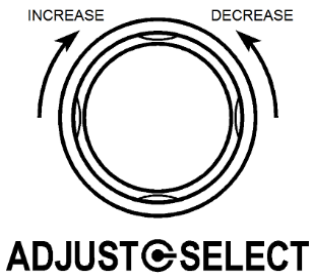


Figure 6-6. Rotary Encoder

Table 6-2. Modes of Rotary Encoder

6.4 FRONT PANEL DISPLAY MENU AND FUNCTIONALITY

6.4.1 POWER-UP SCREENS

At initial power-on, the display shows the Mi-BEAM Splash screen, refer to Figure 6-7, followed by the Start-Up screen with the manufacturer, model number, serial number, firmware revisions

and last calibration date, refer to Figure 6-8, and finally the Dashboard screen, refer to Figure 6-9 and Figure 6-10.

Figure 6-7. Splash Screen

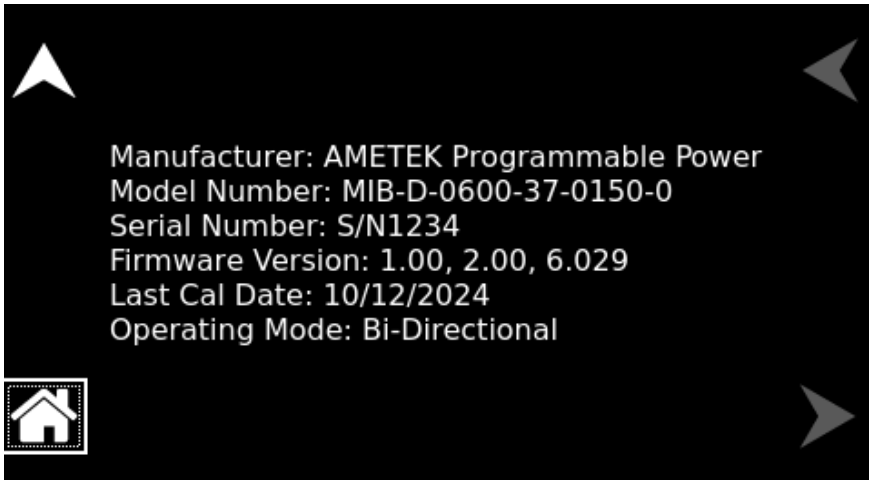


Figure 6-8. Power-On Screen Displaying Model & Version

6.4.2 HOME SCREEN TOP-LEVEL MENU

Selecting the Home icon or Up Arrow will open the HOME screen of the menu structure. It is made up of menus, as follows: Dashboard, Output Program, Measurements, Ramp, Configuration, Control Interface, Operating Mode, System Settings and System Faults.

NOTE: The top-level menu on the home screen will change based on the user's preferred mode of operation.

Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder and depressing the rotary encoder SELECT switch. Refer Figure 6-9 and Figure 6-10.

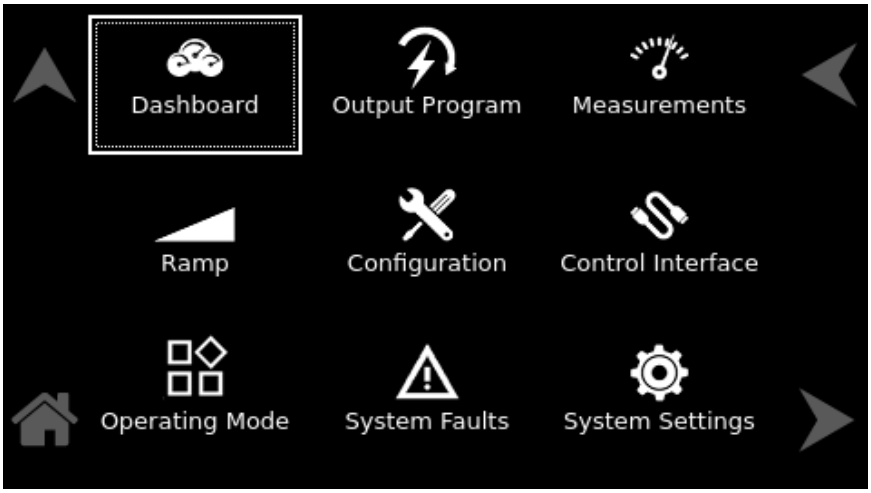


Figure 6-9. Home Screen for Bidirectional Mode, Source Mode and eLoad Mode

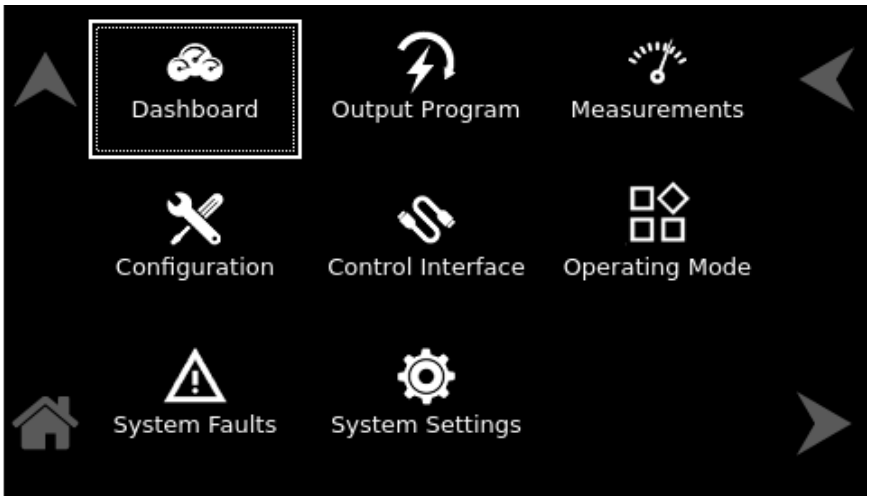


Figure 6-10. Home Screen for PVSIM, BATSIM and BATTEST Mode

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.

The following top-level menu choices can be accessed through the touchscreen:

TOP-LEVEL SCREEN MENU	MENU DESCRIPTION
Dashboard	Provides Regulation settings and measurement of output parameters: Voltage, Current, Power, Series resistance and Over Voltage Protection (OVP).

TOP-LEVEL SCREEN MENU	MENU DESCRIPTION
Output program	Provides setting of Voltage, Current, Power, Output state and Series resistance.
Measurements	Provides measurement of output parameters: Voltage, Current and Power.
Ramp	Provides menu for Voltage and Current ramp.
Configuration	Provides setup of Profiles, Regulation Settings, Slew Rate, Protection, User Limits, Output Sense, External Relay, PONS, Measurement Average Samples, Connections, Battery Mode and Battery Stop Conditions.
Control Interface	Provides setup of remote digital interfaces: RS232, GPIB, LAN, Analog and USB.
Operating Mode	Provides guidance on the operating modes of the power supply: Bi-DIR, SOUR, ELOAD, PVSIM, BATSIM, and BATTEST.
System Settings	Provides display of firmware versions, selection of language, hardware parameter limits, brightness of the display, and default screen timeout.
System Faults	Provides the descriptions of faults that have occurred in a power module.

Table 6-3. Home Screen Menu Content

6.4.2.1 DEFAULT SCREENS

The default screen provides measurements of the DC output 'Voltage', 'Current', and 'Power', and based on the selected modes ‘MPPT’, ‘SOC’, and calculated 'Capacity' will also be shown. When the Dashboard screen is idle for a set time delay, the display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen. Based on the conditions 'Output state', 'Fault', and 'Power direction', the color of the Default screen will differ. Refer to Table 6-4 and Figure 6-11 to Figure 6-14.

OUTPUT STATE	FAULT	POWER DIRECTION	DISPLAY COLOR
OFF	NO	NA	Grey
OFF	YES	NA	Red
ON	NO	Negative	Green
ON	NO	Positive	Blue

Table 6-4. Default Screen – Conditions and Color

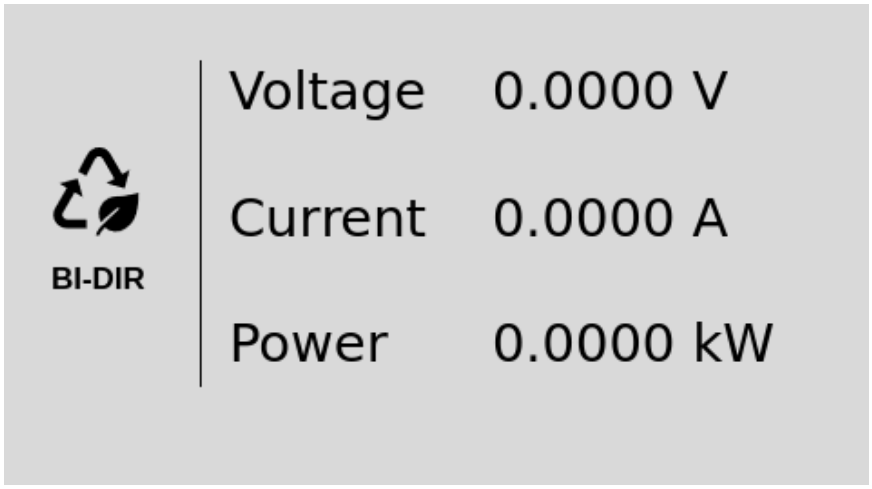


Figure 6-11. Dashboard Screen (Output State – OFF, Fault – NO and Power Direction – NA)

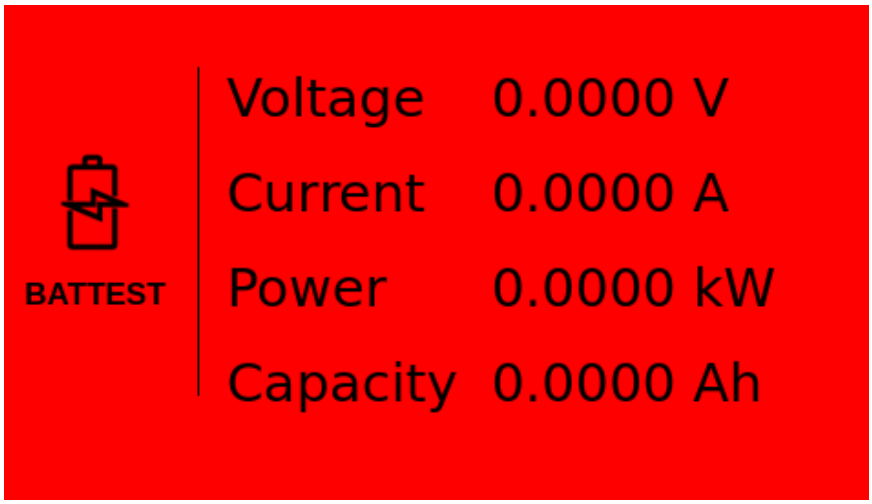


Figure 6-12. Dashboard Screen (Output State – OFF, Fault – YES and Power Direction – NA)

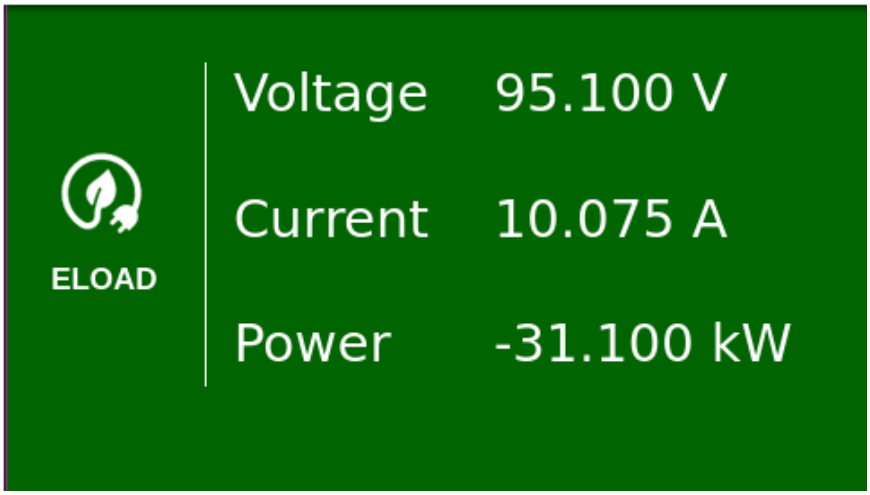


Figure 6-13. Dashboard Screen (Output State – ON, Fault – NO and Power Direction – NEGATIVE)

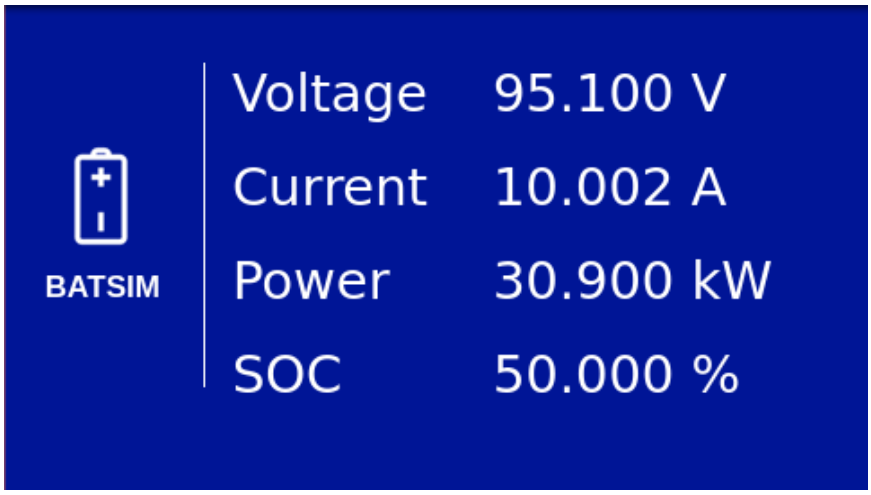


Figure 6-14. Dashboard Screen (Output State – ON, Fault – NO and Power Direction – POSITIVE)

6.4.2.2 NAVIGATING BETWEEN HOME SCREEN MENUS

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

a) Tapping selected menu on HOME SCREEN of the front panel touchscreen.
b) Scrolling to menu with the encoder and depressing the encoder switch.

Tapping the UP-ARROW button will return the user to the previously selected screen menu, and tapping the HOME button will return the user to the Home Screen.

7 BIDIRECTIONAL MODE OPERATION

7.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION

7.1.1 IDENTIFY THE UUT PORT TYPE

Determine if the UUT port is a current type (e.g. DC-Charger output) or a voltage type (e.g. battery or any voltage source).

a) **Current type** – UUT regulates the current
b) **Voltage type** – UUT regulates the voltage

7.1.2 CONFIGURING MI-BEAM FOR CURRENT TYPE UUT

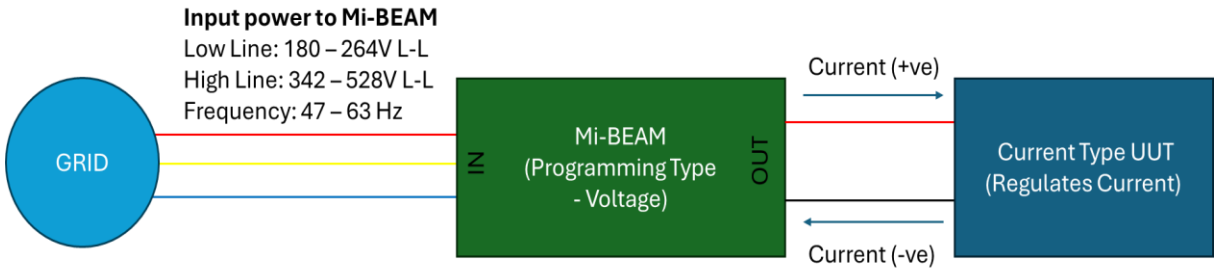


Figure 7-1. Current Type UUT

To configure the Current Type UUT, set the programming type (Prog. type) to 'Voltage' and select the appropriate regulation setting (CV/CC, CV/CP, CV Series Res and CV) in the dashboard. Refer to Section 7.2.1 for detailed instructions.

7.1.2.1 CONSTANT VOLTAGE/ CONSTANT CURRENT (CV/CC)

The power supply regulates the output voltage to the user-set value. On reaching the current limit (positive or negative), the output is regulated to the current limit. On reaching the power limit (positive or negative), the output voltage is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.2.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 7-93.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Negative current limit, Positive Current limit will be used to perform foldback operation and Negative Power limit, Positive Power limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV/CC' are shown in Table 7-1.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CV/CC	YES	NA	NA	NA	NA	YES	YES	YES	YES

Table 7-1. Applicable Options – CV/CC

- **Negative Current limit:** On measured current reaching this value, Mi-BEAM will regulate the current at the set negative current limit. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-19.

- **Positive Current limit:** On measured current reaching this value, Mi-BEAM will regulate the current at the set positive current limit. This value must be set higher than current that can flow from Mi-BEAM to UUT. Refer to Figure 7-18.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 7-21.

- **Positive power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-20.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Negative Current Limit, Positive Current Limit, Negative Power Limit and Positive Power Limit) for the delay time configured. Refer to Figure 7-85.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 7-17.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above, output can be turned ON. Refer to Figure 7-22.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings. Use the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

7.1.2.2 CONSTANT VOLTAGE/ CONSTANT POWER (CV/CP)

The power supply regulates the output voltage to the user-set value. On reaching the power limit (positive or negative), the output is regulated to the power limit. On reaching the current limit (positive or negative) is reached, the output voltage is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.3.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 7-93.

b) Setting Limits: The current and power limits can be set from the ‘Output program’ screen. In this regulation setting, Negative Power limit, Positive Power limit will be used to perform

foldback operation and Negative current limit, Positive Current limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV/CP' are shown in Table 7-2.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CV/CP	YES	NA	NA	NA	NA	YES	YES	YES	YES

Table 7-2. Applicable Options – CV/CP

- **Negative Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from Mi-BEAM to UUT Refer to Figure 7-19.

- **Positive Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the current that can flow from Mi-BEAM to UUT. Refer to Figure 7-18.

- **Negative Power limit:** On measured power reaching this value, Mi-BEAM will regulate the power to set negative power limit. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 7-21.

- **Positive power limit:** On measured power reaching this value, Mi-BEAM will regulate the power to set positive power limit. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-20.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Negative Current Limit, Positive Current Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-85.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 7-17.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-22.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings. Use the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

7.1.2.3 CONSTANT VOLTAGE SERIES RESISTANCE (CV – SER RES)

The user can set the voltage and series resistance. The terminal voltage varies based on the voltage drop across the series resistance. On reaching the current limit (positive or negative), power limit (positive or negative), or voltage limit (high or low), the output voltage is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.5.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 7-93.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low Limit, Negative current limit, Positive Current, Negative Power limit and Positive Power limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.2.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV - Ser. Res' are shown in Table 7-10.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
VOLT	CV-SER. RES	YES	NA	NA	YES	YES	YES	YES	YES	YES	YES

Table 7-3. Applicable Options – CV- Ser. Res

- **Voltage High Limit**: On measured voltage reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from UUT to Mi-BEAM. Refer to Figure 7-26.

- **Voltage Low Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from UUT to Mi-BEAM. Refer to Figure 7-27.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-31.

- **Positive power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-30.

- **Negative Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-29.

- **Positive Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 7-28.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage Low Limit, Voltage High Limit, Negative Current Limit, Positive Current Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-85.

c) **Setting Voltage value:** Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 7-24.

d) **Series Resistance:** Enter the series resistance value to control the voltage drop. Refer to Figure 7-25.

e) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

f) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-32.

g) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

h) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

i) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

7.1.2.4 CONSTANT VOLTAGE (CV)

The power supply regulates the output voltage to the user-set value. On reaching the current limit (positive or negative) or power limit (positive or negative), the output voltage is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.2.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 7-93.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Negative current Limit, Positive Current Limit, Negative Power Limit, and Positive Power Limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV' are shown in Table 7-4.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CV	YES	NA	NA	NA	NA	YES	YES	YES	YES

Table 7-4. Applicable Options – CV

- **Negative Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-19.

- **Positive Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 7-18.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 7-21.

- **Positive Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-20.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Negative Current Limit, Positive Current Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-85.

c) **Setting Voltage value:** Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 7-17.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-22.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

h) **End the Test:** Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

7.1.3 EXAMPLE: TESTING OF DC CHARGER USING CV/CC (DEFAULT) REGULATION SETTING

Test Criteria: Test the DC charger charging at maximum current at various voltage levels.

a) Determine if the UUT port is a current type

- **Current type** – UUT regulates the current

b) Conditions of **DC Charger** (UUT):

- Output Voltage Range: 200V to 1000V
- Maximum Output Current: 30A
- Maximum Output Power: 30kW

c) Assign the protection parameters in Mi-BEAM:

- Set Positive Overcurrent Protection (Pos. OCP) to 60A
- Set Negative Overcurrent Protection (Neg. OCP) to -60A
- Set Overvoltage Protection (OVP) to 1200V
- Set Voltage User Limit to 1000V

d) Assign the Set limits in Mi-Beam:

- Set Positive Current Limit to 5A
- Set Negative Current Limit to -35A
- Set Positive Power Limit to 10kW
- Set Negative Power Limit to 35kW
- Set Delay to 0.100 Sec

e) Set the voltage value of 800V

f) Ensure all configuration parameters are set

g) Turn ON the output of the Mi-BEAM

h) Mi-BEAM will regulate the set voltage of 800V

i) Configure Current from DC Charger:

j) Set the current from the DC charger to a value between 0 to 30A

k) Mi-BEAM will sink the configured current from the DC charger

l) Monitor the output and make necessary adjustments to ensure the UUT operates within the desired parameters

m) Once the test is complete, safely disconnect the UUT from the Mi-BEAM

n) Power down the Mi-BEAM.

7.1.4 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT

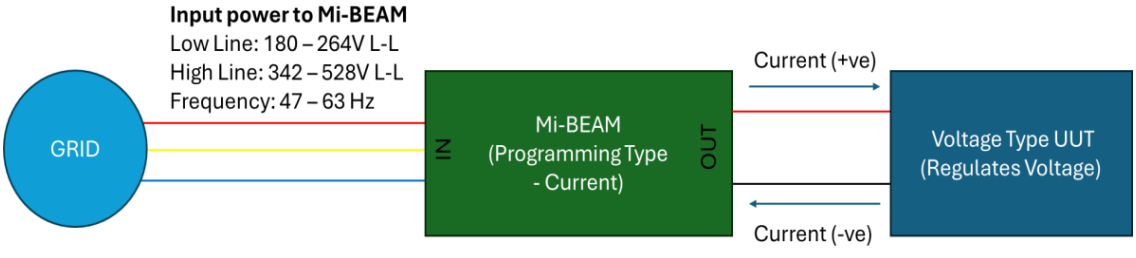


Figure 7-2. Voltage Type UUT

To configure the Voltage Type UUT, set the programming type (Prog. type) to ‘Current’ and select the appropriate regulation setting (CC/CV, CC/CP, CP/CC and CC) in the dashboard. Refer to Section 7.2.1 for detailed instructions.

7.1.4.1 CONSTANT CURRENT/CONSTANT VOLTAGE (CC/CV)

The power supply regulates the output current to the user-set value. On reaching the voltage limit (high or low), the output is regulated to the voltage limit. On reaching the power limit (positive or negative), the output current is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.5.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.
- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.
- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.
- **Current User Limit:** This setting limits the maximum and minimum current value that can be set in Mi-BEAM. Refer to Figure 7-94.

b) Setting Limits: The voltage and power limits can be set from the ‘Output program’ screen. In this regulation setting, Voltage high Limit, Voltage low limit will be used to perform foldback operation and Negative Power limit, Positive Power limit will be used to trip Mi-BEAM. Refer to Section 7.2.1.5.

All applicable options based on the programming type 'Current' and regulation setting 'CC/CV' are shown in Table 7-5.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CC/CV	NA	YES	NA	YES	YES	NA	NA	YES	YES

Table 7-5. Applicable Options – CC/CV

- **Voltage High Limit**: On measured voltage reaching this value, Mi-BEAM will regulate the voltage at set voltage high limit. This value must be set higher than the voltage flown from Mi-BEAM to UUT Refer to Figure 7-35.

- **Voltage Low Limit**: On measured voltage reaching this value, Mi-BEAM will regulate the voltage at set voltage low limit. This value must be set lower than the voltage flown from Mi-BEAM to UUT Refer to Figure 7-36.

- **Positive Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-37.

- **Negative Power Limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-38.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage high Limit, Voltage Low Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-87.

c) Setting Current value: Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OCP. Refer to Figure 7-34.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-39.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM

7.1.4.2 CONSTANT CURRENT/CONSTANT POWER (CC/CP)

The power supply regulates the output current to the user-set value. On reaching the power limit (positive or negative), the output is regulated to the voltage limit. On reaching the voltage limit (high or low), the output current is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.7.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Current User Limit:** This setting limits the maximum and minimum current value that can be set in Mi-BEAM. Refer to Figure 7-94.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low limit will be used to perform foldback operation and Negative Power limit, Positive Power limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.3.

All applicable options based on the programming type 'Current' and regulation setting 'CC/CP' are shown in Table 7-6.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CC/CP	NA	YES	NA	YES	YES	NA	NA	YES	YES

Table 7-6. Applicable Options – CC/CP

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT Refer to Figure 7-35.

- **Voltage Low Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT Refer to Figure 7-36.

- **Positive Power limit:** On measured power reaching this value, Mi-BEAM will regulate the power at set positive power limit. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-37.

- **Negative Power Limit:** On measured power reaching this value, Mi-BEAM will regulate the power at set negative power limit. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-38.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage high Limit, Voltage Low Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-87.

c) **Setting Current value:** Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OCP. Refer to Figure 7-34.

d) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-39.

e) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

h) **End the Test:** Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM

7.1.4.3 CONSTANT POWER/CONSTANT CURRENT (CP/CC)

The power supply regulates the output power to the user-set value. If the current limit (positive or negative) is reached, the output is regulated to the current limit. If the voltage limit (high or low) is reached, the output power is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.6.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Power User Limit:** This setting limits the maximum and minimum power value that can be set in Mi-BEAM. Refer to Figure 7-95.

a) **Setting Limits**: The voltage and power limits can be set from the ‘Output program’ screen. In this regulation setting, Positive Current limit, Negative Current Limit will be used to perform foldback operation and Voltage High Limit, Voltage Low Limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.4.

All applicable options based on the programming type 'Current' and regulation setting 'CP/CC' are shown in Table 7-7.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CP/CC	NA	NA	YES	YES	YES	YES	YES	NA	NA

Table 7-7. Applicable Options – CP/CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 7-42.

- **Voltage Low Limit**: On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 7-43.

- **Positive Current Limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set Positive Current Limit. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-44.

- **Negative Current Limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set Negative Current Limit. This value must be set lower than the power flown from Mi-BEAM to UUT. Refer to Figure 7-45.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-87.

b) Setting Power value: Enter the power value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured protection value. Refer to Figure 7-41.

c) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-46.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

f) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

g) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM

7.1.4.4 CONSTANT CURRENT (CC)

The power supply regulates the output current to the user-set value. On reaching the voltage limit (high or low) or power limit (positive or negative), the output current is programmed to zero and the output is turned OFF. Refer to Section 7.2.1.2.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 7-91.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 7-91.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 7-91.

- **Current User Limit:** This setting limits the maximum and minimum current value that can be set in Mi-BEAM. Refer to Figure 7-94.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low Limit, Negative Power Limit, Positive Power Limit will be used to trip Mi-BEAM. Refer to Section 7.2.2.3.

All applicable options based on the programming type 'Current' and regulation setting 'CC' are shown in Table 7-8.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CC	NA	YES	NA	YES	YES	NA	NA	YES	YES

Table 7-8. Applicable Options – CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 7-35.

- **Voltage Low Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 7-36.

- **Positive Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 7-37.

- **Negative Power Limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 7-38.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Volt high, Volt Low, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 7-87.

c) **Setting Current value:** Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OCP. Refer to Figure 7-34.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 7-39.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 7.2.3.

h) **End the Test:** Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

7.1.5 EXAMPLE: TESTING OF BATTERY PACK USING CC/CV (DEFAULT) REGULATION SETTING

Test Criteria: Test the battery pack's health by performing charge and discharge cycles.

a) Determine if the UUT port is a voltage type (e.g. battery or any voltage source).

- **Voltage type** – UUT regulates the voltage

b) Conditions of **Battery pack** (UUT):

- Output Circuit Voltage (OCV):
  - At 0% SoC: 350V
  - At 100% SoC: 600V

- Maximum Charge Current: 30A

- Maximum Discharge Current: -30A

c) Ensure that the programming type is set to current, and the regulation setting is in CC/CV (Default)

d) Assign the protection parameters in Mi-BEAM:

- Set Positive Overcurrent Protection (Pos. OCP) to 35A
- Set Negative Overcurrent Protection (Neg. OCP) to -35A
- Set Overvoltage Protection (OVP) to 650V
- Set Current High (User Soft Limit) Limit to 30A
- Set Current Low (User Soft Limit) Limit to -30A

e) Assign the Set limits in Mi-Beam:

- Set Volt High Limit to 600V
- Set Volt Low Limit to 350V
- Set Positive Power Limit to 37kW
- Set Negative Power Limit to -37kW
- Set Delay to 0.100 Sec

f) Set a current value (positive value for charging and negative value for discharging the battery pack).

g) Ensure all configuration parameters are set

h) Turn ON the output of the Mi-BEAM

i) Mi-BEAM will charge or discharge the battery based on the current set (Positive current for charging and Negative current for discharging)

j) Monitor the output and make necessary adjustments to ensure the UUT operates within the desired parameters

k) Once the test is complete, safely disconnect the UUT from the Mi-BEAM

l) Power down the Mi-BEAM.

7.2 FRONT PANEL OPERATION

This section provides detailed information on the front panel operation in Bi-directional mode. Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder. Refer to Figure 7-3.

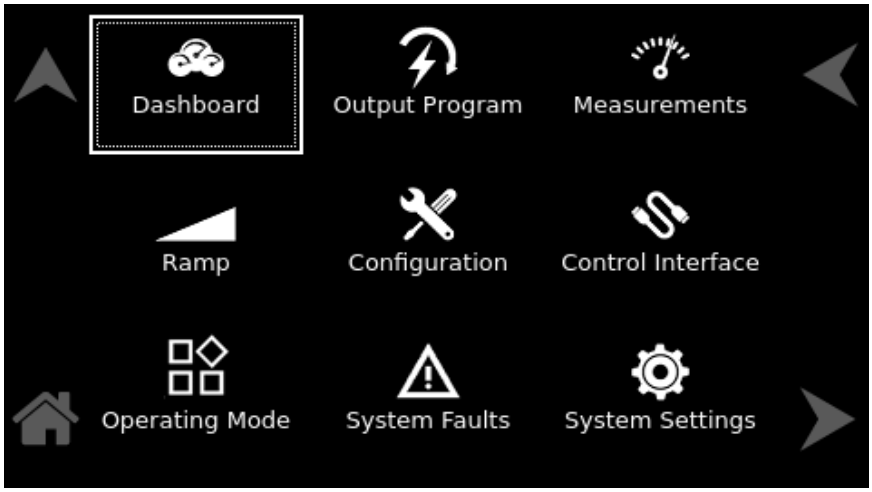


Figure 7-3. Home Screen Top-Level Menu

7.2.1 DASHBOARD SCREEN TOP-LEVEL MENU

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

7.2.1.1 CONFIGURING PROGRAMMING TYPE AND REGULATION SETTINGS

The Regulation Settings Menu allows users to configure the 'Prog. Type' (Programming Type) and 'Regulation Settings' of the Mi-beam power supply. Refer to Figure 7-4 and Figure 7-5.

The 'Reg. Setting' function on the Dashboard Screen enables users to switch between 'Voltage (CV/CC, CV/CP, CV-Ser. Res and CV)' and 'Current (CC/CV, CP/CC, CC/CP and CC)' Regulation settings. Refer Figure 7-6 to Figure 7-13 and Table 7-9 to Table 7-17.

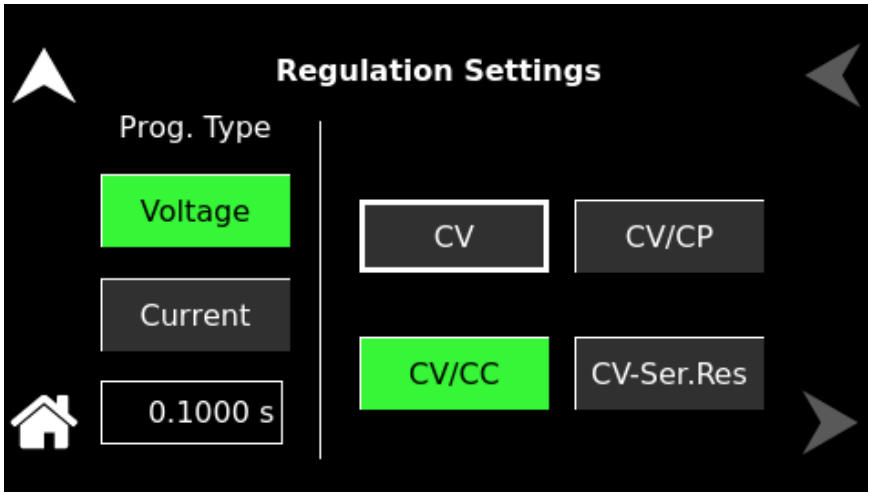


Figure 7-4. Regulation Settings – Voltage programming type

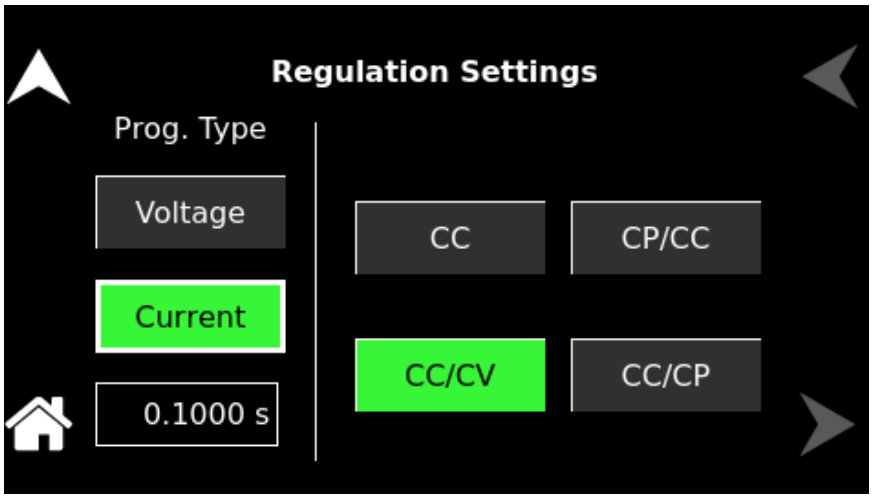


Figure 7-5. Regulation Settings – Current programming type

7.2.1.2 VOLTAGE PROGRAMMING TYPE CV/CC AND CV REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CV/CC Regulation setting is shown Figure 7-6,
b) Voltage - CV Regulation setting is shown in Figure 7-7,

Refer to Section 6.4.2.1 for navigating to Dashboard-Screen.

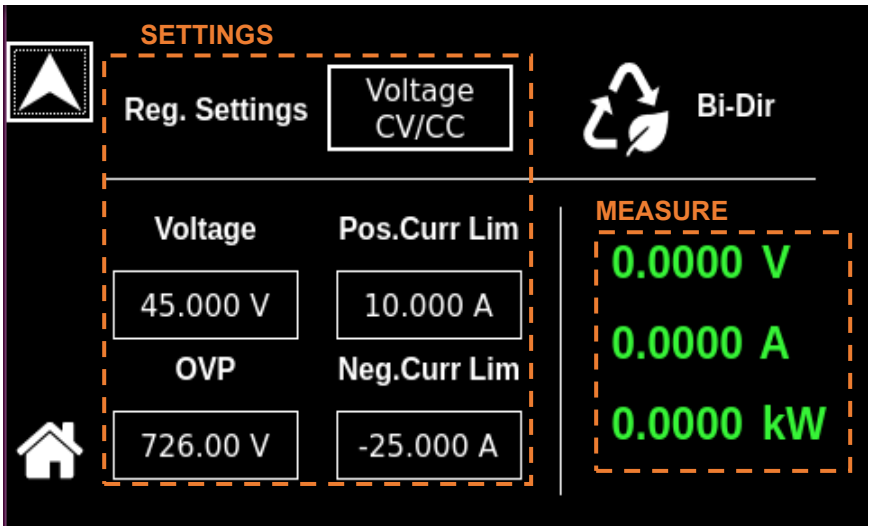


Figure 7-6. Dashboard Screen in CV/CC Mode

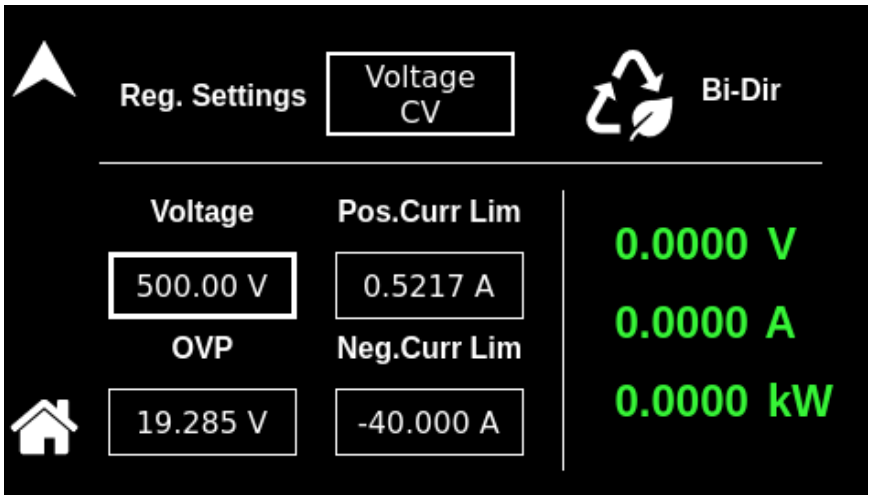


Figure 7-7. Dashboard Screen in CV Mode

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type, 'CV/CC' and 'CV' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 7-84. **a) Voltage - Constant Voltage/Constant Current (CV/CC):** The output voltage is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the current limit reached. On reaching the power limit (positive or negative), the output voltage would be programmed to zero. **b) Voltage - Constant Voltage (CV):** The output voltage is regulated to the user set value. On reaching the set current limit (positive or negative) or power limit (positive or negative), the output voltage would be programmed to zero.
Voltage	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	In CV regulation setting, this functions as a trip limit. In CV/CC regulation setting, on reaching this set value, the output would be regulated to the Pos. Curr Lim. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	In CV regulation setting, this functions as a trip limit. In CV/CC regulation setting, on reaching this set value, the output would be regulated to the Neg. Curr Lim. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.

MEASURE	DESCRIPTION
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.

Table 7-1. Top-level Screen menu

7.2.1.3 VOLTAGE PROGRAMMING TYPE CV/CP REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage – CV/CP Regulation setting is shown in Figure 7-8,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

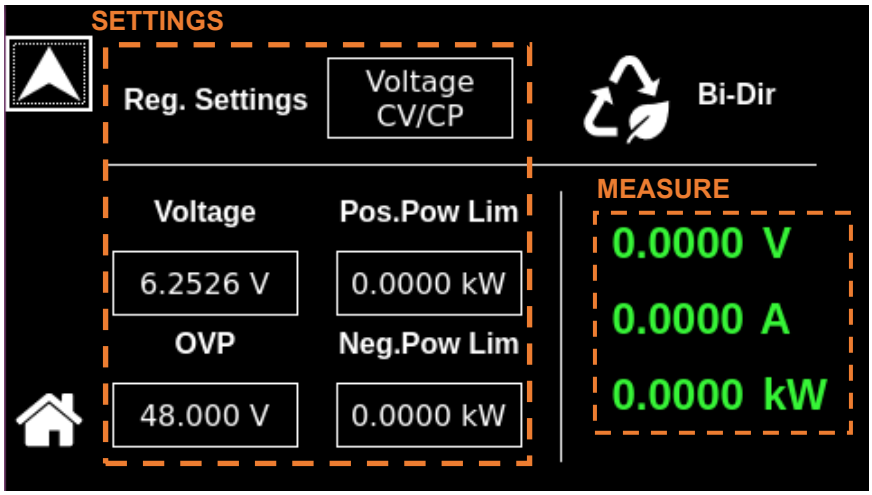


Figure 7-8. Dashboard Screen in CV/CP Mode

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type, 'CV/CP' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 7-84. **a) Voltage - Constant Voltage/ Constant Power:** The output voltage is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the power limit reached. On reaching the current limit (positive or negative), the output voltage would be programmed to zero.
Voltage	Programs the output Voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Pos. Pow Lim	Regulates the output upon reaching the Positive Power Limit. Real-time setting is possible using the rotary encoder.
Neg. Pow Lim	Regulates the output upon reaching the Negative Power Limit. Real-time setting is possible using the rotary encoder.

SETTINGS	DESCRIPTION
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 7-10. Dashboard screen top-level menu- CV/CP Mode

7.2.1.4 VOLTAGE PROGRAMMING TYPE CV-SER. RES REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CV-Ser. Res Regulation setting is shown in Figure 7-9,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

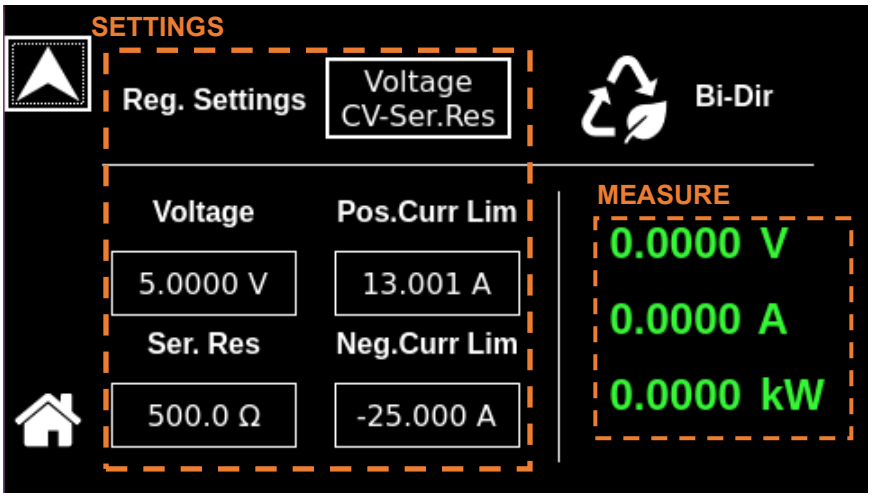


Figure 7-9. Dashboard Screen in CV-Ser. Res Mode

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CV-Ser. Res' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 7-84. **a) Voltage - Constant Voltage Series Resistance (CV – Ser Res):** The user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive or negative) or power limit (positive or negative) or voltage limit (high or low), the output voltage is programmed to zero.

SETTINGS	DESCRIPTION
Voltage	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	Programs the output positive current limit in amps and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
Ser. Res	Programs the series resistance in ohms. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	Programs the negative current limit in amps and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 7-11. Dashboard screen top-level menu- CV-Ser. Res Mode

7.2.1.5 CURRENT PROGRAMMING TYPE CC AND CC/CV REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current - CC/CV Regulation setting is shown in Figure 7-10,
b) Current - CC Regulation setting is shown in Figure 7-11,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

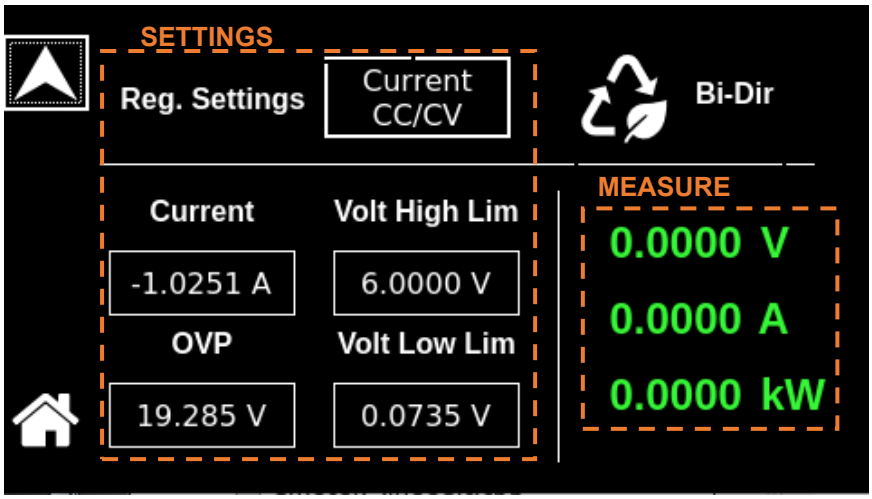


Figure 7-10. Dashboard Screen in CC/CV Mode

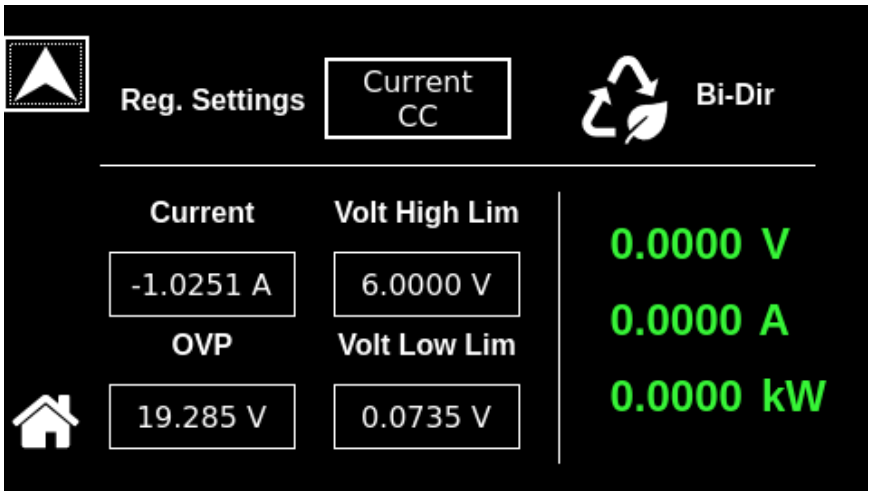


Figure 7-11. Dashboard Screen in CC Mode

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type 'CC/CV' and 'CC' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 7-86. **a) Current - Constant Current/Constant Voltage (CC/CV):** The output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (positive or negative), the output current would be programmed to zero. **b) Current - Constant Current (CC):** The output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive or negative), the output current would be programmed to zero.
Current	Programs the output current in amps. Real-time setting is possible using the rotary encoder.
Volt High Lim	In CC mode, this setting functions as a trip limit. In CC/CV mode, it regulates the output upon reaching the voltage high limit. Real-time setting is possible using the rotary encoder.
Volt Low Lim	In CC mode, this setting functions as a trip limit. In CC/CV mode, it regulates the output upon reaching the voltage low limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 7-12. Dashboard screen top-level menu – CC and CC/CV

7.2.1.6 CURRENT PROGRAMMING TYPE CP/CC REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current – CP/CC Regulation setting is shown in Figure 7-12,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

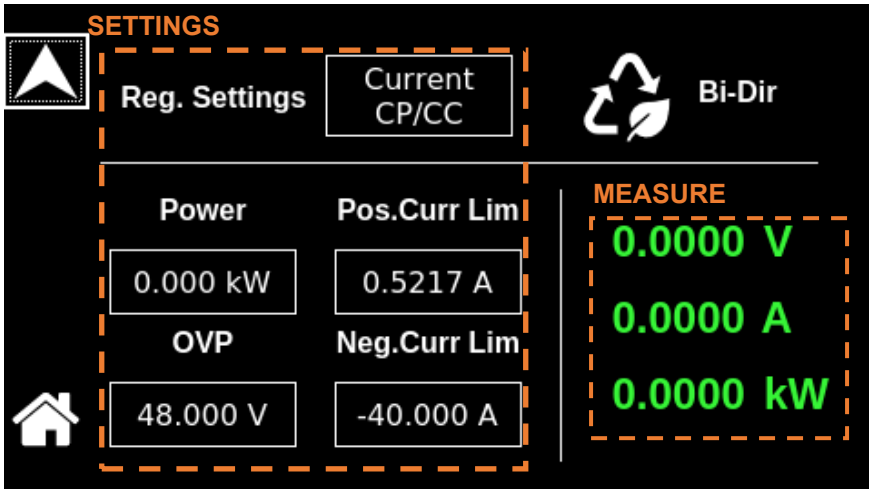


Figure 7-12. Dashboard Screen in CP/CC Mode

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type, 'CP/CC' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 7-86. **a) Current - Constant Power/ Constant Current:** The output power is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the current limit reached. On reaching the voltage limit (positive or negative), the output power would be programmed to zero.
Power	Programs the output power of the supply in watts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	Regulates the output upon reaching the Positive Current Limit. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	Regulates the output upon reaching the Negative Current Limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 7-13. Dashboard screen top-level menu- CP/CC Mode

7.2.1.7 CURRENT PROGRAMMING TYPE CC/CP REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current – CC/CP Regulation setting is shown in Figure 7-13,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

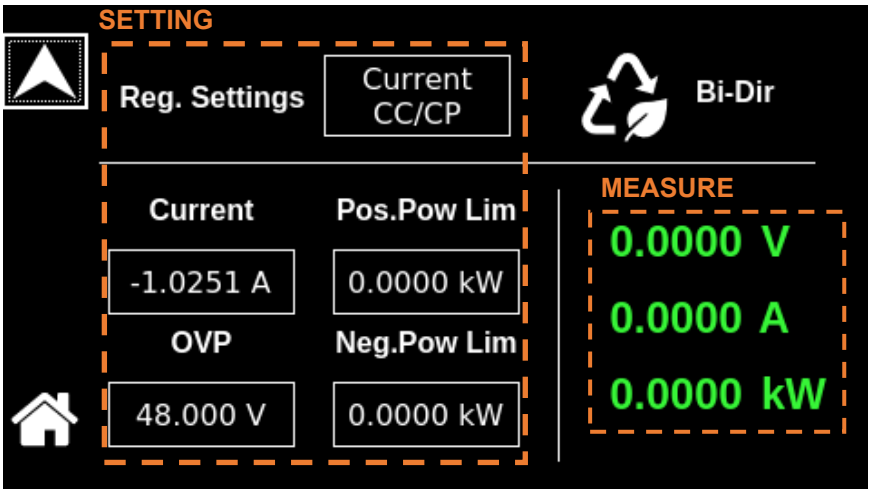


Figure 7-13. Dashboard Screen in CP/CC Mode

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type 'CC/CP' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 7-86. **a) Current - Constant Current/ Constant Power:** The output current is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
Current	Programs the output current of the supply in amps. Real-time setting is possible using the rotary encoder.
Pos. Pow Lim	Regulates the output upon reaching the Positive Power Limit. Real-time setting is possible using the rotary encoder.
Neg. Pow Lim	Regulates the output upon reaching the Negative Power Limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 7-14. Dashboard screen top-level menu- CC/CP Mode

7.2.1.8 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 tapping 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 7-14. The rotary encoder can then be used to continuously adjust the parameter value, up and down, as it is rotated. The value change takes immediate effect on the output.

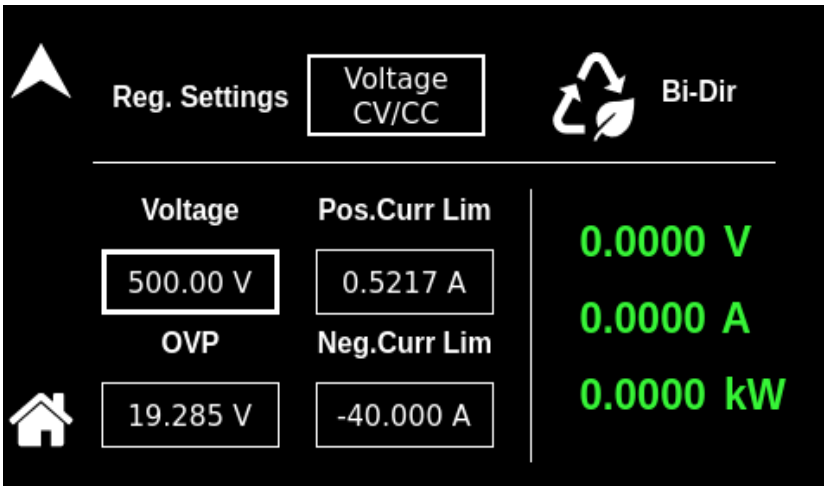


Figure 7-14. Real-Time, Immediate Output Parameter Adjustment

7.2.1.9 DEFAULT SCREEN

The Default screen provides measurement of the DC output voltage, current and power, refer to Figure 7-15. When the Dashboard screen is idle for an interval equal to a set time delay, refer to Figure 7-197 and Figure 7-198. The display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen.

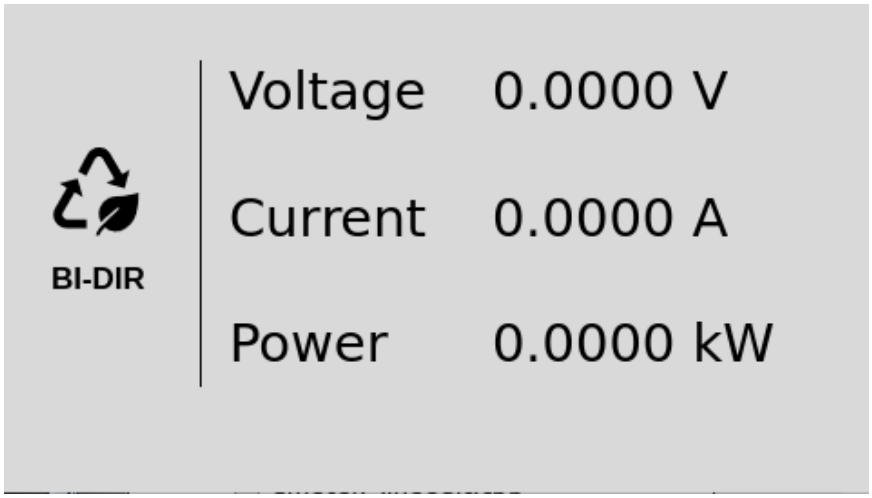


Figure 7-15. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage, current and power in various modes of operation.

7.2.2 OUTPUT PROGRAM SCREEN

The settings in the output program screen will change based on the Programming type and Regulation setting configured. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

7.2.2.1 CV/CC, CV/CP AND CV MODE

The Output Program screen provides settings of ‘Voltage’, ‘Positive Current Limit’, ‘Negative Current Limit’, ‘Positive Power Limit’, ‘Negative Power Limit’ and ‘Output State’. Refer to Figure 7-16.

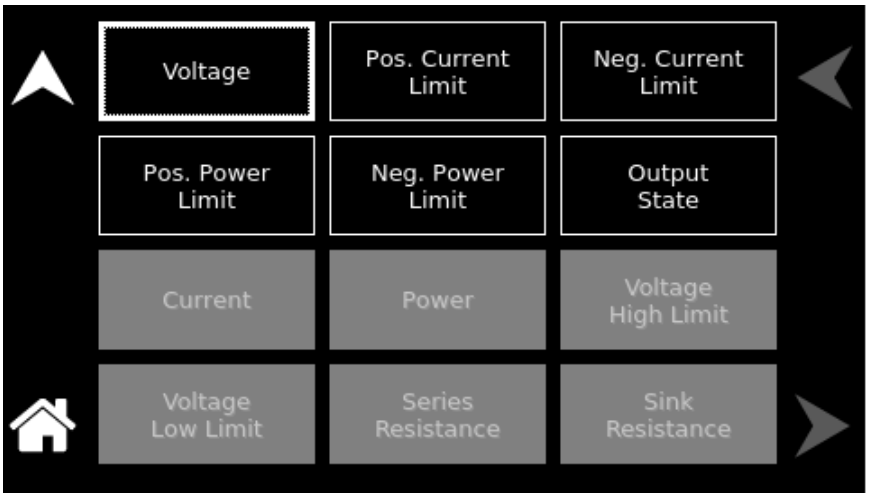


Figure 7-16. Output Program Screen – CV/CC, CV/CP and CV

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CV/CC, CV/CP and CV mode includes the following functions:

ENTRY	DESCRIPTION
Voltage	User can set a Voltage value within the specified limit. Refer to Figure 7-17.

ENTRY	DESCRIPTION

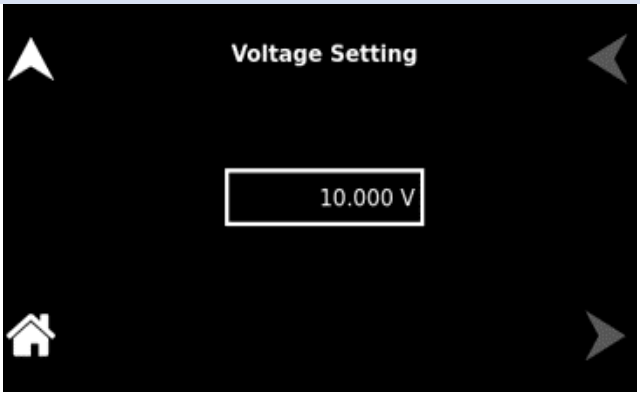


Figure 7-17. Voltage setting screen

Pos. Current Limit User can set a positive current value, which functions as a trip limit (CV and CV/CP), or it regulates (CV/CC) the output upon reaching the Positive Current Limit. Refer to Figure 7-18.

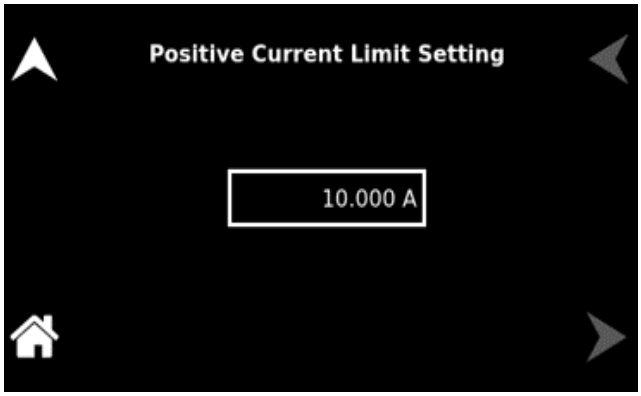


Figure 7-18. Positive Current limit setting screen

Neg. Current Limit User can set a negative current value, which functions as a trip limit (CV and CV/CP), or it regulates (CV/CC) the output upon reaching the Negative Current Limit. Refer to Figure 7-19.

ENTRY	DESCRIPTION

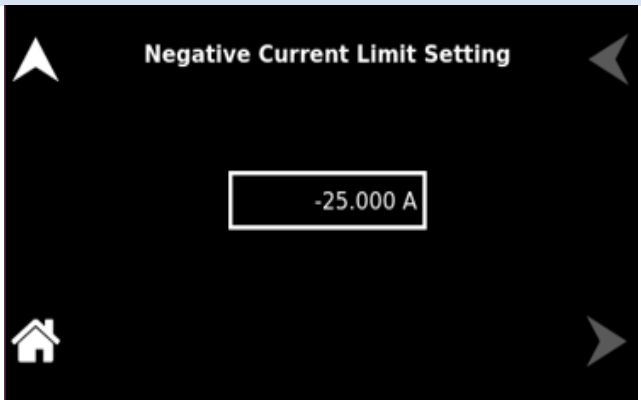


Figure 7-19. Negative Current limit setting screen

Pos. Power Limit User can set the Positive power limit value which functions as a trip limit (CV and CV/CC), or it regulates (CV/CP) the output upon reaching the Positive Power Limit. Refer to Figure 7-20.

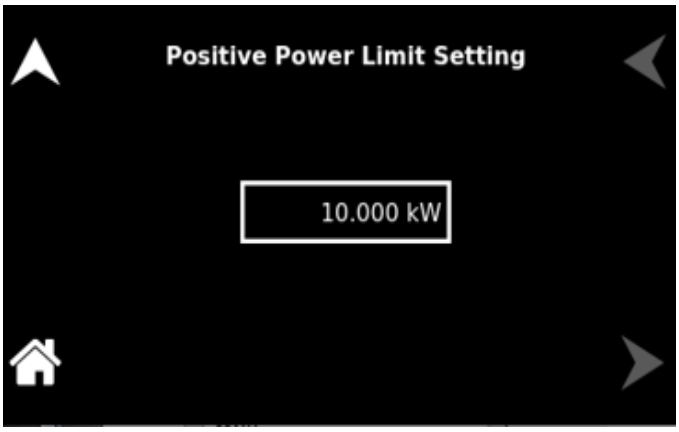


Figure 7-20. Positive Power Limit setting screen

Neg. Power Limit User can set the Negative power limit value which functions as a trip limit (CV and CV/CC), or it regulates (CV/CP) the output upon reaching the Negative Power Limit. Refer to Figure 7-21.

ENTRY	DESCRIPTION

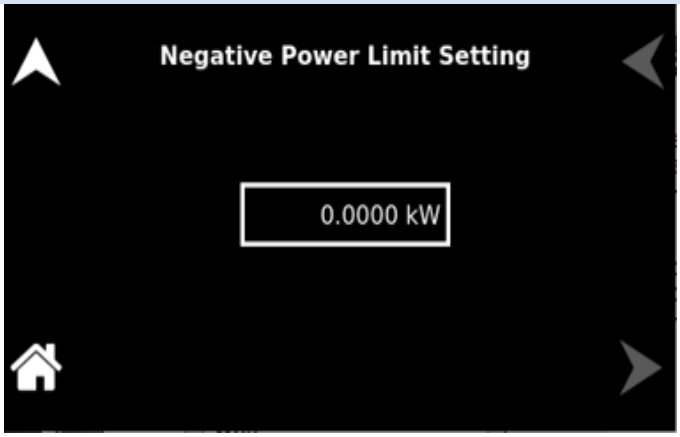


Figure 7-21. Negative Current limit setting screen

Output State User can program the output to ON or OFF state. Refer to Figure 7-22.

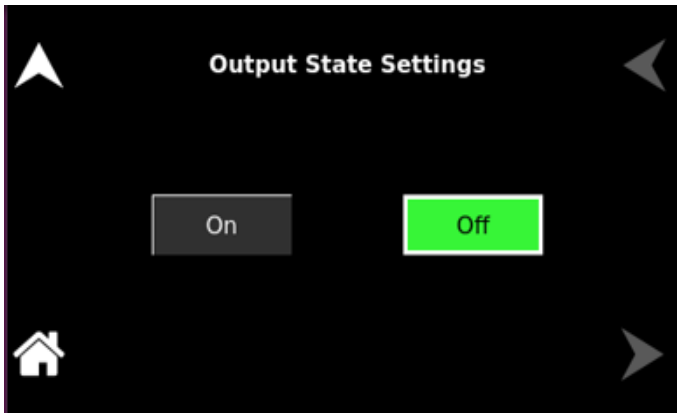


Figure 7-22. Output State Settings

Table 7-15. Output Program Settings in CV/CC and CV Mode

7.2.2.2 CV SER. RES MODE

The Output Program screen provides settings of ‘Voltage’, ‘Series Resistance’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Positive Current Limit’, ‘Negative Current Limit’, ‘Positive Power Limit’, ‘Negative Power Limit’, and ‘Output State’. Refer to Figure 7-63.

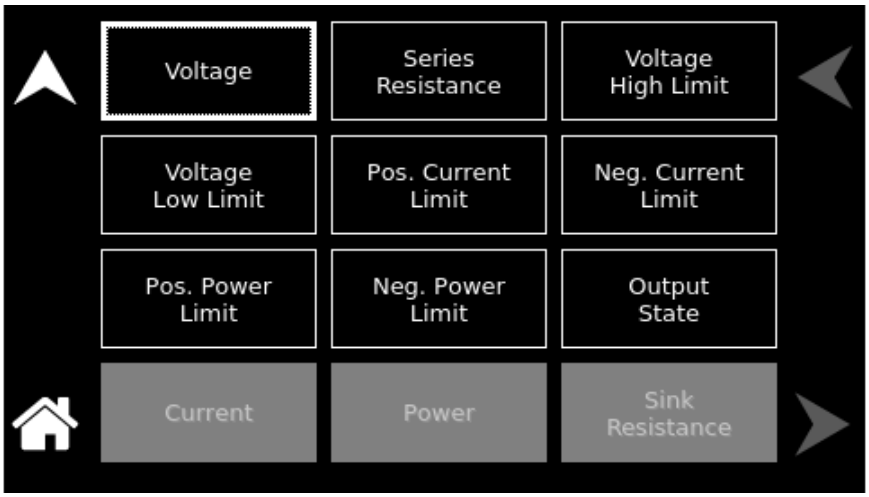


Figure 7-23. Output Program Screen

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CV Ser. Res mode includes the following functions:

ENTRY	DESCRIPTION
Voltage	User can set a voltage value within the specified limit. Refer to Figure 7-24.

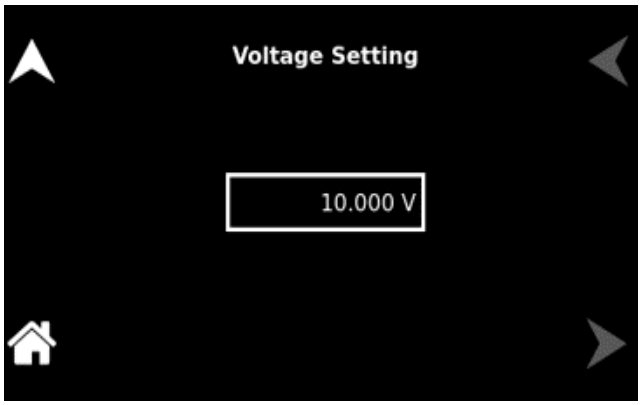


Figure 7-24. Voltage Setting

Series Resistance	User can set the series resistance value within the specified limit. Refer to Figure 7-25.

ENTRY	DESCRIPTION

Figure 7-25. Series Resistance Setting

Voltage High Limit User can set the voltage high limit value, and it regulates upon reaching the Voltage High Limit. Refer to Figure 7-26.

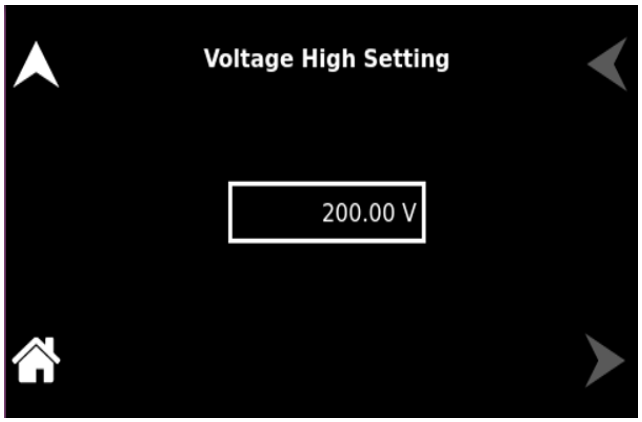


Figure 7-26. Voltage High Setting

Voltage Low Limit User can set the voltage low limit value, and it regulates upon reaching the Voltage Low Limit. Refer to Figure 7-27.

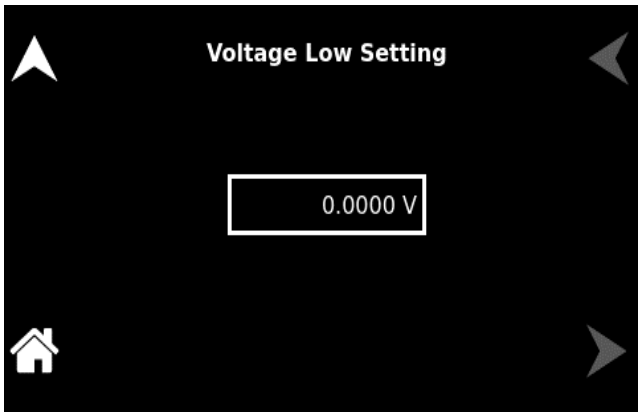


Figure 7-27. Voltage Low Setting

ENTRY	DESCRIPTION
Pos. Current Limit	User can set a Positive Current limit value, and which functions as a trip limit. Refer to Figure 7-28.

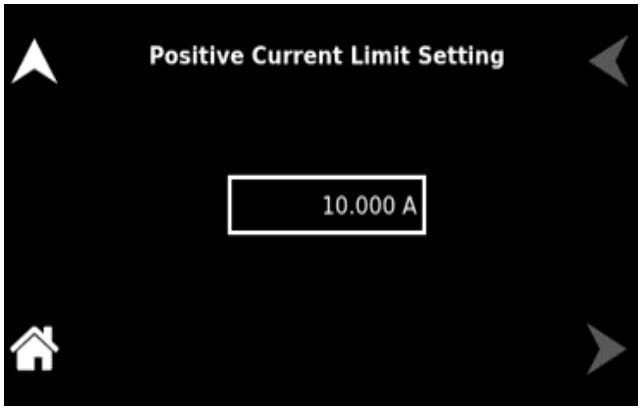


Figure 7-28. Positive Current Limit

Neg. Current Limit	User can set the Negative Current limit value which functions as a trip limit. Refer to Figure 7-29.

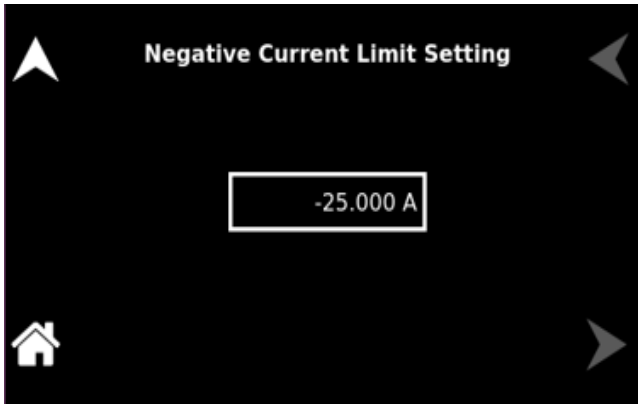


Figure 7-29. Negative Current limit setting screen

Pos. Power Limit	User can set the positive power limit value which functions as a trip limit. Refer to Figure 7-30.

ENTRY	DESCRIPTION

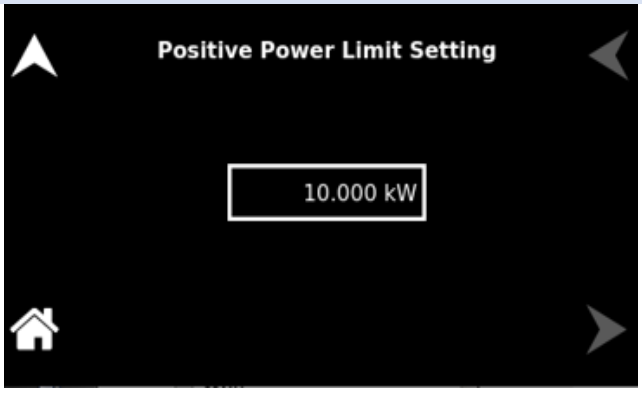


Figure 7-30. Positive Power Limit

Neg. Power Limit User can set the Negative power Limit value which functions as a trip limit. Refer to Figure 7-31.

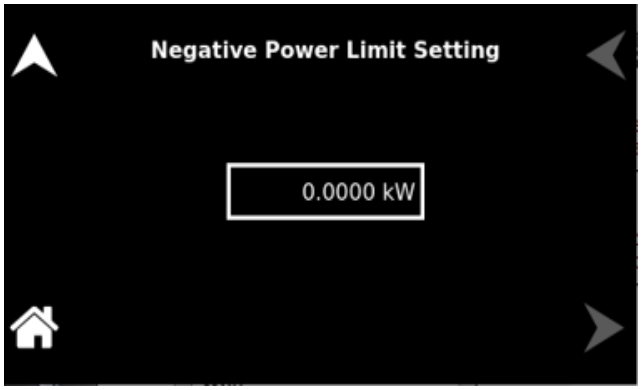


Figure 7-31. Negative Power limit setting screen

Output State User can program the output to ON or OFF state. Refer to Figure 7-32.

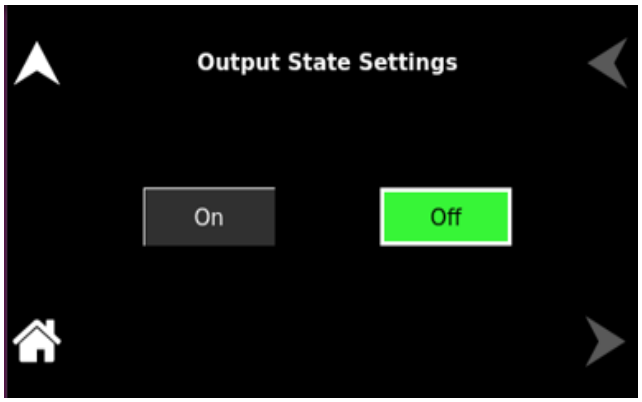


Figure 7-32. Output State

Table 7-16. Output Program Settings in CV-Ser. Res

7.2.2.3 CC/CV, CC/CP AND CC MODE

The Output Program screen in CC/CV, CC/CP and CC mode provides settings of ‘Current, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Positive Power Limit’, ‘Negative Power Limit’ and ‘Output State’.

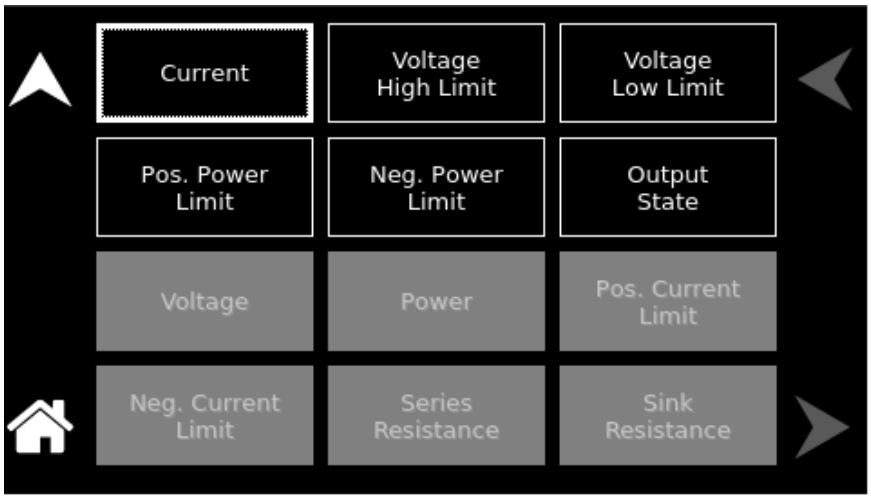


Figure 7-33. Output Program Screen of CC/CV, CC/CP and CC mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CC/CV, CC/CP and CC mode includes the following functions:

ENTRY	DESCRIPTION
Current	User can set the Current value within the specified limit. Refer to Figure 7-34.

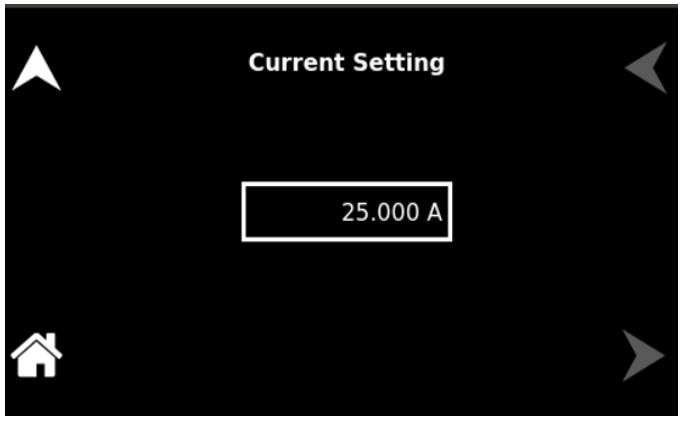


Figure 7-34. Current Setting

ENTRY	DESCRIPTION
Voltage High Limit	User can set the high voltage value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the Voltage High Limit. Refer to Figure 7-35.

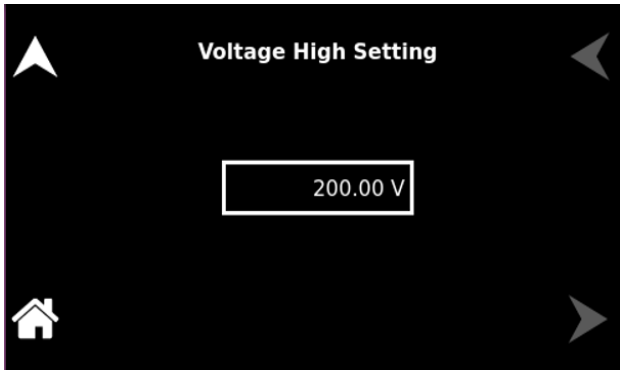


Figure 7-35. Voltage High Setting

Voltage Low Limit	User can set the low voltage value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the Voltage Low Limit. Refer to Figure 7-36.

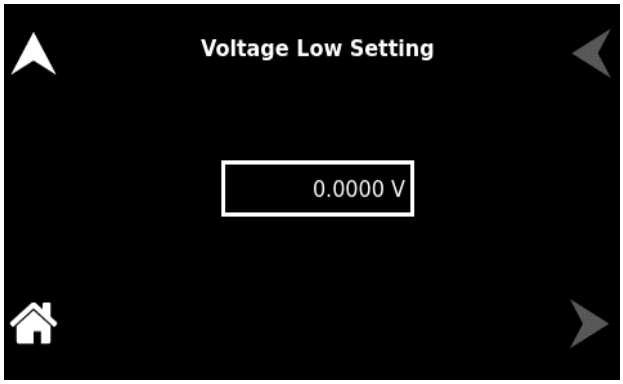


Figure 7-36. Voltage Low Settings

Pos. Power Limit	User can set the positive power value, which functions as a trip limit (CC/CV and CC), or it regulates (CC/CP) the output upon reaching the Positive Power Limit. Refer to Figure 7-37.

ENTRY	DESCRIPTION

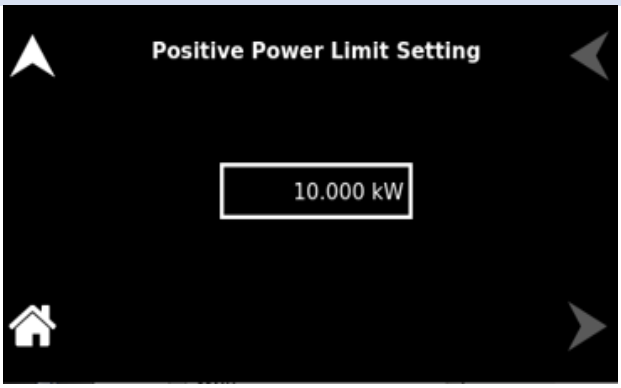


Figure 7-37. Positive Power Limit

Neg. Power Limit User can set the negative power value, which functions as a trip limit (CC/CV and CC), or it regulates (CC/CP) the output upon reaching the Negative Power Limit. Refer to Figure 7-38.

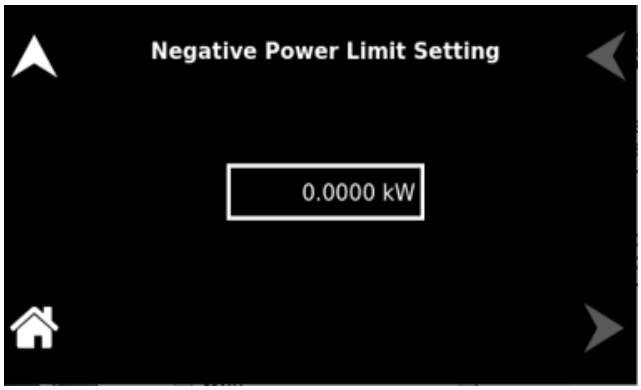


Figure 7-38. Negative Power Limit

Output State User can program the output to ON or OFF state. Refer to Figure 7-39.

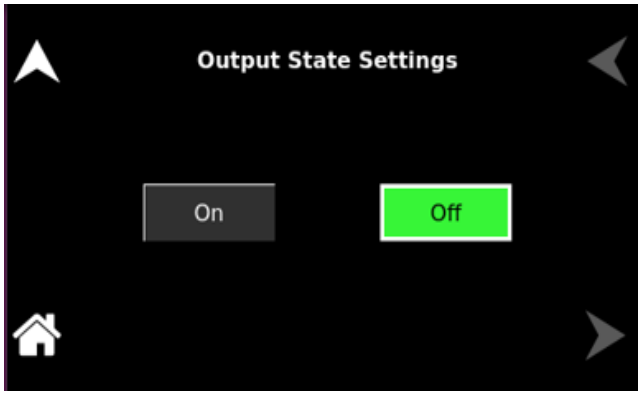


Figure 7-39. Output State Settings

Table 7-17. Output Program Settings in CC/CV, CC/CP and CC Mode

7.2.2.4 CP/CC MODE

The Output Program screen in CP/CC mode provides settings of ‘Power’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Negative Current Limit’, ‘Positive Current Limit’ and ‘Output State’. Refer to Figure 7-40.

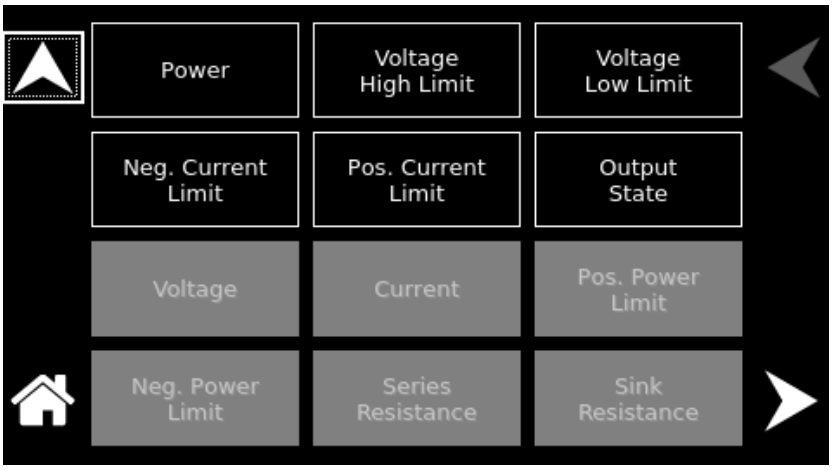


Figure 7-40. Output Program Screen of CP/CC mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CP/CC mode includes the following functions:

ENTRY	DESCRIPTION
Power	User can set the Power value within the specified limit. Refer to Figure 7-41.

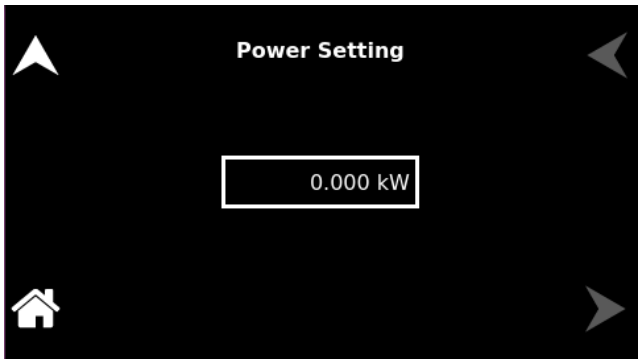


Figure 7-41. Power Setting

ENTRY	DESCRIPTION
Voltage High Limit	User can set the high voltage value, and which functions as a trip limit. Refer to Figure 7-42.

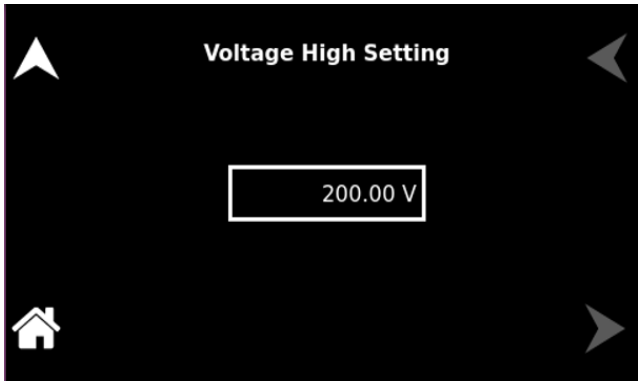


Figure 7-42. Voltage High Setting

Voltage Low Limit	User can set the low voltage value, and which functions as a trip limit. Refer to Figure 7-43.

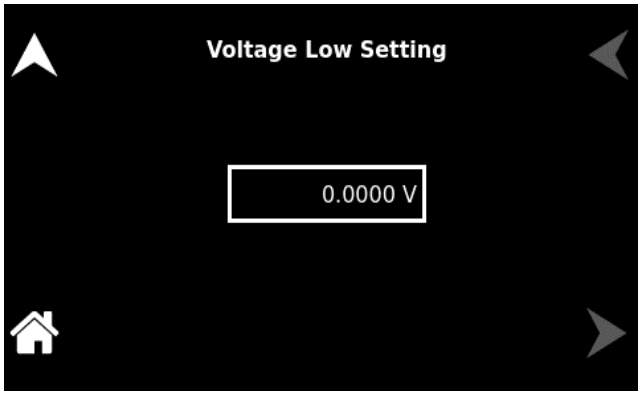


Figure 7-43. Voltage Low Settings

Pos. Current Limit	User can set a positive current limit value, and it regulates the output upon reaching the Positive Current Limit. Refer to Figure 7-44.

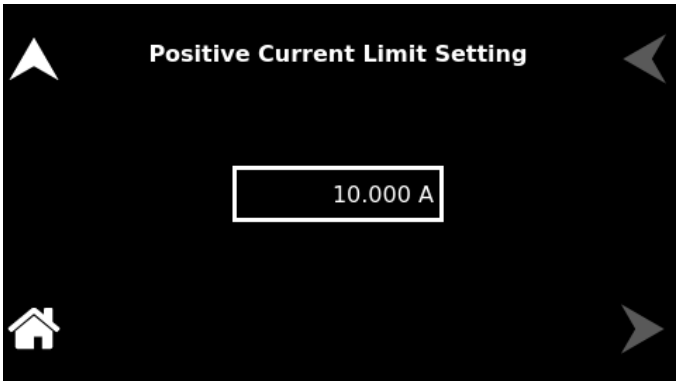


Figure 7-44. Positive Power Limit

ENTRY	DESCRIPTION
Neg. Current Limit	User can set a negative current limit value, and it regulates the output upon reaching the Negative Current Limit. Refer to Figure 7-45.

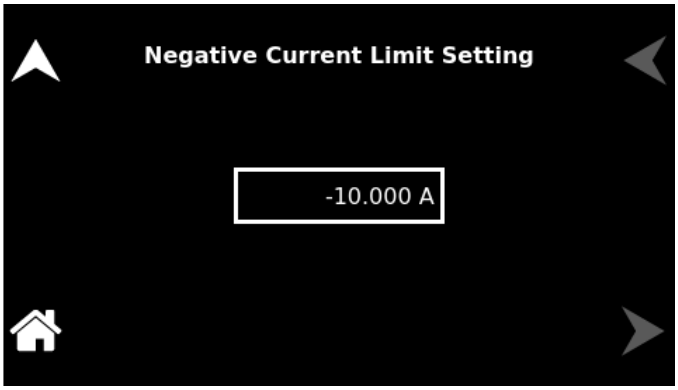


Figure 7-45. Negative Power Limit

Output State	User can program the output to ON or OFF state. Refer to Figure 7-46.

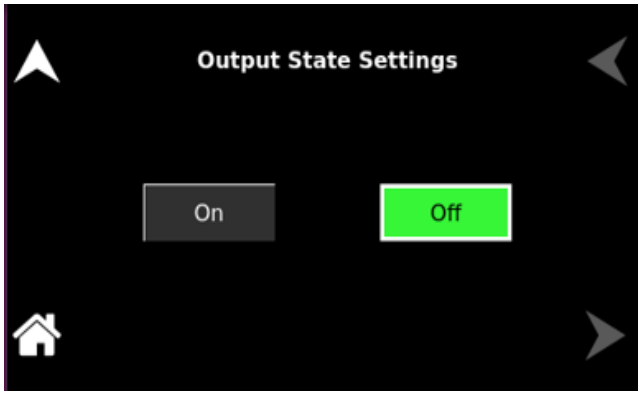


Figure 7-46. Output State Settings

Table 7-18. Output Program Settings in CP/CC Mode

7.2.3 MEASUREMENTS SCREEN

The Measurements screen displays the floating-point values for DC ‘Output Voltage’, ‘Output Current’, and ‘Output Power’. For the Measurement screen refer to Figure 7-47 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

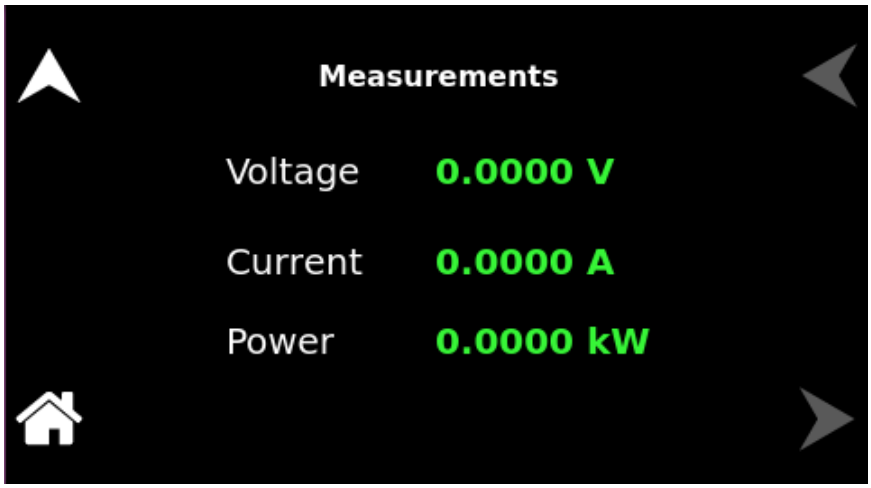


Figure 7-47. Measurements Screen

7.2.4 RAMP SCREEN

The Ramp Screen provides the interface based on the Programming type and the Regulation setting selected, refer to Section 7.2.5.1. The Ramp screen will be displayed according to the Programming type configured 'Voltage Ramp' screen for 'Voltage' Programming type and 'Current Ramp' screen for 'Current' Programming type.

7.2.4.1 VOLTAGE RAMP – CV/CC, CV/CP, CV–SER. RES AND CV

The Voltage Ramp menu allows the user to configure and execute voltage ramp, refer to Figure 7-48. This menu provides the selection of parameters such as From Volt, To Volt, Time, Set Limits, Trigger and Initial Slew.

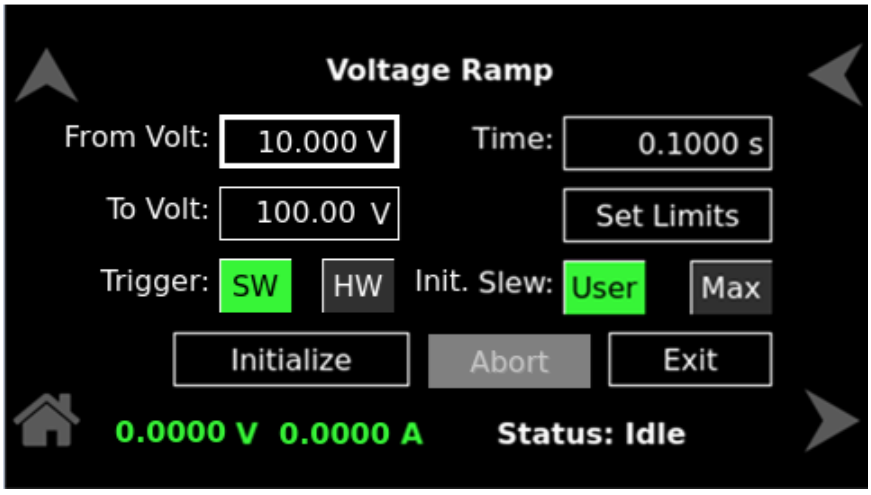


Figure 7-48. Voltage Ramp Screen

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Voltage Ramp menu has the following fields:

ENTRY	DESCRIPTION
From Volt	Sets the start voltage for the ramp. Refer to Figure 7-49.

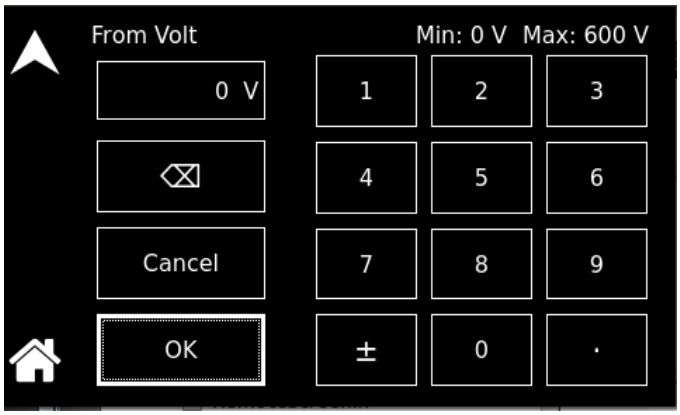


Figure 7-49. From Voltage

To Volt Sets the end voltage for the ramp. Refer to Figure 7-50.

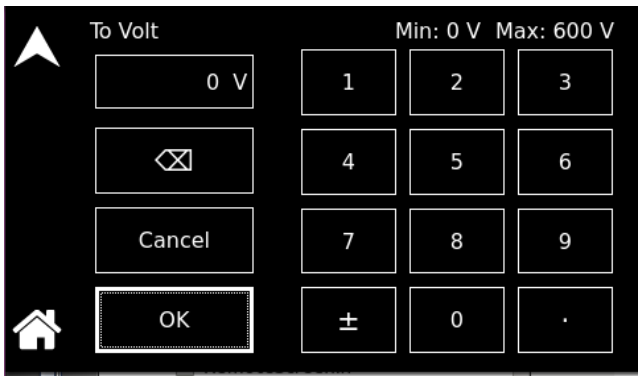


Figure 7-50. To Voltage

Trigger Mode This setting allows the user to configure the input signal to start the ramp execution ('From Volt' to 'To Volt')

a) Software (SW) Trigger Mode:
If 'SW' is selected, post ramp initialization power supply will wait for the software trigger to start the ramp, displaying the status as 'Waiting for Trigger'.

ENTRY	DESCRIPTION

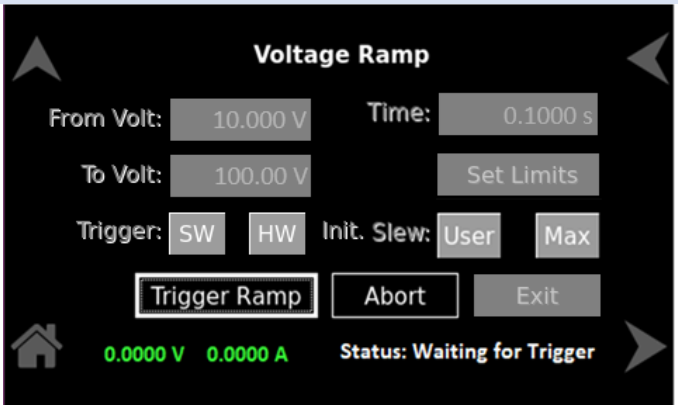


Figure 7-51. Software Trigger Mode

b) Hardware (HW) Trigger Mode:

If 'HW' is selected, post ramp initialization power supply will wait for the hardware trigger to start the ramp execution, displaying the status as 'Waiting for Trigger'.

The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN)

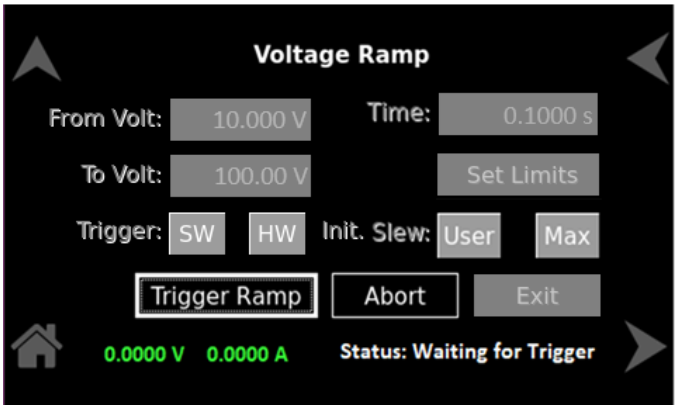


Figure 7-52. Hardware Trigger Mode

ENTRY	DESCRIPTION
Time	Sets the time in seconds to reach from 'From Volt' to 'To Volt'. Refer to Figure 7-53.

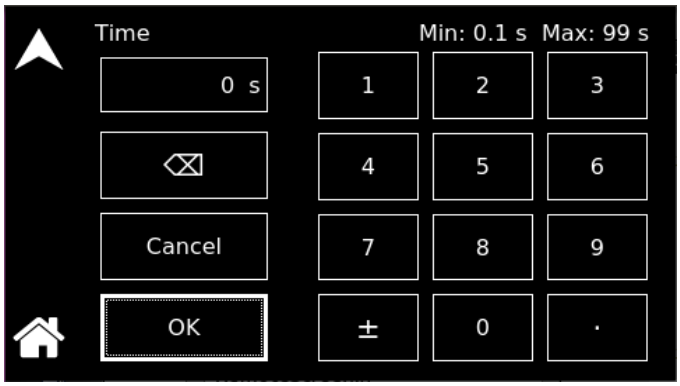


Figure 7-53. Time

Set Limits User can define the limits for the Ramp execution. Refer to Figure 7-54 and Figure 7-55.

Figure 7-54. Set Limits – CV/CC, CV/CP and CV

Figure 7-55. Set Limits – CV – Ser.Res

ENTRY	DESCRIPTION
Initial Slew	This setting allows the user to configure the initial slew, the slew rate at which the power supply reaches from the current output voltage of the power supply to the configured 'From Volt' in the ramp screen. Refer to Section 7.2.5.2. **a) User:** When the setting is 'User', the output voltage of the power supply reaches the 'From Volt' (when the ramp is initialized) with the voltage slew rate configured in the 'Configuration Menu'. **b) Max:** When the setting is 'Max', the output voltage of the power supply reaches the 'From Volt' (when the ramp is initialized) with maximum slew rate.
Initialize	The function of the initialization process is to bring the current device voltage value to the 'From Volt' value programmed in the ramp screen. Click the 'Initialize' button to initialize the ramp, and the progress will be displayed as a percentage in the status bar. Upon completion of the initialization process, the status will indicate as 'Waiting for Trigger'. Refer to Figure 7-56.

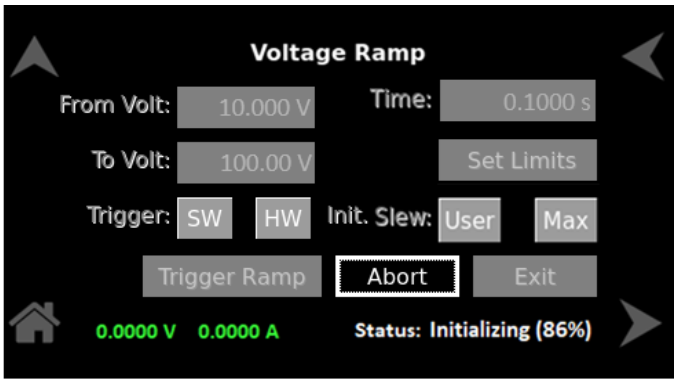
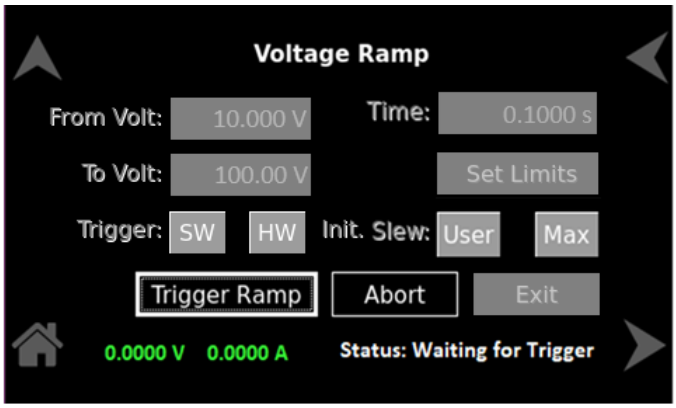


Figure 7-56. Initializing

Trigger Ramp	Used to send software trigger to the unit to start the ramp execution. Post initialization of ramp this function is enabled only when 'Trigger' selection is 'SW'. Refer to Figure 7-57. If the 'Trigger' selection is set to 'HW', this function is not enabled. The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN).



ENTRY	DESCRIPTION

Figure 7-57. Trigger Ramp

Abort User can abort the process at any stage of the ramp execution. The progress of the operation is displayed in the status on the right side of the screen. Refer to Figure 7-58.

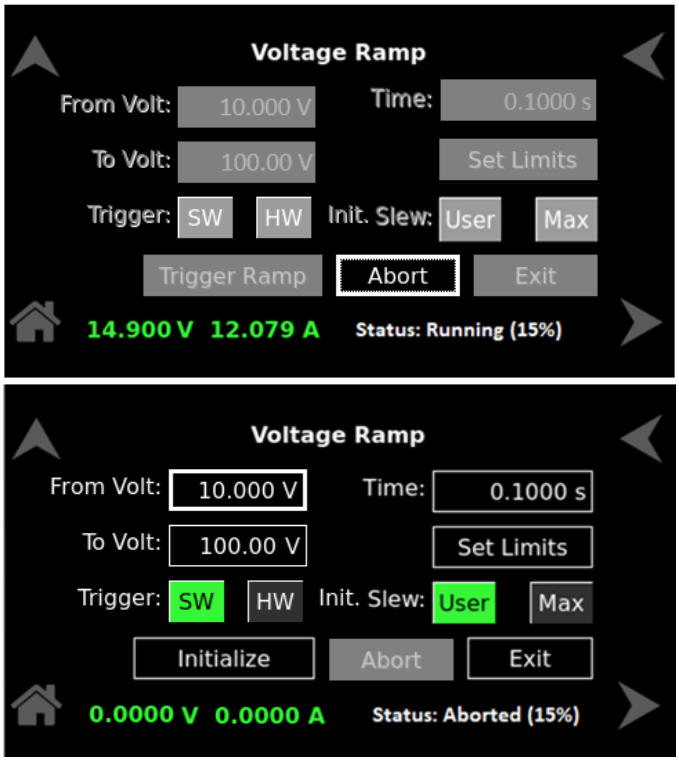


Figure 7-58. Abort

Status This field displays the progress or state of the process.

a) IDLE - When the system is in Idle (not performing any task) situation, refer to Figure 7-59.

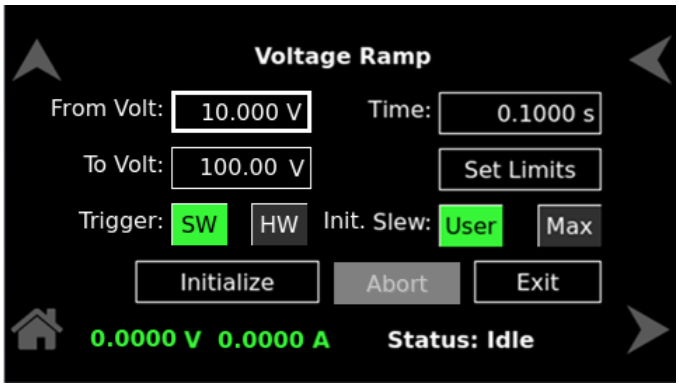


Figure 7-59. Status – IDLE

ENTRY	DESCRIPTION
	c) Initializing - When the system is initializing (configuring the current device voltage value to the 'From Volt' value programmed in the ramp screen), and the progress is displayed as a percentage. Refer to **Figure 7-60.**

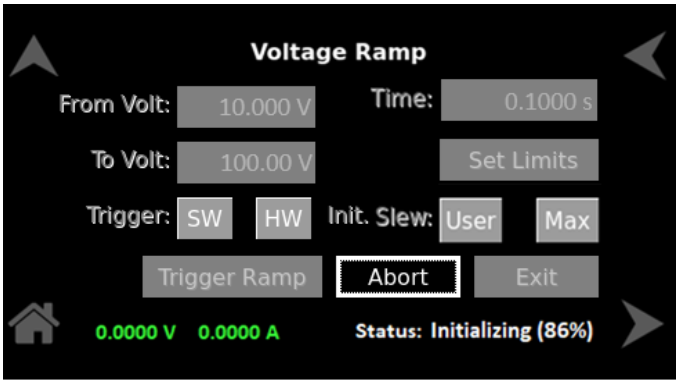


Figure 7-60. Status – Initializing

c) Waiting for Trigger: When the system is waiting for the trigger, refer to Figure ***7-61***.

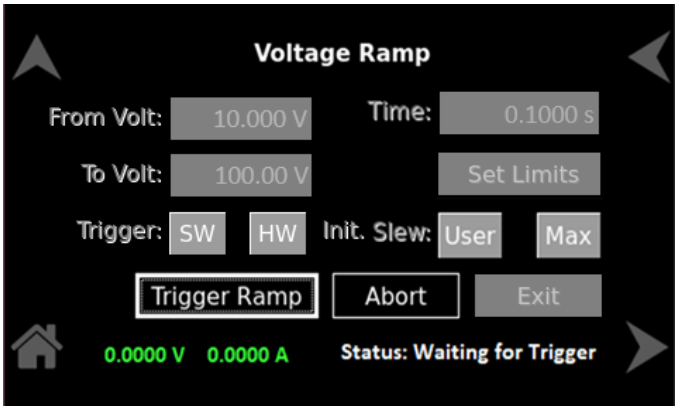


Figure 7-61. Status – Waiting for Trigger

d) Running: When the system is executing the trigger ramp process, refer to Figure 7-62.

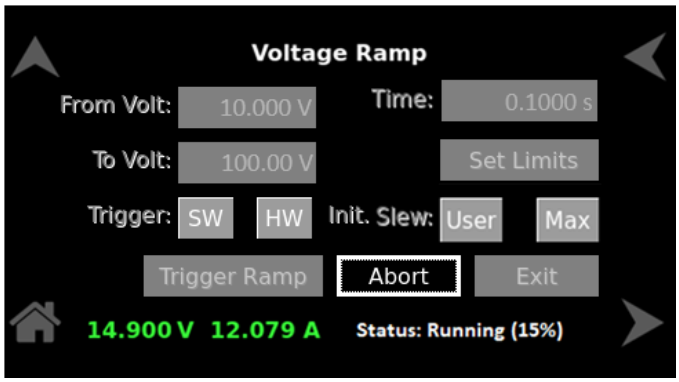


Figure 7-62. Status – Running

ENTRY	DESCRIPTION

e) Aborted: When the process is aborted (Initializing, Waiting for Trigger, Running), 'Aborted' is displayed in the status. Refer to Figure 7-63.

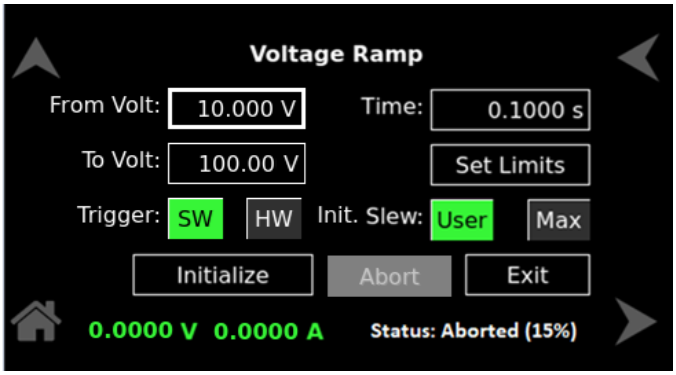


Figure 7-63. Status – Aborted

f) Complete: When the ramp execution (bringing the voltage from 'From Volt' to 'To Volt') is completed. Refer to Figure 7-64.

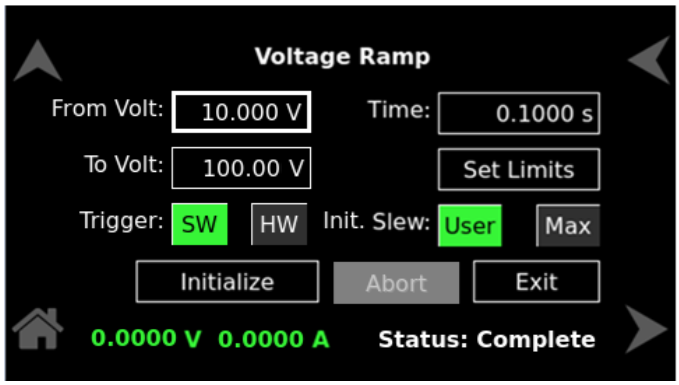


Figure 7-64. Status- Completed

Exit Exits the Voltage Ramp sub menu and return to Top level menu, refer to Figure 7-3.

NOTE: User cannot exit the Voltage Ramp Screen using HOME and UP arrow. To exit while a process is ongoing, user must first abort the process.

Table 7-19. Voltage Ramp

a) Example 1: Creating a Voltage ramp using Software Trigger mode

- Set the From Volt to 25V
- Set the To Volt to 50V
- Set the Time to 10s

- Select the Trigger mode as SW
- Select between User or Max for the slew setting according to the user's requirement
- Click on Initialize
- Observe that the Initialize button changes to the Trigger Ramp button after completion of initializing, and Abort button becomes enabled from a disabled state
- Click on Trigger Ramp
- The status of the Trigger Ramp progress can be seen on the screen
- 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.

b) Example 2: Creating a Voltage ramp using Hardware Trigger mode

- Set the Volt to 25V
- Set the To Volt to 50V
- Set the Time to 10s
- Select the Trigger mode as HW
- Select between User or Max for the slew setting according to the requirements
- Click on Initialize
- Observe that Initialize button change from enable to disable state after completion of initializing, and Abort button becomes enabled
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-19 (TRIGGGER IN) and pin-18 (RTN) to generate the Voltage Ramp
- 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.

7.2.4.2 CURRENT RAMP – CC/CV, CC/CP AND CC

The Current Ramp menu allows the users to configure and execute current ramp. This menu provides the selection of parameters such as From Current, Status, To Current, Time, Trigger, Initial Slew and Set Limits. Refer to Figure 7-65.

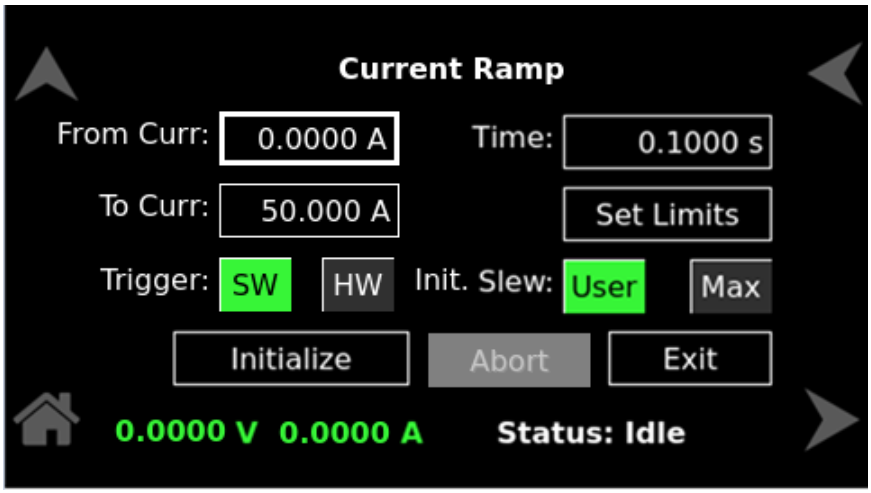


Figure 7-65. Current Ramp Screen

The Current Ramp menu has the following fields:

ENTRY	DESCRIPTION
From Curr	Sets the start current for the ramp. Refer to Figure 7-66.

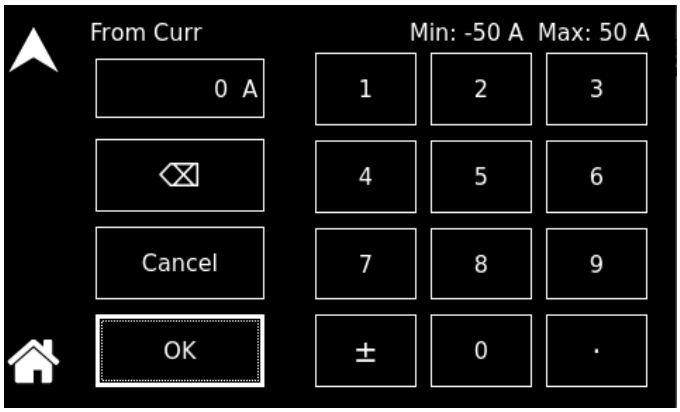


Figure 7-66. From Current

ENTRY	DESCRIPTION
To Curr	Sets the end current for the ramp. Refer Figure 7-67.

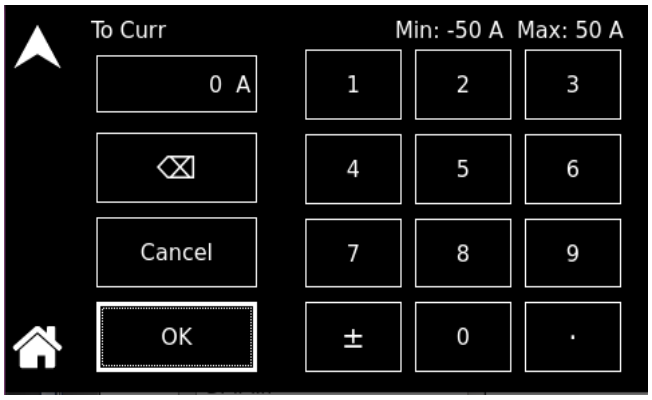


Figure 7-67. To Current

Trigger Mode

This setting allows the user to configure the input signal to start the ramp execution (‘From Curr’ to ‘To Curr’)

a) Software (SW) Trigger Mode:

If ‘SW’ is selected, post ramp initialization power supply will wait for the software trigger to start the ramp execution, displaying the status as ‘Waiting for Trigger’. Refer to Figure 7-68.

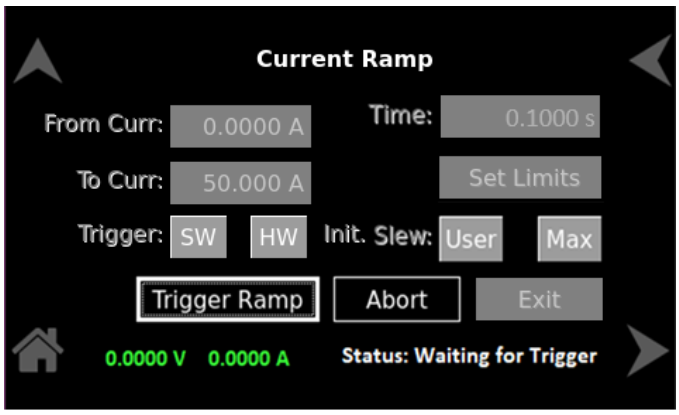


Figure 7-68. SW Mode

b) Hardware (HW) Trigger Mode:

When ‘HW’ is selected, post ramp initialization power supply will wait for a hardware trigger to start the ramp execution, displaying the status as ‘Waiting for Trigger’.

The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-19 (TRIGGER IN) and pin 18 (RTN). Refer to Figure 7-69.

ENTRY	DESCRIPTION

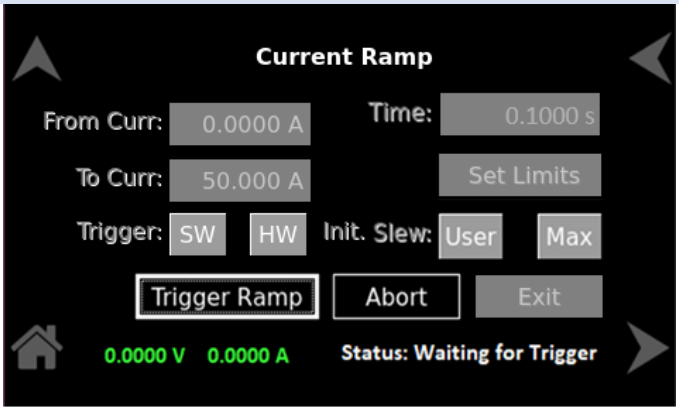


Figure 7-69. HW Mode

Time Sets the time in seconds to reach from 'From Curr' to 'To Curr'. Refer to Figure 7-70.

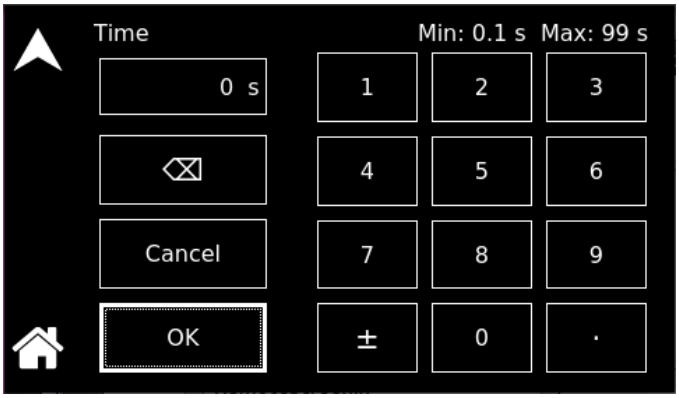


Figure 7-70. Time

Set Limits User can define the limits for the Ramp execution. Refer to Figure 7-71.

Figure 7-71. Set Limits - CC/CV, CC/CP and CC

ENTRY	DESCRIPTION

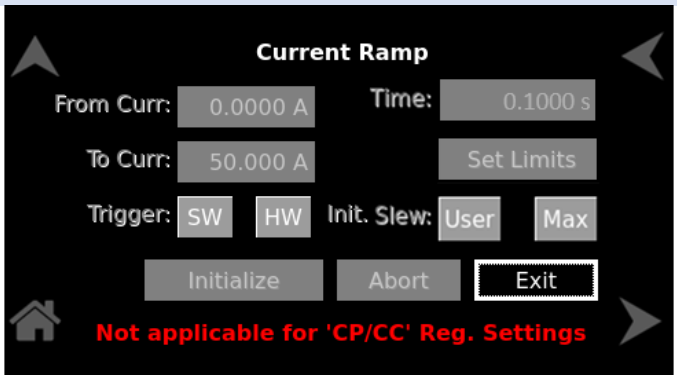


Figure 7-72. Set Limits - CP/CC

Initial Slew

This setting allows the user to configure the initial slew, the slew rate at which the power supply reaches from the output Current of the power supply to the configured 'From Curr' in the ramp screen.

a) User: When the setting is 'User', the output current of the power supply reaches the 'From Curr' (when the ramp is initialized) with the voltage slew rate configured in the configuration menu.

b) Max: When the setting is 'Max', the output current of the power supply reaches the 'From Curr' (when the ramp is initialized) with maximum slew rate.

Initialize

The function of the initialization process is to bring the current device voltage value to the 'From Curr' value programmed in the ramp screen. Click the 'Initialize' button to initialize the ramp, and the progress will be displayed as a percentage in the status bar. Upon completion of the initialization process, the status will indicate as 'Waiting for Trigger'. Refer to Figure 7-73.

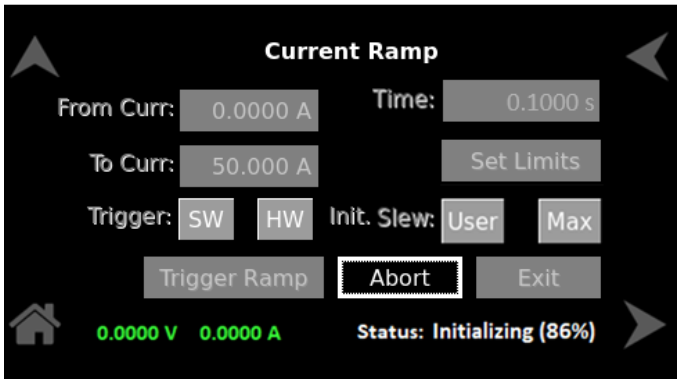


Figure 7-73. Initializing

Trigger Ramp

Used to send software trigger to the unit to start the ramp execution. Post initialization of ramp this function is enabled only when 'Trigger' selection is 'SW'. Refer to Figure 7-74.

ENTRY	DESCRIPTION
	If the 'Trigger' selection is set to 'HW', this function is not enabled. The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-19 (TRIGGER IN) and pin-18 (RTN).

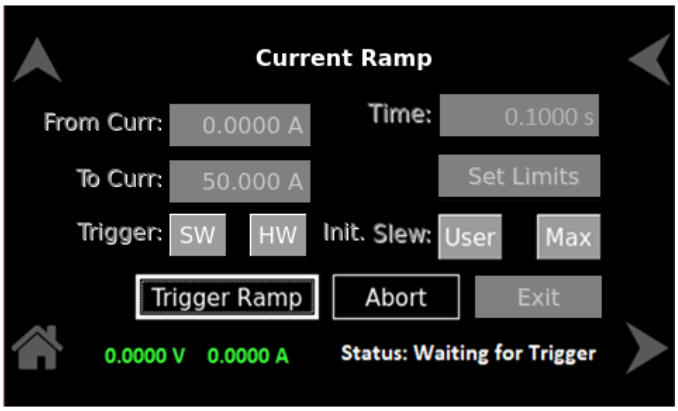


Figure 7-74. Trigger Ramp

Abort User can abort the process at any stage of the ramp execution. The progress of the operation is displayed in the status on the right side of the screen. Refer to Figure 7-75.

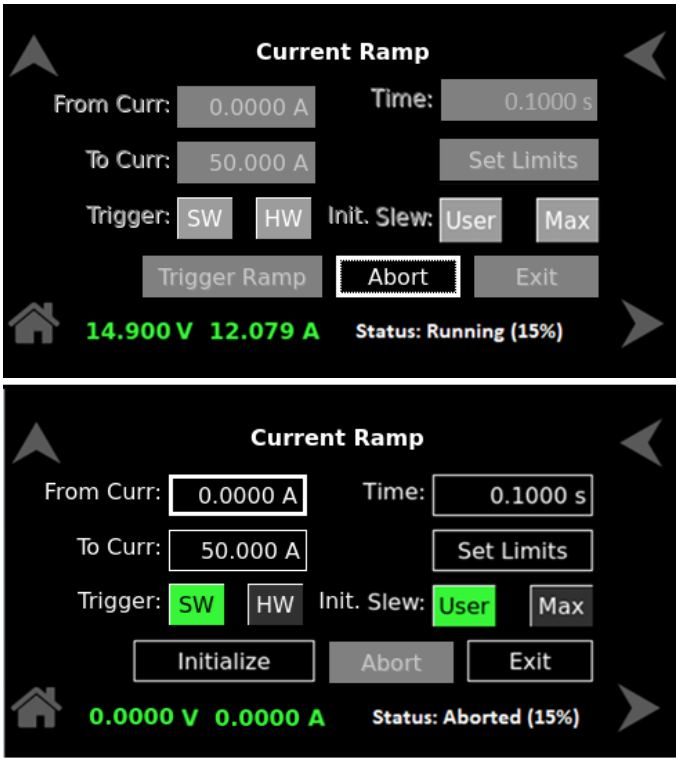


Figure 7-75. Abort – SW

Status This field displays the progress or state of the process.

ENTRY	DESCRIPTION

a) IDLE - When the system is in Idle (not performing any task) situation, refer to Figure 7-76.

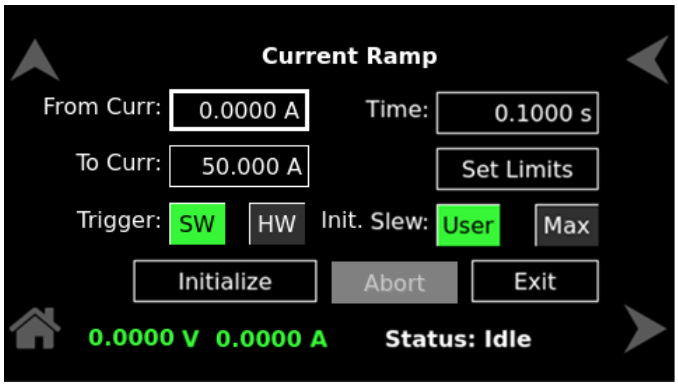


Figure 7-76. Status – IDLE

b) Initializing - When the system is initializing (configuring the device current value to the 'From Curr' value programmed in the ramp screen), and the progress is displayed as a percentage. Refer to Figure 7-77.

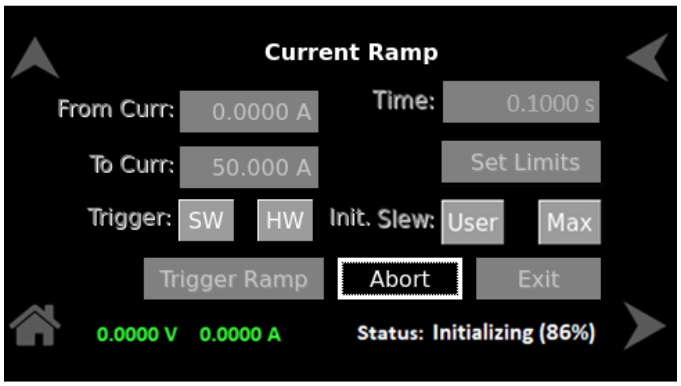


Figure 7-77. Status - Initializing

c) Waiting for Trigger: When the system is waiting for the trigger, refer to Figure 7-78.

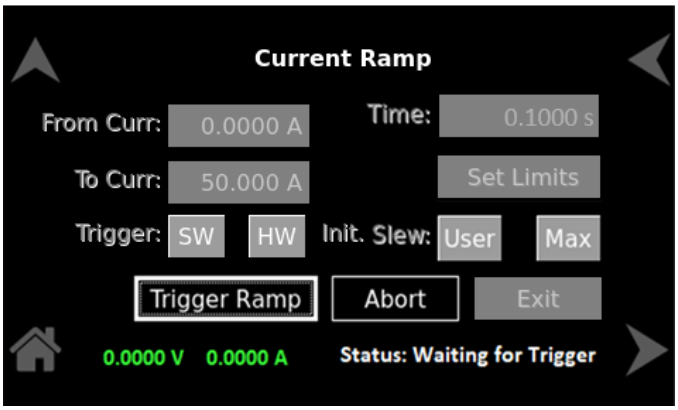


Figure 7-78. Status – Waiting for Trigger

d) Running: When the system is executing the trigger ramp process, refer to Figure 7-79.

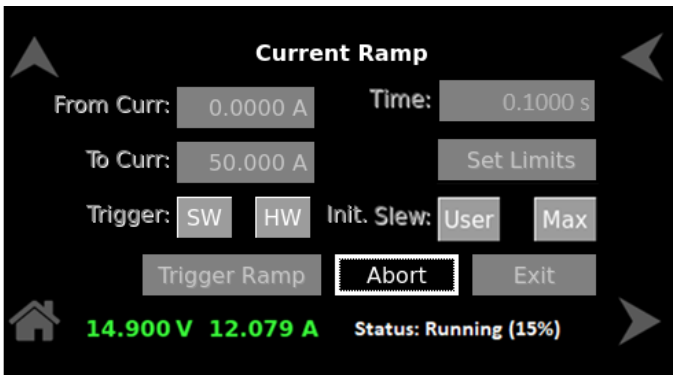


Figure 7-79. Status – Running

e) Aborted: When the process is aborted (Initializing, Waiting for Trigger, Running), 'Aborted' is displayed in the status. Refer to Figure 7-80.

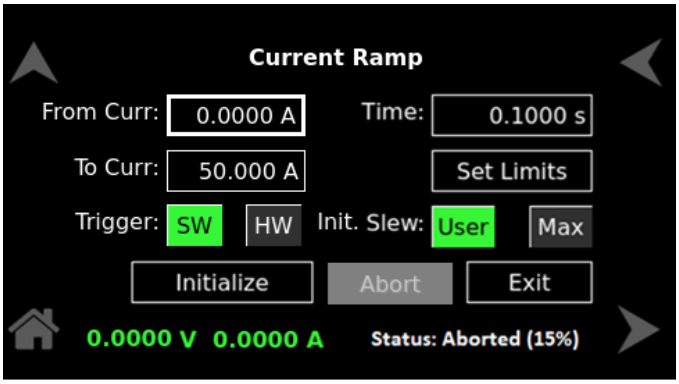


Figure 7-80. Status – Aborted

ENTRY	DESCRIPTION
	f) Complete: When the ramp execution (bringing the voltage from 'From Curr' to 'To Curr') is completed. Refer to Figure 7-81.

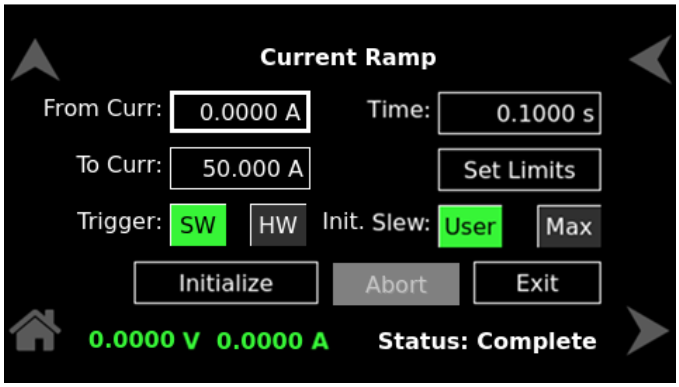


Figure 7-81. Status- Completed

Exit	Exits the Current Ramp sub menu and return to Top level menu, refer to Figure 7-3.

NOTE: User cannot exit the Current Ramp Screen using HOME and UP arrow. To exit while a process is ongoing, user must first abort the process.

7.2.4.3 CURRENT RAMP – CP/CC

Current Ramp is not applicable in CP/CC Regulation Settings.

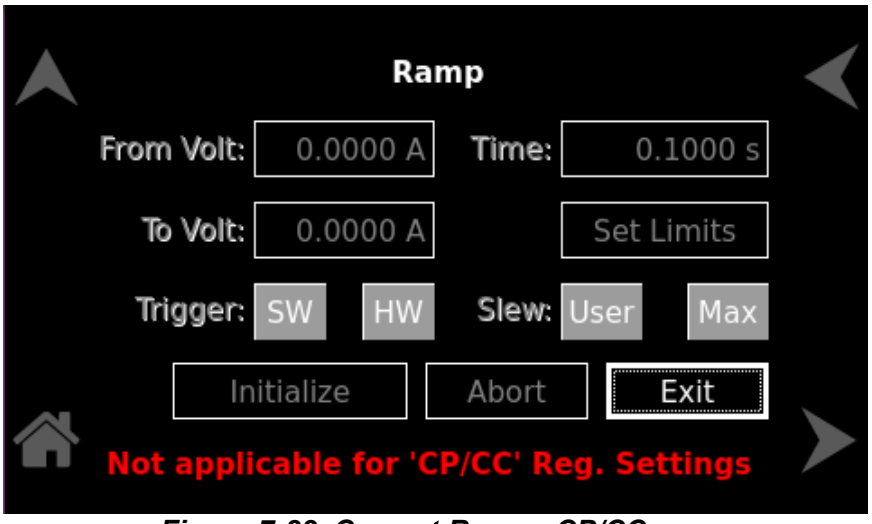


Figure 7-82. Current Ramp - CP/CC

Table 7-20. Current ramp

a) Example 1: Creating a Current ramp using Software Trigger mode

- Set the From Current to 10A
- Set the To Curr to 30A
- Set the Time to 10s
- Select the Trigger mode as SW
- Select between User or Max for the slew setting according to the user's requirement
- Click on Initialize
- Observe that the Initialize button changes to the Trigger Ramp button after completion of initializing, and Abort button becomes enabled from disabled state
- Click on Trigger Ramp
- The status of the Trigger Ramp progress can be seen on the screen
- 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.

b) 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
- Select the Trigger mode as HW
- Select between User or Max for the slew setting according to the user's requirements
- Click on Initialize
- Observe that Initialize button change from enable to disable state after completion of initializing, and Abort button becomes enabled
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-9 (ISO-COMMON) and pin-10 (TRIGGGER IN) to generate the Current Ramp.

- 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.

7.2.5 CONFIGURATION SCREEN

The Configuration screen provides Regulation settings, Slew Rate, Protection, User Limits, Output Sense, External Relay, PONS, Measurement Average Samples and Connections.

For the top-level menu of the Configuration screen, refer to Figure 7-83 and for instructions on how to navigate, refer to Section 6.4.2.1.

Figure 7-83. Configuration Screen Top-Level Menu

7.2.5.1 REGULATION SETTINGS

The Regulation Settings Menu is used to configure the Programming type and Regulation setting of the power supply. Refer to Figure 7-84 and Figure 7-86.

The ‘Reg. Setting’ function on the Configuration Screen enables users to switch between Voltage (CV/CC, CV/CP, CV-Ser. Res and CV) and Current (CC/CV, CV/CP, CP/CV and CC) Regulation settings.

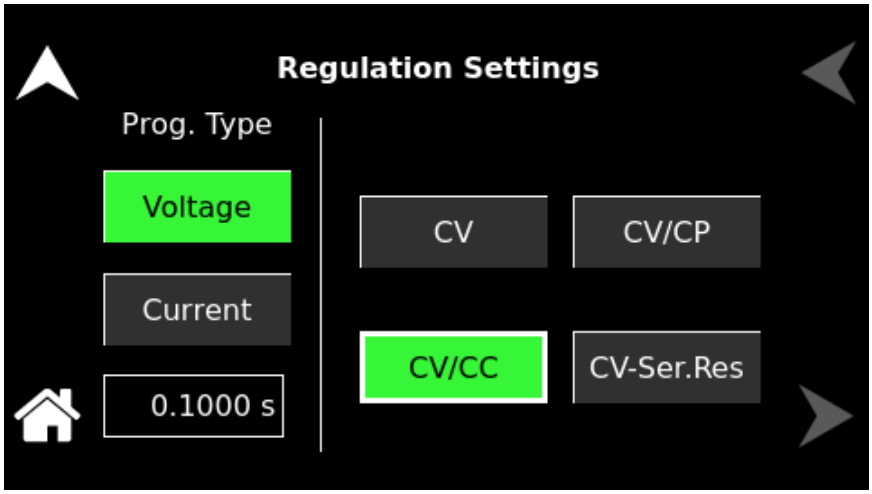


Figure 7-84. Regulation Settings – CV/CC, CV/CP, CV-Ser. Res and CV

a) When the programming type is set to 'Voltage' in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CV/CC	In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the current limit reached. On reaching the power limit (positive or negative), the output voltage would be programmed to zero.
CV/CP	In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the power limit reached. On reaching the current limit (positive or negative), the output voltage would be programmed to zero.
CV-Ser.Res	In this setting, user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive or negative) or power limit (positive or negative) or voltage limit (high or low), the output voltage is programmed to zero.
CV	In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (positive or negative) or power limit (positive or negative), the output voltage would be programmed to zero.

ENTRY	DESCRIPTION
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 7-85.

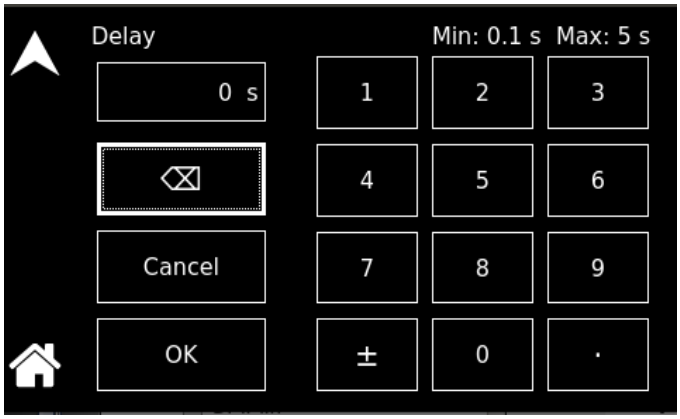


Figure 7-85. Delay Screen

Table 7-21. Regulation Settings

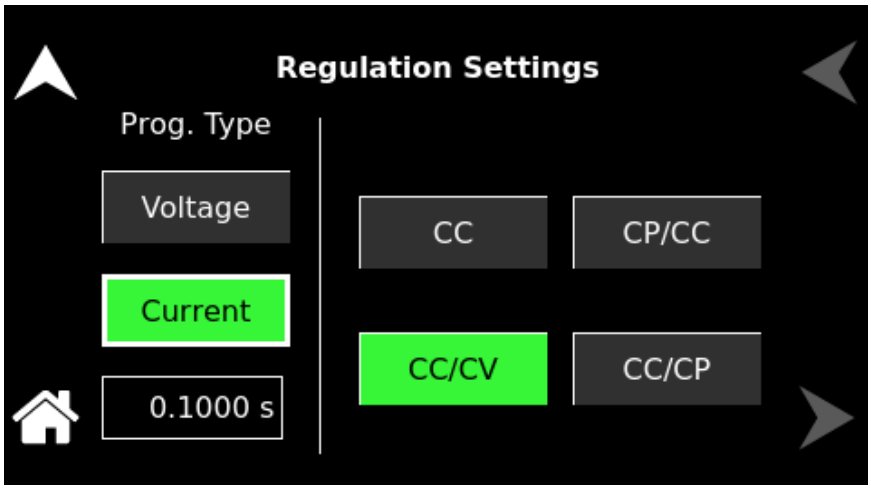


Figure 7-86. Regulation Settings – CC/CV, CP/CC, CC/CP and CC

b) When the programming type is set to 'Current' in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CC/CV	In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (positive or negative), the output current would be programmed to zero.
CP/CC	In this regulation setting, output power is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the current limit reached.

ENTRY	DESCRIPTION
	On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC/CP	In this regulation setting, output current is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC	In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive or negative), the output current would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 7-86.

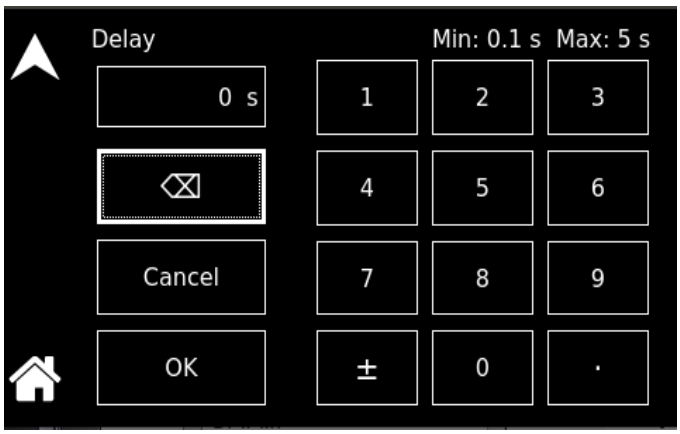


Figure 7-87. Delay Screen

Table 7-22. Regulation Settings

7.2.5.2 SLEW RATE

In the Slew Rate Settings, users can configure the ‘Voltage’, ‘Current’ and ‘Power’ slew rate. This allows for precise control over the voltage, current and power change, ensuring smoother transitions and better performance of the power supply. Adjusting these settings can help in optimizing the response time and stability of the system.

The Slew Rate provides the interface based on the programming type selected in the ‘Configuration Screen’, refer to section 7.2.5.1. When the program type is set to ‘Voltage- CV/CC, CV-Ser.Res, CV/CP and CV’ in the Regulation setting, the Slew Settings screen that appears will be the Volt Slew rate. Refer to Figure 7-88.

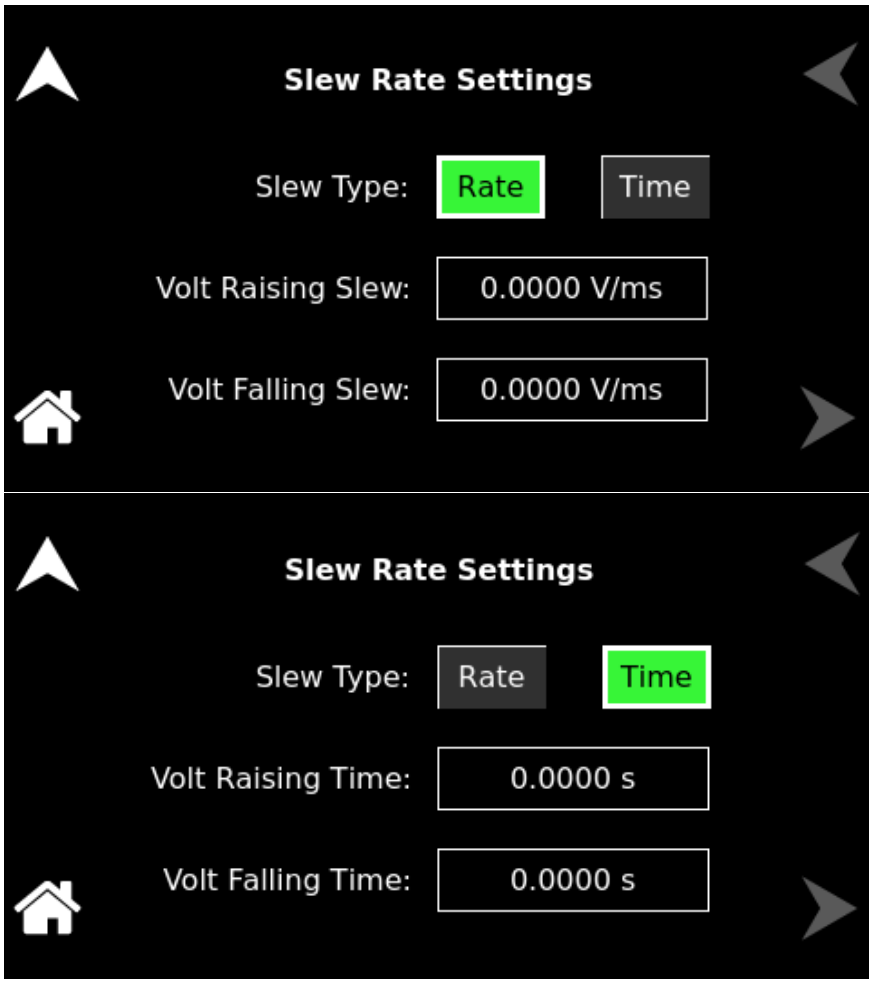


Figure 7-88. Slew Rate Settings

When the program type is set to 'Current – CC/CV, CC/CP and CC' in the Regulation setting, the Slew Settings screen that appears will be the Curr Slew rate. Refer to Figure 7-89.

Figure 7-89. Slew Rate Settings – Current (CC/CV, CC/CP and CC)

When the program type is set to 'Current –CP/CC' in the regulation setting, the Slew Settings screen that appears will be the Pow Slew rate. Refer to Figure 7-90.

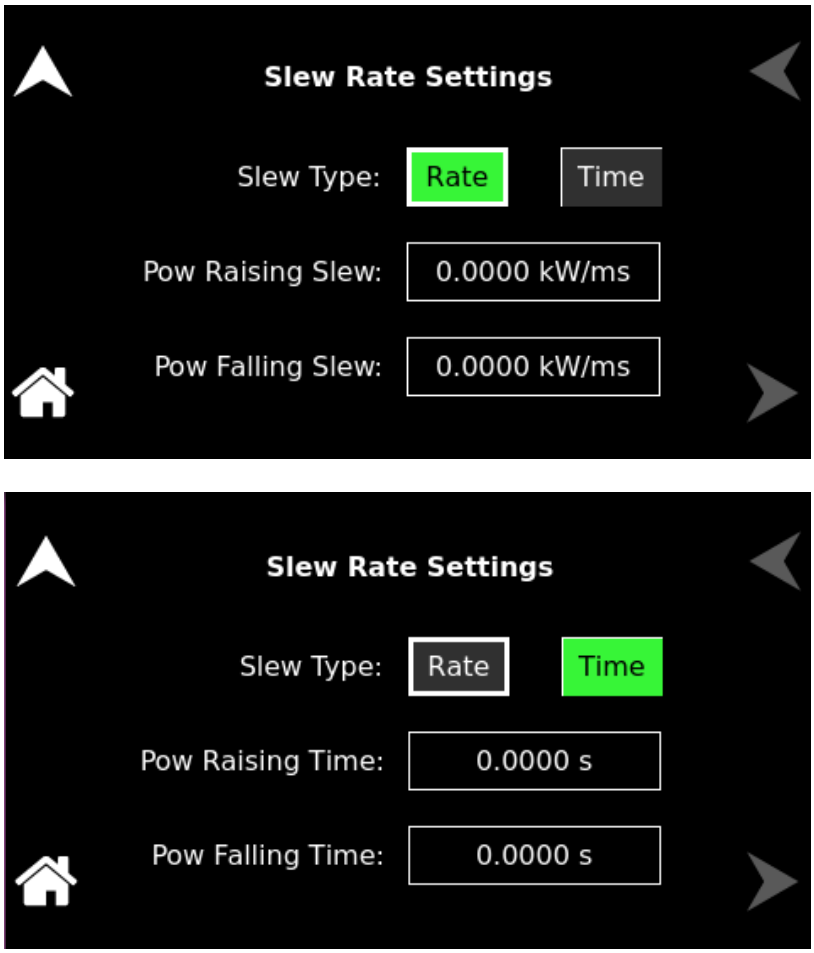


Figure 7-90. Slew Rate Settings – Power (CP/CC)

7.2.5.3 PROTECTION

In protection settings, users can define Over Voltage Protection (OVP), Positive Overcurrent Protection (Pos. OCP), and Negative Overcurrent Protection (Neg. OCP) in the specified limit to help safeguard their devices from electrical anomalies. Refer to Figure 7-91.

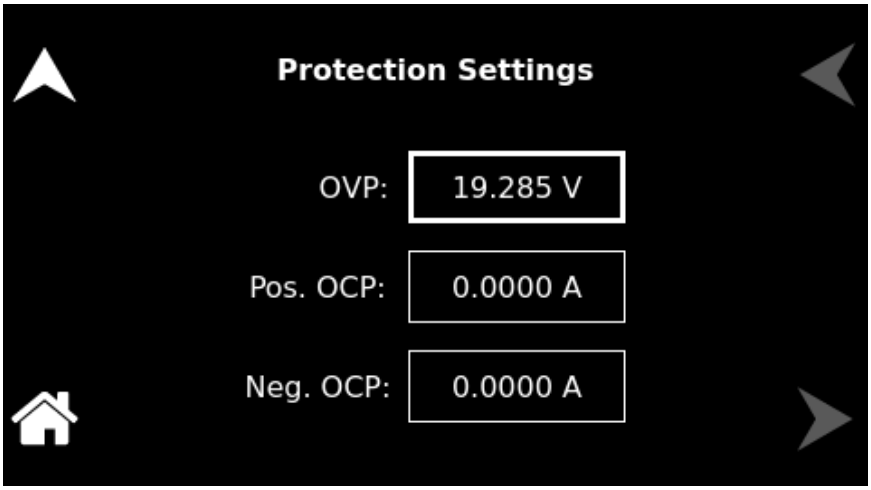


Figure 7-91. Protection Settings

7.2.5.4 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits.

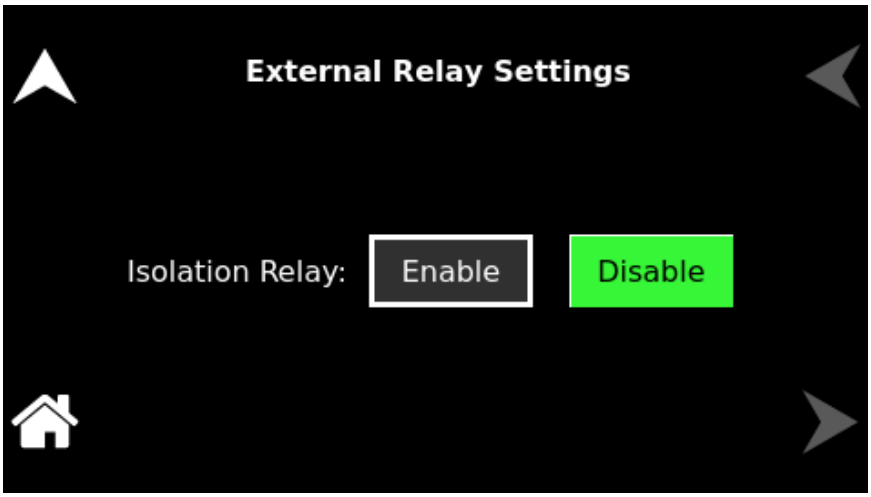


Figure 7-92. External Relay Settings

7.2.5.5 USER LIMITS

In the user limits settings, users can set the maximum allowable voltage, current and power values. This allows users to specify the highest and lowest values the device can reach without exceeding these limits.

When the programming type is set to ‘Voltage’ in the Regulation Settings menu, the user limit screen with an adjustable Voltage option will appear. Refer to Figure 7-93.

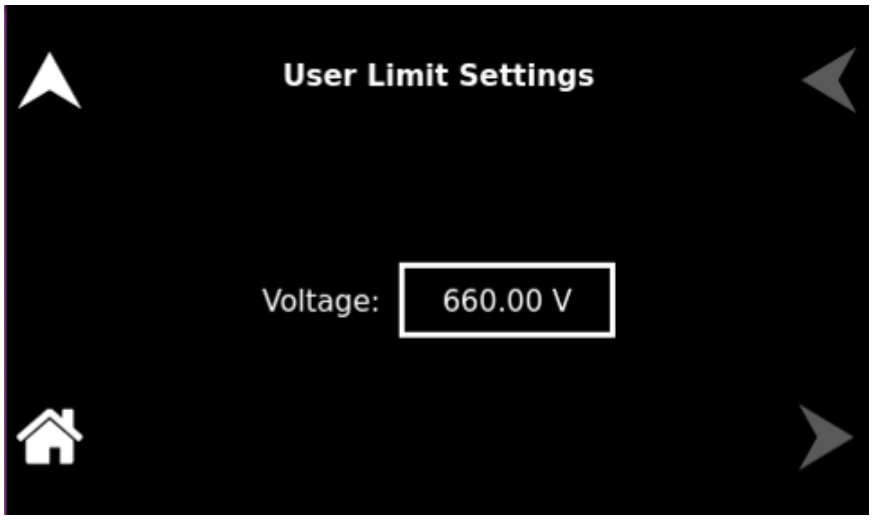


Figure 7-93. User Limit Settings- CV/CC, CV/CP, CV-Ser.Res and CV

When the programming type is set to ‘Current’ in the Regulation Settings menu, the user limit Setting Screen with an adjustable Current High Limit and Current Low Limit will appear. Refer to Figure 7-94.

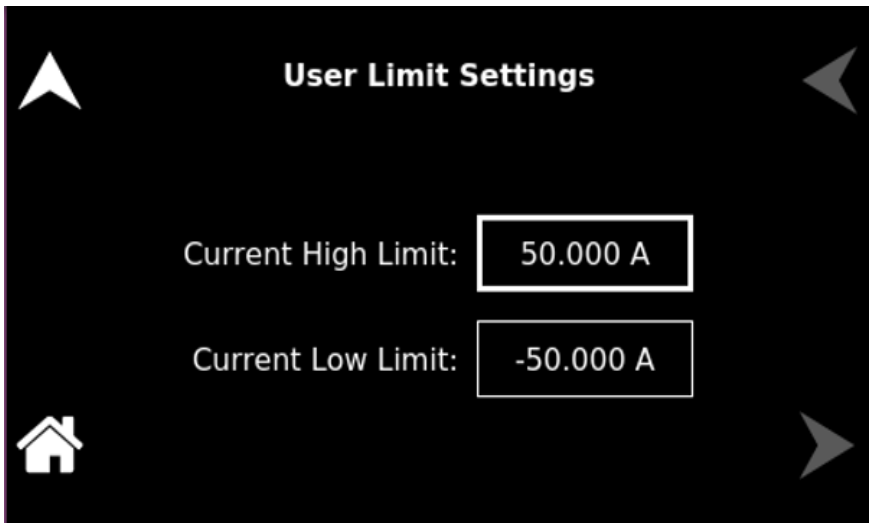


Figure 7-94. User Limit Settings- CC/CV, CC/CP and CC

When the programming type is set to ‘Current– CP/CC’ in the Regulation setting, user limit Setting Screen with an adjustable Power High Limit will appear. Refer to Figure 7-95.

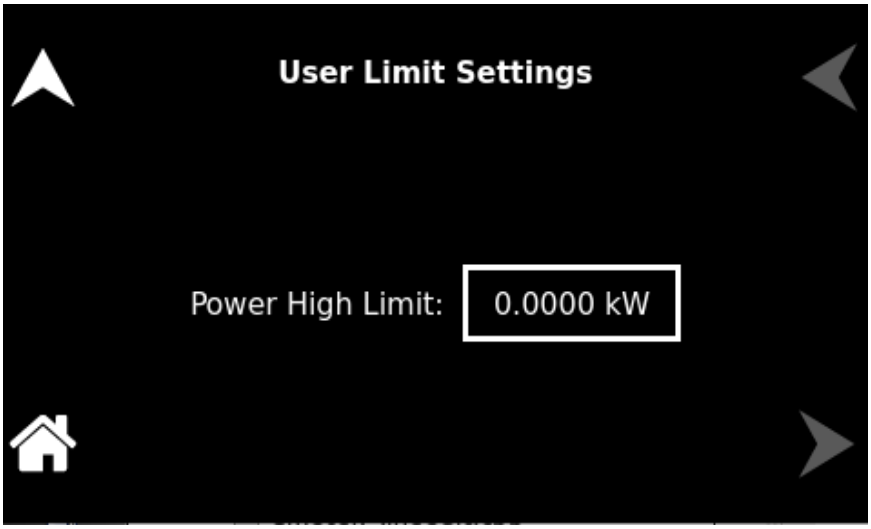


Figure 7-95. User Limit Settings- Current (CP/CC)

7.2.5.6 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS (Remote Voltage Sense) connector. Refer to Figure 7-96.

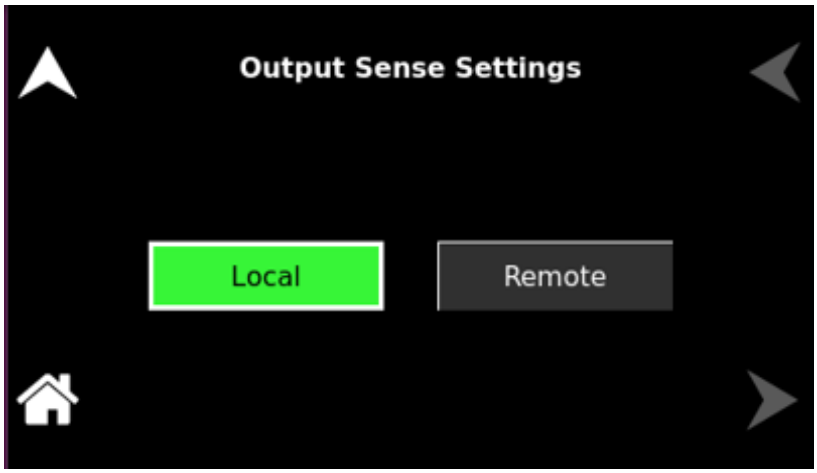


Figure 7-96. Output Sense Settings

7.2.5.7 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings.

When the programming type is set to ‘Voltage’ in the Regulation Settings menu, the PONS Program Type will display as ‘Voltage,’ and the PONS Reg. Setting will show the selected mode. Refer to Figure 7-97 to Figure 7-100.

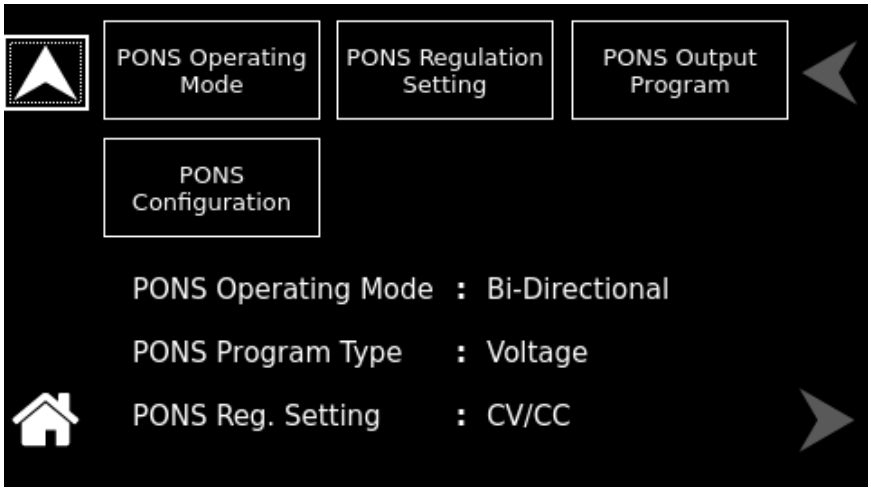


Figure 7-97. PONS Main Screen – CV/CC

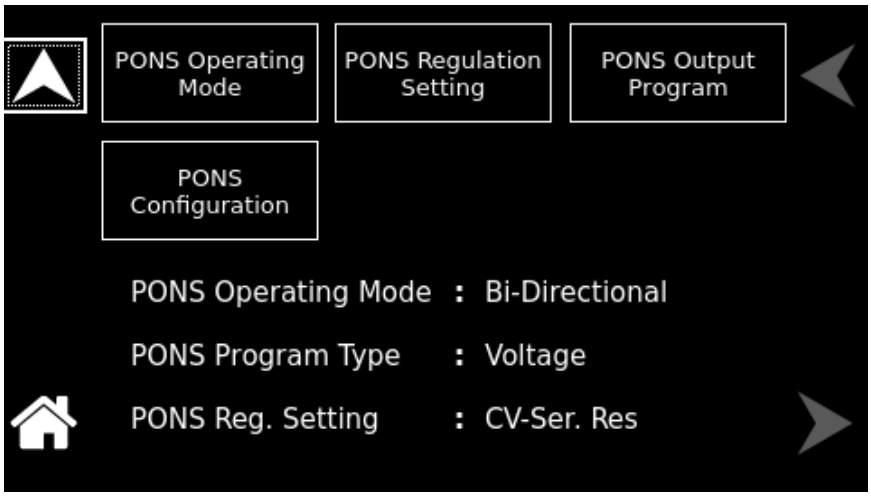


Figure 7-98. PONS Main Screen – CV-Ser. Res

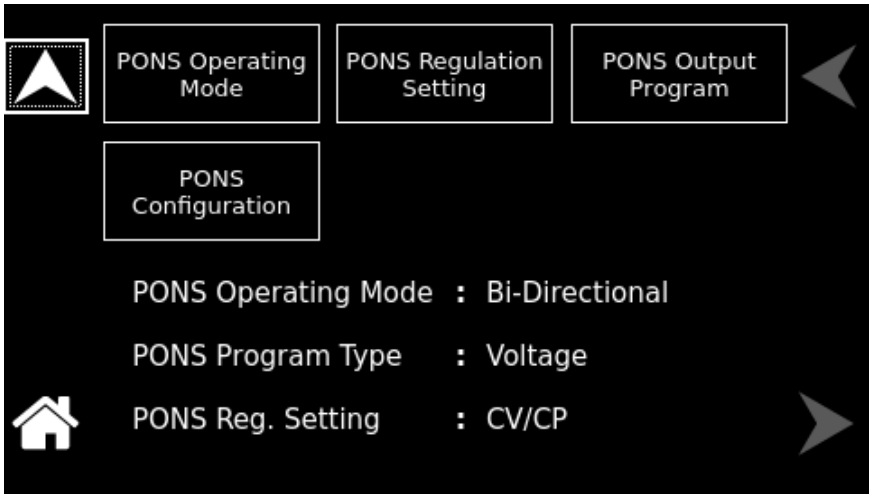


Figure 7-99. PONS Main Screen – CV/CP

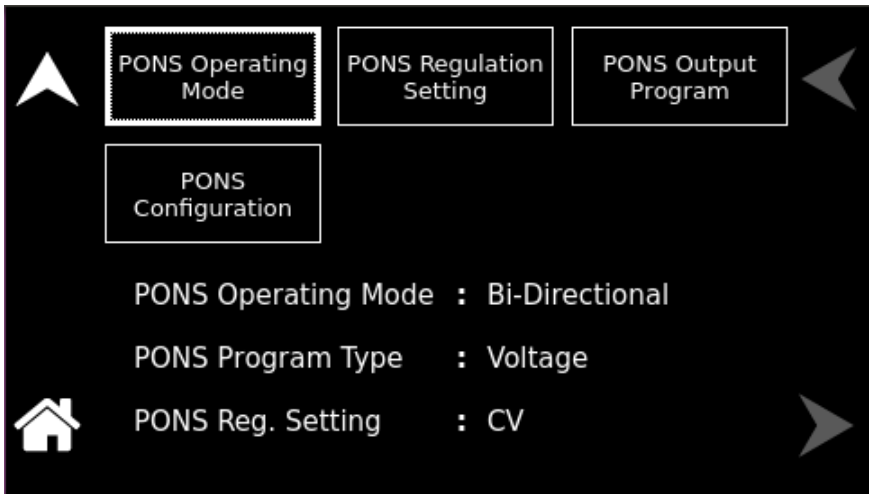


Figure 7-100. PONS Main Screen – CV

When the programming type is set to ‘Current’ in the Regulation Settings menu, the PONS Program Type will display as ‘Current,’ and the PONS Reg. Setting will show the selected mode. Refer to Figure 7-101 to Figure 7-104.

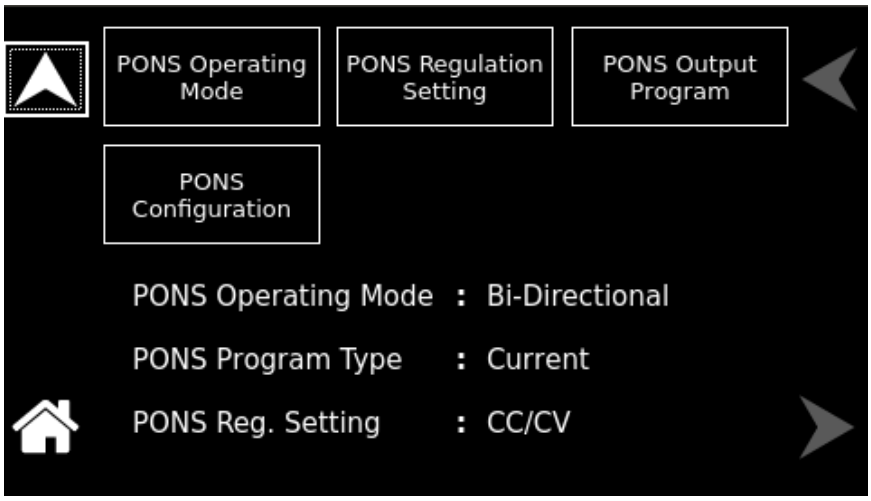


Figure 7-101. PONS Main Screen – CC/CV

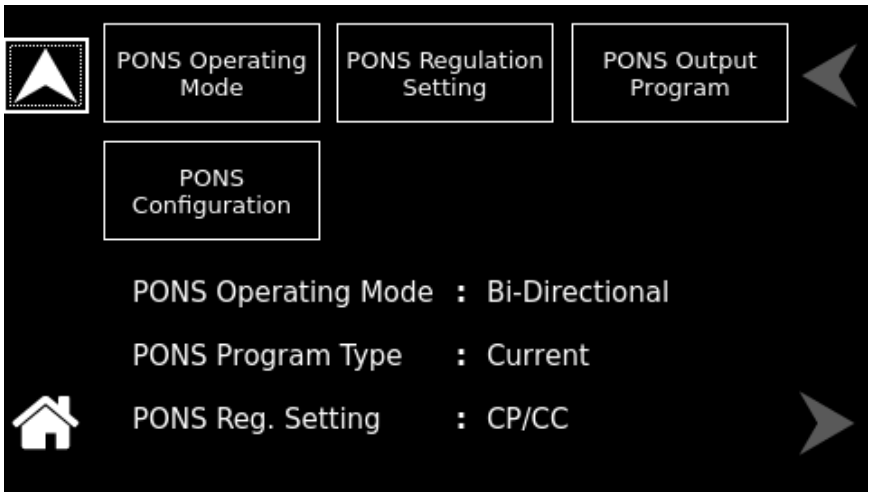


Figure 7-102. PONS Main Screen – CP/CC

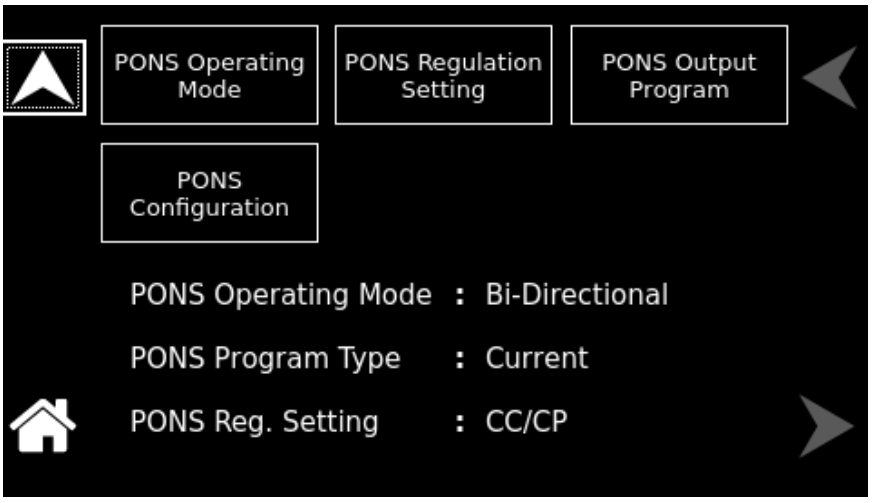


Figure 7-103. PONS Main Screen – CC/CP

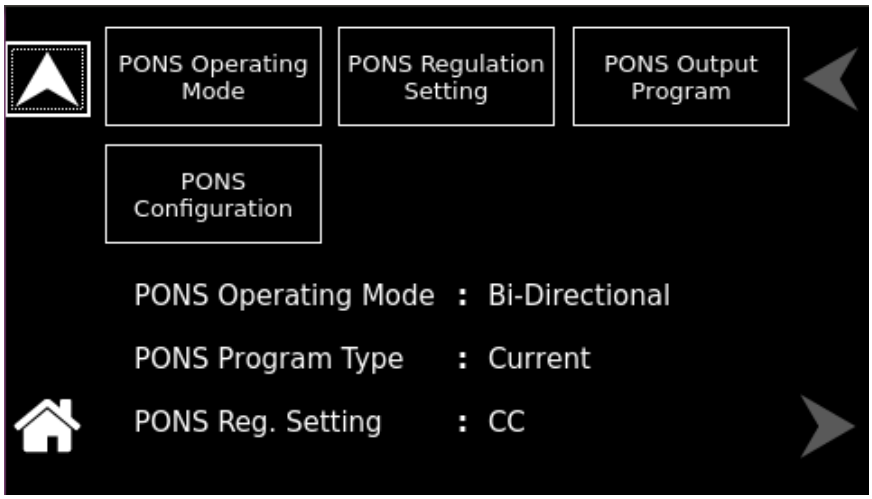


Figure 7-104. PONS Main Screen - CC

7.2.5.7.1 PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the ' Operating Mode' settings on the Home screen. Users must separately select the ‘BI-DIR’ mode in the 'PONS Operating Mode Settings', which will update the 'PONS Operating Mode Settings', ‘PONS Regulation’, ‘PONS Output Program’ and the 'PONS Configuration' screens. Refer to Figure 7-105, Figure 7-106, Figure 7-110, Figure 7-116, Figure 7-125, Figure 7-131 and Figure 7-137.

The same applies to other modes such as SOUR, ELOAD, PVSIM, BATSIM and BATTEST. Refer to the Sections 8.2.5.7.1, 9.2.5.7.1, 10.2.4.2.1.5, 11.2.4.7.1 and 12.2.4.6.1.

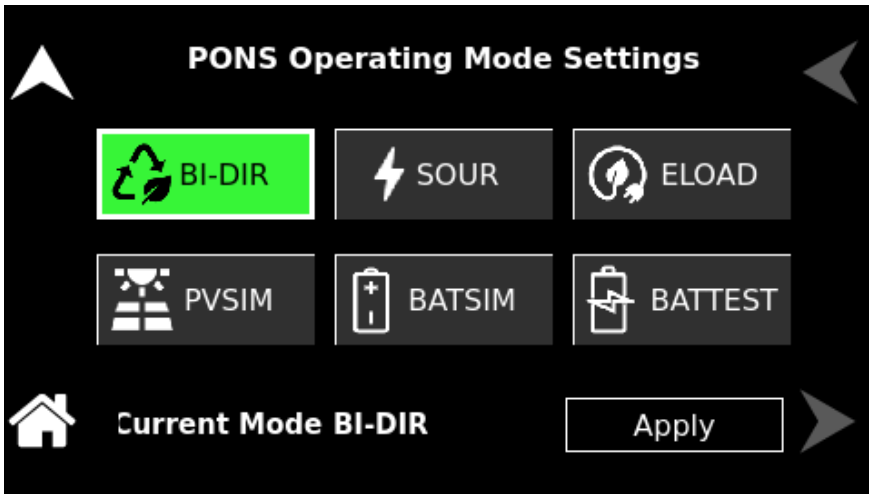


Figure 7-105. PONS Operating Mode Settings

7.2.5.7.2 PONS REGULATION SETTINGS

The Regulation Settings Menu is used to configure the Programming type and Regulation setting of the power supply. Refer to Figure 7-106 and Figure 7-108.

a) When the programming type is set to 'Voltage' in the Regulation Settings menu, the following fields are available:

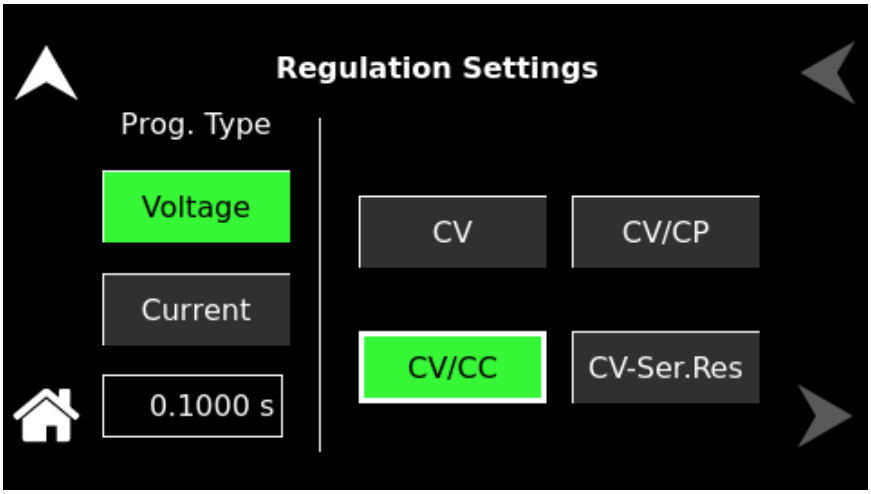


Figure 7-106. PONS regulation Settings

ENTRY	DESCRIPTION
CV/CC	In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the current limit reached. On reaching the power limit (positive or negative), the output voltage would be programmed to zero.
CV/CP	In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the power limit reached. On reaching the current limit (positive or negative), the output voltage would be programmed to zero.
CV-Ser.Res	In this setting, user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive or negative) or power limit (positive or negative) or voltage limit (high or low), the output voltage is programmed to zero.
CV	In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (positive or negative) or power limit (positive or negative), the output voltage would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 7-107.

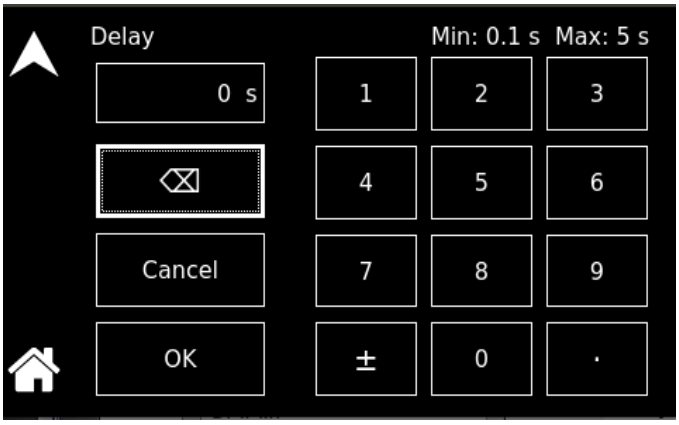


Figure 7-107. Delay Screen

Table 7-23. Regulation Settings

b) When the programming type is set to 'Current' in the PONS Regulation Settings menu, the following fields are available:

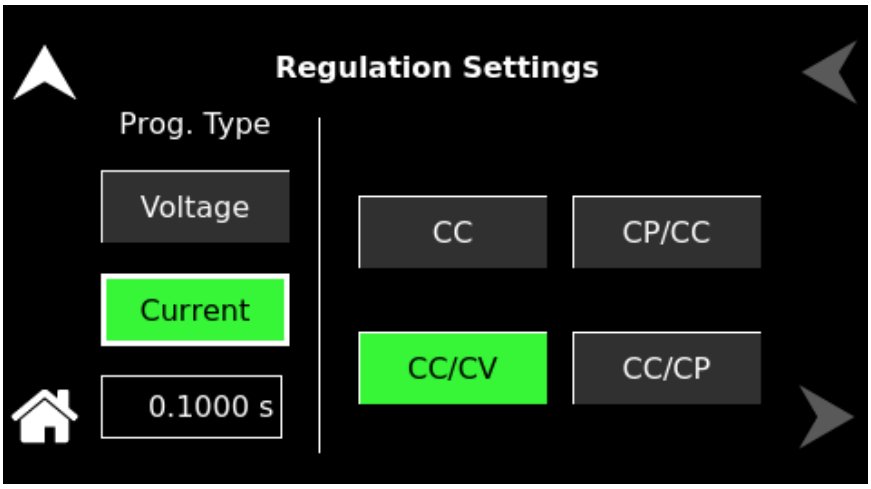


Figure 7-108. PONS regulation Settings

ENTRY	DESCRIPTION
CC/CV	In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (positive or negative), the output current would be programmed to zero.
CP/CC	In this regulation setting, output power is regulated to the user set value. On reaching the current limit (positive or negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.

ENTRY	DESCRIPTION
CC/CP	In this regulation setting, output current is regulated to the user set value. On reaching the power limit (positive or negative), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC	In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive or negative), the output current would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 7-109.

Figure 7-109. Delay Screen

Table 7-24. Regulation Setting

7.2.5.7.3 PONS OUTPUT PROGRAM

a) PONS Output Program (Voltage) – CV/CC, CV/CP and CV

When the regulation setting is selected as ‘Voltage (CV/CC, CV/CP and CV)’, the screen will display the following parameters: ‘PONS Voltage’, ‘PONS Pos. Curr Limit’, ‘PONS Neg. Curr Limit’, ‘PONS Pos. Pow Limit’, and ‘PONS Neg. Pow Limit’. Refer to Figure 7-110.

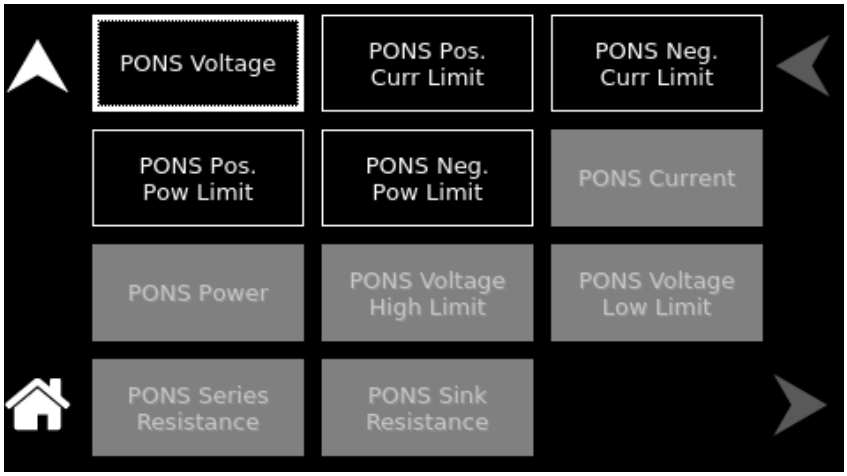


Figure 7-110. Pons Output Program mode – CV/CC and CV

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Voltage	User can set a voltage value within the specified limit. Refer to Figure 7-111.

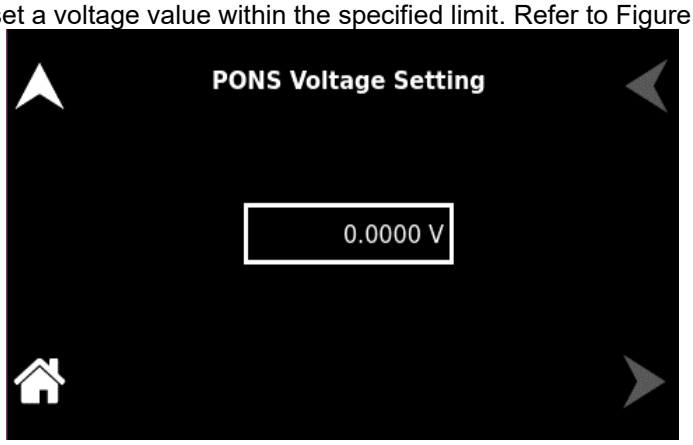
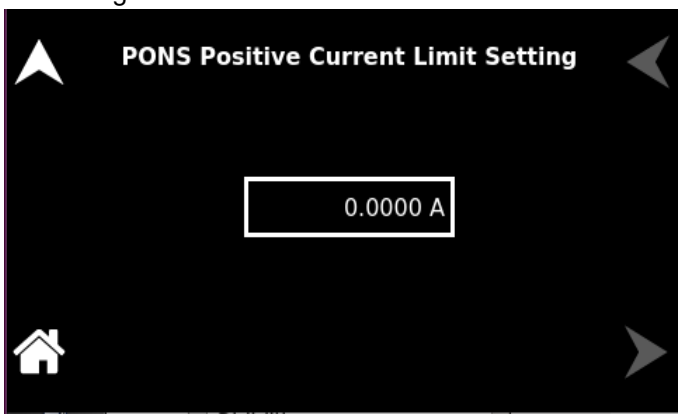


Figure 7-111. PONS Voltage Settings

PONS Pos. Curr Limit	User can set a positive current limit value, which functions as a trip limit (CV and CV/CP), or it regulates the output upon reaching the PONS Pos. Curr Limit (CV/CC). Refer to Figure 7-112.



ENTRY	DESCRIPTION

Figure 7-112. PONS Positive Current Limit Settings

PONS Neg. Curr Limit

User can set a negative current limit value, which functions as a trip limit (CV and CV/CP), or it regulates the output upon reaching the PONS Neg. Curr Limit (CV/CC). Refer to Figure 7-113.

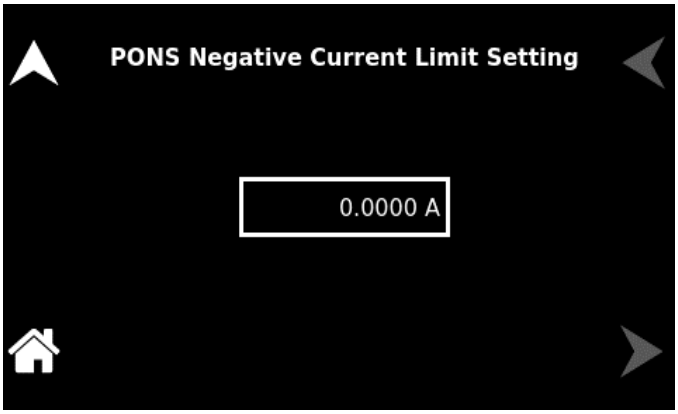


Figure 7-113. PONS Positive Current Limit Settings

PONS Pos. Pow Limit

User can set a positive power limit value, which functions as a trip limit (CV and CV/CC), or it regulates the output upon reaching the PONS Pos. Pow Limit (CV/CP). Refer to Figure 7-114.

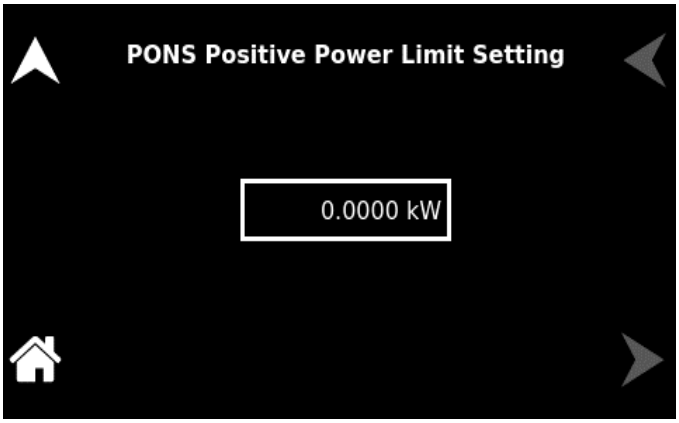


Figure 7-114. PONS Positive Power Limit Setting

ENTRY	DESCRIPTION
PONS Neg. Pow Limit	User can set a negative power limit value, which functions as a trip limit (CV and CV/CC), or it regulates the output upon reaching the PONS Neg. Pow Limit (CV/CP). Refer to Figure 7-115.

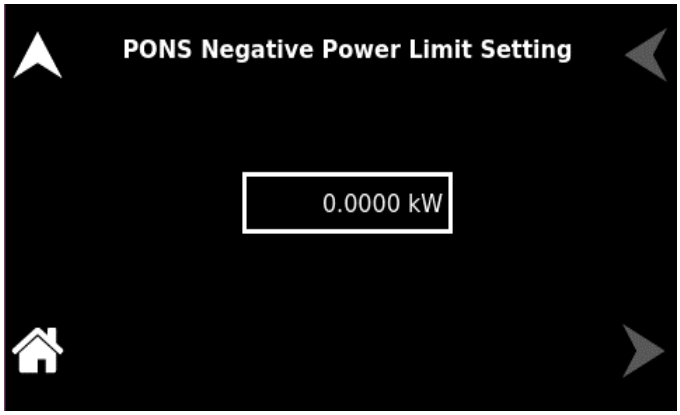


Figure 7-115. PONS Negative Power Limit Setting

Table 7-25. PONS Output Program Settings –CV/CC, CV/CP and CV

b) PONS Output Program (Voltage) – CV- Ser. Res

When the regulation setting is selected as Voltage (CV- Ser. Res), the screen will display the following parameters: PONS Voltage, PONS Pos. Curr Limit, PONS Neg. Current Limit, and PONS Pos. Pow Limit and PONS Neg. Pow Limit. Refer to Figure 7-116.

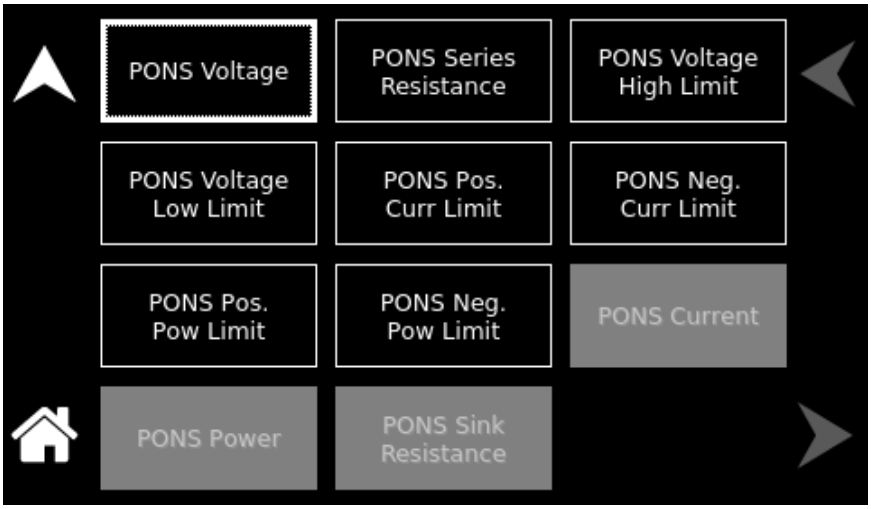


Figure 7-116. Pons Output Program mode – CV -Ser. Res

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Voltage	User can set a voltage value within the specified limit. Refer to Figure 7-117.

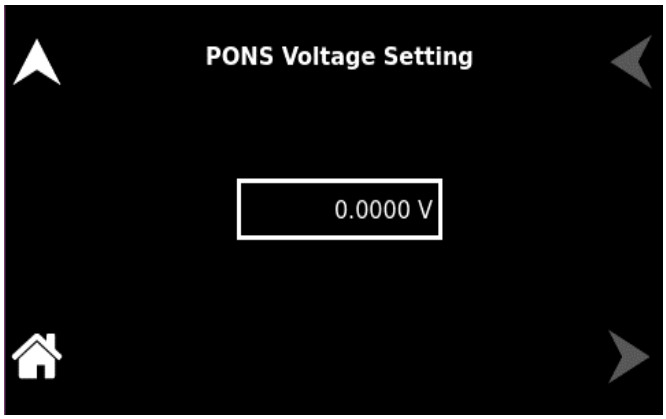


Figure 7-117. PONS Voltage Settings

PONS Series Resistance	User can set the series resistance value within the specified limit. Refer to Figure 7-118.

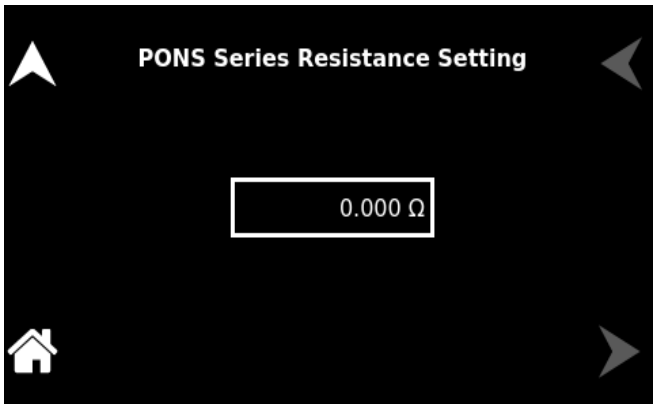


Figure 7-118. PONS Series resistance setting

PONS Voltage High Limit	User can set the high voltage limit value, and it regulates the output upon reaching the PONS Voltage High Limit. Refer to Figure 7-118.

ENTRY	DESCRIPTION

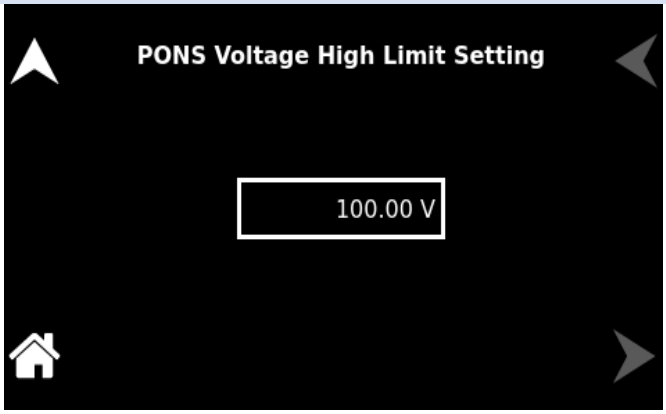


Figure 7-119. PONS Voltage high limit setting

PONS Voltage High Limit

User can set the low voltage limit value, and it regulates the output upon reaching the PONS Voltage Low Limit. Refer to Figure 7-120.

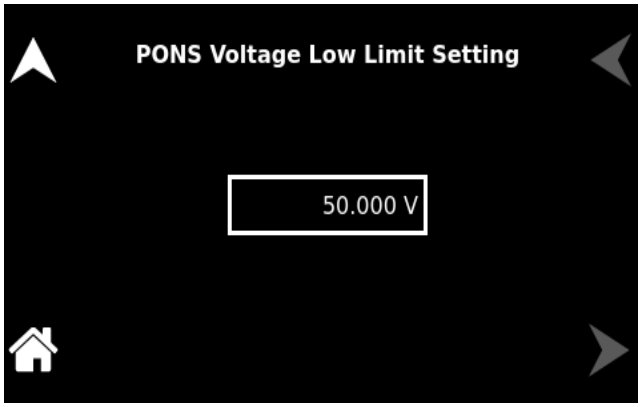


Figure 7-120. PONS Voltage low limit setting

PONS Pos. Curr Limit

User can set the positive current value and which functions as a trip limit. Refer to Figure 7-121.

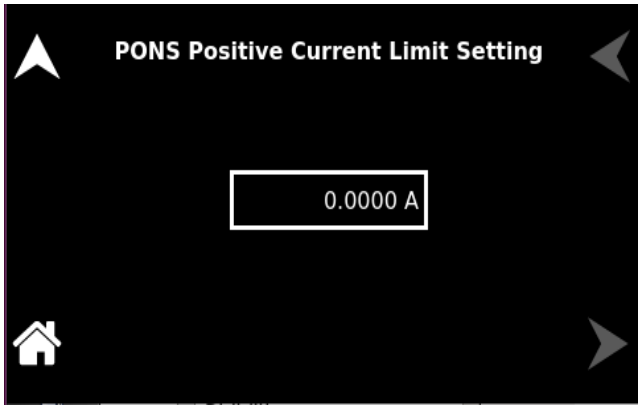


Figure 7-121. PONS* Positive Current Limit *Settings

ENTRY	DESCRIPTION
PONS Neg. Curr Limit	User can set a negative current value and which functions as a trip limit. Refer to Figure 7-122.

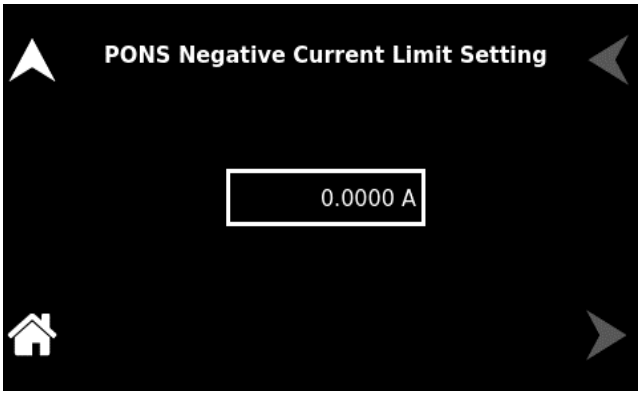


Figure 7-122. PONS Negative Current Limit Setting

PONS Pos. Pow Limit	User can set the positive power value and which functions as a trip limit. Refer to Figure 7-123.

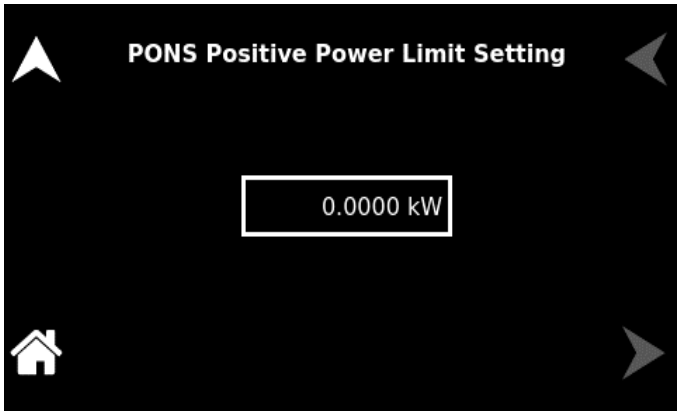
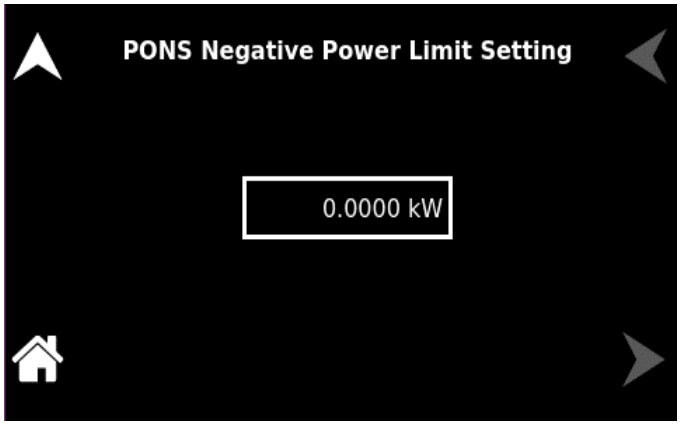


Figure 7-123. PONS Positive Power Limit Settings

PONS Neg. Pow Limit	User can set a negative power limit value and which functions as a trip limit. Refer to Figure 7-124.



ENTRY	DESCRIPTION

Figure 7-124. PONS Negative Power Limit Setting

Table 7-26. PONS Output Program Settings

c) PONS Output Program (Current) – CC/CV, CC/CP and CC

When the regulation setting is selected as 'Current (CC/CV, CC/CP and CC)', the screen will display the following parameters: 'PONS Current', 'PONS Voltage High', 'PONS Voltage Low', 'PONS Pos. Pow Limit' and 'PONS Neg. Pow Limit'. Refer to Figure 7-125.

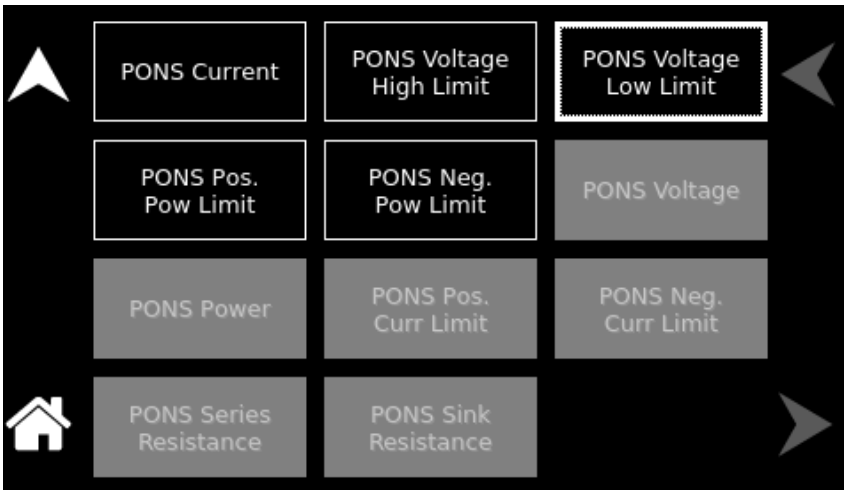


Figure 7-125. Pons Output Program mode – CC/CV, CC/CP and CC

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Current	User can set the Current value within the specified limit. Refer to Figure 7-126.

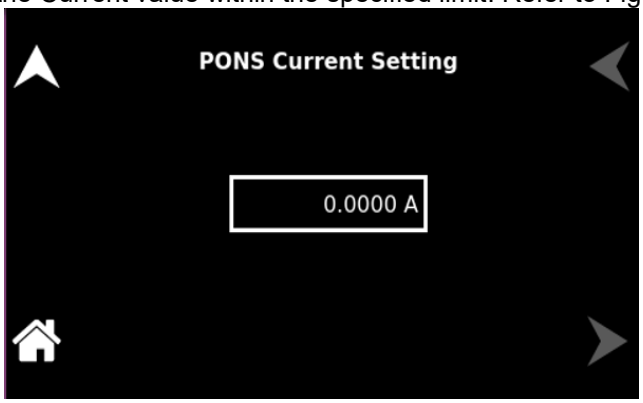


Figure 7-126. PONS Current Setting

PONS Voltage High limit	User can set a high voltage limit value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the PONS Voltage High Limit. Refer to Figure 7-127.

ENTRY	DESCRIPTION

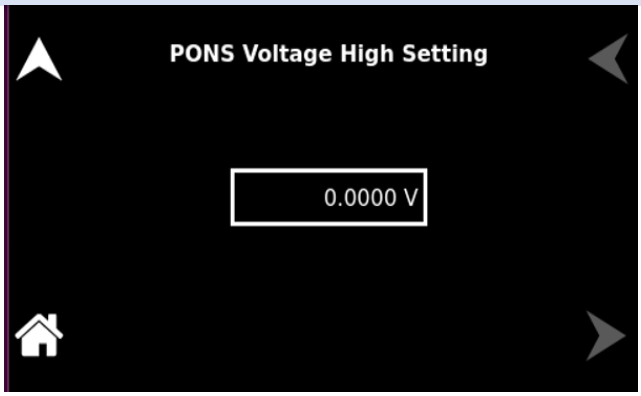


Figure 7-127. PONS Voltage High Setting

PONS Voltage Low Limit

User can set a low voltage limit value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the PONS Voltage Low Limit. Refer to Figure 7-128.

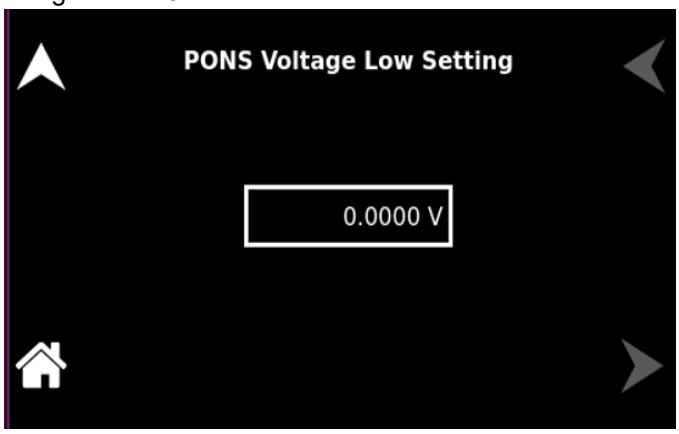


Figure 7-128. PONS Voltage Low Settings

PONS Pos. Power Limit

User can set a positive power limit value, which functions as a trip limit (CC and CC/CV), or it regulates (CC/CP) the output upon reaching the PONS Pos. Power Limit. Refer to Figure 7-129.

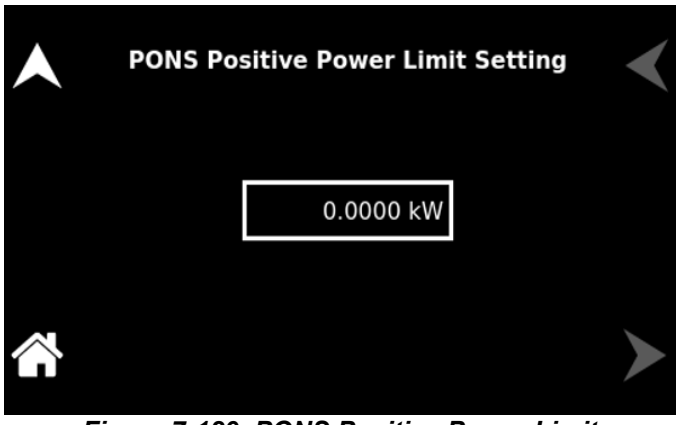


Figure 7-129. PONS Positive Power Limit

ENTRY	DESCRIPTION
PONS Neg. Power Limit	User can set a negative power limit value, which functions as a trip limit (CC and CC/CV), or it regulates (CC/CP) the output upon reaching the PONS Neg. Power Limit. Refer to Figure 7-130.

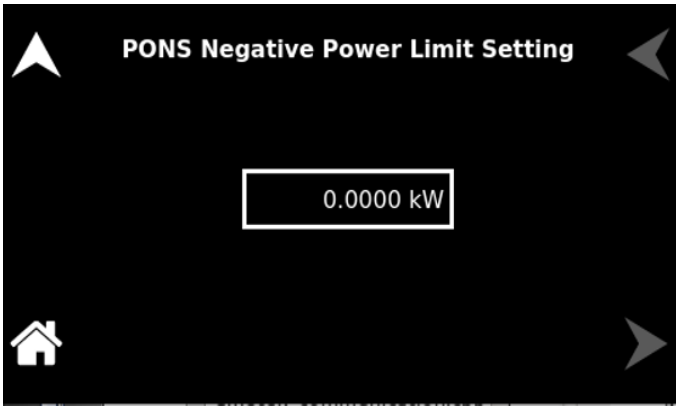


Figure 7-130. PONS Negative Power Limit

Table 7-27. PONS Output Program Settings

d) PONS Output Program (Current) –CP/CC

When the regulation setting is selected as 'Current (CP/CC)', the screen will display the following parameters: 'PONS Power', 'PONS Voltage High Limit', 'PONS Voltage Low Limit', 'PONS Negative Current Limit' and 'PONS Positive Current Limit'. Refer to Figure 7-131.

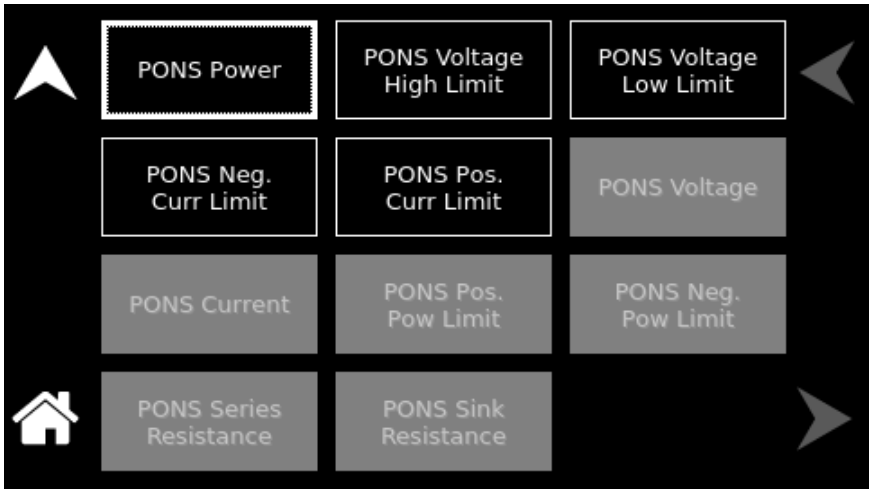


Figure 7-131. Pons Output Program mode – CC/CP

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Power	User can set the Power value within the specified limit. Refer to Figure 7-132.

ENTRY	DESCRIPTION

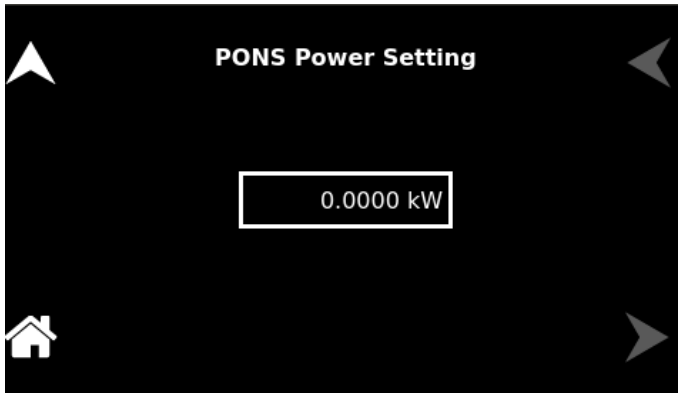


Figure 7-132. PONS Power Setting

PONS Voltage High Limit

User can set the high voltage limit value, and which functions as a trip limit. Refer to Figure 7-133.

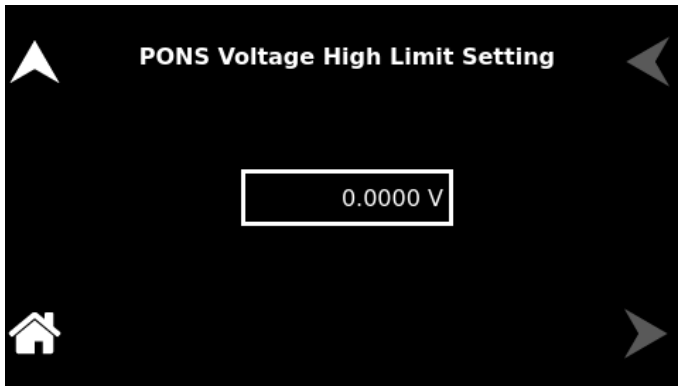


Figure 7-133. PONS Voltage High Setting

PONS Voltage Low Limit

User can set the low voltage value, and which functions as a trip limit. Refer to Figure 7-134.

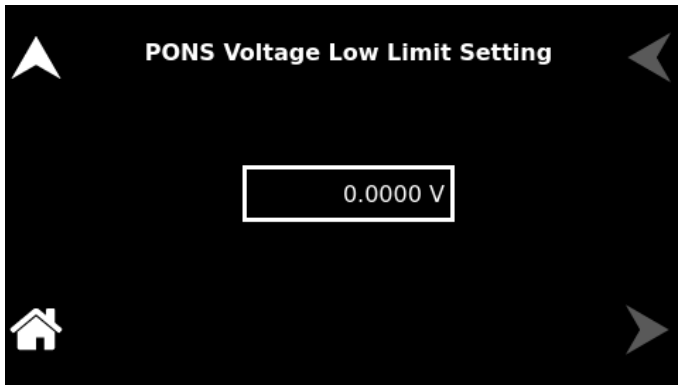


Figure 7-134. PONS Voltage Low Settings

PONS Pos. Current

User can set a positive current limit value, and it regulates the output upon reaching the PONS Pos. Current Limit. Refer to Figure 7-135.

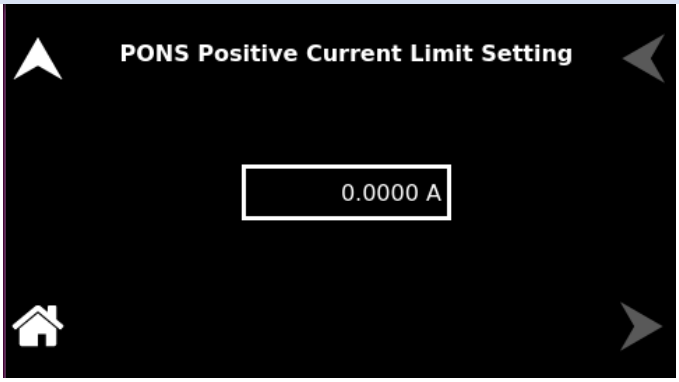
ENTRY	DESCRIPTION
Limit	

Figure 7-135. PONS Positive Current Limit

PONS Neg. Current Limit	User can set a negative current limit value, and it regulates the output upon reaching the PONS Neg. Current Limit. Refer to Figure 7-136.

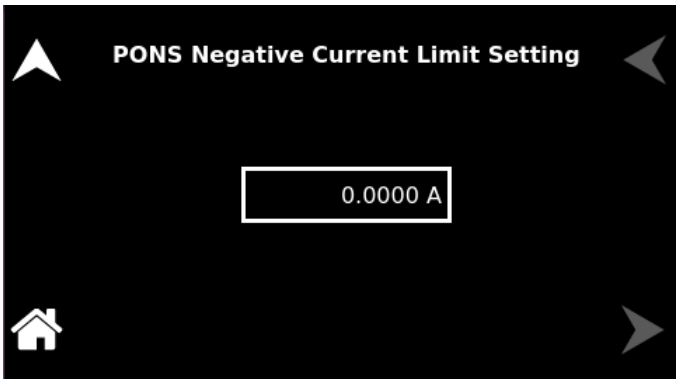


Figure 7-136. PONS Negative Current Limit

Table 7-28. PONS Output Program Settings

7.2.5.7.4 PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select PONS Protection, PONS Slew Rate, PONS User Limit, PONS Output Sense, PONS Measurement Average Samples, PONS Remote Inhibit. Refer to Figure 7-137.

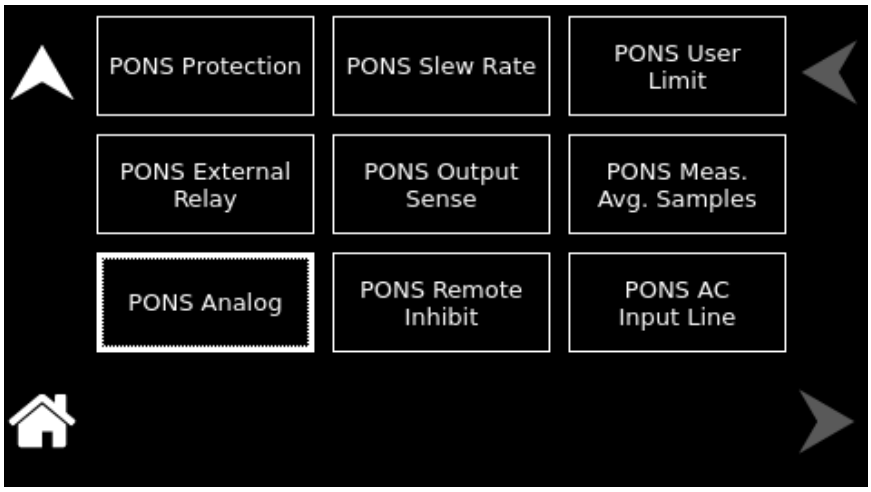


Figure 7-137. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	User can define OVP, Pos. OCP and Neg. OCP to help safeguard their devices from electrical anomalies by shutting down the output if it exceeds the preset voltage. Refer to Figure 7-138.

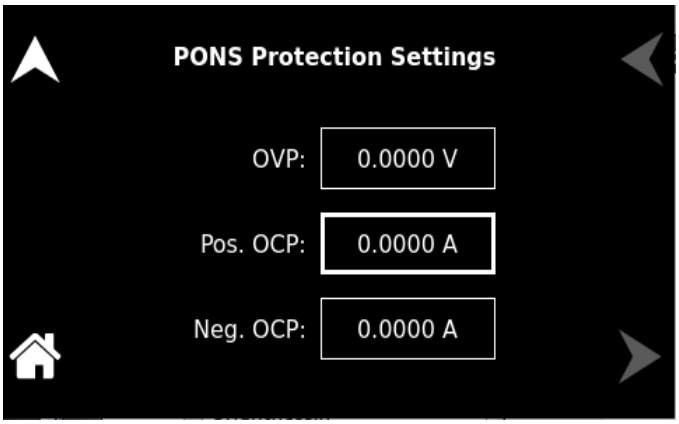
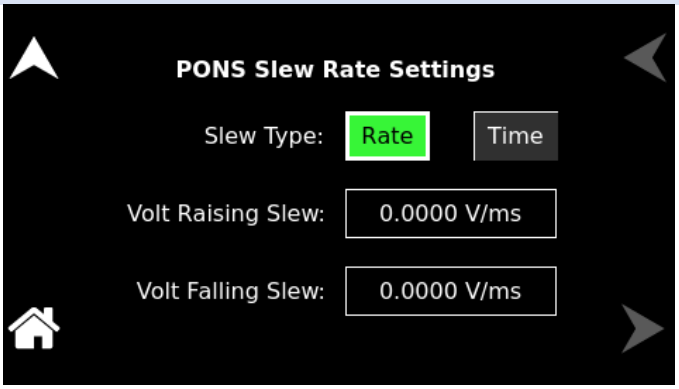


Figure 7-138. PONS Protection Settings

PONS Slew Rate	User can configure the voltage, current and power slew rate. This allows for precise control over the voltage, current and power, ensuring smoother transitions and better performance of the power supply. Adjusting these settings can help in optimizing the response time and stability of the system. Refer to Figure 7-139, Figure 7-140 and Figure 7-141.

ENTRY	DESCRIPTION



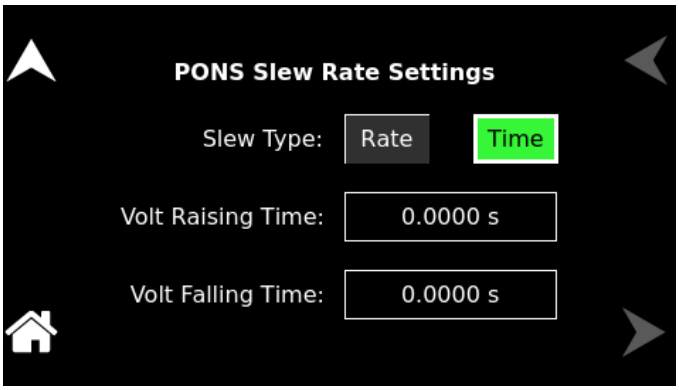
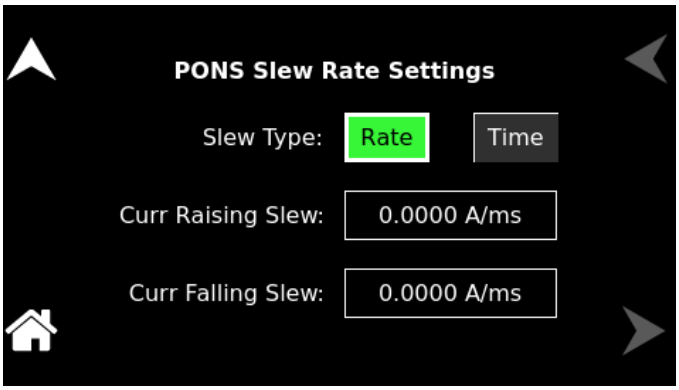
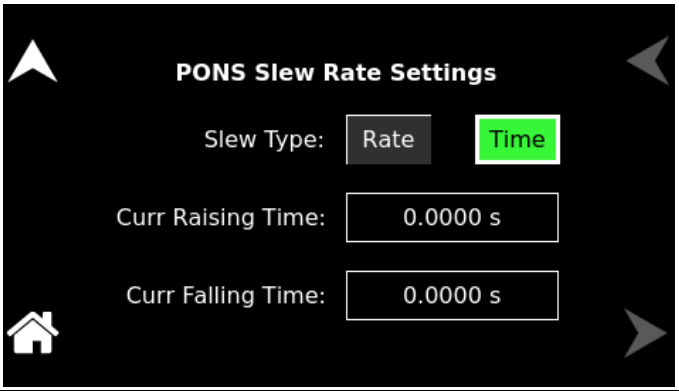


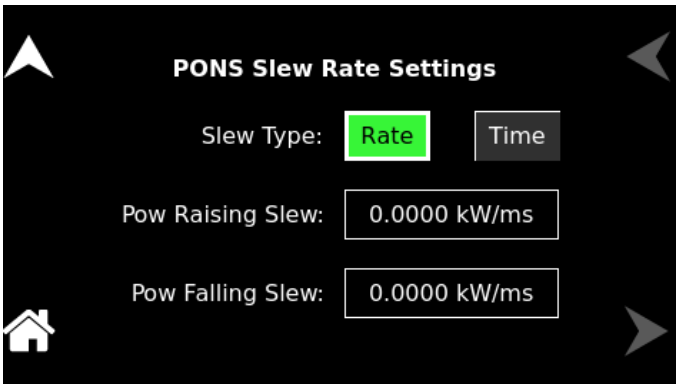
Figure 7-139. PONS Slew Rate Settings – Voltage





ENTRY	DESCRIPTION

Figure 7-140. PONS Slew Rate Settings – Current(CC/CV, CV/CP and CC)



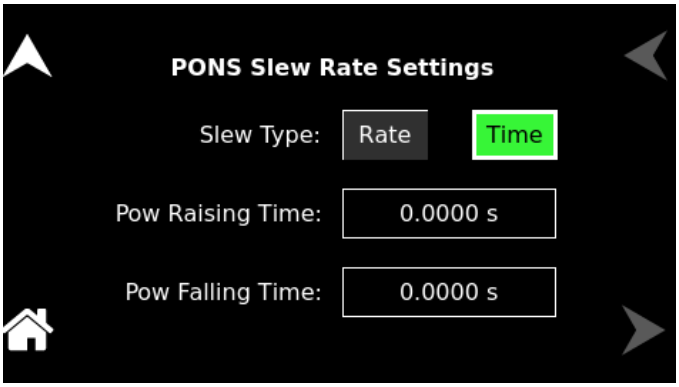


Figure 7-141. Slew Rate Settings – Power (CP/CC)

PONS User Limit

Users can set the maximum voltage value and Current High and Current Low limit values. This allows users to specify the values that the device can reach without exceeding these limits. Refer to Figure 7-142, Figure 7-143 and Figure 7-144.

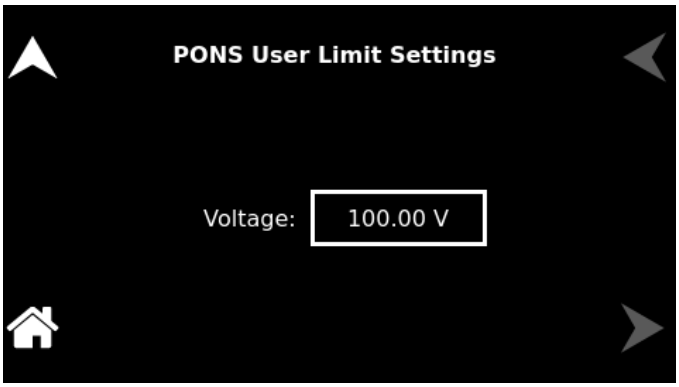


Figure 7-142. PONS User Limit Settings - Voltage

ENTRY	DESCRIPTION

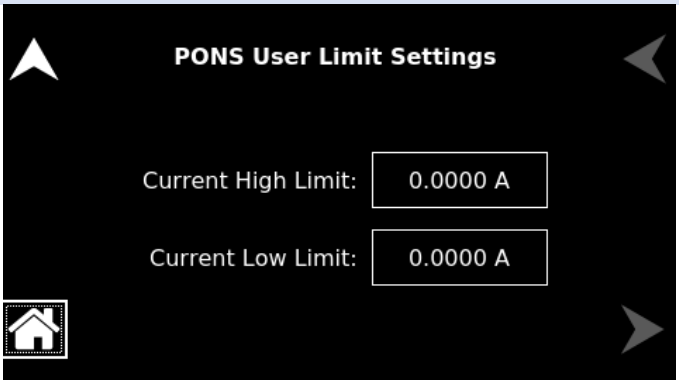


Figure 7-143. PONS User Limit Settings – Current (CC/CV, CC/CP and CC)

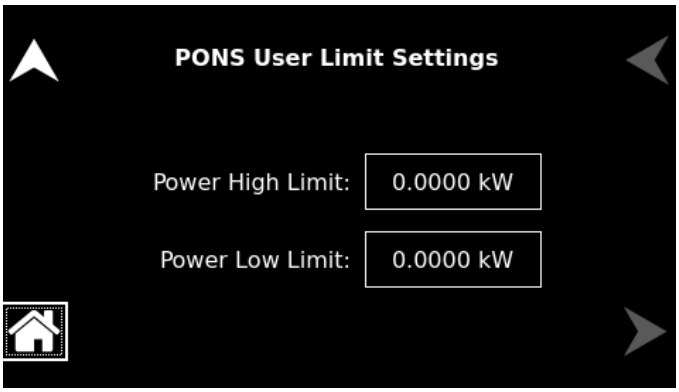


Figure 7-144. User Limit Settings- Current (CP/CC)

PONS External Relay

Users can set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 7-145.

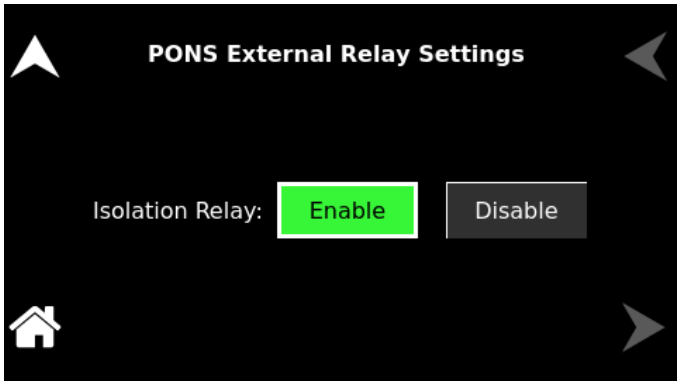


Figure 7-145. PONS External Relay Settings

ENTRY	DESCRIPTION
PONS Output Sense	User can program the PONS output to ON or OFF state. Refer to Figure 7-146.

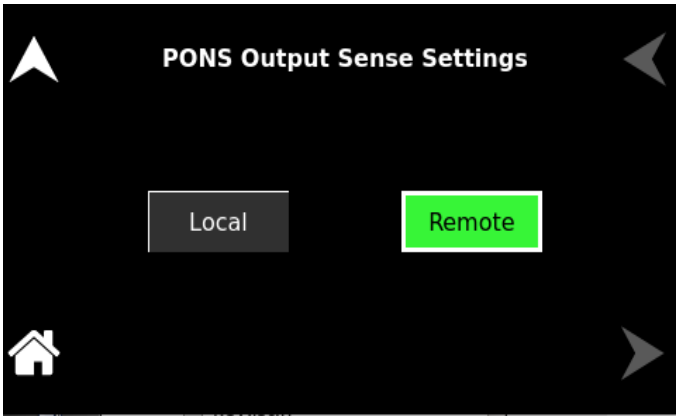


Figure 7-146. PONS Output Sense Settings

PONS Measurement Average Samples

Users can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 7-147.

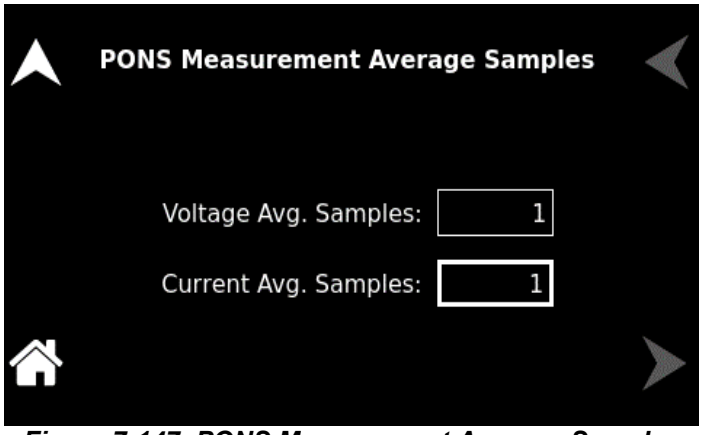


Figure 7-147. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 7-148.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

ENTRY	DESCRIPTION

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch**: after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

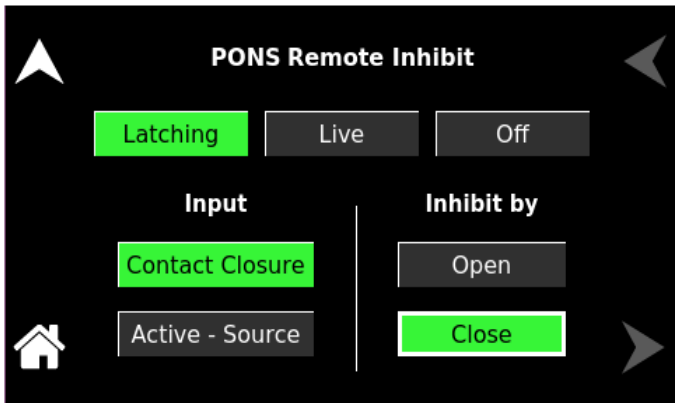


Figure 7-148. PONS remote Inhibit

AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 7-149.

a) **High Line:** The nominal High Line Input range is 380 to 480 VAC.

ENTRY	DESCRIPTION

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

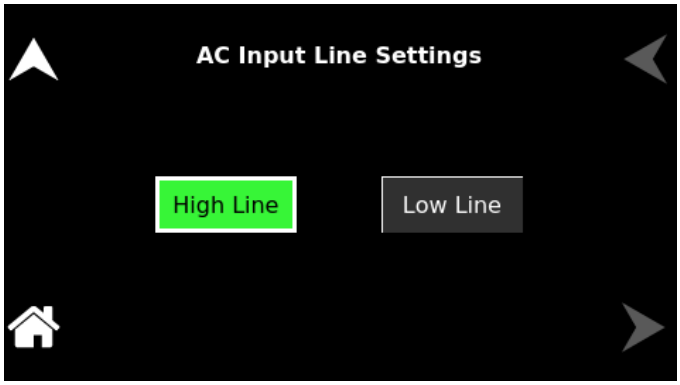


Figure 7-149. AC Input Line Settings

PONS Analog

Configures the PONS Analog programming interface, refer to Figure 7-150.

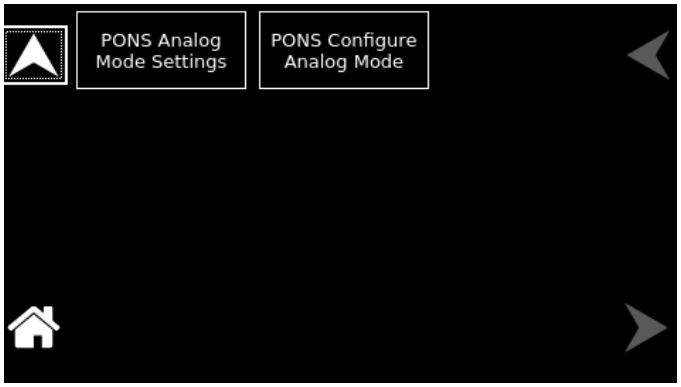


Figure 7-150. PONS Analog Screen

a) PONS Analog Mode Settings

Lists the configuration settings of the PONS Analog Programming interface. Refer Figure 7-151.

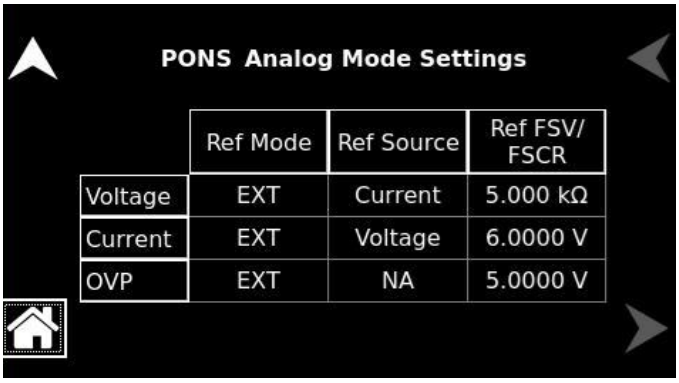


Figure 7-151. PONS Analog Mode Settings

b) PONS Configure Analog Mode

ENTRY	DESCRIPTION
	Sets parameter values and controls operation of the PONS Analog Programming interface. Refer to Figure 7-152.

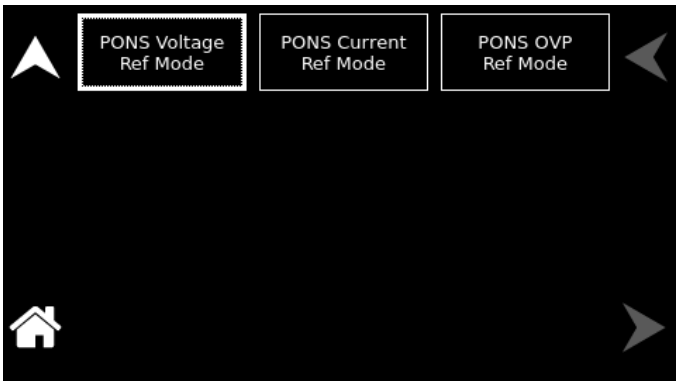


Figure 7-152. PONS Configure Analog Mode Settings

- **PONS Voltage Ref Mode :** Configures the PONS Voltage Reference Mode, refer to Figure 7-152. When the PONS Voltage Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 7-153 to Figure 7-156.

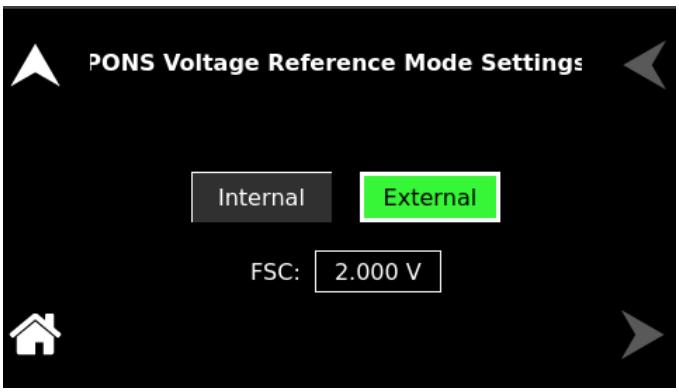


Figure 7-153. PONS Voltage Reference Mode

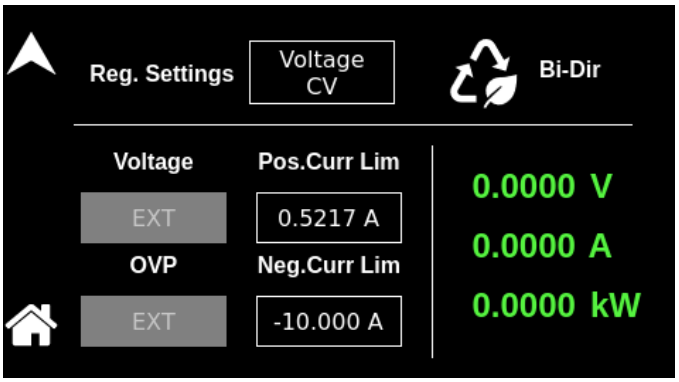


Figure 7-154. Dashboard Screen – Voltage (EXT)

ENTRY	DESCRIPTION

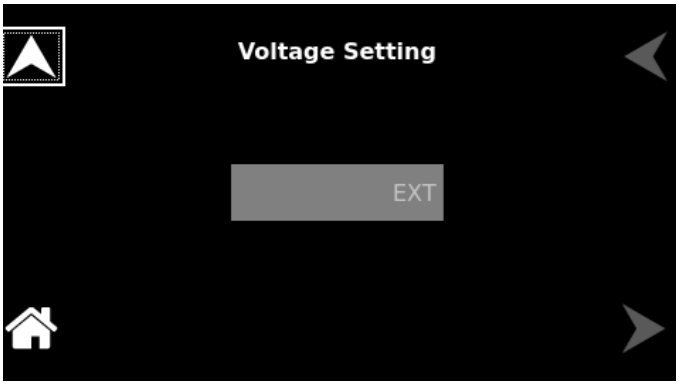


Figure 7-155. Output Program Screen – Voltage (EXT)

When Voltage Reference Mode is selected as Current, FSCR (Full Scale Current Resistance) unit will be kΩ (k Ohms). Refer to Figure 7-156.

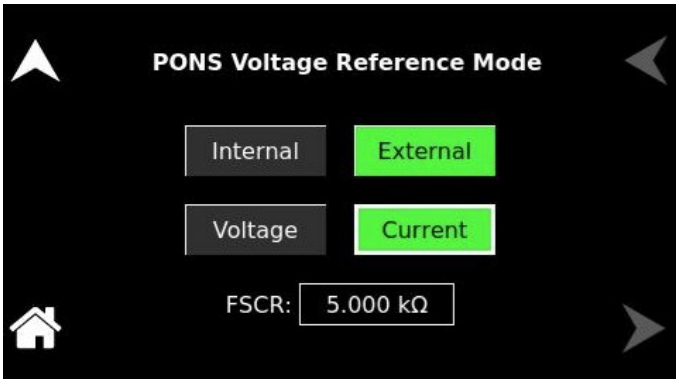


Figure 7-156. PONS Voltage Reference Mode – Resistive

- **PONS Current Ref Mode:** Configures the PONS Current Reference Mode, refer to Figure 7-152. When the PONS Current Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 7-157.

  NOTE: 'Current' is only applicable for Bi-directional mode. When you select the 'Current', the screen display as 'Only applicable for Source Mode'

ENTRY	DESCRIPTION

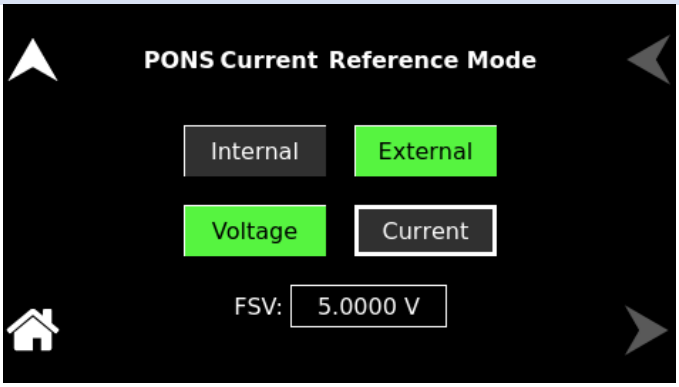


Figure 7-157. PONS Current Reference Mode

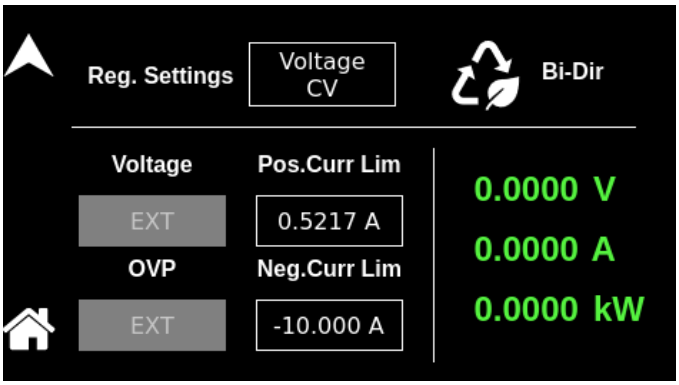


Figure 7-158. Dashboard Screen – Current (EXT)

- **PONS OVP Ref Mode:** Configures the PONS Over Voltage Protection (OVP) Reference Mode. When the PONS OVP Reference Mode is set to External, the OVP setting field on the Dashboard screen and the 'Protection' option in the Configuration screen will be disabled, and these OVP fields will display as 'EXT' refer to Figure 7-158 and Figure 7-159.

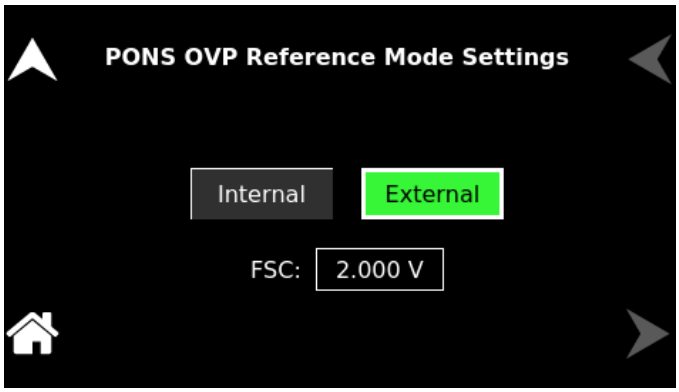


Figure 7-159. PONS OVP Reference Mode

Table 7-29. PONS Configuration mode

7.2.5.8 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 7-160.

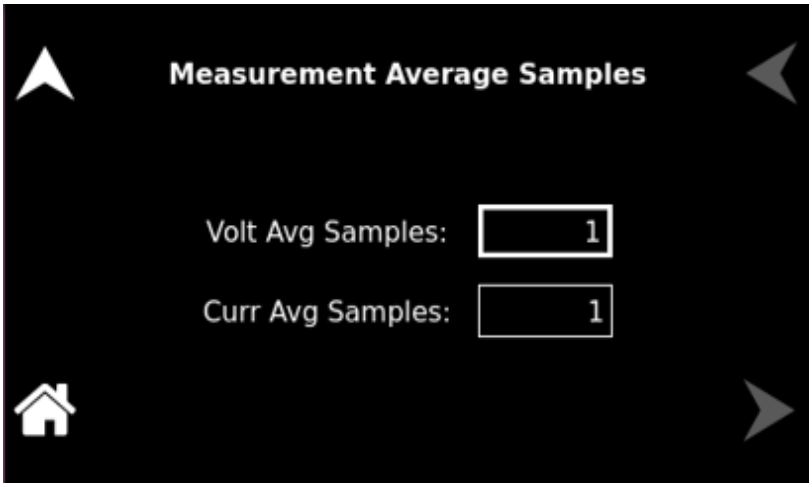


Figure 7-160. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 7-30. Measurement Average Sample

7.2.6 CONTROL INTERFACE SCREEN

The Control Interface screen provides the ability to configure the power supply for remote control through the data communications interfaces. For the top-level menu of the Control Interface Screen, refer to Figure 7-161 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

Figure 7-161. Control Interface Screen Top-Level Menu

The Control interface Settings menu has the following fields:

ENTRY	DESCRIPTION
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 7-162. After settings are changed, the unit must be turned OFF/ON for them to take effect.

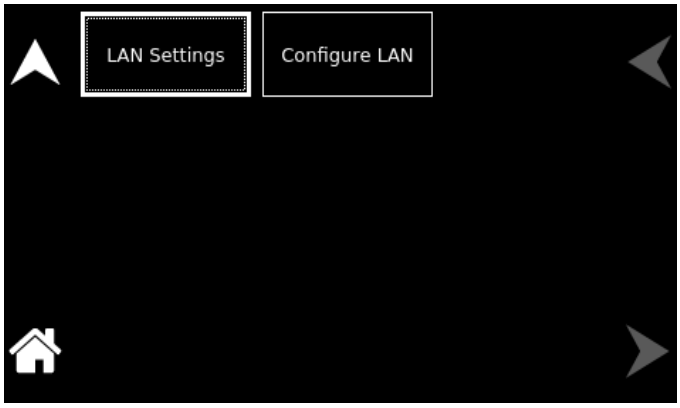


Figure 7-162. LAN Screen

a) LAN SETTINGS

Lists the configuration settings of the LAN interface, and the DNS-SD service name; a number, (n), would be appended to the service name, if necessary, to differentiate duplicate power supply names. Refer to Figure 7-163.

ENTRY	DESCRIPTION

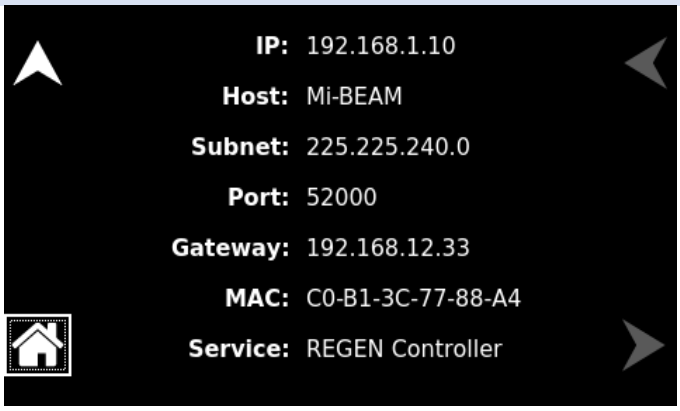


Figure 7-163. LAN Settings

b) LAN CONFIGURE

Sets parameter values and controls operation of the LAN interface, refer to Figure 7-164.

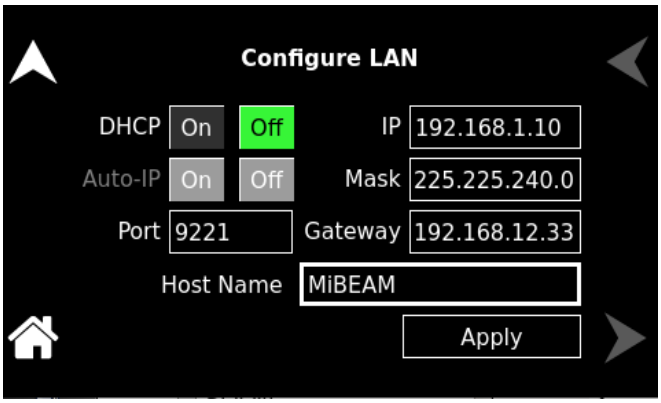


Figure 7-164. Configure LAN

- **DHCP**: Selects whether DHCP is enabled or disabled. Refer to Figure 7-164.

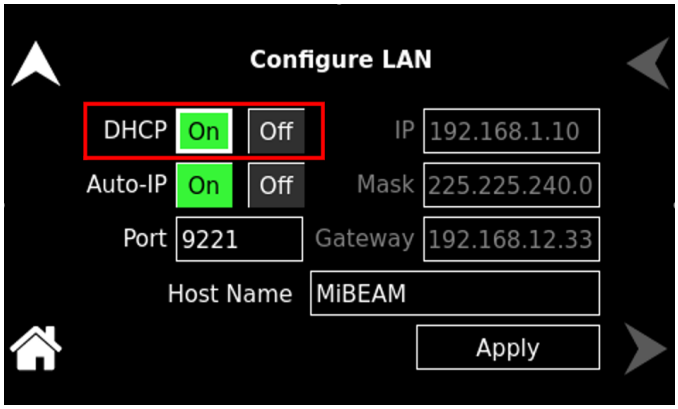


Figure 7-165. LAN Screen – DHCP

NOTE: When DHCP is selected, the IP address is assigned by the network DHCP

ENTRY	DESCRIPTION

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.

- **Auto-IP**: Enables or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 7-166.

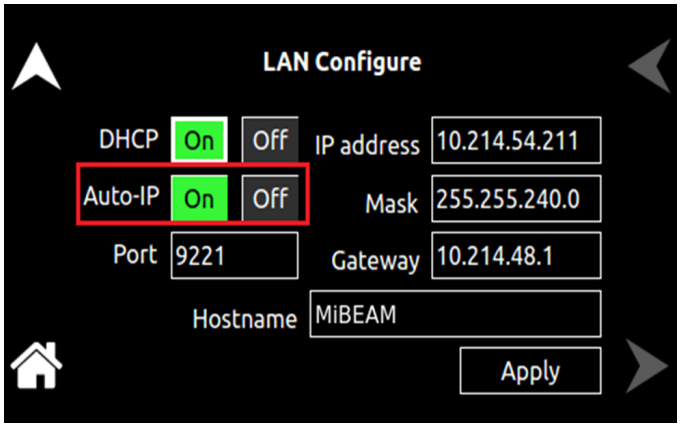


Figure 7-166. LAN Screen - Auto -IP

- **IP Address**: Sets the static IP address for the unit. When DHCP is turned off in the LAN CONFIG sub-menu, AUTO IP is selected, set the IP address to all zeros so that the IP address would be requested from the network; when DHCP is selected, the IP address is assigned by the network DHCP server. Refer to Figure 7-167.

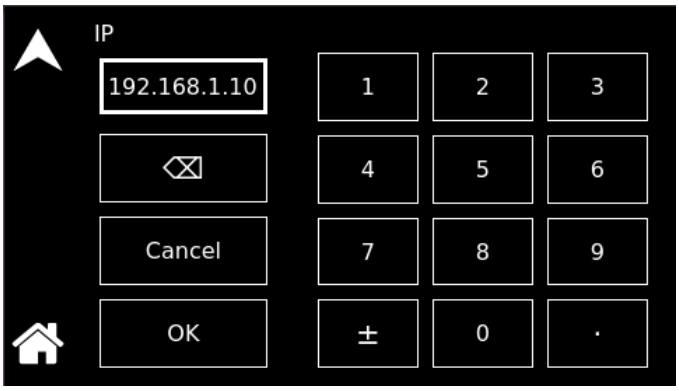


Figure 7-167. LAN Screen - IP Address

- **Subnet Mask**: Sets the subnet mask, when DHCP is turned off in the LAN CONFIG sub-menu. Refer to Figure 7-168.

ENTRY	DESCRIPTION

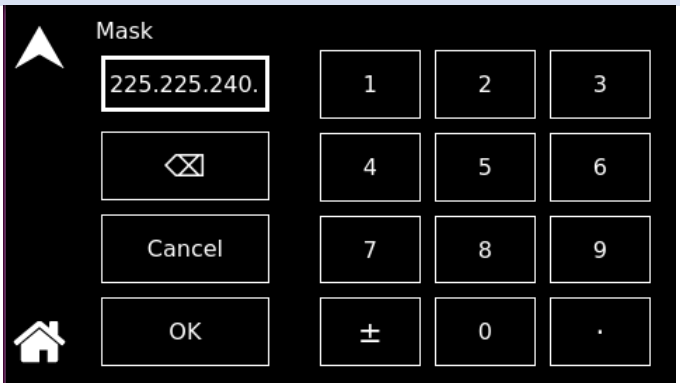


Figure 7-168. LAN Screen - Subnet Mask

- **Gateway Address**: Sets the gateway address when DHCP is turned off in the LAN CONFIG sub-menu and when AUTO IP is selected, set the gateway address to all zeros so that the gateway address would be requested from the network; when DHCP is selected, the gateway address is assigned by the network DHCP server. Refer to Figure 7-169.

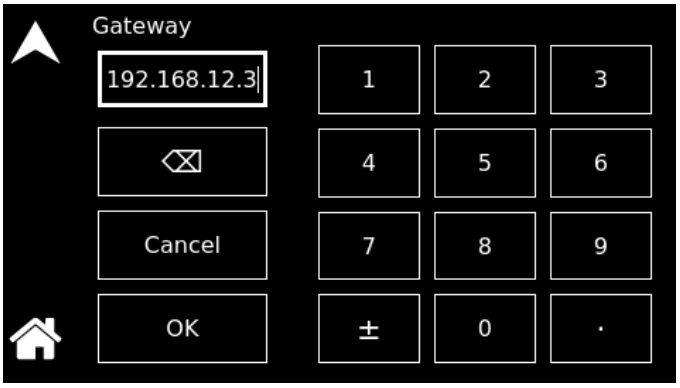


Figure 7-169. LAN Screen - Gateway Address

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

- **Port**: Sets the port number; the factory-default value is 9221. Refer to Figure 7-170.

ENTRY	DESCRIPTION

Figure 7-170. LAN Screen -Port

- **MAC Address:** Displays the MAC address; the MAC address is listed on a label on the chassis of the unit. Refer to Figure 7-171.

Figure 7-171. MAC Address

- **Host Name**: Allows setting a unique alpha-numeric host name. Refer to Figure 7-172.

Figure 7-172. LAN Screen - Host Name

ENTRY	DESCRIPTION

- **Apply**: Applies the LAN settings to the supply. Refer to Figure 7-173 and Figure 7-174.

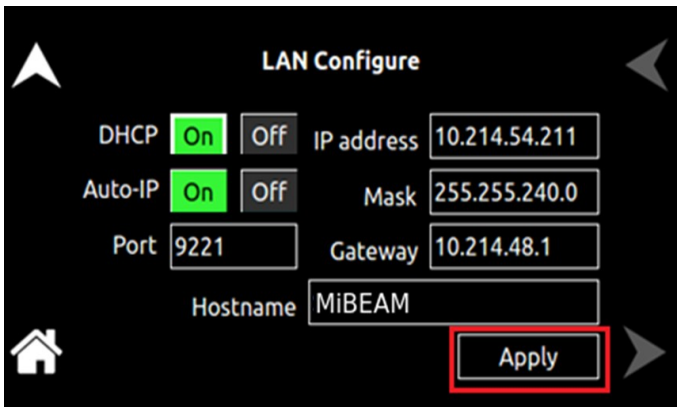


Figure 7-173. LAN Screen – Apply

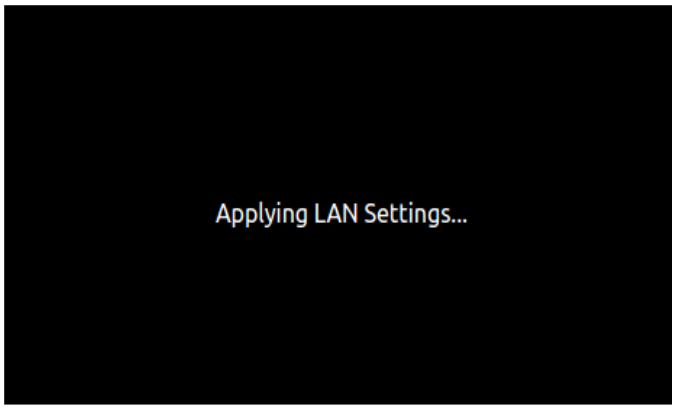


Figure 7-174. LAN Screen - Applying LAN Settings

RS232

Configures the RS-232C communications interface.RS232 has two sub-menus: RS232 Settings and RS232 Configure

a) RS232 Settings: Lists the configured Baud Rate, Stop Bits, Bits and Parity for the RS232 digital interface, refer to Figure 7-175.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.
- **Stop Bits** sets the number of stop bits to either 1 or 2 bits. The default setting is 1 stop bit.
- **Data**: sets the number of data bits to either 7 or 8. The default setting is 8 bits.
- **Parity**: sets the parity to either Even, Odd, or no parity, None. The default setting is no parity, None.

ENTRY	DESCRIPTION

Figure 7-175. RS232 Screen -Settings

b) Configure RS232: Configures the RS-232 Baud Rate, refer to Figure 7-175, Figure 7-176 and Figure 7-177. This setting must match those set for the communications port of the user external controller.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.

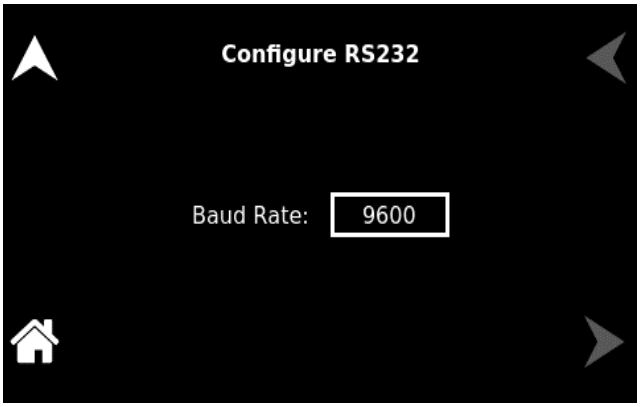


Figure 7-176. RS232 Screen -Configure

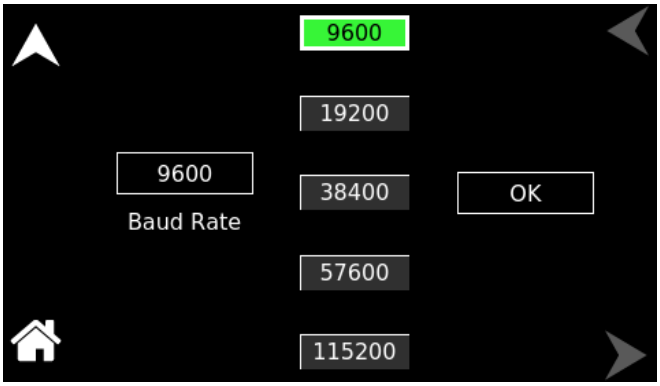


Figure 7-177. Baud Rate Selection

ENTRY	DESCRIPTION
Remote Inhibit	Sets the control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 7-178. **a) Remote Inhibit Input – Contact Closure** Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output. Remote inhibit can be configured in three modes; • **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output. • **Live:** after reclosing the contact, user needs to turn ON the output. • **OFF:** inhibit function would be disabled. **b) Remote Inhibit Input – Active Source** An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply. Remote inhibit can be configured in three modes; • **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output. • **Live:** after removing the active voltage source, user needs to turn ON the output. • **OFF:** inhibit function would be disabled.

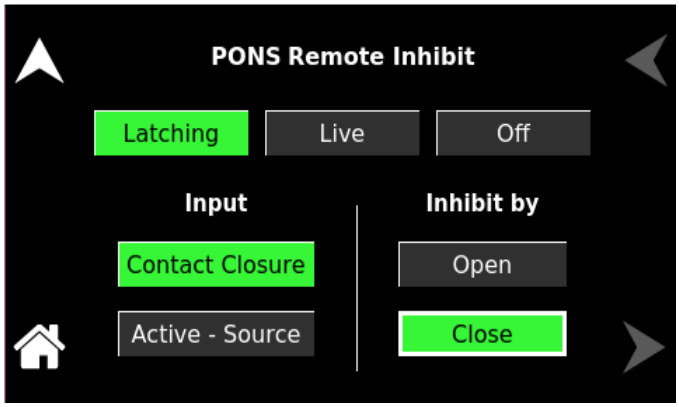


Figure 7-178. PONS Remote Inhibit

ENTRY	DESCRIPTION
Analog	Configures the Analog programming interface, refer to Figure 7-179.

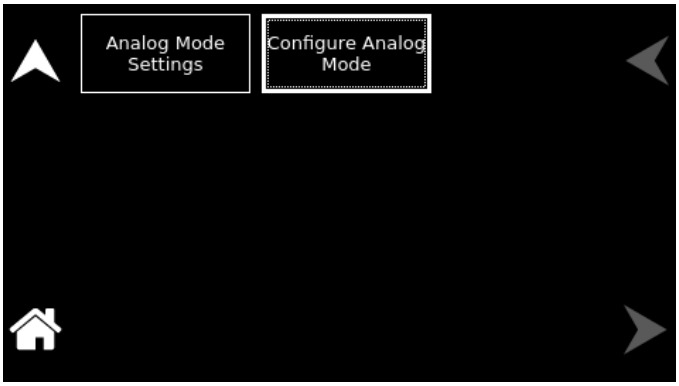


Figure 7-179. Analog Screen

a) Analog Mode Settings

Lists the configuration settings of the Analog Programming interface. Refer to Figure 7-180.

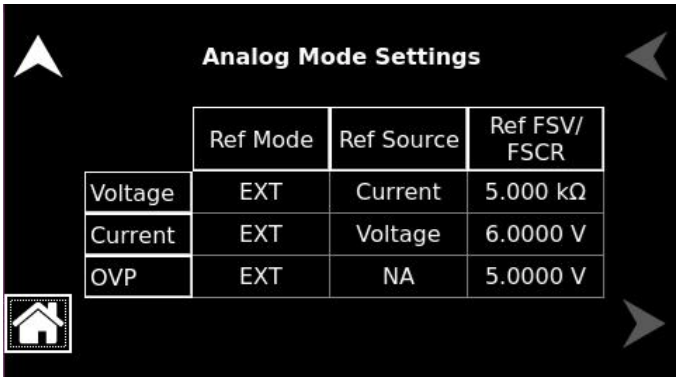


Figure 7-180. Analog Mode Settings

b) Configure Analog Mode

Sets parameter values and controls operation of the Analog Programming interface. Refer to Figure 7-181.

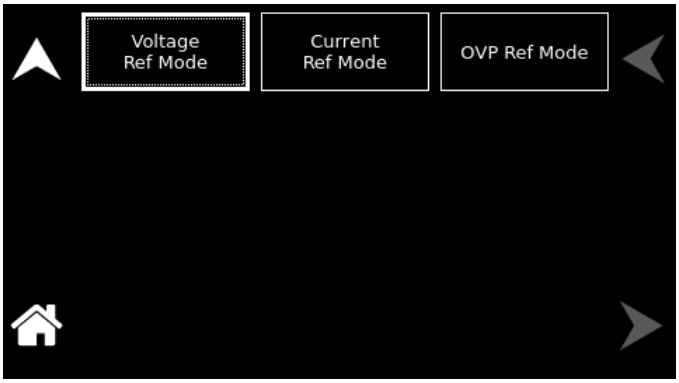


Figure 7-181. Configure Analog Mode Settings

ENTRY	DESCRIPTION

- **Voltage Ref Mode :** Configures the Voltage Reference Mode, refer to Figure 7-181. When the Voltage Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 7-182 to Figure 7-185.

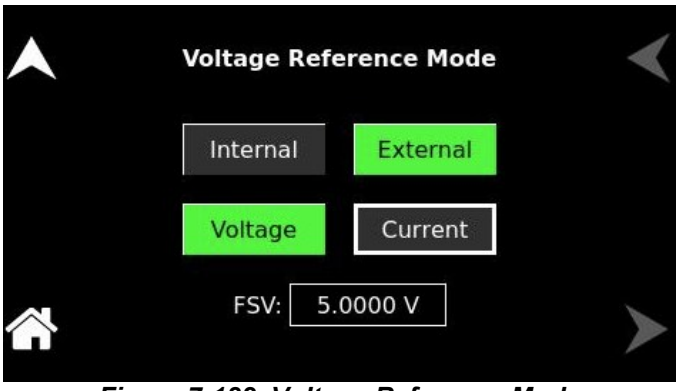


Figure 7-182. Voltage Reference Mode

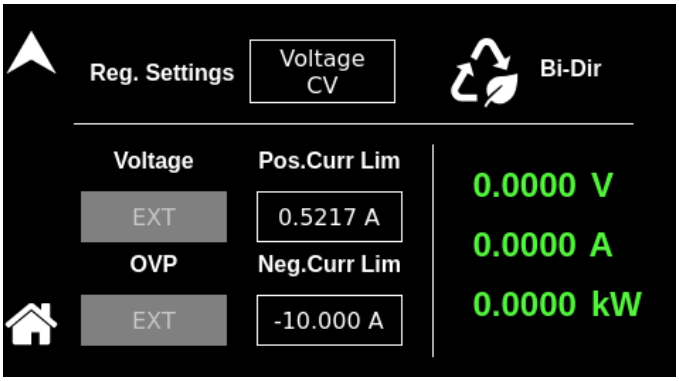


Figure 7-183. Dashboard Screen – Voltage (EXT)

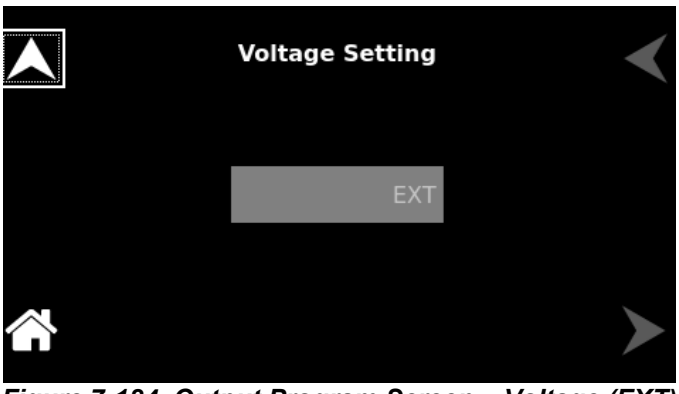


Figure 7-184. Output Program Screen – Voltage (EXT)

When Voltage Reference Mode is selected as Current, FSCR (Full Scale Current Resistance) unit will be kΩ (k Ohms). Refer to Figure 7-185.

ENTRY	DESCRIPTION

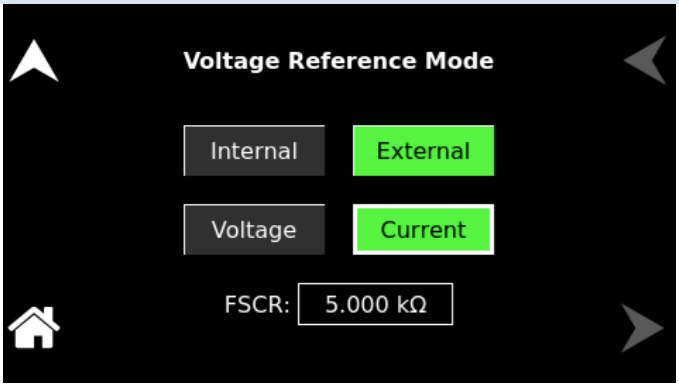


Figure 7-185. Voltage Reference Mode – Resistive

- **Current Ref Mode:** Configures the Current Reference Mode, refer to Figure 7-181. When the Current Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 7-186 and Figure 7-187.

  NOTE: 'Current' is only applicable for Bi-directional mode. When you select the 'Current', the screen display as 'Only applicable for Source Mode'

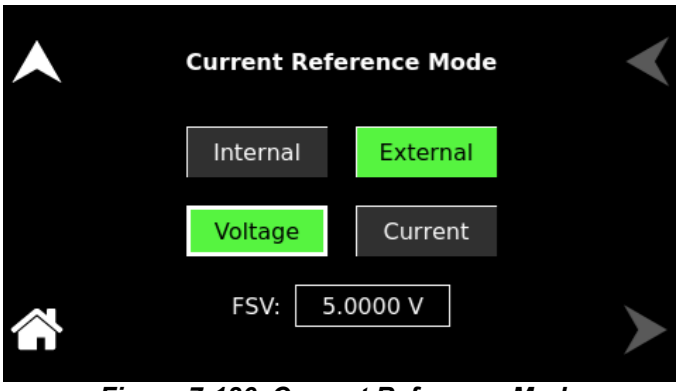


Figure 7-186. Current Reference Mode

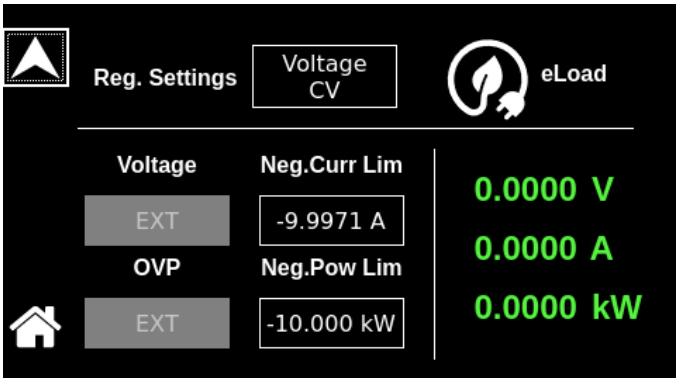


Figure 7-187. Dashboard Screen – Current (EXT)

ENTRY	DESCRIPTION
	• **OVP Ref Mode:** Configures the Over Voltage Protection (OVP) Reference Mode. When the OVP Reference Mode is set to External, the OVP setting field on the Dashboard screen and the 'Protection' option in the Configuration screen will be disabled, and these OVP fields will display as 'EXT' refer to Figure 7-187. And Figure 7-188.

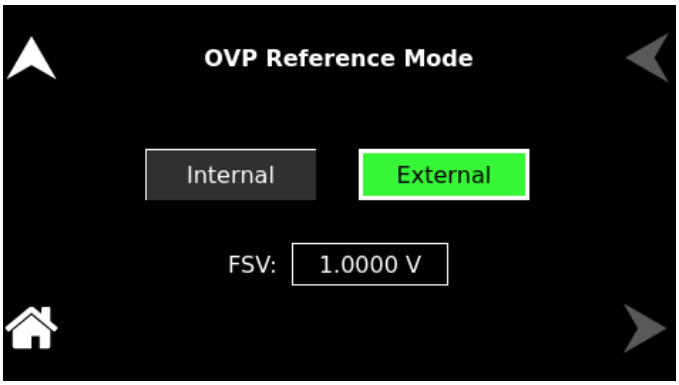


Figure 7-188. OVP Reference Mode

USB	Displays the configured Baud Rate. Refer to Figure 7-189.

Figure 7-189. USB Setting

Table 7-31. System Settings Screen

7.2.7 OPERATING MODE

The Operating Mode Settings screen offers comprehensive guidance on the system modes of the Mi-BEAM Series power supply. This model is engineered for versatile and reliable performance across various applications, ensuring precise and efficient power delivery through its advanced control features. Depending on user requirements, the Mi-BEAM Series supports multiple modes of operation. Refer to the Figure 7-190.

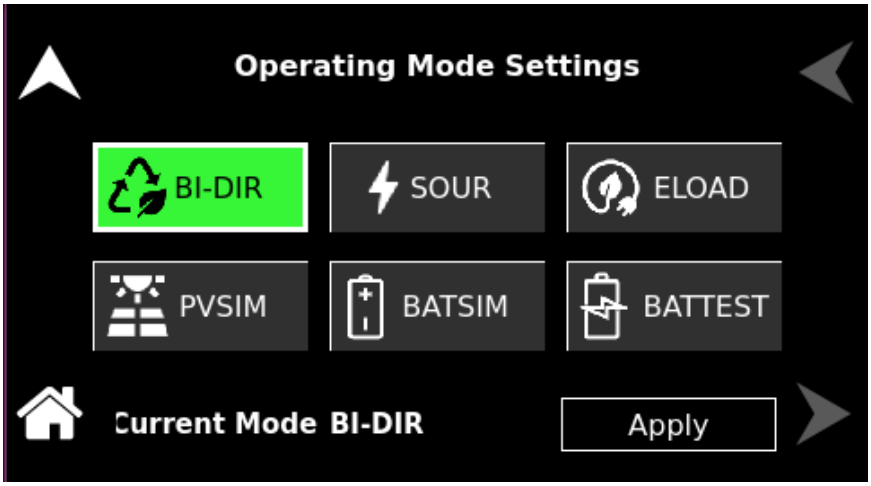


Figure 7-190. Operating Mode

7.2.8 SYSTEM SETTINGS SCREEN

The System Settings screen provides information on 'Hardware Limits', System Details', 'Firmware Version', 'LCD', 'Default Screen' and 'Factory Default'. The top-level menu of the System Settings menu is shown in Figure 7-191. Refer to Section 6.4.2.1 for navigating to System Settings Screen.

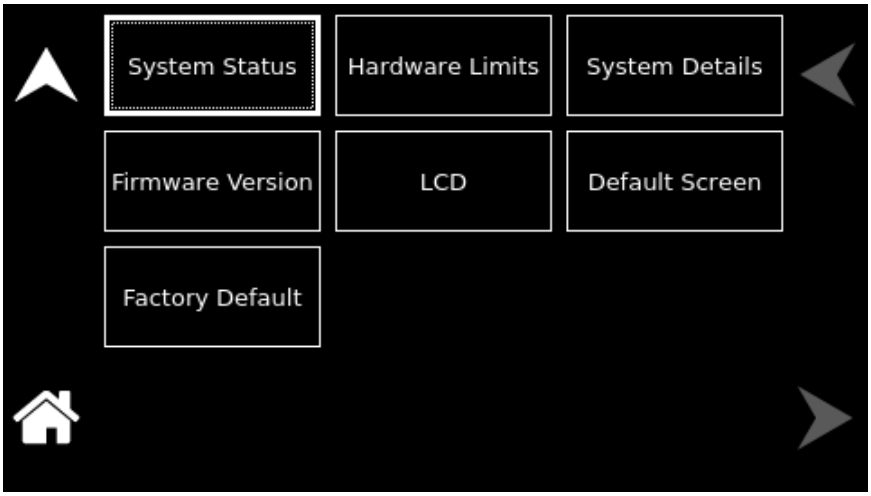


Figure 7-191. System Settings Screen

ENTRY	DESCRIPTION
System Status	Displays the present system status information of the power supply, including the Input Line, Output Sense, Isolation and No. of chassis. Refer to Figure 7-192.

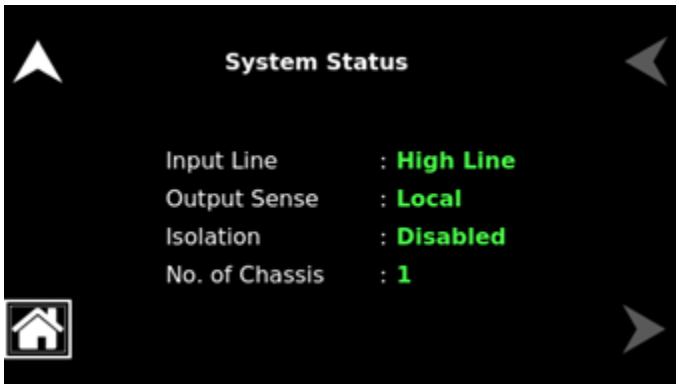


Figure 7-192. System Status

Hardware Limits Displays the hardware parameter limit values. Refer to Figure 7-193.

Figure 7-193. Hardware Limits

System Details Displays the information about the power supply, including the Manufacturer, Model Number, Serial Number, Firmware Version, Last Calibration Date, and Operating Mode. Refer to Figure 7-194.

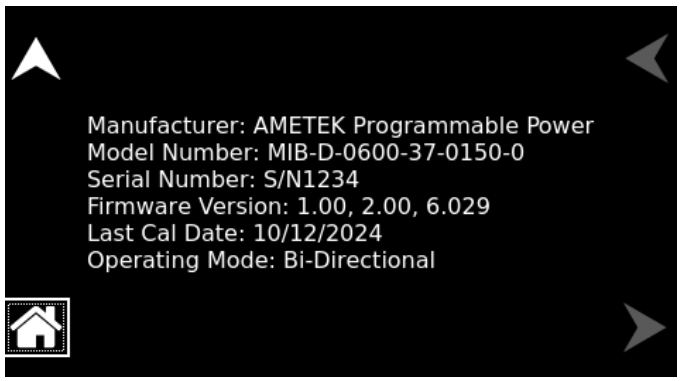


Figure 7-194. System Details

Firmware Version Displays information about the configuration of the power supply, including the Communication Controller, System Interface, Front Panel, Fan Controller, Mod 1 Primary Controller, Mod 1 Secondary Controller, Mod 2 Primary Controller, Mod 2 Secondary Controller, Mod 3 Primary Controller, Mod 3 Secondary Controller. This information helps

identify the unit. Refer to Figure 7-195.

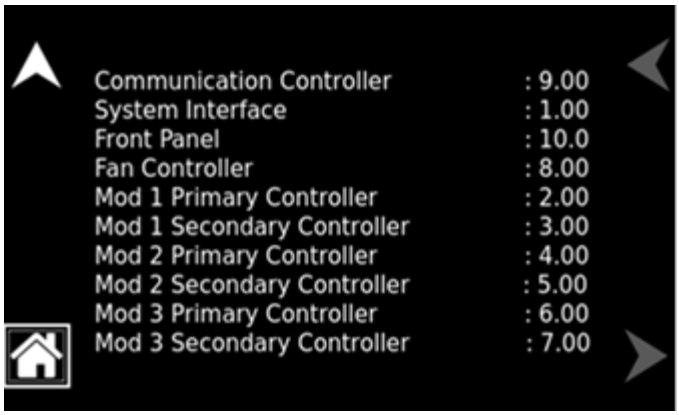


Figure 7-195. Firmware Version

LCD Provides settings for the calibration of the display touchscreen. Refer to Figure 7-196.

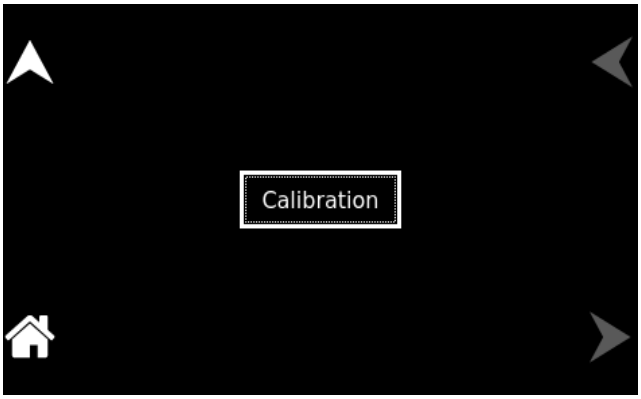


Figure 7-196. LCD

Default Screen Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 7-197 and Figure 7-198. It allows to set the time out if the default screen is enabled.

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

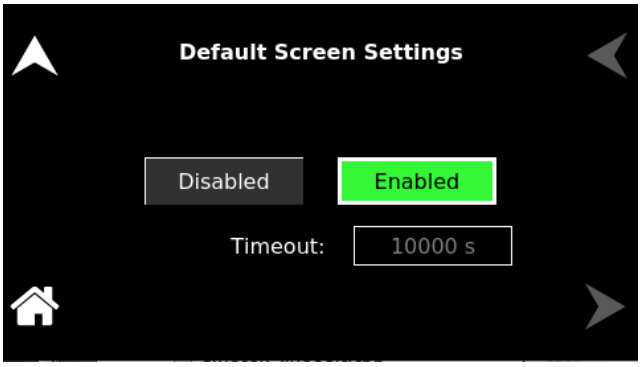


Figure 7-197. Default Screen Settings - Enabled

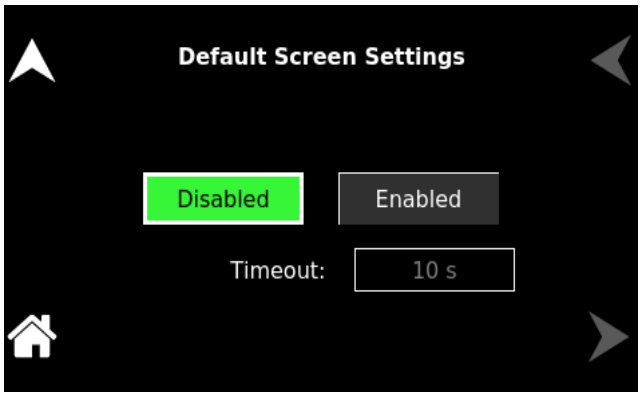


Figure 7-198. Default Screen Settings - Disabled

Factory Default Set the device to its original factory settings, as it was when it left the manufacturer. Refer to Figure 7-199.

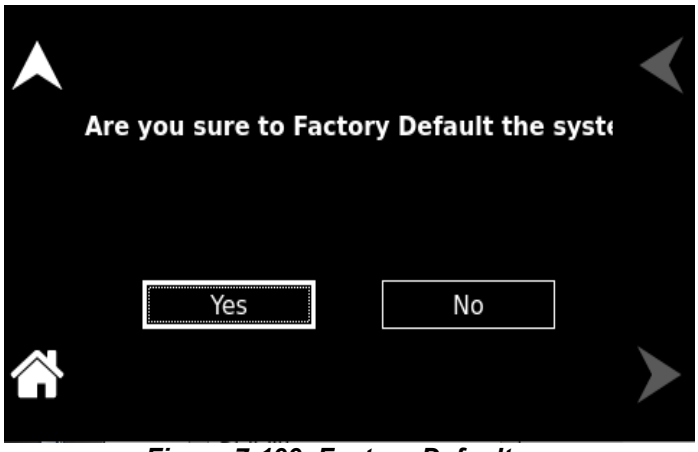


Figure 7-199. Factory Default

Table 7-32. System Settings Screen

7.2.9 SYSTEM FAULTS SCREEN

The System Faults screen provides descriptions of faults that have occurred in a power module. The fault screen appear if any supply fault conditions occur, refer to Figure 7-200. The user should press ‘Clear’ to clear the fault and continue the operations of the power supply and press the ‘Reload’ to refresh the system faults and check for errors. If no fault has occurred, the screen will show 'No Fault Occurred', refer to Figure 7-201.

NOTE: These conditions might resolve themselves; however, if they continue to occur after pressing 'Clear', refer to Chapter 14.

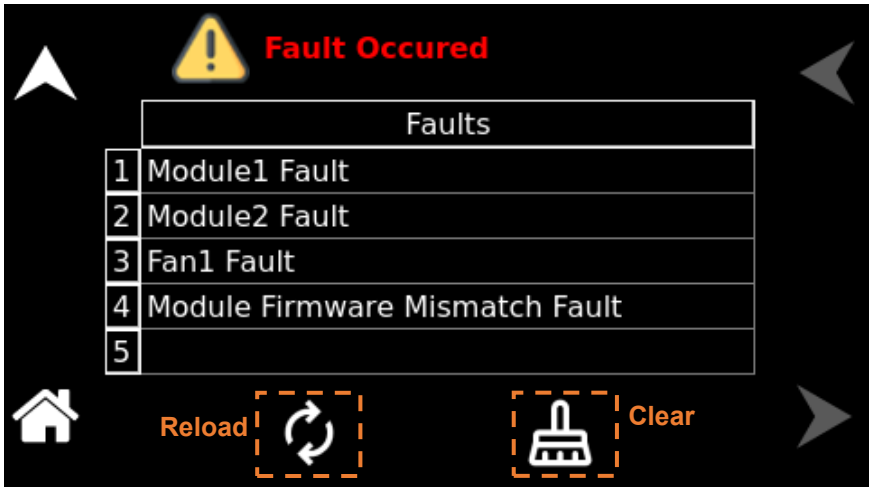


Figure 7-200. System Faults

Figure 7-201. No Fault Occurred Screen

7.3 PARALLEL OPERATION

Parallel mode of operation is used for applications that require more current or power than a single power supply can provide. To meet these higher output requirements, up to six power supplies can be connected in parallel, effectively combining their capacities to achieve the desired performance.

NOTE: Up to six units can be connected in parallel, contact factory to connect more than six units in parallel.

7.3.1 SETTING UP PARALLEL OPERATION

Each power supply has two separate 15-pin connectors on the upper left rear panel, labeled ‘PARALLEL INTERFACE IN’ and ‘PARALLEL INTERFACE OUT’. To connect power supplies in

parallel, use a ‘Leader’ or ‘Follower’ daisy-chain wiring configuration . Refer to Figure 7-202. For parallel cable information refer to Section 2.25.

a) Using an interface cable (P/N 890-015-01), connect the 'PARALLEL INTERFACE OUT' port of the Leader power supply to the 'PARALLEL INTERFACE IN' port of the second power supply (Follower 1).

NOTE: In parallel operation, the Leader unit manages all programming, readback, and control functions. Remote analog control is not supported in this mode.

NOTE: Units with the same model number are allowed to be connected in parallel.

b) On the second power supply (Follower 1), connect another interface cable from its 'PARALLEL INTERFACE OUT' port to the 'PARALLEL INTERFACE IN' port of the third power supply (Follower 2). Continue this daisy-chain connection for up to a maximum of six power supplies.

c) Connect the positive output terminals of all power supplies together, along with the positive terminal of the load.

d) Connect the negative output terminals of all power supplies together, along with the negative terminal of the load.

e) Ensure that there are no shorts between the Positive and Negative output terminals.

f) Ensure all cables are kept as short as possible and connect twisted-pair sense cables as follows.

- For remote sensing at the load, only the Leader unit should have a twisted-pair cable running from its sense terminals to the load terminals.

g) After all the successful connection, power ON all the follower units followed by leader.

NOTE: Doing Parallel operation for the first time, make sure to reset the power supply units by selecting ‘Factory default’ in ‘System Settings’ Screen. This step is essential to prevent setting conflicts caused by pre-existing PONS settings.

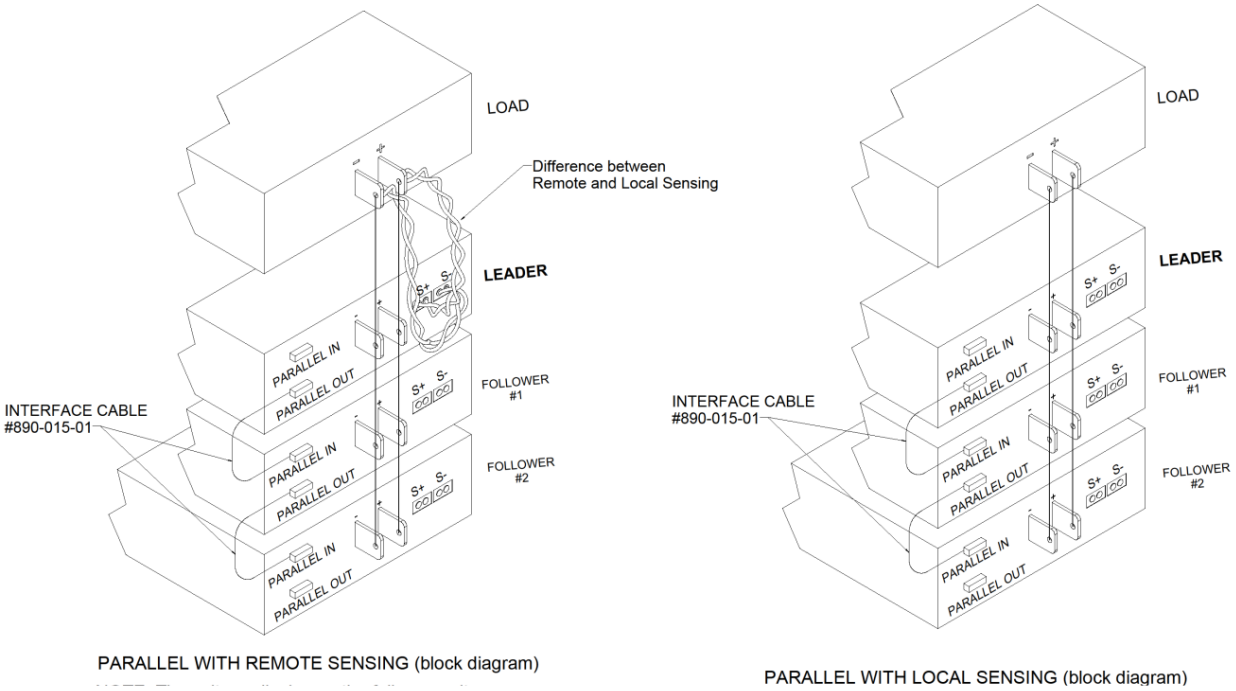


Figure 7-202. Parallel Connection

8 SOURCE MODE OPERATION

8.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION

8.1.1 IDENTIFY THE UUT PORT TYPE

Determine if the UUT port is a current type (e.g. DC-Charger output) or a voltage type (e.g. battery or any voltage source).

a) Current type – UUT regulates the current
b) Voltage type – UUT regulates the voltage

8.1.2 CONFIGURING MI-BEAM FOR CURRENT TYPE UUT

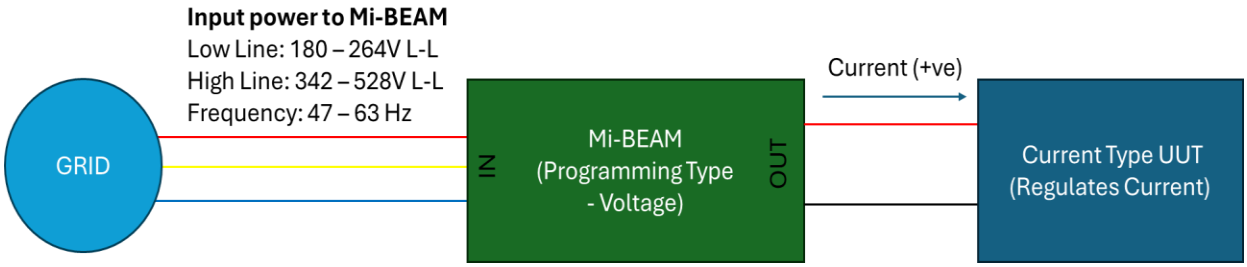


Figure 8-1. Current Type UUT

To configure the Current Type UUT, set the programming type (Prog. type) to 'Voltage' and select the appropriate regulation setting (CV/CC, CV Series Res, CV/CP, CP/CV and CV) in the dashboard. Refer to Section 8.2.1 for detailed instructions.

8.1.2.1 CONSTANT VOLTAGE/ CONSTANT CURRENT (CV/CC)

The power supply regulates the output voltage to the user-set value. On reaching the current limit (positive), the output is regulated to the current limit. On reaching the power limit (positive), the output voltage is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.2

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 8-95.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Positive Current limit will be used to perform foldback operation and Positive Power limit will be used to trip Mi-BEAM. Refer to section 8.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV/CC' are shown in Table 8-1.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
VOLT	CV/CC	YES	NA	NA	NA	NA	YES	NA	YES	NA	NA

Table 8-1. Applicable Options – CV/CC

- **Positive Current limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set current limit. This value must be set higher than the desired current which flows from Mi-BEAM to UUT. Refer to Figure 8-19.

- **Positive Power limit:** On measured power reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-20.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Positive Current Limit and Positive Power Limit) after the delay time configured. Refer to Figure 8-86.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 8-18.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-21.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 8.2.3.

h) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

8.1.2.2 CONSTANT VOLTAGE SERIES RESISTANCE (CV – SER RES)

The user can set the voltage and series resistance. The terminal voltage varies based on the voltage drop across the series resistance. On reaching the current limit (positive), power limit (positive), or voltage limit (low), the output voltage is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.4.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 8-95.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage Low Limit, Negative Current limit, Positive Current Limit, and Positive Power Limit will be used to trip Mi-BEAM. Refer to Section 8.2.2.2.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV-Ser. Res ' are shown in Table 8-2.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
VOLT	CV-SER RES	YES	NA	NA	NA	YES	YES	NA	YES	NA	YES

Table 8-2. Applicable Options – CV Ser. Res

- **Voltage Low Limit**: On measured voltage reaching this value output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-26.

- **Positive Power limit:** On measured power reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-27.

- **Positive Current limit:** On measured current reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 8-25.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage Low Limit, Positive Current Limit, and Positive Power Limit) after the delay time configured. Refer to Figure 8-86.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 8-23.

d) Series Resistance: Enter the series resistance value to control the voltage drop. Refer to Figure 8-24.

e) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

f) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-28.

g) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

h) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 8.2.3.

i) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

8.1.2.3 CONSTANT VOLTAGE/ CONSTANT POWER (CV/CP)

The power supply regulates the output voltage to the user-set value. If the power limit (positive) is reached, the output is regulated to the power limit. If the current limit (positive) is reached, the output voltage is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.2.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 8-95.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Positive Power limit will be used to perform foldback operation, and Positive Current Limit is used to trip the Mi-BEAM. Refer to Section 8.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV/CP' are shown in Table 8-3.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POWER SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
VOLT	CV/CP	YES	NA	NA	NA	NA	YES	NA	YES	NA	NA

Table 8-3. Applicable Options – CV/CP

- **Positive Power limit:** On measured power reaching this value Mi-BEAM will regulate the power at set power limit. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 8-20.

- **Positive Current limit:** On measured current reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 8-19.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Positive Power Limit and Positive Current Limit) after the delay time configured. Refer to Figure 8-86.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 8-23.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-24.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 8.2.3.

h) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

8.1.2.4 CONSTANT POWER/CONSTANT VOLTAGE (CP/CV)

The power supply regulates the output power to the user-set value. If the voltage limit (high or low) is reached, the output is regulated to the voltage limit. If the current limit (positive) is reached, the output power is programmed to zero and the output is turned OFF. Refer to section 8.2.1.6.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Power High Limit:** This setting limits the maximum power value that can be set in Mi-BEAM. Refer to Figure 8-95.

b) **Setting Limits:** The current and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage Low Limit, Voltage High Limit will be used to perform foldback operation, and Positive Current Limit is used to trip the Mi-BEAM. Refer to Section 8.2.2.3.

All applicable options based on the programming type 'Voltage' and regulation setting 'CP/CV' are shown in Table 8-4.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
VOLT	CP/CV	NA	NA	YES	YES	YES	YES	NA	NA	NA	NA

Table 8-4. Applicable Options – CP/CV

- **Voltage High Limit**: On measured voltage reaching this value Mi-BEAM will regulate the voltage at set Voltage High Limit. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-31.

- **Voltage Low Limit**: On measured voltage reaching this value Mi-BEAM will regulate the voltage at set Voltage Low Limit. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-32.

- **Positive Current limit:** On measured current reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 8-33.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage Low Limit, Positive Current Limit, and Positive Power Limit) after the delay time configured. Refer to Figure 8-86.

c) **Setting Power value:** Enter the power value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured protection limit. Refer to Figure 8-30.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-34.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 8.2.3.

h) **End the Test:** Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

8.1.2.5 CONSTANT VOLTAGE (CV)

The power supply regulates the output voltage to the user-set value. On reaching the current limit (positive) or power limit (positive), the output voltage is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.2.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Voltage User Limit:** This setting limits the maximum voltage value that can be set in Mi-BEAM. Refer to Figure 8-95.

b) **Setting Limits:** The current and power limits can be set from the ‘Output program’ screen. In this regulation setting, Positive Current limit and Positive Power limit will be used to trip Mi-BEAM. Refer to section 8.2.2.1.

   All applicable options based on the programming type 'Voltage' and regulation setting 'CV' are shown in Table 8-5.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
VOLT	CV	YES	NA	NA	NA	NA	YES	NA	YES -	NA	NA

Table 8-5. Applicable Options – CV

- **Positive Current Limit:** On measured current reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the current flown from Mi-BEAM to UUT. Refer to Figure 8-19.

- **Positive Power Limit:** On measured power reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-20.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Positive Current Limit and Positive Power Limit) after the delay time configured. Refer to Figure 8-86.

c) **Setting Voltage value:** Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 8-18.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-21.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 8.2.3.

h) **End the Test:** Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

8.1.3 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT

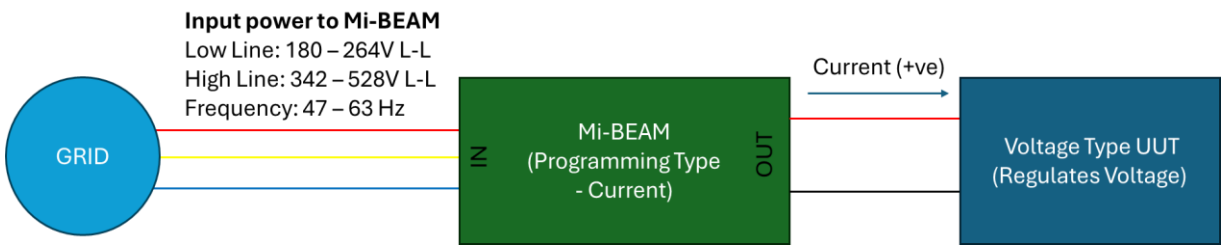


Figure 8-2. Voltage Type UUT

To configure the Voltage Type UUT, set the programming type (Prog. type) to ‘Current’ and select the appropriate regulation setting (CC/CV, CC/CP, CP/CC and CC) in the dashboard. Refer to Section 8.2.1 for detailed instructions.

8.1.3.1 CONSTANT CURRENT/CONSTANT VOLTAGE (CC/CV)

The power supply regulates the output current to the user-set value. On reaching the voltage limit (high or low), the output is regulated to the voltage limit. On reaching the power limit (positive), the output current is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.5.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Current User Limit:** This setting limits the maximum current value that can be set in Mi-BEAM. Refer to Figure 8-97.

b) Setting Limits: The voltage and power limits can be set from the ‘Output program’ screen. In this regulation setting, Voltage High Limit, Voltage Low Limit will be used to perform foldback operation and Positive Power limit will be used to trip Mi-BEAM. Refer to Section 8.2.2.4.

All applicable options based on the programming type 'Current' and regulation setting 'CC/CV' are shown in Table 8-6.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
CURR	CC/CV	NA	YES	NA	YES	YES	NA	NA	YES	NA	NA

Table 8-6. Applicable Options – CC/CV

- **Voltage High Limit:** On measured voltage reaching this value Mi-BEAM will regulate the voltage at set Voltage High Limit. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-37.

- **Voltage Low Limit**: On measured voltage reaching this value Mi-BEAM will regulate the voltage at set Voltage Low Limit. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-38.

- **Positive Power limit:** On measured power reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-39.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 8-88.

c) Setting Current value: Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OCP. Refer to Figure 8-36.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-40.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

8.1.3.2 CONSTANT CURRENT/CONSTANT POWER (CC/CP)

The power supply regulates the output current to the user-set value. If the power limit (positive) is reached, the output is regulated to the power limit. If the voltage limit (high or low) is reached, the output current is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.5.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Current User Limit:** This setting limits the maximum current value that can be set in Mi-BEAM. Refer to Figure 8-97.

b) Setting Limits: The current and power limits can be set from the ‘Output program’ screen. In this regulation setting, Positive Power Limit will be used to perform foldback operation and Voltage High Limit, Voltage Low Limit will be used to trip Mi-BEAM. Refer to Section 8.2.2.4.

All applicable options based on the programming type 'Current' and regulation setting 'CC/CP' are shown in Table 8-7.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
CURR	CC/CP	NA	YES	NA	YES	YES	NA	NA	YES	NA	NA

Table 8-7. Applicable Options – CC/CP

- **Voltage High Limit**: On measured voltage reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-37.

- **Voltage Low Limit**: On measured voltage reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-38.

- **Positive Power limit:** On measured power reaching this value Mi-BEAM will regulate the power at set Positive Power Limit. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-39.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 8-88.

c) Setting Current value: Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OCP. Refer to Figure 8-36.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-40.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

8.1.3.3 CONSTANT POWER/CONSTANT CURRENT (CP/CC)

The power supply regulates the output power to the user-set value. If the current limit (positive) is reached, the output is regulated to the current limit. If the voltage limit (high or low) is reached, the output power is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.6.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Power High User Limit:** This setting limits the maximum power value that can be set in Mi-BEAM. Refer to Figure 8-97.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Positive Power Limit will be used to perform foldback operation and Voltage High Limit, Voltage Low Limit will be used to trip Mi-BEAM. Refer to section 8.2.2.5.

All applicable options based on the programming type 'Current' and regulation setting 'CP/CC' are shown in Table 8-8.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
CURR	CP/CC	NA	NA	YES	YES	YES	YES	NA	NA	NA	NA

Table 8-8. Applicable Options – CP/CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-43.

- **Voltage Low Limit**: On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-44.

- **Positive Current Limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set current limit. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-45.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit, Negative Power Limit and Positive Power Limit) after the delay time configured. Refer to Figure 8-88.

c) **Setting Power value:** Enter the power value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured protection value. Refer to Figure 8-42.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-46.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded.

h) **End the Test:** Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

8.1.3.4 CONSTANT CURRENT (CC)

The power supply regulates the output current to the user-set value. On reaching the voltage limit (high or low) or power limit (positive), the output current is programmed to zero and the output is turned OFF. Refer to Section 8.2.1.5.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 8-93.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 8-93.

- **Current User Limit:** This setting limits the maximum current value that can be set in Mi-BEAM. Refer to Figure 8-97.

b) **Setting Limits**: The voltage and power limits can be set from the ‘Output program’ screen. In this regulation setting, Voltage high limit, Voltage low limit, Positive Power limit will be used to trip Mi-BEAM. Refer to section 8.2.2.4.

   All applicable options based on the programming type 'Current' and regulation setting 'CC' are shown in Table 8-9.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM	SERIES RES
CURR	CC	NA	YES	NA	YES	YES	NA	NA	YES	NA	NA

Table 8-9. Applicable Options – CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT Refer to Figure 8-37.

- **Voltage Low limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 8-38.

- **Positive Power limit:** On measured power reaching this value output of the Mi-BEAM will be turned OFF. This value must be set higher than the power flown from Mi-BEAM to UUT. Refer to Figure 8-39.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage high limit, Voltage Low Limit and Positive Power Limit) after the delay time configured. Refer to Figure 8-88.

c) Setting Current value: Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OCP. Refer to Figure 8-36.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 8-40.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

8.2 FRONT PANEL OPERATION

This chapter provides detailed information on the front panel operation in Source mode. Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder. Refer to Figure 8-3.

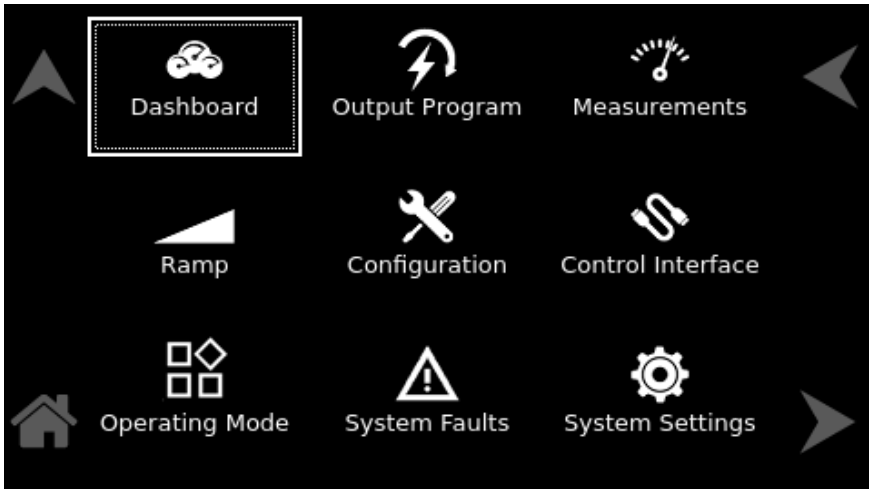


Figure 8-3. Home Screen Top-Level Menu

8.2.1 DASHBOARD SCREEN TOP-LEVEL MENU

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

8.2.1.1 CONFIGURING PROGRAMMING TYPE AND REGULATION SETTINGS

The Regulation Settings Menu allows users to configure the ‘Prog. Type’ (Programming Type) and ‘Regulation Settings’ of the Mi-beam power supply. Refer to Figure 8-4 and Figure 8-5.

The ‘Reg. Setting’ function on the Dashboard Screen enables users to switch between ‘Voltage (CV/CC, CV-Ser. Res, CV/CP, CP/CV and CV) ’ and ‘Current (CC/CV, CP/CC, CC/CP and CC)’ Regulation settings. Refer to Figure 8-6 to Figure 8-14 and Table 8-10 to Table 8-19.

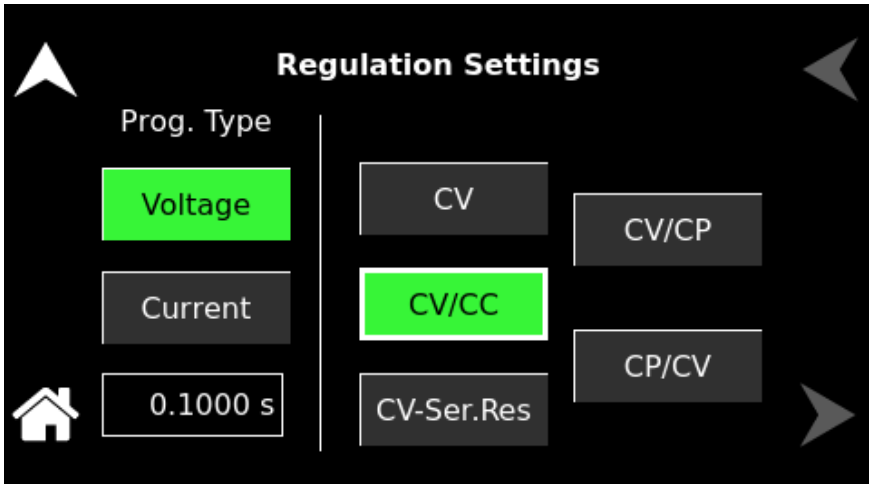


Figure 8-4. Regulation Settings – Voltage

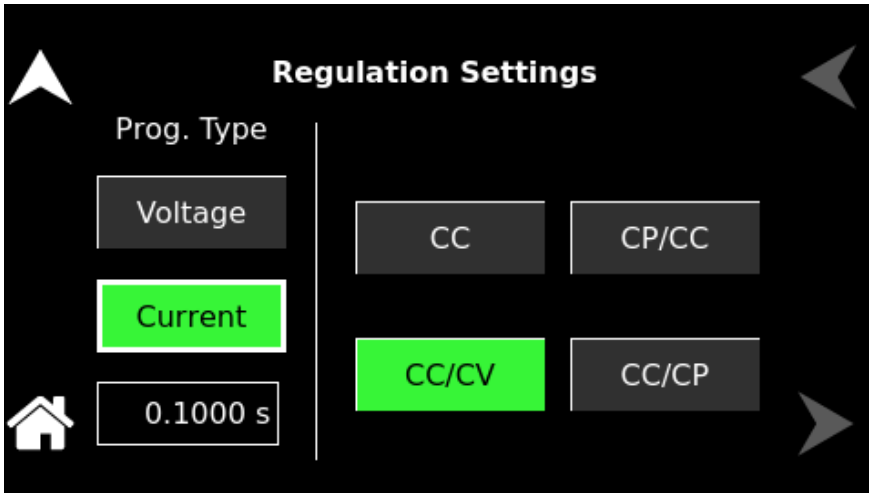


Figure 8-5. Regulation Settings – Current

8.2.1.2 VOLTAGE PROGRAMMING TYPE CV, CV/CC AND CV/CP REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CV/CC Regulation setting is shown in Figure 8-6,
b) Voltage - CV/CP Regulation setting is shown in Figure 8-7,
c) Voltage - CV Regulation setting is shown in Figure 8-8,

Refer to Section 6.4.2.1 for navigating to the Dashboard Screen.

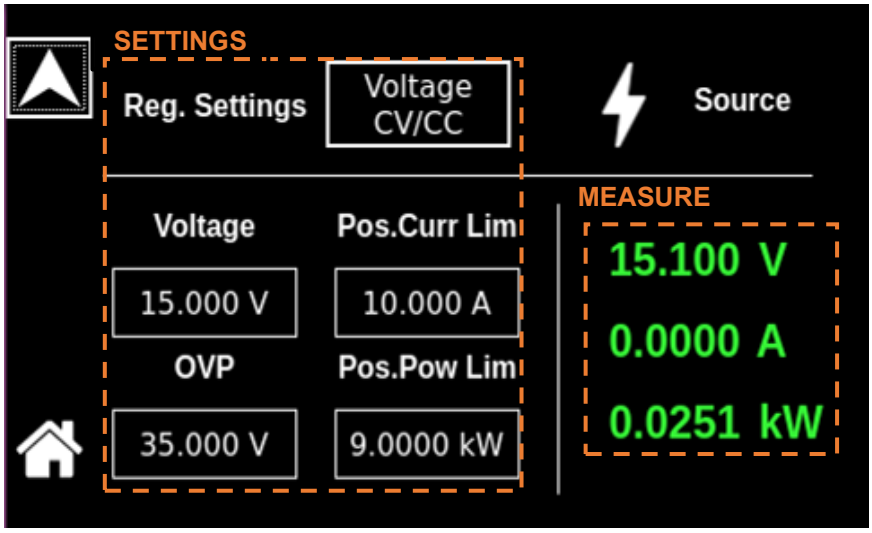


Figure 8-6. Dashboard Screen in Voltage CV/CC Regulation setting

Figure 8-7. Dashboard Screen in Voltage CV/CP Regulation setting

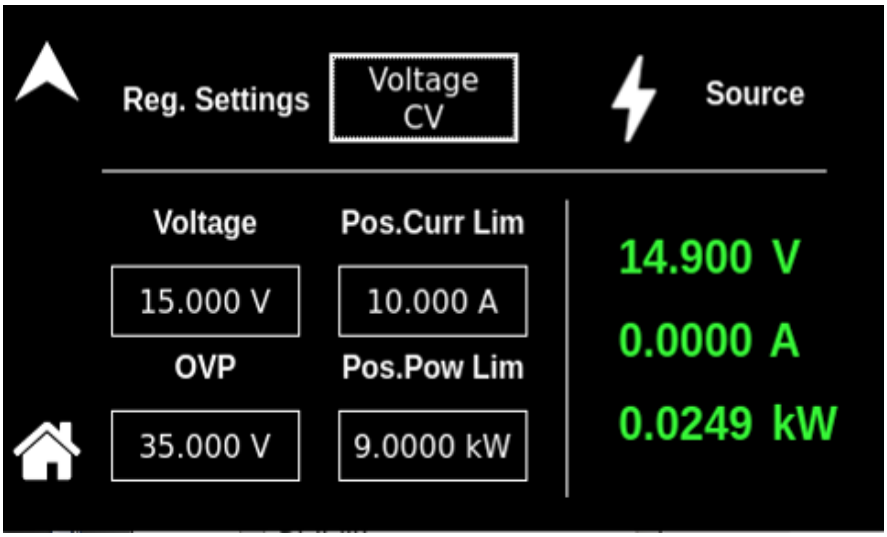


Figure 8-8. Dashboard Screen in Voltage CV Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CV/CC', 'CV/CP' and 'CV' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 8-85. **a) Voltage - Constant Voltage/Constant Current (CV/CC):** The output voltage is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the current limit reached. On reaching the power limit (positive), the output voltage would be programmed to zero. **b) Voltage - Constant Voltage/Constant Current (CV/CP):** The output voltage is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the power limit reached. On reaching the current limit (positive), the output voltage would be programmed to zero. **c) Voltage - Constant Voltage (CV):** The output voltage is regulated to the user set value. On reaching the set current limit (positive) or power limit (positive), the output voltage would be programmed to zero.
Voltage	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	In CV and CV/CP regulation setting, this acts as a trip limit. In CV/CC regulation setting, on reaching this set value the output would be regulated to the Pos. Curr Lim. Real-time setting is possible using the rotary encoder.

SETTINGS	DESCRIPTION
Pos. Pow Lim	In CV and CV/CC regulation setting, this acts as a trip limit. In CV/CP regulation setting, on reaching this set value the output would be regulated to the Pos. Pow Lim. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 8-10. Dashboard screen top-level menu Voltage CV and CV/CC

8.2.1.3 VOLTAGE PROGRAMMING TYPE CP/CV REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CP/CV is shown in Figure 8-9,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

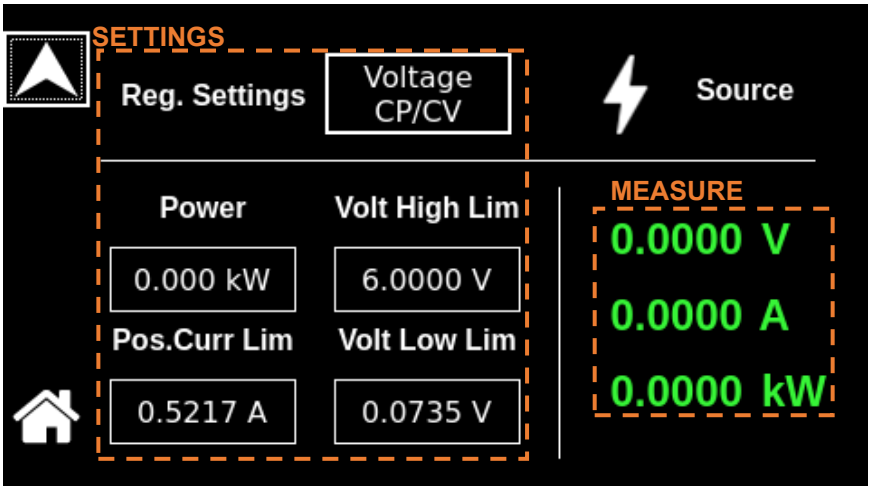


Figure 8-9. Dashboard Screen in Voltage CP/CV Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of ‘Voltage’ Programming type ‘CP/CV’ Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 8-85. **a) Voltage - Constant Power/Constant Voltage (CP/CV):** The output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (positive), the output power would be programmed to zero.
Power	Programs the output power of the supply in watts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	Programs the output positive current limit and this setting acts as a trip limit. Real-time setting is possible using the rotary encoder.
Volt High Lim	Regulates the output upon reaching the Volt High Lim. Real-time setting is possible using the rotary encoder.
Volt Low Lim	Regulates the output upon reaching the Volt Low Lim. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 8-11. Dashboard screen top-level menu Voltage CP/CV

8.2.1.4 VOLTAGE PROGRAMMING TYPE CV-SER. RES REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CV-Ser. Res is shown in Figure 8-10,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

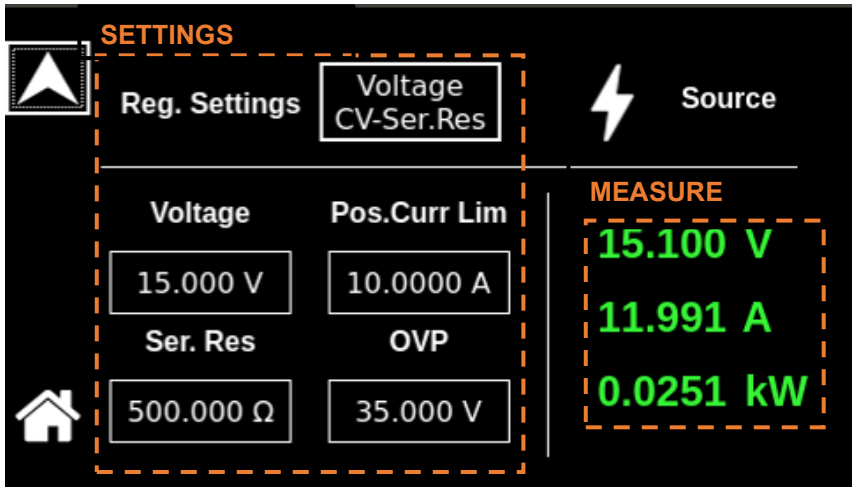


Figure 8-10. Dashboard Screen in CV-Ser. Res Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CV-Ser. Res' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 8-85. **a) Voltage - Constant Voltage Series Resistance (CV – Ser Res):** The user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive) or power limit (positive) or voltage limit (low), the output voltage is programmed to zero.
Voltage	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	Programs the output positive current limit in amps and this setting acts as a trip limit. Real-time setting is possible using the rotary encoder.
Ser. Res	Programs the series resistance in ohms. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 8-12. Dashboard screen top-level menu- CV-Ser. Res Mode

8.2.1.5 CURRENT PROGRAMMING TYPE CC, CC/CV AND CC/CP REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current - CC/CV Regulation setting is shown in Figure 8-11,
b) Current - CC/CP Regulation setting is shown in Figure 8-12,
c) Current - CC Regulation setting is shown in Figure 8-13

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

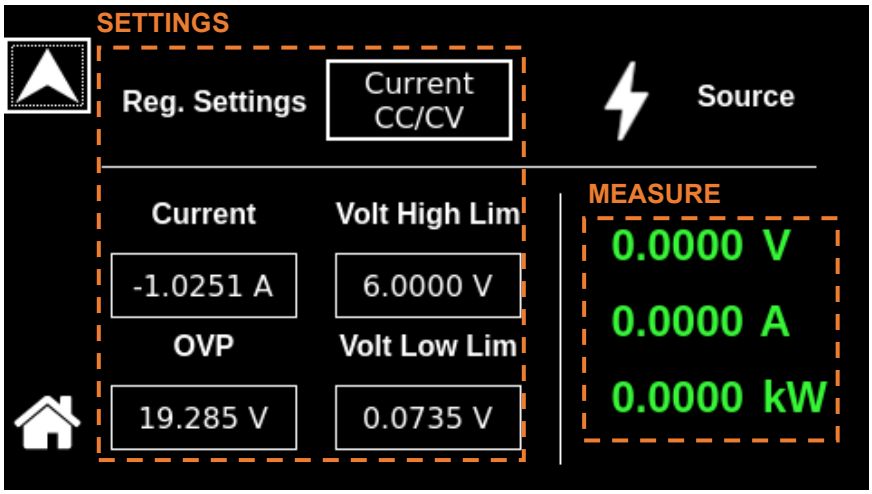


Figure 8-11. Dashboard Screen in Current CC/CV Regulation setting

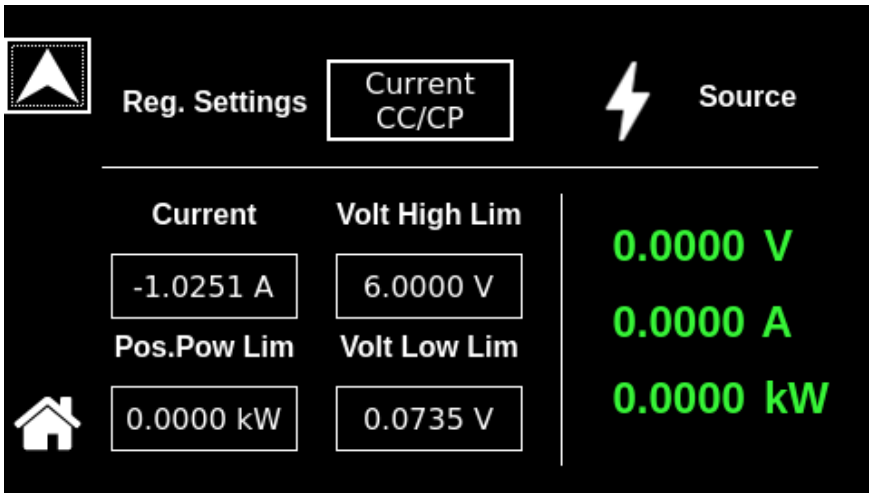


Figure 8-12. Dashboard Screen in Current CC/CP Regulation setting

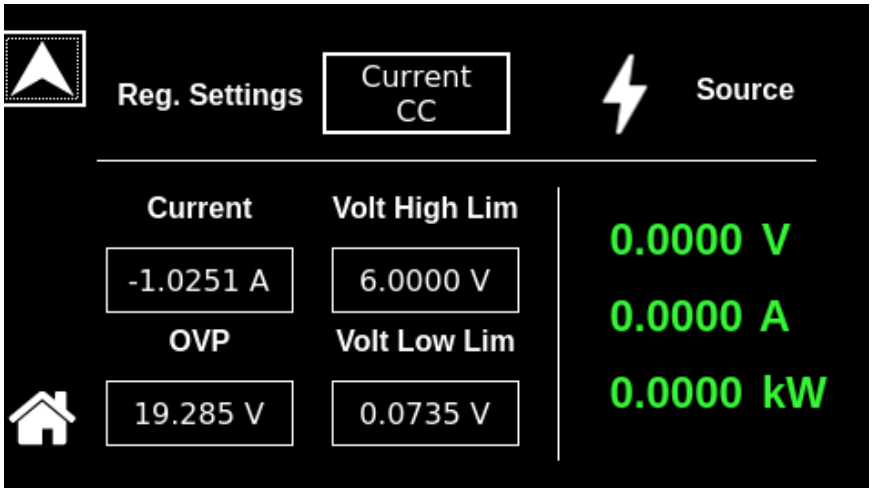


Figure 8-13. Dashboard Screen in Current CC Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type 'CC/CV', 'CC/CP' and 'CC' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 8-87. **a) Current - Constant Current/Constant Voltage (CC/CV):** The output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (positive), the output current would be programmed to zero. **b) Current - Constant Current/Constant Power (CC/CP):** The output current is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero. **c) Current - Constant Current (CC):** The output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive), the output current would be programmed to zero.
Current	Programs the output current in amps. Real-time setting is possible using the rotary encoder.
Pos. Pow Lim	In CC and CC/CV Regulation Setting, this functions as a trip limit. In CC/CP Regulation Setting, on reaching this set value the output would be regulated to the Pos. Pow Lim. Real-time setting is possible using the rotary encoder.
Volt High Lim	In CC and CC/CP Regulation Setting, this functions as a trip limit. In CC/CV Regulation Setting, it regulates the output upon reaching the Volt High Lim. Real-time setting is possible using the rotary encoder.
Volt Low Lim	In CC and CC/CP Regulation Setting, this functions as a trip limit. In CC/CV Regulation mode, it regulates the output upon reaching the Volt Low Lim. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 8-13. Dashboard screen top-level menu – CC, CC/CV and CC/CP

8.2.1.6 CURRENT PROGRAMMING TYPE CP/CC REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current - CP/CC Regulation setting is shown in Figure 8-14,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

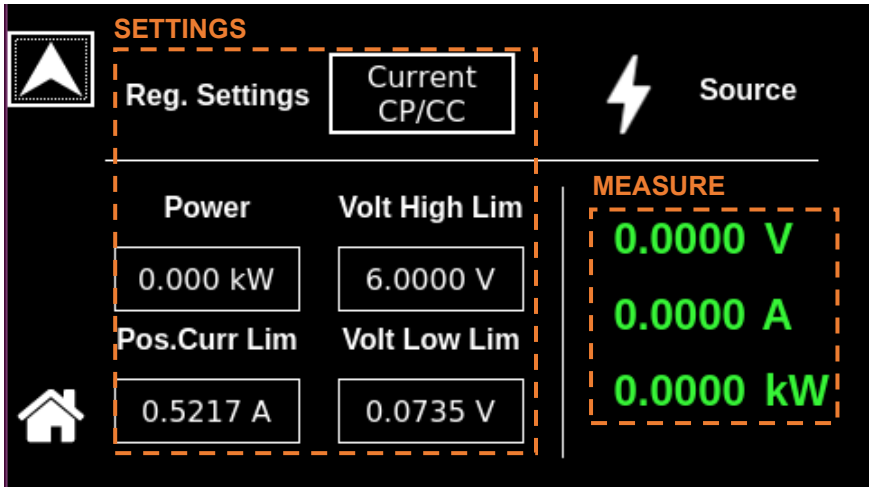


Figure 8-14. Dashboard Screen in Current CP/CC Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type 'CP/CC' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 8-41. **a) Current - Constant Power/Constant Current (CP/CC):** The output power is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
Power	Programs the output power of the supply in watts. Real-time setting is possible using the rotary encoder.
Pos. Curr Lim	Programs the output positive current limit in amps and upon reaching this set value the output would be regulated to the Pos. Curr Lim. Real-time setting is possible using the rotary encoder.
Volt High Lim	Programs the voltage high limit and this setting acts as a trip limit. Real-time setting is possible using the rotary encoder.
Volt Low Lim	Programs the voltage low limit and this setting acts as a trip limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 8-14. Dashboard screen top-level menu – CP/CC

8.2.1.7 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 8-15. 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.

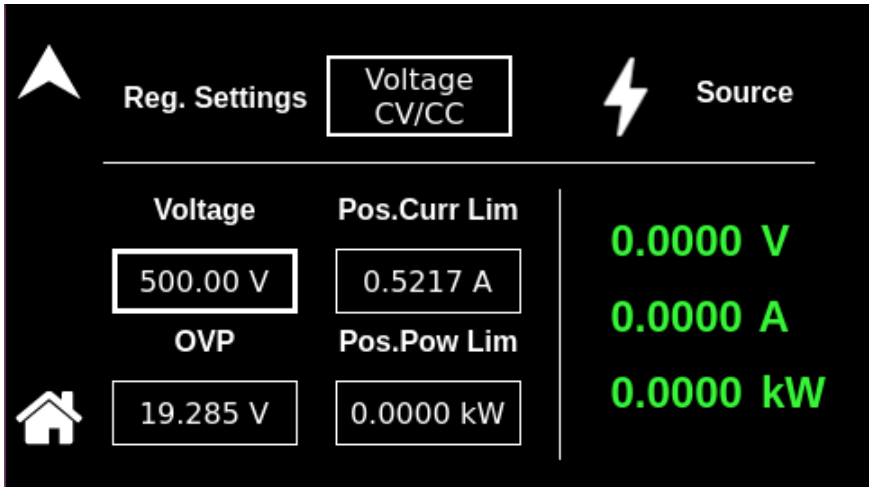


Figure 8-15. Real-Time, Immediate Output Parameter Adjustment

8.2.1.8 DEFAULT SCREEN

The Default screen provides measurement of the DC output ‘Voltage’, ‘Current’ and ‘Power’, refer to Figure 8-16. When the Dashboard screen is idle for an interval equal to a set time delay, refer to Figure 8-200 and Figure 8-201. The display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen.

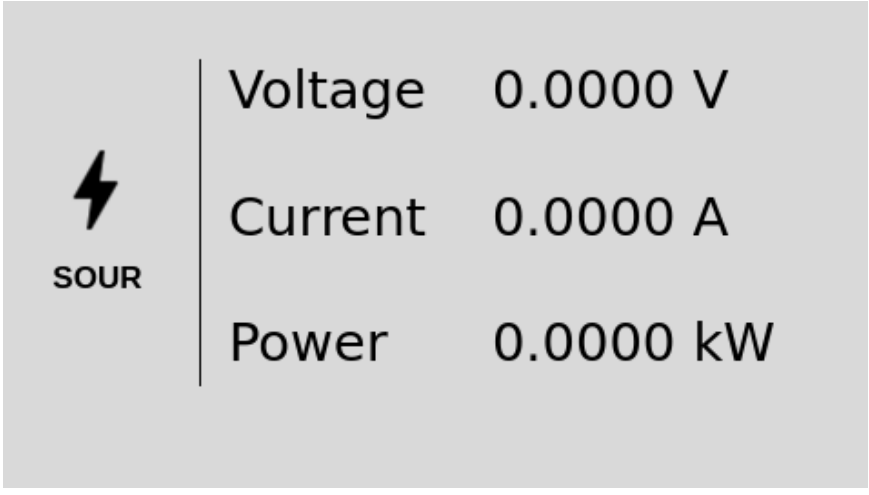


Figure 8-16. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage, current and power in various modes of operation.

8.2.2 OUTPUT PROGRAM SCREEN

The settings in the output program screen will change based on the Programming type and Regulation setting configured. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

8.2.2.1 CV/CC, CV/CP AND CV MODE

The Output Program screen provides settings of 'Voltage', 'Positive Current Limit', 'Positive Power Limit', and 'Output State'. Refer to Figure 8-17.

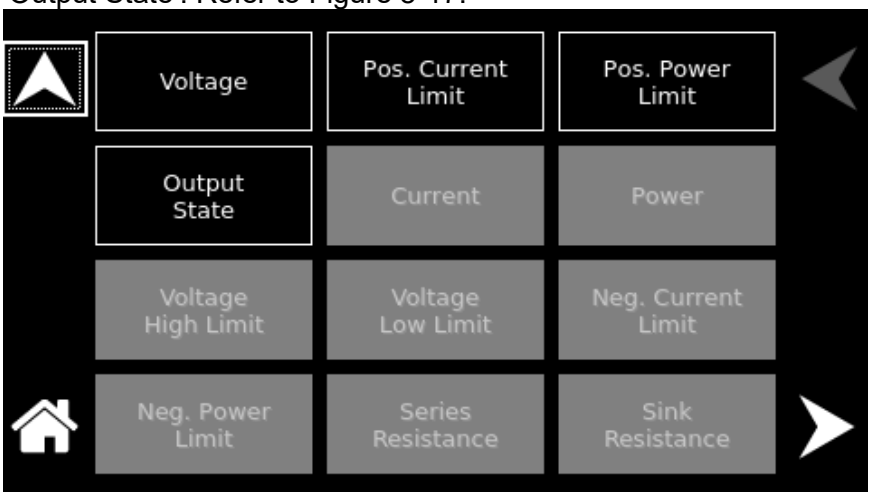


Figure 8-17. Output Program Screen of CV/CC, CV/CP and CV mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CV/CC, CV/CP and CV mode includes the following functions:

ENTRY	DESCRIPTION
Voltage	Users can set a Voltage value within the specified limit. Refer to Figure 8-18.

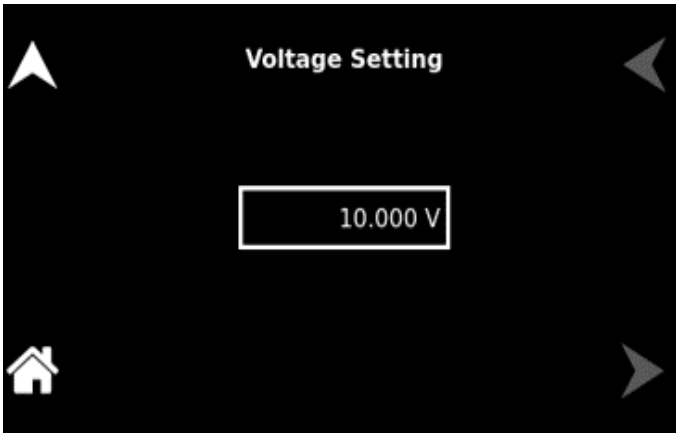


Figure 8-18. Voltage setting screen

ENTRY	DESCRIPTION
Pos. Current Limit	Users can set a positive current limit value, which functions as trip limit (CV and CV/CP), or it regulates (CV/CC) the output upon reaching the Positive Current Limit. Refer to Figure 8-19.

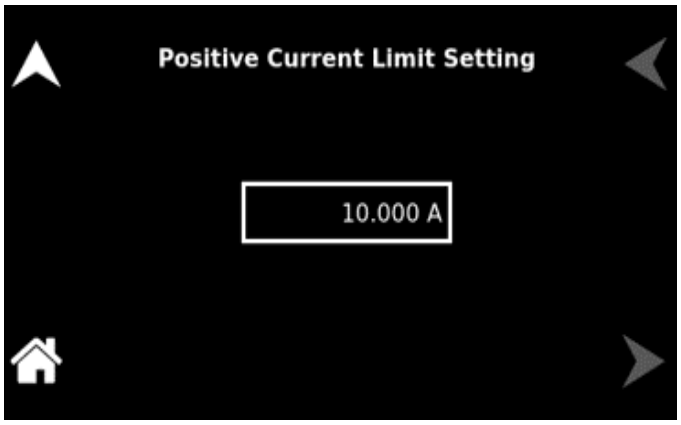


Figure 8-19. Positive Current limit setting screen

Pos. Power Limit	User can set a positive power limit value, which functions as a trip limit (CV and CV/CC), or it regulates (CV/CP) the output upon reaching the Positive power Limit. Refer to Figure 8-20.

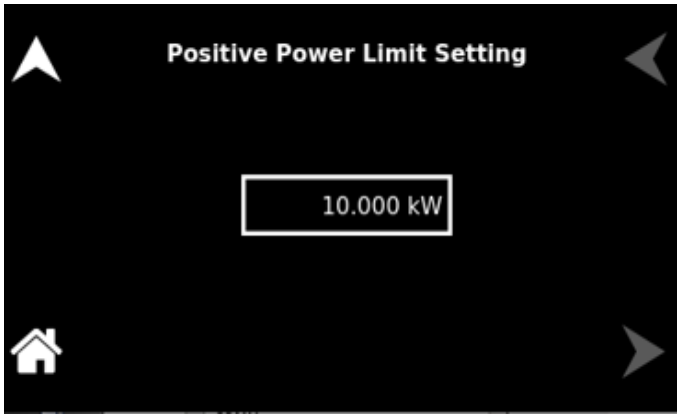


Figure 8-20. Positive Power limit setting screen

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 8-21.

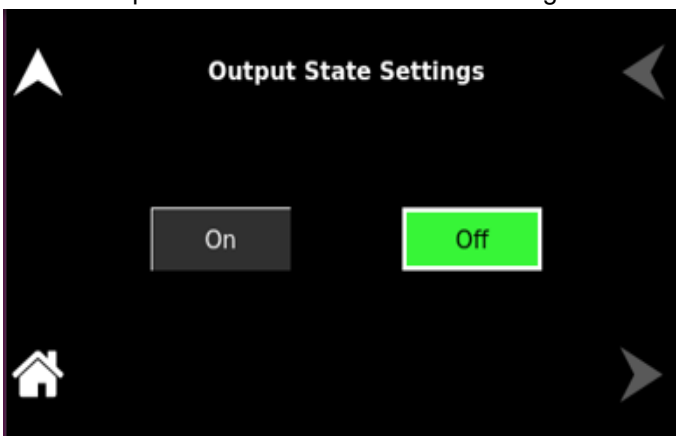


Figure 8-21. Output State Settings

Table 8-15. Output Program Settings in CV/CC, CV/CP and CV Mode

8.2.2.2 CV SER. RES MODE

The Output Program screen provides settings of 'Voltage', 'Series Resistance', 'Positive Current Limit', 'Voltage Low Limit', 'Positive Power Limit', and 'Output State'. Refer to Figure 8-22.

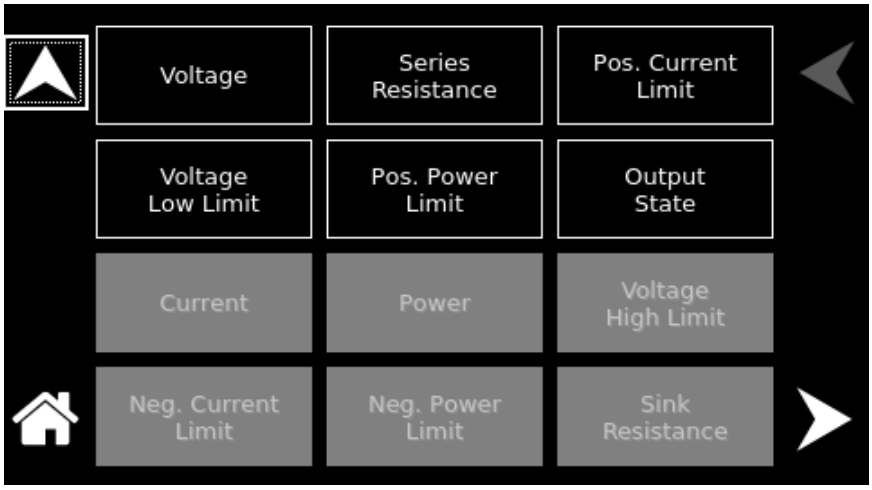


Figure 8-22. Output Program Screen of CV Ser. Res mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CV Ser. Res mode includes the following functions:

ENTRY	DESCRIPTION
Voltage	Users can set a voltage value within the specified limit. Refer to Figure 8-23.

ENTRY	DESCRIPTION

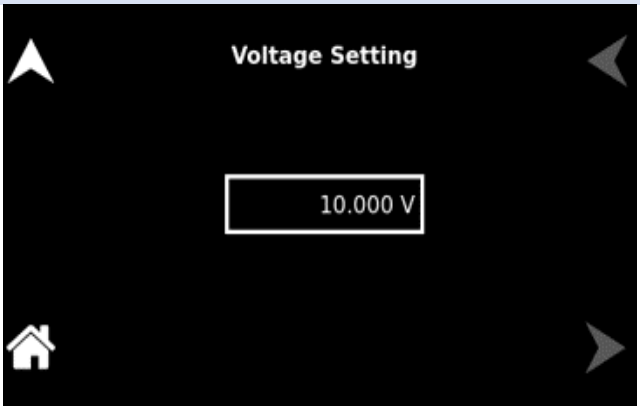


Figure 8-23. Voltage Setting

Series Resistance Users can set the series resistance value within the specified limit. Refer to Figure 8-24.

Figure 8-24. Series Resistance Setting

Pos. Current Limit Users can set a positive current limit value and this functions as a trip limit. Refer to Figure 8-25.

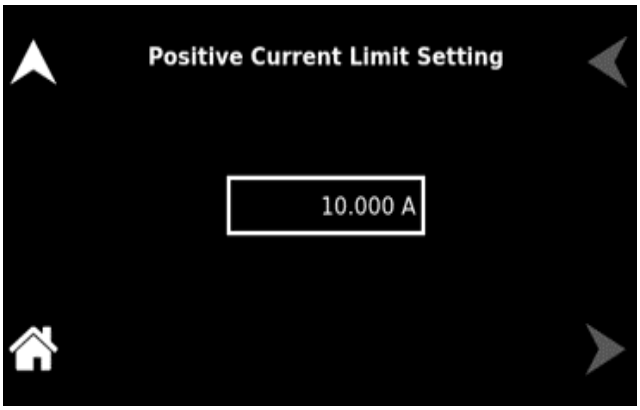


Figure 8-25. Positive Current Limit

Voltage Low Limit Users can set the voltage low limit value, and it regulates upon reaching the Voltage Low Limit. Refer to Figure 8-26.

ENTRY	DESCRIPTION

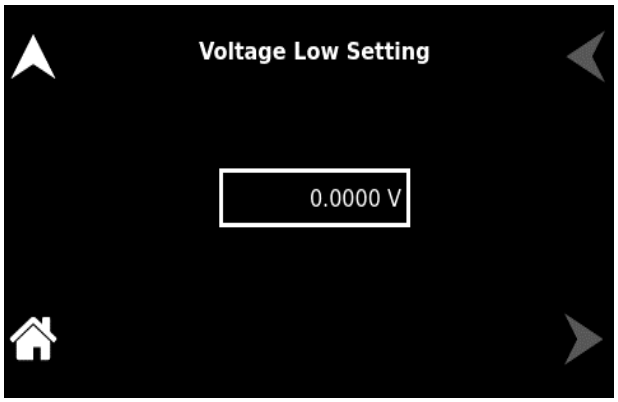


Figure 8-26. Voltage Low Setting

Pos. Power Limit Users can set a positive power limit value, and which functions as a trip limit. Refer to Figure 8-27.

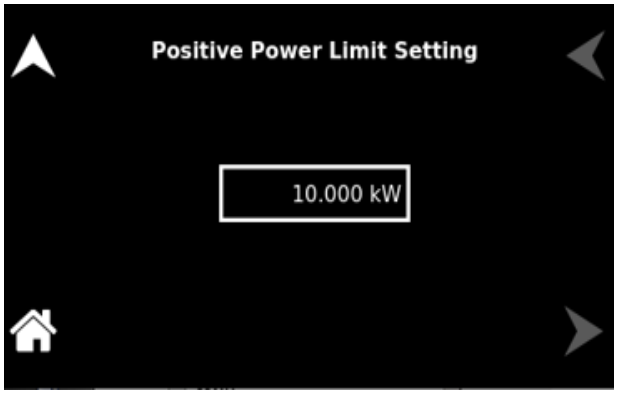


Figure 8-27. Positive Power Limit

Output State Users can program the output to ON or OFF state. Refer to Figure 8-28.

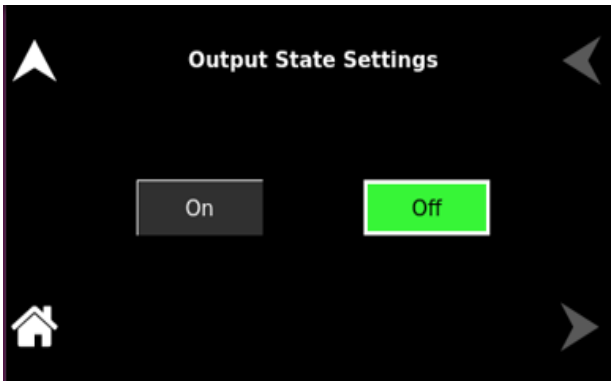


Figure 8-28. Output State

Table 8-16. Output Program Settings in CV Ser. Res Mode

8.2.2.3 CP/CV MODE

The Output Program screen provides the settings of ‘Power’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Positive Current Limit’, and ‘Output State’. Refer to Figure 8-29.

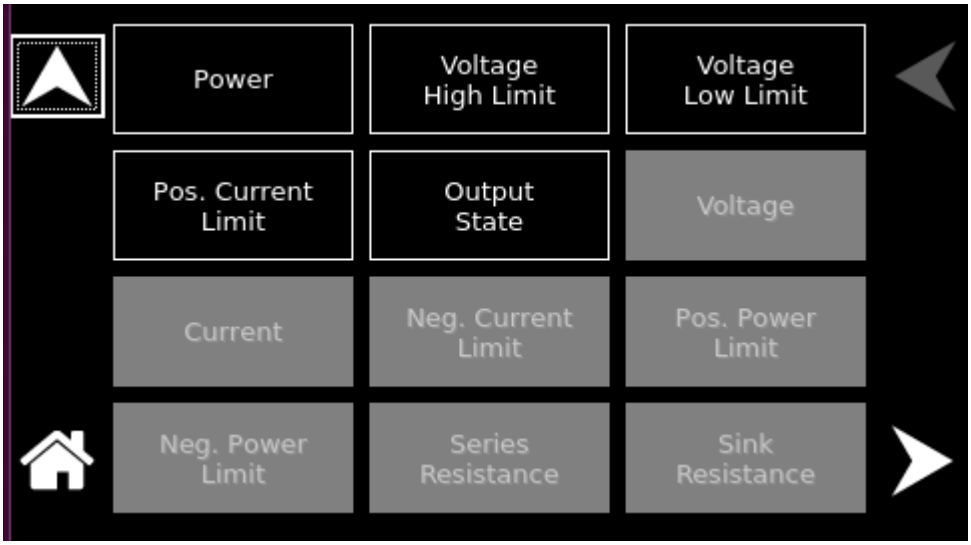


Figure 8-29. Output Program Screen of CP/CV mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CP/CV mode includes the following functions:

ENTRY	DESCRIPTION
Power	Users can set a power value within the specified limit. Refer to Figure 8-30.
Voltage High Limit	Users can set the voltage high limit value, and it regulates the output upon reaching the Voltage High Limit. Refer to Figure 8-31.

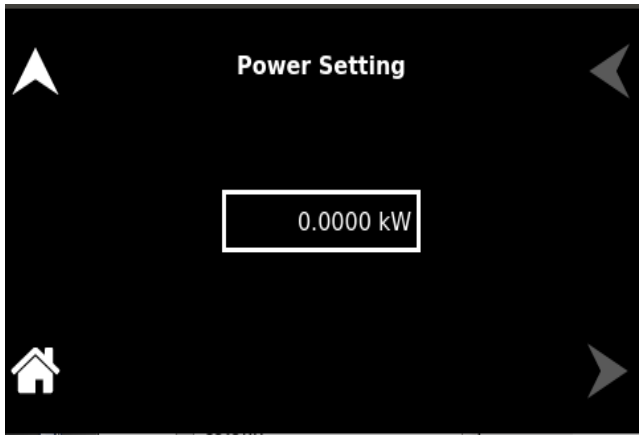


Figure 8-30. Power Settings

ENTRY	DESCRIPTION

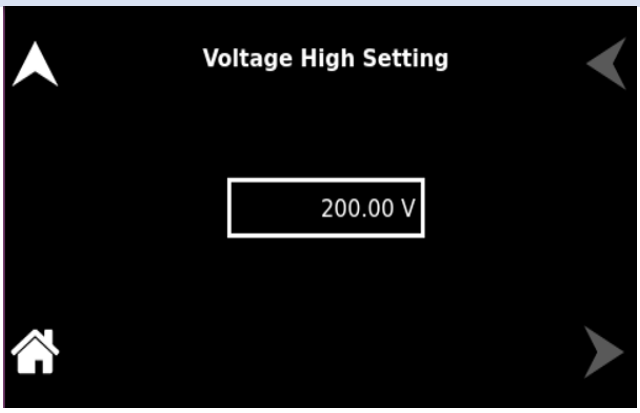


Figure 8-31. Volt High Setting

Voltage Low Limit

Users can set the voltage high limit value, and it regulates the output upon reaching the Voltage Low Limit. Refer to Figure 8-32.

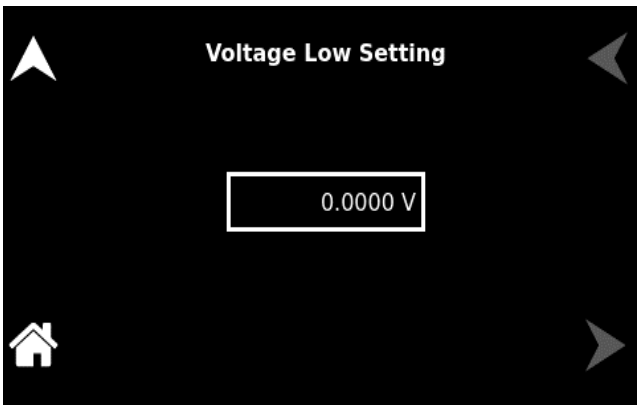


Figure 8-32. Voltage Low Setting

Pos. Current Limit

Users can set a Positive Current limit value, and this functions as a trip limit. Refer to Figure 8-33.

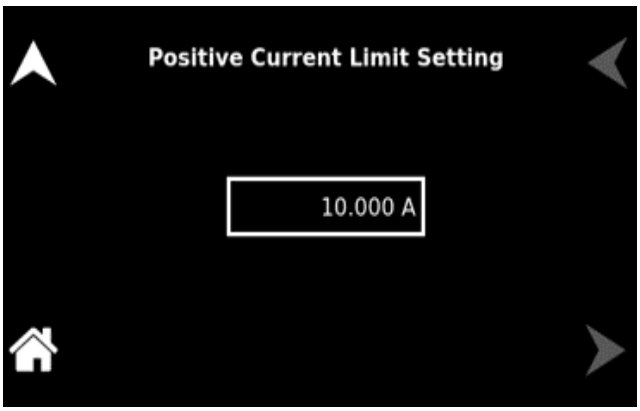


Figure 8-33. Pos. Current Limit Setting

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 8-34.

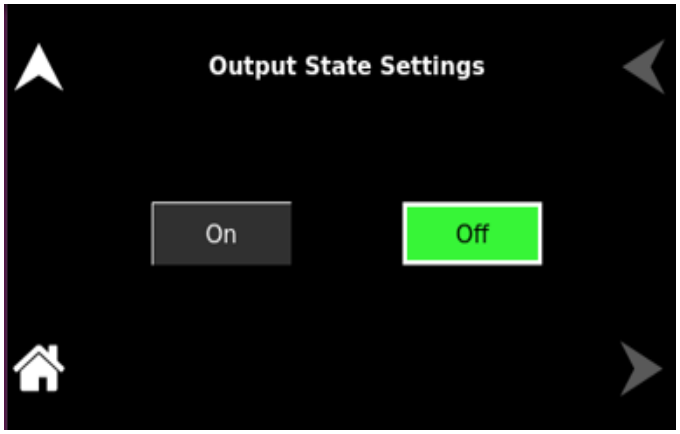


Figure 8-34. Output State

Table 8-17. Output Program Settings in CP/CV

8.2.2.4 CC/CV, CC/CP AND CC MODE

The Output Program screen provides the settings of 'Current', 'Voltage High Limit', 'Voltage Low Limit', 'Positive Power Limit', and 'Output State'. Refer to Figure 8-35.

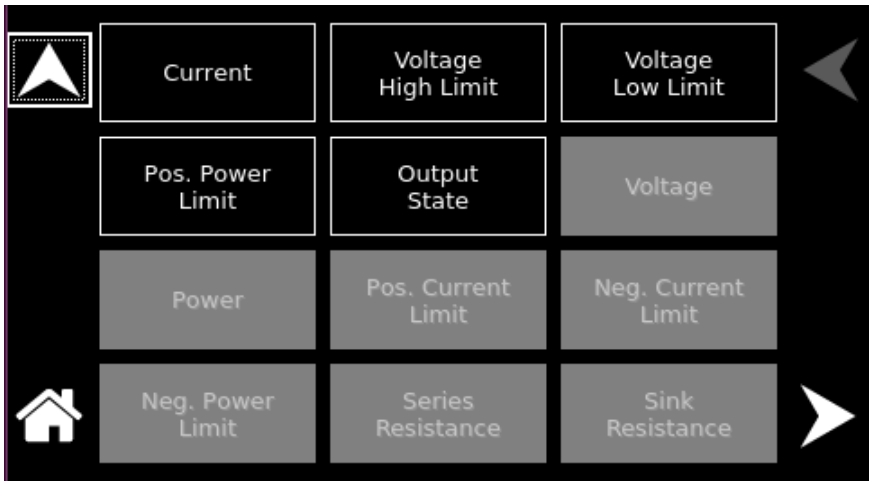


Figure 8-35. Output Program Screen of CC/CV,CC/CP and CC mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CC/CV, CC/CP and CC mode includes the following functions:

ENTRY	DESCRIPTION
Current	Users can set the Current value within the specified limit. Refer to Figure 8-36.

ENTRY	DESCRIPTION

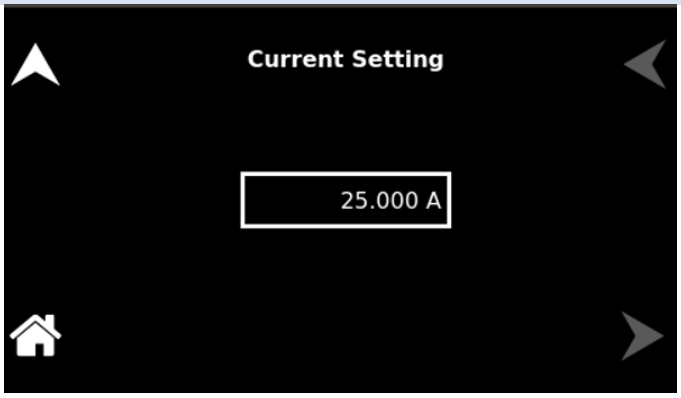


Figure 8-36. Current Setting

Voltage High Limit

Users can set a Volt high limit value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the Voltage High Limit. Refer to Figure 8-37.

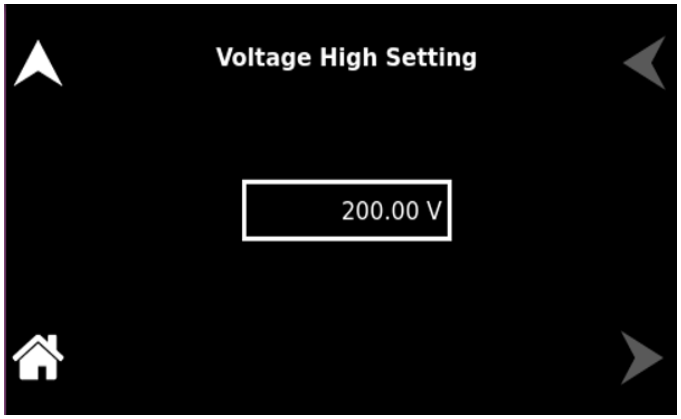


Figure 8-37. Voltage High Setting

Voltage Low Limit

Users can set a Volt low limit value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the Voltage Low Limit. Refer to Figure 8-38.

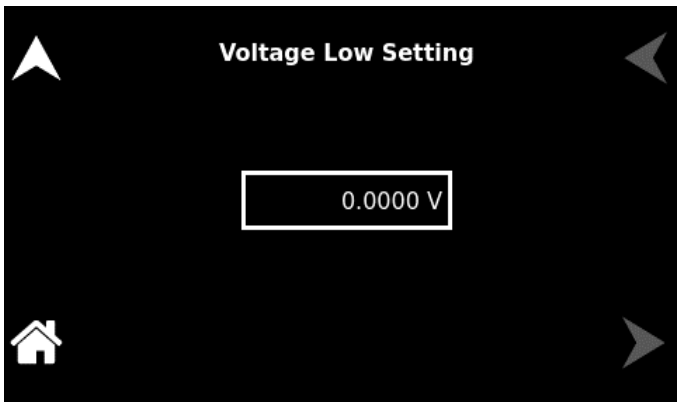


Figure 8-38. Voltage Low Settings

ENTRY	DESCRIPTION
Pos. Power Limit	Users can set a Positive Power limit value, which functions as a trip limit (CC and CC/CV), or it regulates (CV/CP) the output upon reaching the Positive Power Limit. Refer to Figure 8-39.

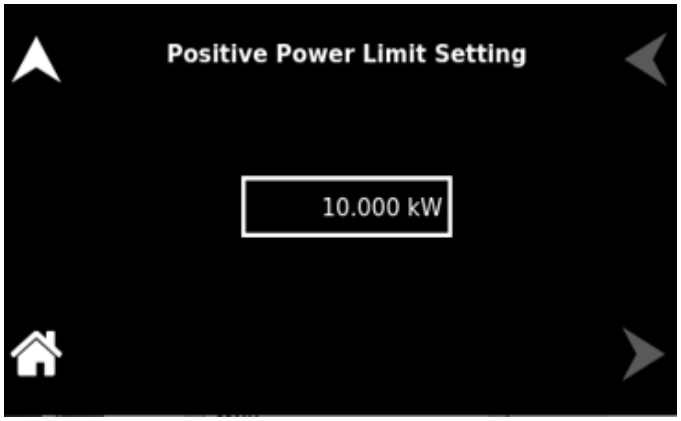


Figure 8-39. Positive Power Limit

Output State	Users can program the output to ON or OFF state. Refer to Figure 8-40.

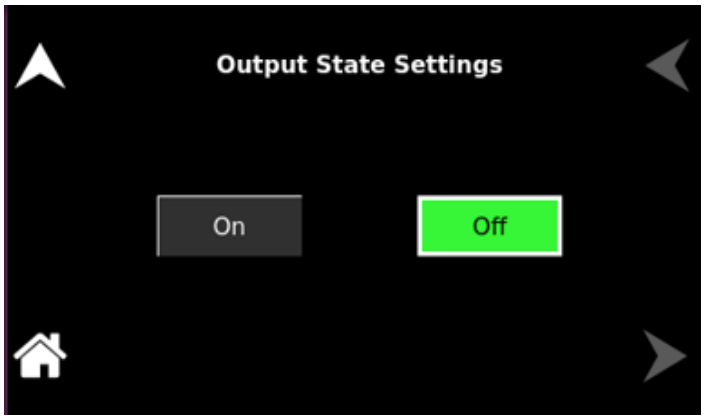


Figure 8-40. Output State Settings

Table 8-18. Output Program Settings in CC/CV, CC/CP and CC mode

8.2.2.5 CP/CC MODE

The Output Program screen provides settings of ‘Power’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Positive Current Limit’, and ‘Output State’. Refer to Figure 8-41.

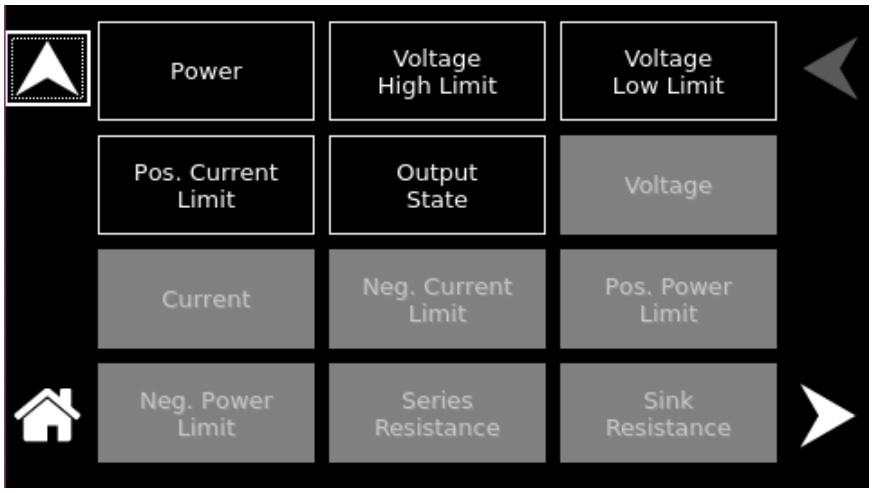


Figure 8-41. Output Program Settings in CP/CC mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CP/CC mode includes the following functions:

ENTRY	DESCRIPTION
Power	Users can set a power value within the specified limit. Refer to Figure 8-42.
Voltage High Limit	Users can set a Volt high limit value, and which functions as a trip limit. Refer to Figure 8-43.

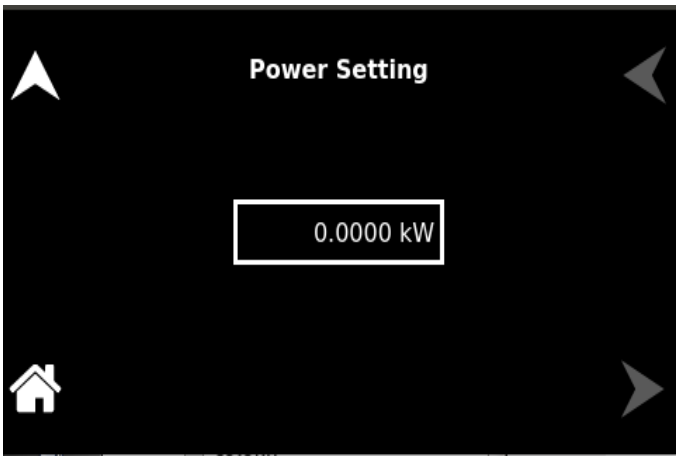


Figure 8-42. Power Settings

ENTRY	DESCRIPTION

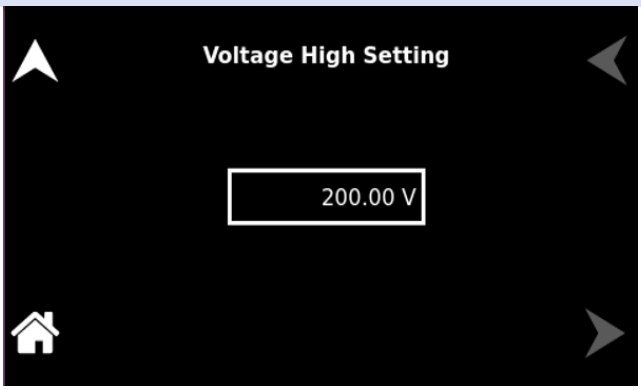


Figure 8-43. Volt High Setting

Voltage Low Limit

Users can set a Voltage Low limit value, and which functions as a trip limit. Refer to Figure 8-44.

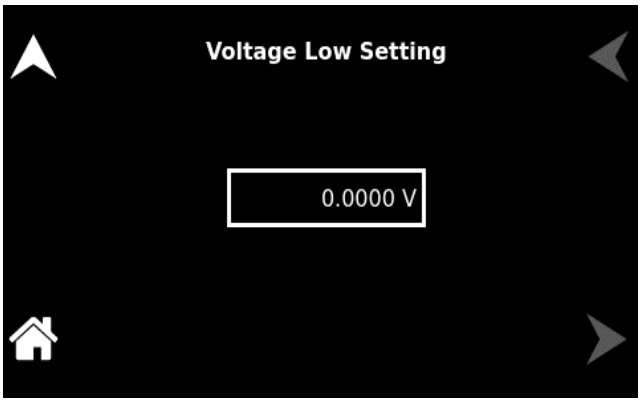


Figure 8-44. Volt Low Setting

Pos. Current Limit

Users can set a Positive Current limit value, and it regulates upon reaching the Pos. Curr Lim. Refer to Figure 8-45.

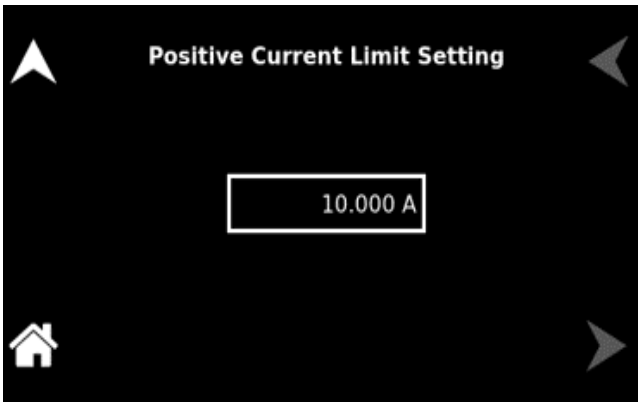


Figure 8-45. Pos. Current Limit Setting

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 8-46.

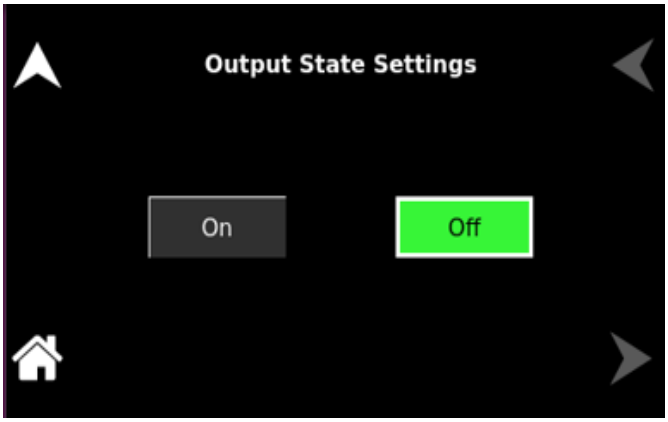


Figure 8-46. Output State

Table 8-19. Output Program Settings CP/CC mode

8.2.3 MEASUREMENTS SCREEN

The Measurements screen displays the floating-point values for DC Output 'Voltage', 'Output Current', and Output 'Power'. For the Measurement screen, refer to Figure 8-47 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

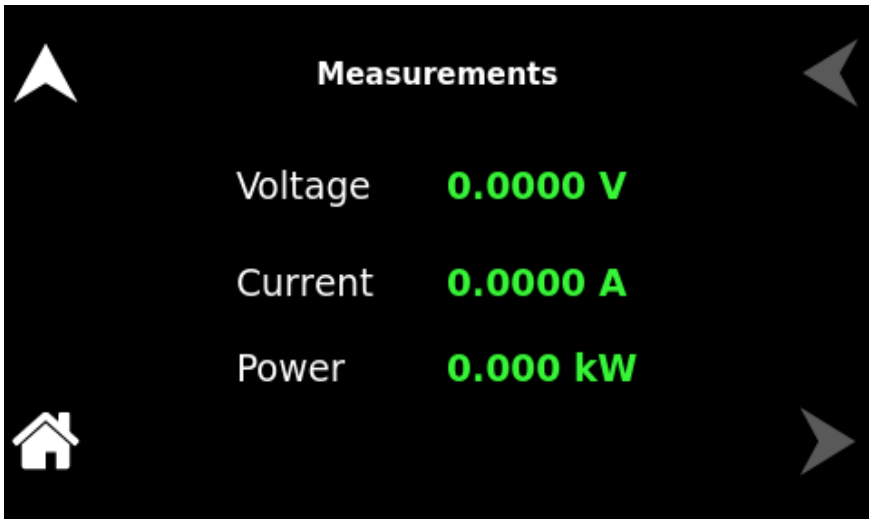


Figure 8-47. Measurements Screen

8.2.4 RAMP SCREEN

The Ramp Screen provides the interface based on the programming type and regulation setting selected, refer to section 8.2.5.1. The Ramp screen will be displayed according to the Programming type configured 'Voltage Ramp' screen for 'Voltage' programming type and 'Current Ramp' screen for 'Current' programming type.

8.2.4.1 VOLTAGE RAMP –CV/CC AND CV – SER. RES, CV/CP AND CV

The Voltage Ramp menu allows the user to configure and execute voltage ramp, refer to Figure 8-48. The Voltage Ramp menu allows the selection of parameters such as 'From Volt', 'To Volt', 'Time', 'Set Limits', 'Trigger' and 'Initial Slew'.

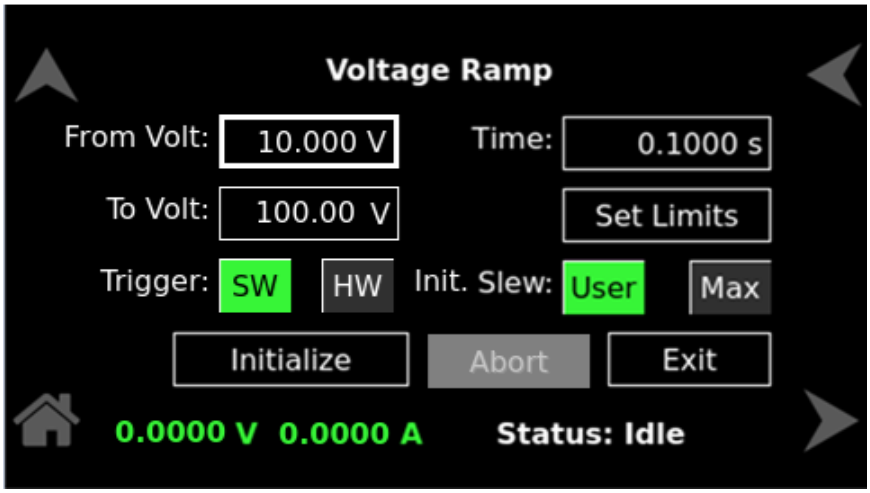


Figure 8-48. Voltage Ramp Screen

The Voltage Ramp menu has the following fields:

ENTRY	DESCRIPTION
From Volt	Sets the start voltage for the ramp. Refer to Figure 8-49.

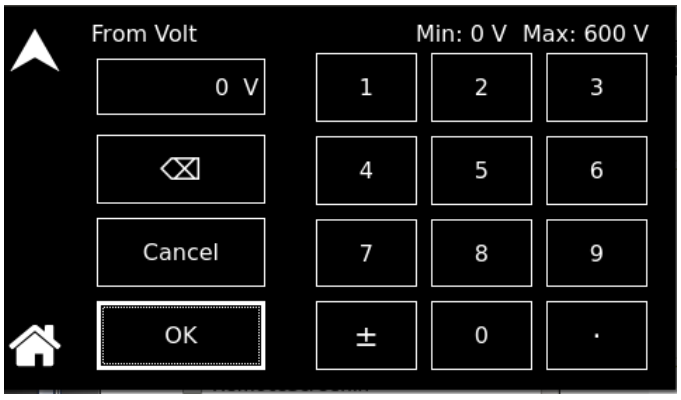


Figure 8-49. From Voltage

To Volt	Sets the end voltage for the ramp. Refer to Figure 8-50.

ENTRY	DESCRIPTION

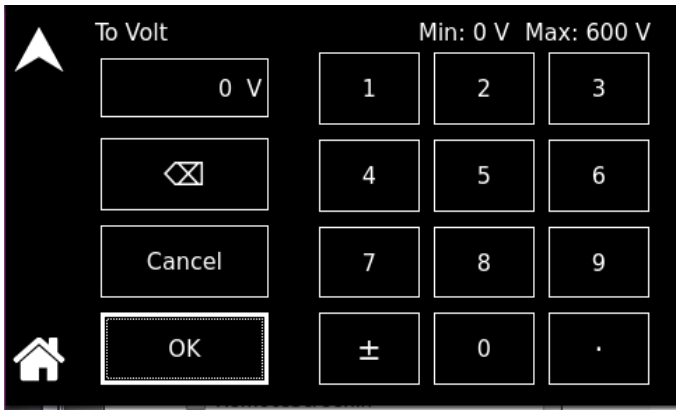


Figure 8-50. To Voltage

Trigger Mode

This setting allows the user to configure the input signal to start the ramp execution (‘From Volt’ to ‘To Volt’)

a) Software (SW) Trigger Mode:
If ‘SW’ is selected, post ramp initialization power supply will wait for the software trigger to start the ramp, displaying the status as ‘Waiting for Trigger’. Refer to Figure 8-51.

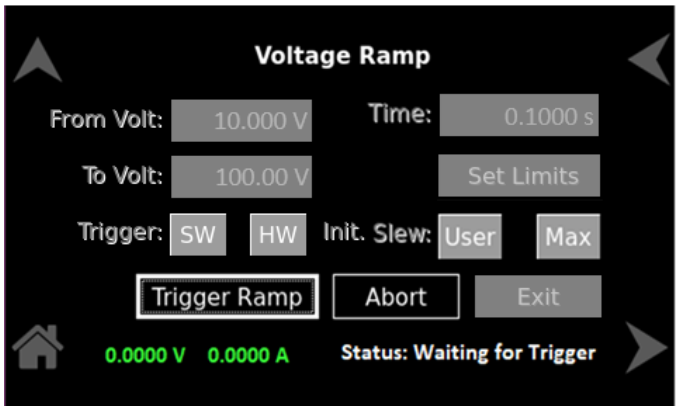


Figure 8-51. Software Trigger Mode

b) Hardware (HW) Trigger Mode:
If ‘HW’ is selected, post ramp initialization power supply will wait for the hardware trigger to start the ramp execution, displaying the status as ‘Waiting for Trigger’.

The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN). Refer to Figure 8-52.

ENTRY	DESCRIPTION

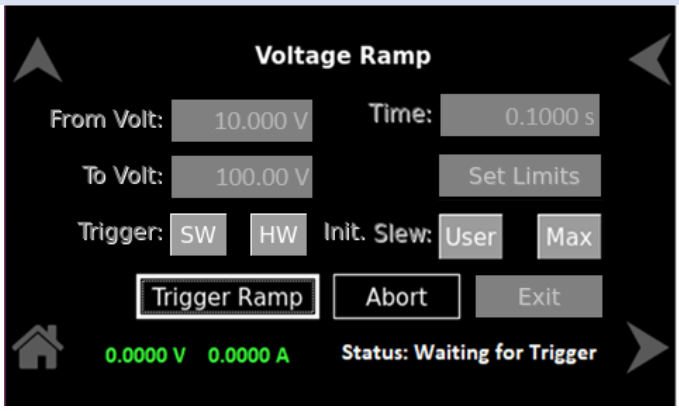


Figure 8-52. Hardware Trigger Mode

Time Sets the time in seconds to reach from ‘From Volt’ to ‘To Volt’. Refer to Figure 8-53.

Figure 8-53. Time

Set Limits User can define the limits for the Ramp execution. Refer to Figure 8-54, Figure 8-55 and Figure 8-56.

Figure 8-54. Set Limits – CV/CC and CV

ENTRY	DESCRIPTION

Figure 8-55. Set Limits – CV – Ser.Res

Figure 8-56. Set Limits – CV/CP

Initial Slew

This setting allows the user to configure the initial slew, the slew rate at which the power supply reaches from the current output voltage of the power supply to the configured ‘From Volt’ in the ramp screen.

a) **User:** When the setting is ‘User’, the output voltage of the power supply reaches the ‘From Volt’ (when the ramp is initialized) with the voltage slew rate configured in the configuration menu.

b) **Max:** When the setting is ‘Max’, the output voltage of the power supply reaches the ‘From Volt’ (when the ramp is initialized) with maximum slew rate.

ENTRY	DESCRIPTION
Initialize	The function of the initialization process is to bring the current device voltage value to the 'From Volt' value programmed in the ramp screen. Click the 'Initialize' button to initialize the ramp, and the progress will be displayed as a percentage in the status bar. Upon completion of the initialization process, the status will indicate as 'Waiting for Trigger'. Refer to Figure 8-57.

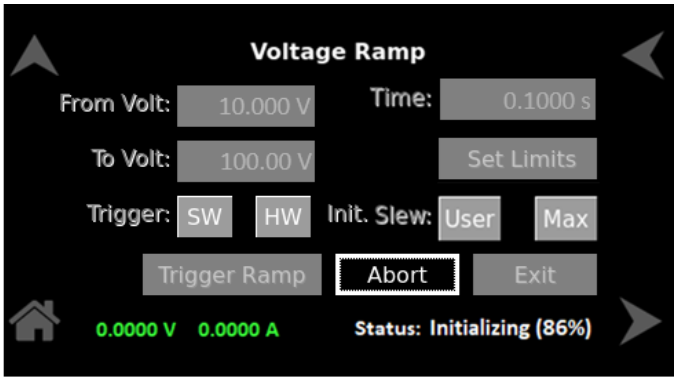


Figure 8-57. Initializing

Trigger Ramp	Used to send software trigger to the unit to start the ramp execution. Post initialization of ramp this function is enabled only when 'Trigger' selection is 'SW'. Refer to Figure 8-58. If the 'Trigger' selection is set to 'HW', this function is not enabled. The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN).

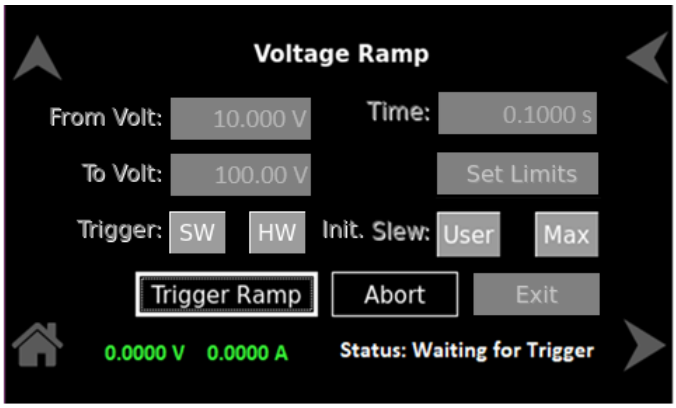


Figure 8-58. Trigger Ramp

ENTRY	DESCRIPTION
Abort	User can abort the process at any stage of the ramp execution. The progress of the operation is displayed in the status on the right side of the screen. Refer to Figure 8-59.

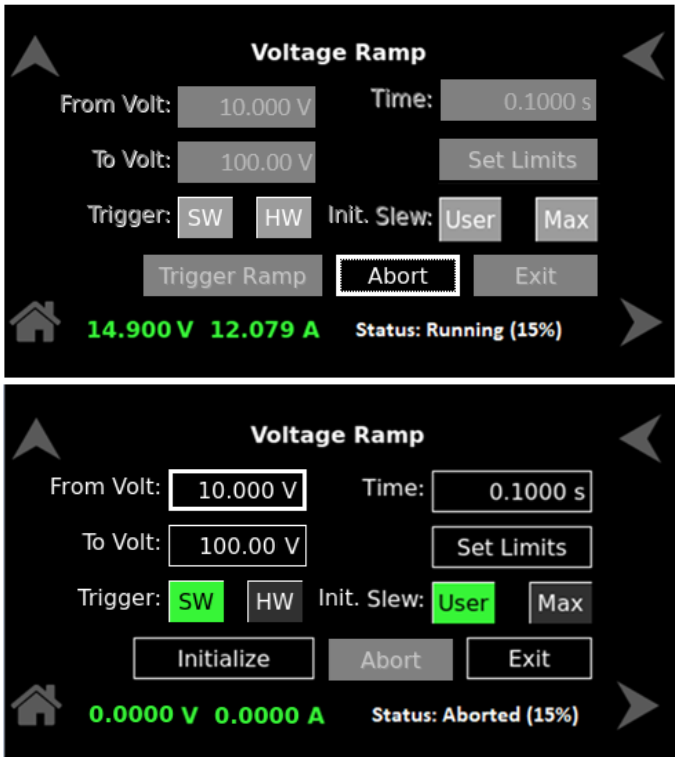


Figure 8-59. Abort

Status This field displays the progress or state of the process.

a) IDLE - When the system is in Idle (not performing any task) situation, refer to Figure 8-60.

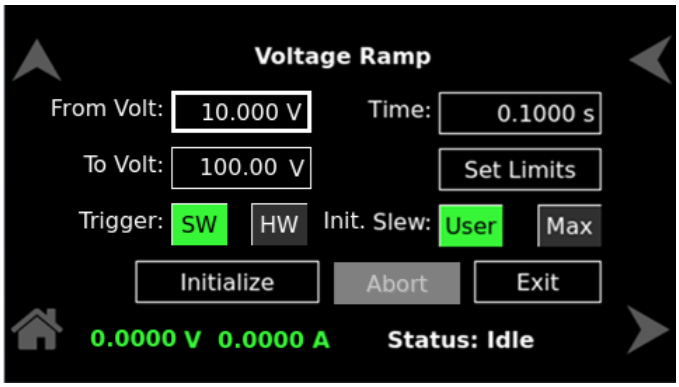


Figure 8-60. Status – IDLE

b) Initializing - When the system is initializing (configuring the current device voltage value to the 'From Volt' value programmed

ENTRY	DESCRIPTION

in the ramp screen), and the progress is displayed as a percentage. Refer to Figure 8-61.

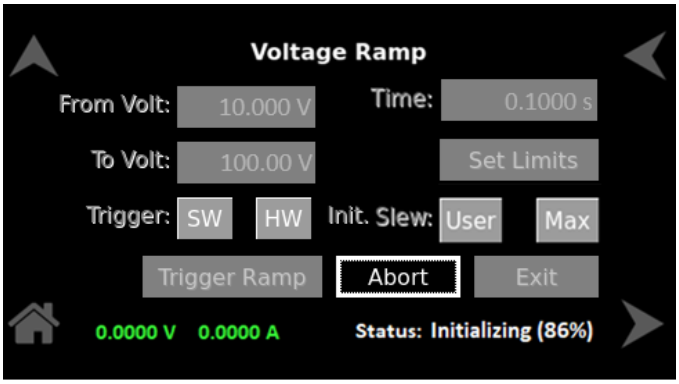


Figure 8-61. Status – Initializing

c) **Waiting for Trigger:** When the system is waiting for the trigger, refer to Figure 8-62.

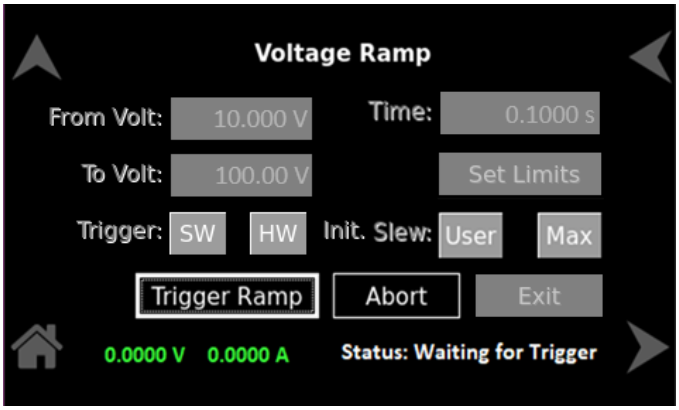


Figure 8-62. Status – Waiting for Trigger

d) **Running:** When the system is executing the trigger ramp process, refer to Figure 8-63.

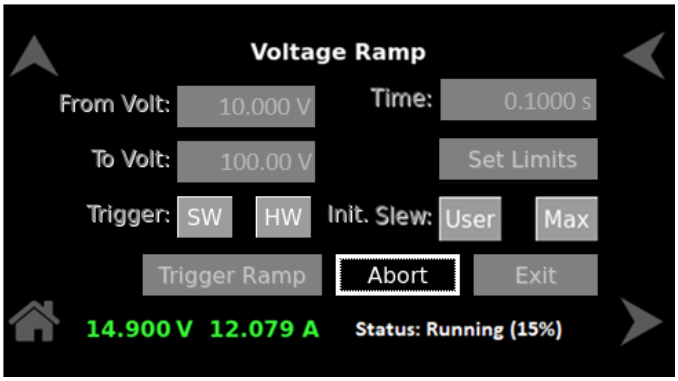


Figure 8-63. Status – Running

ENTRY	DESCRIPTION
	e) **Aborted:** When the process is aborted (Initializing, Waiting for Trigger, Running), 'Aborted' is displayed in the status. Refer to Figure 8-64.

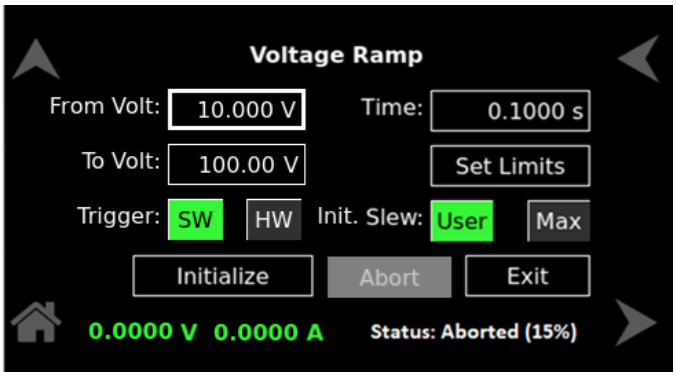


Figure 8-64. Status – Aborted

	f) **Complete:** When the ramp execution (bringing the voltage from 'From Volt' to 'To Volt') is completed. Refer to Figure 8-65.

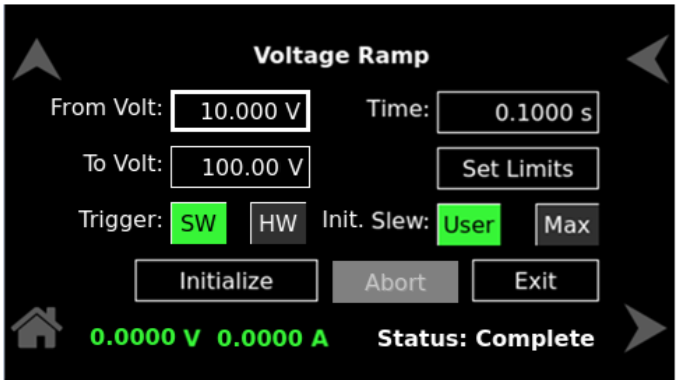


Figure 8-65. Status- Completed

Exit	Exits the Voltage Ramp sub menu and return to Top level menu, refer to Figure 8-3.

NOTE: User cannot exit the Voltage Ramp Screen using HOME and UP arrow. To exit while a process is ongoing, user must first abort the process.

Table 8-20. Voltage Ramp

a) Example 1: Creating a Voltage ramp using Software Trigger mode

- Set the From Volt to 25V
- Set the To Volt to 50V

- Set the Time to 10s
- Select the Trigger mode as SW
- Select between User or Max for the slew setting according to the user's requirement
- Click on Initialize
- Observe that the Initialize button changes to the Trigger Ramp button after completion of initializing, and Abort button becomes enabled from a disabled state
- Click on Trigger Ramp
- The status of the Trigger Ramp progress can be seen on the screen
- 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.

b) Example 2: Creating a Voltage ramp using Hardware Trigger mode

- Set the Volt to 25V
- Set the To Volt to 50V
- Set the Time to 10s
- Select the Trigger mode as HW
- Select between User or Max for the slew setting according to the requirements
- Click on Initialize
- Observe that Initialize button change from enable to disable state after completion of initializing, and Abort button becomes enabled
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-19 (TRIGGER IN) and pin-18 (RTN) to generate the Voltage Ramp
- 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.

8.2.4.2 VOLTAGE RAMP – CP/CV

Voltage Ramp is not applicable in CP/CV Regulation Settings. Refer to Figure 8-66.

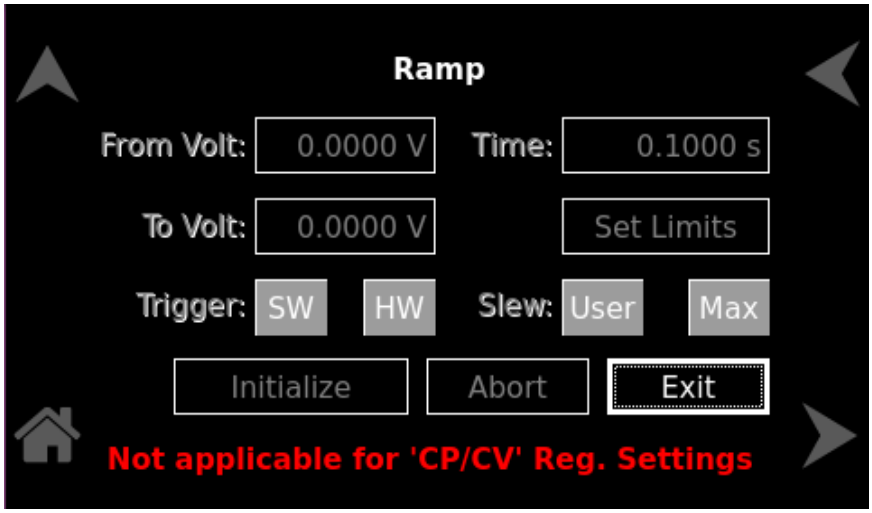


Figure 8-66. Voltage ramp – CP/CV

8.2.4.3 CURRENT RAMP – CC/CV, CC/CP AND CC

The Current Ramp menu allows to configure and execute current ramp, refer to Figure 8-67. The Current Ramp menu allows the selection of parameters such as From Current, Status, To Current, Time, Trigger, Set Limits and Initial Slew.

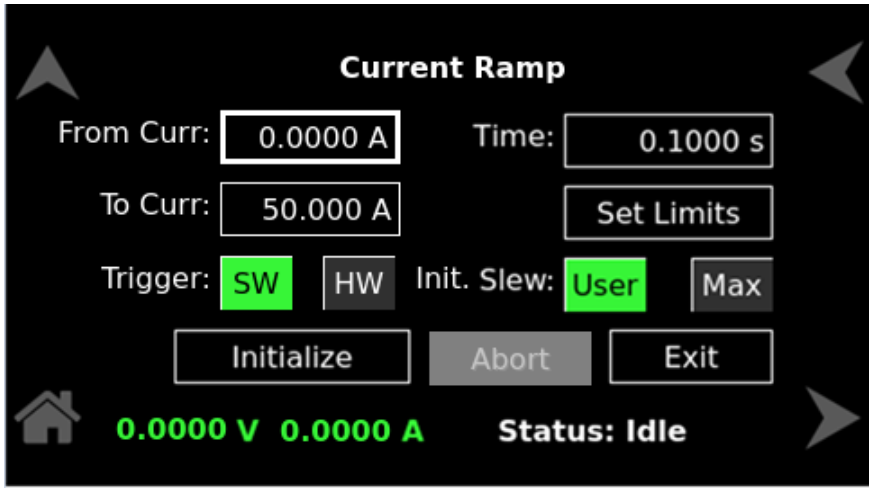


Figure 8-67. Current Ramp Screen

The Current Ramp menu has the following fields:

ENTRY	DESCRIPTION
From Curr	Sets the start current for the ramp. Refer to Figure 8-68.

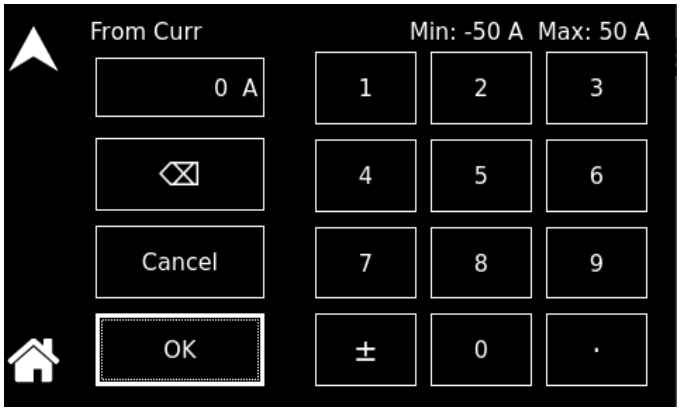


Figure 8-68. From Current

To Curr

Sets the end current for the ramp. Refer to Figure 8-69.

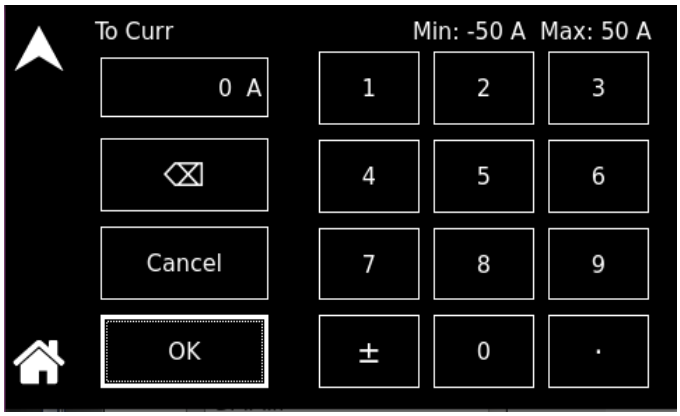


Figure 8-69. To Current

Trigger Mode

This setting allows the user to configure the input signal to start the ramp execution (‘From Curr’ to ‘To Curr’)

a) Software (SW) Trigger Mode:

If ‘SW’ is selected, post ramp initialization power supply will wait for the software trigger to start the ramp execution, displaying the status as ‘Waiting for Trigger’. Refer to Figure 8-70.

ENTRY	DESCRIPTION

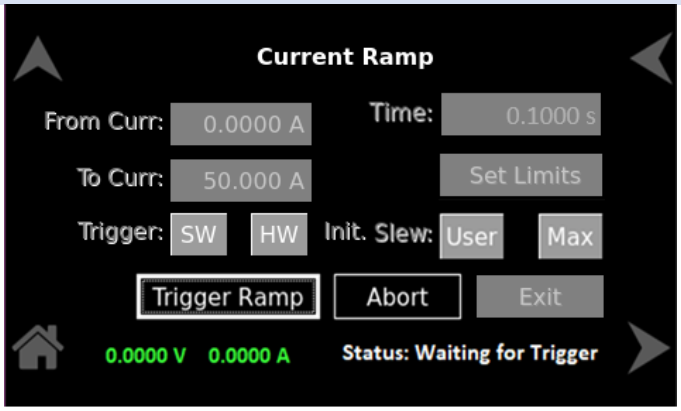


Figure 8-70. SW Mode

b) Hardware (HW) Trigger Mode:

When 'HW' is selected, post ramp initialization power supply will wait for a hardware trigger to start the ramp execution, displaying the status as 'Waiting for Trigger'.

The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN). Refer to Figure 8-71.

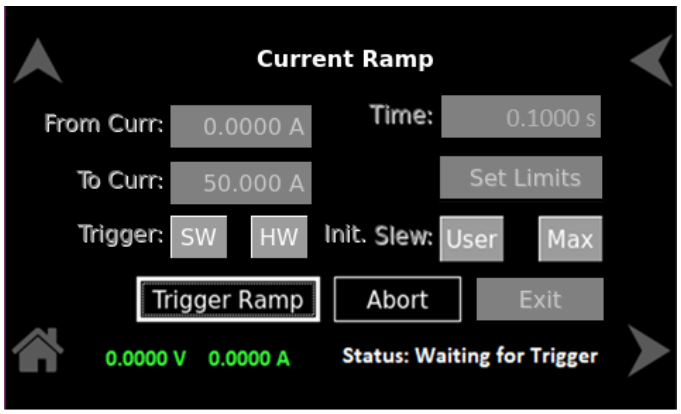


Figure 8-71. HW Mode

ENTRY	DESCRIPTION
Time	Sets the time in seconds to reach from 'From Curr' to 'To Curr'. Refer to Figure 8-72.

Figure 8-72. Time

Set Limits User can define the limits for the Ramp execution. Refer to Figure 8-73.

Figure 8-73. Set Limits - CC/CV, CC/CP and CC

Initial Slew This setting allows the user to configure the initial slew, the slew rate at which the power supply reaches from the output Current of the power supply to the configured 'From Curr' in the ramp screen.

a) User: When the setting is 'User', the output current of the power supply reaches the 'From Curr' (when the ramp is initialized) with the voltage slew rate configured in the configuration menu. Refer to section 8.2.5.2.

b) Max: When the setting is 'Max', the output current of the power supply reaches the 'From Curr' (when the ramp is initialized) with maximum slew rate.

ENTRY	DESCRIPTION
Initialize	The function of the initialization process is to bring the current device voltage value to the 'From Curr' value programmed in the ramp screen. Click the 'Initialize' button to initialize the ramp, and the progress will be displayed as a percentage in the status bar. Upon completion of the initialization process, the status will indicate as 'Waiting for Trigger'. Refer to Figure 8-74.

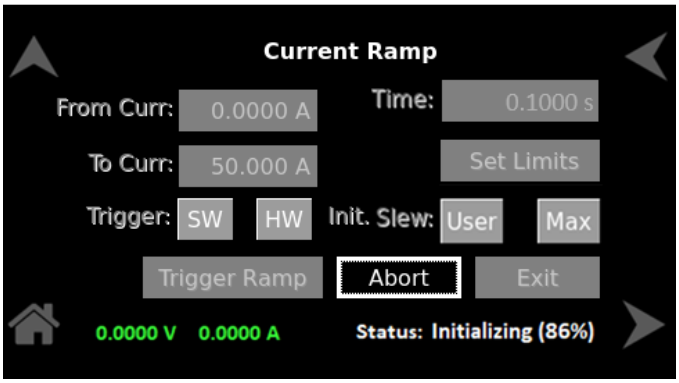


Figure 8-74. Initializing

Trigger Ramp

Used to send software trigger to the unit to start the ramp execution. Post initialization of ramp this function is enabled only when 'Trigger' selection is ''SW'. Refer to Figure 8-75.

If the 'Trigger' selection is set to 'HW', this function is not enabled. The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN).

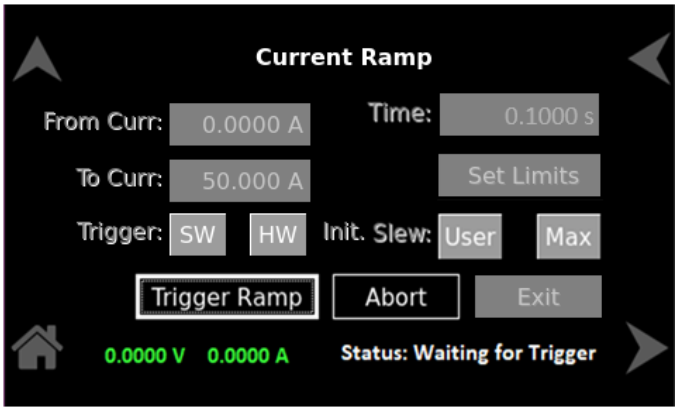


Figure 8-75. Trigger Ramp

ENTRY	DESCRIPTION
Abort	User can abort the process at any stage of the ramp execution. The progress of the operation is displayed in the status on the right side of the screen. Refer to Figure 8-76.

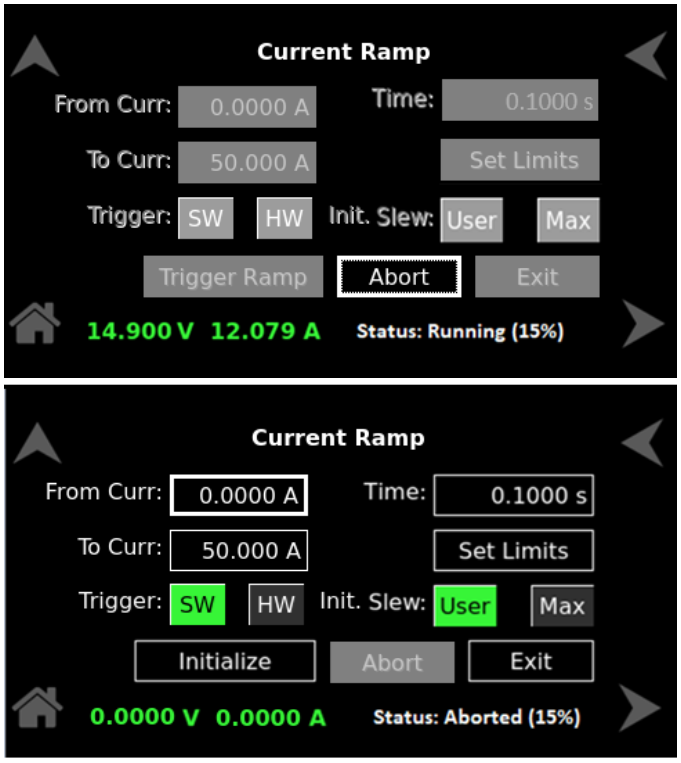


Figure 8-76. Abort – SW

Status	This field displays the progress or state of the process. **a) IDLE -** When the system is in Idle (not performing any task) situation, refer to Figure 8-77.

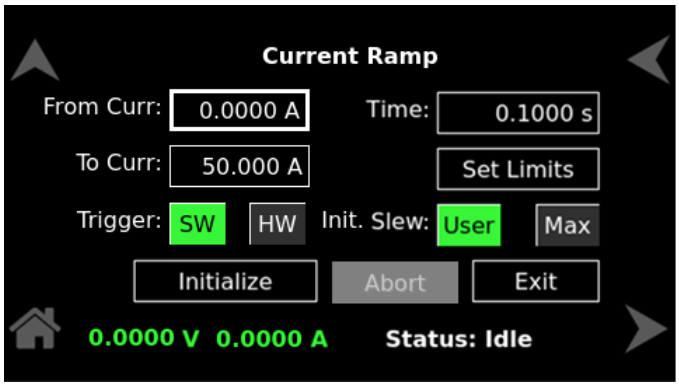


Figure 8-77. Status – IDLE

ENTRY	DESCRIPTION

b) Initializing - When the system is initializing (configuring the device current value to the 'From Curr' value programmed in the ramp screen), and the progress is displayed as a percentage. Refer to Figure 8-78.

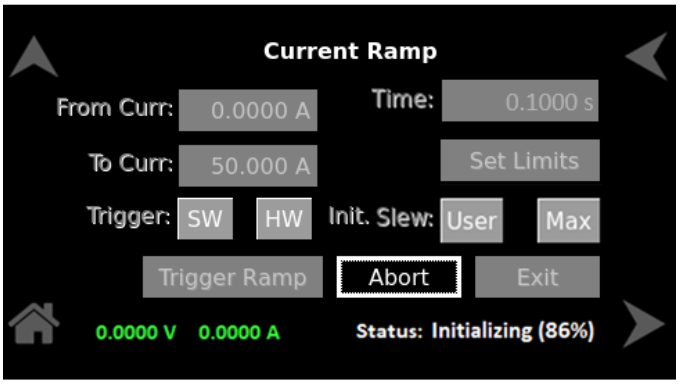


Figure 8-78. Status - Initializing

c) Waiting for Trigger: When the system is waiting for the trigger, refer to Figure 8-79.

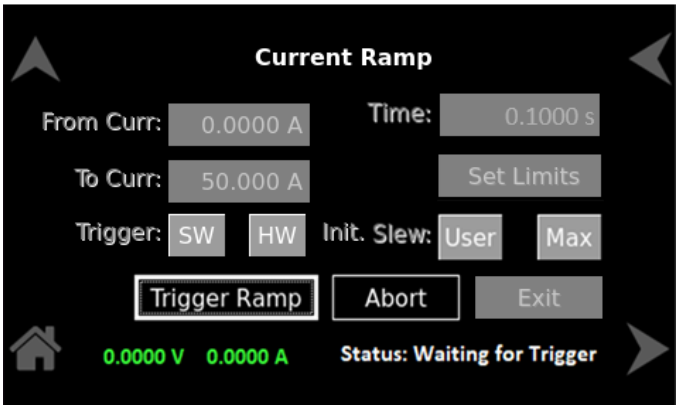


Figure 8-79. Status – Waiting for Trigger

d) Running: When the system is executing the trigger ramp process, refer to Figure 8-80.

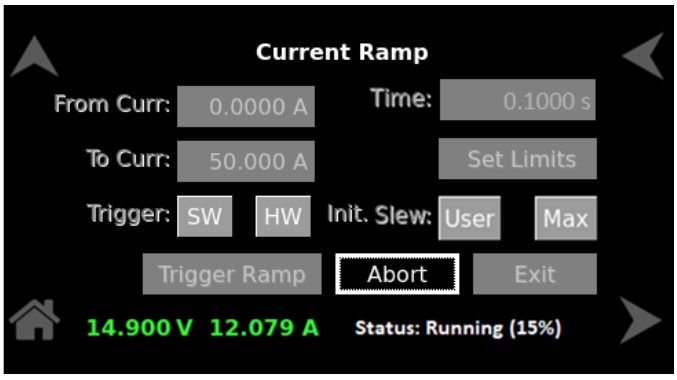


Figure 8-80. Status – Running

ENTRY	DESCRIPTION
	e) Aborted: When the process is aborted (Initializing, Waiting for Trigger, Running), 'Aborted' is displayed in the status. Refer to Figure 8-81.

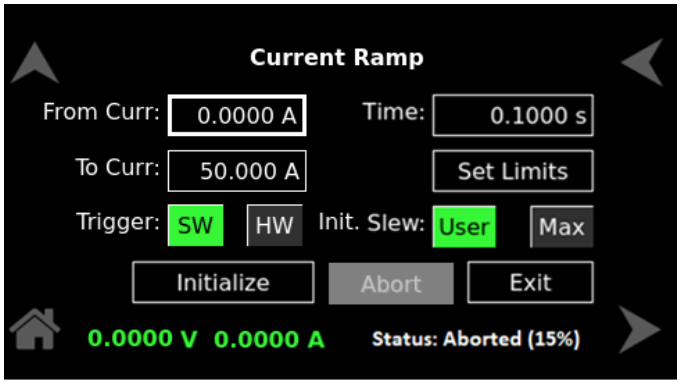


Figure 8-81. Status – Aborted

f) Complete: When the ramp execution (bringing the voltage from "From Curr" to "To Curr") is completed. Refer to Figure 8-82.

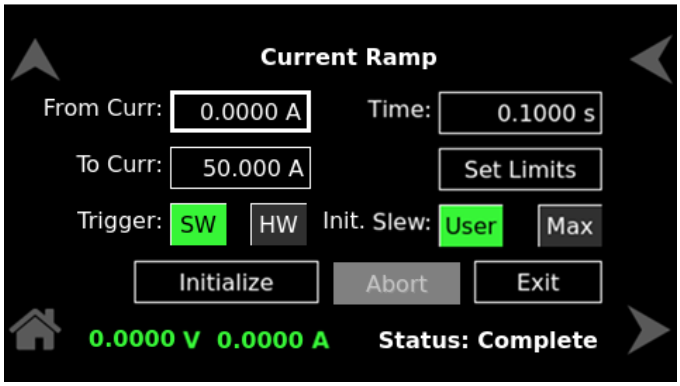


Figure 8-82. Status- Completed

Exit	Exits the Current Ramp sub menu and return to Top level menu, refer to Figure 8-3.

NOTE: User cannot exit the Current Ramp Screen using HOME and UP arrow. To exit while a process is ongoing, user must first abort the process.

Table 8-21. Current ramp

a) Example 1: Creating a Current ramp using Software Trigger mode

- Set the From Current to 10A
- Set the To Curr to 30A

- Set the Time to 10s
- Select the Trigger mode as SW
- Select between User or Max for the slew setting according to the user's requirement
- Click on Initialize
- Observe that the Initialize button changes to the Trigger Ramp button after completion of initializing, and Abort button becomes enabled from disabled state
- Click on Trigger Ramp
- The status of the Trigger Ramp progress can be seen on the screen
- 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.

b) 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
- Select the Trigger mode as HW
- Select between User or Max for the slew setting according to the users' requirements
- Click on Initialize
- Observe that Initialize button change from enable to disable state after completion of initializing, and Abort button becomes enabled
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-19 (TRIGGER IN) and pin-18 (RTN) to generate the Current Ramp.
- 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.

8.2.4.4 CURRENT RAMP – CP/CC

Current Ramp is not applicable in CP/CC Regulation Settings. Refer to Figure 8-83.

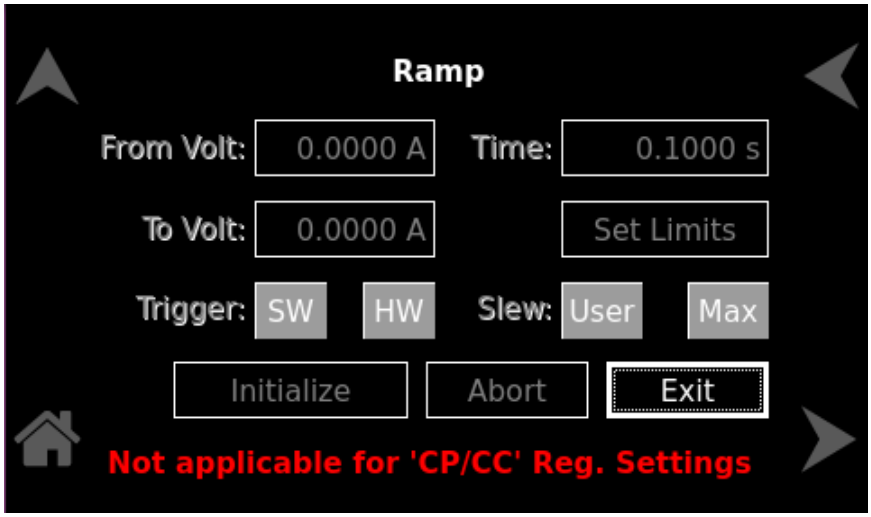


Figure 8-83. Current Ramp - CP/CC

8.2.5 CONFIGURATION SCREEN

The Configuration screen provides ‘Regulation Settings’, ‘Slew Rate’, ‘Protection’, ‘User Limits’, ‘Output Sense’, ‘PONS’, and ‘Measurement Average Samples’.

For the top-level menu of the Configuration screen, refer to Figure 8-84 and for instructions on how to navigate, refer to Section 6.4.2.1.

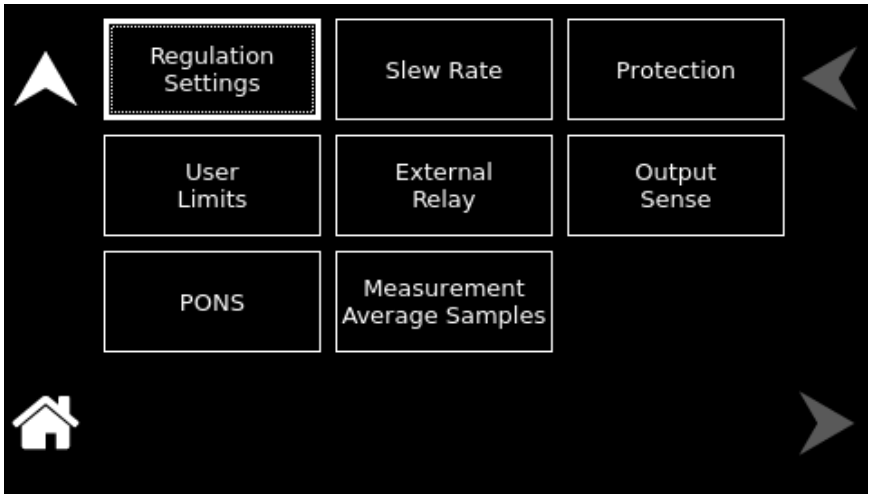


Figure 8-84. Configuration Screen Top-Level Menu

8.2.5.1 REGULATION SETTINGS

The Regulation Settings Menu is used to configure the Programming type and Regulation setting of the power supply. Refer to Figure 8-85.

The 'Reg. Setting' function on the Configuration Screen enables users to switch between 'Voltage (CV/CC, CV-Ser. Res, CV/CP, CP/CV and CV) ' and 'Current (CC/CV, CC/CP, CP/CC, and CC) ' regulation settings.

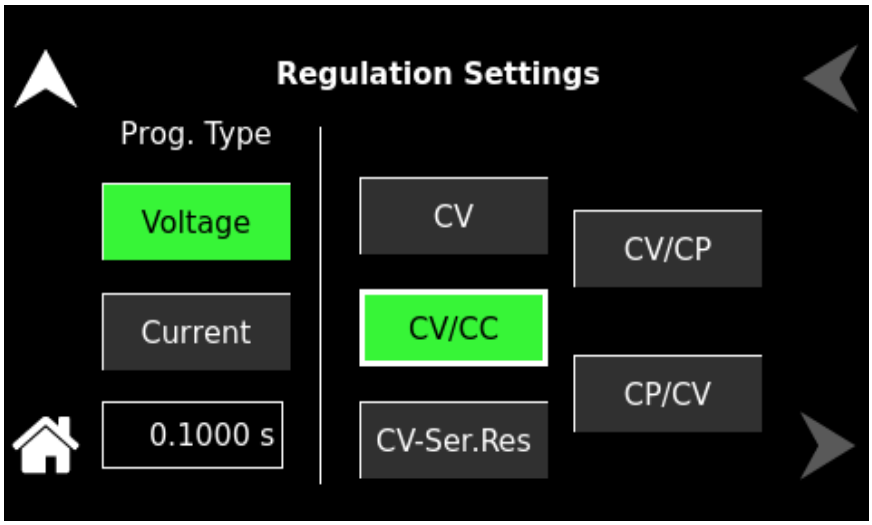


Figure 8-85. Regulation Settings – CV/CC, CV-Ser. Res, CV/CP, CP/CV and CV

a) When the programming type is set to 'Voltage' in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CV/CC	In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the current limit reached. On reaching the power limit (positive), the output voltage would be programmed to zero.
CV-Ser.Res	In this regulation setting, user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop across the series resistance. In the event of reaching the programmed current limit (positive) or power limit (positive) or voltage limit (low), the output voltage is programmed to zero.
CV/CP	In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the power limit reached. On reaching the current limit (positive), the output voltage would be programmed to zero.

ENTRY	DESCRIPTION
CP/CV	In this regulation setting, output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (positive), the output power would be programmed to zero.
CV	In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (positive) or power limit (positive), the output voltage would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 8-86.

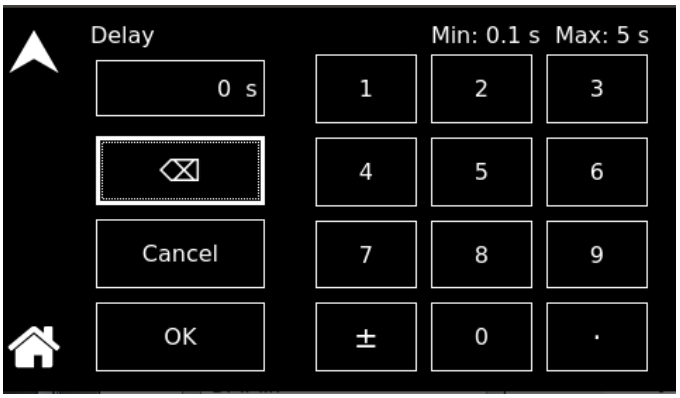


Figure 8-86. Delay Screen

Table 8-22. Regulation Settings

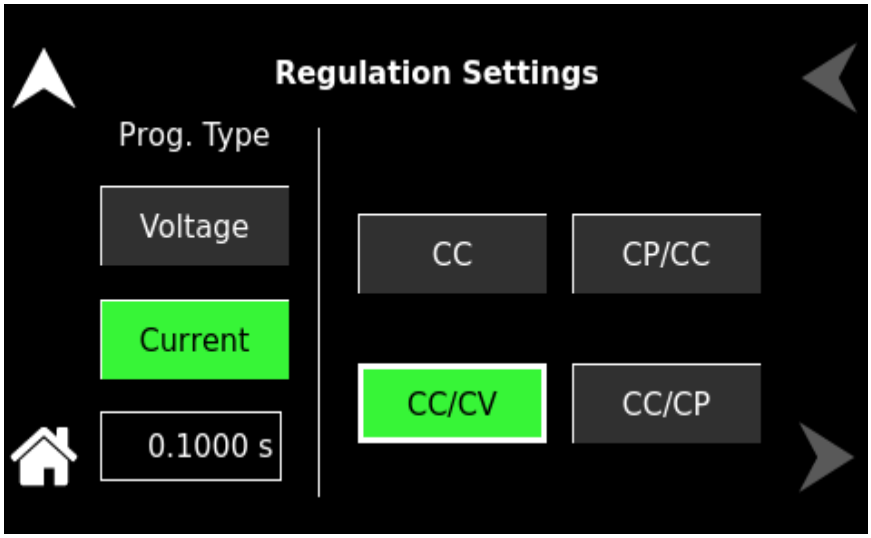


Figure 8-87. Regulation Settings – CC/CV,CC/CP, CP/CC, and CC

b) When the programming type is set to ‘Current’ in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CC/CV	In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (positive), the output current would be programmed to zero.
CP/CC	In this regulation setting, output power is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC/CP	In this regulation setting, output current is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero.
CC	In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive), the output current would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 8-88.

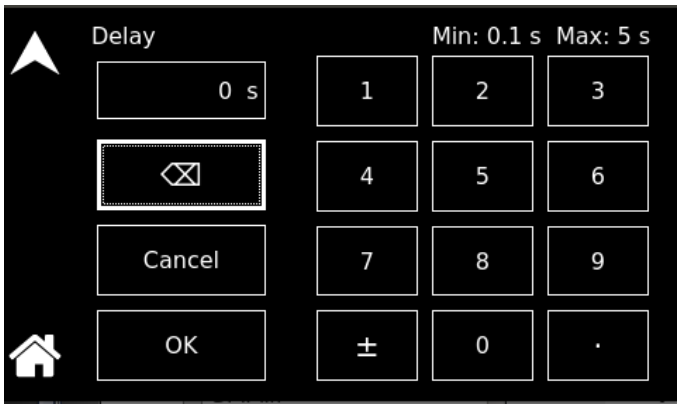


Figure 8-88. Delay Screen

Table 8-23. Regulation Settings

8.2.5.2 SLEW RATE

In the Slew Rate Settings, users can configure the voltage, current and power slew rate. This allows for precise control over the voltage, current and power change, ensuring smoother

transitions and better performance of the power supply. Adjusting these settings can help in optimizing the response time and stability of the system.

The Slew Rate provides the interface based on the programming type selected in the configuration screen, refer to section 8.2.5.1. When the program type is set to 'Voltage- CV/CC, CV-Ser.Res, CV/CP and CV' in the regulation setting, the Slew Settings screen that appears will be the 'Volt Slew Rate'. Refer to Figure 8-89.

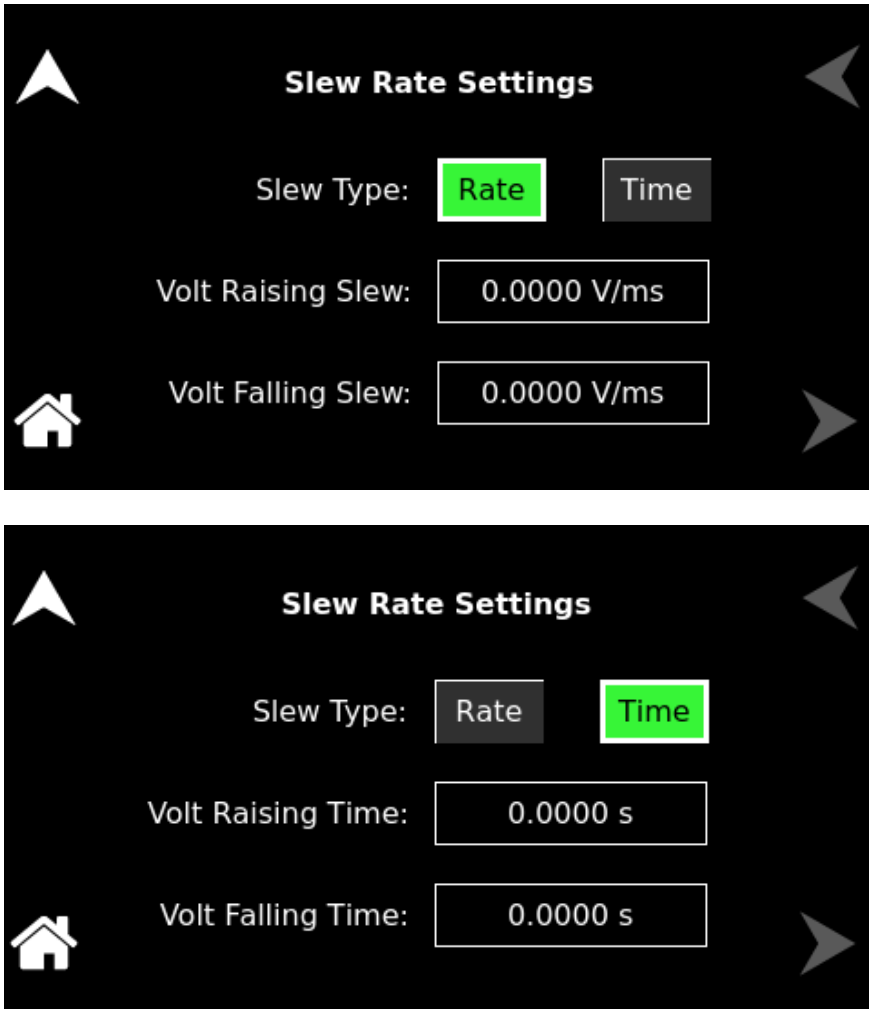


Figure 8-89. Slew Rate Settings - Voltage (CV/CC, CV-Ser.Res, CV/CP and CV)

When the program type is set to 'Voltage - CP/CV' in the regulation setting, the Slew Settings screen that appears will be the 'Pow Slew Rate'. Refer to Figure 8-90.

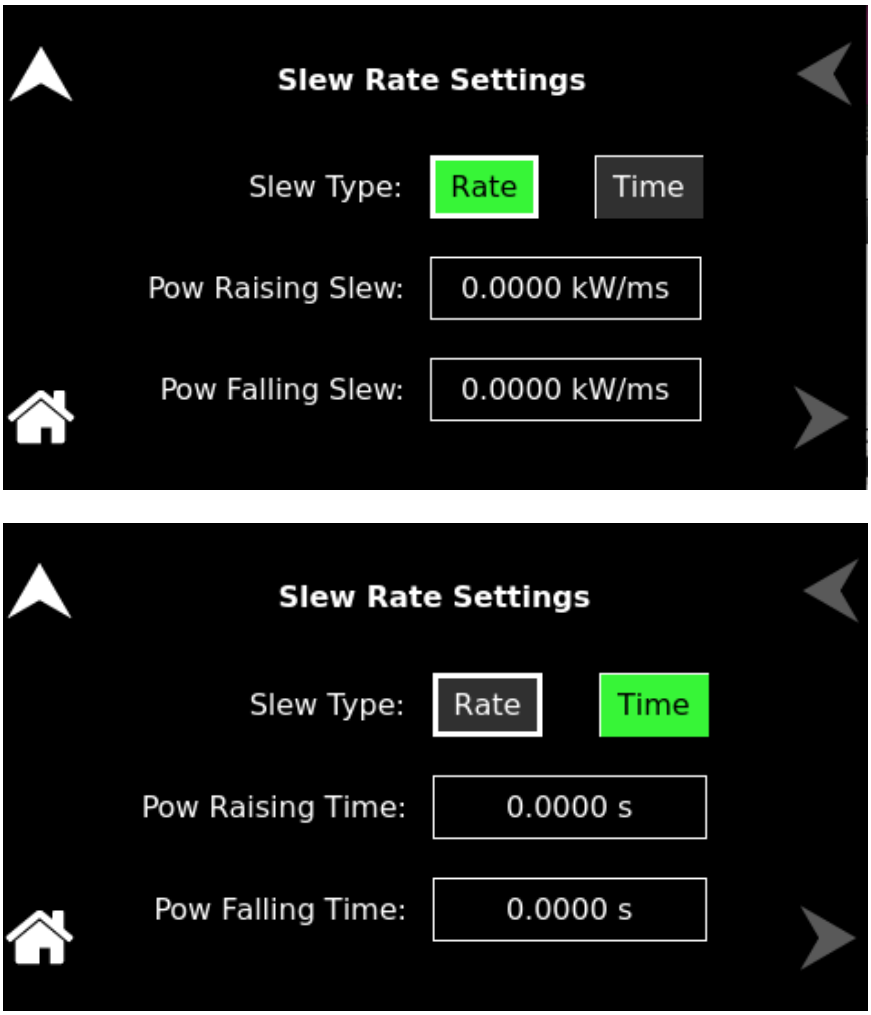


Figure 8-90. Slew Rate Settings – Power (CP/CV)

When the program type is set to 'Current – CC/CV, CC/CP and CC' in the regulation setting, the Slew Settings screen that appears will be the 'Curr Slew Rate'. Refer to Figure 8-91.

Figure 8-91. Slew Rate Settings – Current (CC/CV, CC/CP and CC)

When the program type is set to 'Current –CP/CC' in the regulation setting, the Slew Settings screen that appears will be the 'Pow Slew Rate'. Refer to Figure 8-91.

Figure 8-92. Slew Rate Settings – Power (CP/CC)

8.2.5.3 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 8-93.

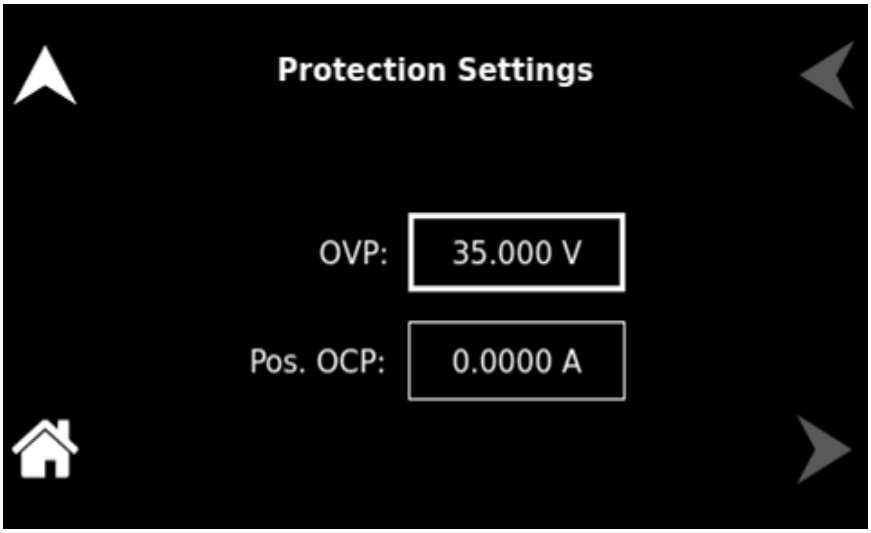


Figure 8-93. Protection Settings

8.2.5.4 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits.

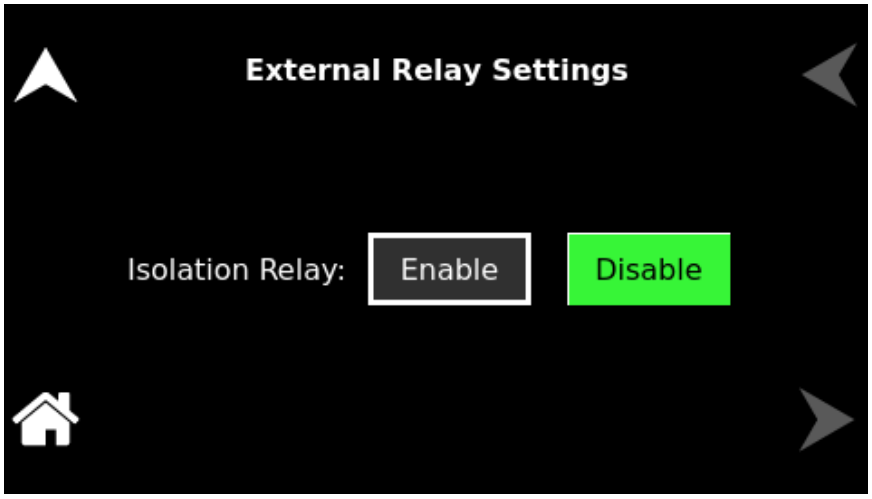


Figure 8-94. External Relay Settings

8.2.5.5 USER LIMITS

In the user limits settings, users can set the maximum allowable voltage, current and power values. This allows users to specify the highest values the device can reach without exceeding these limits.

When the programming type is set to 'Voltage- CV/CC, CV-Ser.Res, CV/CP and CV' in the Regulation Settings menu, the user limit screen that appear will be 'Voltage'. Refer to Figure 8-95.

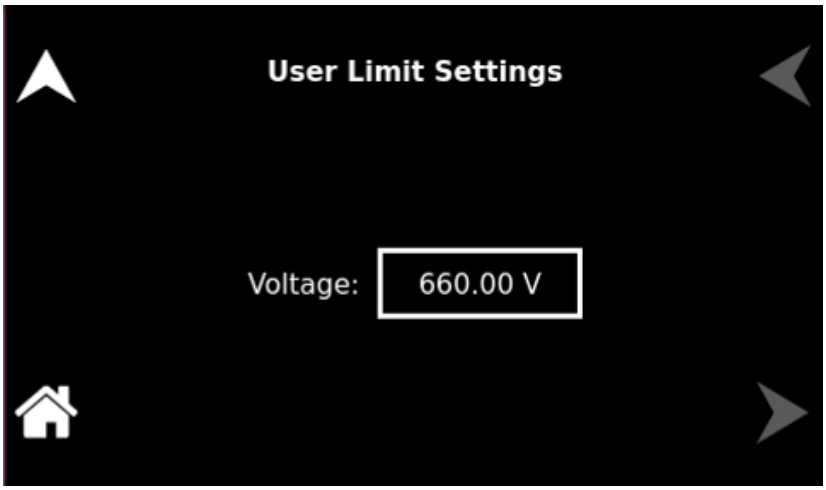


Figure 8-95. User Limit Settings- Voltage (CV/CC, CV-Ser.Res, CV/CP and CV)

When the program type is set to 'Voltage - CP/CV' in the regulation setting, the Slew Settings screen that appears will be the 'Power High Limit'. Refer to Figure 8-96.

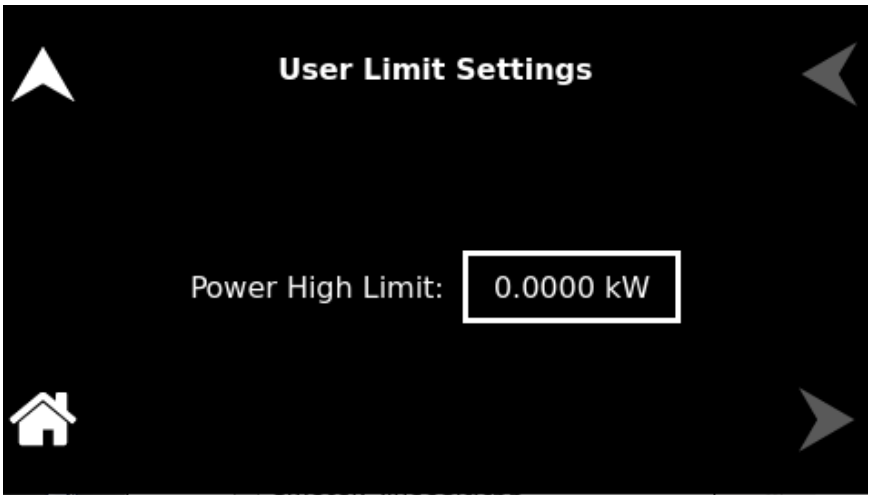


Figure 8-96. User Limit Settings- Voltage (CP/CV)

When the programming type is set to ‘Current– CC/CV, CC/CP and CC’ in the regulation setting, the slew settings screen that appears will be ‘Current High Limit’. Refer to Figure 8-97.

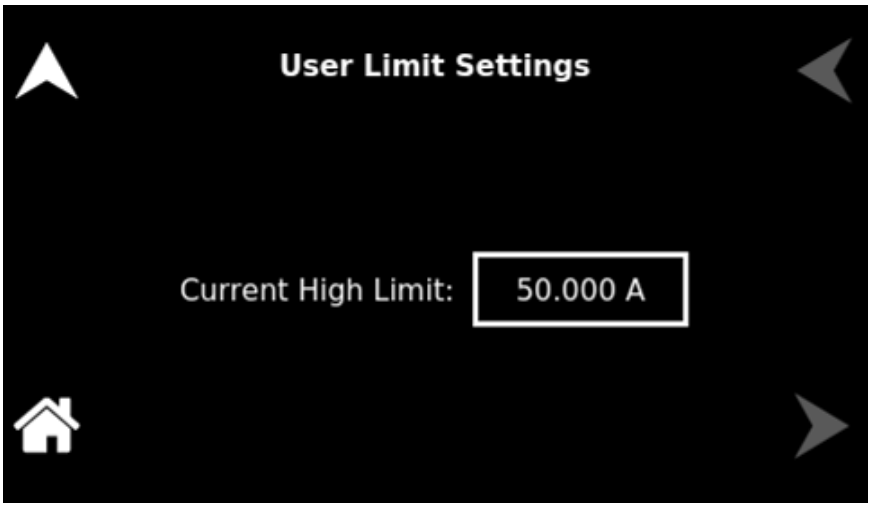


Figure 8-97. User Limit Settings- Current (CC/CV, CC/CP and CC)

When the programming type is set to ‘Current– CP/CC’ in the regulation setting, the slew settings screen that appears will be ‘Power High Limit’. Refer to Figure 8-97.

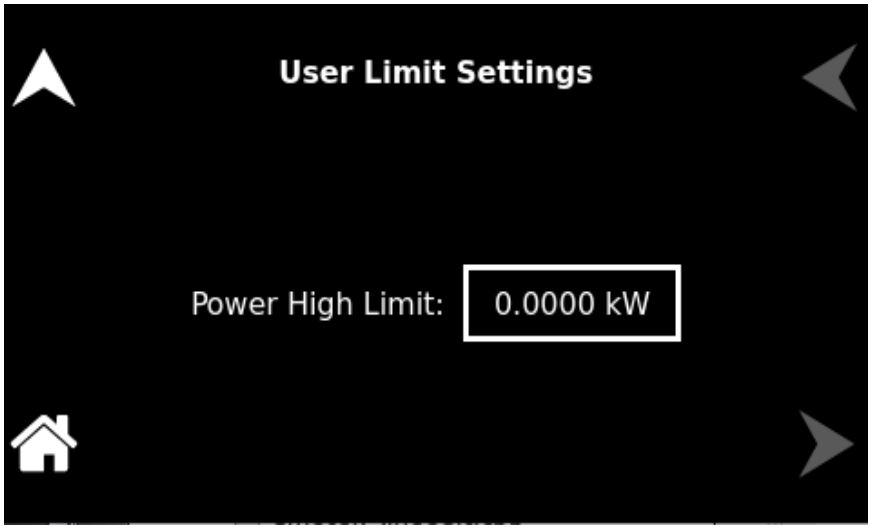


Figure 8-98. User Limit Settings- Current (CP/CC)

8.2.5.6 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS (Remote Voltage Sense) connector. Refer to Figure 8-99.

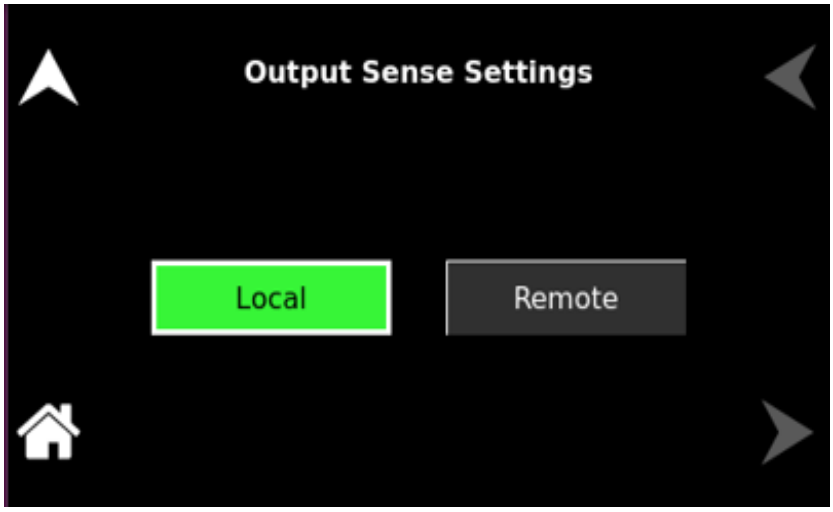


Figure 8-99. Output Sense Settings

8.2.5.7 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on their chosen mode regulation settings.

When the Programming type is set to ‘Voltage’ in the Regulation Settings menu, the PONS Program Type will display as ‘Voltage,’ and the PONS Reg. Setting will show the selected mode. Refer Figure 8-100 to Figure 8-104.

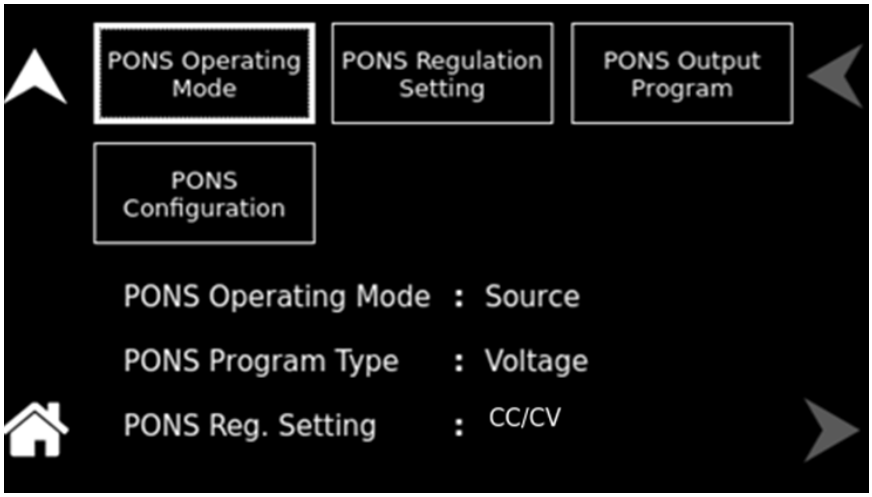


Figure 8-100. PONS Main Screen – CV/CC

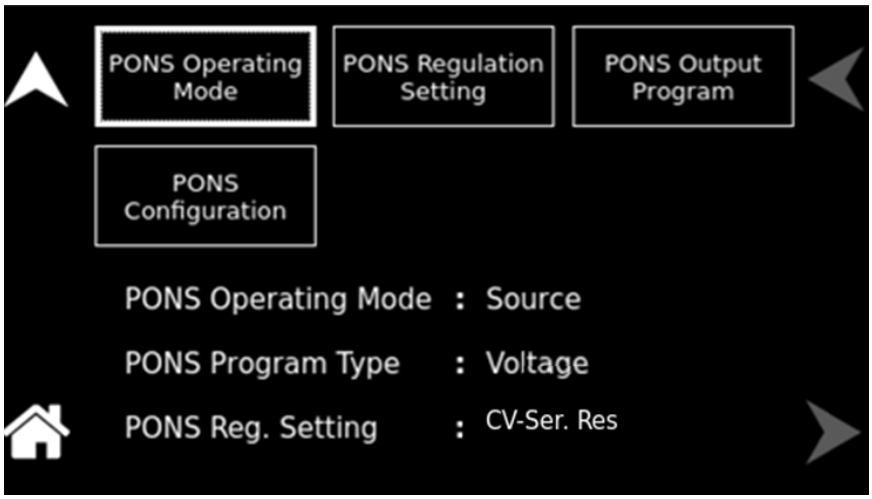


Figure 8-101. PONS Main Screen – CV-Ser. Res

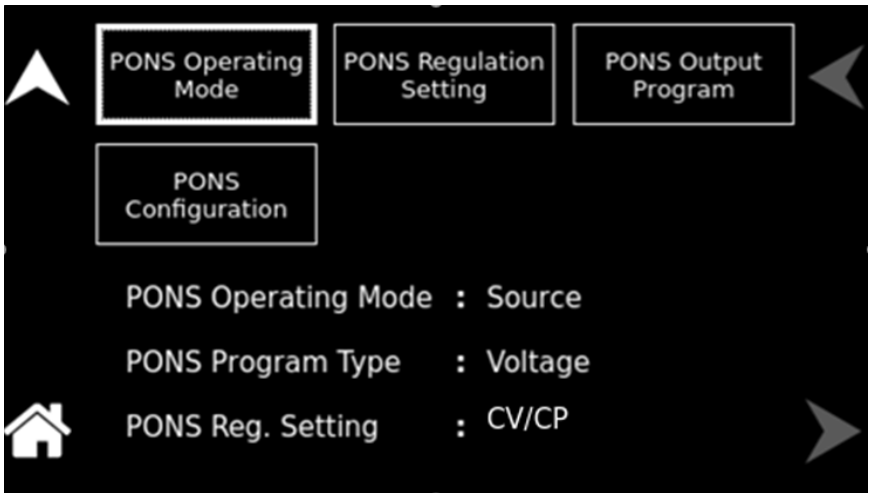


Figure 8-102. PONS Main Screen – CV/CP

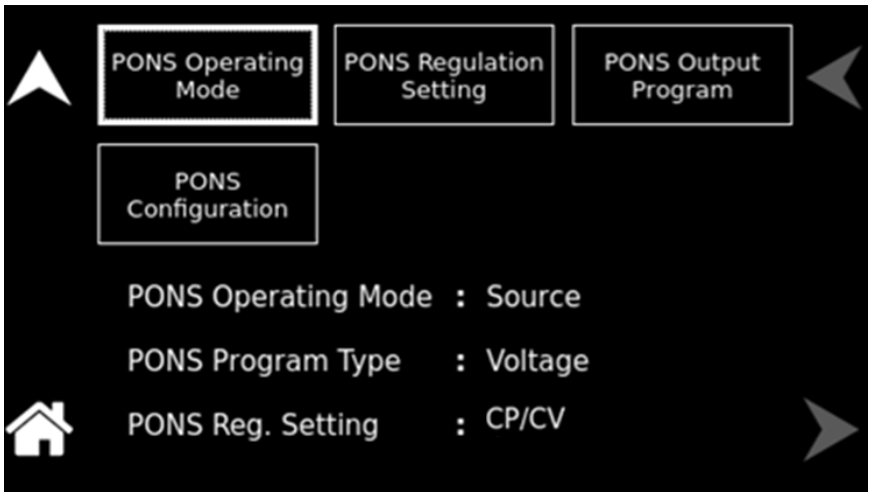


Figure 8-103. PONS Main Screen – CP/CV

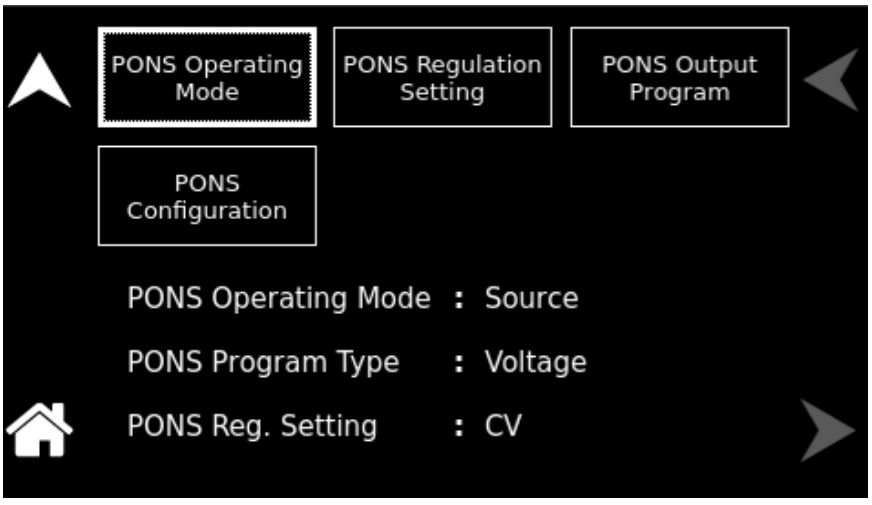


Figure 8-104. PONS Main Screen - CV

When the Programming type is set to ‘Current’ in the Regulation Settings menu, the PONS Program Type will display as ‘Current,’ and the PONS Reg. Setting will show the selected mode. Refer Figure 8-105 to Figure 8-108.

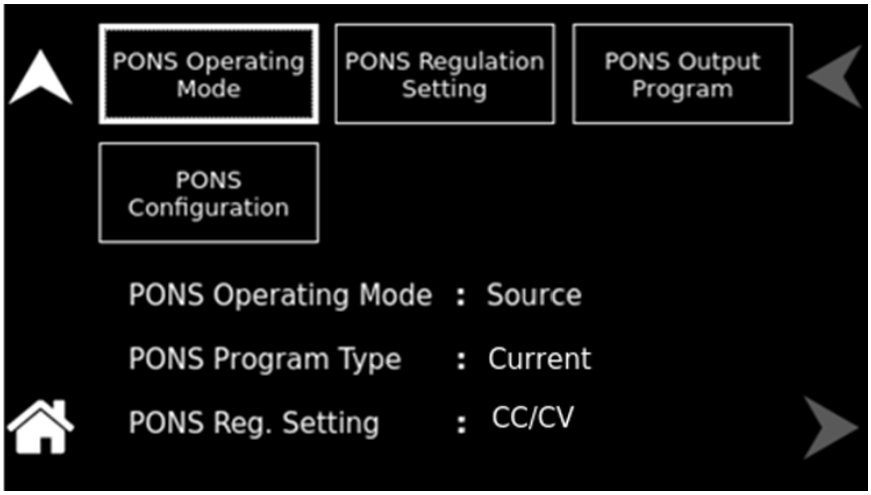


Figure 8-105. PONS Main Screen – CC/CV

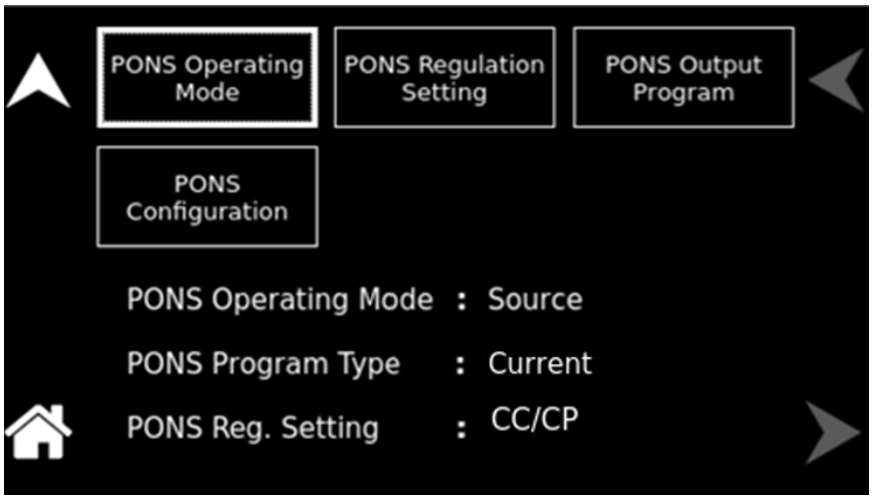


Figure 8-106. PONS Main Screen – CC/CP

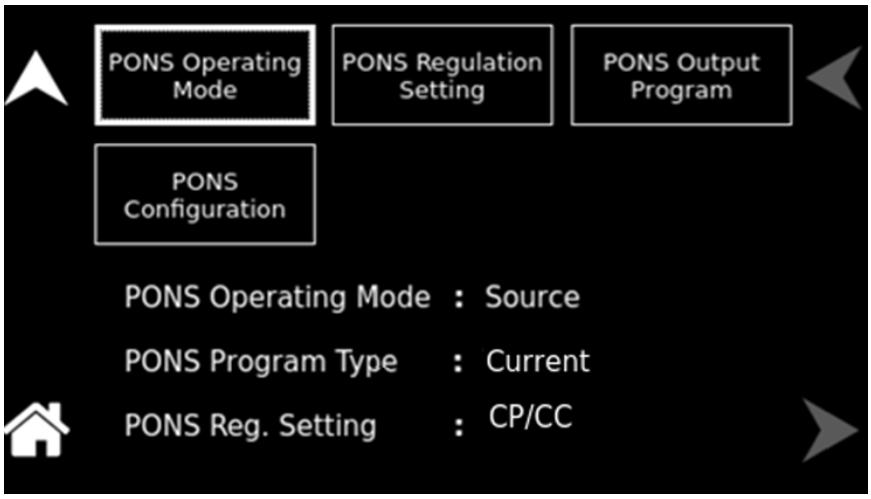


Figure 8-107. PONS Main Screen – CP/CC

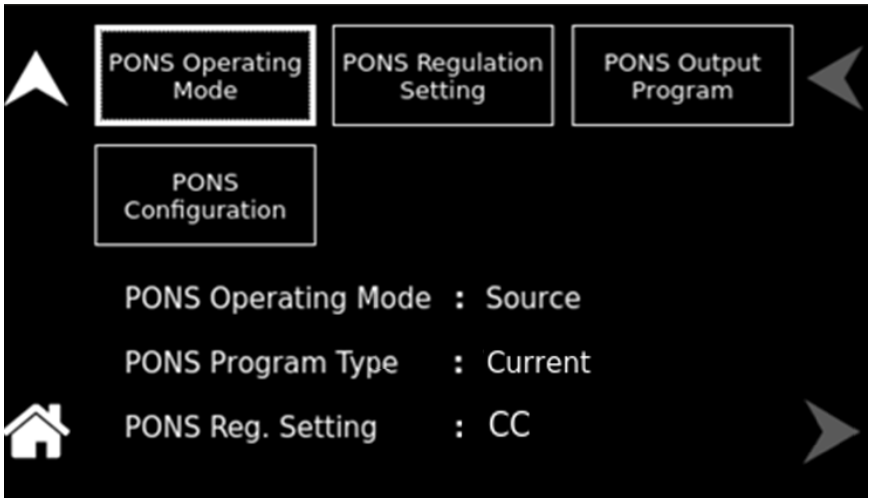


Figure 8-108. PONS Main Screen – CC

8.2.5.7.1 PONS OPERATING MODE

The ‘PONS Operating Mode Settings’ will not change automatically when the user changes the mode in the ‘Operating Mode’ settings on the Home screen. Users must separately select the ‘SOUR’ mode in the 'PONS Operating Mode Settings', which will update the 'PONS Operating Mode Settings', ‘PONS Regulation’, ‘PONS Output Program’ and the 'PONS Configuration' screens. Refer to Figure 8-109, Figure 8-110, Figure 8-112, Figure 8-114, Figure 8-118, Figure 8-124, Figure 8-129, Figure 8-135 and Figure 8-140.

The same applies to other modes such as Bi-DIR, ELOAD, PVSIM, BATSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 9.2.5.7.1, 10.2.4.2.1.5, 11.2.4.7.1 and 12.2.4.6.1.

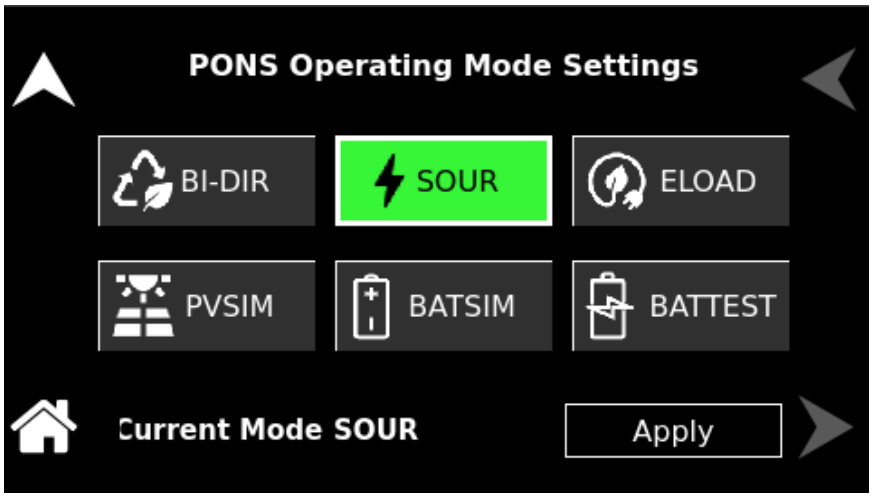


Figure 8-109. PONS Operating Mode Settings

8.2.5.7.2 PONS REGULATION SETTINGS

The Regulation Settings Menu is used to configure the Regulation mode of the power supply. Refer to Figure 8-110.

a) When the programming type is set to 'Voltage' in the Regulation Settings menu, the following fields are available:

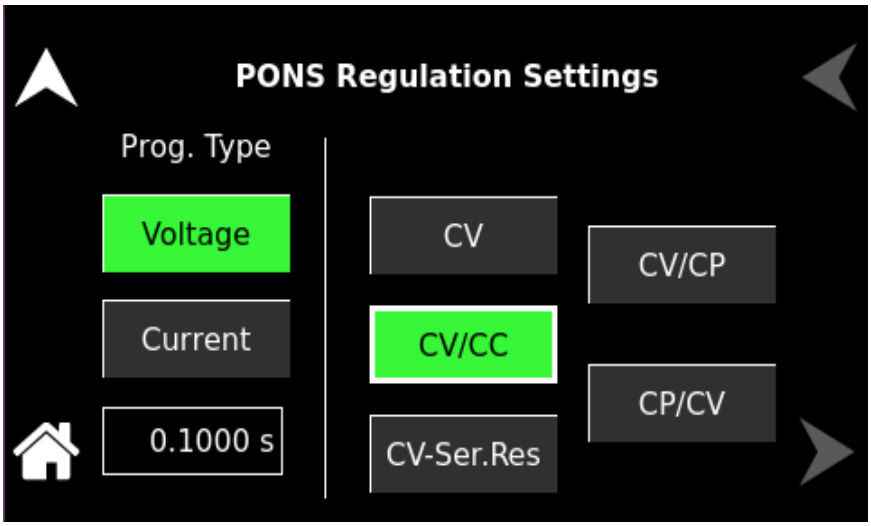


Figure 8-110. PONS regulation Settings

ENTRY	DESCRIPTION
CV/CC	In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the current limit reached. On reaching the power limit (positive), the output voltage would be programmed to zero.
CV-Ser.Res	In this regulation setting, user can set the voltage and series resistance. Depending on the current output, the terminal voltage would be varied based on the voltage drop

ENTRY	DESCRIPTION
	across the series resistance. In the event of reaching the programmed current limit (positive) or power limit (positive) or voltage limit (low), the output voltage is programmed to zero.
CV/CP	In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the power limit reached. On reaching the current limit (positive), the output voltage would be programmed to zero.
CP/CV	In this regulation setting, output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (positive), the output power would be programmed to zero.
CV	In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (positive) or power limit (positive), the output voltage would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 8-111.

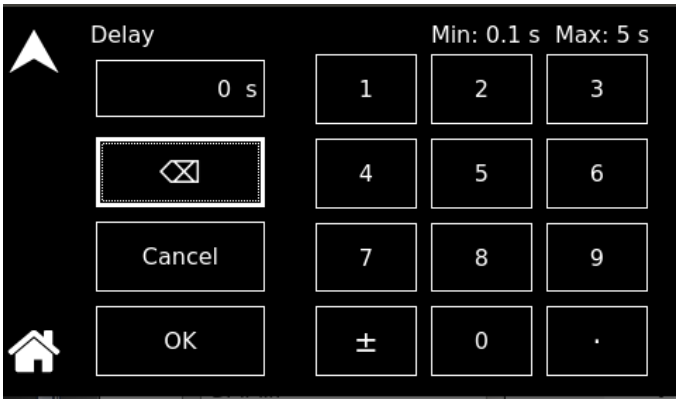


Figure 8-111. Delay Screen

Table 8-24. Regulation Settings

b) When the programming type is set to ‘Current’ in the Regulation Settings menu, the following fields are available:

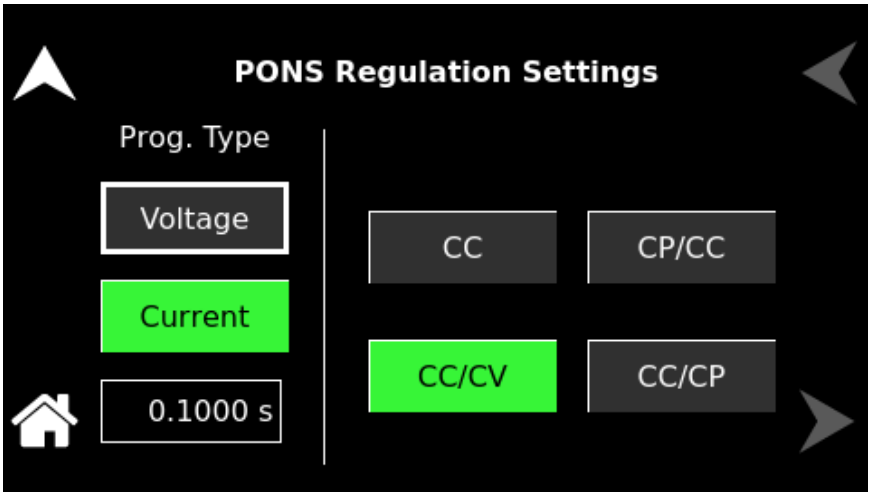


Figure 8-112. PONS regulation Settings

ENTRY	DESCRIPTION
CC/CV	In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (positive), the output current would be programmed to zero.
CP/CC	In this regulation setting, output power is regulated to the user set value. On reaching the current limit (positive), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC/CP	In this regulation setting, output current is regulated to the user set value. On reaching the power limit (positive), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero.
CC	In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (positive), the output current would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 8-113.

ENTRY	DESCRIPTION

Figure 8-113. Delay Screen

Table 8-25. Regulation Setting

8.2.5.7.3 PONS OUTPUT PROGRAM

a) PONS Output Program (Voltage) - CV/CC, CV/CP and CV

When the regulation setting is selected as ‘Voltage (CV/CC, CV/CP and CV) ’, the screen will display the following parameters: ‘PONS Voltage’, ‘PONS Pos. Curr Limit’ and ‘PONS Pos. Pow Limit’. Refer to Figure 8-114.

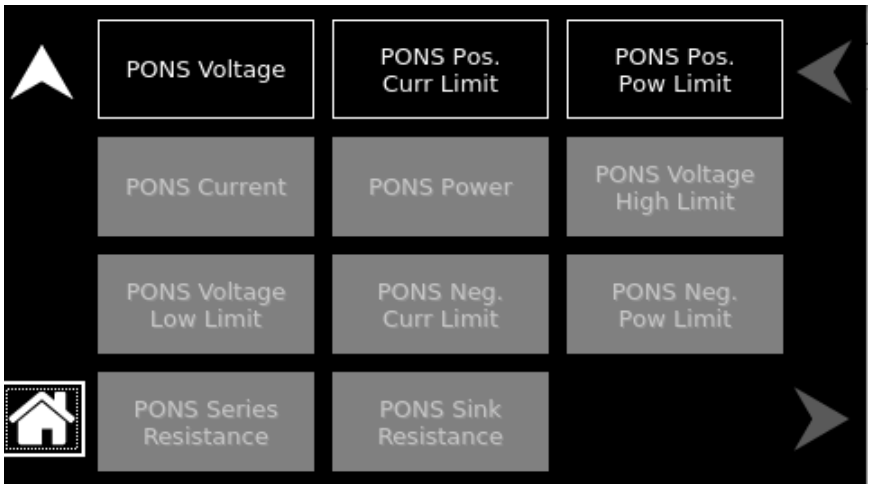


Figure 8-114. Pons Output Program mode – CV/CC, CV/CP and CV

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Voltage	Users can set a voltage value within the specified limit. Refer to Figure 8-115.

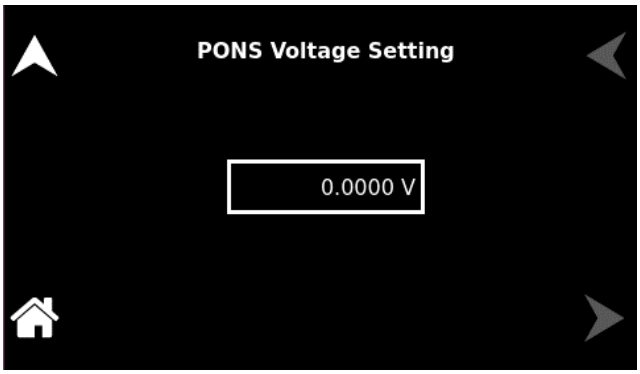


Figure 8-115. PONS Voltage Settings

PONS Pos. Curr Limit Users can set a positive current limit value, which functions as a trip limit (CV and CV/CP), or it regulates (CV/CC) the output upon reaching the PONS Pos. Curr Limit. Refer to Figure 8-116.

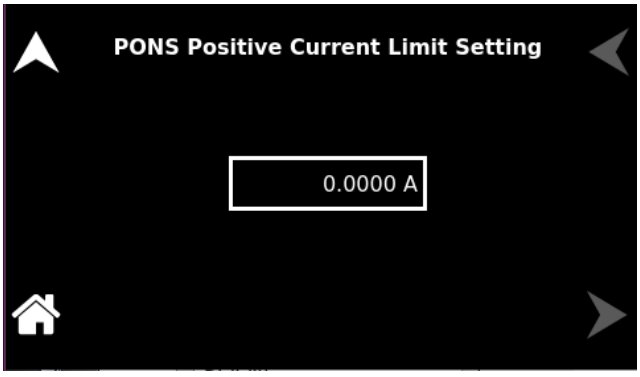


Figure 8-116. PONS Positive Current Limit Settings

PONS Pos. Pow Limit Users can set a positive power limit value, which functions as a trip limit (CV and CV/CC), or it regulates (CV/CP) the output upon reaching the PONS Pos. Pow Limit. Refer to Figure 8-117.

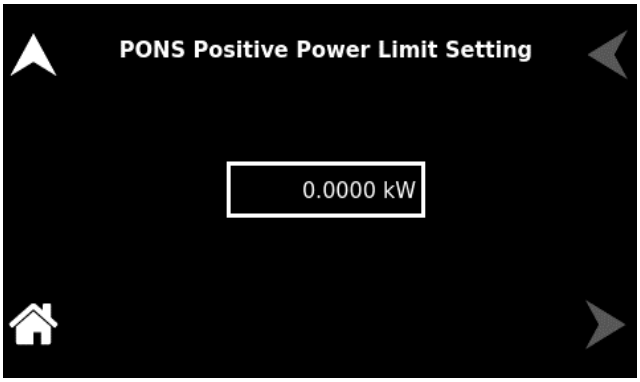


Figure 8-117. PONS Positive Power Limit Setting

ENTRY	DESCRIPTION

Table 8-26. PONS Output Program Settings – CV/CC, CV/CP and CV

b) PONS Output Program (Voltage) – CV- Ser. Res

When the regulation setting is selected as 'Voltage (CV- Ser. Res) ', the screen will display the following parameters: 'PONS Voltage', 'PONS Series Resistance', 'PONS Pos. Current Limit', and 'PONS Voltage Low Limit' and 'PONS Pos. Pow Limit'. Refer to Figure 8-118.

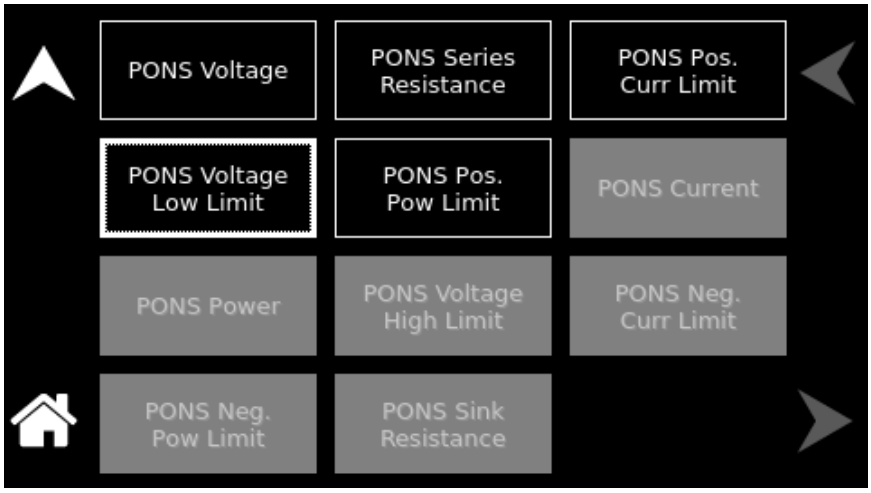


Figure 8-118. Pons Output Program mode – CV -Ser. Res

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Voltage	Users can set a voltage value within the specified limit. Refer to Figure 8-119.

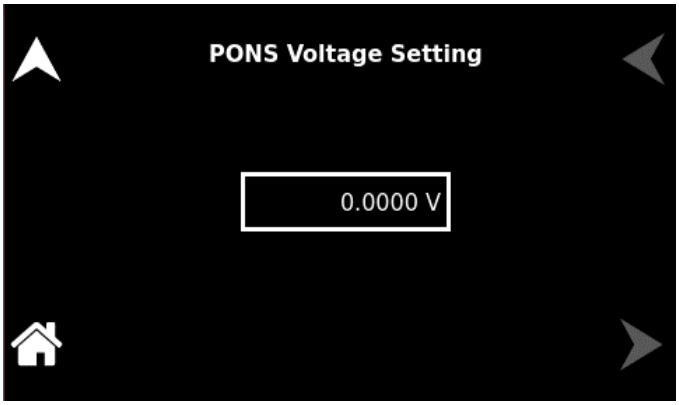


Figure 8-119. PONS Voltage Settings

PONS Series Resistance	Users can set the series resistance value within the specified limit. Refer to Figure 8-120.

ENTRY	DESCRIPTION

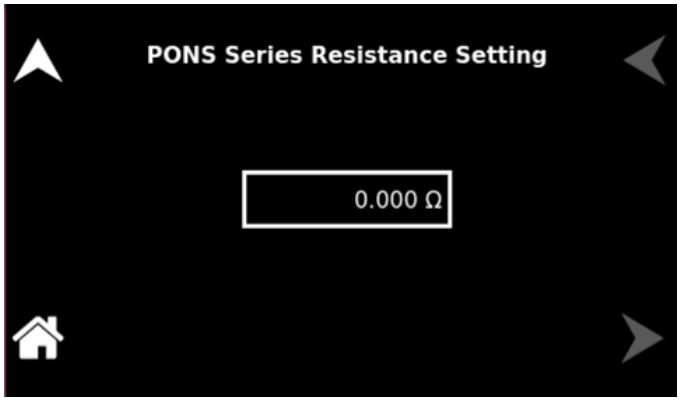


Figure 8-120. PONS* Series Resistance *Settings

PONS Pos. Curr Limit

Users can set a positive current limit value and which functions as a trip limit. Refer to Figure 8-121.

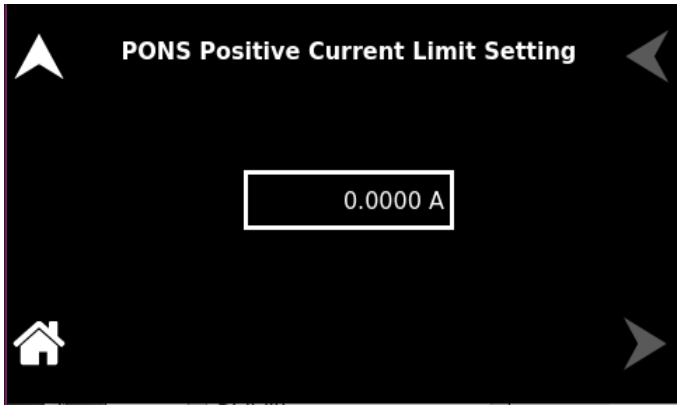


Figure 8-121. PONS Positive Current Limit Settings

PONS Voltage Low Limit

Users can set the voltage low limit value, and it regulates upon reaching the Voltage Low Limit. Refer to Figure 8-122.

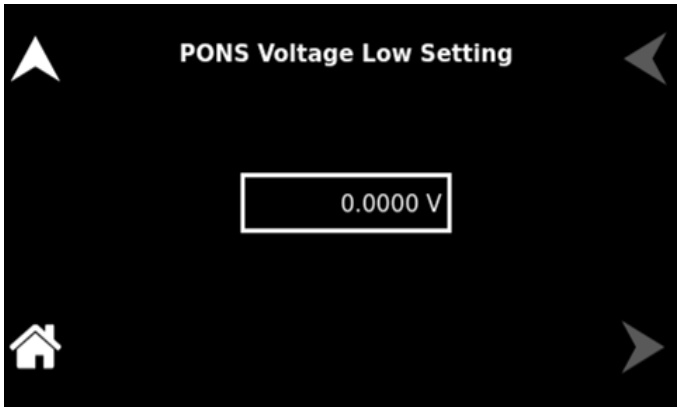


Figure 8-122. PONS* Voltage Low *Settings

ENTRY	DESCRIPTION
PONS Pos. Pow Limit	Users can set a positive power limit value and which functions as a trip limit. Refer to Figure 8-123.

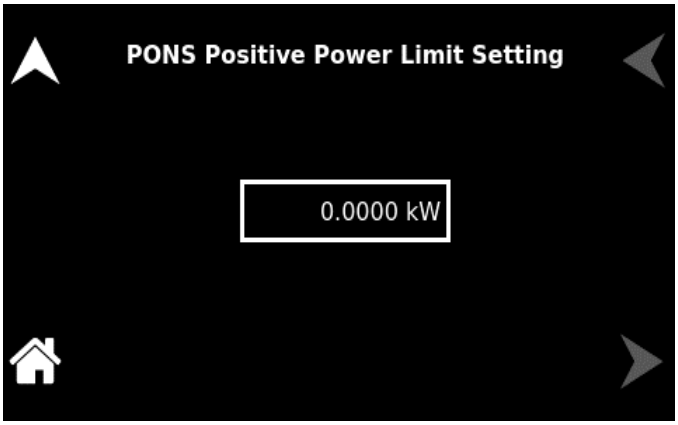


Figure 8-123. PONS Positive Power Limit Setting

Table 8-27. PONS Output Program Settings

c) PONS Output Program (Voltage) – CP/CV

When the regulation setting is selected as ‘Voltage (CP/CV) ’ the screen will display the following parameters: ‘PONS Power’, ‘PONS Voltage High Limit’, ‘PONS Voltage Low Limit’ and ‘PONS Pos. Current Limit’. Refer to Figure 8-124.

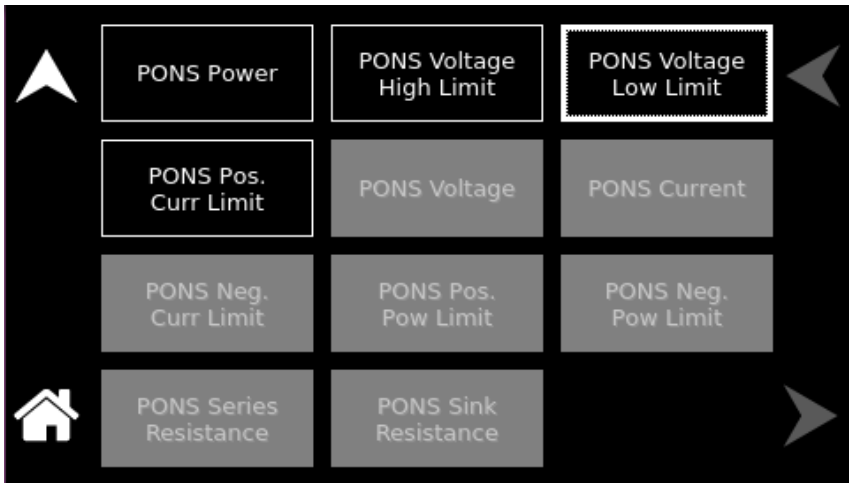


Figure 8-124. Pons Output Program mode – CP/CV

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Power	Users can set a power value within the specified limit. Refer to Figure 8-125.

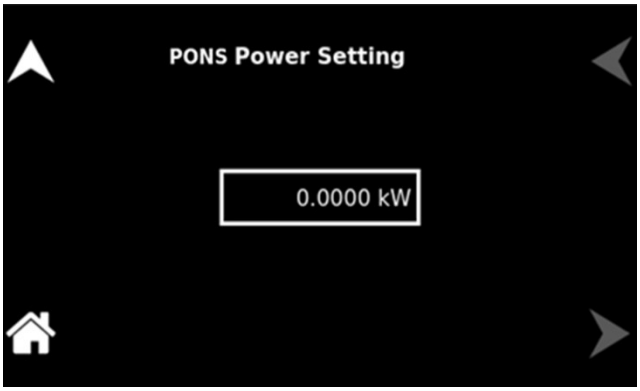


Figure 8-125. Power Settings

PONS Voltage High Limit	Users can set the voltage high limit value, and it regulates the output upon reaching the PONS Voltage High Limit. Refer to Figure 8-126.

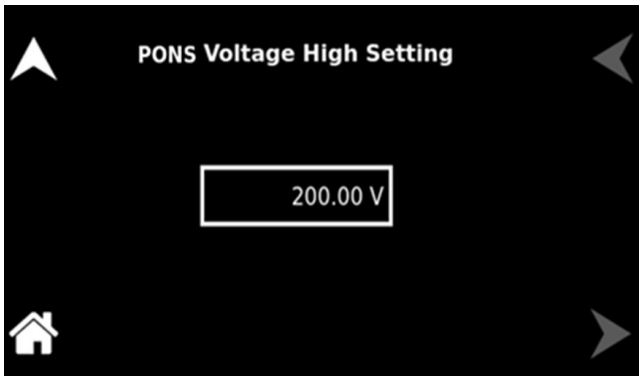


Figure 8-126. Voltage High Setting

PONS Voltage Low Limit	Users can set the voltage low limit value, and it regulates the output upon reaching the PONS Voltage Low Limit. Refer to Figure 8-127.

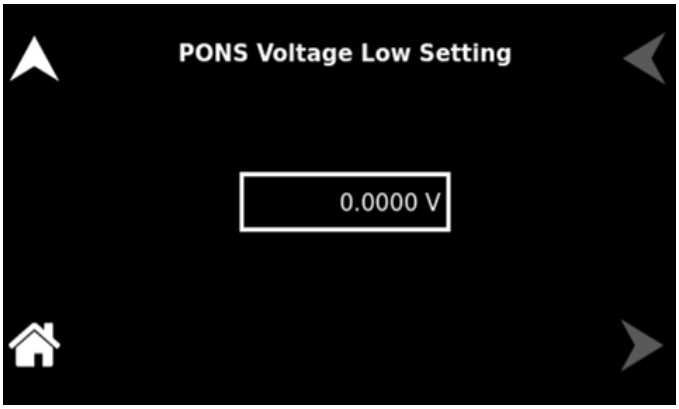


Figure 8-127. Voltage Low Setting

ENTRY	DESCRIPTION
PONS Pos. Current Limit	Users can set a positive current limit value, and which functions as a trip limit. Refer to Figure 8-128.

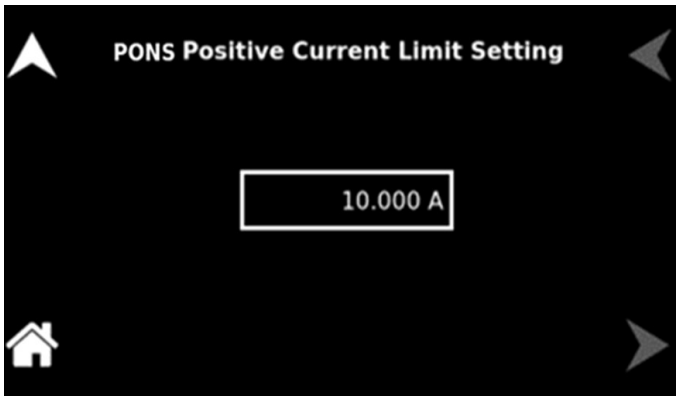


Figure 8-128. Pos. Current Limit Setting

Table 8-28. PONS Output Program Settings

b) PONS Output Program (Current) - CC/CV, CC/CP and CC

When the regulation setting is selected as ‘Current (CC/CV, CC/CP and CC) ’ the screen will display the following parameters: ‘PONS Current’, ‘PONS Voltage High Limit’, ‘PONS Voltage Low Limit’ and ‘PONS Pos. Pow Limit’. Refer to Figure 8-129.

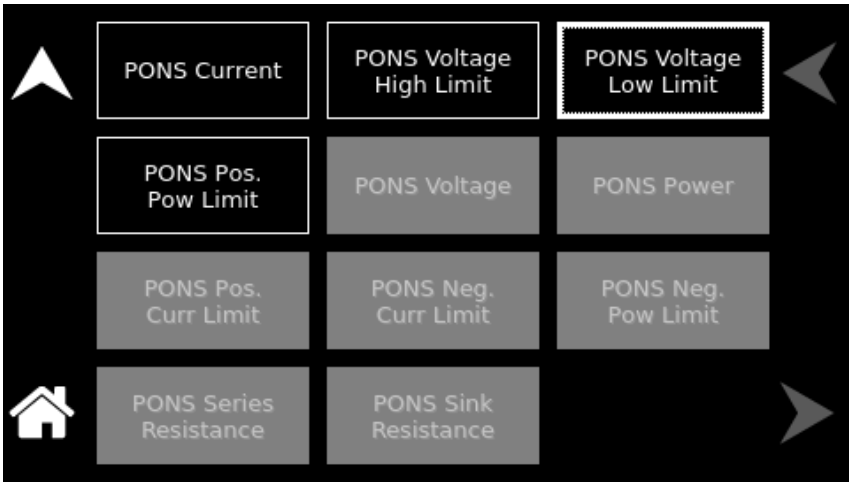


***Figure 8-129. Pons Output Program mode* –CC/CV, CC/CP and CC**

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Current	Users can set the Current value within the specified limit. Refer to Figure 8-130.

ENTRY	DESCRIPTION

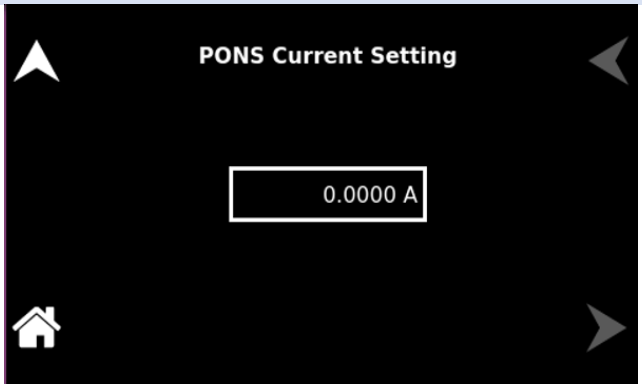


Figure 8-130. Current Setting

PONS Voltage High Limit

Users can set a voltage high limit value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the PONS Voltage High Limit. Refer to Figure 8-131.

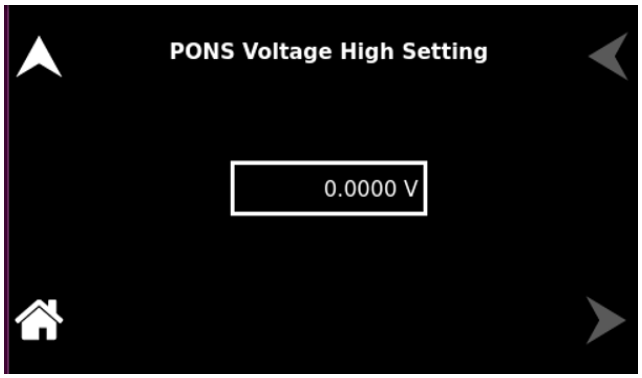


Figure 8-131. Voltage High Setting

PONS Voltage Low Limit

Users can set a voltage low limit value, which functions as a trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the PONS Voltage Low Limit. Refer to Figure 8-132.

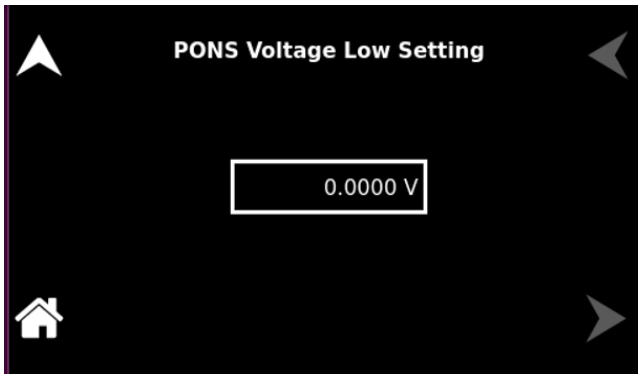


Figure 8-132. Voltage Low Settings

ENTRY	DESCRIPTION
PONS Pos. Power Limit	Users can set a positive power limit value, which functions as a trip limit (CC and CC/CV), or it regulates (CC/CP) the output upon reaching the PONS Pos. Power Limit. Refer to Figure 8-133.

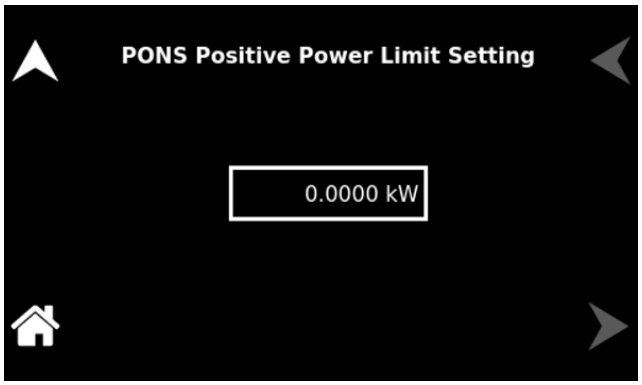


Figure 8-133. Positive Power Limit

PONS Output State	Users can program the output to ON or OFF state. Refer to Figure 8-134.

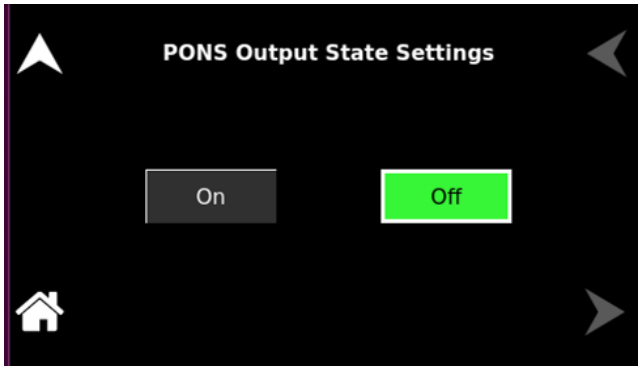


Figure 8-134. Output State Settings

Table 8-29. PONS Output Program Settings

c) PONS Output Program (Current) - CP/CC

When the regulation setting is selected as ‘Current (CP/CV) ’ the screen will display the following parameters: ‘PONS Power’, ‘PONS Voltage High Limit’, ‘PONS Voltage Low Limit’ and ‘PONS Pos. Current Limit’. Refer to Figure 8-135.

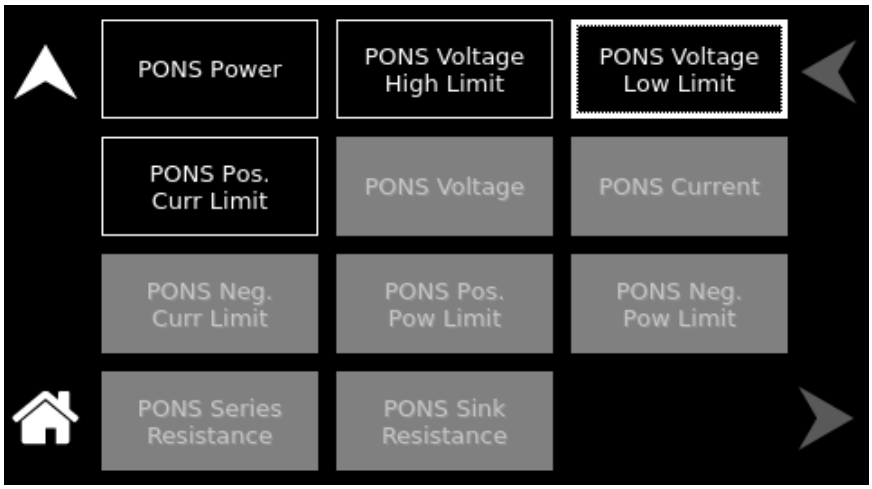


***Figure 8-135. Pons Output Program mode* – CP/CC**

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Power	Users can set a power value within the specified limit. Refer to Figure 8-136.
PONS Voltage High Limit	Users can set voltage high limit value within the specified limit and this functions as a trip limit. Refer to Figure 8-137.

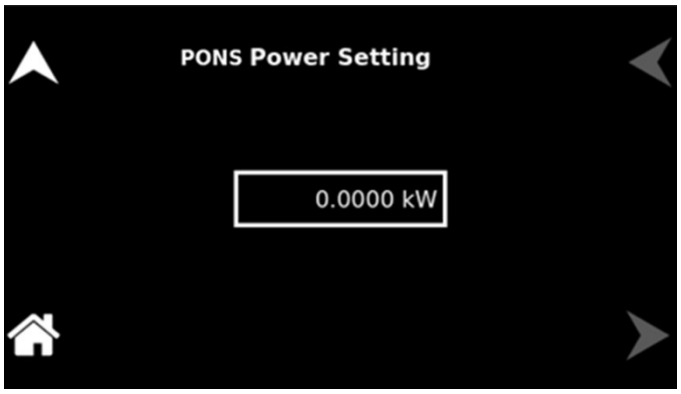


Figure 8-136. PONS Power Settings

ENTRY	DESCRIPTION

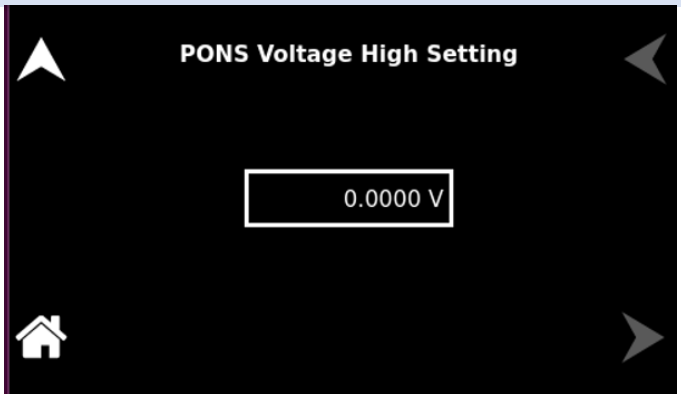


Figure 8-137. PONS Voltage High Setting

PONS Voltage Low Limit

Users can set a voltage low limit value within the specified limit and this functions as a trip limit. Refer to Figure 8-138.

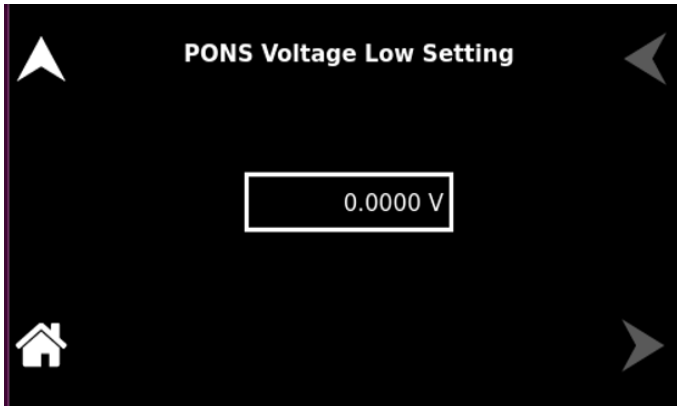
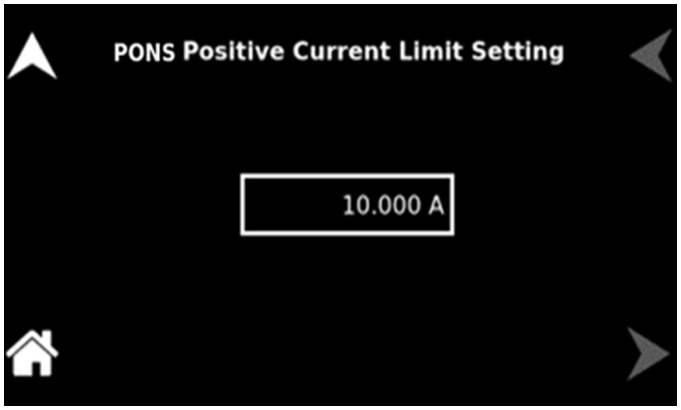


Figure 8-138. PONS Volt Low Setting

PONS Pos. Current Limit

Users can set a positive current limit value, and which regulates upon reaching the PONS Pos. Current Limit. Refer to Figure 8-139.



ENTRY	DESCRIPTION

Figure 8-139. PONS Pos. Current Limit Setting

Table 8-30. PONS Output Program Settings

8.2.5.7.4 PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select ‘PONS Protection’, ‘PONS Slew Rate’, ‘PONS User Limit’, ‘PONS Output Sense’ and ‘PONS Measurement Average Samples’. Refer to Figure 8-140.

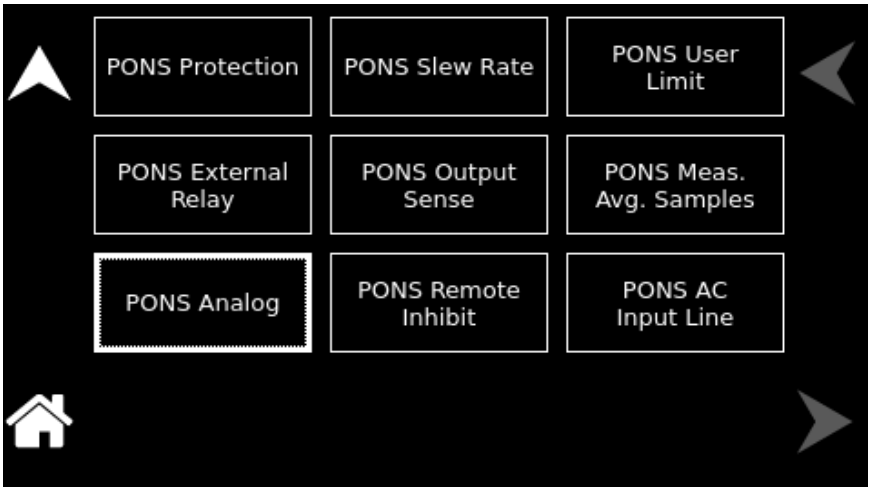


Figure 8-140. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	Users can define OVP and Pos. OCP to help safeguard their devices from electrical anomalies by shutting down the output if it exceeds the preset voltage. Refer to Figure 8-141.

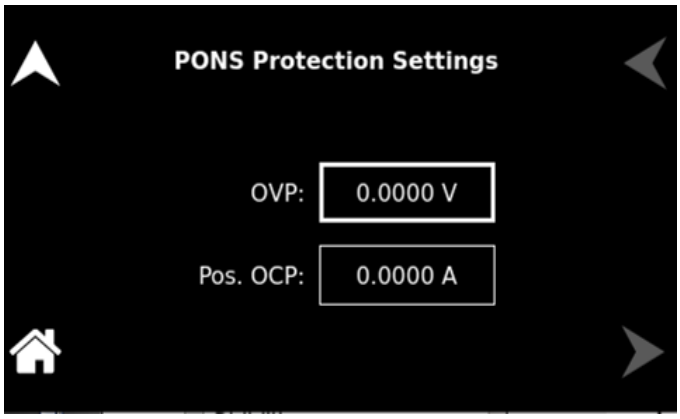


Figure 8-141. PONS Protection Settings

PONS Slew Rate	Users can configure the voltage, current and power slew rate. This allows for

ENTRY	DESCRIPTION

precise control over the voltage, current and power ensuring smoother transitions and better performance of the power supply. Adjusting these settings can help in optimizing the response time and stability of the system. Refer Figure 8-142 to Figure 8-144.

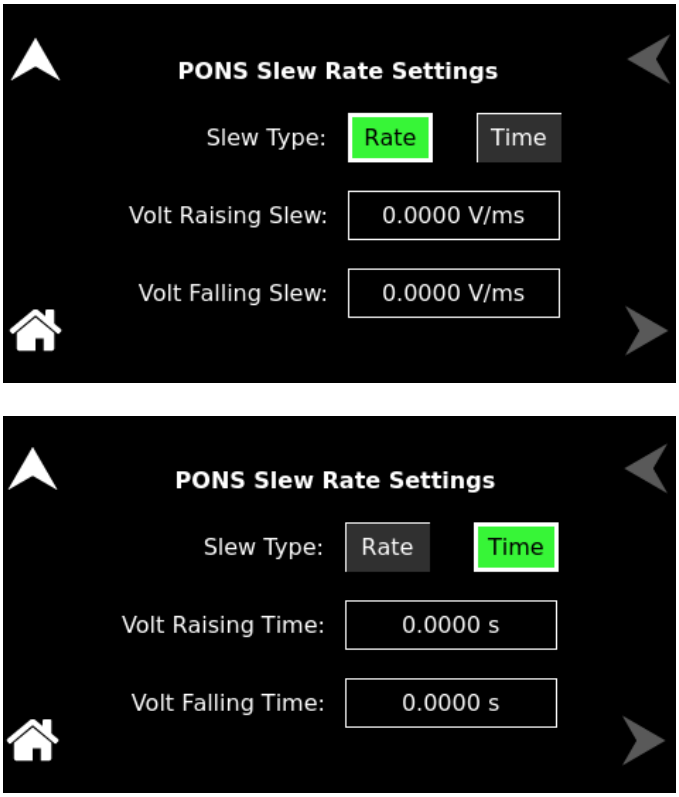
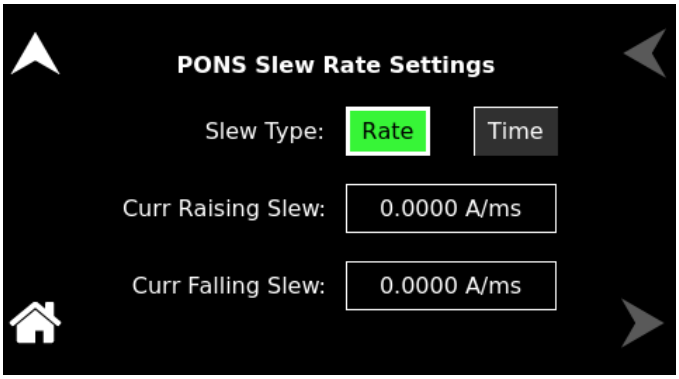


Figure 8-142. PONS Slew Rate Settings – Voltage (CV/CC, CV-Ser.Res, CV/CP and CV)



ENTRY	DESCRIPTION

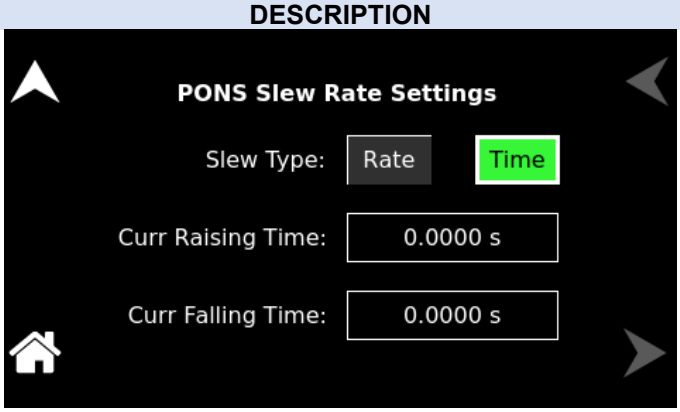
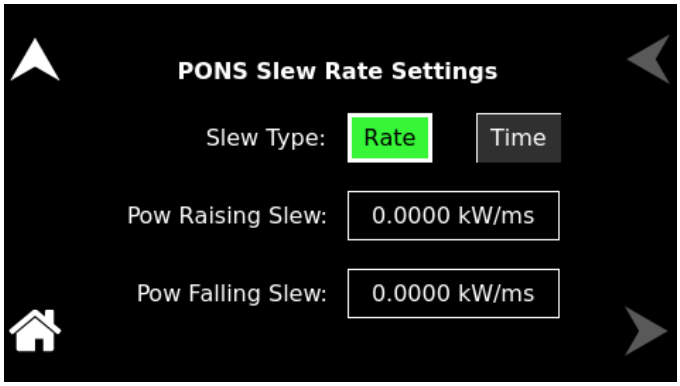


Figure 8-143. PONS Slew Rate Settings – Current (CC/CV, CC/CP and CC)



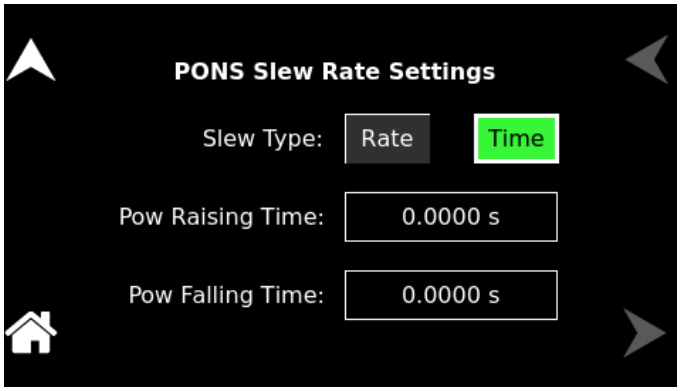


Figure 8-144. PONS Slew Rate Settings – Power (CP/CV and CP/CC)

PONS User Limit

Users can set the Voltage, Current High Limit and Power High Limit values. Refer Figure 8-145 to Figure 8-147.

ENTRY	DESCRIPTION

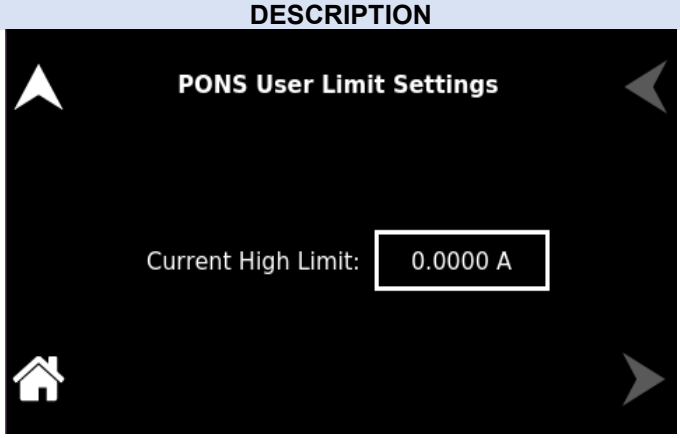


Figure 8-145. PONS User Limit Settings- Current (CC/CV, CC/CP and CC)

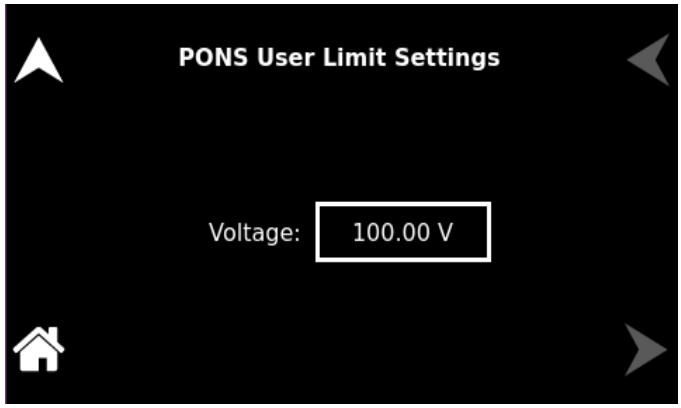


Figure 8-146. PONS User Limit Settings – Voltage (CV/CC, CV-Ser.Res, CV/CP and CV)

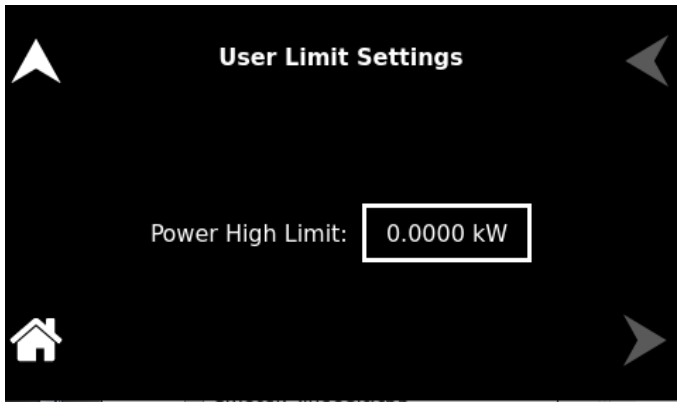


Figure 8-147. PONS User Limit Settings – Power (CP/CV and CP/CC)

ENTRY	DESCRIPTION
PONS External Relay	Users can set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 8-148.

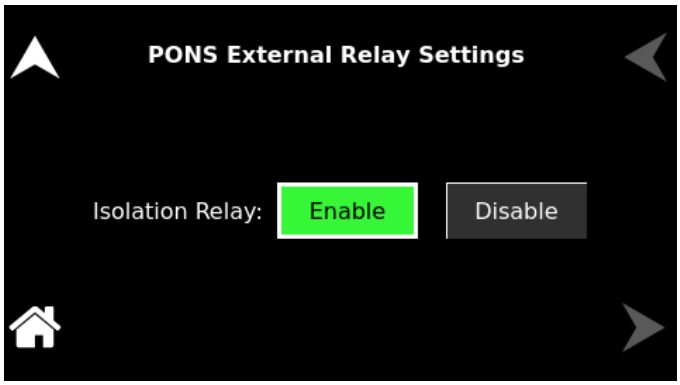


Figure 8-148. PONS External Relay Settings

PONS Output Sense Settings	Programs the PONS output to ON or OFF state. Refer to Figure 8-149.

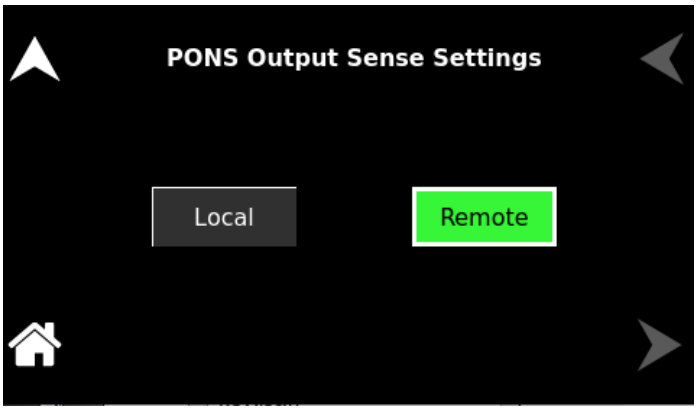


Figure 8-149. PONS Output Sense Settings

PONS Measurement Average Samples	Users can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 8-150.

ENTRY	DESCRIPTION

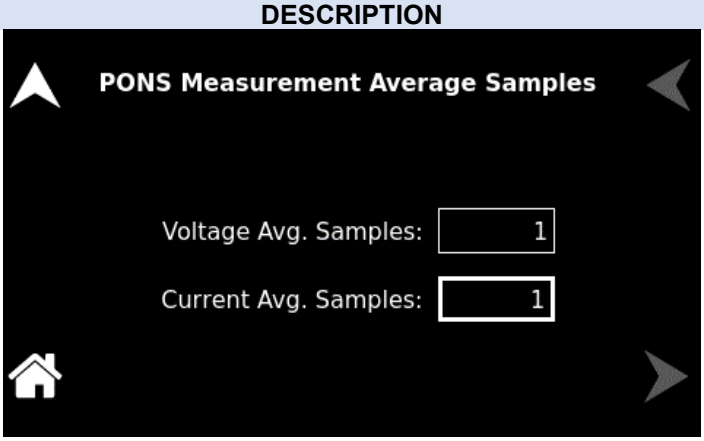


Figure 8-150. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 8-151.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

ENTRY	DESCRIPTION

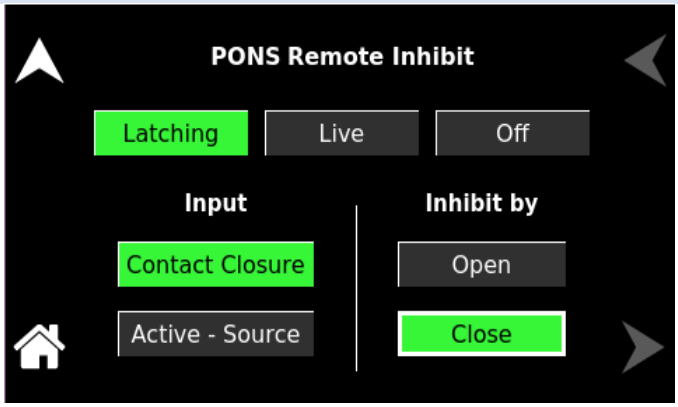


Figure 8-151. PONS remote Inhibit

AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 8-152.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

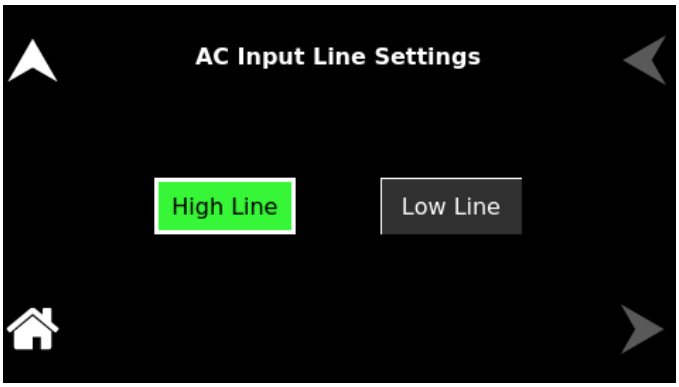


Figure 8-152. AC Input Line Settings

PONS Analog

Configures the PONS Analog programming interface, refer to Figure 8-153.

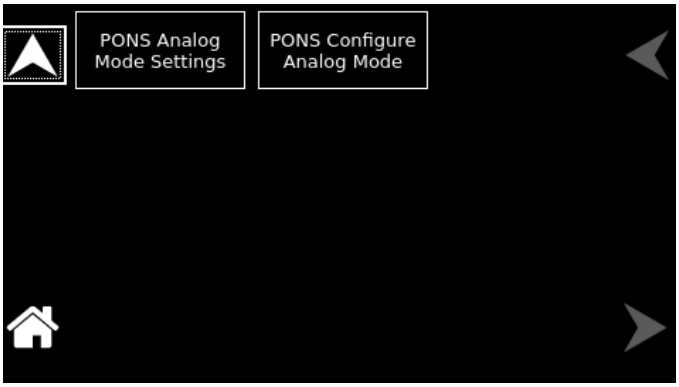


Figure 8-153. PONS Analog Screen

a) PONS Analog Mode Settings

ENTRY	DESCRIPTION

Lists the configuration settings of the PONS Analog Programming interface. Refer Figure 8-154.

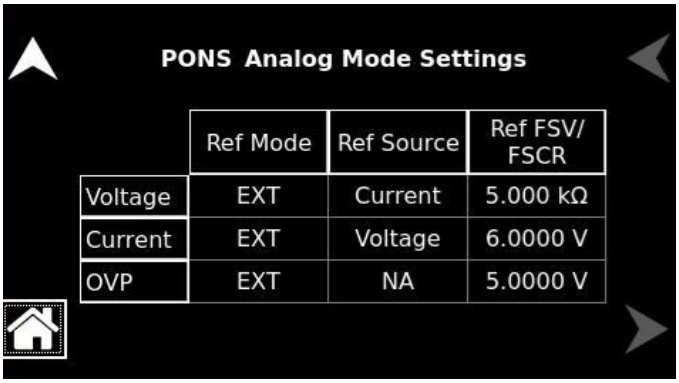


Figure 8-154. PONS Analog Mode Settings

b) PONS Configure Analog Mode

Sets parameter values and controls operation of the PONS Analog Programming interface. Refer to Figure 8-155.

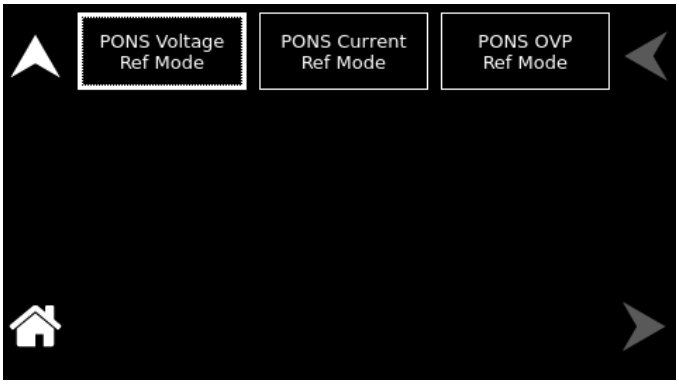


Figure 8-155. PONS Configure Analog Mode Settings

- **PONS Voltage Ref Mode :** Configures the PONS Voltage Reference Mode, refer to Figure 8-155. When the PONS Voltage Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 8-156 to Figure 8-158.

ENTRY	DESCRIPTION

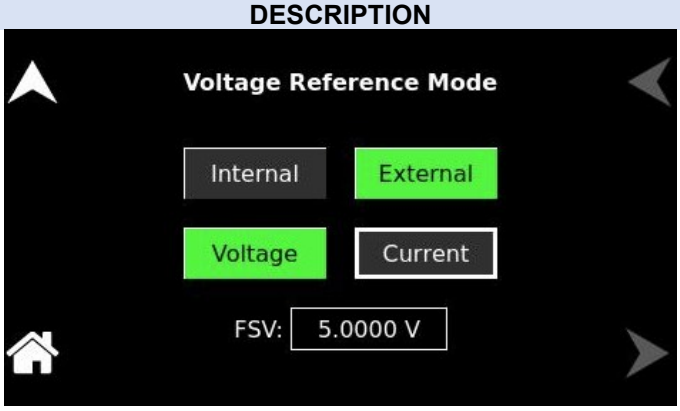


Figure 8-156. PONS Voltage Reference Mode

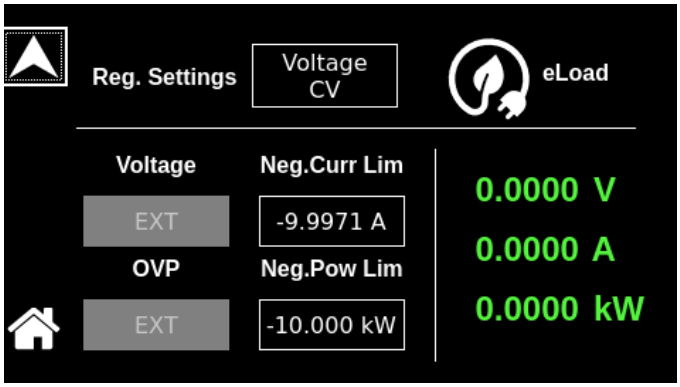


Figure 8-157. Dashboard Screen – Voltage (EXT)

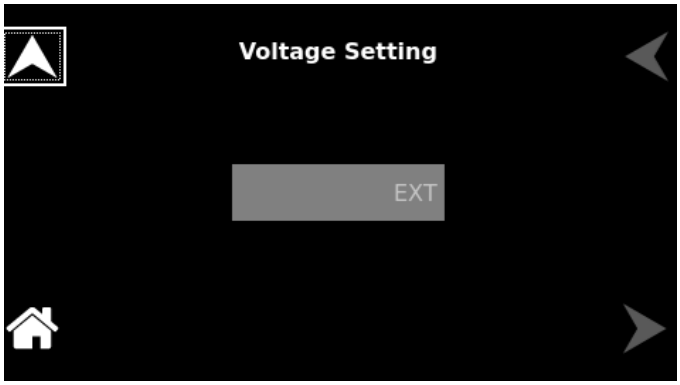


Figure 8-158. Output Program Screen – Voltage (EXT)

- When Voltage Reference Mode is selected as Current, FSCR (Full Scale Current Resistance) unit will be kΩ (k Ohms). Refer to Figure 8-159.

ENTRY	DESCRIPTION

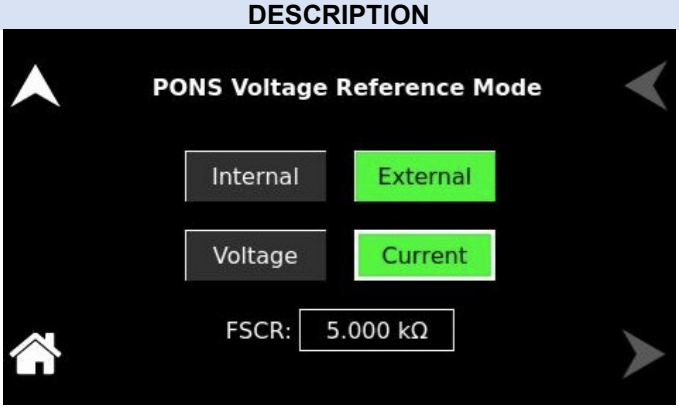


Figure 8-159. PONS Voltage Reference Mode – Resistive

- **PONS Current Ref Mode:** Configures the PONS Current Reference Mode, refer to Figure 8-155. When the PONS Current Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 8-160 and Figure 8-161.

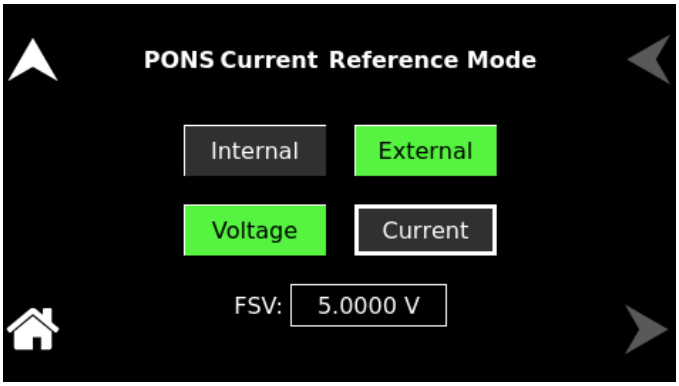


Figure 8-160. PONS Current Reference Mode

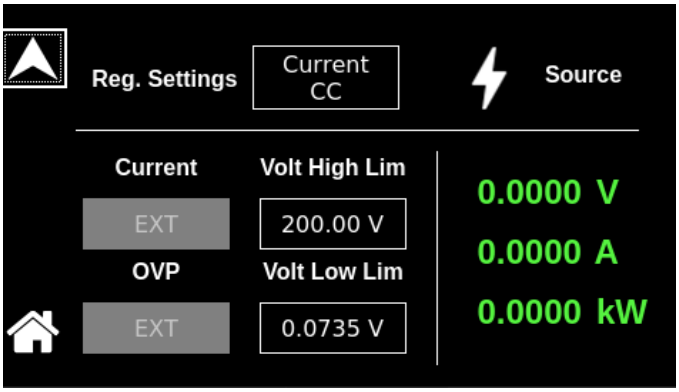


Figure 8-161. Dashboard Screen – Current (EXT)

- **PONS OVP Ref Mode:** Configures the PONS Over Voltage Protection (OVP) Reference Mode. When the PONS OVP Reference

ENTRY	DESCRIPTION
	Mode is set to External, the OVP setting field on the Dashboard screen and the 'Protection' option in the Configuration screen will be disabled, and these OVP fields will display as 'EXT' refer to Figure 8-161 and Figure 8-162.

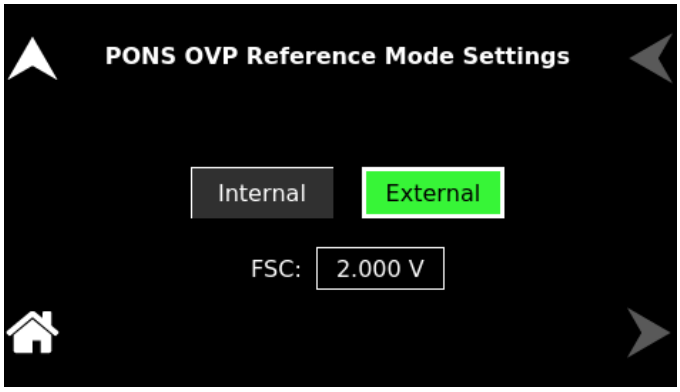


Figure 8-162. PONS OVP Reference Mode

Table 8-31. PONS Configuration mode

8.2.5.8 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 8-163.

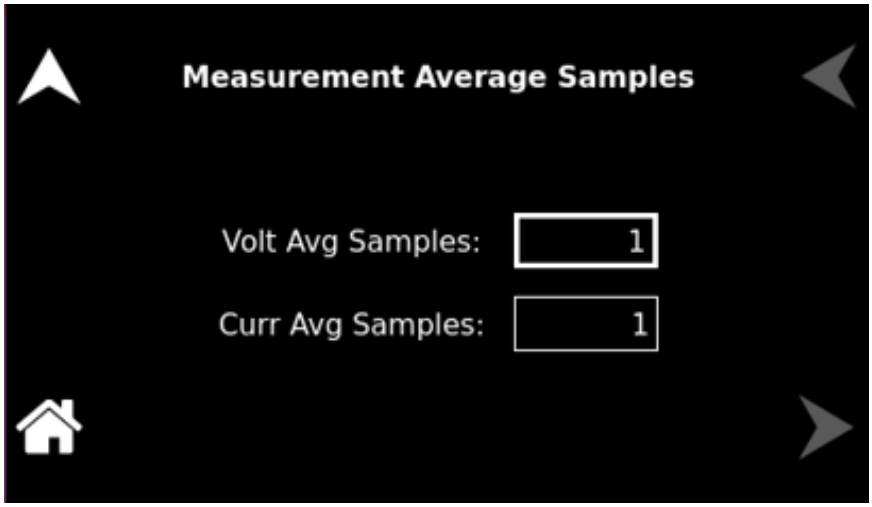


Figure 8-163. Measurement Average Samples

The Measurement Average Samples 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 8.

ENTRY	DESCRIPTION
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 8-32. Measurement Average Samples Settings menu

8.2.6 CONTROL INTERFACE SCREEN

The Control Interface screen provides the ability to configure the power supply for remote control through the data communications interfaces. For the top-level menu of the Control Interface Screen, refer to Figure 8-164 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

Figure 8-164. Control Interface Screen Top-Level Menu

The Control interface Settings menu has the following fields:

ENTRY	DESCRIPTION
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 8-165. After settings are changed, the unit must be turned OFF/ON for them to take effect.

Figure 8-165. LAN Screen

a) LAN SETTINGS

Lists the configuration settings of the LAN interface, and the DNS-SD service name; a number, (n), would be appended to the service name, if necessary, to differentiate duplicate power supply names. Refer to Figure 8-166.

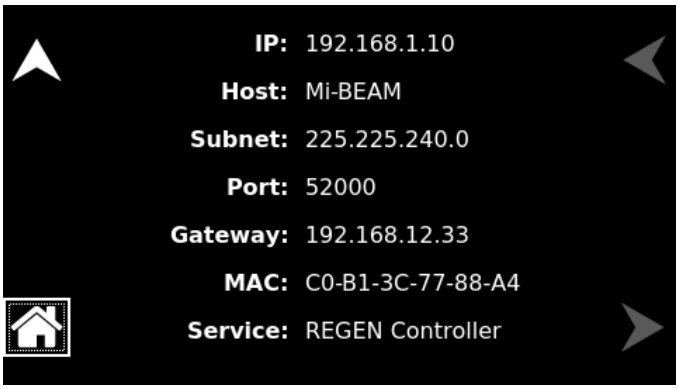


Figure 8-166. LAN Settings

b) LAN CONFIGURE

Sets parameter values and controls operation of the LAN interface, refer to Figure 8-167.

ENTRY	DESCRIPTION

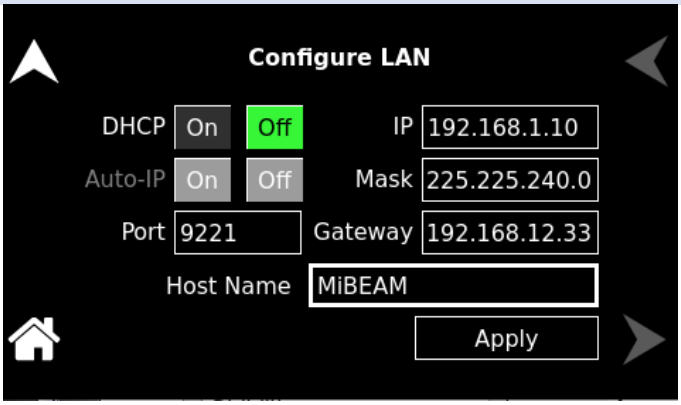


Figure 8-167. Configure LAN

- **DHCP**: Selects whether DHCP is enabled or disabled. Refer to Figure 8-168.

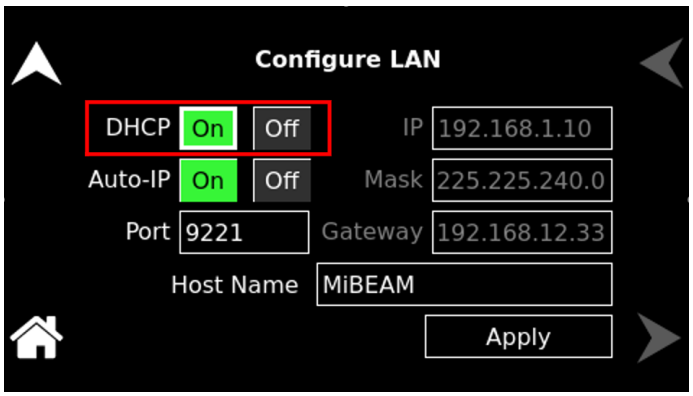
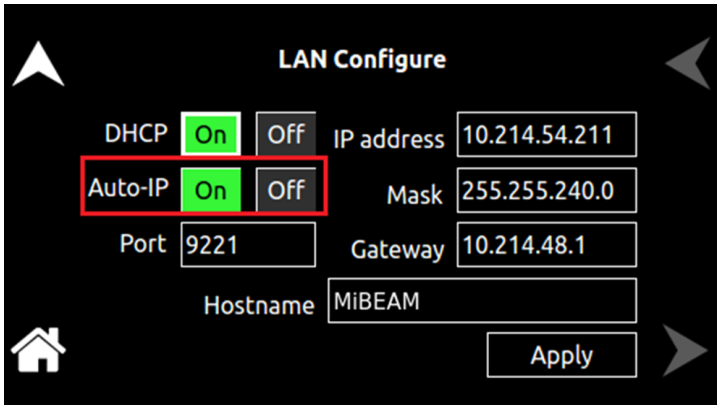


Figure 8-168. LAN Screen – DHCP

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.

- **Auto-IP**: Enables or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 8-169.



ENTRY	DESCRIPTION

Figure 8-169. LAN Screen - Auto -IP

- **IP Address**: Sets the static IP address for the unit. When DHCP is turned off in the LAN CONFIG sub-menu, AUTO IP is selected, set the IP address to all zeros so that the IP address would be requested from the network; when DHCP is selected, the IP address is assigned by the network DHCP server. Refer to Figure 8-170.

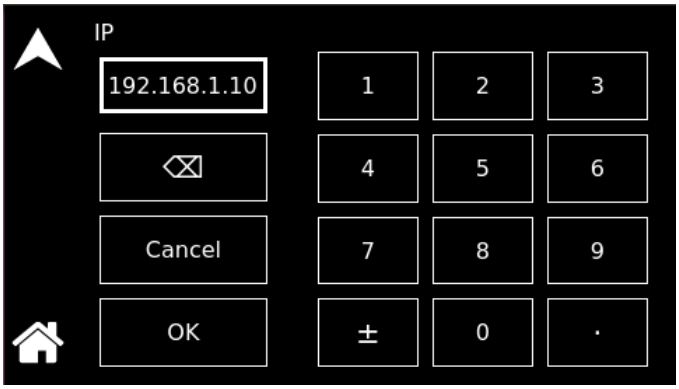


Figure 8-170. LAN Screen - IP Address

- **Subnet Mask**: Sets the subnet mask for use in static IP configuration. Refer to Figure 8-171.

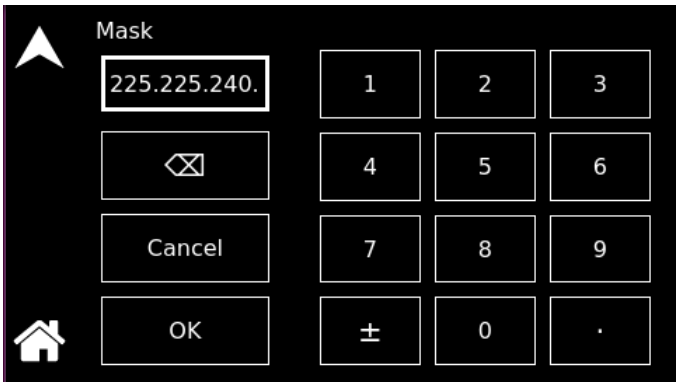


Figure 8-171. LAN Screen - Subnet Mask

- **Gateway Address**: Sets the gateway address when DHCP is turned off in the LAN CONFIG sub-menu and when AUTO IP is selected, set the gateway address to all zeros so that the gateway address would be requested from the network; when DHCP is selected, the gateway address is assigned by the network DHCP server. Refer to Figure 8-172.

ENTRY	DESCRIPTION

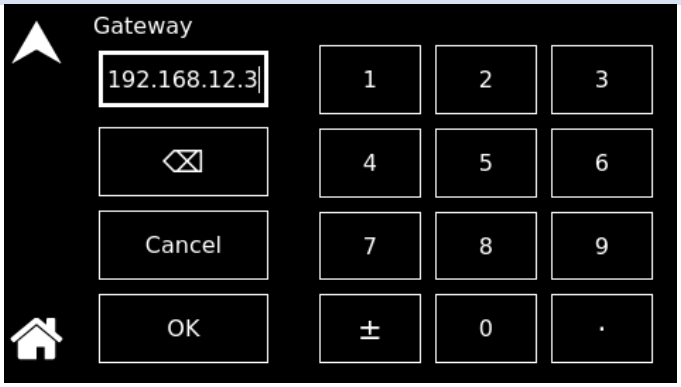


Figure 8-172. LAN Screen - Gateway Address

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

- **Port**: sets the port number; the factory-default value is 9221. Refer to Figure 8-173.

Figure 8-173. LAN Screen -Port

- **MAC Address:** Displays the MAC address; the MAC address is listed on a label on the chassis of the unit. Refer to Figure 8-174.

Figure 8-174. MAC Address

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

ENTRY	DESCRIPTION

Figure 8-175.

Figure 8-175. LAN Screen - Host Name

- **Apply**: Applies the LAN settings to the supply. Refer to Figure 8-176 and Figure 8-177.

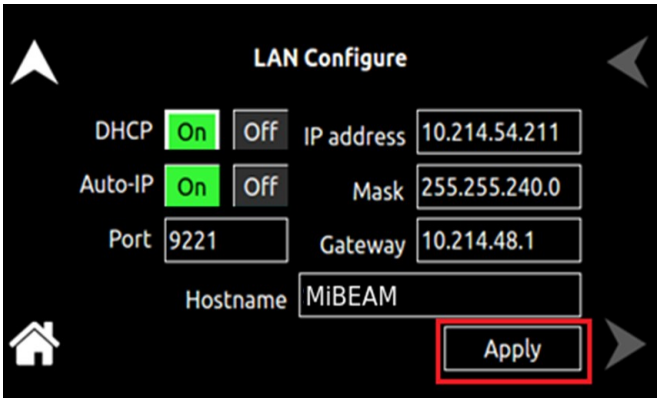


Figure 8-176. LAN Screen – Apply

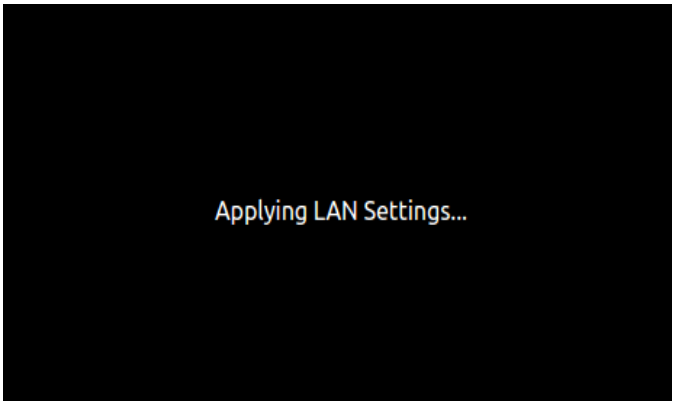


Figure 8-177. LAN Screen - Applying LAN Settings

RS232 Configures the RS-232C communications interface.RS232 has two sub-menus: RS232 Settings and RS232 Configure

a) RS232 Settings: Lists the configured Baud Rate, Stop Bits, Bits and

ENTRY	DESCRIPTION

Parity for the RS232 digital interface, refer to Figure 8-178.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.
- **Stop Bits** sets the number of stop bits to either 1 or 2 bits. The default setting is 1 stop bit.
- **Data**: sets the number of data bits to either 7 or 8. The default setting is 8 bits.
- **Parity**: sets the parity to either Even, Odd, or no parity, None. The default setting is no parity, None.

Figure 8-178. RS232 Screen -Settings

b) Configure RS232: Configures the RS-232 Baud Rate, refer to Figure 8-179 and Figure 8-180. This setting must match those set for the communications port of the user external controller.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud

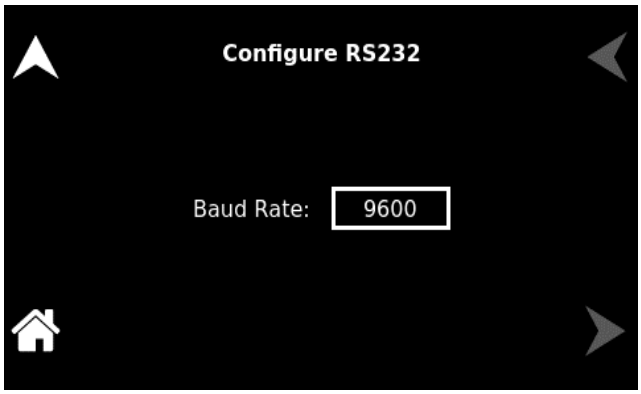


Figure 8-179. RS232 Screen -Configure

ENTRY	DESCRIPTION

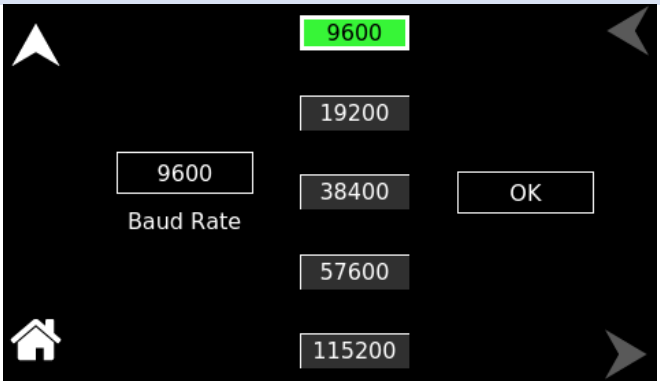


Figure 8-180. Baud Rate Selection

PONS Remote Inhibit

Sets the control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 8-181.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

ENTRY	DESCRIPTION

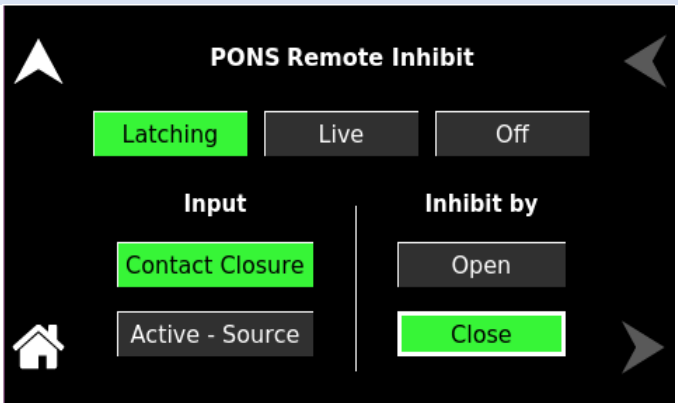


Figure 8-181. PONS remote Inhibit

Analog Configures the Analog programming interface, refer to Figure 8-182.

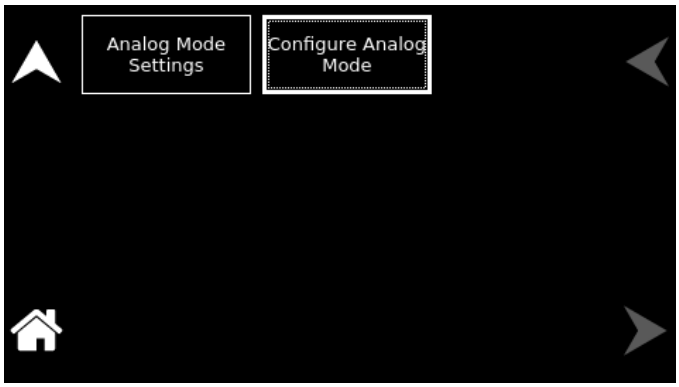


Figure 8-182. Analog Screen

a) Analog Mode Settings

Lists the configuration settings of the Analog Programming interface. Refer to Figure 8-183.

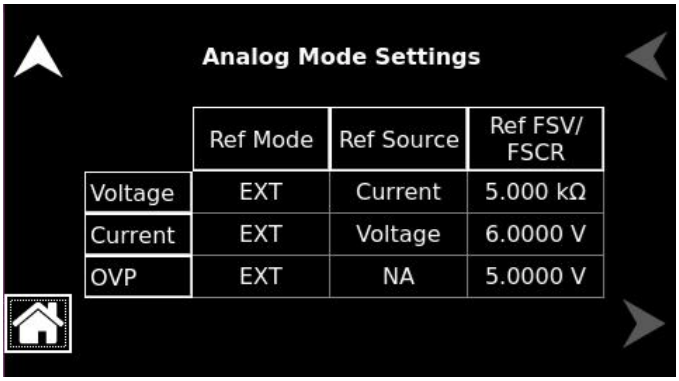


Figure 8-183. Analog Mode Settings

b) Configure Analog Mode

Sets parameter values and controls operation of the Analog Programming interface. Refer to Figure 8-184.

ENTRY	DESCRIPTION

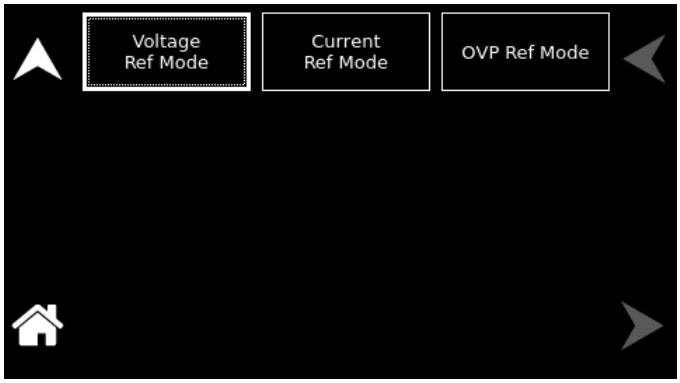


Figure 8-184. Configure Analog Mode Settings

- **Voltage Ref Mode :** Configures the Voltage Reference Mode, refer to Figure 8-184.When the Voltage Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 8-185 to Figure 8-188.

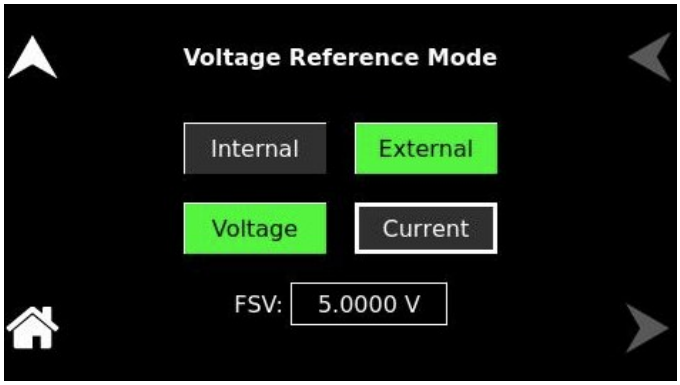


Figure 8-185. Voltage Reference Mode

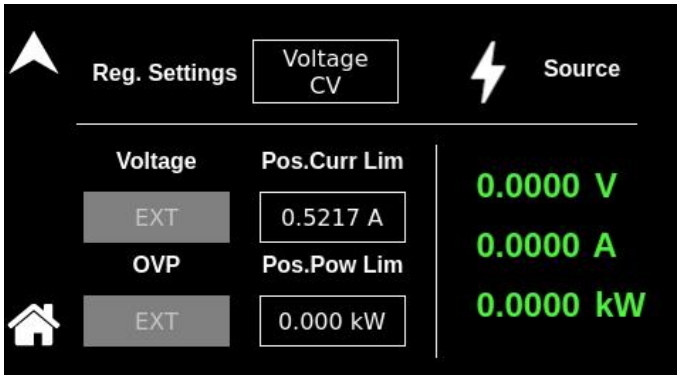


Figure 8-186. Dashboard Screen – Voltage (EXT)

ENTRY	DESCRIPTION

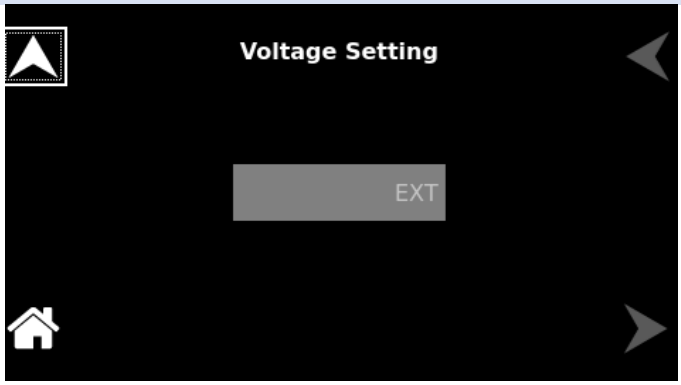


Figure 8-187. Output Program Screen – Voltage (EXT)

When Voltage Reference Mode is selected as Current, FSCR (Full Scale Current Resistance) unit will be kΩ (k Ohms). Refer to Figure 7-185.

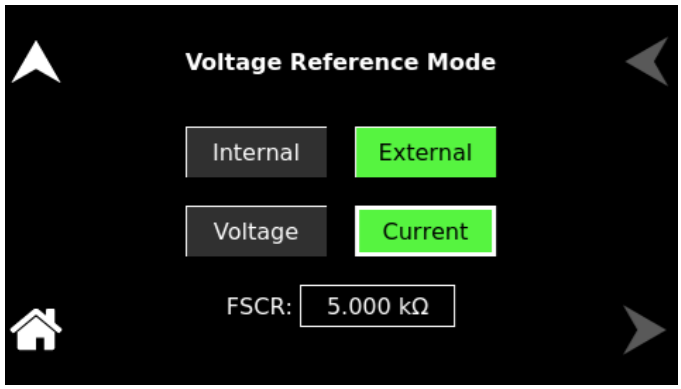


Figure 8-188. Voltage Reference Mode – Resistive

- **Current Ref Mode:** Configures the Current Reference Mode, refer to Figure 8-184. When the Current Reference Mode is set to External, the Current setting field on the Dashboard screen and the 'Current' option in the Output Program screen will be disabled, and these Current fields will display as 'EXT'. Refer to Figure 8-189 and Figure 8-190.

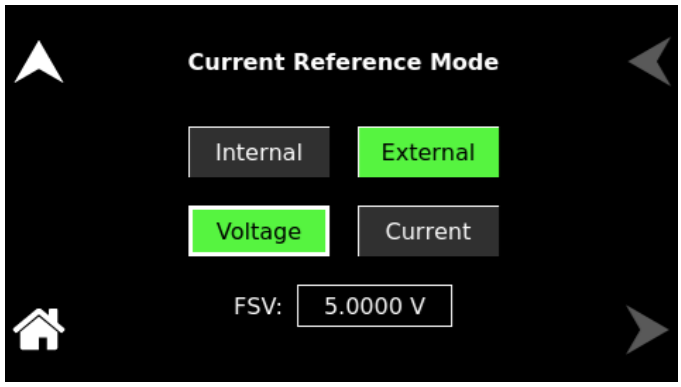


Figure 8-189. Current Reference Mode

ENTRY	DESCRIPTION

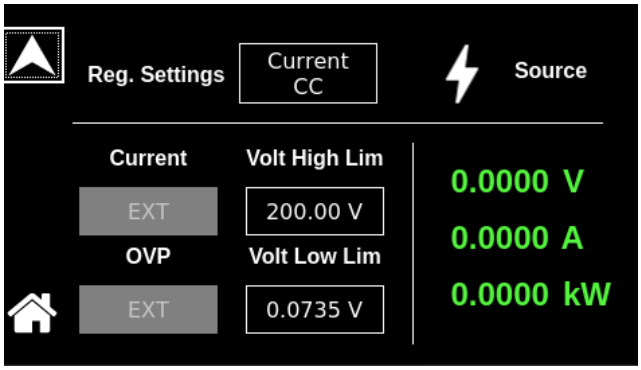


Figure 8-190. Dashboard Screen – Current (EXT)

- **OVP Ref Mode:** Configures the Over Voltage Protection (OVP) Reference Mode. When the OVP Reference Mode is set to External, the OVP setting field on the Dashboard screen and the 'Protection' option in the Configuration screen will be disabled, and these OVP fields will display as 'EXT' refer to Figure 8-190 and Figure 8-191

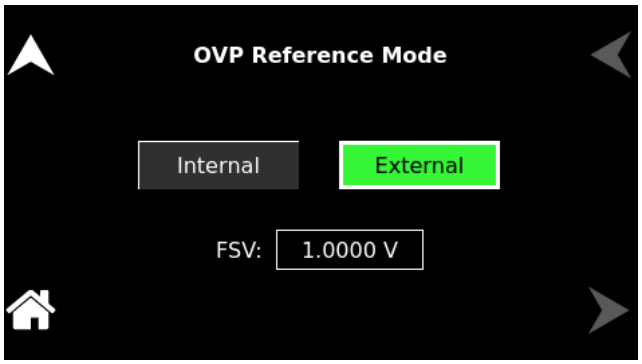


Figure 8-191. OVP Reference Mode

USB Displays the configured Baud Rate. Refer to Figure 8-192.

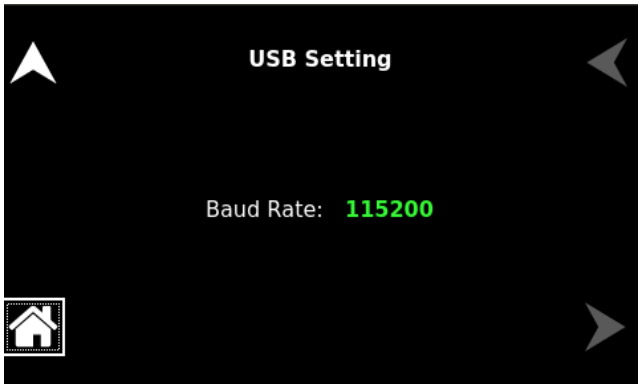


Figure 8-192. USB Setting

Table 8-33. System Setting Screen

8.2.7 OPERATING MODE

The Operating Mode Settings screen offers comprehensive guidance on the system modes of the Mi-BEAM Series power supply. This model is engineered for versatile and reliable performance across various applications, ensuring precise and efficient power delivery through its advanced control features. Depending on user requirements, the Mi-BEAM Series supports multiple modes of operation. Refer to the Figure 8-193.

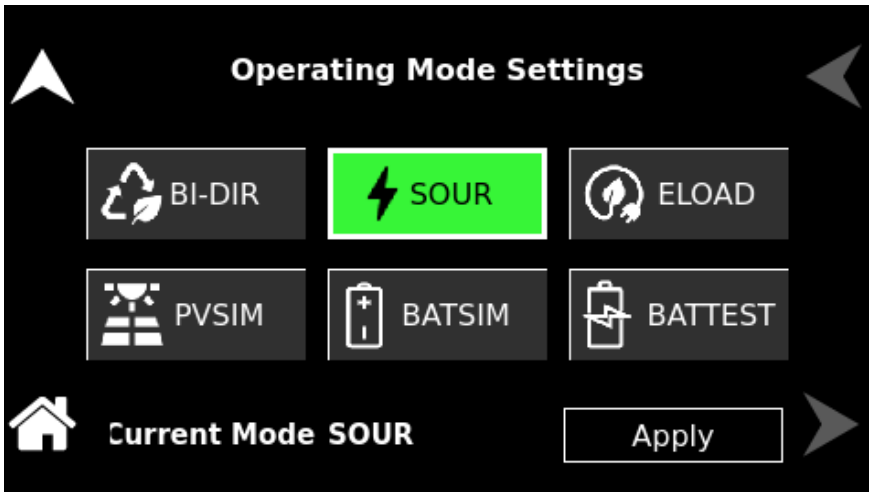


Figure 8-193. Operating Mode Settings

8.2.8 SYSTEM SETTINGS SCREEN

The System Settings screen provides the settings of ‘Hardware Limits’, ‘System Details’ ‘Firmware Version’, ‘LCD’, ‘Default Screen’ and ‘Factory Default’. The top-level menu of the System Settings menu is shown in Figure 8-194. Refer to Section 6.4.2.1 for navigating to System Settings Screen.

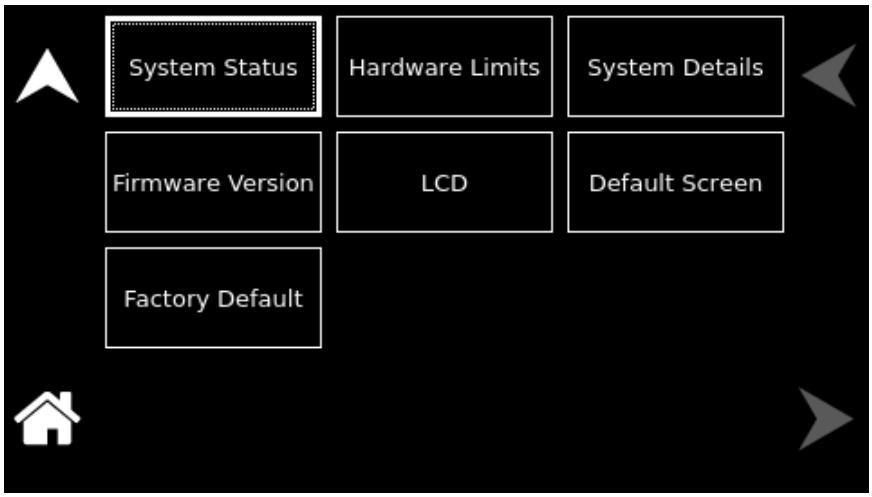


Figure 8-194. System Settings Screen

ENTRY	DESCRIPTION
System Status	Displays the present system status information of the power supply, including the Input Line, Output Sense, Isolation and No. of chassis. Refer to Figure 8-195.

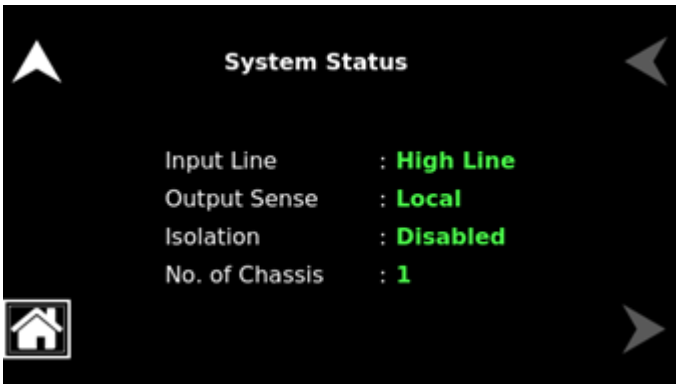


Figure 8-195. System Status

Hardware Limits	Displays the hardware parameter limit values. Refer to Figure 8-196.

Figure 8-196. Hardware Limits

System Details	Displays information about the user's device, including the Manufacturer, Model Number, Serial Number, Last Calibration Date, and Operating Mode. Refer to Figure 8-197.

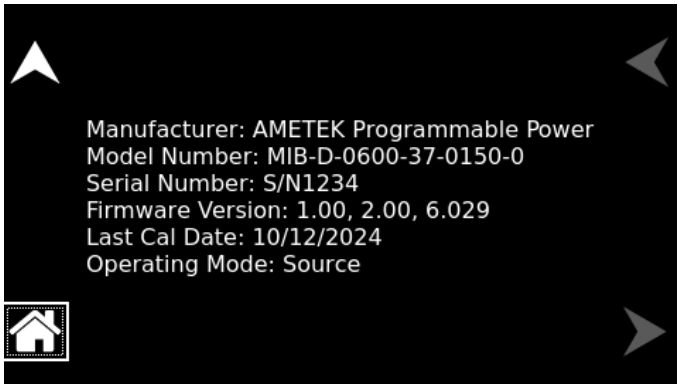


Figure 8-197. System Details

Firmware	Displays information about the configuration of the power supply, including the

ENTRY	DESCRIPTION
Version	Communication Controller, System Interface, Front Panel, Fan Controller, Mod 1 Primary Controller, Mod 1 Secondary Controller, Mod 2 Primary Controller, Mod 2 Secondary Controller, Mod 3 Primary Controller, Mod 3 Secondary Controller. This information helps identify the unit. Refer to Figure 8-198.

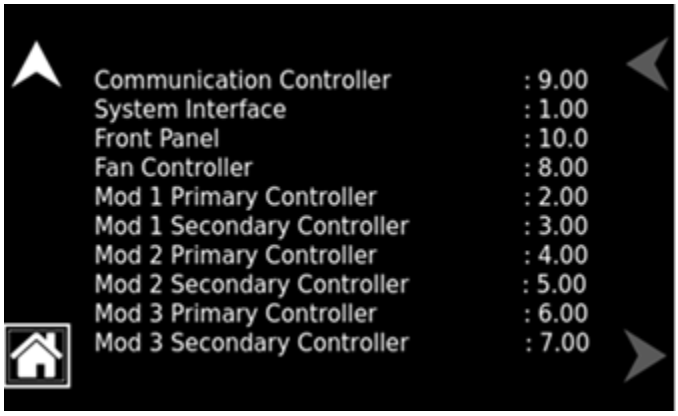


Figure 8-198. Firmware Version

LCD Provides settings for the calibration of the display touchscreen. Refer to Figure 8-199.

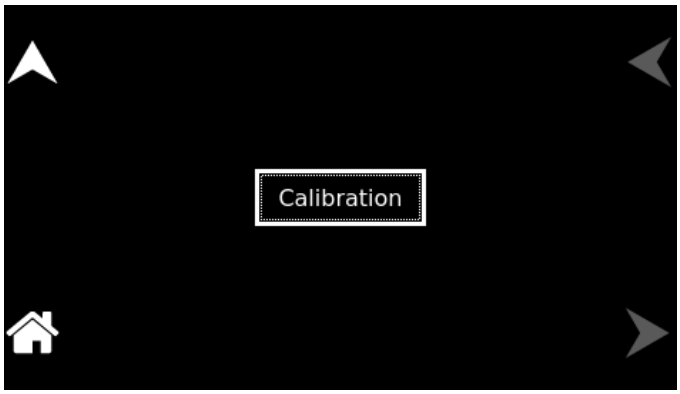


Figure 8-199. LCD

Default Screen Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 8-200 and Figure 8-201. It allows to set the time out if the default screen is enabled.

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

ENTRY	DESCRIPTION

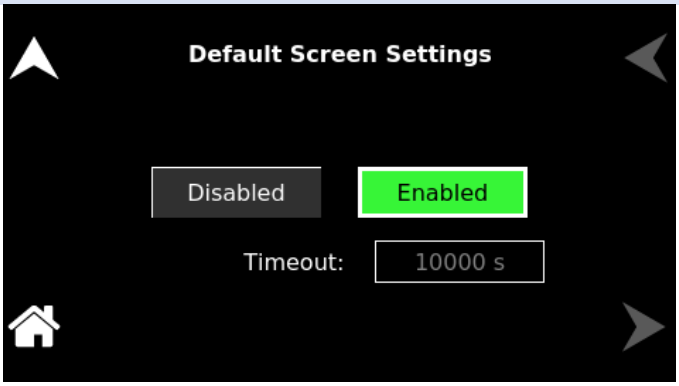


Figure 8-200. Default Screen Settings - Enabled

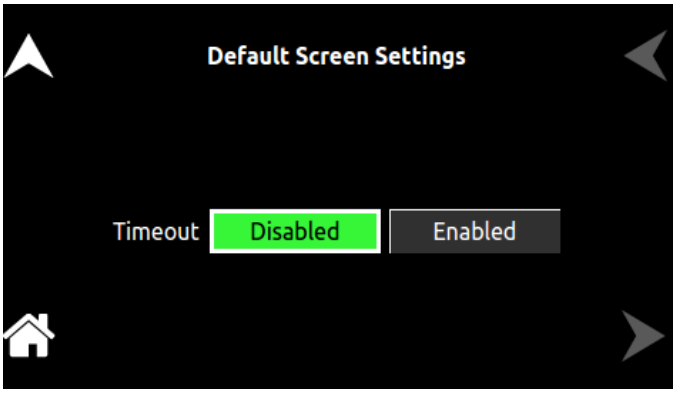


Figure 8-201. Default Screen Settings – Disabled

Factory Default Set the device to its original factory settings, as it was when it left the manufacturer. Refer to Figure 8-202.

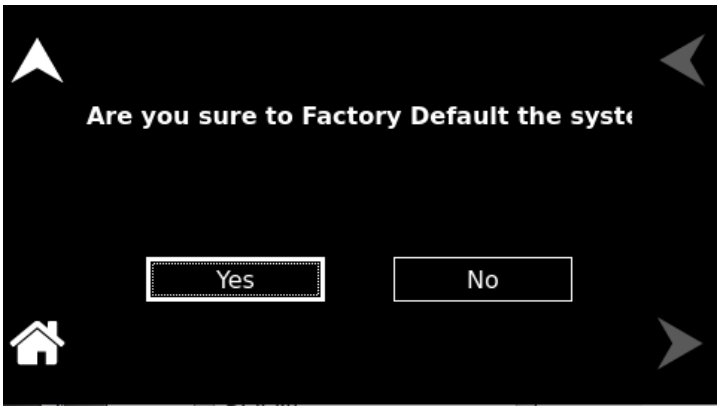


Figure 8-202. Factory Default

Table 8-34. System Setting Screen

8.2.9 SYSTEM FAULTS SCREEN

The System Faults screen provides descriptions of faults that have occurred in a power module. The fault screen appears if any supply fault conditions occur, refer to Figure 8-203. The user should press ‘Clear’ to clear the fault and continue the operations of the power supply and press the ‘Reload’ to refresh the system faults and check for errors. If no fault has occurred, the screen will show 'No Fault Occurred', refer to Figure 8-204.

NOTE: These conditions might resolve themselves; however, if they continue to occur after pressing 'Clear', refer to Chapter 14.

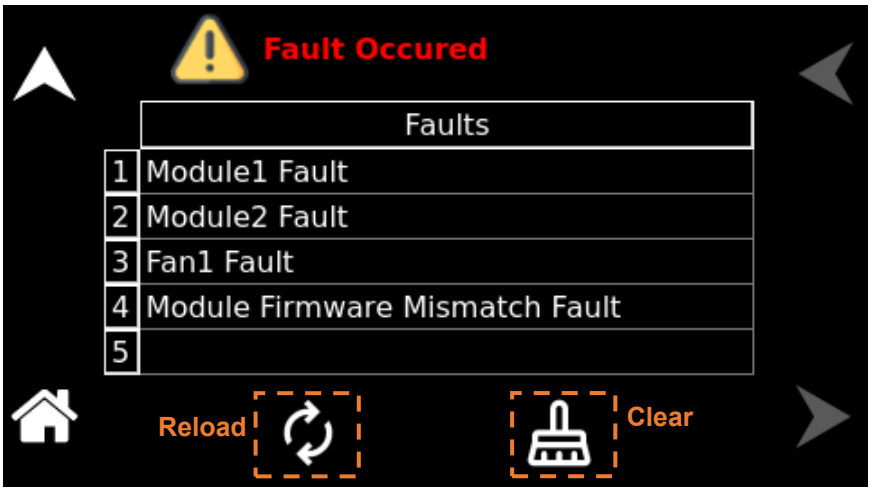


Figure 8-203. System Faults

Figure 8-204. No Fault Occurred Screen

8.3 PARALLEL OPERATION

Parallel mode of operation is used for applications that require more current or power than a single power supply can provide. To meet these higher output requirements, up to six power supplies can be connected in parallel, effectively combining their capacities to achieve the desired performance.

NOTE: Up to six units can be connected in parallel, contact factory to connect more than six units in parallel.

8.3.1 SETTING UP PARALLEL OPERATION

Each power supply has two separate 15-pin connectors on the upper left rear panel, labeled ‘PARALLEL INTERFACE IN’ and ‘PARALLEL INTERFACE OUT’. To connect power supplies in parallel, use a ‘Leader’ or ‘Follower’ daisy-chain wiring configuration . Refer to Figure 8-205. For parallel cable information refer to Section 2.25.

a) Using an interface cable (P/N 890-015-01), connect the 'PARALLEL INTERFACE OUT' port of the Leader power supply to the 'PARALLEL INTERFACE IN' port of the second power supply (Follower 1).

NOTE: In parallel operation, the Leader unit manages all programming, readback, and control functions. Remote analog control is not supported in this mode.

NOTE: Units with the same model number are allowed to be connected in parallel.

b) On the second power supply (Follower 1), connect another interface cable from its 'PARALLEL INTERFACE OUT' port to the 'PARALLEL INTERFACE IN' port of the third power supply (Follower 2). Continue this daisy-chain connection for up to a maximum of six power supplies.

c) Connect the positive output terminals of all power supplies together, along with the positive terminal of the load.

d) Connect the negative output terminals of all power supplies together, along with the negative terminal of the load.

e) Ensure that there are no shorts between the Positive and Negative output terminals.

f) Ensure all cables are kept as short as possible and connect twisted-pair sense cables as follows.

- For remote sensing at the load, only the Leader unit should have a twisted-pair cable running from its sense terminals to the load terminals.

g) After all the successful connection, power ON all the follower units followed by leader.

NOTE: Doing Parallel operation for the first time, make sure to reset the power supply units by selecting ‘Factory default’ in ‘System Settings’ Screen. This step is essential to prevent setting conflicts caused by pre-existing PONS settings.

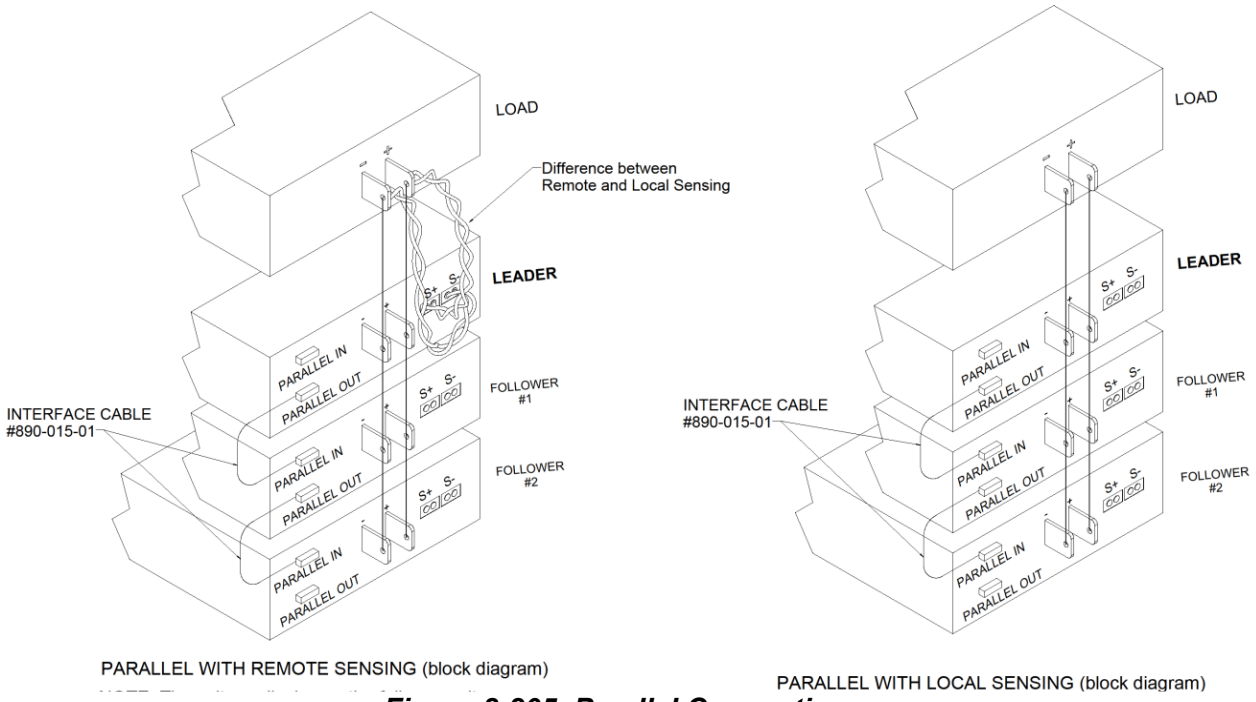


Figure 8-205. Parallel Connection

This page intentionally left blank

9 ELOAD MODE OPERATION

9.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION

9.1.1 IDENTIFY THE UUT PORT TYPE

Determine if the UUT port is a current type (e.g. DC-Charger output) or a voltage type (e.g. battery or any voltage source).

a) **Current type** – UUT regulates the current
b) **Voltage type** – UUT regulates the voltage

9.1.2 CONFIGURING MI-BEAM FOR CURRENT TYPE UUT

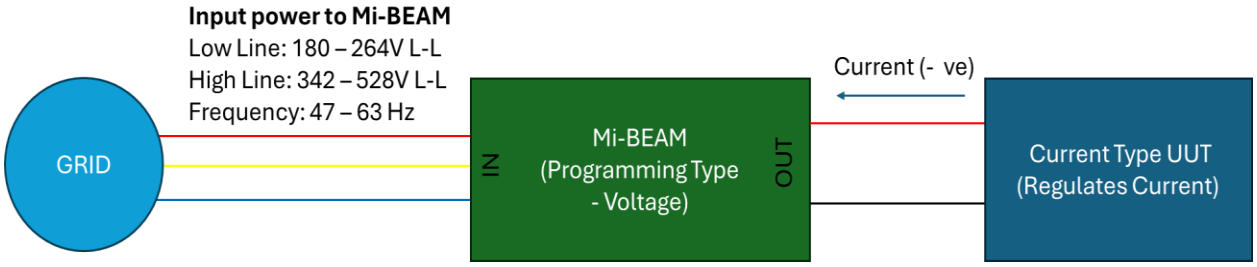


Figure 9-1. Current Type UUT

To configure the Current Type UUT, set the programming type (Prog. type) to 'Voltage' and select the appropriate regulation setting (CV/CC, CV/CP CR/CV, CP/CV and CV) in the dashboard. Refer to Section 9.2.1 for detailed instructions.

9.1.2.1 CONSTANT VOLTAGE/ CONSTANT CURRENT (CV/CC)

The power supply regulates the output voltage to the user-set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the power limit (negative), the output voltage would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.2.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Voltage User Limit:** This setting limits the voltage value that can be set in Mi-BEAM. Refer to Figure 9-104.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Negative Current limit will be used to perform foldback operation and Negative Power limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV/CC' are shown in Table 9-1.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CV/CC	YES	NA	NA	NA	NA	NA	YES	NA	YES

Table 9-1. Applicable Options – CV/CC

- **Negative Current limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set Negative Current Limit. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-20.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 9-21.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Negative Current Limit and Negative Power Limit) after the delay time configured. Refer to Figure 9-94.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 9-19.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-22.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

9.1.2.2 CONSTANT RESISTANCE/ CONSTANT VOLTAGE (CR/CV)

The power supply regulates the output resistance to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.3.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low Limit, Negative Current limit, and Negative Power limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.3.

All applicable options based on the programming type 'Voltage' and regulation setting 'CR/CV' are shown in Table 9-2.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CR/CV	NA	NA	NA	YES	YES	NA	YES	NA	YES

Table 9-2. Applicable Options – CR/CV

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from UUT to Mi-BEAM. Refer to Figure 9-31.

- **Voltage Low Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from UUT to Mi-BEAM. Refer to Figure 9-32.

- **Negative Power limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-34.

- **Negative Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-33.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit, Negative Current Limit and Negative Power Limit) after the delay time configured. Refer to Figure 9-94.

c) Sink Resistance: Enter the sink resistance value to control the voltage drop. Refer to Figure 9-30.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-35.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

9.1.2.3 CONSTANT VOLTAGE/ CONSTANT POWER (CV/CP)

The power supply regulates the output voltage to the user-set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.2.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Voltage User Limit:** This setting limits the voltage value that can be set in Mi-BEAM. Refer to Figure 9-104.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Positive Power limit will be used to perform foldback operation, and Negative Current Limit is used to trip the Mi-BEAM. Refer to Section 8.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV/CP' are shown in Table 9-3.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CV/CP	YES	NA	NA	NA	NA	NA	YES	NA	YES

Table 9-3. Applicable Options – CV/CP

- **Negative Current limit:** On measured current reaching this value output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-20.

- **Negative Power limit:** On measured power reaching this value, Mi-BEAM will regulate the power at set Negative Power Limit. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 9-21.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Negative Current Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-94.

c) Setting Voltage value: Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 9-19.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-22.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

9.1.2.4 CONSTANT POWER/CONSTANT VOLTAGE (CP/CV)

The power supply regulates the output power to the user-set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output power would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.4.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Power Low User Limit:** This setting limits the minimum power value that can be set in Mi-BEAM. Refer to Figure 9-105.

b) Setting Limits: The current and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage Low Limit and Voltage High Limit will be used to perform foldback operation and Negative Current limit is used to trip the Mi-BEAM. Refer to Section 9.2.2.

All applicable options based on the programming type 'Voltage' and regulation setting 'CP/CV' are shown in Table 9-3.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CP/CV	NA	NA	YES	YES	YES	NA	YES	NA	NA

Table 9-4. Applicable Options – CP/CV

- **Voltage High Limit:** On measured voltage reaching this value Mi-BEAM will regulate the voltage at set Voltage High Limit. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-25.

- **Voltage Low Limit**: On measured voltage reaching this value, Mi-BEAM will regulate the voltage at set Voltage Low Limit. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-26.

- **Negative Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-27.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage Low Limit, Voltage High Limit and Negative Current Limit) for the delay time configured. Refer to Figure 9-94.

c) Setting Power value: Enter the power value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured protection limit. Refer to Figure 9-24.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-28.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

9.1.2.5 CONSTANT VOLTAGE (CV)

The power supply regulates the output voltage to the user-set value. On reaching the set current limit (negative) or power limit (negative), the output voltage would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.2.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Voltage User Limit:** This setting limits the voltage value that can be set in Mi-BEAM. Refer to Figure 9-104.

b) Setting Limits: The current and power limits can be set from the ‘Output program’ screen. In this regulation setting, Negative Current limit and Negative Power limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.1.

All applicable options based on the programming type 'Voltage' and regulation setting 'CV' are shown in Table 6-1.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
VOLT	CV	YES	NA	NA	NA	NA	NA	YES)	NA	YES

Table 9-5. Applicable Options – CV

- **Negative Current limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-20.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 9-21.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Negative Current Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-94.

c) **Setting Voltage value:** Enter the voltage value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured OVP. Refer to Figure 9-19.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-22.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) **End the Test:** Once the test is complete, turn OFF the output and input and safely disconnect the UUT from the Mi-BEAM.

9.1.3 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT

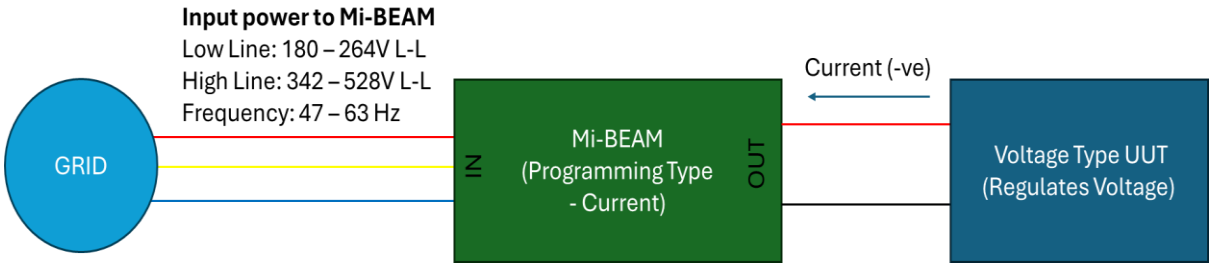


Figure 9-2. Voltage Type UUT

To configure the Voltage Type UUT, set the programming type (Prog. type) to 'Current' and select the appropriate regulation setting (CC/CV, CC/CP, CP/CC, CR/CC and CC) in the dashboard. Refer to Section 9.2.1 for detailed instructions.

9.1.3.1 CONSTANT CURRENT/CONSTANT VOLTAGE (CC/CV)

The power supply regulates the output current to the user-set value. On reaching the voltage limit (high or low), the output is regulated to the voltage limit reached. On reaching the power limit (negative), the output current is programmed to zero and the output is turned OFF. Refer to Section 9.2.1.5.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Current Low User Limit:** This setting limits the current value that can be set in Mi-BEAM. Refer to Figure 9-106.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low Limit will be used to perform foldback operation and Negative Power limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.4.

All applicable options based on the programming type Current' and regulation setting 'CC/CV' are shown in Table 9-6.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CC/CV	NA	YES	NA	YES	YES	NA	NA	NA	YES

Table 9-6. Applicable Options – CC/CV

- **Voltage High Limit**: On measured voltage reaching this value, Mi-BEAM will regulate the voltage at set Voltage High Limit. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-38.

- **Voltage Low Limit**: On measured voltage reaching this value, Mi-BEAM will regulate the voltage at set Voltage Low Limit. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-39.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 9-40.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-96.

c) **Setting Current value:** Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured Neg. OCP. Refer to Figure 9-37.

d) **Connect the UUT to the Mi-BEAM**: Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-42.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) **End the Test:** Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

9.1.3.2 CONSTANT CURRENT/CONSTANT POWER (CC/CP)

The power supply regulates the output current to the user-set value. If the power limit (positive) is reached, the output is regulated to the power limit reached. If the voltage limit (high or low) is reached, the output current is programmed to zero and the output is turned OFF. Refer to Section 9.2.1.5.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Current Low Limit:** This setting limits the current value that can be set in Mi-BEAM. Refer to Figure 9-106.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low Limit will be used to perform foldback operation and Negative Power limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.4.

All applicable options based on the programming type 'Current' and regulation setting 'CC/CP' are shown in Table 9-7.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CC/CP	NA	YES	NA	YES	YES	NA	NA	NA	YES

Table 9-7. Applicable Options – CC/CP

- **Voltage High Limit**: On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-38.

- **Voltage Low Limit**: On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-39.

- **Negative Power limit:** On measured power reaching this value, Mi-BEAM will regulate the power at set Negative Power Limit. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 9-40.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-96.

c) Setting Current value: Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured Neg. OCP. Refer to Figure 9-37.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-42.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

9.1.3.3 CONSTANT POWER/CONSTANT CURRENT (CP/CC)

The power supply regulates the output power to the user-set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.6.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Power Low Limit:** This setting limits the maximum power value that can be set in Mi-BEAM. Refer to Figure 9-107.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Negative Current Limit will be used to perform foldback operation and Voltage High Limit, Voltage Low Limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.5.

All applicable options based on the programming type 'Current' and regulation setting 'CP/CC' are shown in Table 9-8.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CP/CC	NA	NA	YES	YES	YES	NA	YES	NA	NA

Table 9-8. Applicable Options – CP/CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-44.

- **Voltage Low Limit**: On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-45.

- **Negative Current limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set negative current limit. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-46.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-96.

c) Setting Power value: Enter the power value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured protection value. Refer to Figure 9-43.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-47.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

9.1.3.4 CONSTANT RESISTANCE/ CONSTANT CURRENT (CR/CC)

The power supply regulates the output resistance to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.7.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

b) Setting Limits: The current and power limits can be set from the ‘Output program’ screen. In this regulation setting, Negative Current limit will be used to perform foldback operation and Voltage High Limit, Voltage Low Limit, Negative Power Limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.6.

All applicable options based on the programming type 'Current' and regulation setting 'CR/CC' are shown in Table 9-9.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CR/CC	NA	NA	NA	YES	YES	NA	YES	NA	YES

Table 9-9. Applicable Options – CR/CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from UUT to Mi-BEAM. Refer to Figure 9-50.

- **Voltage Low Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from UUT to Mi-BEAM. Refer to Figure 9-51.

- **Negative Power limit:** On measured current reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-53.

- **Negative Current limit:** On measured current reaching this value, Mi-BEAM will regulate the current at set Negative Current Limit. This value must be set lower than the current flown from UUT to Mi-BEAM. Refer to Figure 9-52.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit, Negative Current Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-96.

c) Sink Resistance: Enter the sink resistance value to control the voltage drop. Refer to Figure 9-49.

d) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

e) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-54.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

9.1.3.5 CONSTANT CURRENT (CC)

The power supply regulates the output current to the user-set value. On reaching the set voltage limit (high or low) or power limit (negative), the output current would be programmed to zero and the output is turned OFF. Refer to Section 9.2.1.5.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 9-102.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 9-102.

- **Current Low User Limit:** This setting limits the minimum current value that can be set in Mi-BEAM. Refer to Figure 9-106.

b) Setting Limits: The voltage and power limits can be set from the 'Output program' screen. In this regulation setting, Voltage High Limit, Voltage Low Limit and Negative Power limit will be used to trip Mi-BEAM. Refer to Section 9.2.2.4.

All applicable options based on the programming type 'Current' and regulation setting 'CC' are shown in Table 9-10.

PROG TYPE	REG SETTING	VOLT SETTING	CURR SETTING	POW SETTING	VOLT HIGH	VOLT LOW	POS CURR LIM	NEG CURR LIM	POS POW LIM	NEG POW LIM
CURR	CC	NA	YES	NA	YES	YES	NA	NA	NA	YES

Table 9-10. Applicable Options – CC

- **Voltage High Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set higher than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-38.

- **Voltage Low Limit**: On measured voltage reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the voltage flown from Mi-BEAM to UUT. Refer to Figure 9-39.

- **Negative Power limit:** On measured power reaching this value, output of the Mi-BEAM will be turned OFF. This value must be set lower than the power flown from UUT to Mi-BEAM. Refer to Figure 9-40.

- **Delay time:** Mi-BEAM output will be turned OFF on reaching the limits (Voltage High Limit, Voltage Low Limit and Negative Power Limit) for the delay time configured. Refer to Figure 9-96.

c) **Setting Current value:** Enter the current value which needs to be regulated by the Mi-BEAM. Ensure that the entered value is less than configured Neg. OCP. Refer to Figure 9-37.

d) **Connect the UUT to the Mi-BEAM**: Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 9-42.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 9.2.3.

h) **End the Test:** Once the test is complete, safely disconnect the UUT from the Mi-BEAM and power down the Mi-BEAM if no further tests are required.

9.2 FRONT PANEL OPERATION

This chapter provides detailed information on the front panel operation in eLoad mode. Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder. Refer to Figure 9-3.

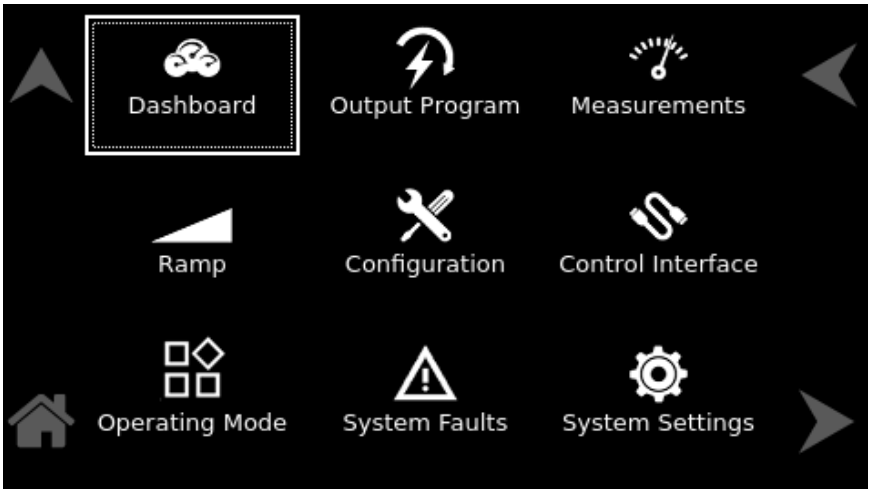


Figure 9-3. Home Screen Top-Level Menu

9.2.1 DASHBOARD SCREEN TOP-LEVEL MENU

The DASHBOARD screen top-level menu is used to change output parameters and simultaneously view output measurements. The most used output parameters are in the

DASHBOARD screen menu. The DASHBOARD screen is the default menu that is displayed after power-on.

9.2.1.1 CONFIGURING PROGRAMMING TYPE AND REGULATION SETTINGS

The Regulation Settings Menu allows users to configure the 'Prog. Type' (Programming Type) and 'Regulation Settings' of the Mi-beam power supply. Refer to Figure 9-4 and Figure 9-5.

The 'Reg. Setting' function on the Dashboard Screen enables users to switch between 'Voltage (CV/CC, CR/CV, CV/CP, CP/CV and CV)' and 'Current (CC/CV, CR/CC, CP/CC, CC/CP and CC) ' Regulation settings. Refer to Figure 9-6 to Figure 9-16 and Table 9-11 to Table 9-16.

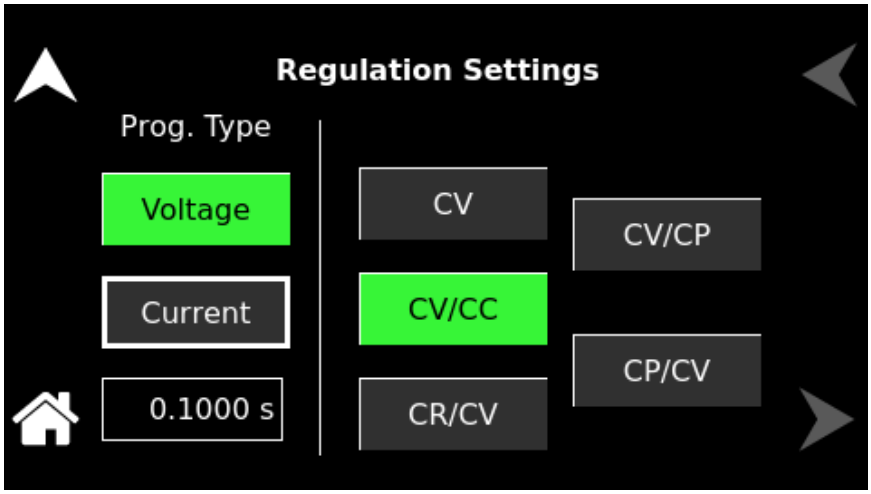


Figure 9-4. Regulation Settings – Voltage

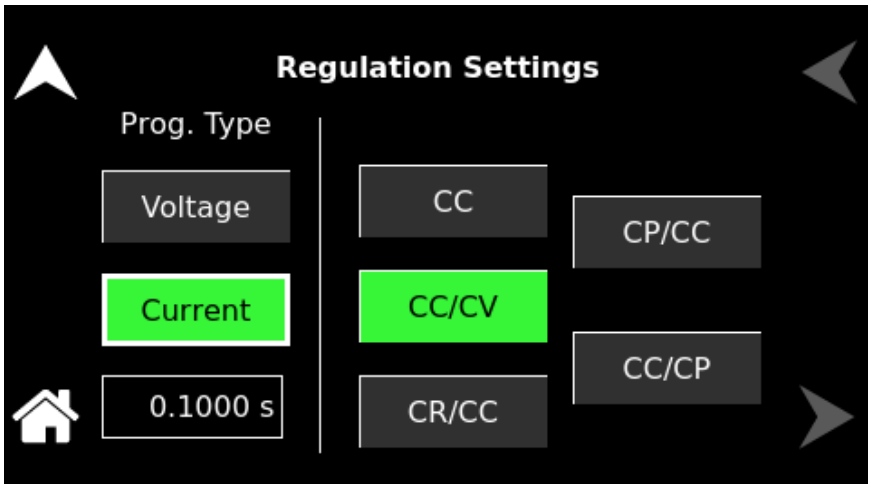


Figure 9-5. Regulation Settings – Current

9.2.1.2 VOLTAGE PROGRAMMING TYPE CV/CC AND CV REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CV/CC Regulation settings is shown in Figure 9-6,
b) Voltage – CV/CP Regulation settings is shown in Figure 9-7,
c) Voltage - CV Regulation settings is shown in Figure 9-8,

Refer to Section 6.4.2.1 for navigating to the Dashboard Screen.

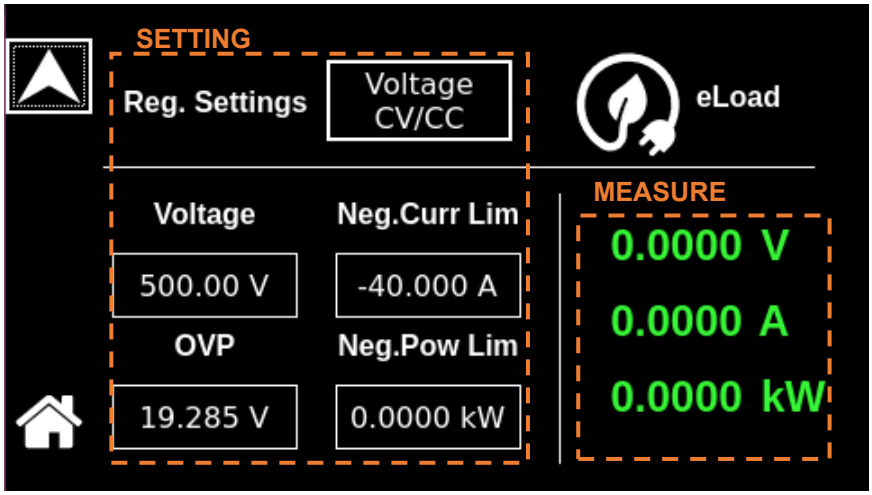


Figure 9-6. Dashboard Screen in Voltage CV/CC Regulation setting

Figure 9-7. Dashboard Screen in Voltage CV/CP Regulation setting

Figure 9-8. Dashboard Screen in Voltage CV Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CV/CC, CV/CP and CV' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 9-93. **a) Voltage - Constant Voltage/Constant Current (CV/CC):** The output voltage is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the power limit (negative), the output voltage would be programmed to zero. **b) Voltage - Constant Voltage/Constant Power (CV/CP):** The output voltage is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero. **c) Voltage - Constant Voltage (CV):** The output voltage is regulated to the user set value. On reaching the set current limit (negative) or power limit (negative), the output voltage would be programmed to zero.
Voltage	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	In CV and CV/CP regulation setting, this functions as a trip limit. In CV/CC regulation setting, on reaching this set value the output would be regulated to the Neg. Curr Lim. Real-time setting is possible using the rotary encoder.
Neg. Pow Lim	In CV and CV/CC regulation setting, this functions as a trip limit. In CV/CP regulation setting, on reaching this set value the output would be regulated to the Neg. Pow Lim. Real-time setting is possible using the rotary encoder.

SETTINGS	DESCRIPTION
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 9-1. Dashboard screen top-level menu Voltage CV/CC, CV/CP and CV

9.2.1.3 VOLTAGE PROGRAMMING TYPE CR/CV REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage – CR/CV is shown in Figure 9-9,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

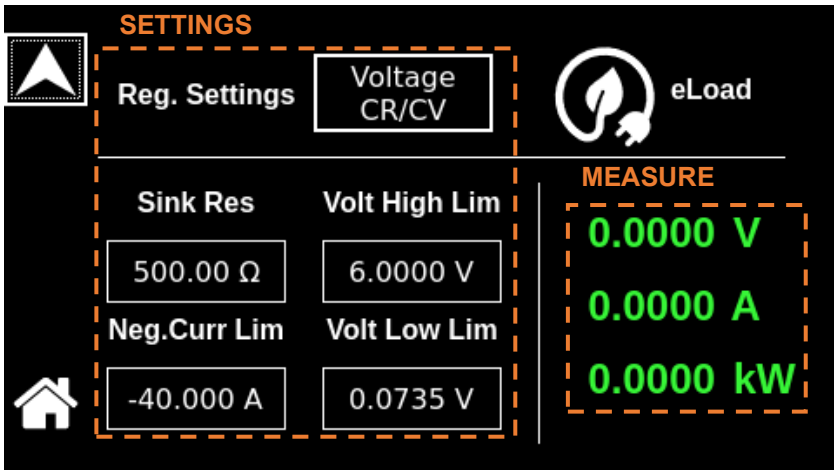


Figure 9-9. Dashboard Screen in CR/CV Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CR/CV' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 9-93. **a) Voltage - Constant Resistance/ Constant Voltage:** The output resistance is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero.
Sink. Res	Programs the sink resistance in ohms. Real-time setting is possible using the rotary encoder.

SETTINGS	DESCRIPTION
Volt High Lim	Regulates the output upon reaching the Volt High Lim. Real-time setting is possible using the rotary encoder.
Volt Low Lim	Regulates the output upon reaching the Volt Low Lim. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	Programs the output negative current limit in amps and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 9-12. Dashboard screen top-level menu- CR/CV Mode

9.2.1.4 VOLTAGE PROGRAMMING TYPE CP/CV REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage - CP/CV is shown in Figure 9-10,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

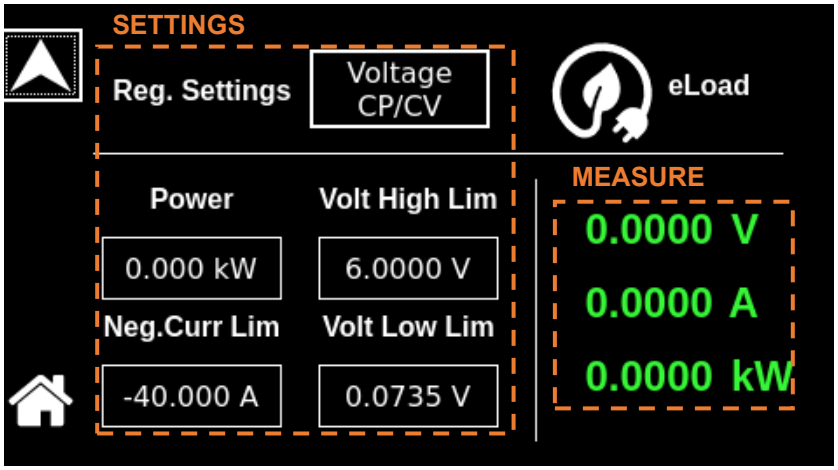


Figure 9-10. Dashboard Screen in Voltage CP/CV Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CP/CV' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 9-93. **a) Voltage - Constant Power/Constant Voltage (CP/CV):** The output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output power would be programmed to zero.
Power	Programs the output power of the supply in watts. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	Programs the output negative current limit in amps and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
Volt High Lim	Regulates the output upon reaching the Volt High Lim. Real-time setting is possible using the rotary encoder.
Volt Low Lim	Regulates the output upon reaching the Volt Low Lim. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 9-13. Dashboard screen top-level menu Voltage CP/CV

9.2.1.5 CURRENT PROGRAMMING TYPE CC/CV, CC/CP AND CC REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current - CC/CV Regulation setting is shown in Figure 9-11,
b) Current – CC/CP Regulation setting is shown in Figure 9-12,
c) Current - CC Regulation setting is shown in Figure 9-13,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

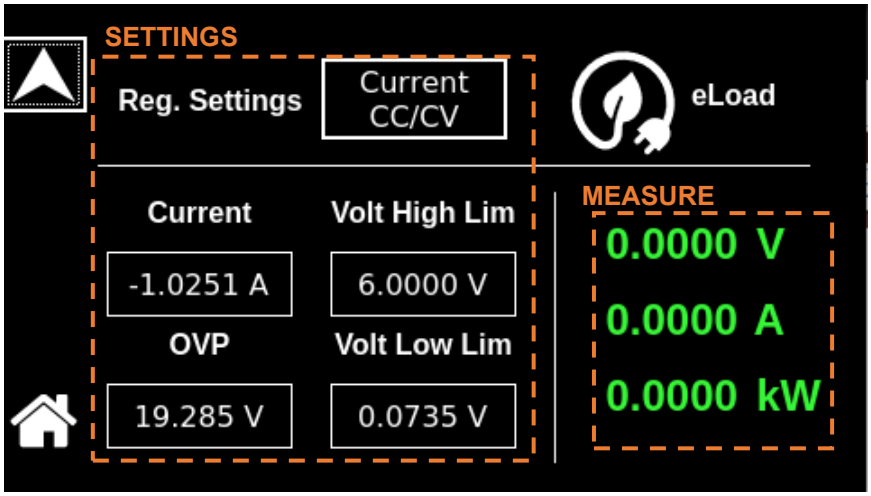


Figure 9-11. Dashboard Screen in Current CC/CV Regulation setting

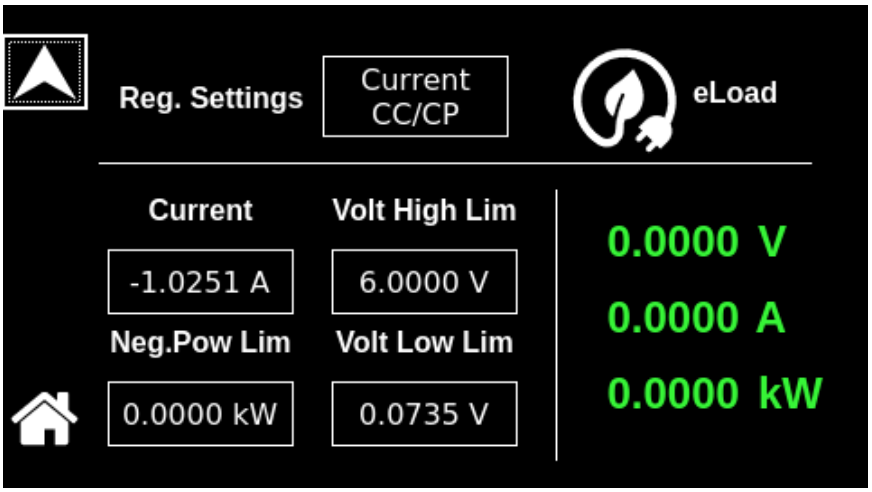


Figure 9-12. Dashboard Screen in Current CC/CP Regulation setting

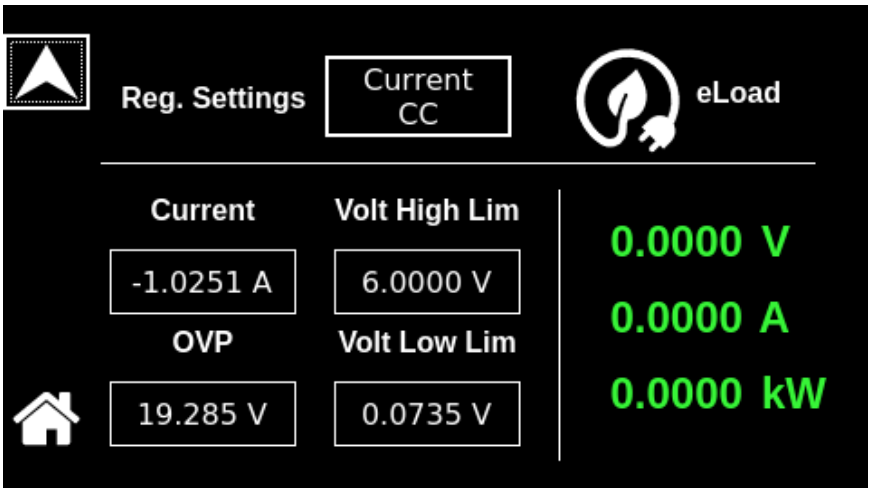


Figure 9-13. Dashboard Screen in Current CC Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type 'CC/CV, CC/CP and CC' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 9-95. **a) Current - Constant Current/Constant Voltage (CC/CV):** The output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (negative), the output current would be programmed to zero. **b) Current - Constant Current/Constant Power (CC/CP):** The output current is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero. **c) Current - Constant Current (CC):** The output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (negative), the output current would be programmed to zero.
Current	Programs the output current in amps. Real-time setting is possible using the rotary encoder.
Volt High Lim	In CC and CC/CP Regulation Setting, this functions as a trip limit. In CC/CV Regulation Setting, it regulates the output upon reaching the Volt High Lim. Real-time setting is possible using the rotary encoder.
Volt Low Lim	In CC and CC/CP Regulation Setting, this functions as a trip limit. In CC/CV Regulation Setting, it regulates the output upon reaching the Volt Low Lim. Real-time setting is possible using the rotary encoder.
Neg. Pow Limit	In CC and CC/CV Regulation Setting, this functions as a trip limit. In CC/CP Regulation Setting, it regulates the output upon reaching the Neg. Pow Limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 9-14. Dashboard screen top-level menu – CC/CV, CC/CP and CC

9.2.1.6 CURRENT PROGRAMMING TYPE CP/CC REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Current - CP/CC Regulation setting is shown in Figure 9-14,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

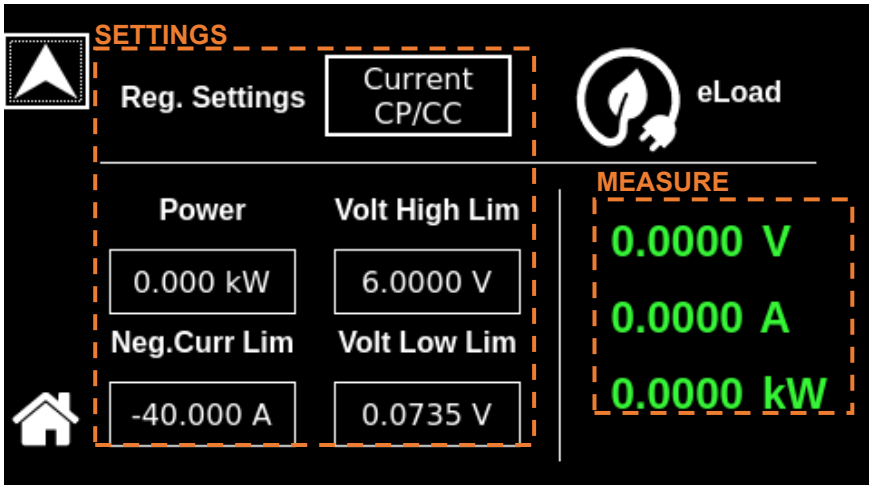


Figure 9-14. Dashboard Screen in Current CP/CC Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Current' Programming type 'CP/CC' regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 9-95. **a) Current - Constant Power/Constant Current (CP/CC):** The output power is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
Power	Programs the output power of the supply in watts. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	Programs the output negative current limit in amps, and upon reaching this set value the output would be regulated to the Neg. Curr Lim. Real-time setting is possible using the rotary encoder.
Volt High Lim	Programs the volt high limit and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
Volt Low Lim	Programs the volt low limit and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.

Table 9-15. Dashboard screen top-level menu – CP/CC

9.2.1.7 VOLTAGE PROGRAMMING TYPE CR/CC REGULATION SETTING

The top-level menu of the DASHBOARD screen for:

a) Voltage – CR/CC is shown in Figure 9-15,

Refer to Section 6.4.2.1 for navigating to Dashboard Screen.

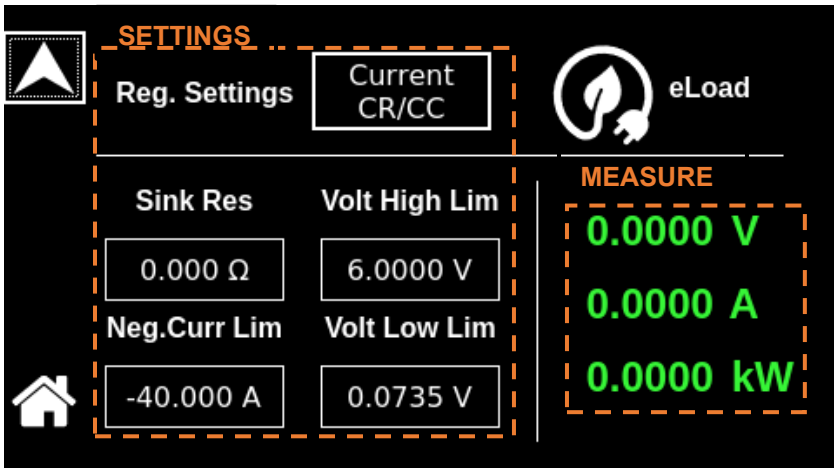


Figure 9-15. Dashboard Screen in CR/CV Regulation setting

The following selections are available in the DASHBOARD screen top-level menu of 'Voltage' Programming type 'CR/CC' Regulation settings:

SETTINGS	DESCRIPTION
Reg. Settings	Sets the Programming type and Regulation setting of the supply. Refer to Figure 9-95. **a) Voltage - Constant Resistance/ Constant Current:** The output resistance is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero.
Sink. Res	Programs the sink resistance in ohms. Real-time setting is possible using the rotary encoder.
Volt High Lim	Programs the volt high limit and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
Volt Low Lim	Programs the volt low limit and this setting functions as a trip limit. Real-time setting is possible using the rotary encoder.
Neg. Curr Lim	Programs the output negative current limit in amps and regulates upon reaching Neg. Current Lim. Real-time setting is possible using the rotary encoder.
OVP	Programs the overvoltage protection trip point in volts. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
Voltage	Displays the floating-point value of the DC output voltage in volts.

SETTINGS	DESCRIPTION
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.

Table 9-16. Dashboard screen top-level menu- CR/CC Mode

9.2.1.8 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 9-16. 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 9-16. Real-Time, Immediate Output Parameter Adjustment

9.2.1.9 DEFAULT SCREEN

The Default screen provides measurement of the DC output ‘Voltage’, ‘Current’ and ‘Power’, refer to Figure 9-17. When the Dashboard screen is idle for an interval equal to a set time delay, refer to Figure 9-217 and Figure 9-218. The display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen.

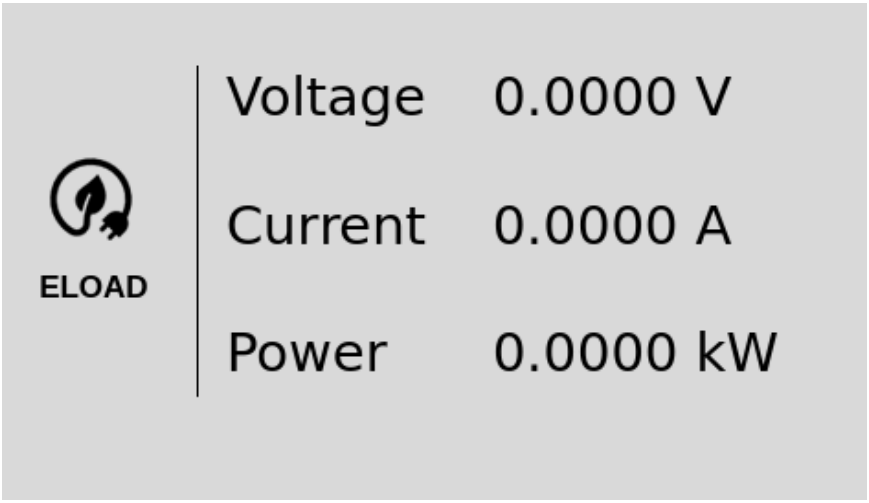


Figure 9-17. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage, current and power in various modes of operation.

9.2.2 OUTPUT PROGRAM SCREEN

The settings in the output program screen will change based on the Programming type and Regulation setting configured. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

9.2.2.1 CV/CC, CV/CP AND CV MODE

The Output Program screen provides settings of ‘Voltage’, ‘Negative Current Limit’, ‘Negative Power Limit’, and ‘Output State’. Refer to Figure 9-18.

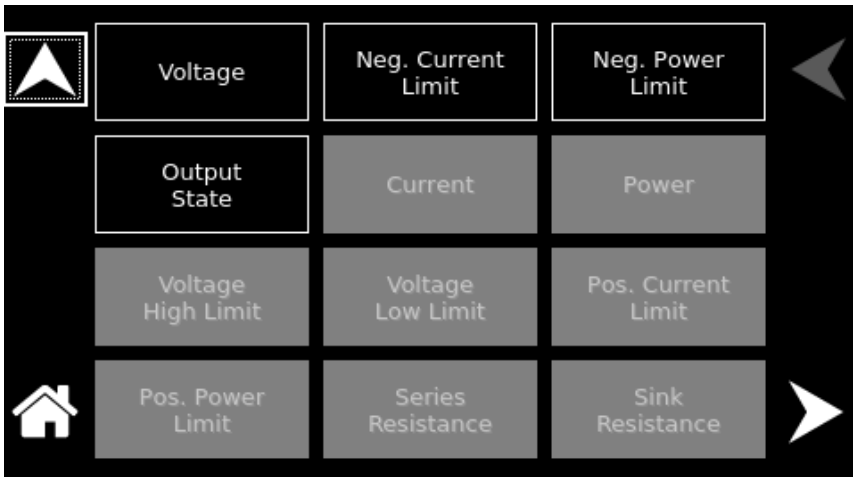


Figure 9-18. Output Program Screen of CV/CC and CV mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CV/CC, CV/CP and CV mode includes the following functions:

ENTRY	DESCRIPTION
Voltage	Users can set a Voltage value within the specified limit. Refer to Figure 9-19.

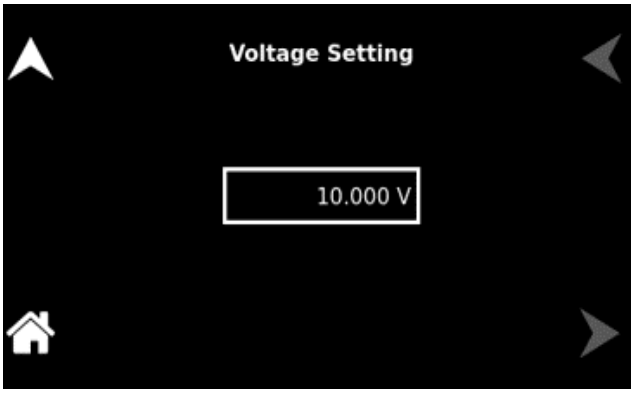


Figure 9-19. Voltage setting screen

Neg. Current Limit	Users can set a negative current limit value, which functions as trip limit (CV and CV/CP), or it regulates (CV/CC) the output upon reaching the Neg. Current Limit. Refer to Figure 9-20.

ENTRY	DESCRIPTION

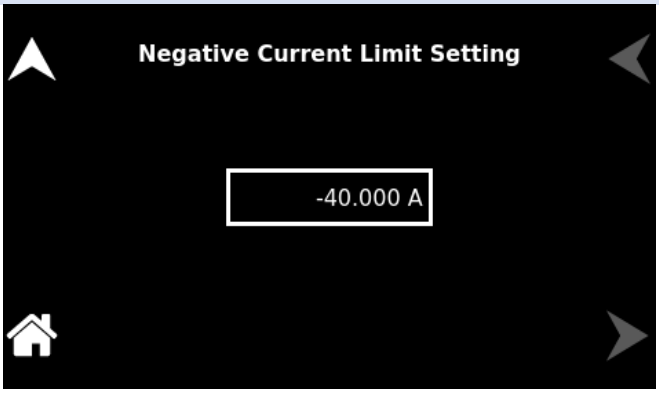


Figure 9-20. Negative Current limit setting screen

Neg. Power Limit Users can set a negative power limit value, which functions as trip limit (CV and CV/CC), or it regulates (CV/CP) the output upon reaching the Neg. Power Limit. Refer to Figure 9-21.

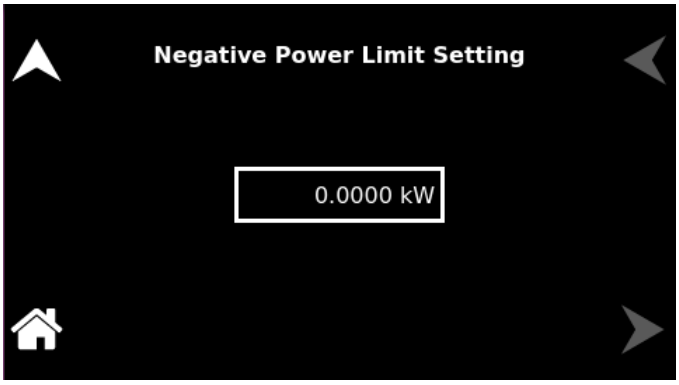


Figure 9-21. Negative Power limit setting screen

Output State Users can program the output to ON or OFF state. Refer to Figure 9-22.

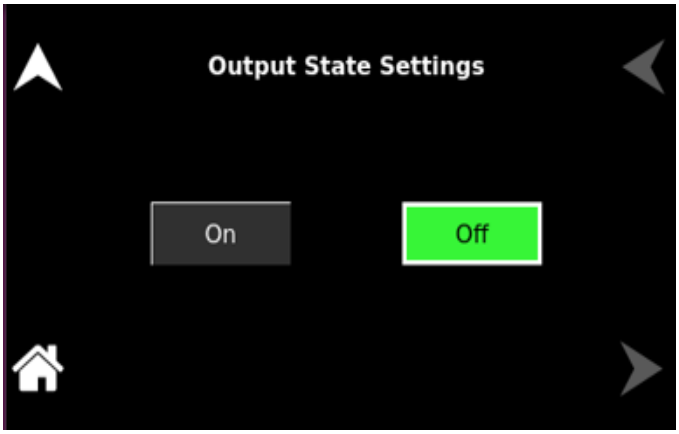


Figure 9-22. Output State Settings

Table 9-17. Output Program Settings in CV/CC and CV Mode

9.2.2.2 CP/CV MODE

The Output Program screen provides settings of ‘Power’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Negative Current Limit’, and ‘Output State’. Refer to Figure 9-23.

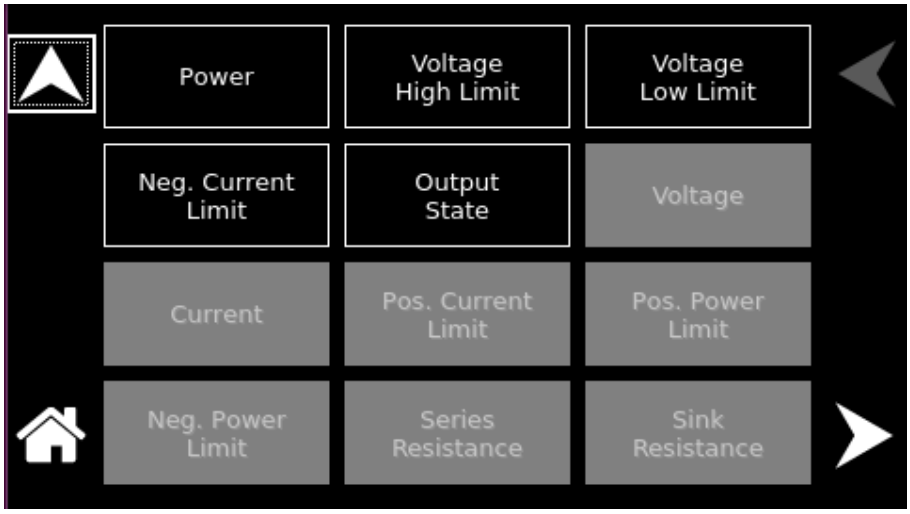


Figure 9-23. Output Program Screen of CP/CV mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CP/CV mode includes the following functions:

ENTRY	DESCRIPTION
Power	Users can set a power value within the specified limit. Refer to Figure 9-24.

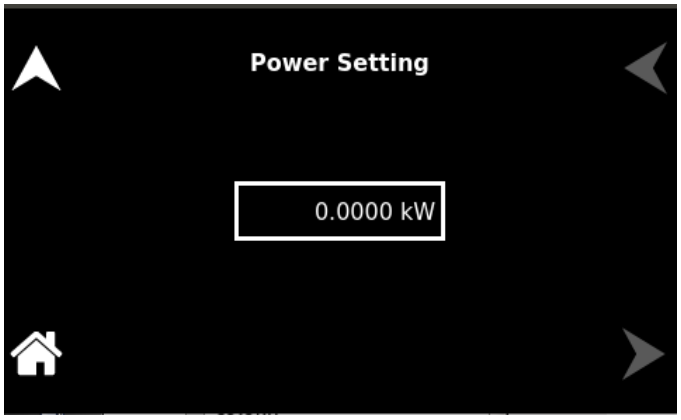


Figure 9-24. Power Setting

Voltage High Limit	Users can set the voltage high limit value, and it regulates the output upon reaching the Voltage High Limit. Refer to Figure 9-25.

ENTRY	DESCRIPTION

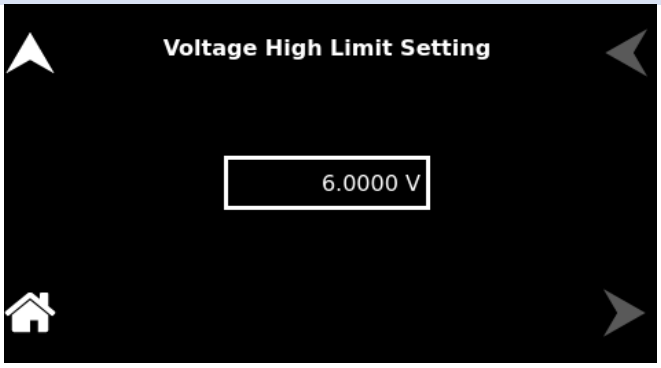


Figure 9-25. Volt High Limit Setting

Voltage Low Limit

Users can set the voltage low limit value, and it regulates the output upon reaching the Voltage Low Limit. Refer to Figure 9-26.

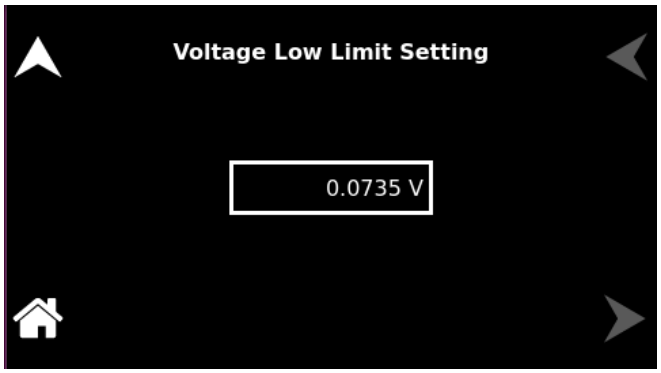


Figure 9-26. Volt Low Limit Setting

Neg. Current Limit

Users can set a negative current limit value, and which functions as a trip limit. Refer to Figure 9-27.

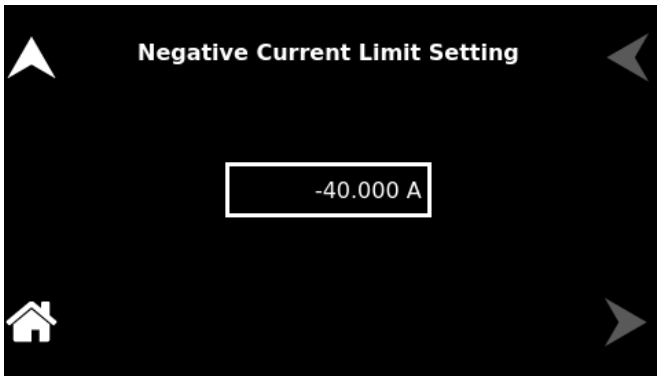


Figure 9-27. Negative Current Limit Setting

Output State

Users can program the output to ON or OFF state. Refer to Figure 9-28.

ENTRY	DESCRIPTION

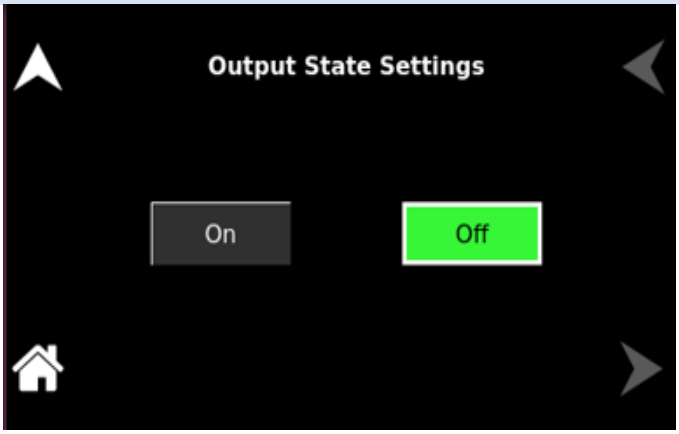


Figure 9-28. Output State

Table 9-18. Output Program Settings in CP/CV

9.2.2.3 CR/CV MODE

The Output Program screen provides settings of ‘Sink Resistance’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Negative Current Limit’, ‘Output State’ and ‘Negative Power Limit’. Refer to Figure 9-29.

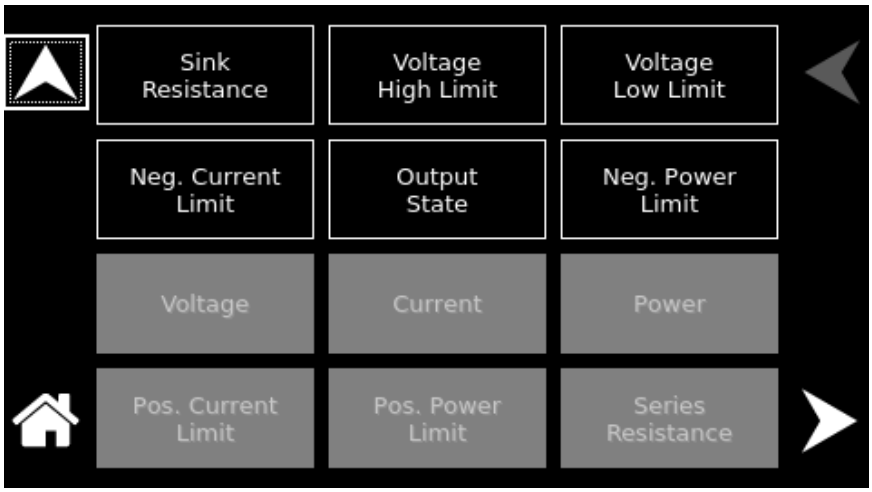


Figure 9-29. Output Program Screen of CV Ser. Res mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CR/CV mode includes the following functions:

ENTRY	DESCRIPTION
Sink Resistance	Users can set the sink resistance value within the specified limit. Refer to Figure 9-30.

ENTRY	DESCRIPTION

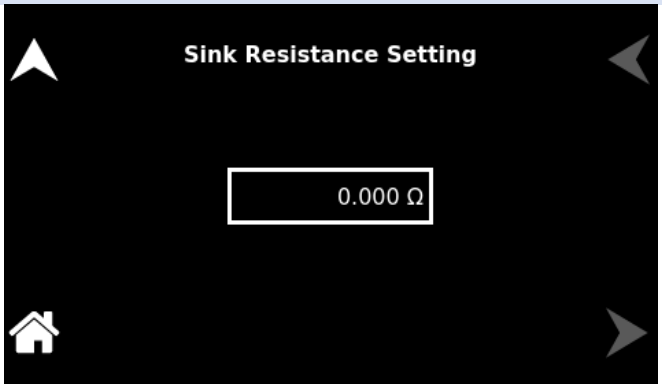


Figure 9-30. Series Resistance Setting

Voltage High Limit Users can set the voltage high limit value, and it regulates the output upon reaching the Voltage High Limit. Refer to Figure 9-31.

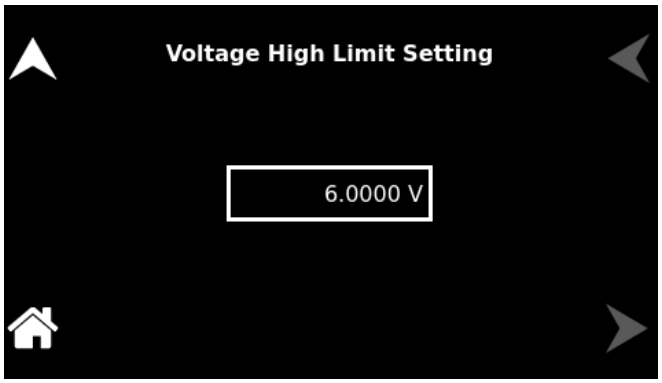


Figure 9-31. Voltage High Limit Setting

Voltage Low Limit Users can set the voltage low limit value, and it regulates the output upon reaching the Voltage Low Limit. Refer to Figure 9-32.

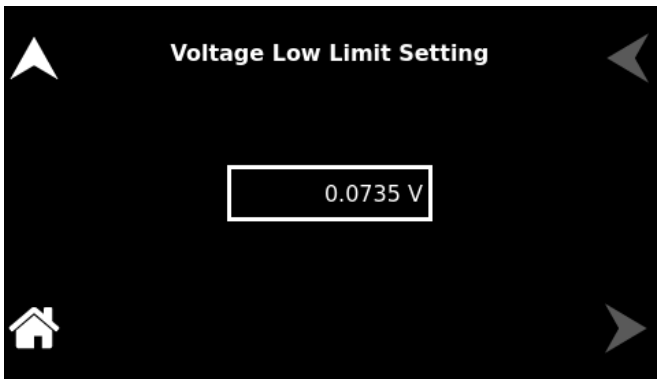


Figure 9-32. Voltage Low Limit Setting

Neg. Current Limit Users can set a negative current limit value, and which functions as a trip limit. Refer to Figure 9-33.

ENTRY	DESCRIPTION

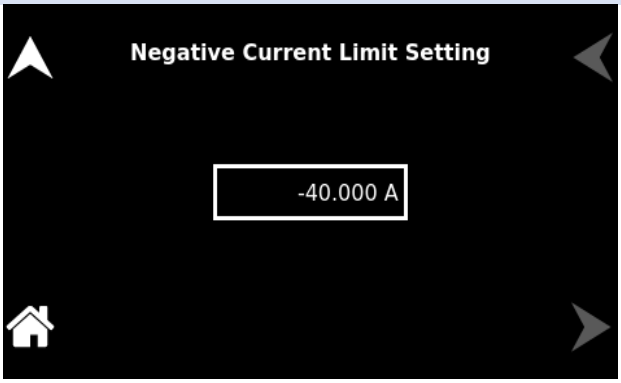


Figure 9-33. Negative Current limit setting screen

Neg. Power Limit Users can set a negative power limit value, and which functions as a trip limit. Refer to Figure 9-34.

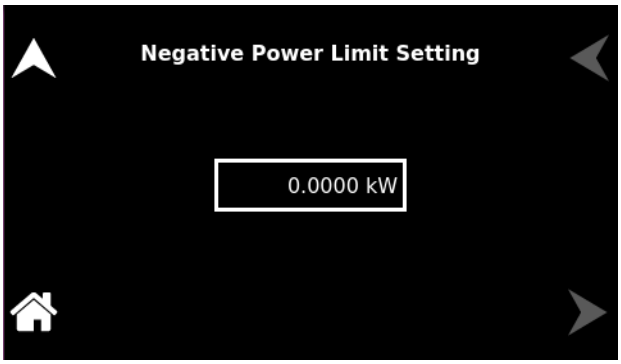


Figure 9-34. Negative Power limit setting screen

Output State Users can program the output to ON or OFF state. Refer to Figure 9-35.

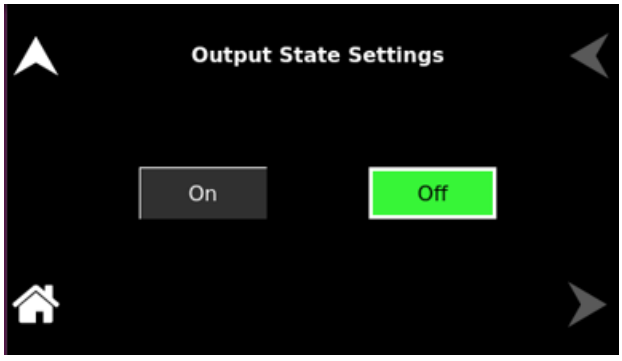


Figure 9-35. Output State

Table 9-19. Output Program Settings in CR/CV Mode

9.2.2.4 CC/CV, CC/CP AND CC MODE

The Output Program screen provides settings of ‘Current’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Negative Power Limit’, and ‘Output State’. Refer to Figure 9-36.

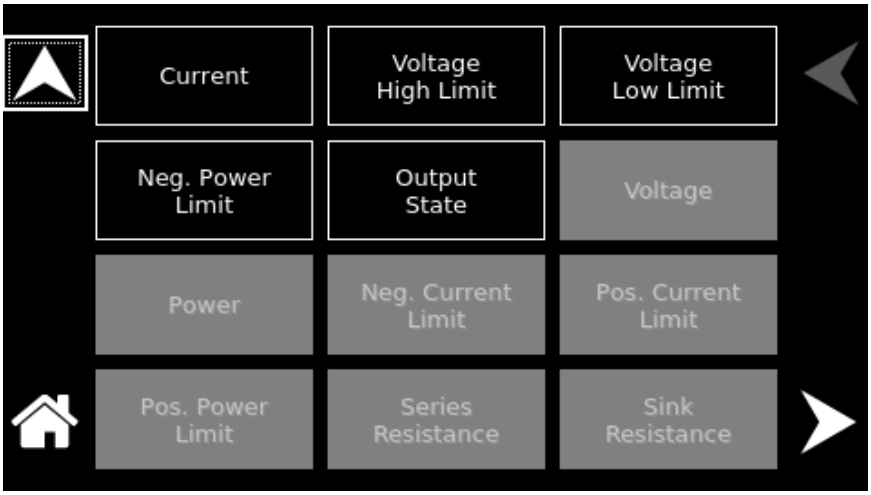


Figure 9-36. Output Program Screen of CC/CV, CC/CP and CC mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in CC/CV, CC/CP and CC mode includes the following functions:

ENTRY	DESCRIPTION
Current	Users can set the Current value within the specified limit. Refer to Figure 9-37.

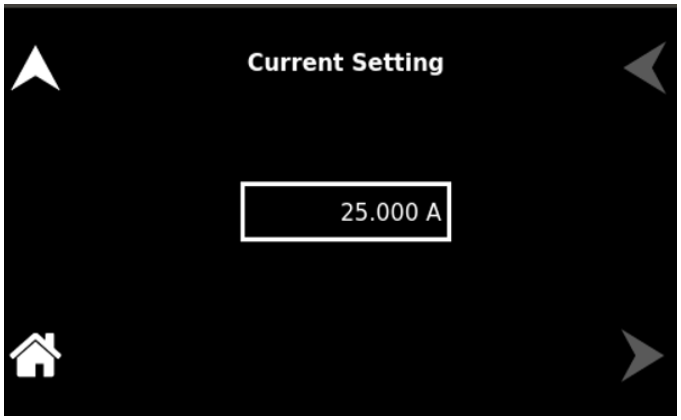


Figure 9-37. Current Setting

Voltage High Limit	Users can set a voltage high limit value, which functions as trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the Voltage High Limit. Refer to Figure 9-38.

ENTRY	DESCRIPTION

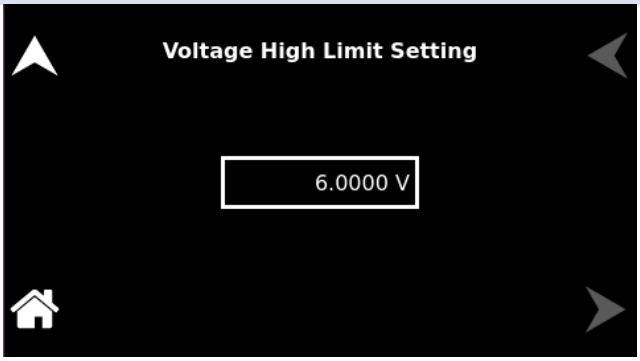


Figure 9-38. Voltage High Setting

Voltage Low Limit Users can set a voltage low limit value, which functions as trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the Voltage Low Limit. Refer to Figure 9-39.

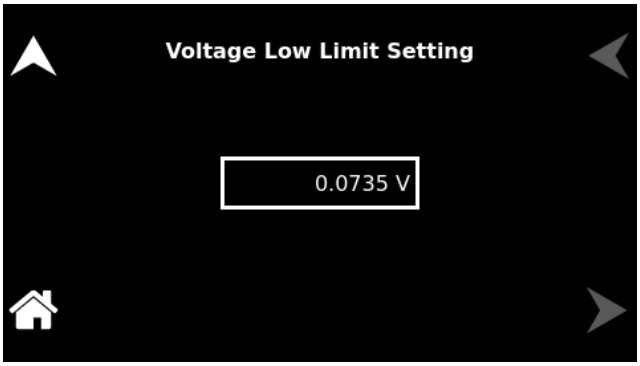


Figure 9-39. Voltage Low Setting

Neg. Power Limit Users can set a negative power limit value, which functions as a trip limit (CC and CC/CV), or it regulates (CC/CP) the output upon reaching the Neg. Power Limit. Refer to Figure 9-40.

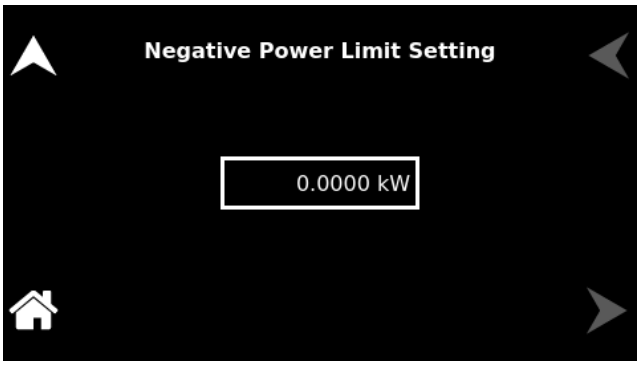


Figure 9-40. Negative Power Limit

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 9-41.

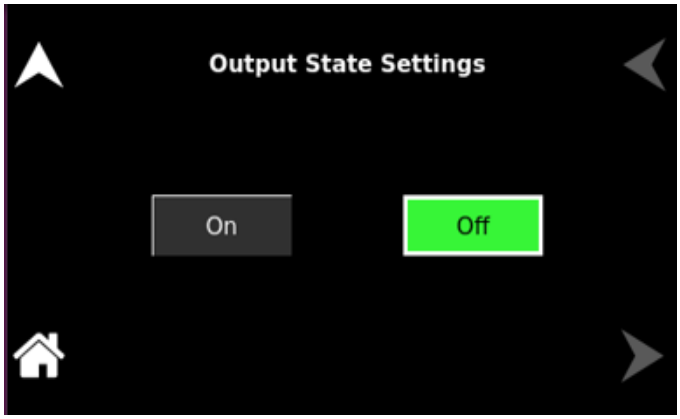


Figure 9-41. Output State Settings

Table 9-20. Output Program Settings in CC/CV, CC/CP and CC mode

9.2.2.5 CP/CC MODE

The Output Program screen provides settings of ‘Power’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Negative Current Limit’, and ‘Output State’. Refer to Figure 9-42.

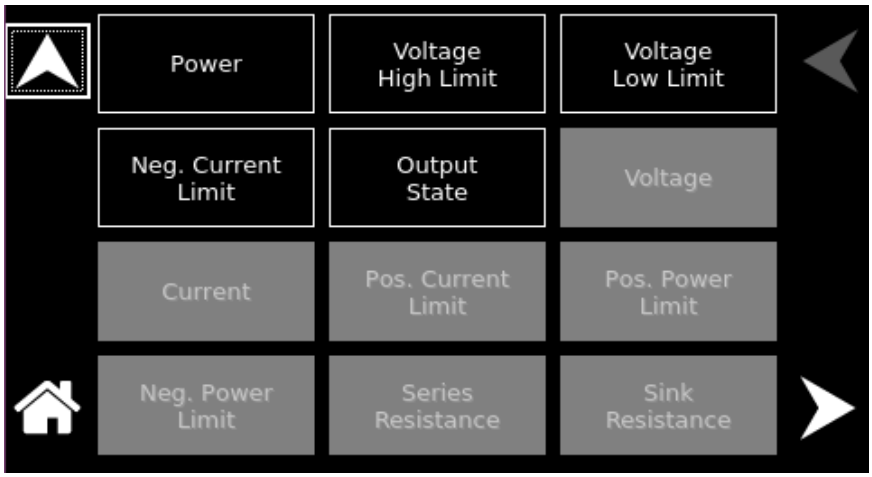


Figure 9-42. Output State Settings in CP/CC

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in ‘CP/CC’ mode includes the following functions:

ENTRY	DESCRIPTION
Power	Users can set a power value within the specified limit. Refer to Figure 9-43.

ENTRY	DESCRIPTION

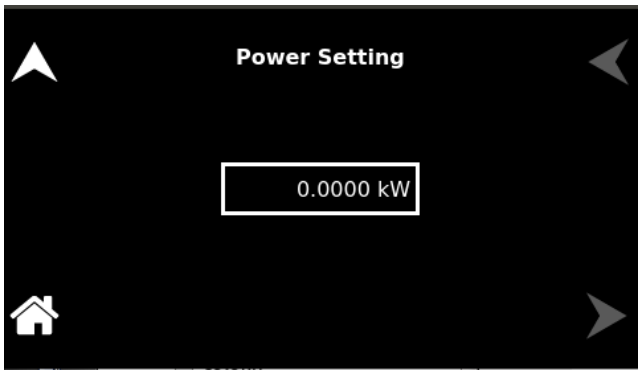


Figure 9-43. Power Settings

Voltage High Limit

Users can set a voltage high limit value, and which functions as a trip limit. Refer to Figure 9-44.

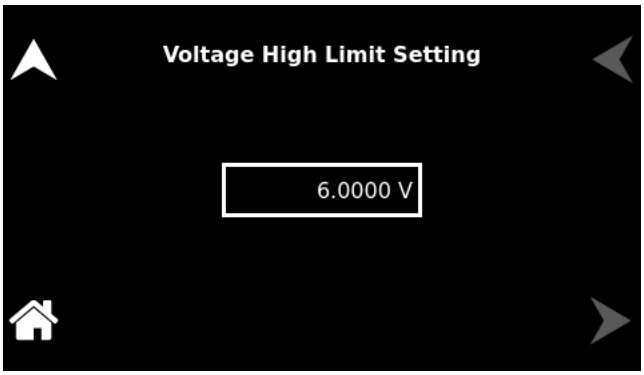


Figure 9-44. Voltage High Limit Setting

Voltage Low Limit

Users can set a voltage low limit value, and which functions as a trip limit. Refer to Figure 9-45.

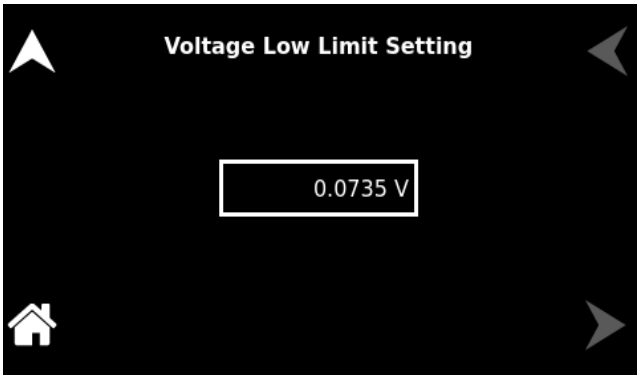


Figure 9-45. Voltage Low Limit Setting

Neg. Current

Users can set a negative current limit value, and it regulates the output upon reaching the Neg. Current Limit. Refer to Figure 9-46.

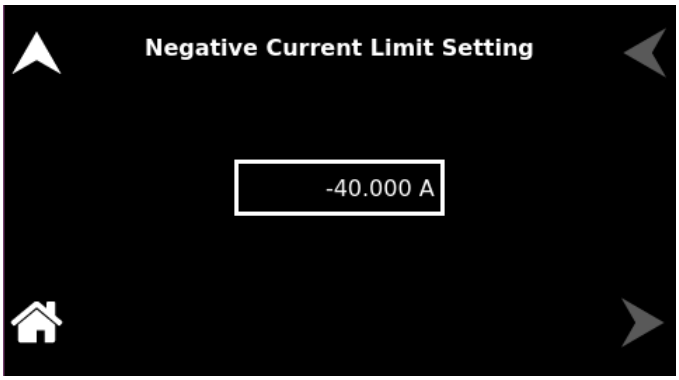
ENTRY	DESCRIPTION
Limit	

Figure 9-46. Negative Current Limit Setting

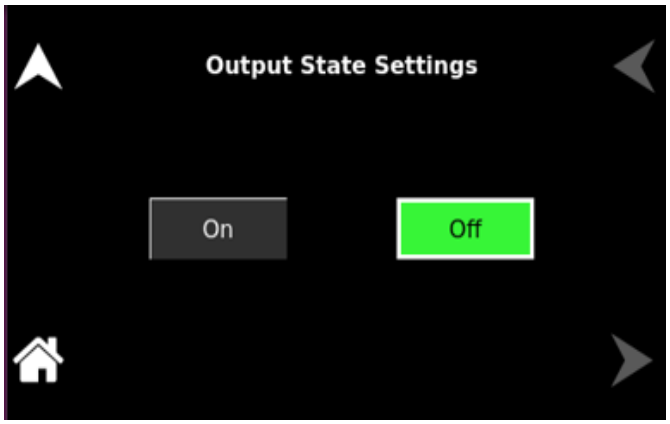
Output State	Users can program the output to ON or OFF state. Refer to Figure 9-47. 

Figure 9-47. Output State

Table 9-21. Output Program Settings CP/CC mode

9.2.2.6 CR/CC MODE

The Output Program screen provides settings of ‘Sink Resistance’, ‘Voltage High Limit’, ‘Voltage Low Limit’, ‘Negative Current Limit’, ‘Output State’ and ‘Negative Power Limit’. Refer to Figure 9-48.

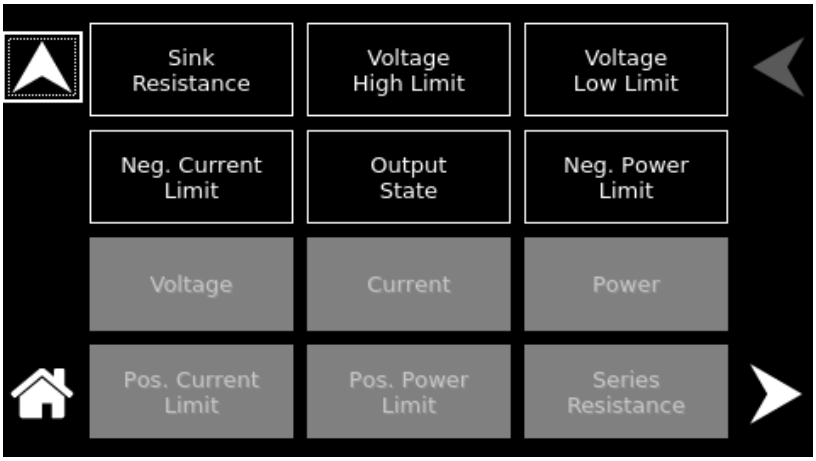


Figure 9-48. Output Program Screen of CR/CC mode

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen in 'CR/CC' mode includes the following functions:

ENTRY	DESCRIPTION
Sink Resistance	Users can set the sink resistance value within the specified limit. Refer to Figure 9-49.

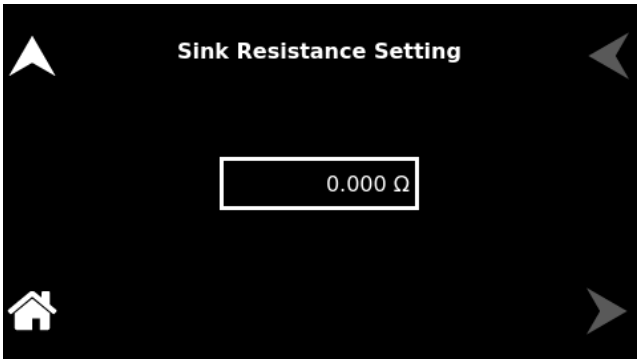


Figure 9-49. Series Resistance Setting

Voltage High Limit	Users can set the voltage high limit value within the specified limit and which functions as a trip limit. Refer to Figure 9-50.

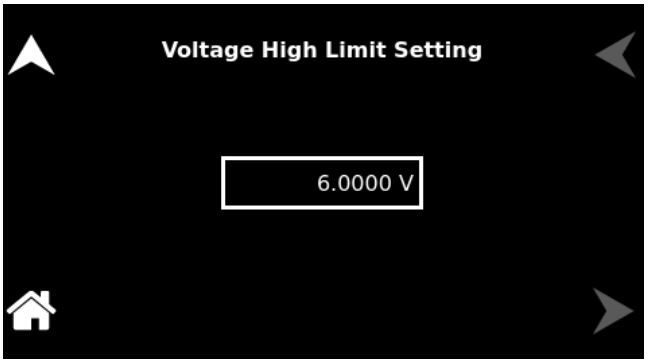


Figure 9-50. Voltage High Limit Setting

ENTRY	DESCRIPTION

Voltage Low Limit

Users can set the voltage low limit value within the specified limit and which functions as a trip limit. Refer to Figure 9-51.

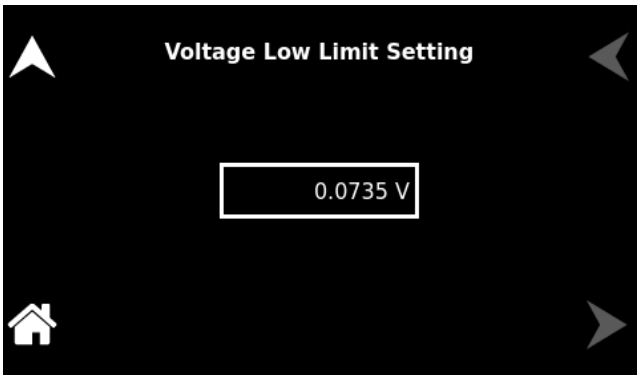


Figure 9-51. Voltage Low Limit Setting

Neg. Current Limit

Users can set a negative current limit value, and it regulates the output upon reaching the Neg. Current Limit. Refer to Figure 9-52.

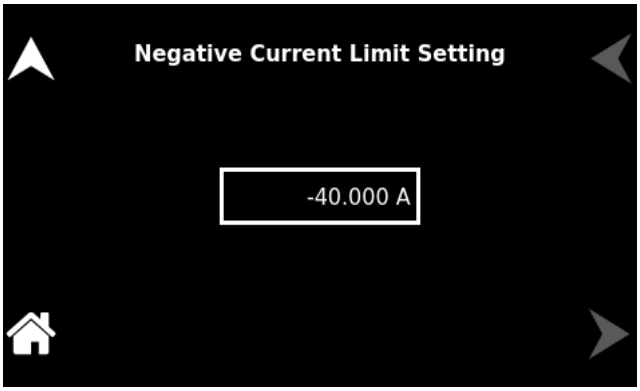


Figure 9-52. Negative Current limit setting screen

Neg. Power Limit

Users can set a negative power limit value, and which functions as a trip limit. Refer to Figure 9-53.

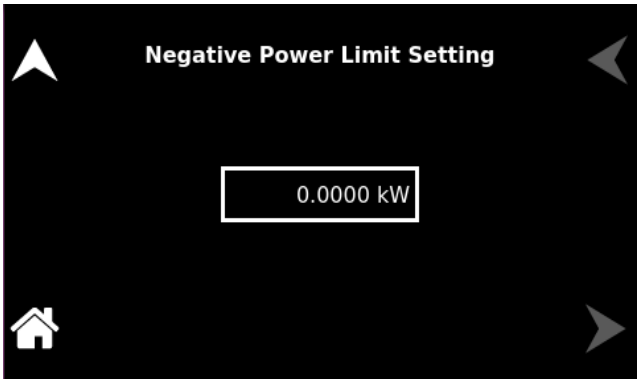


Figure 9-53. Negative Power limit setting screen

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 9-54.

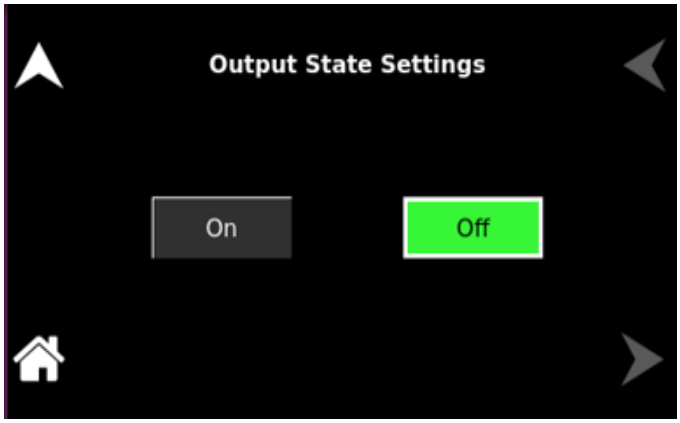


Figure 9-54. Output State

Table 9-22. Output Program Settings in CR/CC Mode

9.2.3 MEASUREMENTS SCREEN

The Measurements screen displays the floating-point values for DC Output 'Voltage', Output 'Current', and Output 'Power'. For the Measurement screen, refer to Figure 9-55 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

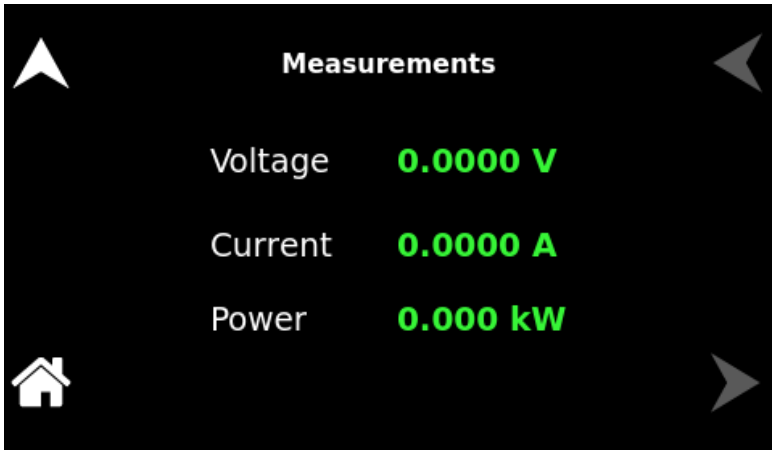


Figure 9-55. Measurements Screen

9.2.4 RAMP SCREEN

The Ramp Screen provides the interface based on the programming type and regulation setting configured (from configuration screen, refer to Section 9.2.5.1). The Ramp screen will be displayed according to the programming type configured, 'Voltage Ramp' screen for 'Voltage' programming type and 'Current Ramp' screen for 'Current' programming type.

9.2.4.1 VOLTAGE RAMP – CV/CC, CV/CP, CR/CV AND CV

The Voltage Ramp menu allows the user to configure and execute voltage ramp, refer to Figure 9-56. The Voltage Ramp menu allows the selection of parameters such as ‘From Volt’, ‘To Volt’, ‘Time’, ‘Set Limits’, ‘Trigger’ and ‘Initial Slew’.

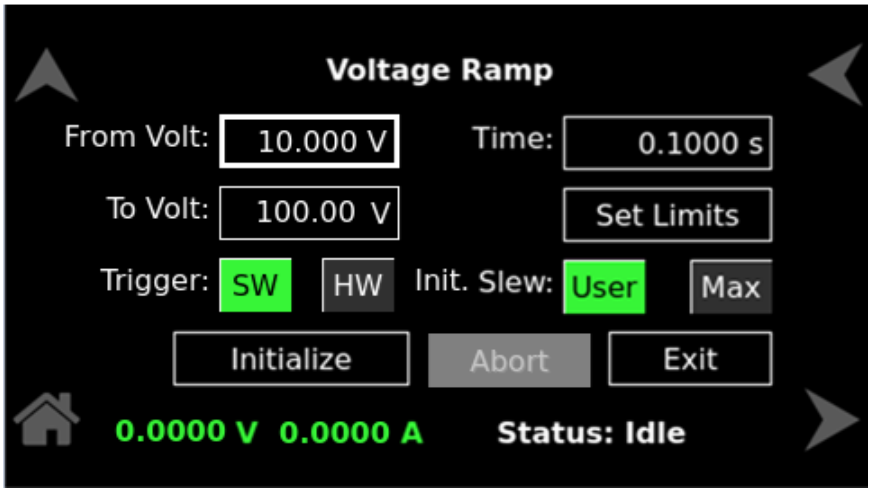


Figure 9-56. Voltage Ramp Screen

The Voltage Ramp menu has the following fields:

ENTRY	DESCRIPTION
From Volt	Sets the start voltage for the ramp. Refer to Figure 9-57.

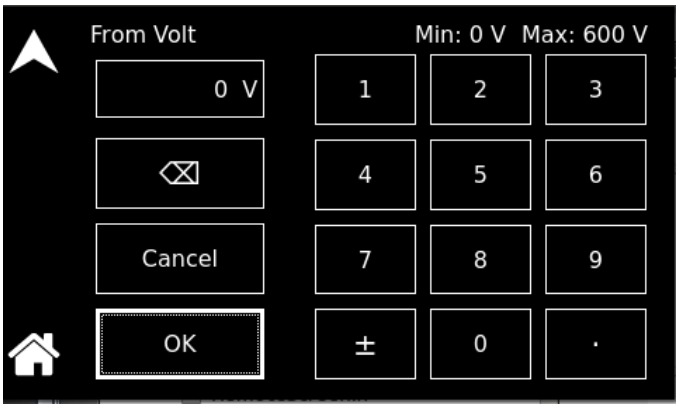


Figure 9-57. From Voltage

To Volt	Sets the end voltage for the ramp. Refer to Figure 9-58.

ENTRY	DESCRIPTION

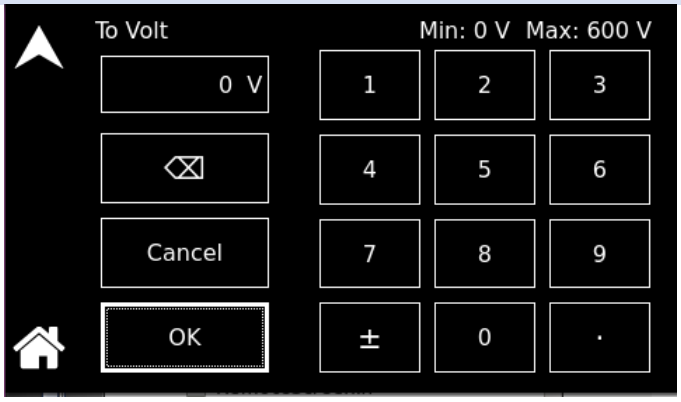


Figure 9-58. To Voltage

Trigger Mode This setting allows the user to configure the input signal to start the ramp execution ('From Volt' to 'To Volt')

a) Software (SW) Trigger Mode:

If 'SW' is selected, post ramp initialization power supply will wait for the software trigger to start the ramp, displaying the status as 'Waiting for Trigger'. Refer to Figure 9-59.

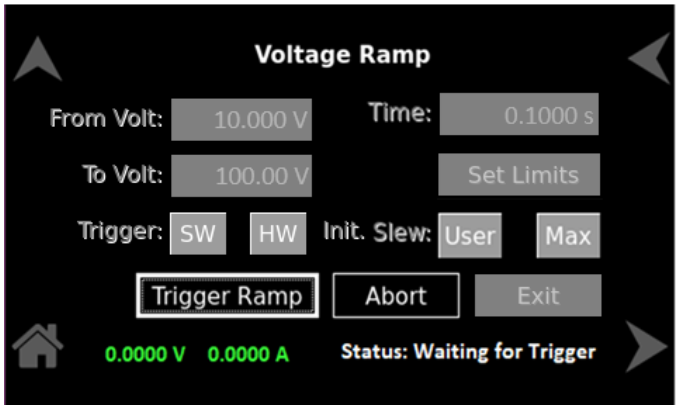


Figure 9-59. Software Trigger Mode

b) Hardware (HW) Trigger Mode:

If 'HW' is selected, post ramp initialization power supply will wait for the hardware trigger to start the ramp execution, displaying the status as 'Waiting for Trigger'.

The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN). Refer to Figure 9-60.

ENTRY	DESCRIPTION

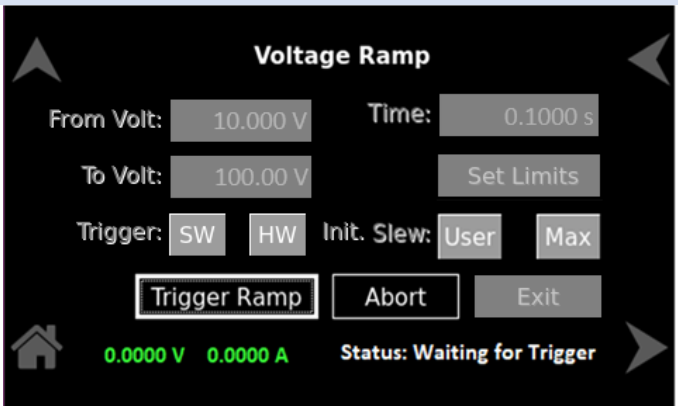


Figure 9-60. Hardware Trigger Mode

Time Sets the time in seconds to reach from 'From Volt' to 'To Volt'. Refer to Figure 9-61.

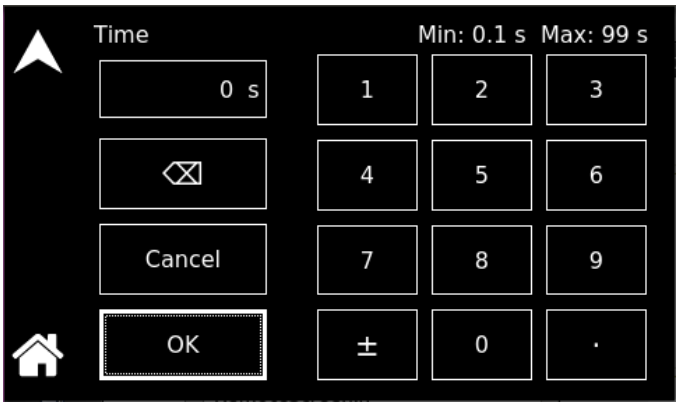


Figure 9-61. Time

Set Limits User can define the limits for the Ramp execution. Refer to Figure 9-62 and Figure 9-63.

Figure 9-62. Set Limits – CV/CC, CV/CP and CV

ENTRY	DESCRIPTION

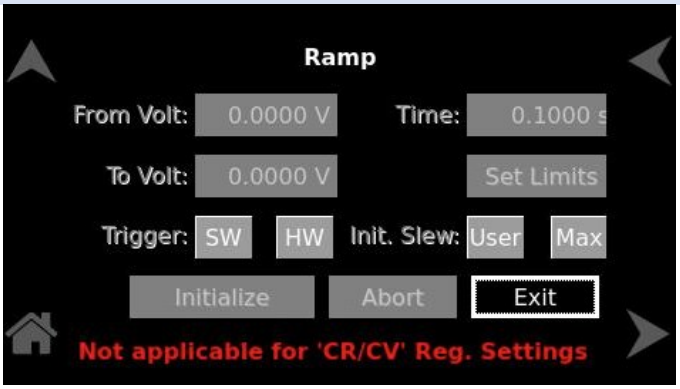


Figure 9-63. Set Limits – CR/CV

Initial Slew This setting allows the user to configure the initial slew, the slew rate at which the power supply reaches from the current output voltage of the power supply to the configured 'From Volt' in the ramp screen.

a) User: When the setting is 'User', the output voltage of the power supply reaches the 'From Volt' (when the ramp is initialized) with the voltage slew rate configured in the configuration menu.

b) Max: When the setting is 'Max', the output voltage of the power supply reaches the 'From Volt' (when the ramp is initialized) with maximum slew rate.

Initialize The function of the initialization process is to bring the current device voltage value to the 'From Volt' value programmed in the ramp screen. Click the 'Initialize' button to initialize the ramp, and the progress will be displayed as a percentage in the status bar. Upon completion of the initialization process, the status will indicate as 'Waiting for Trigger'. Refer to Figure 9-64.

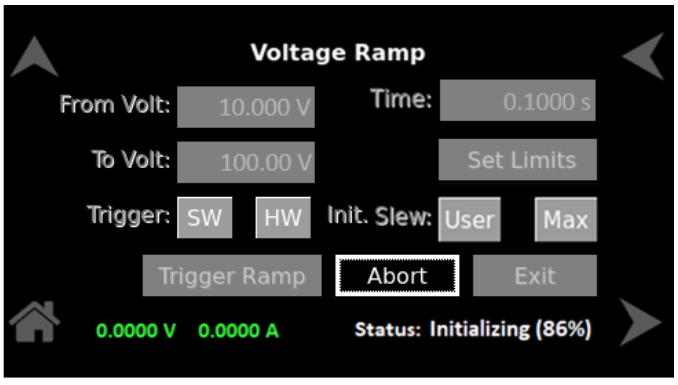


Figure 9-64. Initializing

Trigger Ramp Used to send software trigger to the unit to start the ramp execution. Post initialization of ramp this function is enabled only when 'Trigger' selection is ''SW'. Refer to Figure 9-65.

ENTRY	DESCRIPTION

If the ‘Trigger’ selection is set to ‘HW’, this function is not enabled. The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN).

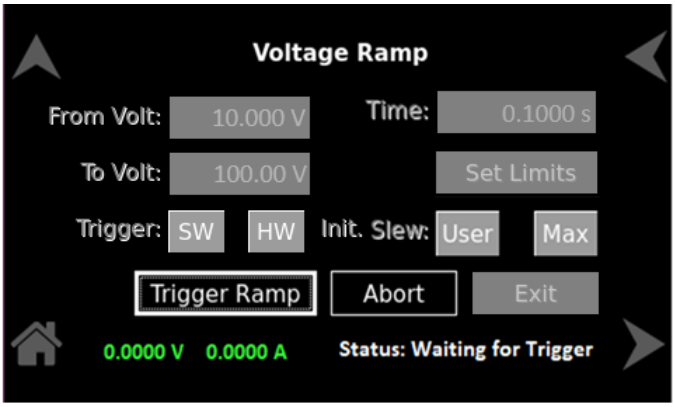


Figure 9-65. Trigger Ramp

Abort User can abort the process at any stage of the ramp execution. The progress of the operation is displayed in the status on the right side of the screen. Refer to Figure 9-66.

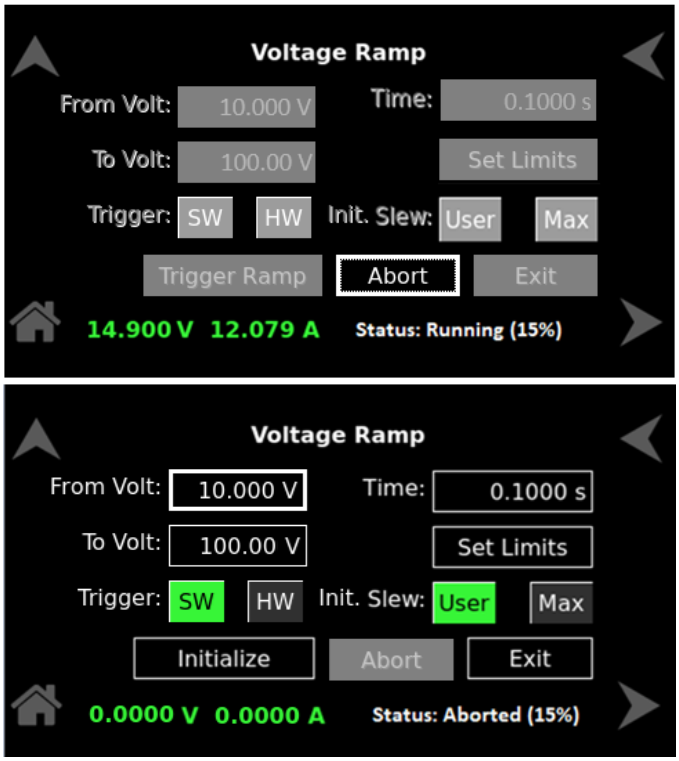


Figure 9-66. Abort

ENTRY	DESCRIPTION
Status	This field displays the progress or state of the process.

a) IDLE - When the system is in Idle (not performing any task) situation, refer to Figure 9-67.

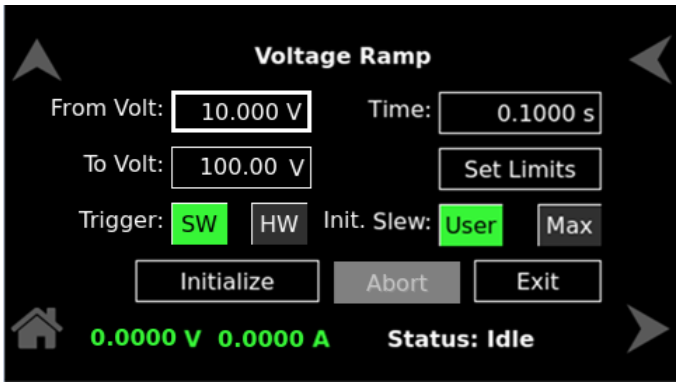


Figure 9-67. Status – IDLE

b) Initializing - When the system is initializing (configuring the current device voltage value to the 'From Volt' value programmed in the ramp screen), and the progress is displayed as a percentage. Refer to Figure 9-68.

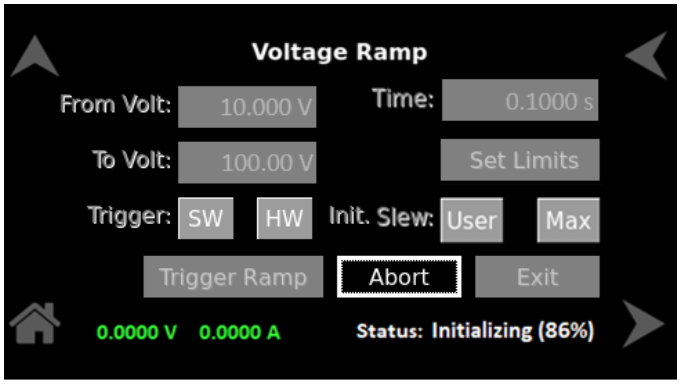


Figure 9-68. Status – Initializing

c) Waiting for Trigger: When the system is waiting for the trigger, refer to Figure 9-69.

ENTRY	DESCRIPTION

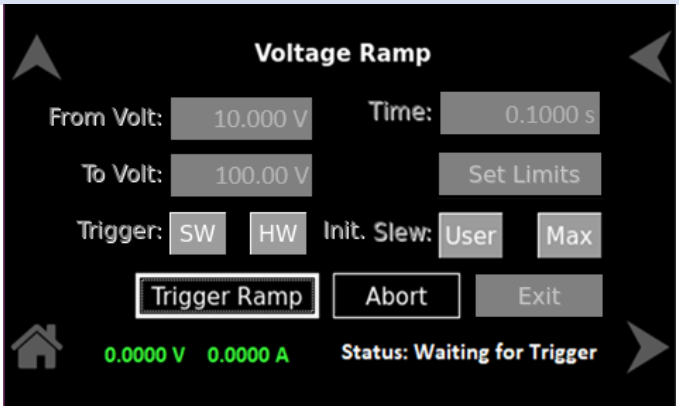


Figure 9-69. Status – Waiting for Trigger

d) Running: When the system is executing the trigger ramp process, refer to Figure 9-70.

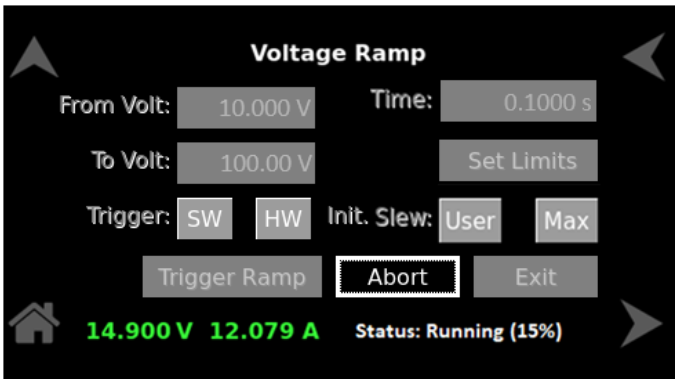


Figure 9-70. Status – Running

e) Aborted: When the process is aborted (Initializing, Waiting for Trigger, Running), 'Aborted' is displayed in the status. Refer to Figure 9-71.

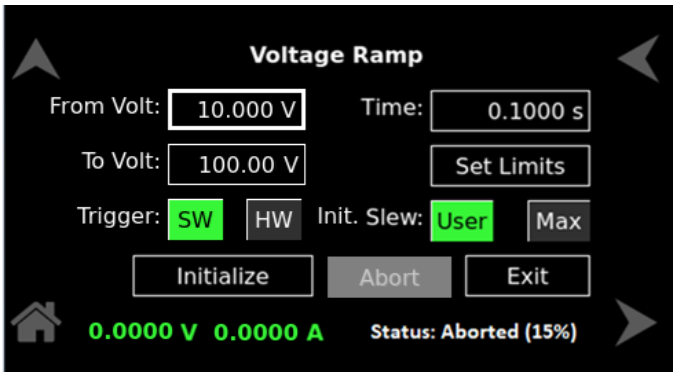


Figure 9-71. Status – Aborted

f) Complete: When the ramp execution (bringing the voltage from 'From Volt' to 'To Volt') is completed. Refer to Figure 9-72.

ENTRY	DESCRIPTION

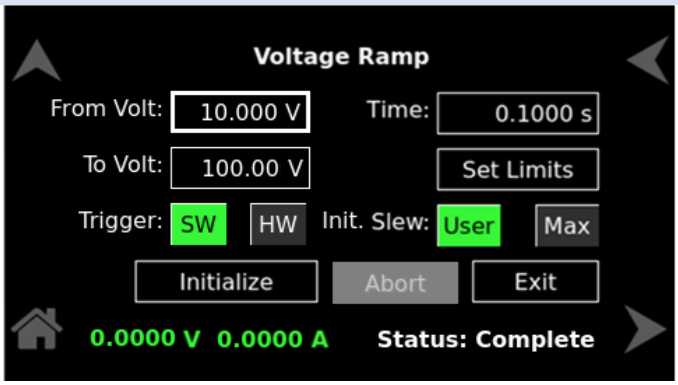


Figure 9-72. Status- Completed

Exit Exits the Voltage Ramp sub menu and return to Top level menu, refer to Figure 9-3.

NOTE: User cannot exit the Voltage Ramp Screen using HOME and UP arrow. To exit while a process is ongoing, user must first abort the process.

Table 9-23. Voltage Ramp

a) Example 1: Creating a Voltage ramp using Software Trigger mode

- Set the From Volt to 25V
- Set the To Volt to 50V
- Set the Time to 10s
- Select the Trigger mode as SW
- Select between User or Max for the slew setting according to the user's requirement
- Click on Initialize
- Observe that the Initialize button changes to the Trigger Ramp button after completion of initializing, and Abort button becomes enabled from a disabled state
- Click on Trigger Ramp
- The status of the Trigger Ramp progress can be seen on the screen
- 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.

b) Example 2: Creating a Voltage ramp using Hardware Trigger mode

- Set the Volt to 25V
- Set the To Volt to 50V
- Set the Time to 10s
- Select the Trigger mode as HW
- Select between User or Max for the slew setting according to the requirements
- Click on Initialize
- Observe that Initialize button change from enable to disable state after completion of initializing, and Abort button becomes enabled
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-19 (TRIGGER IN) and pin-18 (RTN) to generate the Voltage Ramp
- 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.

9.2.4.2 VOLTAGE RAMP – CP/CV

Voltage Ramp is not applicable in CP/CV Regulation Settings. Refer to Figure 9-73.

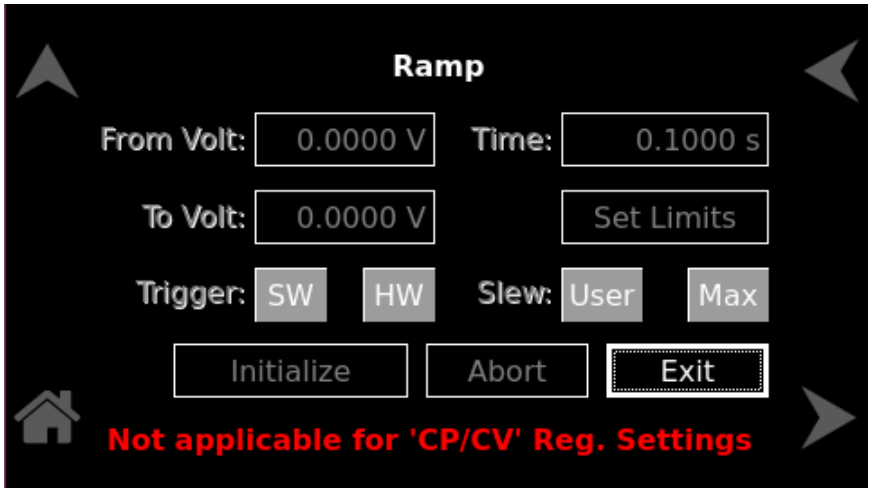


Figure 9-73. Voltage ramp – CP/CV

9.2.4.3 CURRENT RAMP – CC/CV, CR/CC AND CC

The Current Ramp menu allows to configure and execute Current ramp, refer to Figure 9-74. The Current Ramp menu allows the selection of parameters such as 'From Current', 'Status', 'To Current', 'Time', 'Trigger', 'Slew' and 'Set Limits'.

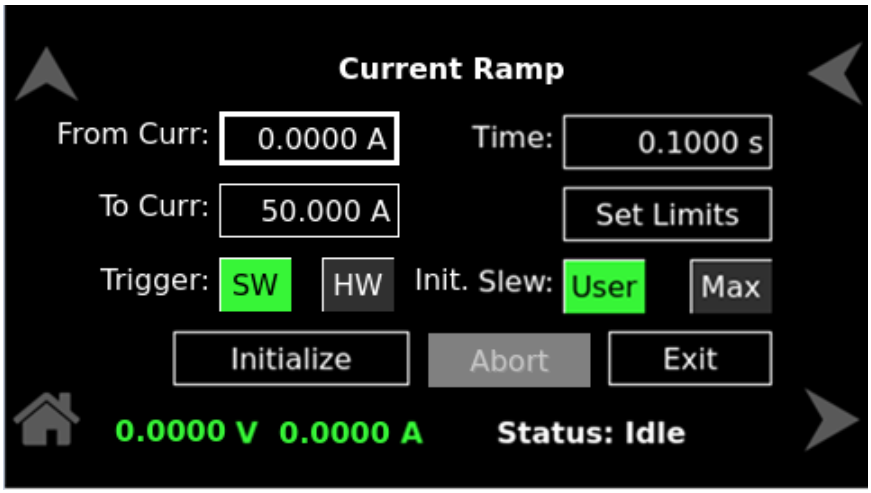


Figure 9-74. Current Ramp Screen

The Current Ramp menu has the following fields:

ENTRY	DESCRIPTION
From Curr	Sets the start current for the ramp. Refer to Figure 9-75.

ENTRY	DESCRIPTION

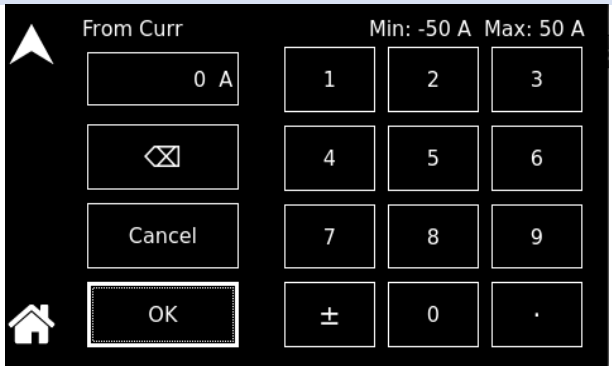


Figure 9-75. From Current

To Curr

Sets the end current for the ramp. Refer to Figure 9-76.

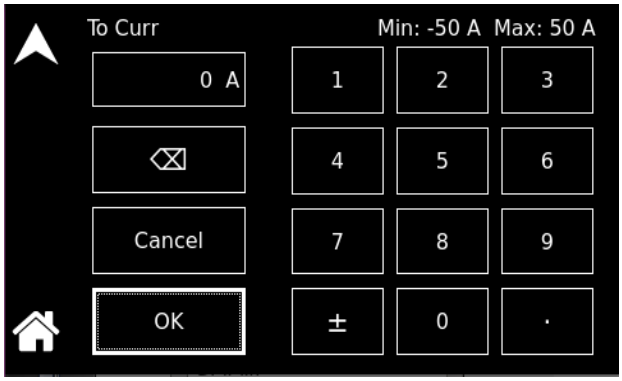


Figure 9-76. To Current

Trigger Mode

This setting allows the user to configure the input signal to start the ramp execution ('From Curr' to 'To Curr')

a) Software (SW) Trigger Mode:

If 'SW' is selected, post ramp initialization power supply will wait for the software trigger to start the ramp execution, displaying the status as 'Waiting for Trigger'. Refer to Figure 9-77.

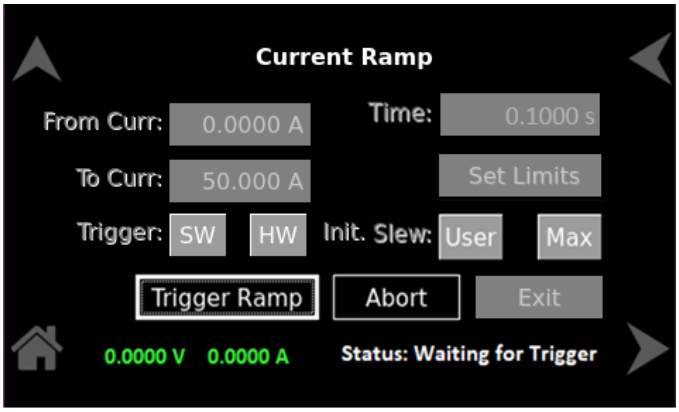


Figure 9-77. SW Mode

ENTRY	DESCRIPTION

b) Hardware (HW) Trigger Mode:

When 'HW' is selected, post ramp initialization power supply will wait for a hardware trigger to start the ramp execution, displaying the status as 'Waiting for Trigger'.

The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN). Refer to Figure 9-78.

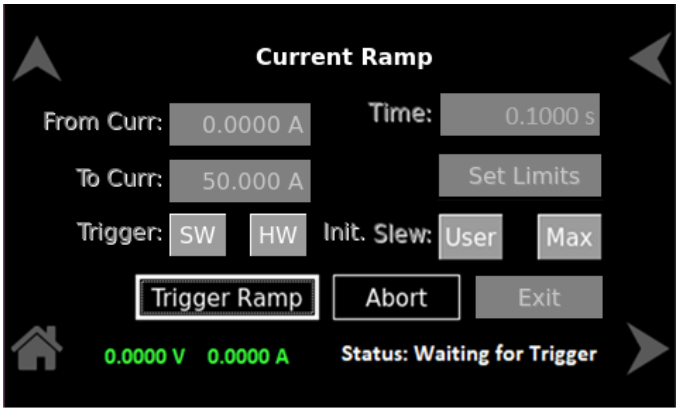


Figure 9-78. HW Mode

Time Sets the time in seconds to reach from 'From Curr' to 'To Curr'. Refer to Figure 9-79.

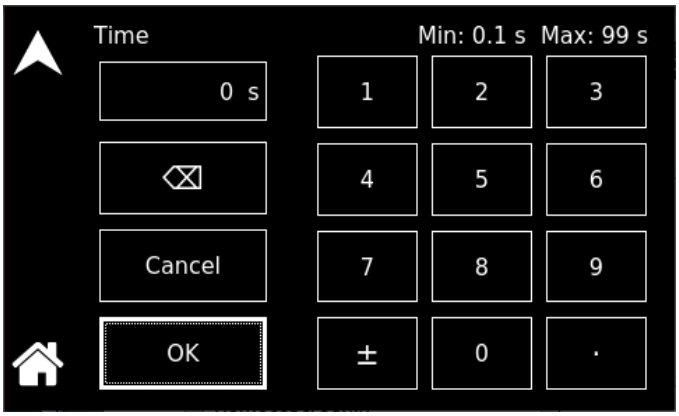


Figure 9-79. Time

Set Limits User can define the limits for the Ramp execution. Refer to Figure 9-80 and Figure 9-81.

ENTRY	DESCRIPTION

Figure 9-80. Set Limits - CC/CV, CC/CP and CC

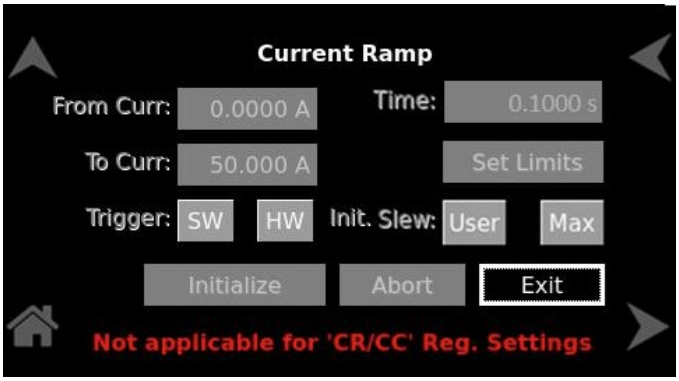


Figure 9-81. Set Limits – CR/CC

Initial Slew

This setting allows the user to configure the initial slew, the slew rate at which the power supply reaches from the output Current of the power supply to the configured ‘From Curr’ in the ramp screen.

a) User: When the setting is ‘User’, the output current of the power supply reaches the ‘From Curr’ (when the ramp is initialized) with the voltage slew rate configured in the configuration menu.

b) Max: When the setting is ‘Max’, the output current of the power supply reaches the ‘From Curr’ (when the ramp is initialized) with maximum slew rate.

Initialize

The function of the initialization process is to bring the current device voltage value to the ‘From Curr’ value programmed in the ramp screen. Click the ‘Initialize’ button to initialize the ramp, and the progress will be displayed as a percentage in the status bar. Upon completion of the initialization process, the status will indicate as ’Waiting for Trigger’. Refer to Figure 9-82.

ENTRY	DESCRIPTION

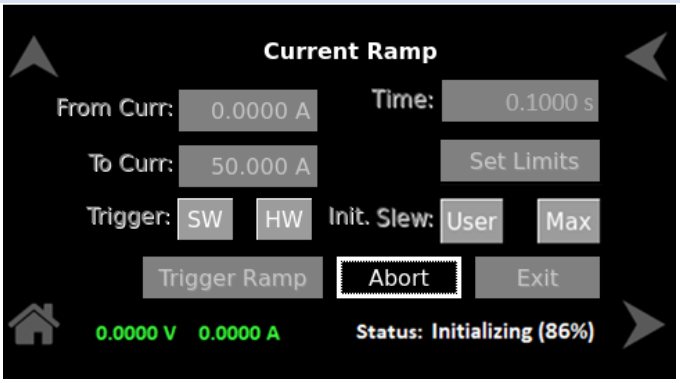


Figure 9-82. Initializing

Trigger Ramp Used to send software trigger to the unit to start the ramp execution. Post initialization of ramp this function is enabled only when 'Trigger' selection is 'SW'. Refer to Figure 9-83.

If the 'Trigger' selection is set to 'HW', this function is not enabled. The ramp execution begins when a 10ms active high pulse is applied to the Norcomp connector at pin-18 (RTN) and pin-19 (TRIGGER IN).

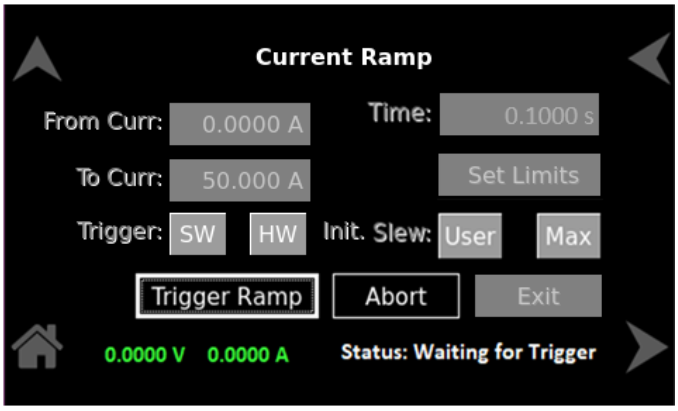
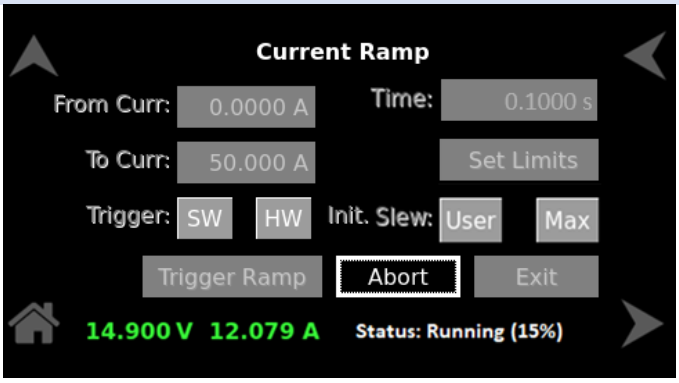


Figure 9-83. Trigger Ramp

Abort User can abort the process at any stage of the ramp execution. The progress of the operation is displayed in the status on the right side of the screen. Refer to Figure 9-84.

ENTRY	DESCRIPTION



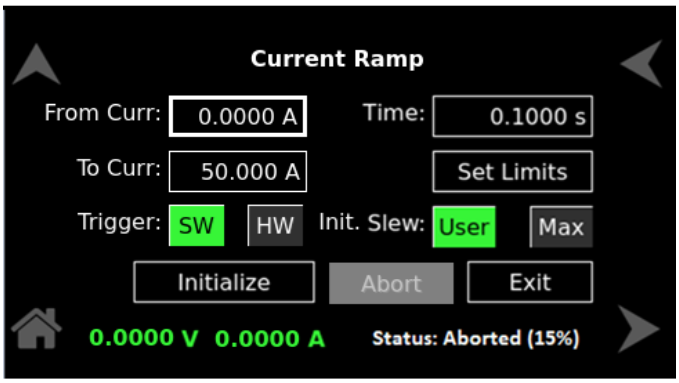


Figure 9-84. Abort – SW

Status This field displays the progress or state of the process.
a) IDLE - When the system is in Idle (not performing any task) situation, refer to Figure 9-85.

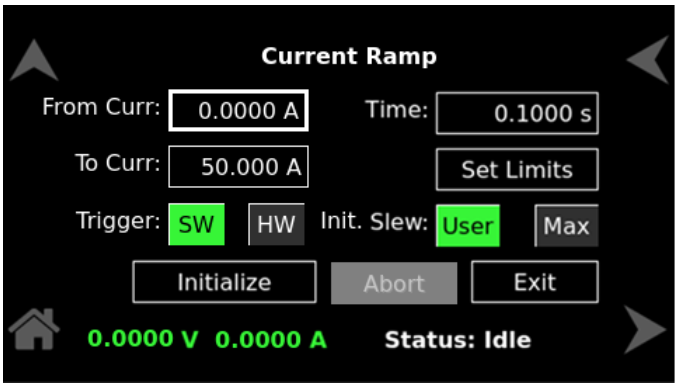


Figure 9-85. Status – IDLE

b) Initializing - When the system is initializing (configuring the device current value to the 'From Curr' value programmed in the ramp screen), and the progress is displayed as a percentage. Refer to Figure 9-86.

ENTRY	DESCRIPTION

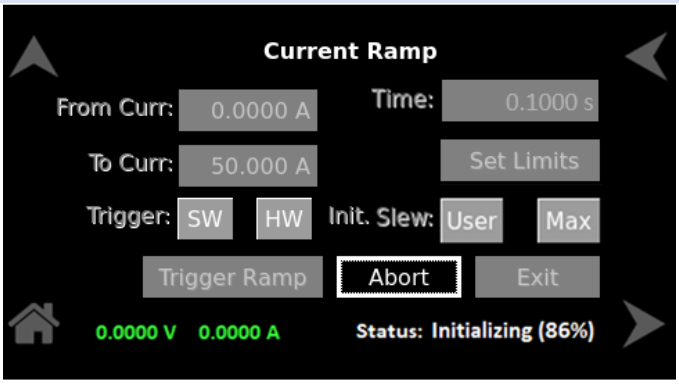


Figure 9-86. Status - Initializing

c) Waiting for Trigger: When the system is waiting for the trigger, refer to Figure 9-87.

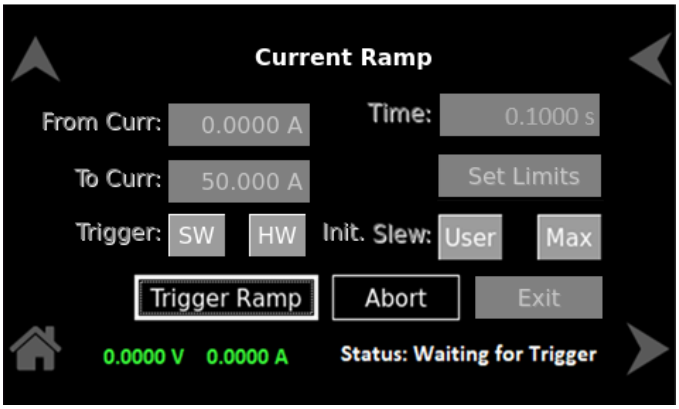


Figure 9-87. Status – Waiting for Trigger

d) Running: When the system is executing the trigger ramp process, refer to Figure 9-88.

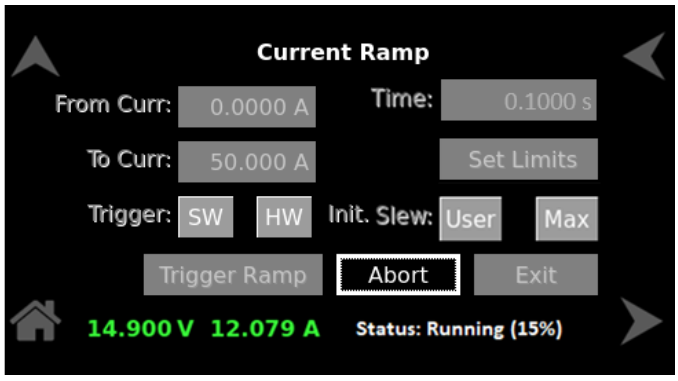


Figure 9-88. Status – Running

e) Aborted: When the process is aborted (Initializing, Waiting for Trigger, Running), 'Aborted' is displayed in the status. Refer to Figure 9-89.

ENTRY	DESCRIPTION

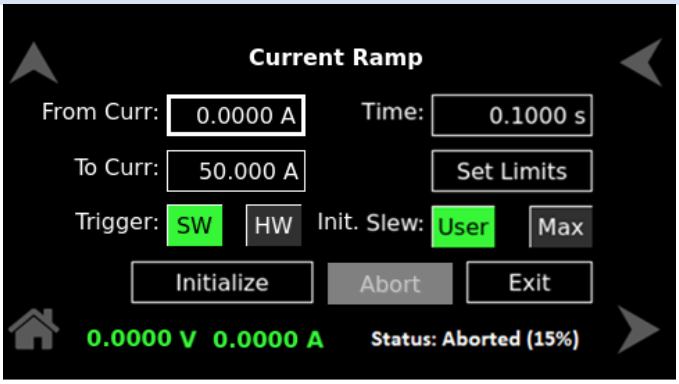


Figure 9-89. Status – Aborted

f) Complete: When the ramp execution (bringing the voltage from “From Curr” to “To Curr”) is completed. Refer to Figure 9-90.

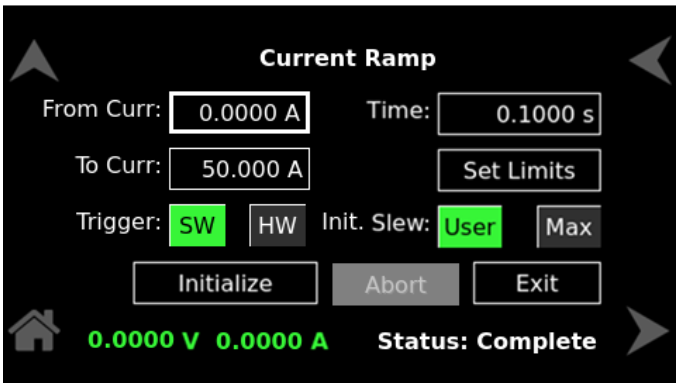


Figure 9-90. Status- Completed

Exit Exits the Current Ramp sub menu and return to Top level menu, refer to Figure 9-3.

NOTE: User cannot exit the Current Ramp Screen using HOME and UP arrow. To exit while a process is ongoing, user must first abort the process.

Table 9-24. Current ramp

a) Example 1: Creating a Current ramp using Software Trigger mode

- Set the From Current to 10A
- Set the To Curr to 30A
- Set the Time to 10s
- Select the Trigger mode as SW
- Select between User or Max for the slew setting according to the user’s requirement

- Click on Initialize
- Observe that the Initialize button changes to the Trigger Ramp button after completion of initializing, and Abort button becomes enabled from disabled state
- Click on Trigger Ramp
- The status of the Trigger Ramp progress can be seen on the screen
- 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.

b) 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
- Select the Trigger mode as HW
- Select between User or Max for the slew setting according to the users' requirements
- Click on Initialize
- Observe that Initialize button change from enable to disable state after completion of initializing, and Abort button becomes enabled
- Give an external trigger i.e. an active high pulse of 10ms on the MOLEX connector pin-19 (TRIGGER IN) and pin-18 (RTN) to generate the Current Ramp.
- 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.

9.2.4.4 CURRENT RAMP – CP/CC AND CR/CC

Current Ramp is not applicable in CP/CC and CR/CC Regulation Settings. Refer to Figure 9-91.

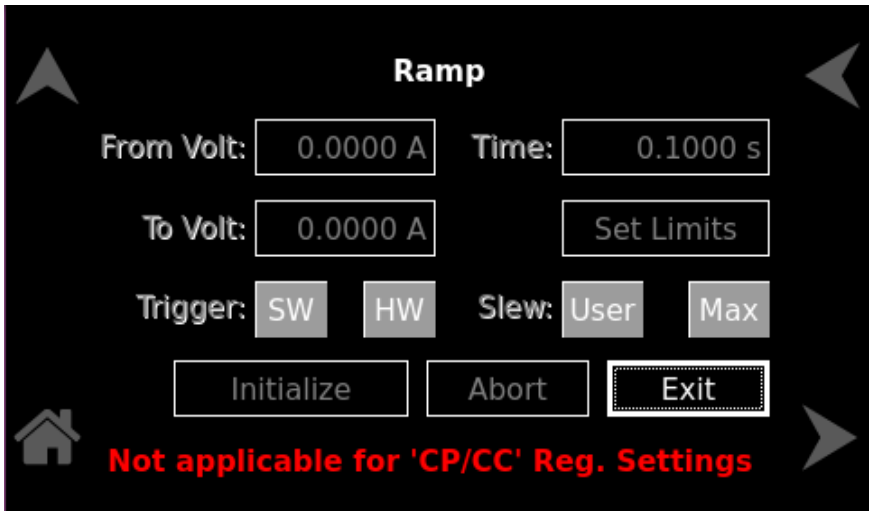


Figure 9-91. Current Ramp - CP/CC

9.2.5 CONFIGURATION SCREEN

The Configuration screen provides ‘Regulation Settings’, ‘Slew Rate’, ‘Protection’, ‘User Limits’, ‘Output Sense’, ‘PONS’, and ‘Measurement Average Samples’.

For the top-level menu of the Configuration screen, refer to Figure 9-92 and for instructions on how to navigate, refer to Section 6.4.2.1.

Figure 9-92. Configuration Screen Top-Level Menu

9.2.5.1 REGULATION SETTINGS

The Regulation Settings Menu is used to configure the Programming type and Regulation setting of the power supply. Refer to Figure 9-93 and Figure 9-95.

The ‘Reg. Setting’ function on the Configuration Screen enables users to switch between ‘Voltage (CV/CC, CR/CV, CV/CP, CP/CV and CV)’ and ‘Current (CC/CV, CR/CC, CP/CC, CC/CP and CC) ’ regulation settings.

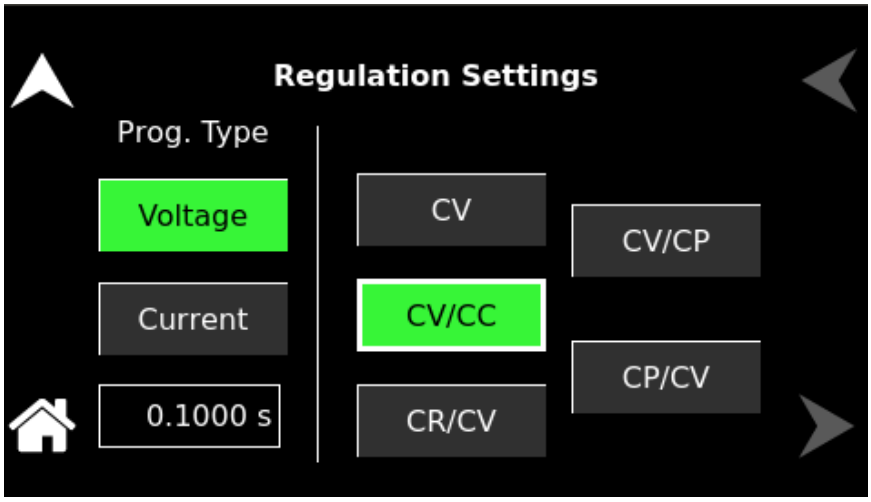


Figure 9-93. Regulation Settings – CV/CC, CR/CV, CV/CP, CP/CV and CV

a) When the programming type is set to ‘Voltage’ in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CV/CC	In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the power limit (negative), the output voltage would be programmed to zero.
CR/CV	In this regulation setting, output resistance is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero.
CV/CP	In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero.
CP/CV	In this regulation setting, output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output power would be programmed to zero.
CV	In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (negative) or power limit (negative), the output voltage would be programmed to zero.

ENTRY	DESCRIPTION
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 9-94.

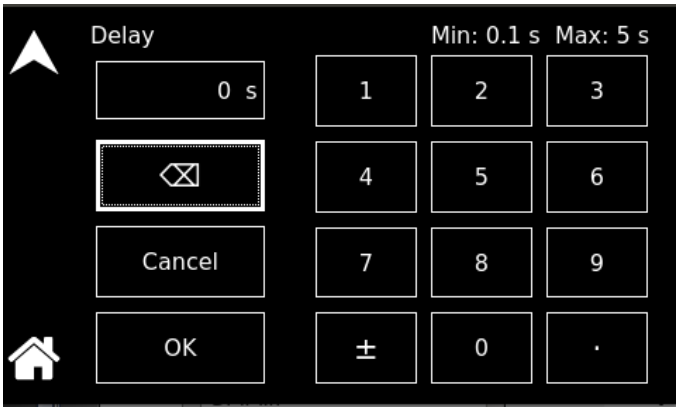


Figure 9-94. Delay Screen

Table 9-25. Regulation Settings

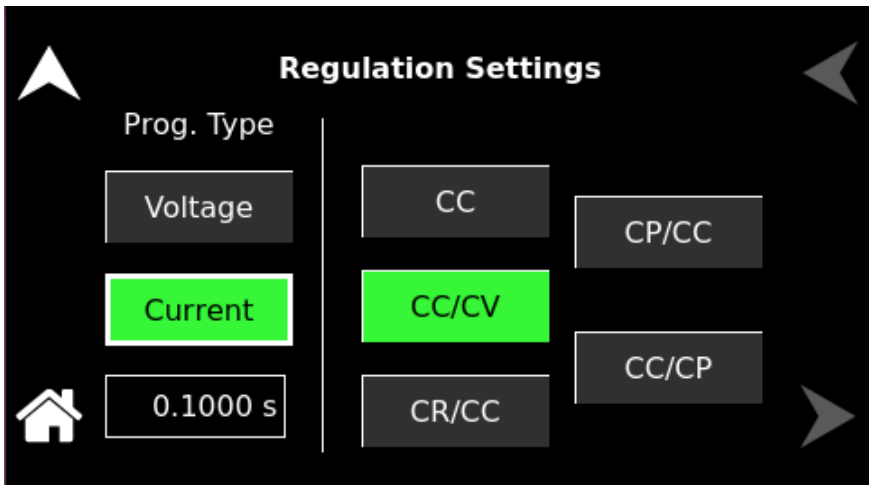


Figure 9-95. Regulation Settings – CC/CV, CR/CC, CP/CC, CC/CP and CC

b) When the programming type is set to ‘Current’ in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CC/CV	In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the power limit (negative), the output current would be programmed to zero.

ENTRY	DESCRIPTION
CR/CC	In this regulation setting, output resistance is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero.
CP/CC	In this regulation setting, output power is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC/CP	In this regulation setting, output power is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC	In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (negative), the output current would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 9-96.

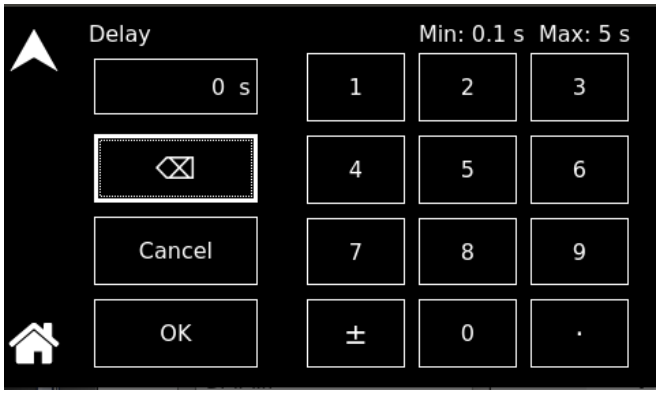


Figure 9-96. Delay Screen

Table 9-26. Regulation Settings

9.2.5.2 SLEW RATE

In the Slew Rate Settings, users can configure the Voltage, Current and Power slew rate. This allows for precise control over the voltage, current and power change, ensuring smoother transitions and better performance of the power supply. Adjusting these settings can help in optimizing the response time and stability of the system.

The Slew Rate provides the interface based on the programming type selected in the configuration screen, refer to Section 9.2.5.1. When the program type is set to 'Voltage – CV/CC, CV/CP and CV' in the regulation setting, the Slew Settings screen that appears will be the 'Volt Slew Rate'. Refer to Figure 9-97.

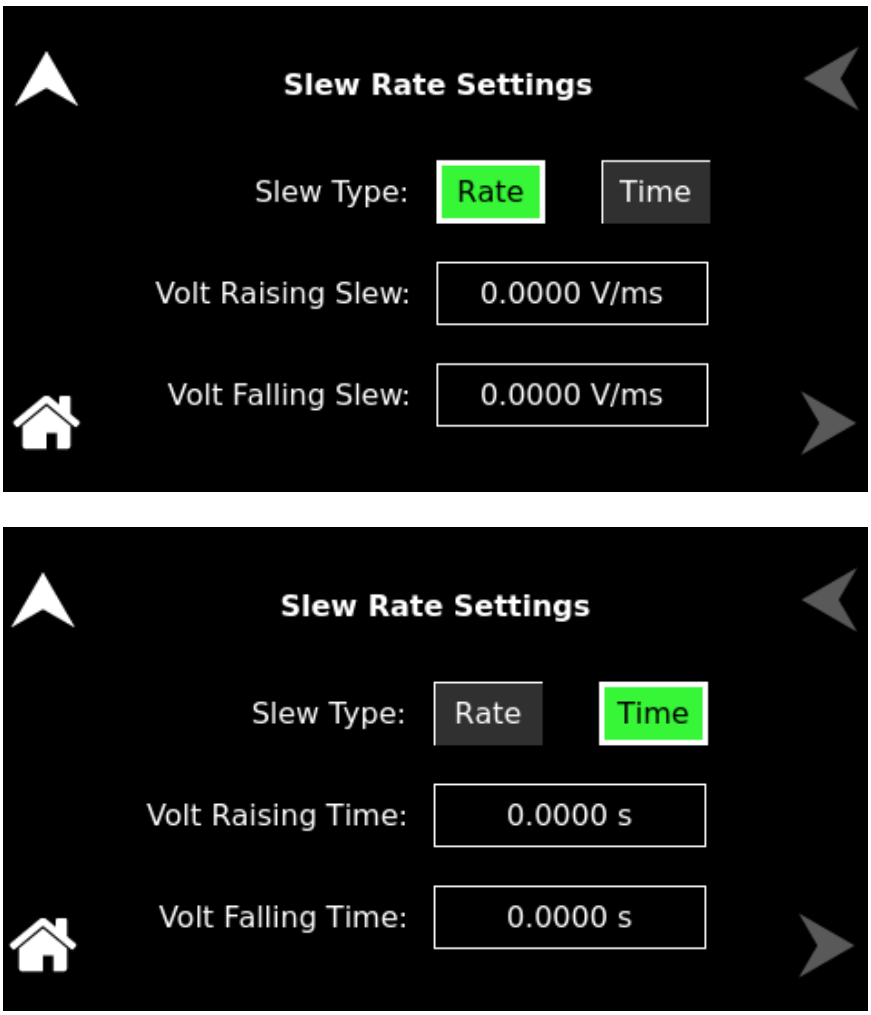


Figure 9-97. Slew Rate Settings – Voltage (CV/CC, CV/CP and CV)

When the program type is set to 'Voltage – CP/CV' in the Regulation setting, the Slew Settings screen that appears will be the 'Pow Slew Rate'. Refer to Figure 9-98.

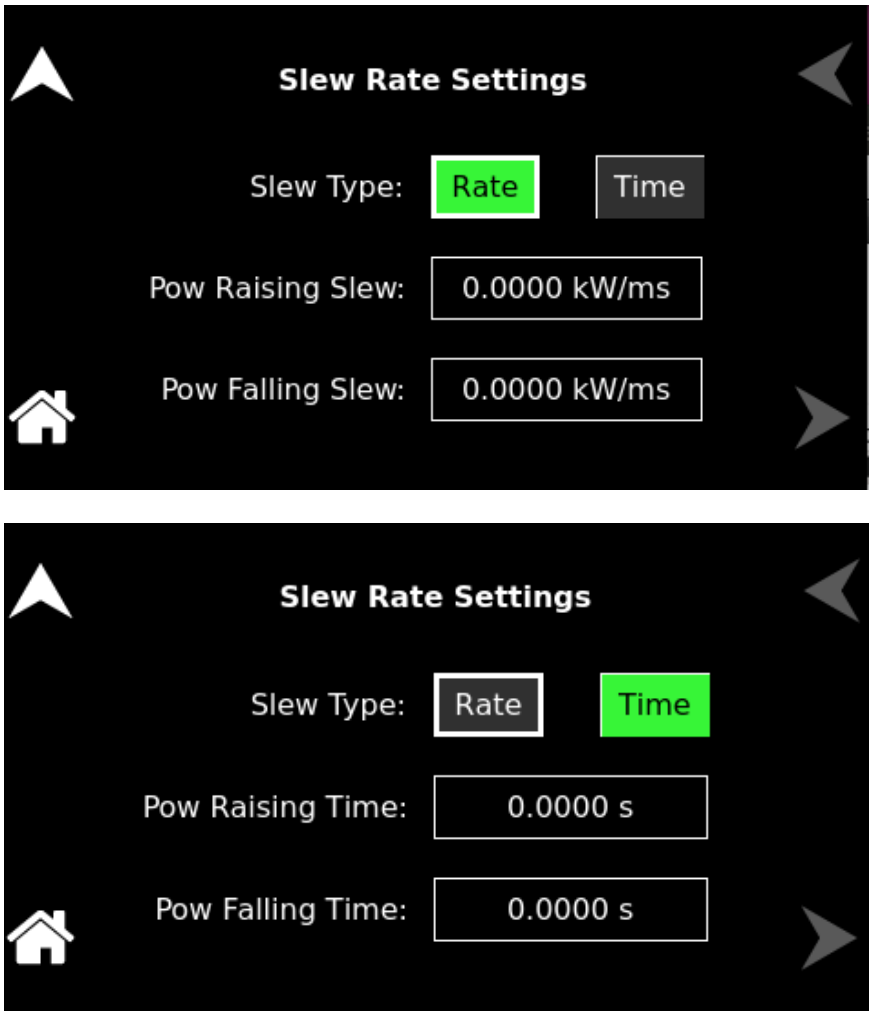


Figure 9-98. Slew Rate Settings – Voltage (CP/CV)

When the program type is set to 'Current – CC/CV, CC/CP and CC' in the Regulation setting, the Slew Settings screen that appears will be the 'Curr Slew Rate'. Refer to Figure 9-99.

Figure 9-99. Slew Rate Settings – Current (CC/CV and CC)

When the program type is set to ‘Current – CP/CC’ in the Regulation setting, the Slew Settings screen that appears will be ‘Pow Slew rate’. Refer to Figure 9-100.

Figure 9-100. Slew Rate Settings – Current (CP/CV)

Slew rate is not applicable for the sink resistance. When the program type is set to ‘Voltage - CR/CV or Current - CR/CC’ in the regulation settings, the slew settings screen that appears will be ‘Not applicable for ‘CR/CV’ Reg. Settings’ or ‘Not applicable for ‘CR/CC’ Reg. Settings’ Refer to Figure 9-101.

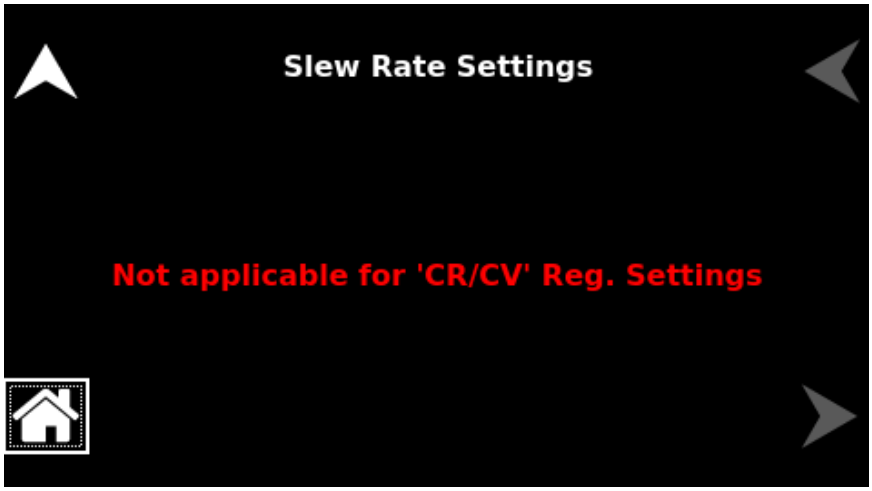


Figure 9-101. Slew Rate Settings – CR/CV and CR/CC

9.2.5.3 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Negative Overcurrent Protection (Neg. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 9-102.

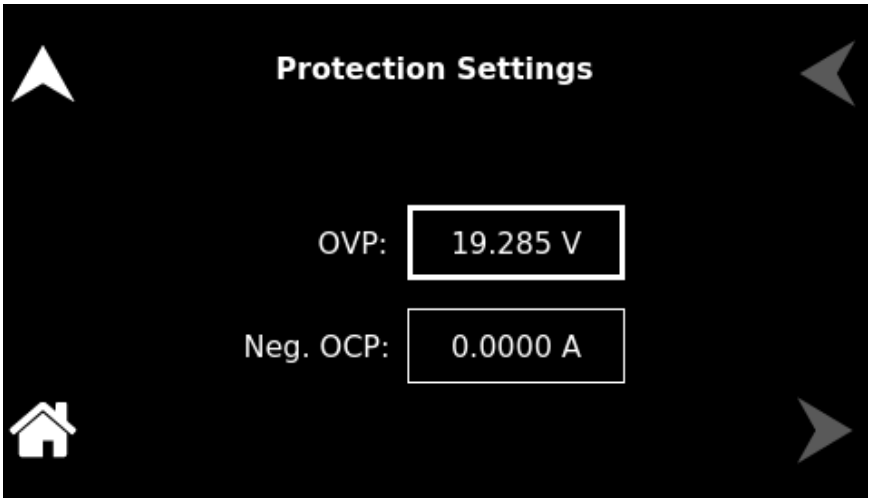


Figure 9-102. Protection Settings

9.2.5.4 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits.

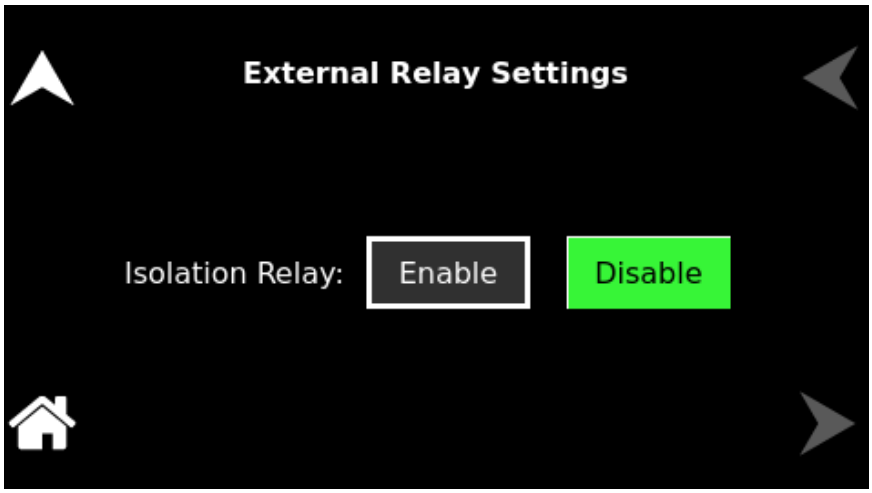


Figure 9-103. Isolation Relay

9.2.5.5 USER LIMITS

In the user limits settings, users can set the maximum allowable voltage, current and power values. This allows users to specify the highest values the device can reach without exceeding these limits.

When the programming type is set to 'Voltage – CV/CC, CV/CP and CV' in the Regulation Settings menu, the user limit screen that appears will be 'Voltage'. Refer to Figure 9-104.

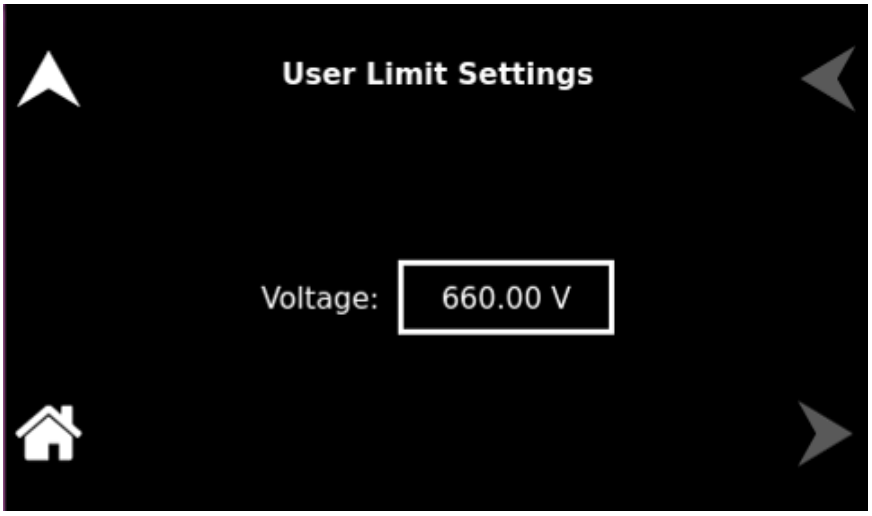


Figure 9-104. User Limit Settings- Voltage (CV/CC, CV/CP and CV)

When the programming type is set to 'Voltage – CP/CV' in the Regulation Settings menu, the user limit screen that appears will be 'Power Low limit'. Refer to Figure 9-105.

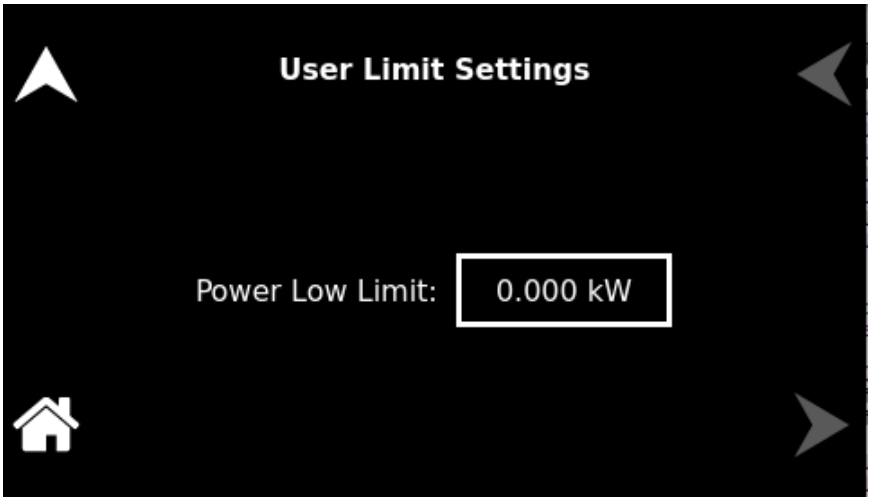


Figure 9-105. User Limit Settings- Power Low Limit (CP/CV)

When the programming type is set to ‘Current- CC/CV, CC/CP and CC’ in the Regulation Settings menu, the user limit screen appears will be ‘Current Low Limit’. Refer to Figure 9-106.

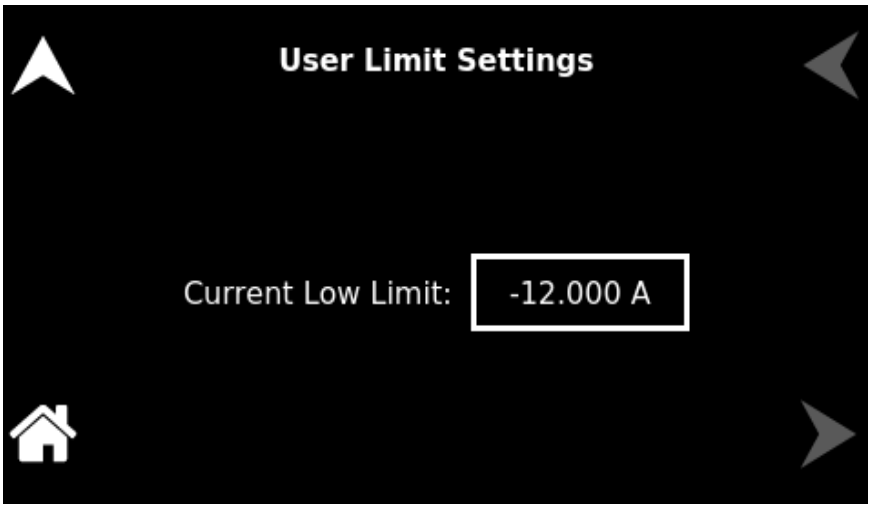


Figure 9-106. User Limit Settings- Current (CC/CV, CC/CP and CC)

When the programming type is set to ‘Current- CP/CC’ in the Regulation Settings menu, the user limit screen appears will be ‘Power Low Limit’. Refer to Figure 9-107.

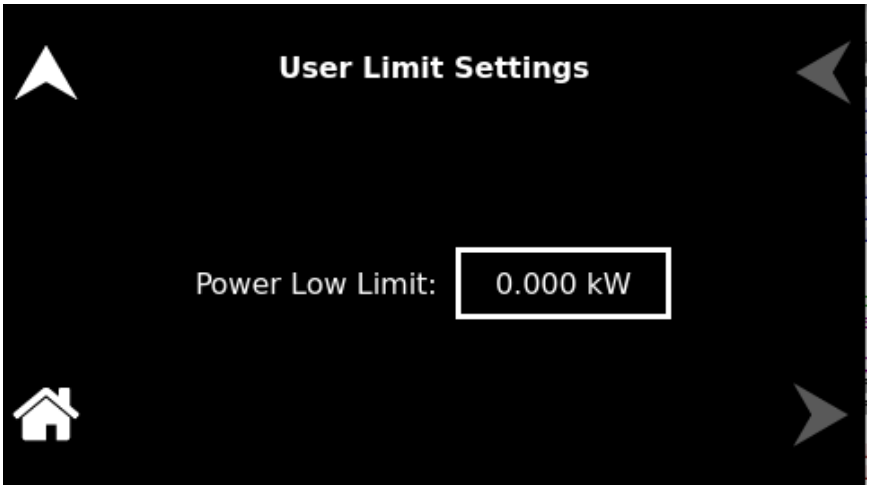


Figure 9-107. User Limit Settings- Power Low Limit (CP/CC)

User limit Settings is not applicable for the sink resistance. When the program type is set to 'Voltage - CR/CV or Current - CR/CC' in the regulation settings, the user limit settings screen that appears will be 'Not applicable for Sink Resistance Regulation Settings'. Refer to Figure 9-108.

Figure 9-108. User Limit Settings- CR/CV and CR/CC

9.2.5.6 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS (Remote Voltage Sense) connector. Refer to Figure 9-109.

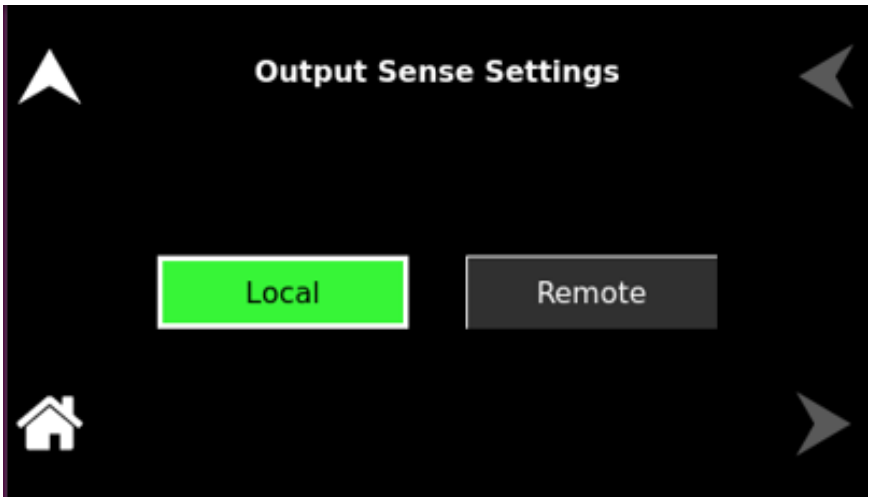


Figure 9-109. Output Sense Settings

9.2.5.7 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on their chosen mode regulation settings.

When the programming type is set to 'Voltage' in the Regulation Settings menu, the PONS Program Type will display as 'Voltage,' and the PONS Reg. Setting will show the selected mode. Refer Figure 9-110 to Figure 9-114.

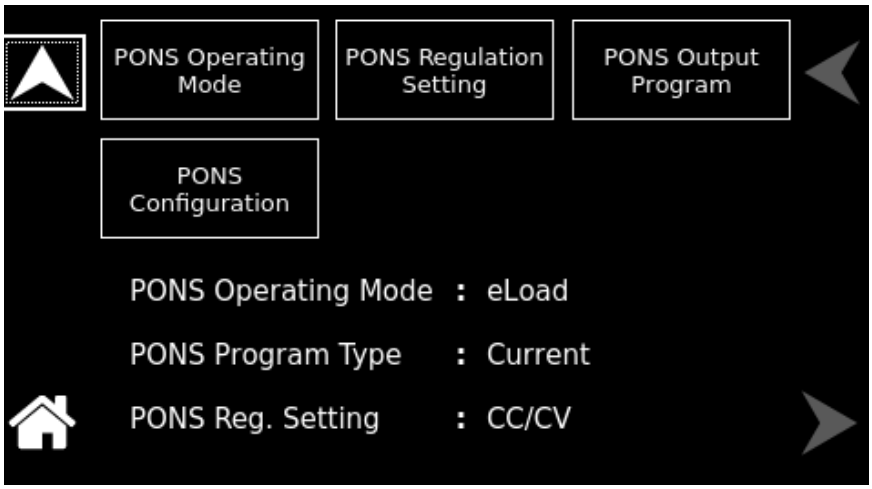


Figure 9-110. PONS Main Screen – CV/CC

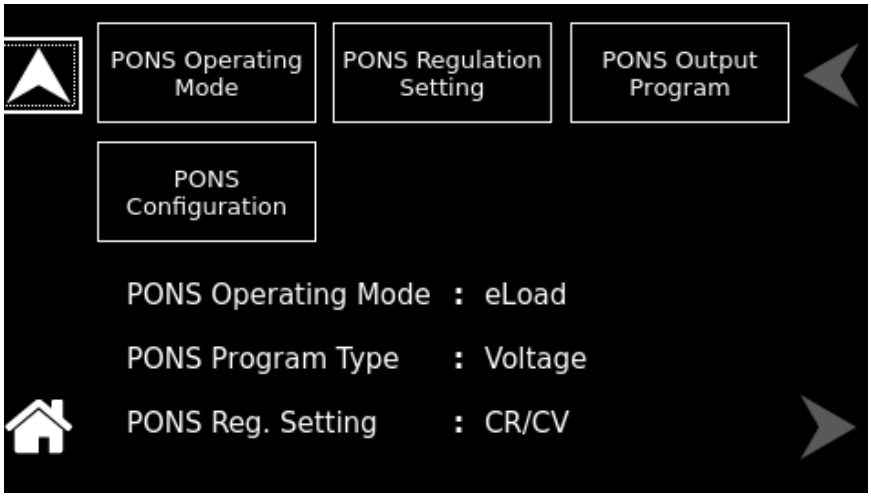


Figure 9-111. PONS Main Screen – CR/CV

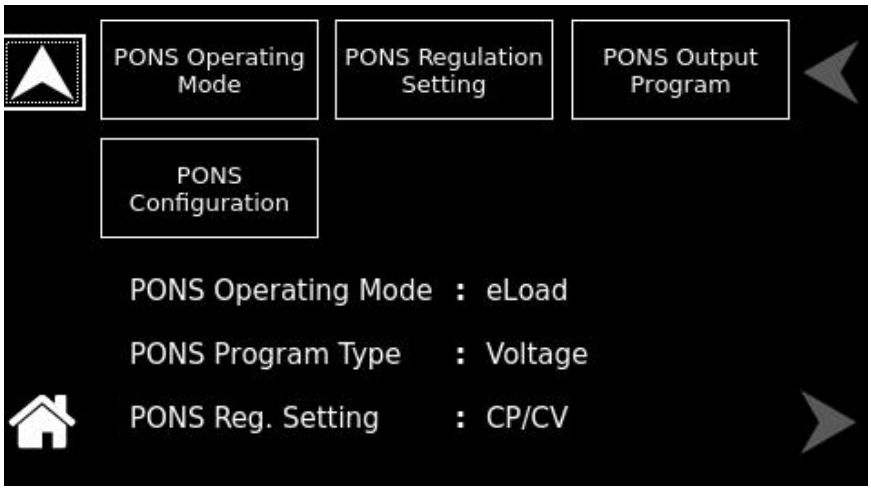


Figure 9-112. PONS Main Screen – CP/CV

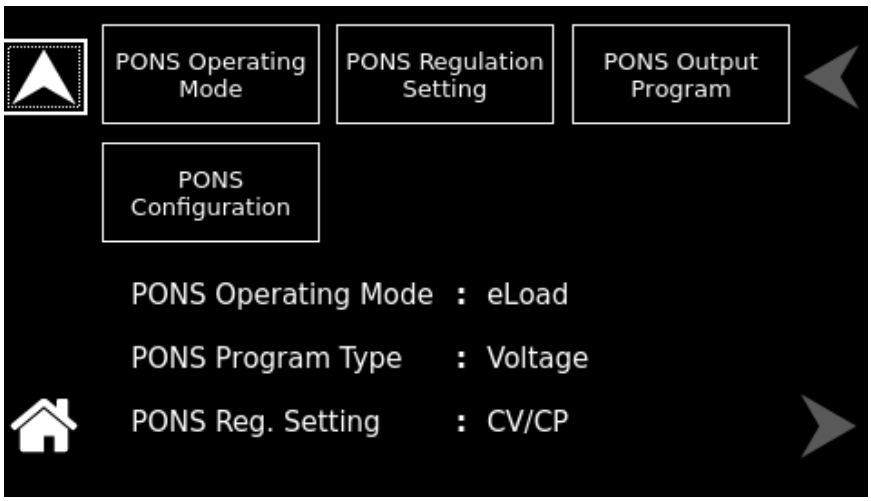


Figure 9-113. PONS Main Screen – CV/CP

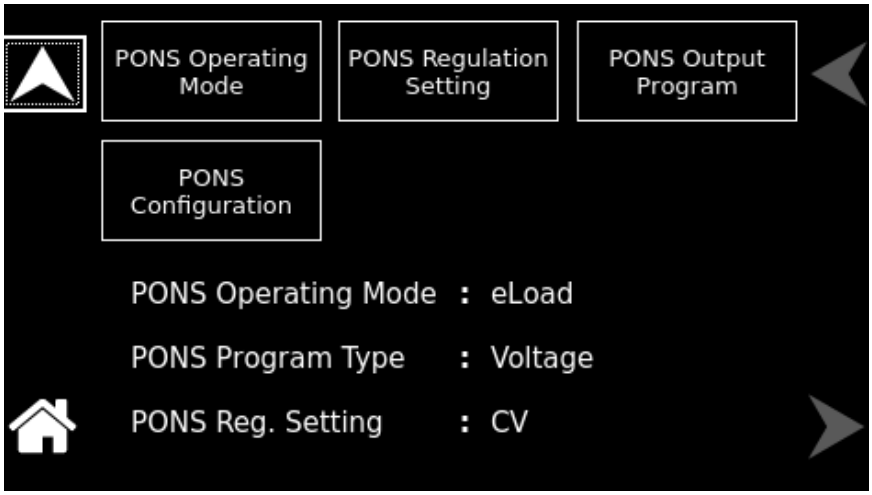


Figure 9-114. PONS Main Screen - CV

When the programming type is set to 'Current' in the Regulation Settings menu, the PONS Program Type will display as 'Current,' and the PONS Reg. Setting will show the selected mode. Refer to Figure 9-115 to Figure 9-119.

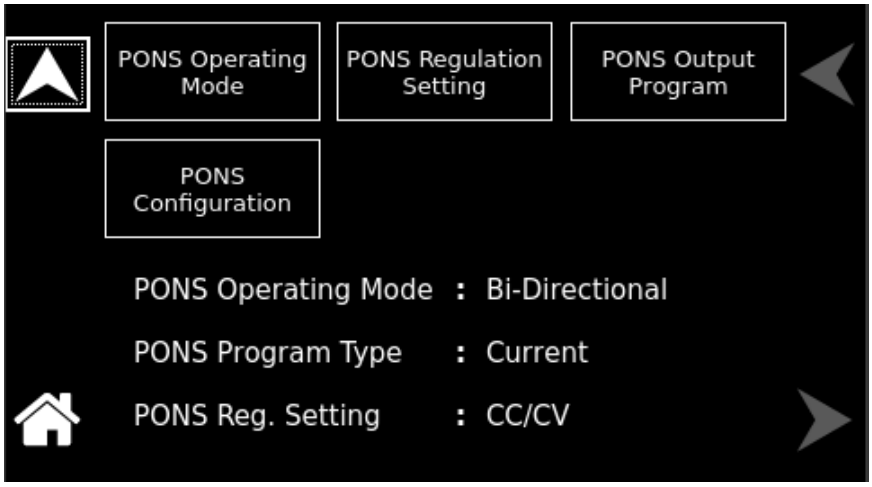


Figure 9-115. PONS Main Screen – CC/CV

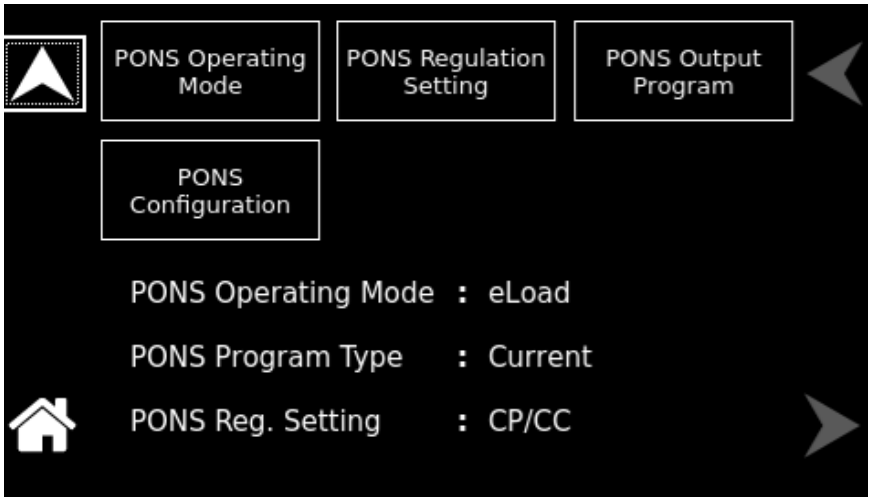


Figure 9-116. PONS Main Screen – CP/CC

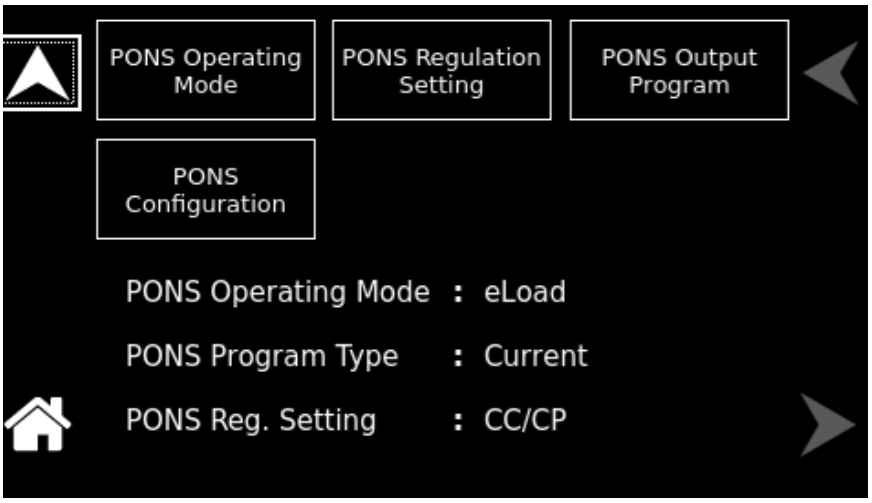


Figure 9-117. PONS Main Screen – CC/CP

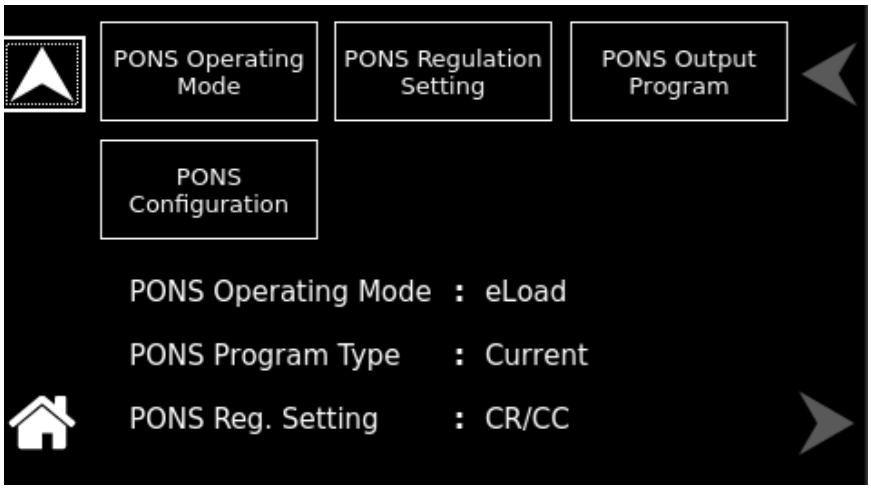


Figure 9-118. PONS Main Screen – CR/CC

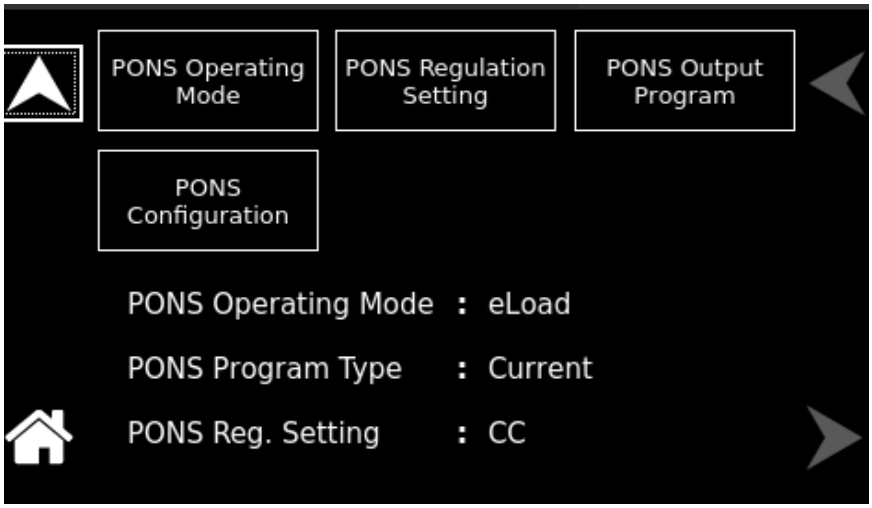


Figure 9-119. PONS Main Screen – CC

9.2.5.7.1 PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the 'Operating Mode' settings on the Home screen. Users must separately select the ‘ELOAD’ mode in the 'PONS Operating Mode Settings', which will update the 'PONS Operating Mode Settings', ‘PONS Regulation’, ‘PONS Output Program’ and the 'PONS Configuration' screens. Refer to Figure 9-120, Figure 9-121, Figure 9-123, Figure 9-125, Figure 9-129, Figure 9-135, Figure 9-140, Figure 9-145, Figure 9-150 and Figure 9-156.

The same applies to other modes such as Bi-DIR, SOUR, PVSIM, BATSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 10.2.4.2.1.5, 11.2.4.7.1 and 12.2.4.6.1.

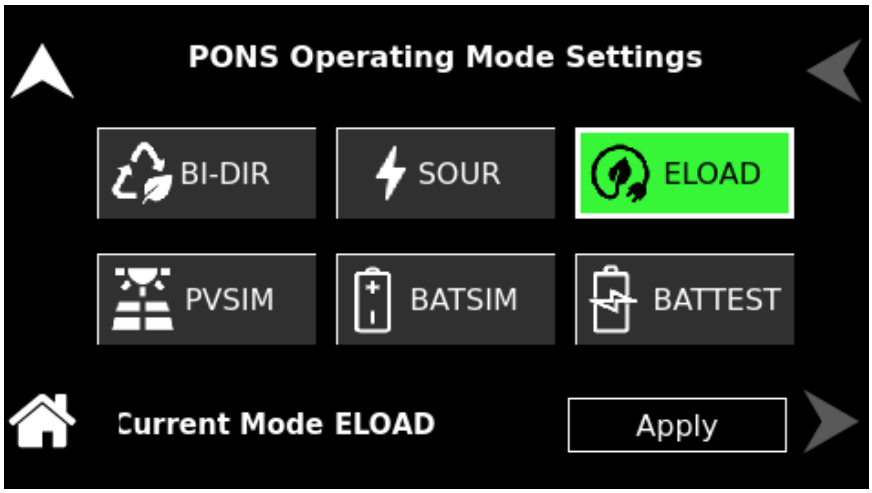


Figure 9-120. PONS Operating Mode Settings

9.2.5.7.2 PONS REGULATION SETTINGS

The Regulation Settings Menu is used to configure the Regulation mode of the power supply. Refer to Figure 9-121 and Figure 9-123.

The ‘Reg. Setting’ function on the Configuration Screen enables users to switch between ‘Voltage (CV/CC, CR/CV, CP/CV, CV/CP and CV)’ and ‘Current (CC/CV, CP/CC, CR/CC, CC/CP and CC) ’ regulation settings.

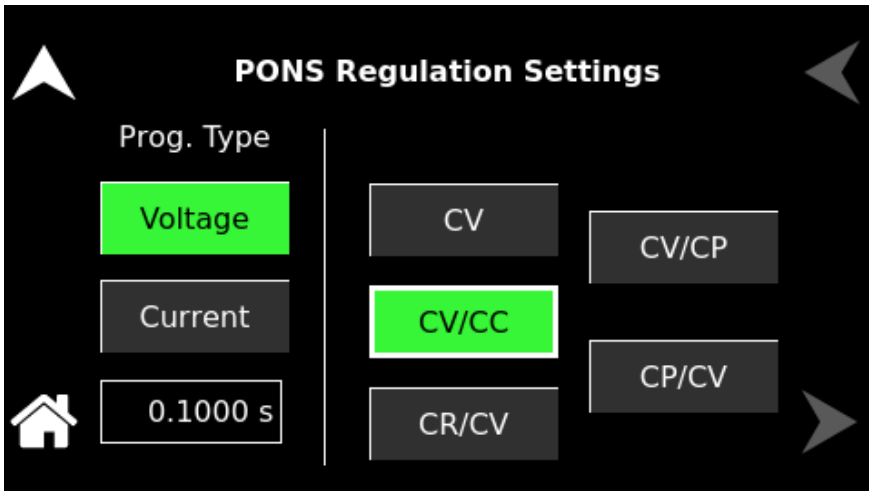


Figure 9-121. PONS regulation Settings

a) When the programming type is set to ‘Voltage’ in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CV/CC	In this regulation setting, output voltage is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the power limit (negative), the output voltage would be programmed to zero.
CR/CV	In this regulation setting, output resistance is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero.
CV/CP	In this regulation setting, output voltage is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the current limit (negative), the output voltage would be programmed to zero.
CP/CV	In this regulation setting, output power is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached. On reaching the current limit (negative), the output power would be programmed to zero.

ENTRY	DESCRIPTION
CV	In this regulation setting, output voltage is regulated to the user set value. On reaching the set current limit (negative) or power limit (negative), the output voltage would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 9-122.

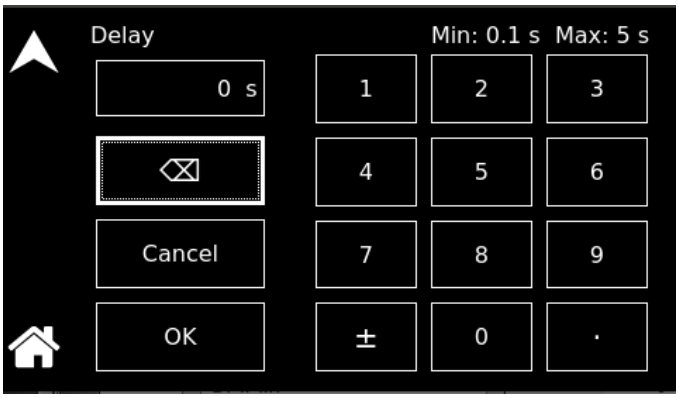


Figure 9-122. Delay Screen

Table 9-27. Regulation Settings

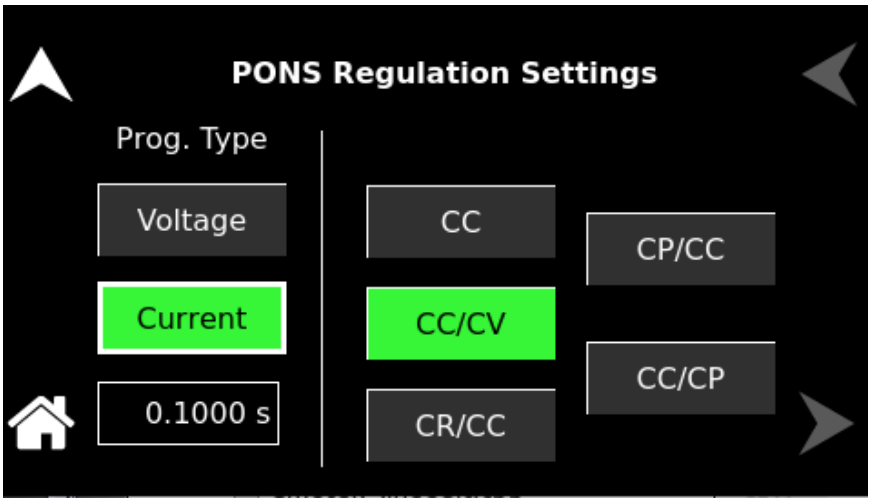


Figure 9-123. PONS regulation Settings

b) When the programming type is set to ‘Current’ in the Regulation Settings menu, the following fields are available:

ENTRY	DESCRIPTION
CC/CV	In this regulation setting, output current is regulated to the user set value. On reaching the voltage limit (high or low), output would be regulated to the voltage limit reached.

ENTRY	DESCRIPTION
	On reaching the power limit (negative), the output current would be programmed to zero.
CP/CC	In this regulation setting, output power is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CR/CC	In this regulation setting, output resistance is regulated to the user set value. On reaching the current limit (negative), output would be regulated to the current limit reached. On reaching the voltage limit (high or low), the output current would be programmed to zero.
CC/CP	In this regulation setting, output power is regulated to the user set value. On reaching the power limit (negative), output would be regulated to the power limit reached. On reaching the voltage limit (high or low), the output power would be programmed to zero.
CC	In this regulation setting, output current is regulated to the user set value. On reaching the set voltage limit (high or low) or power limit (negative), the output current would be programmed to zero.
Delay	Sets the programmable time delay executed by the supply before setting the output to zero. The minimum time that can be set is 0.1 seconds, and the maximum is 5 seconds. Refer to Figure 9-124.

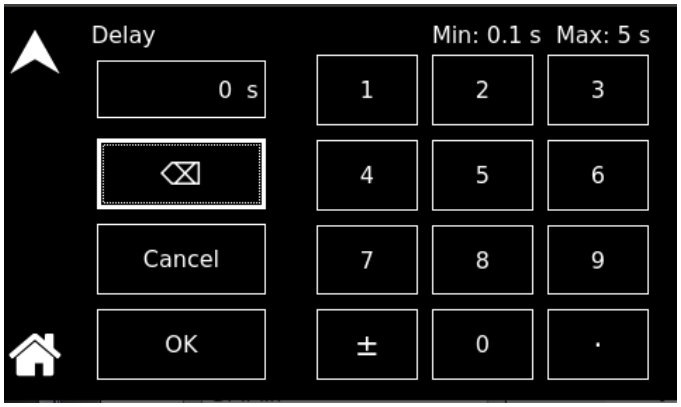


Figure 9-124. Delay Screen

Table 9-28. Regulation Setting

9.2.5.7.3 PONS OUTPUT PROGRAM

a) PONS Output Program (Voltage) - CV/CC, CV/CP and CV

When the regulation setting is selected as ‘Voltage (CV/CC, CV/CP and CV) ’, the screen will display the following parameters: ‘PONS Voltage’, ‘PONS Neg. Curr Limit’ and ‘PONS Neg. Pow Limit’. Refer to Figure 9-125.

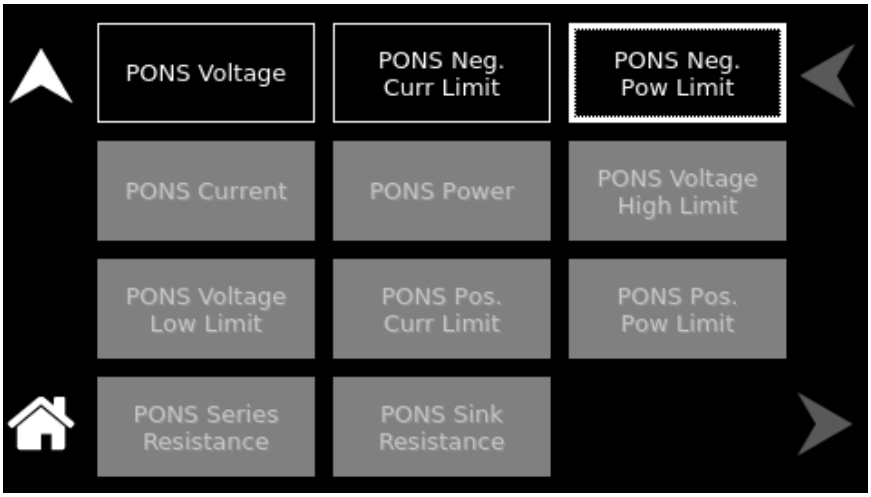


Figure 9-125. Pons Output Program mode – CV/CC and CV

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Voltage	Users can set a voltage value within the specified limit. Refer to Figure 9-126.

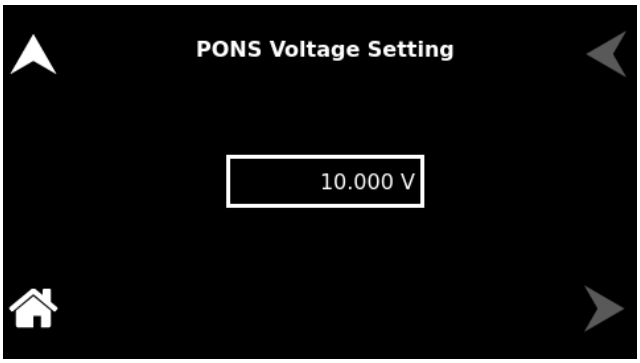


Figure 9-126. PONS Voltage Settings

PONS Neg. Curr Limit	Users can set a negative current limit value, which functions as trip limit (CV and CV/CP), or it regulates (CV/CC) the output upon reaching the PONS Neg. Curr Limit. Refer to Figure 9-127.

ENTRY	DESCRIPTION

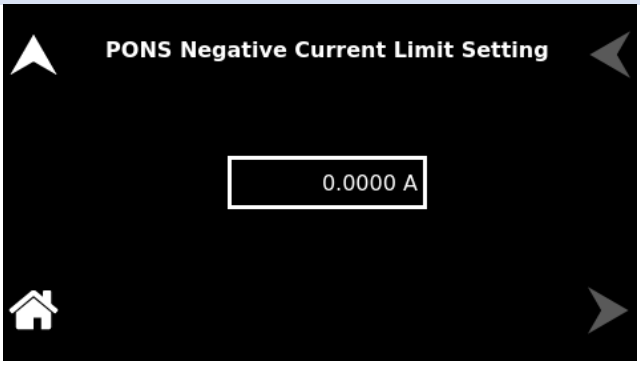


Figure 9-127. PONS Negative Current Limit Settings

PONS Neg. Pow Limit Users can set a negative power limit value, which functions as trip limit (CV and CV/CC), or it regulates (CV/CP) the output upon reaching the PONS Neg. Pow Limit. Refer to Figure 9-128.

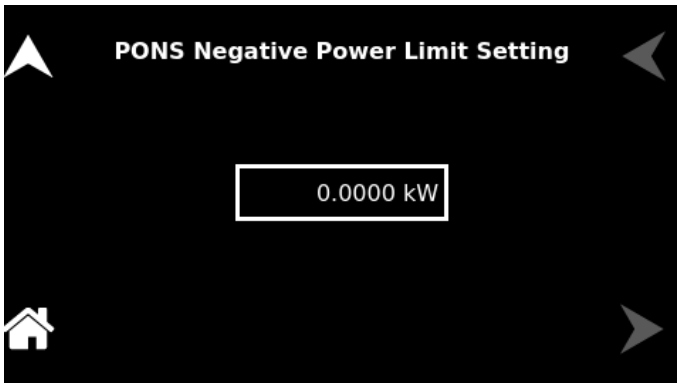


Figure 9-128. PONS Negative Power Limit Setting

Table 9-29. PONS Output Program Settings – CV/CC, CV/CP and CV

b) PONS Output Program (Voltage) – CR/CV

When the regulation setting is selected as ‘’Voltage (CR/CV)’, the screen will display the following parameters: ‘PONS Sink Resistance’, ‘PONS Voltage High Limit’, ‘PONS Voltage Low Limit’, ‘PONS Neg. Current Limit’ and ‘PONS Neg. Pow Limit’. Refer to Figure 9-129.

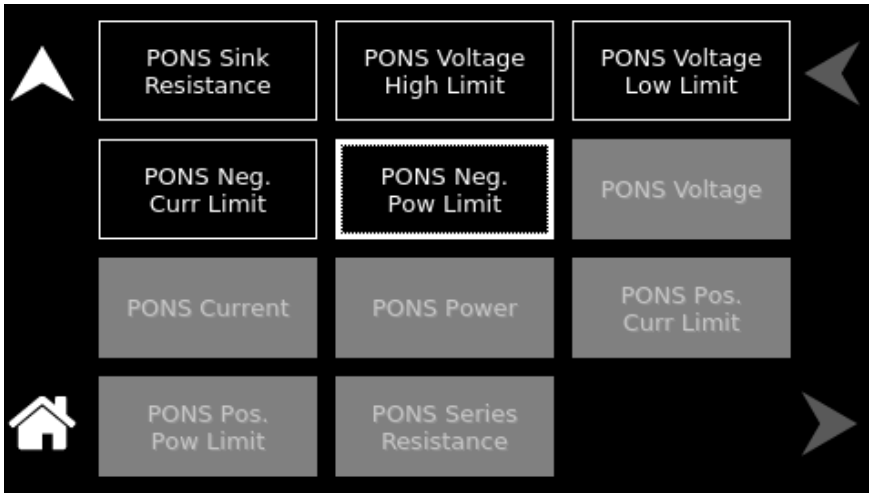


Figure 9-129. Pons Output Program mode – CR/CV

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Sink Resistance	Users can set the sink resistance value within the specified limit. Refer to Figure 9-130.
PONS Voltage High Limit	Users can set the voltage high limit value, and it regulates the output upon reaching the PONS Voltage High Limit. Refer to Figure 9-131.

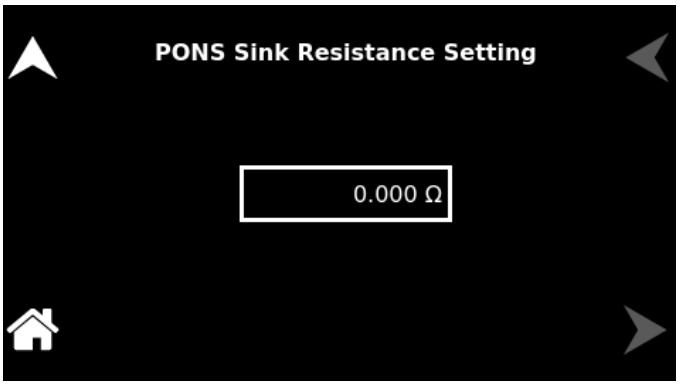


Figure 9-130. Series Resistance Setting

ENTRY	DESCRIPTION

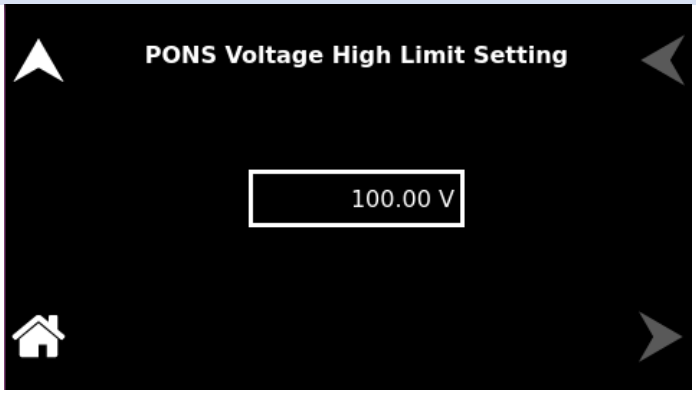


Figure 9-131. Voltage High Limit Setting

PONS Voltage Low Limit

Users can set the voltage low limit value, and it regulates the output upon reaching the PONS Voltage Low Limit. Refer to Figure 9-132.

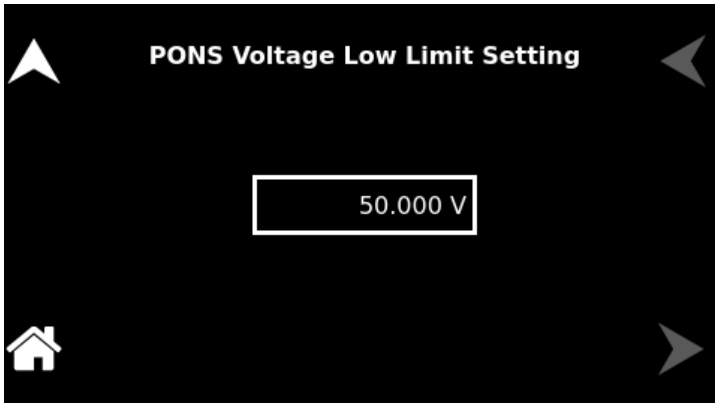


Figure 9-132. Voltage Low Limit Setting

PONS Neg. Current Limit

Users can set a negative current limit value, and which functions as a trip limit. Refer to Figure 9-133.

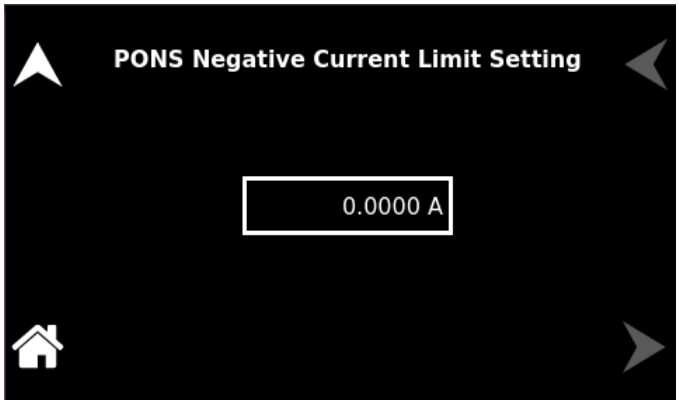


Figure 9-133. Negative Current limit setting screen

ENTRY	DESCRIPTION
PONS Neg. Power Limit	Users can set a negative power limit value, and which functions as a trip limit. Refer to Figure 9-134.

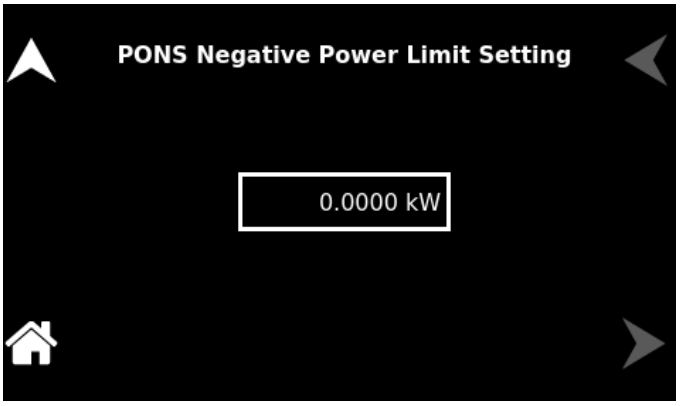


Figure 9-134. Negative Power limit setting screen

Table 9-30. PONS Output Program Settings

c) PONS Output Program (Voltage) – CP/CV

When the regulation setting is selected as 'Voltage (CP/CV)' the screen will display the following parameters: 'PONS Power', 'PONS Voltage High Limit', 'PONS Voltage Low Limit', 'PONS Neg. Current Limit'. Refer to Figure 9-135.

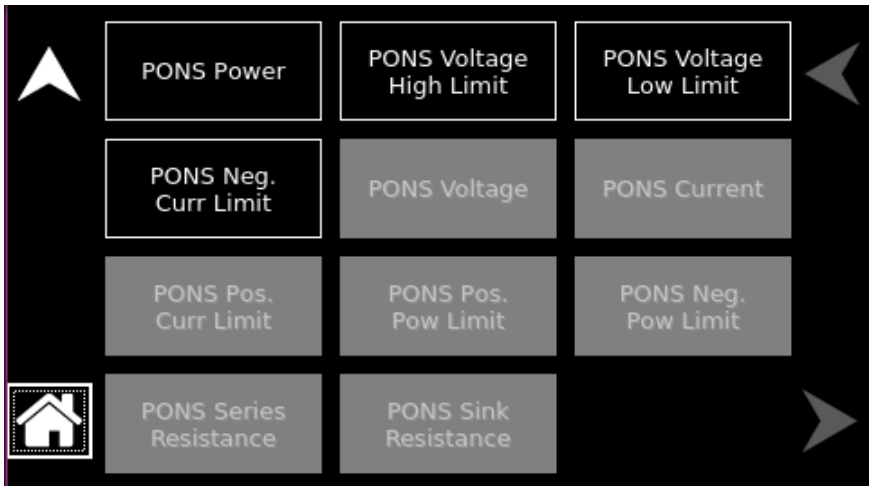


Figure 9-135. Pons Output Program mode – CP/CV

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Power	Users can set a power value within the specified limit. Refer to Figure 9-136.

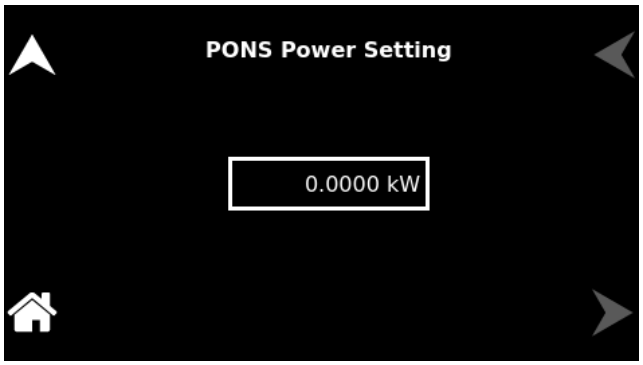


Figure 9-136. PONS Power Setting

PONS Voltage High Limit

Users can set the voltage high limit value, and it regulates the output upon reaching the PONS Voltage High Limit. Refer to Figure 9-137.

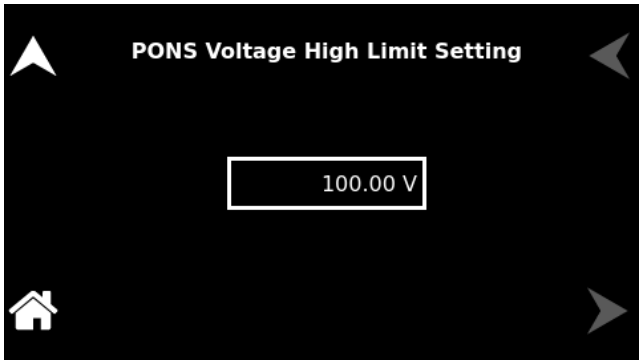


Figure 9-137. Voltage High Limit Setting

PONS Voltage Low Limit

Users can set the voltage high limit value, and it regulates the output upon reaching the PONS Voltage Low limit. Refer to Figure 9-138.

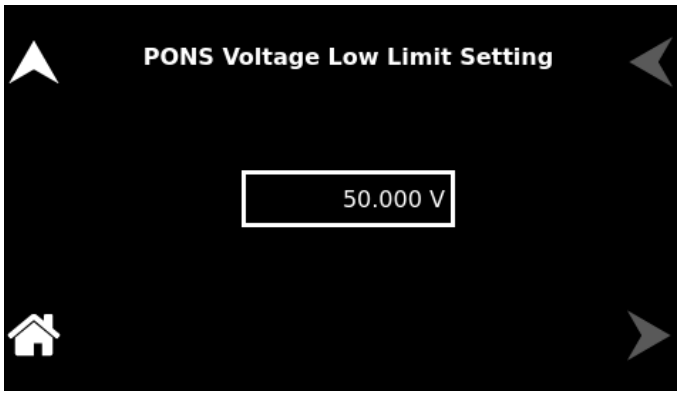


Figure 9-138. Voltage Low Limit Setting

ENTRY	DESCRIPTION
PONS Neg. Current Limit	Users can set a negative current limit value, and which functions as a trip limit. Refer to Figure 9-139.

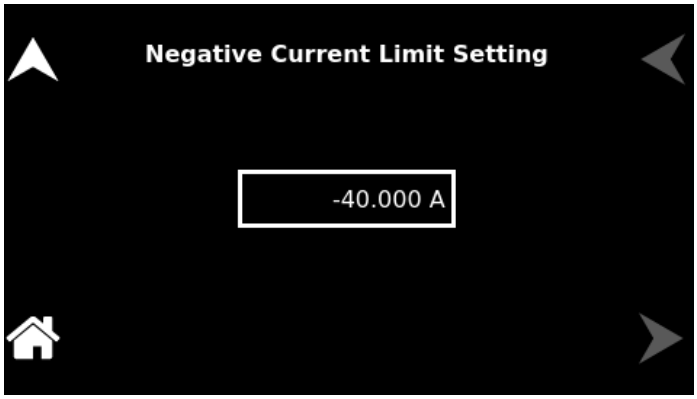


Figure 9-139. Negative Current Limit Setting

Table 9-31. PONS Output Program Settings

d) PONS Output Program (Current) - CC/CV, CC/CP and CC

When the regulation setting is selected as 'Current (CC/CV, CC/CP and CC) ' the screen will display the following parameters: 'PONS Current', 'PONS Voltage High Limit', 'PONS Voltage Low Limit', 'PONS Pos. Pow Limit' and 'PONS Output State'. Refer to Figure 9-140.

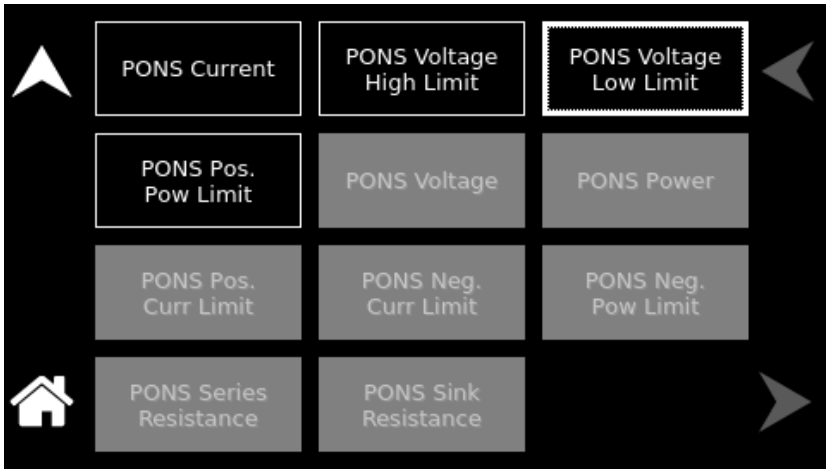


***Figure 9-140. Pons Output Program mode* –CC/CV and CC**

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Current	Users can set the PONS Current value within the specified limit. Refer to Figure 9-141.

ENTRY	DESCRIPTION

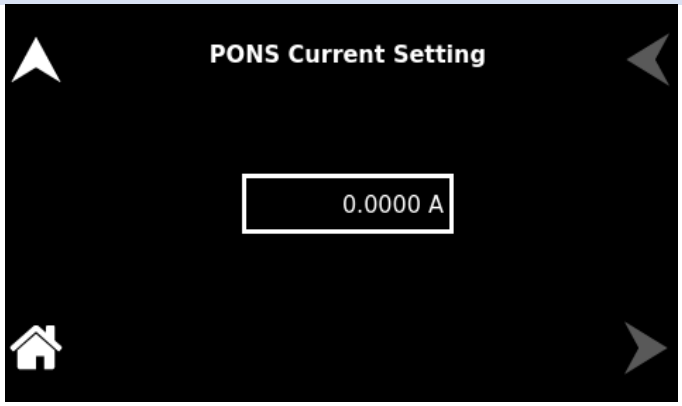


Figure 9-141. Current Setting

PONS Voltage High Limit

Users can set voltage high limit value, which functions as trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the PONS Voltage High Limit. Refer to Figure 9-142.

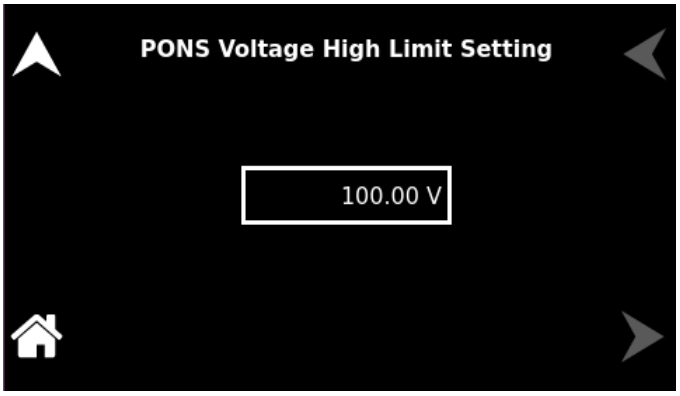


Figure 9-142. Voltage High Setting

PONS Voltage Low Limit

Users can set voltage low limit value, which functions as trip limit (CC and CC/CP), or it regulates (CC/CV) the output upon reaching the PONS Voltage Low Limit. Refer to Figure 9-143.

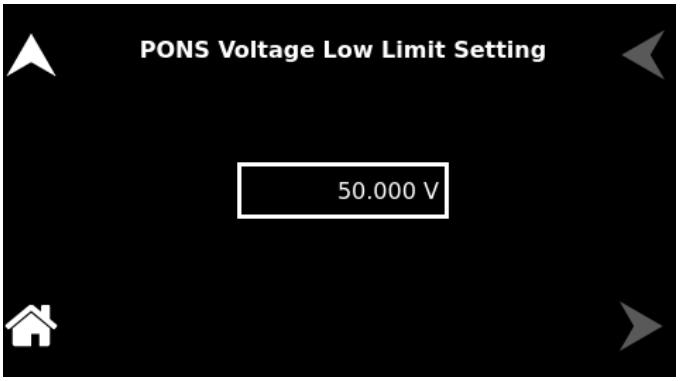


Figure 9-143. Voltage Low Setting

ENTRY	DESCRIPTION
PONS Neg. Power Limit	Users can set a negative power limit value, which functions as a trip limit (CC and CC/CV), or it regulate (CC/CP) the output upon reaching the PONS Neg. Power limit. Refer to Figure 9-144.

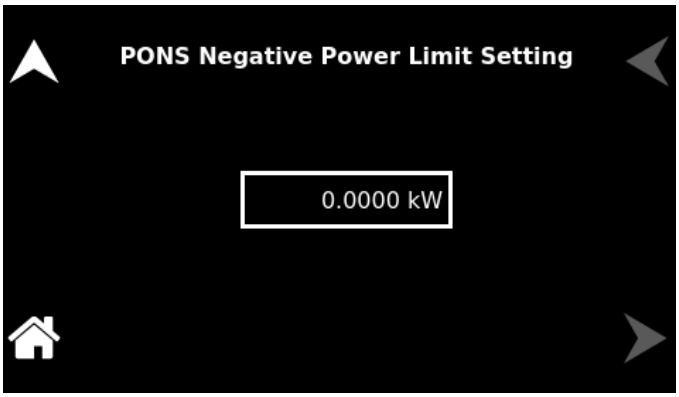


Figure 9-144. Positive Power Limit

Table 9-32. PONS Output Program Settings

e) PONS Output Program (Current) - CP/CC

When the regulation setting is selected as 'Current (CP/CC) ' the screen will display the following parameters: 'PONS Power', 'PONS Voltage High Limit', 'PONS Voltage Low Limit', 'PONS Neg. Current Limit'. Refer to Figure 9-145.

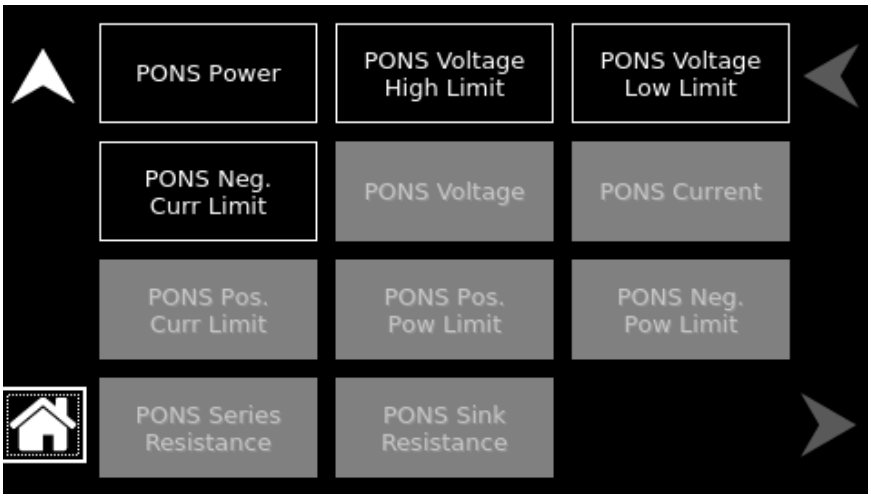


***Figure 9-145. Pons Output Program mode* – CP/CC**

The PONS Output Program Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Power	Users can set PONS power value within the specified limit. Refer to Figure 9-146.

ENTRY	DESCRIPTION

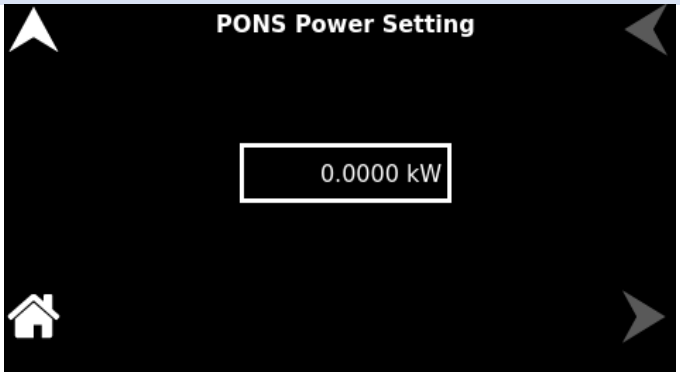


Figure 9-146. Power Settings

PONS Voltage High Limit

Users can set voltage high limit value, and which functions as a trip limit. Refer to Figure 9-147.

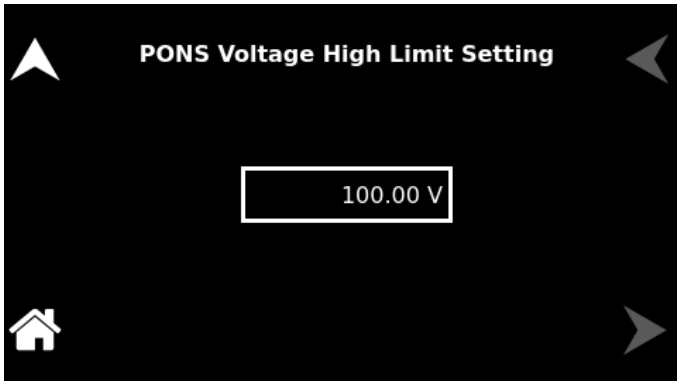


Figure 9-147. Volt High Setting

PONS Voltage Low Limit

Users can set voltage low limit value, and which functions as a trip limit. Refer to Figure 9-148.

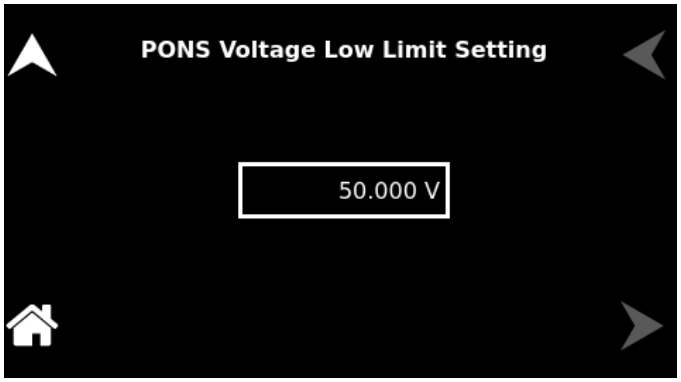


Figure 9-148. Volt Low Setting

PONS Neg.

Users can set negative current limit value, and it regulates the output upon

ENTRY	DESCRIPTION
Current Limit	reaching the PONS Neg. Current Limit. Refer to Figure 9-149.

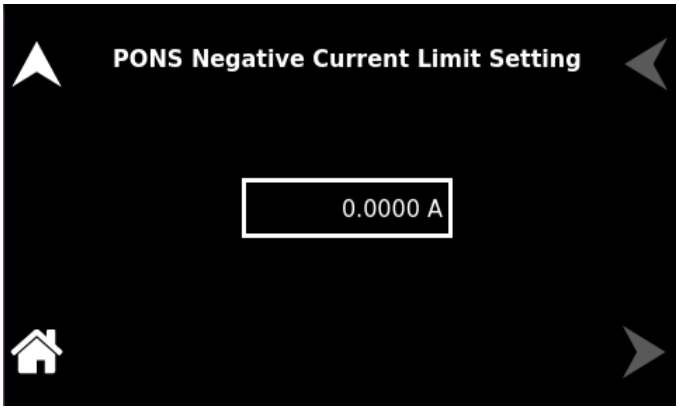


Figure 9-149. Negative Current Limit Setting

Table 9-33. PONS Output Program Setting

f) PONS Output Program (Current) - CR/CC

When the regulation setting is selected as 'Current (CR/CC) ' the screen will display the following parameters: 'PONS Power', 'PONS Voltage High Limit', 'PONS Voltage Low Limit', 'PONS Neg. Current Limit'. Refer to Figure 9-150.

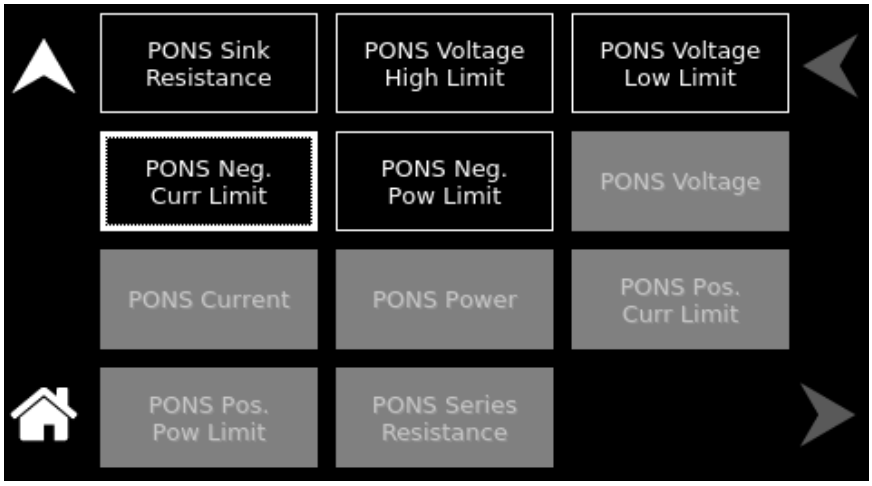


Figure 9-150. PONS Output Program – CR/CC

ENTRY	DESCRIPTION
PONS Sink Resistance	Users can set the sink resistance value within the specified limit. Refer to Figure 9-151.

ENTRY	DESCRIPTION

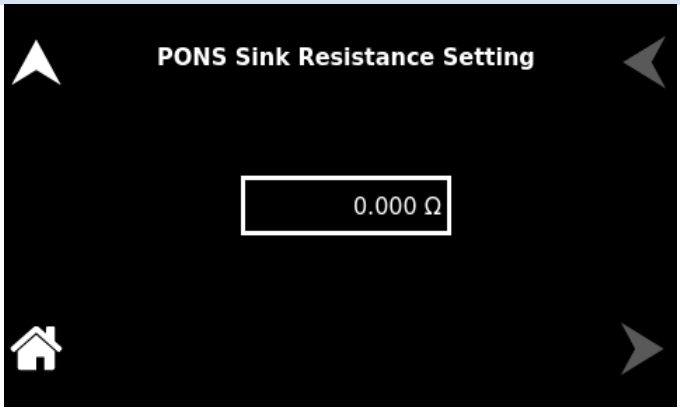


Figure 9-151. Series Resistance Setting

PONS Voltage High Limit Users can set the voltage high limit value, and which functions as a trip limit. Refer to Figure 9-152.

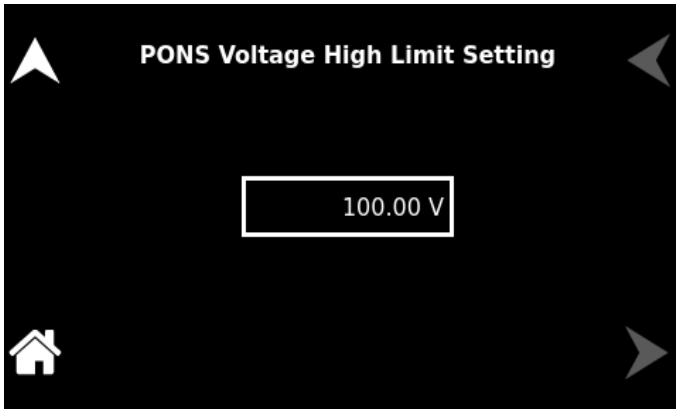


Figure 9-152. Voltage High Limit Setting

PONS Voltage Low Limit Users can set the voltage low limit value, and which functions as a trip limit. Refer to Figure 9-153.

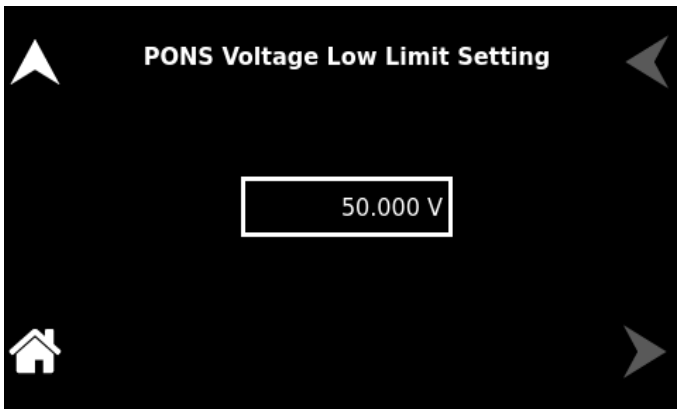


Figure 9-153. Voltage Low Limit Setting

ENTRY	DESCRIPTION
PONS Neg. Current Limit	Users can set a negative current limit value, and it regulates the output upon reaching the PONS Neg. Current Limit. Refer to Figure 9-154.

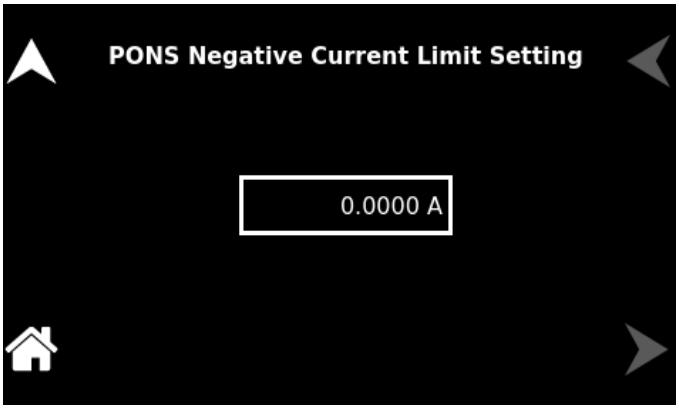


Figure 9-154. Negative Current limit setting screen

PONS Neg. Power Limit	Users can set a negative power limit value, and which functions as a trip limit. Refer to Figure 9-155.

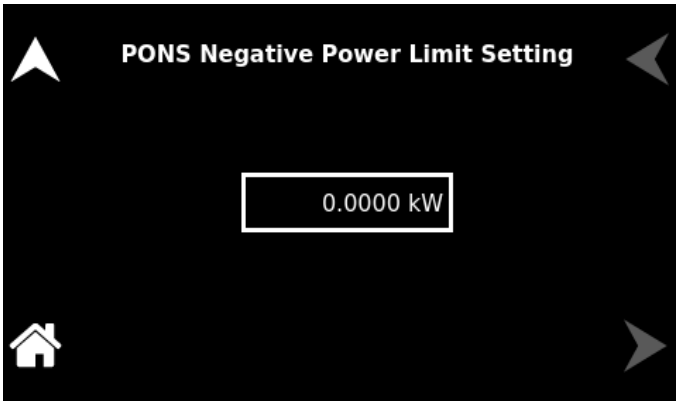


Figure 9-155. Positive Power limit setting screen

Table 9-34. PONS Output Program Settings

9.2.5.7.4 PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select ‘PONS Protection’, ‘PONS Slew Rate’, ‘PONS User Limit’, ‘PONS Output Sense’ and ‘PONS Measurement Average Samples’. Refer to Figure 9-156.

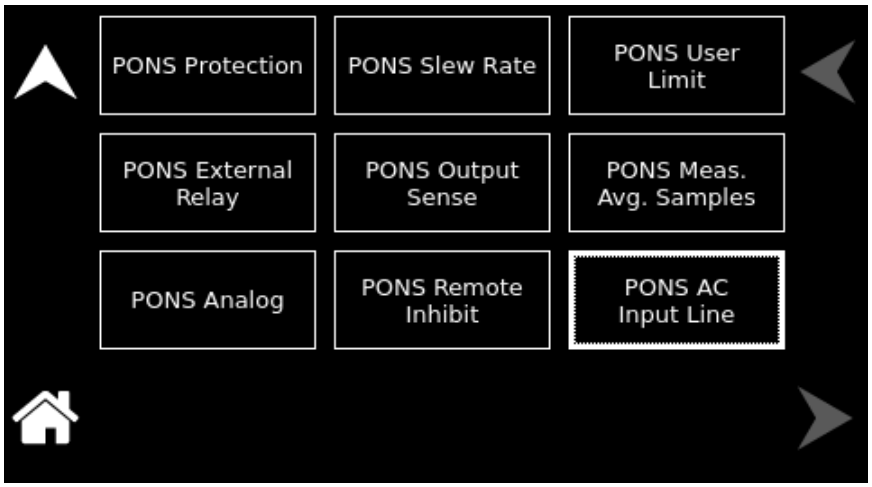


Figure 9-156. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	Users can define OVP and Pos. OCP to help safeguard their devices from electrical anomalies by shutting down the output if it exceeds the preset voltage. Refer to Figure 9-157.

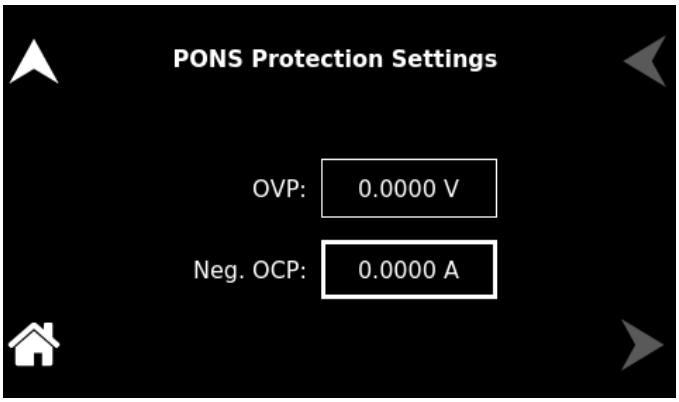


Figure 9-157. PONS Protection Settings

PONS Slew Rate	Users can configure the voltage, current and power slew rate. This allows for precise control over the voltage,current and power, ensuring smoother transitions and better performance of the power supply. Adjusting these settings can help in optimizing the response time and stability of the system. Refer Figure 9-158 to Figure 9-160.

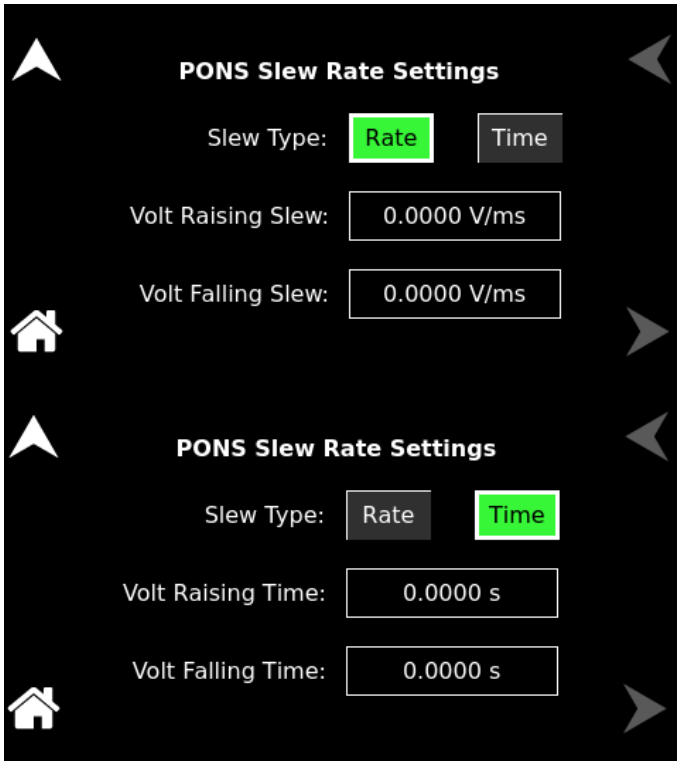
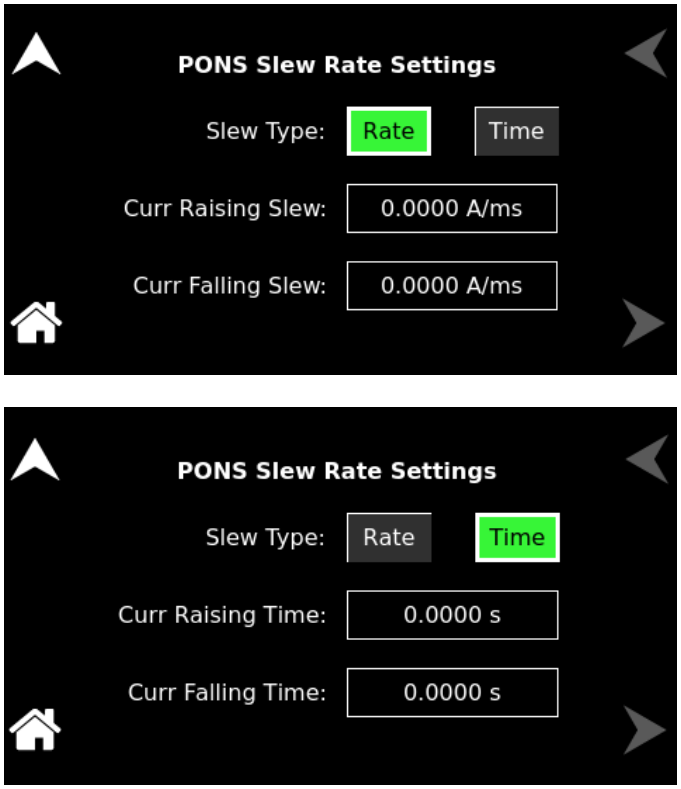
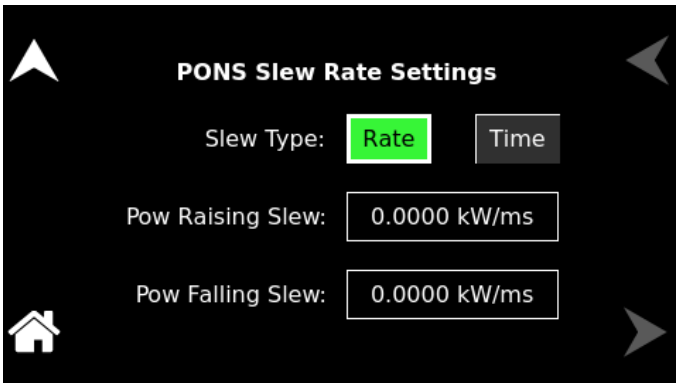


Figure 9-158. PONS Slew Rate Settings – Voltage (CV/CC, CR/CV CV/CP and CV)



ENTRY	DESCRIPTION

Figure 9-159. PONS Slew Rate Settings – Current (CC/CV, CC/CP, CR/CC and CC)



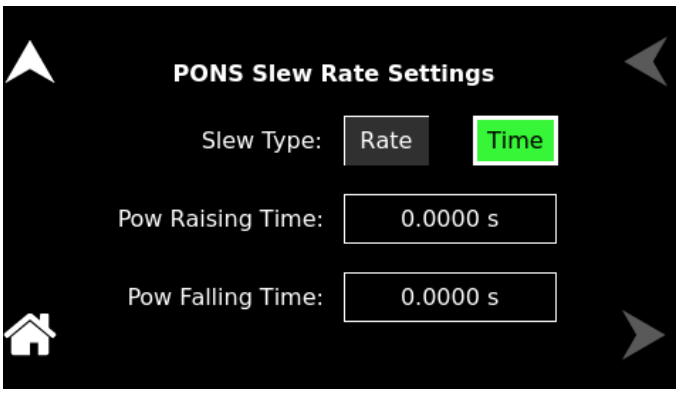


Figure 9-160. PONS Slew Rate Settings – Power (CP/CV and CP/CC)

PONS External Relay

Users can set the isolation relay to either 'Enable' or 'Disable'. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 9-161.

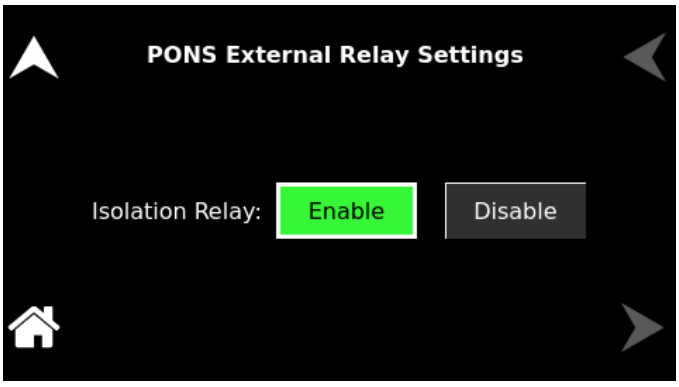


Figure 9-161. PONS External Relay Settings

ENTRY	DESCRIPTION
PONS User Limit	Users can set the voltage, current and power high limit value. Refer Figure 9-162 to Figure 9-165.

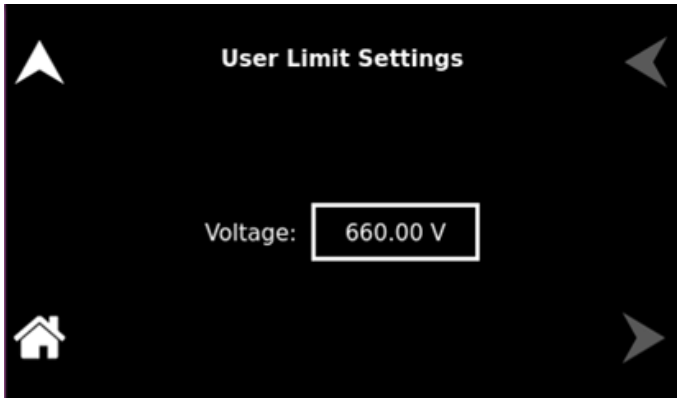


Figure 9-162. PONS User Limit Settings- Voltage (CV/CC, CV/CP and CV)

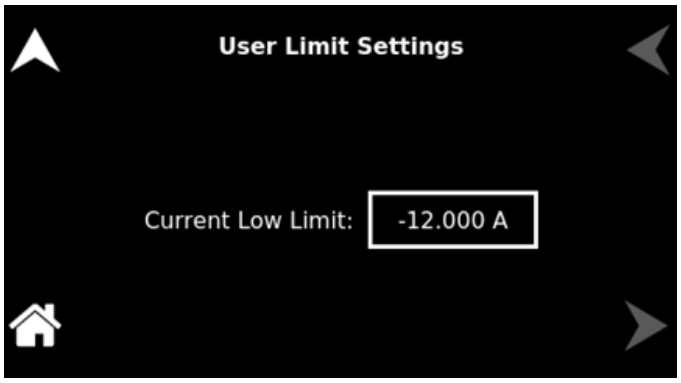


Figure 9-163. PONS User Limit Settings – Current (CC/CV, CC/CP and CC)

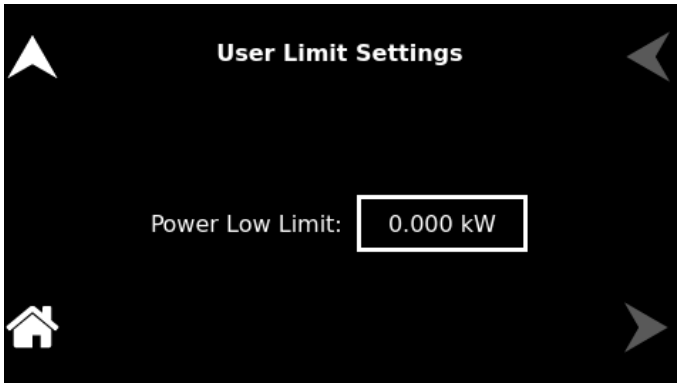


Figure 9-164. PONS User Limit Settings- Power (CP/CV and CP/CC)

User limit Settings is not applicable for the sink resistance. When the program type is set to ‘Voltage - CR/CV or Current - CR/CC’ in the regulation settings, the user limit settings screen that appears will be ‘Not applicable for Sink Resistance Regulation Settings’. Refer to Figure 9-165.

ENTRY	DESCRIPTION

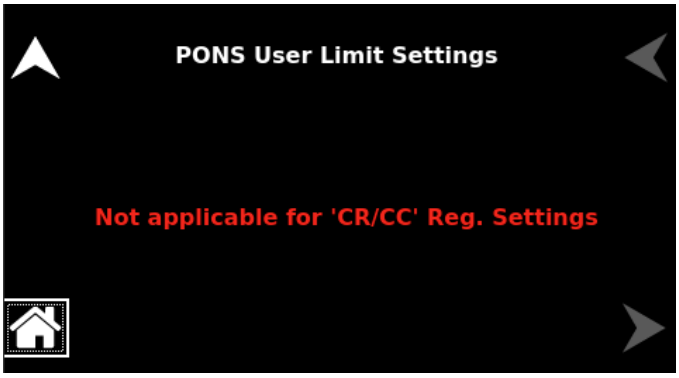


Figure 9-165. User Limit Settings- CR/CV and CR/CC

PONS Output Sense Settings

Programs the PONS output to ON or OFF state. Refer to Figure 9-166.

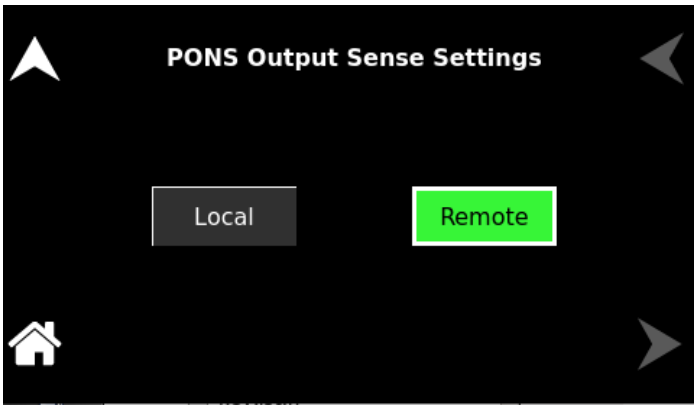


Figure 9-166. PONS Output Sense Settings

PONS Measurement Average Samples

Users can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 9-167.

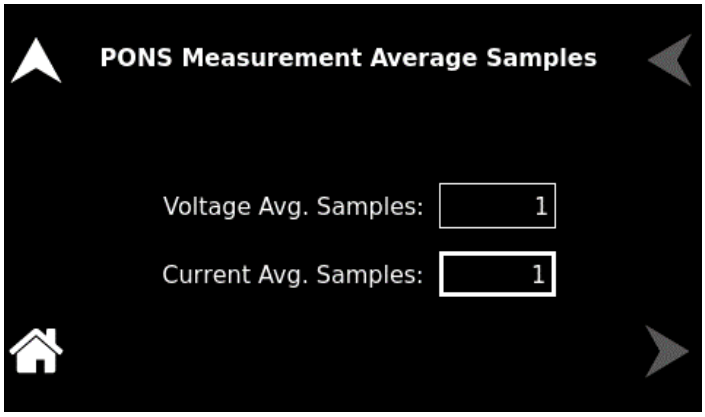


Figure 9-167. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be

ENTRY	DESCRIPTION

particularly useful for safety and operational control in various applications. Refer to Figure 9-168.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

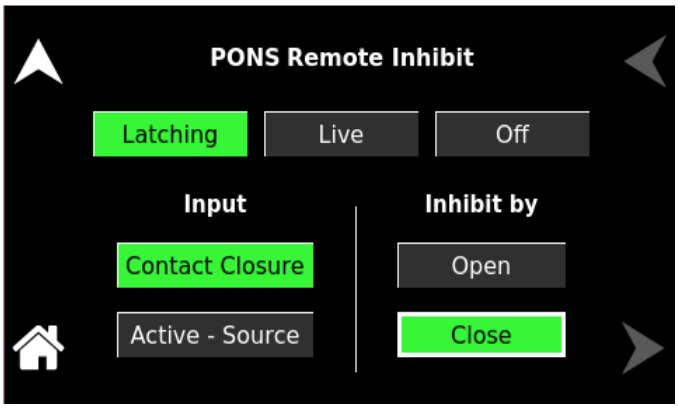


Figure 9-168. PONS remote Inhibit

PONS AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 9-170.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

ENTRY	DESCRIPTION

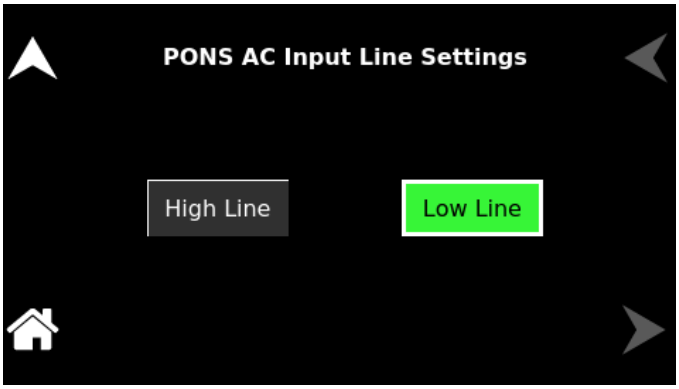


Figure 9-169. AC Input Line Settings

PONS Analog Configures the PONS Analog programming interface, refer to Figure 9-170.

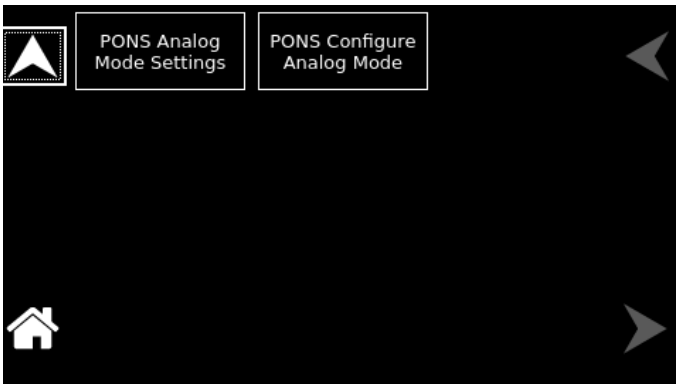


Figure 9-170. PONS Analog Screen

c) PONS Analog Mode Settings

Lists the configuration settings of the PONS Analog Programming interface. Refer Figure 9-171.

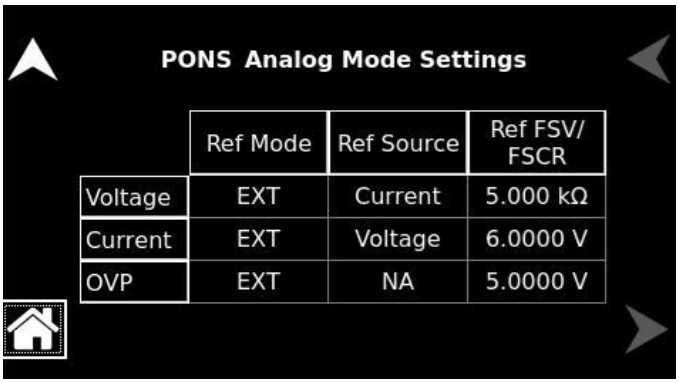


Figure 9-171. PONS Analog Mode Settings

d) PONS Configure Analog Mode

Sets parameter values and controls operation of the PONS Analog Programming interface. Refer to Figure 9-172.

ENTRY	DESCRIPTION

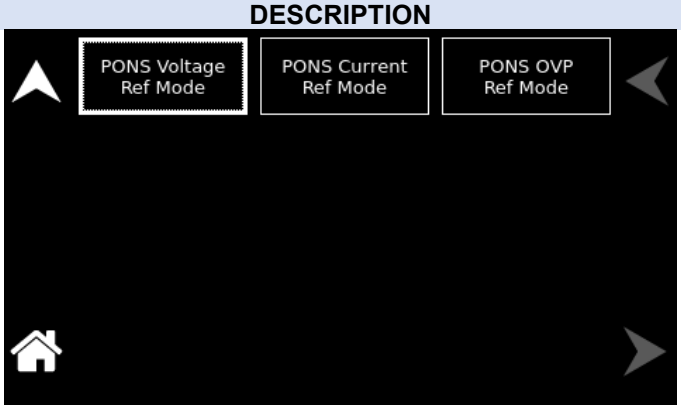


Figure 9-172. PONS Configure Analog Mode Settings

- **PONS Voltage Ref Mode :** Configures the PONS Voltage Reference Mode, refer to Figure 9-173. When the PONS Voltage Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 9-174 and Figure 9-175.

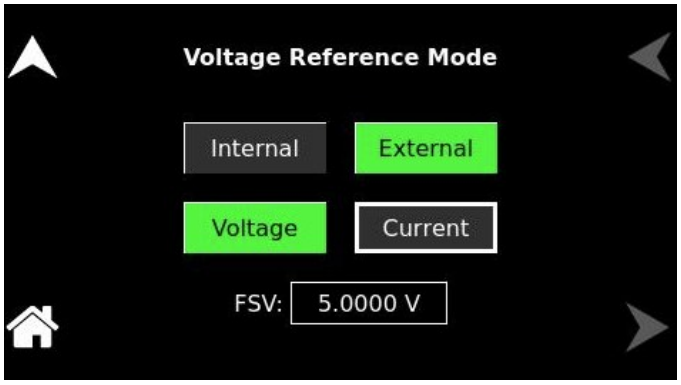


Figure 9-173. PONS Voltage Reference Mode

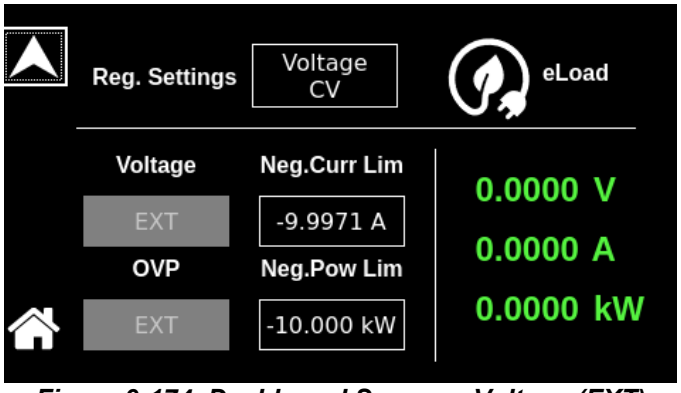


Figure 9-174. Dashboard Screen – Voltage (EXT)

ENTRY	DESCRIPTION

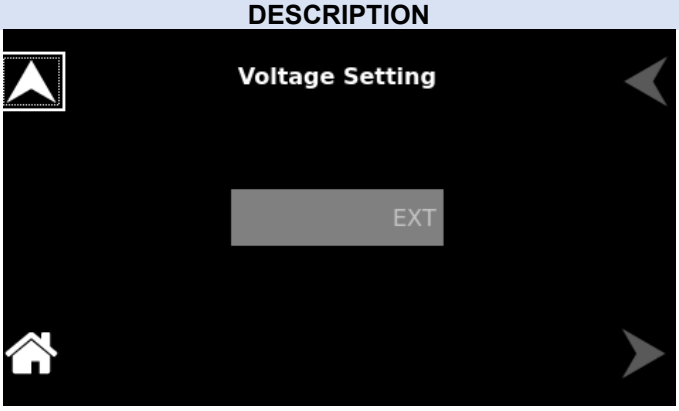


Figure 9-175. Output Program Screen – Voltage (EXT)

When Voltage Reference Mode is selected as Current, FSCR (Full Scale Current Resistance) unit will be kΩ (k Ohms). Refer to Figure 9-177.

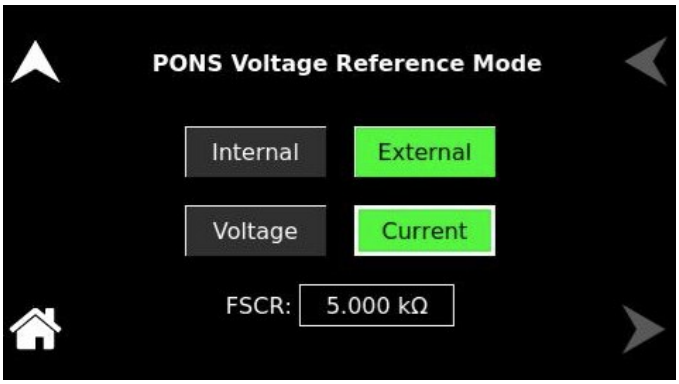


Figure 9-176. PONS Voltage Reference Mode – Resistive

- **PONS Current Ref Mode:** Configures the PONS Current Reference Mode, refer to Figure 9-178. When the PONS Current Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 9-179.

  NOTE: 'Current' is only applicable for eLoad mode. When you select the 'Current', the screen display as 'Only applicable for Source Mode'

ENTRY	DESCRIPTION

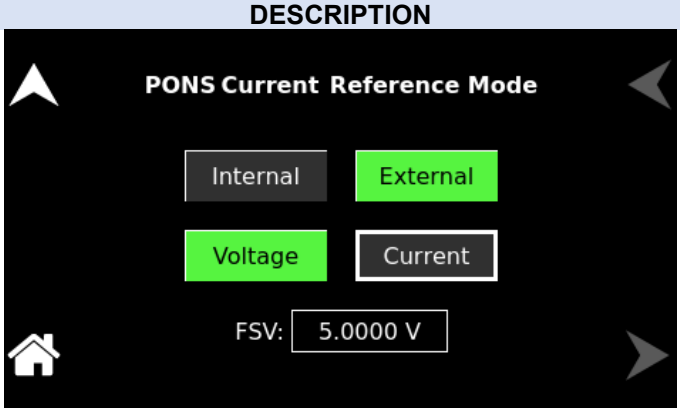


Figure 9-177. PONS Current Reference Mode

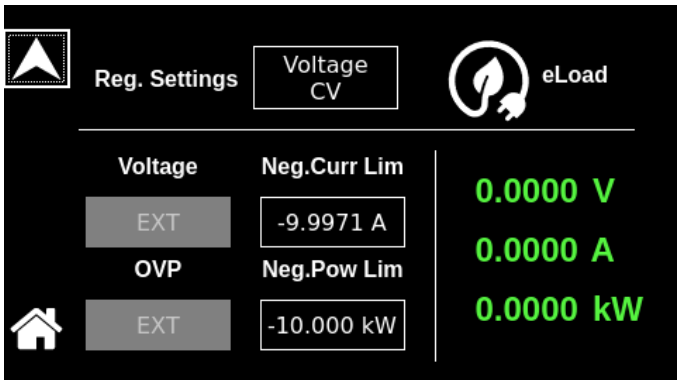


Figure 9-178. Dashboard Screen – Current (EXT)

- **PONS OVP Ref Mode:** Configures the PONS Over Voltage Protection (OVP) Reference Mode. When the PONS OVP Reference Mode is set to External, the OVP setting field on the Dashboard screen and the 'Protection' option in the Configuration screen will be disabled, and these OVP fields will display as 'EXT' refer to Figure 9-179.

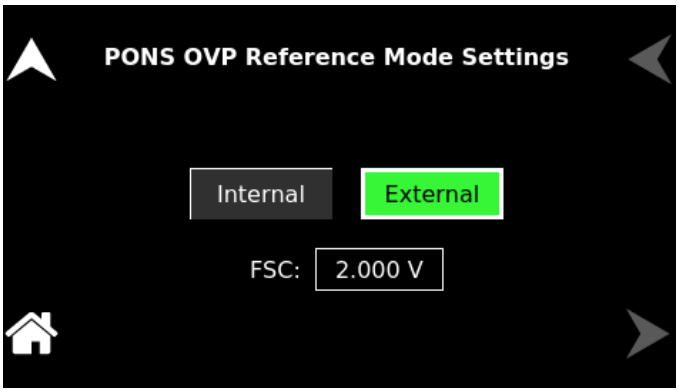


Figure 9-179. PONS OVP Reference Mode

Table 9-35. PONS Configuration mode

9.2.5.8 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 9-180.

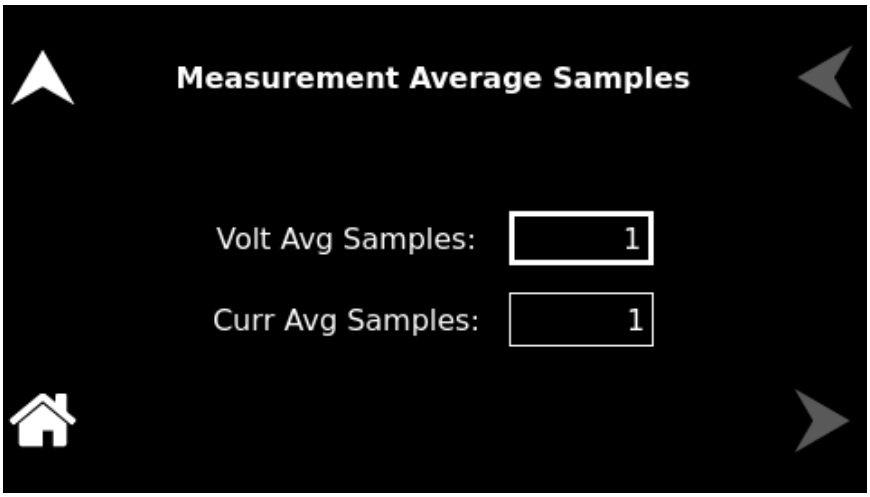


Figure 9-180. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 9-36. Measurement Average Samples Settings menu

9.2.6 CONTROL INTERFACE SCREEN

The Control Interface screen provides the ability to configure the power supply for remote control through the data communications interfaces. For the top-level menu of the Control Interface Screen, refer to Figure 9-181 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

Figure 9-181. Control Interface Screen Top-Level Menu

The Control interface Settings menu has the following fields:

ENTRY	DESCRIPTION
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 9-182. After settings are changed, the unit must be turned OFF/ON for them to take effect.

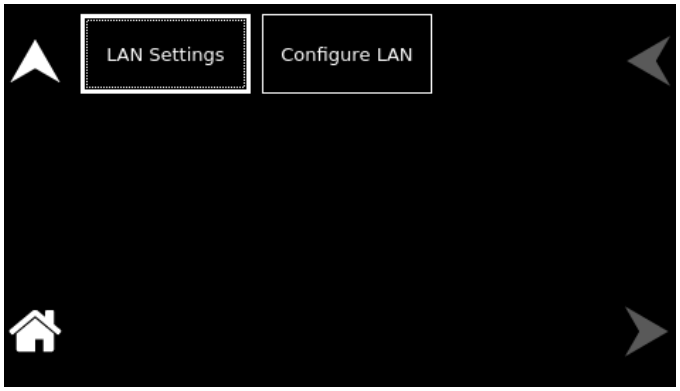


Figure 9-182. LAN Screen

a) LAN SETTINGS

Lists the configuration settings of the LAN interface, and the DNS-SD service name; a number, (n), would be appended to the service name, if necessary, to differentiate duplicate power supply names. Refer to Figure 9-183.

ENTRY	DESCRIPTION

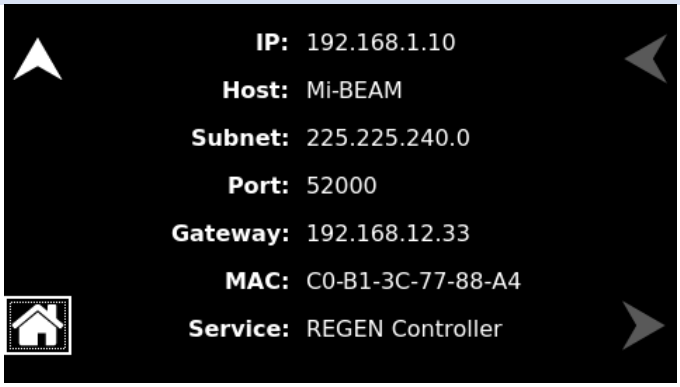


Figure 9-183. LAN Settings

b) LAN CONFIGURE

Sets parameter values and controls operation of the LAN interface, refer to Figure 9-184.

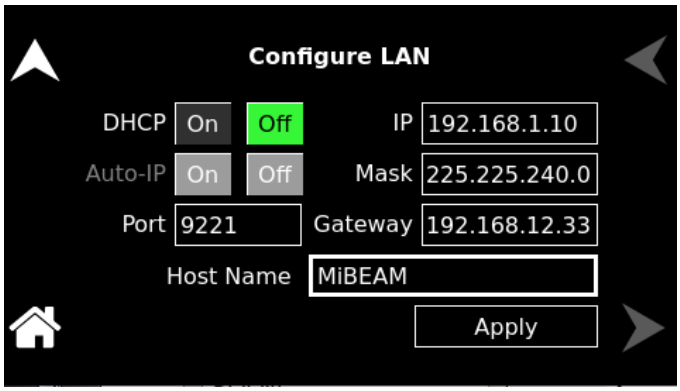


Figure 9-184. Configure LAN

- **DHCP**: Selects whether DHCP is enabled or disabled. Refer to Figure 9-185.

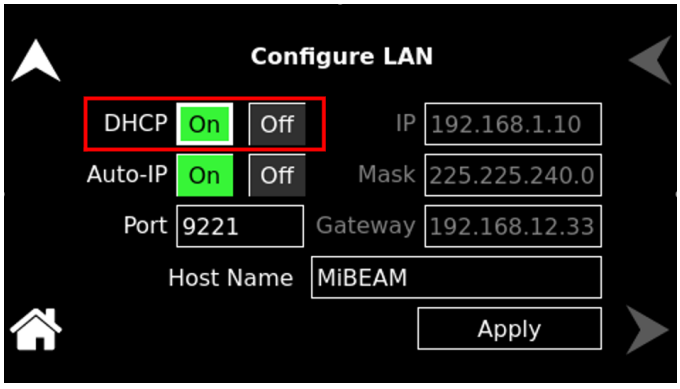


Figure 9-185. LAN Screen – DHCP

ENTRY	DESCRIPTION

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.

- **Auto-IP**: Enables or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 9-186.

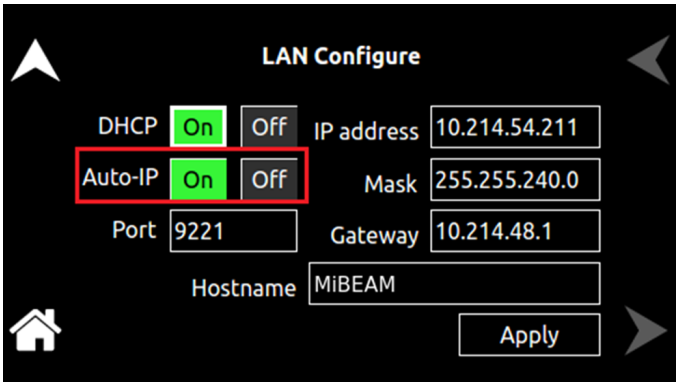


Figure 9-186. LAN Screen - Auto -IP

- **IP Address**: Sets the static IP address for the unit. When DHCP is turned off in the LAN CONFIG sub-menu, AUTO IP is selected, set the IP address to all zeros so that the IP address would be requested from the network; when DHCP is selected, the IP address is assigned by the network DHCP server. Refer to Figure 9-187.

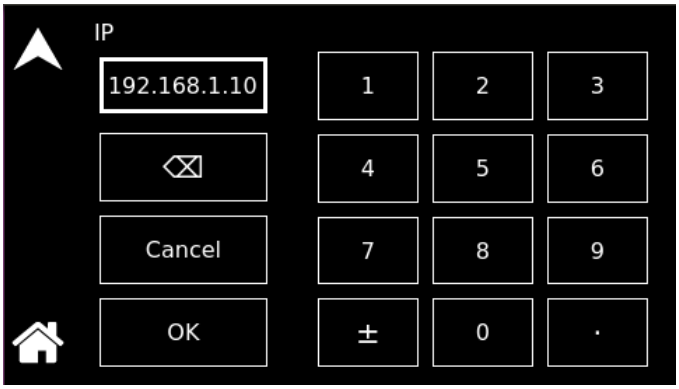


Figure 9-187. LAN Screen - IP Address

- **Subnet Mask**: Sets the subnet mask for use in static IP configuration. Refer to Figure 9-188.

ENTRY	DESCRIPTION

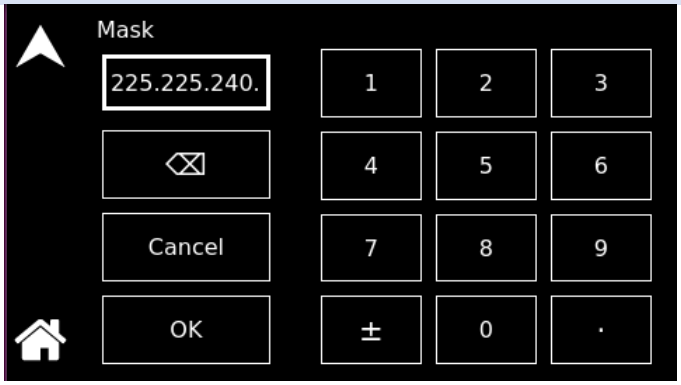


Figure 9-188. LAN Screen - Subnet Mask

- **Gateway Address**: Sets the gateway address when DHCP is turned off in the LAN CONFIG sub-menu and when AUTO IP is selected, set the gateway address to all zeros so that the gateway address would be requested from the network; when DHCP is selected, the gateway address is assigned by the network DHCP server. Refer to Figure 9-189.

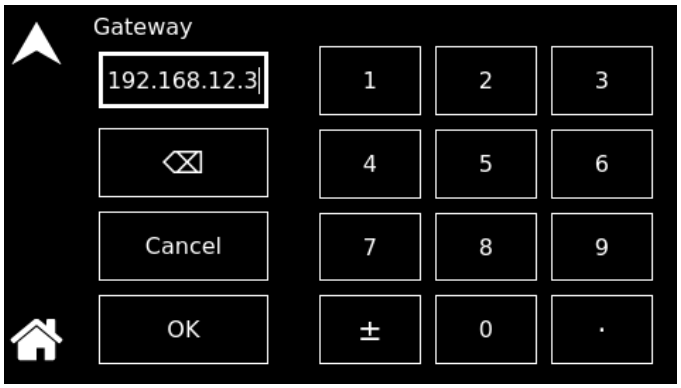


Figure 9-189. LAN Screen - Gateway Address

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

- **Port**: sets the port number; the factory-default value is 9221. Refer to Figure 9-190.

ENTRY	DESCRIPTION

Figure 9-190. LAN Screen -Port

- **MAC Address:** Displays the MAC address; the MAC address is listed on a label on the chassis of the unit. Refer to Figure 9-191.

Figure 9-191. MAC Address

- **Host Name**: Allows setting a unique alpha-numeric host name. Refer to Figure 9-192.

Figure 9-192. LAN Screen - Host Name

- **Apply**: Applies the LAN settings to the supply. Refer to Figure 9-193 and Figure 9-194.

ENTRY	DESCRIPTION

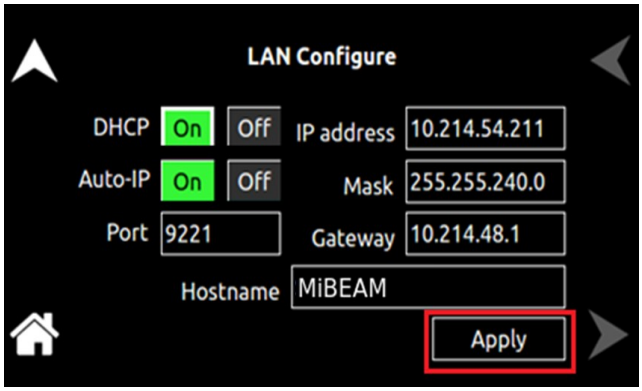


Figure 9-193. LAN Screen – Apply

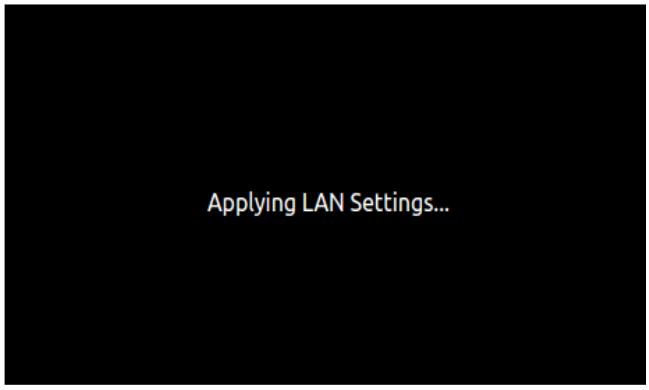


Figure 9-194. LAN Screen - Applying LAN Settings

RS232

Configures the RS-232C communications interface.RS232 has two sub-menus: RS232 Settings and RS232 Configure

a) RS232 Settings: Lists the configured Baud Rate, Stop Bits, Bits and Parity for the RS232 digital interface, refer to Figure 9-195.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.
- **Stop Bits** sets the number of stop bits to either 1 or 2 bits. The default setting is 1 stop bit.
- **Data**: sets the number of data bits to either 7 or 8. The default setting is 8 bits.
- **Parity**: sets the parity to either Even, Odd, or no parity, None. The default setting is no parity, None.

ENTRY	DESCRIPTION

Figure 9-195. RS232 Screen -Settings

b) Configure RS232: Configures the RS-232 Baud Rate, refer to Figure 9-196 and Figure 9-197. This setting must match those set for the communications port of the user external controller.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud

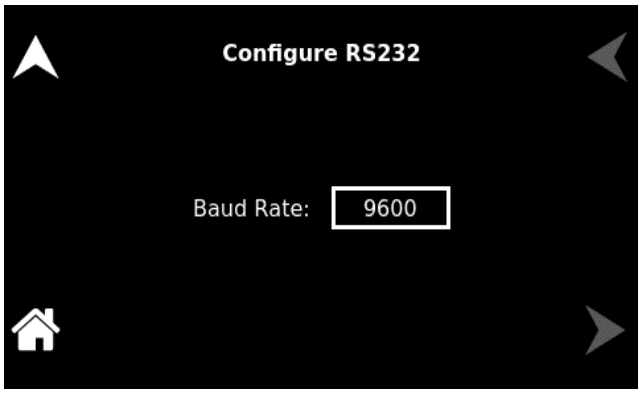


Figure 9-196. RS232 Screen -Configure

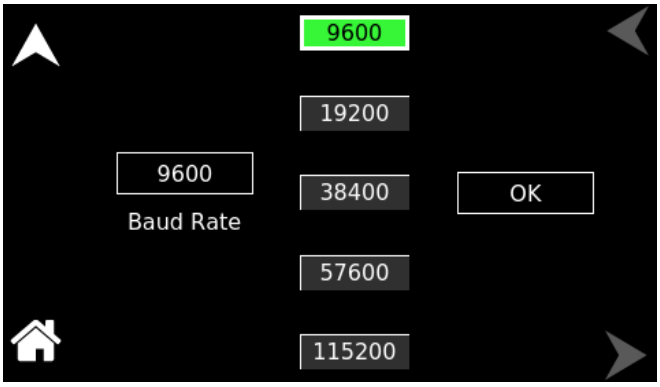


Figure 9-197. Baud Rate Selection

ENTRY	DESCRIPTION
Remote Inhibit	Sets the control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 9-198.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- Latch - after reclosing the contact, user needs to clear the fault and turn ON the output.
- Live - after reclosing the contact, user needs to turn ON the output.
- OFF - inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- Latch - after removing the active voltage source, user needs to clear the fault and turn ON the output.
- Live - after removing the active voltage source, user needs to turn ON the output.
- OFF - inhibit function would be disabled.

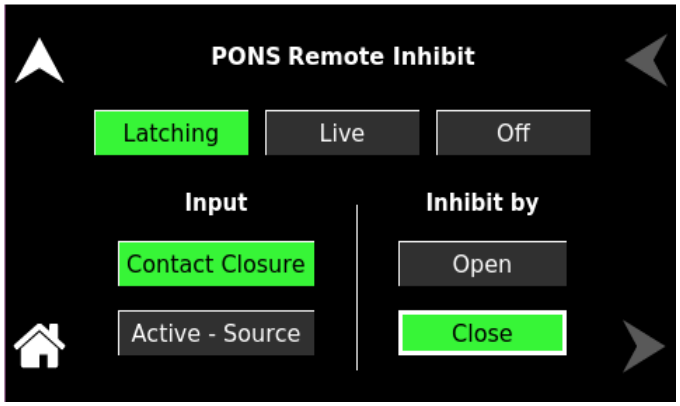


Figure 9-198. PONS remote Inhibit

ENTRY	DESCRIPTION
Analog	Configures the Analog programming interface, refer to Figure 9-199.

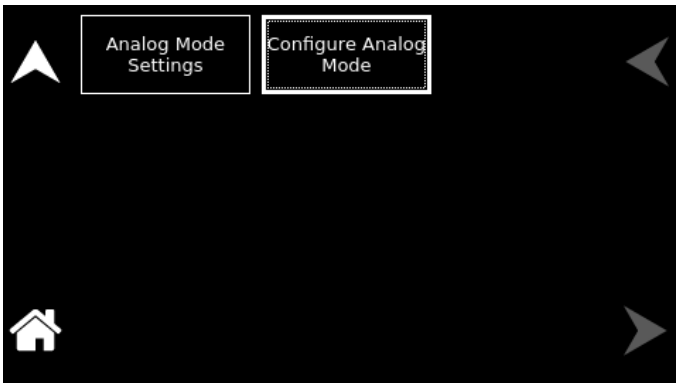


Figure 9-199. Analog Screen

a) Analog Mode Settings

Lists the configuration settings of the Analog Programming interface. Refer to Figure 9-200.

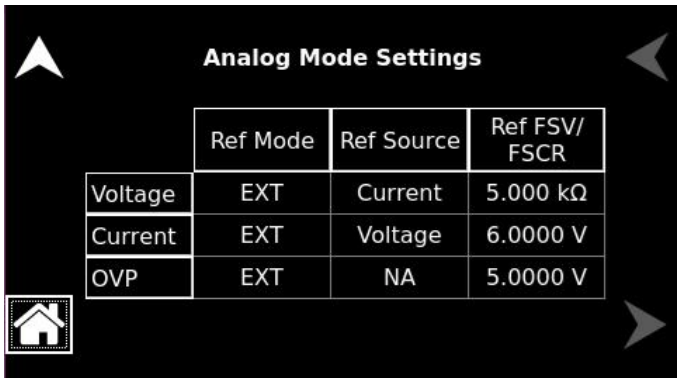


Figure 9-200. Analog Mode Settings

b) Configure Analog Mode

Sets parameter values and controls operation of the Analog Programming interface. Refer to Figure 9-201.

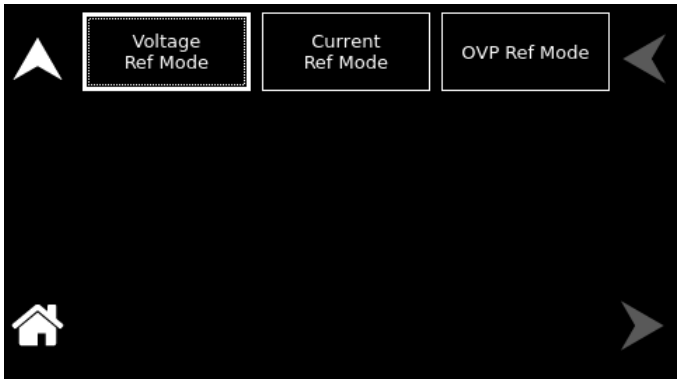


Figure 9-201. Configure Analog Mode Settings

ENTRY	DESCRIPTION

- **Voltage Ref Mode :** Configures the Voltage Reference Mode, refer to Figure 9-202. When the Voltage Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'. Refer to Figure 9-203 and Figure 9-204.

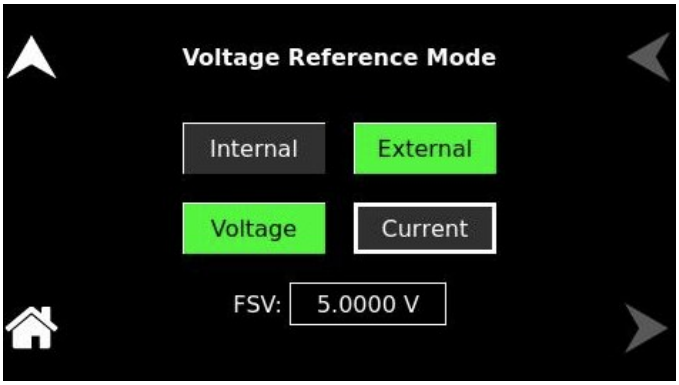


Figure 9-202. Voltage Reference Mode

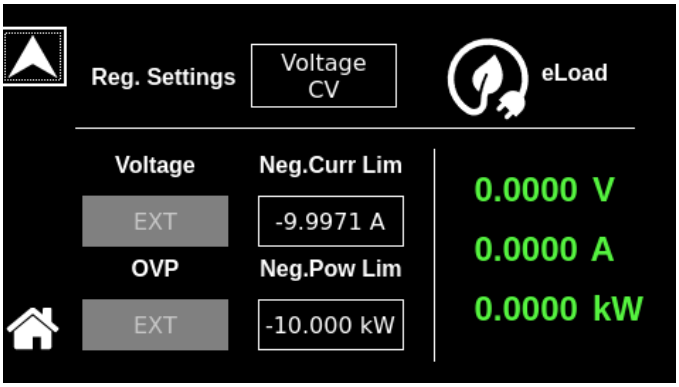


Figure 9-203. Dashboard Screen – Voltage (EXT)

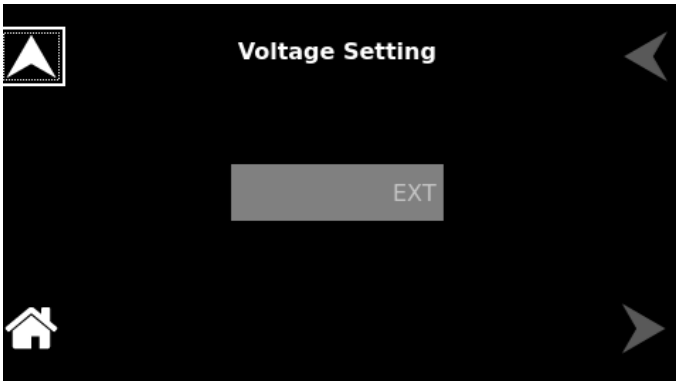


Figure 9-204. Output Program Screen – Voltage (EXT)

ENTRY	DESCRIPTION

When Voltage Reference Mode is selected as Current, FSCR (Full Scale Current Resistance) unit will be kΩ (k Ohms). Refer to Figure 9-206.

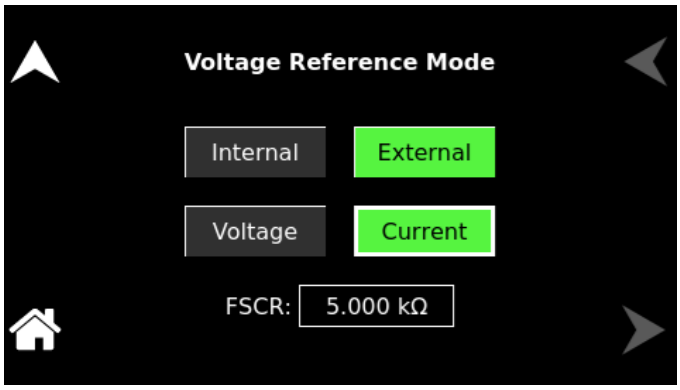


Figure 9-205. Voltage Reference Mode – Resistive

- **Current Ref Mode:** Configures the Current Reference Mode, refer to Figure 9-207. When the Current Reference Mode is set to External, the Voltage setting field on the Dashboard screen and the 'Voltage' option in the Output Program screen will be disabled, and these Voltage fields will display as 'EXT'.

  NOTE: 'Current' is only applicable for Source mode. When you select the 'Current', the screen display as 'Only applicable for Source Mode'

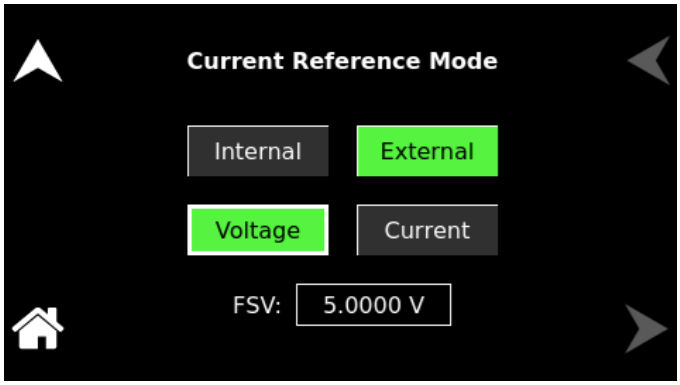


Figure 9-206. Current Reference Mode

ENTRY	DESCRIPTION

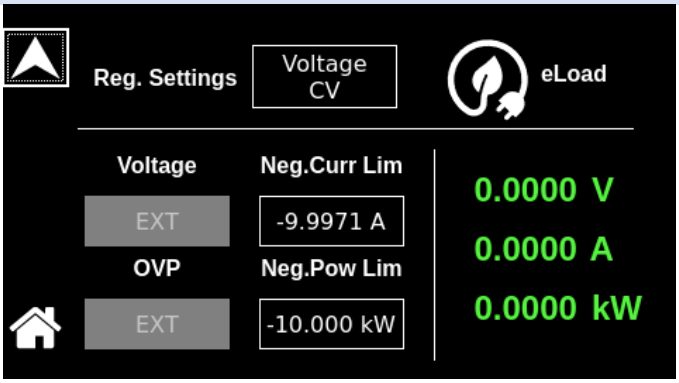


Figure 9-207. Dashboard Screen – Current (EXT)

- **OVP Ref Mode:** Configures the Over Voltage Protection (OVP) Reference Mode. When the OVP Reference Mode is set to External, the OVP setting field on the Dashboard screen and the 'Protection' option in the Configuration screen will be disabled, and these OVP fields will display as 'EXT' refer to Figure 9-208.

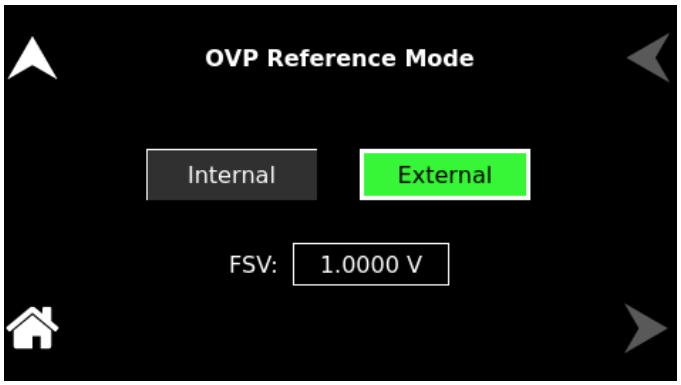


Figure 9-208. OVP Reference Mode

USB Displays the configured Baud Rate. Refer to Figure 9-209.

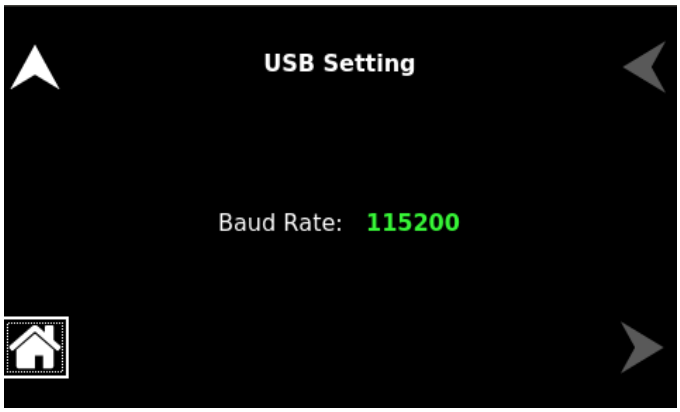


Figure 9-209. USB Setting

Table 9-37. System Setting Screen

9.2.7 OPERATING MODE

The Operating Mode Settings screen offers comprehensive guidance on the system modes of the Mi-BEAM Series power supply. This model is engineered for versatile and reliable performance across various applications, ensuring precise and efficient power delivery through its advanced control features. Depending on user requirements, the Mi-BEAM Series supports multiple modes of operation. Refer to the Figure 9-210.

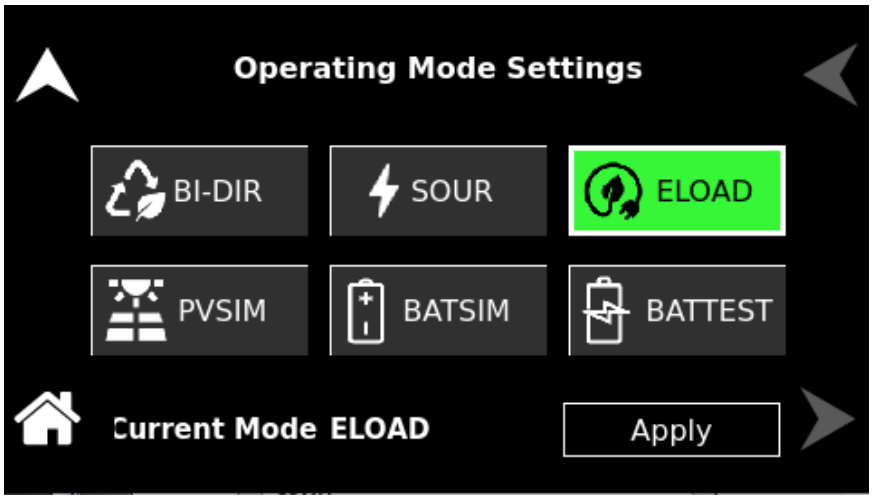


Figure 9-210. Operating Mode Settings

9.2.8 SYSTEM SETTINGS SCREEN

The System Settings screen provides the settings of ‘Hardware Limits’, ‘System Details’ ‘Firmware Version’, ‘LCD’, ‘Default Screen’ and ‘Factory Default’. The top-level menu of the System Settings menu is shown in Figure 9-211. Refer to Section 6.4.2.1 for navigating to System Settings Screen.

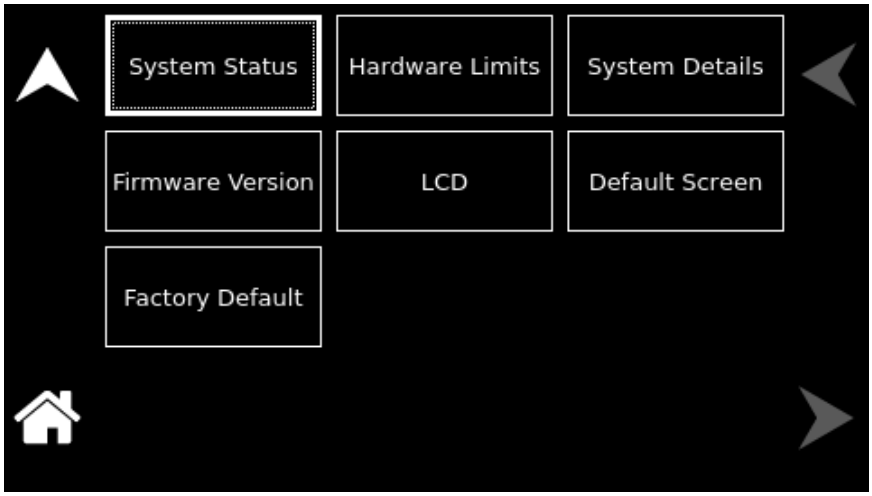


Figure 9-211. System Settings Screen

ENTRY	DESCRIPTION
System Status	Displays the present system status information of the power supply, including the Input Line, Output Sense, Isolation and No. of chassis. Refer to Figure 9-212.

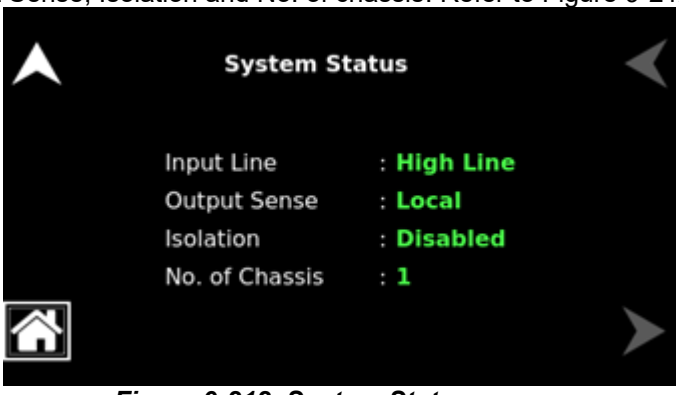


Figure 9-212. System Status

Hardware Limits	Displays the hardware parameter limit values. Refer to Figure 9-213.

Figure 9-213. Hardware Limits

ENTRY	DESCRIPTION
System Details	Displays information about the user's device, including the Manufacturer, Model Number, Serial Number, Last Calibration Date, and Operating Mode. Refer to Figure 9-214.

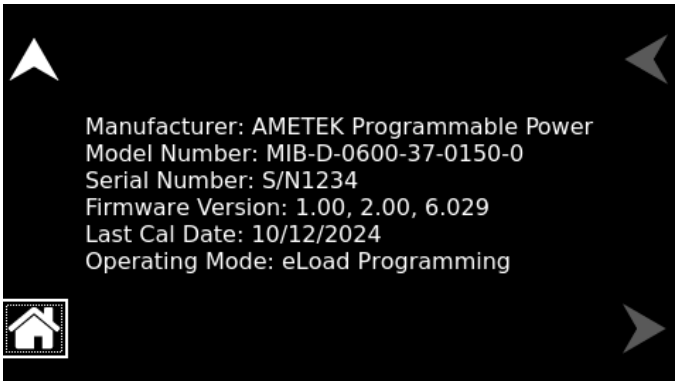


Figure 9-214. System Details

Firmware Version	Displays information about the configuration of the power supply, including the Communication Controller, System Interface, Front Panel, Fan Controller, Mod 1 Primary Controller, Mod 1 Secondary Controller, Mod 2 Primary Controller, Mod 2 Secondary Controller, Mod 3 Primary Controller, Mod 3 Secondary Controller. This information helps identify the unit. Refer to Figure 9-215.

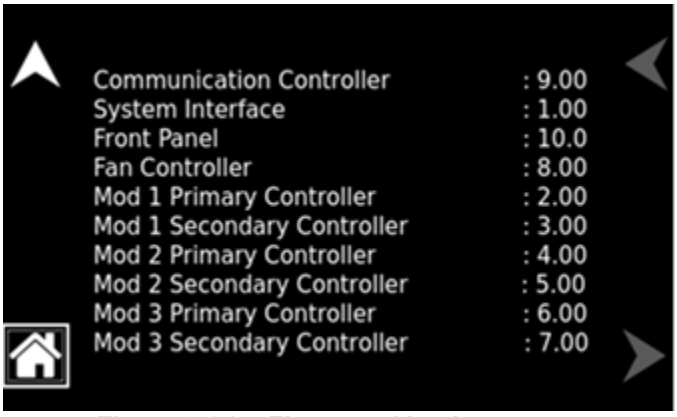


Figure 9-215. Firmware Version

LCD	Provides settings for the calibration of the display touchscreen. Refer to Figure 9-216.

ENTRY	DESCRIPTION

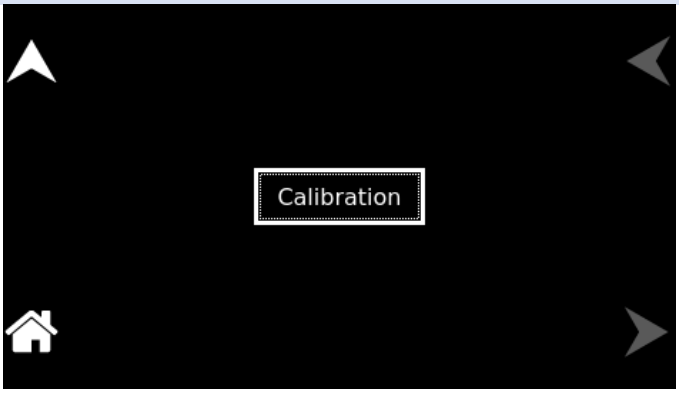


Figure 9-216. LCD

Default Screen Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 9-217 and Figure 9-218. It allows to set the time out if the default screen is enabled.

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

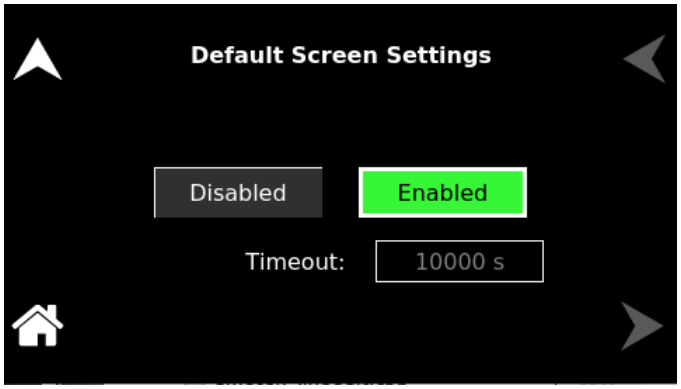


Figure 9-217. Default Screen Settings- Enabled

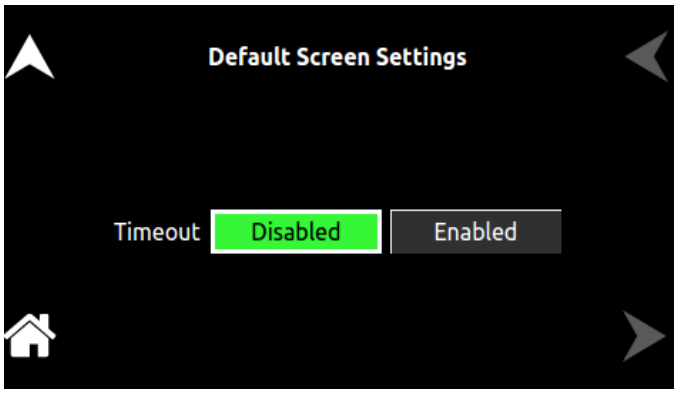


Figure 9-218. Default Screen Settings- Disabled

Factory Default Set the device to its original factory settings, as it was when it left the manufacturer. Refer to Figure 9-219.

ENTRY	DESCRIPTION

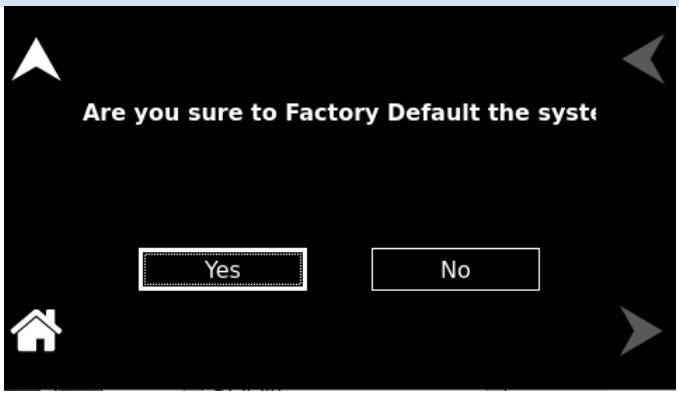


Figure 9-219. Factory Default

Table 9-38. System Setting Screen

9.2.9 SYSTEM FAULTS SCREEN

The System Faults screen provides descriptions of faults that have occurred in a power module. The fault screen appear if any supply fault conditions occur, refer to Figure 9-220. The user should press ‘Clear’ to clear the fault and continue the operations of the power supply and press the ‘Reload’ to refresh the system faults and check for errors. If no fault has occurred, the screen will show 'No Fault Occurred', refer to Figure 9-221.

NOTE: These conditions might resolve themselves; however, if they continue to occur after pressing 'Clear', refer to Chapter 14.

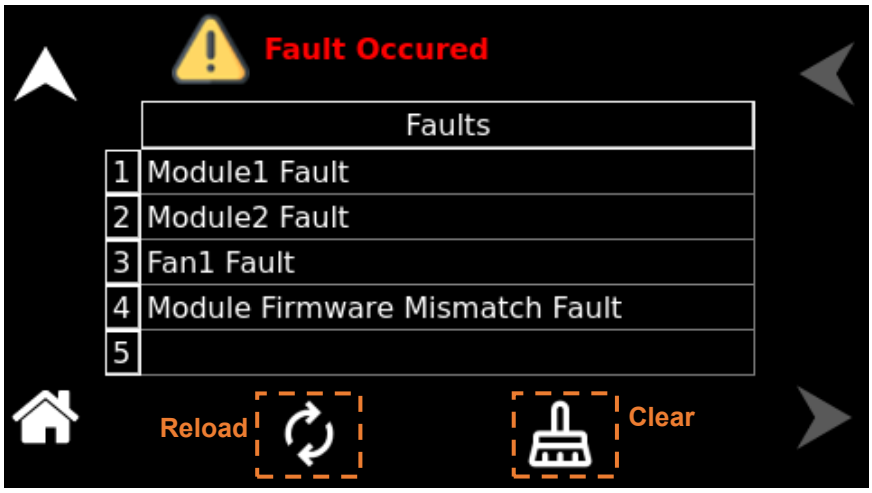


Figure 9-220. System Faults

Figure 9-221. No Fault Occurred Screen

9.3 PARALLEL OPERATION

Parallel mode of operation is used for applications that require more current or power than a single power supply can provide. To meet these higher output requirements, up to six power supplies can be connected in parallel, effectively combining their capacities to achieve the desired performance.

NOTE: Up to six units can be connected in parallel, contact factory to connect more than six units in parallel.

9.3.1 SETTING UP PARALLEL OPERATION

Each power supply has two separate 15-pin connectors on the upper left rear panel, labeled ‘PARALLEL INTERFACE IN’ and ‘PARALLEL INTERFACE OUT’. To connect power supplies in parallel, use a ‘Leader’ or ‘Follower’ daisy-chain wiring configuration . Refer to Figure 9-222. For parallel cable information refer to Section 2.25.

a) Using an interface cable (P/N 890-015-01), connect the 'PARALLEL INTERFACE OUT' port of the Leader power supply to the 'PARALLEL INTERFACE IN' port of the second power supply (Follower 1).

NOTE: In parallel operation, the Leader unit manages all programming, readback, and control functions. Remote analog control is not supported in this mode.

NOTE: Units with the same model number are allowed to be connected in parallel.

b) On the second power supply (Follower 1), connect another interface cable from its 'PARALLEL INTERFACE OUT' port to the 'PARALLEL INTERFACE IN' port of the third power supply (Follower 2). Continue this daisy-chain connection for up to a maximum of six power supplies.

c) Connect the positive output terminals of all power supplies together, along with the positive terminal of the load.

d) Connect the negative output terminals of all power supplies together, along with the negative terminal of the load.

e) Ensure that there are no shorts between the Positive and Negative output terminals.

f) Ensure all cables are kept as short as possible and connect twisted-pair sense cables as follows.

- For remote sensing at the load, only the Leader unit should have a twisted-pair cable running from its sense terminals to the load terminals.

g) After all the successful connection, power ON all the follower units followed by leader.

NOTE: Doing Parallel operation for the first time, make sure to reset the power supply units by selecting 'Factory default' in 'System Settings' Screen. This step is essential to prevent setting conflicts caused by pre-existing PONS settings.

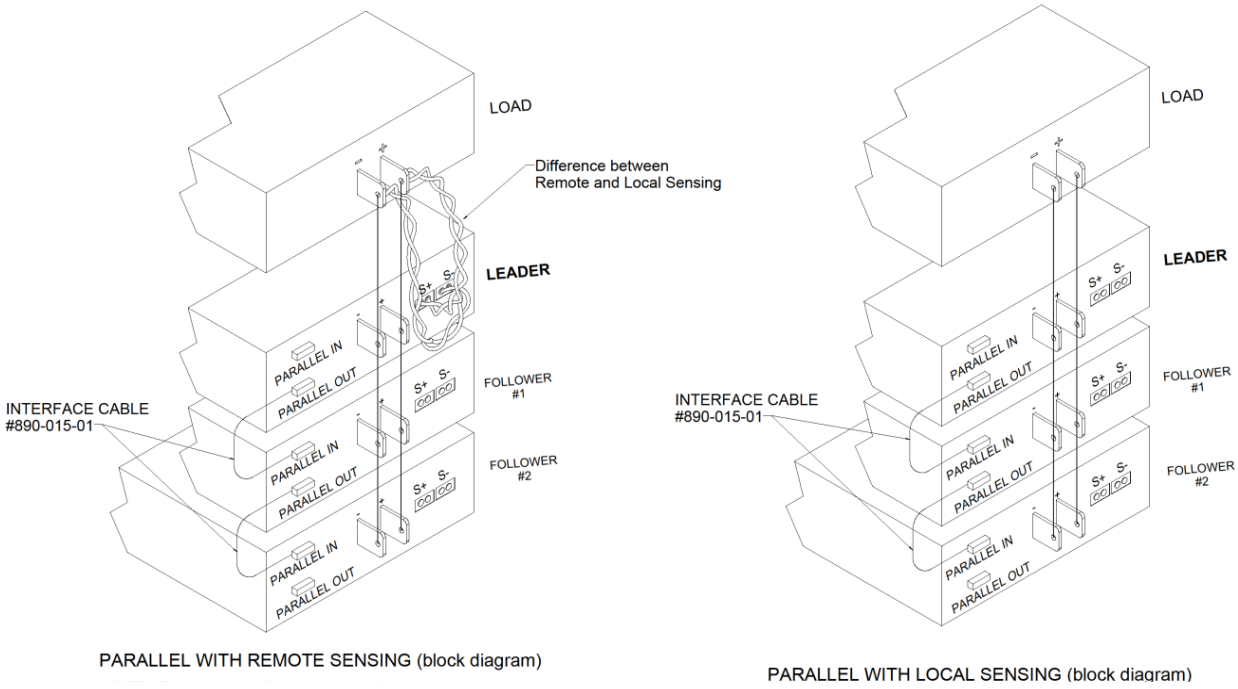


Figure 9-222. Parallel Connection

10 PV SIMULATOR MODE OPERATION

This chapter provides comprehensive information on the front panel display in PV Simulator mode, designed to offer an intuitive interface for seamless setup, control, and monitoring of various photovoltaic simulation parameters.

10.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION

10.1.1 CONFIGURING MI-BEAM FOR VOLTAGE TYPE UUT

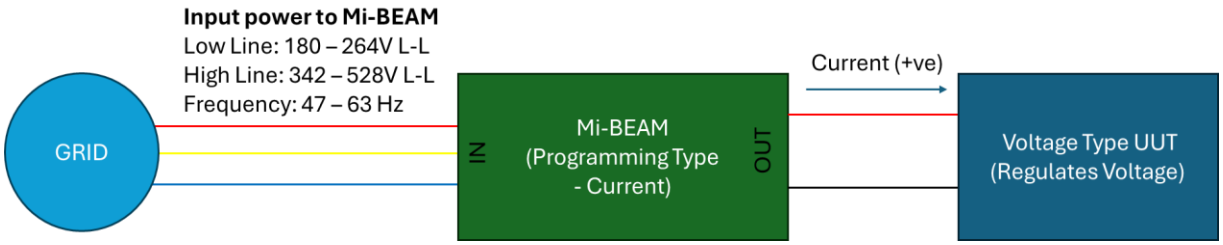


Figure 10-1. Voltage Type UUT

The Mi-BEAM Series power supply in PVSIM operates with a fixed Programming Type (Current) and the Regulation Setting is 'Constant Current/Constant Voltage (CC/CV).

10.1.1.1 OPER. TYPE - STEADY STATE, OPER. MODE - STANDARD, AND CURVE TYPE – SNL

When the settings selected in 'PVSIM Mode Selection Settings (Oper. Type - Steady State, Oper. Mode - Standard, and Curve type - SNL)' are applied in the Configuration Screen, the settings in top-level screens will appear with required options. Refer to Section 10.2.4.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current that flows from Mi-BEAM to UUT. Refer to Figure 10-76.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 10-76.

b) Curve Selection: Define a curve which simulate various PV module characteristics. Refer to Figure 10-49.

c) Setting Irradiance value: Enter the irradiance level value that represents the intensity of sunlight per unit area. Refer to Figure 10-28.

d) Setting Temperature value: Enter the temperature value to simulate the desired environmental conditions. Refer to Figure 10-29.

e) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

f) Output State: Once all the parameters are configured as mentioned above, output can be turned ON. Refer to Figure 10-32.

g) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

h) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 10.2.2.1.3.

i) End the Test: Once the test is complete, power down the system and safely disconnect the UUT from the Mi-BEAM.

10.1.1.2 OPER. TYPE - STEADY STATE, OPER. MODE - STANDARD, AND CURVE TYPE - EN50530 (TEST TYPE – STATIC)

When the settings selected in 'PVSIM Mode Selection Settings (Oper. Type - Steady State, Oper. Mode - Standard, and Curve type - EN50530)' are applied in the Configuration Screen, the top-level screens will appear with required options. Refer to Section 10.2.4.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 10-76.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 10-76.

- **EN50530 Test Type:** Select the Test Type to 'Static' in 'EN50530 Test Type Settings'. Refer to Figure 10-72.

b) Rated Power: Enter the rated power value that the unit to be delivered. Refer to Figure 10-30.

c) **Rated Voltage:** Enter the rated voltage value that the unit to be delivered. Refer to Figure 10-31.

d) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

e) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 10-32.

f) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 10.2.2.1.3.

h) **End the Test:** Once the test is complete, power down the system and safely disconnect the UUT from the Mi-BEAM.

10.1.1.3 CURVE TYPE - EN50530 AND TEST TYPE – DYNAMIC

When the settings selected in 'PVSIM Mode Selection Settings (Oper. Type - Steady State, Oper. Mode - Standard, and Curve type - EN50530)' are applied in the Configuration Screen, the top-level screens will appear with required options. Refer to Section 10.2.4.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 10-76.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 10-76.

- **EN50530 Test Type:** Select the Test Type to 'Dynamic' in 'EN505530 Test Type Settings'. Refer to Figure 10-72.

b) **Rated Voltage**: Enter the rated voltage value that the unit to be delivered. Refer to Figure 10-30.

c) **Rated Power**: Enter the rated power value that the unit to be delivered. Refer to Figure 10-30.

d) **Setting Irradiance value:** Enter the irradiance level to measure the intensity of sunlight per unit area. Refer to Figure 10-28.

e) **Setting Temperature value:** Enter the temperature to simulate the desired environmental conditions. Refer to Figure 10-29.

f) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

g) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 10-32.

h) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

i) **Monitoring and Adjustments:** Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 10.2.2.1.3.

j) **End the Test:** Once the test is complete, power down the system and safely disconnect the UUT from the Mi-BEAM.

10.1.1.4 OPER. TYPE - STEADY STATE, OPER. MODE - STANDARD, AND CURVE TYPE – USER

When the settings selected in 'PVSIM Mode Selection Settings (Oper. Type - Steady State, Oper. Mode - Standard, and Curve type - User)' are applied in the Configuration Screen, the top-level screens will appear with required options. Refer to Section 10.2.4.

a) **Configuration:** Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 10-76.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 10-76.

b) **Curve Selection:** Users can upload a user defined curve which simulates the PV module characteristics. Refer to Figure 10-49.

c) **Connect the UUT to the Mi-BEAM:** Ensure all connections are secure and correctly aligned with the UUT port type.

d) **Output State:** Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 10-32.

e) **Start the Test:** Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

f) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Section 10.2.2.1.3.

g) End the Test: Once the test is complete, power down the system and safely disconnect the UUT from the Mi-BEAM.

10.2 FRONT PANEL OPERATION

This section provides detailed information on the front panel operation in PV Simulator (PVSIM) mode. Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder. Refer to Figure 10-2.

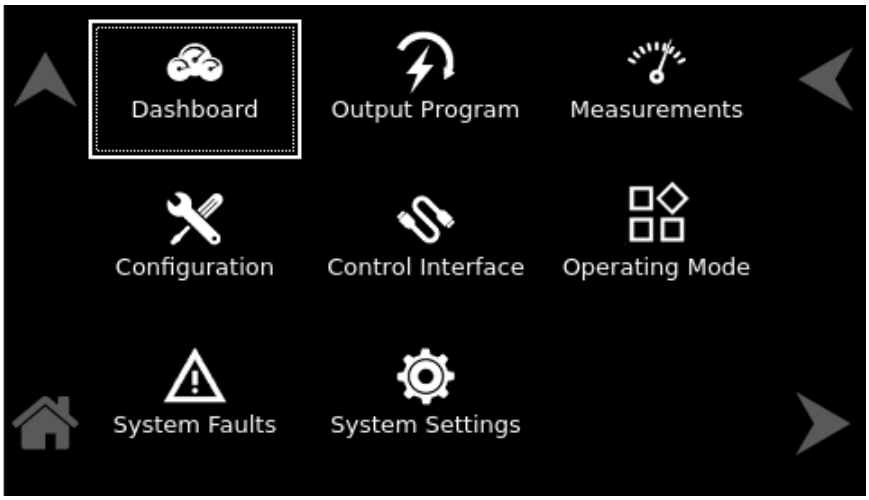


Figure 10-2. Home Screen Top-Level Menu

10.2.1 DASHBOARD SCREEN TOP-LEVEL MENU

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

Note: The PVSIM operates with a fixed programming type, 'Current,' and Regulation setting 'Constant Current/Constant Voltage (CC/CV)'.

10.2.1.1 DASHBOARD SCREENS BASED ON PV MODE CONFIGURED

Dashboard screen will be updated based on the configuration in PVSIM Mode Selection. The 'PVSIM Mode Selection' menu in the 'Configuration' Screen allows the user to configure the settings below:

a) Oper. Type

- Steady State
- Profile

b) Oper. Mode

- Standard
- Array

c) Curve Type

- SNL
- EN50530
- User

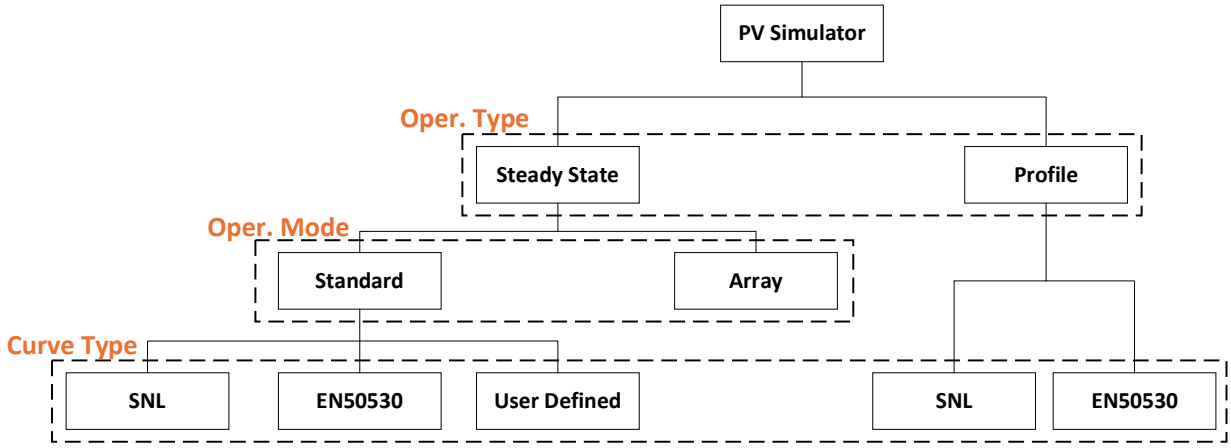


Figure 10-3. PVSIM mode Selection Setting

The front panel will not support all the modes in PV Simulator. To operate all the modes, Virtual panels can be used. Refer to Figure 10-3 for the available PV Simulator modes and the Table 10-1 for the front panel support. The dashboard screen will change based on the user's selection. Refer to Section 9.2.4 for PVSIM mode configuration.

Oper. Type	Oper. Mode	Curve Type	Front Panel Support
Steady State	Standard	SNL	Yes
Steady State	Standard	EN50530	Yes
Steady State	Standard	Userdefined	Partial
Steady State	Standard	NA	Only view in the dashboard.
Profile	NA	SNL	Only view in the dashboard.
Profile	NA	EN50530	Only view in the dashboard.

Table 10-1. PVSIM mode Selection Setting – Front Panel Support

10.2.1.2 DASHBOARD SCREEN – OPER. TYPE : STEADY STATE AND OPER. MODE: STANDARD

When the 'Oper. Type – **Steady State**' and 'Oper. Mode - **Standard**' is selected in the 'PVSIM Mode Selection' menu, the following curve types become available:

a) SNL

b) EN50530

c) Userdefined

The 'Dashboard Screen' will change based on the selected curve type, as described below.

10.2.1.2.1 CURVE TYPE – SNL

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type – Steady State

b) Oper. Mode – Standard

c) Curve type – SNL

the dashboard screen will appear with options to adjust the 'Curve Selection', 'Irradiance', and 'Temperature' values. Refer to Figure 10-4.

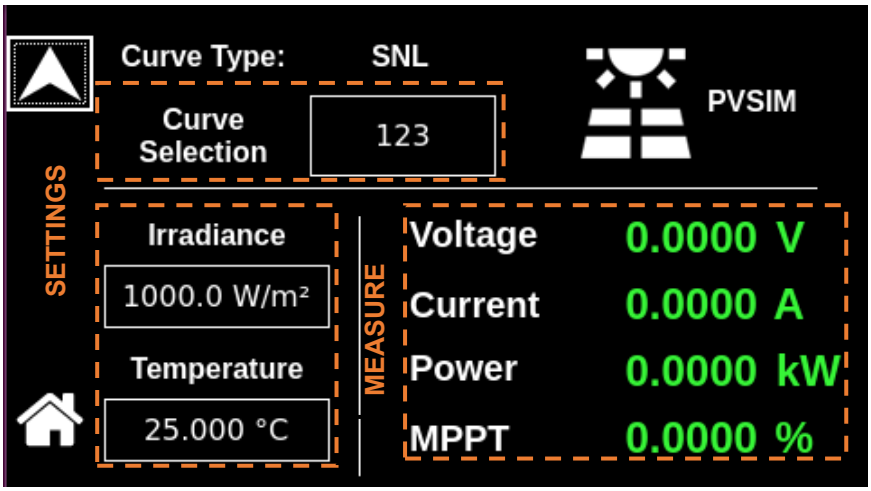


Figure 10-4. Dashboard Screen (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type - SNL)

SETTINGS	DESCRIPTION
Curve Selection[(1)(2)]	The selected curve will be displayed. Users can also select, edit, delete, or load the curve. Refer to Figure 10-49.
Irradiance	Programs the irradiance value for the curve. Real-time setting is possible using the rotary encoder.

SETTINGS	DESCRIPTION
Temperature	Programs the temperature value for the curve. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.
(1) The '' symbol before the curve name indicates that the curve is selected but not yet loaded. To load the curve, click the load button available in the 'Curve Selection Setting'. To turn ON the output of the power supply, selected curve must be loaded.* *(2) The 'NONE' indicates that no curve is selected.*	

Table 10-2. Dashboard screen top-level menu (Oper. Type - Steady State, Oper. Mode – Standard and Curve Type - SNL)

10.2.1.2.2 CURVE TYPE - EN50530

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type – Steady State

b) Oper. Mode – Standard

c) Curve type – EN50530

the dashboard screen will appear with options to adjust 'Test Type (Static or Dynamic) ', 'Irradiance', 'Temperature', 'Rated Power' and 'Rated Volt'. Refer to Figure 10-8 and Figure 10-9.

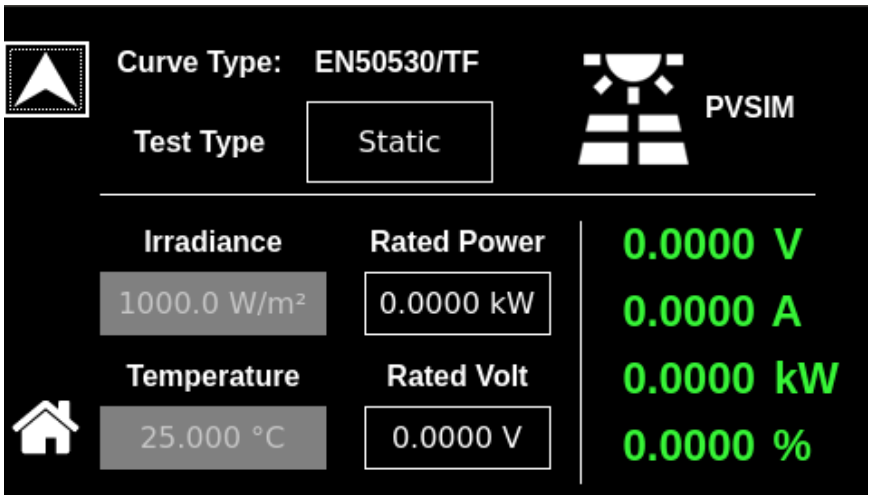


Figure 10-5. EN50530 Test Type Settings - Static

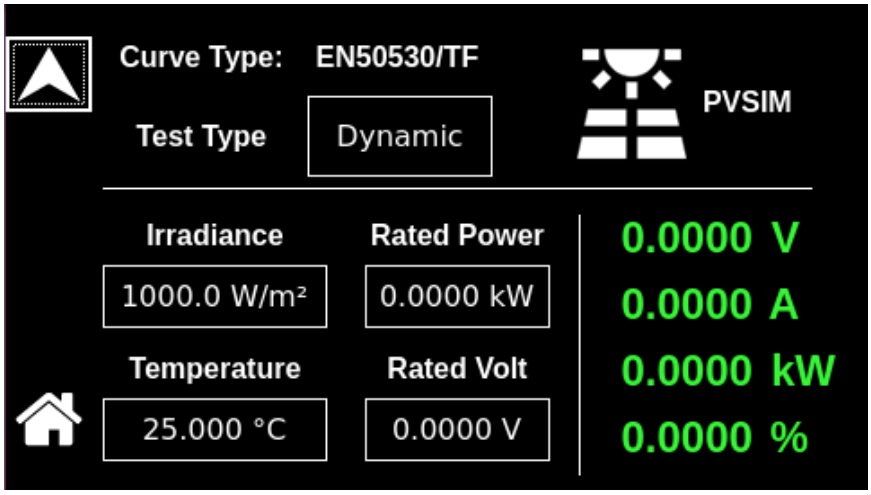


Figure 10-6. EN50530 Test Type Settings- Dynamic

NOTE: The configured 'Technology type' in 'EN50530 Configuration' screen will be displayed on the dashboard along with the curve type for EN50530 curve.

a) When Technology type configured as **Thin Film** Curve Type will be **EN50530/TF**
b) When Technology type configured as **cSi** Curve Type will be **EN50530/cSi**

10.2.1.2.2.1 CONFIGURING THE TEST TYPES

The 'Test Type' settings in the Dashboard Screen enables users to select between 'Static' and 'Dynamic' test type of EN50530 curve. Refer to Figure 10-7.

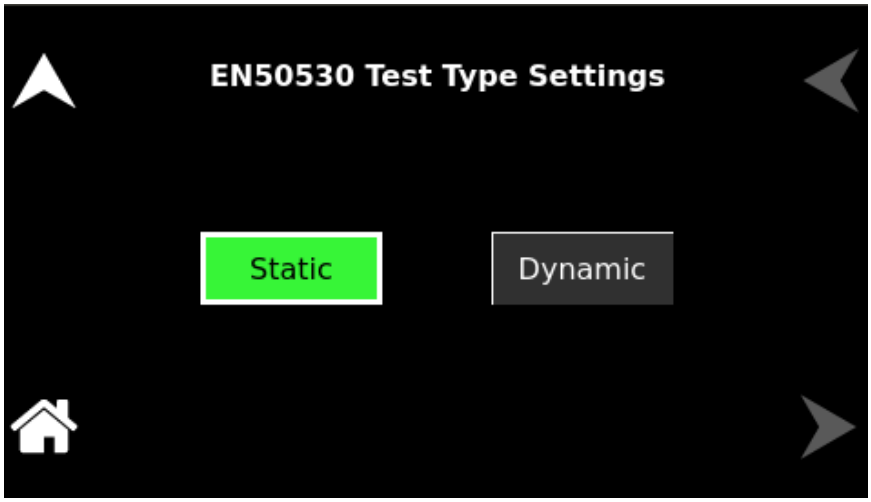


Figure 10-7. EN50530 Test Type Settings

a) EN50530 Test Type - Static

The top-level menu of the DASHBOARD screen is shown in Figure 10-8. Refer to Section 6.4.2.1 for navigating to the Dashboard Screen.

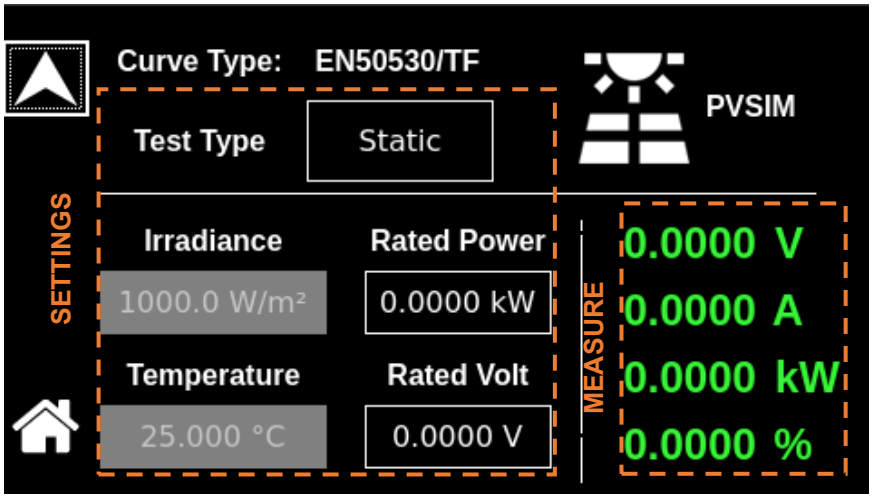


Figure 10-8. Dashboard Screen in Static Test Type

The following selections are available in the DASHBOARD screen top-level menu of Test Type 'Static':

SETTINGS	DESCRIPTION
Test Type	Programs the test type for the EN50530 Curve. Refer to Figure 10-72. **a) Static:** Programs the test type to Static for the EN50530 Curve.
Rated Power	Programs the rated power value for the curve. Real-time setting is possible using the rotary encoder.
Rated Voltage	Programs the rated voltage value for the curve. Real-time setting is possible using the rotary encoder.
Irradiance(1)	The fixed irradiance value (1000 W/m²) will be displayed.
Temperature(1)	The fixed temperature value (25 °C) will be displayed.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.
(1) *Standard Test Conditions (STC):* ***a)*** *Irradiance: 1000 W/m²* ***b)*** *Temperature: 25°C*	

Table 10-3. Dashboard screen top-level menu – Static Test Type

b) EN50530 Test Type - Dynamic

The top-level menu of the DASHBOARD screen is shown in Figure 10-9. Refer to Section 6.4.2.1 for navigating to the Dashboard Screen.

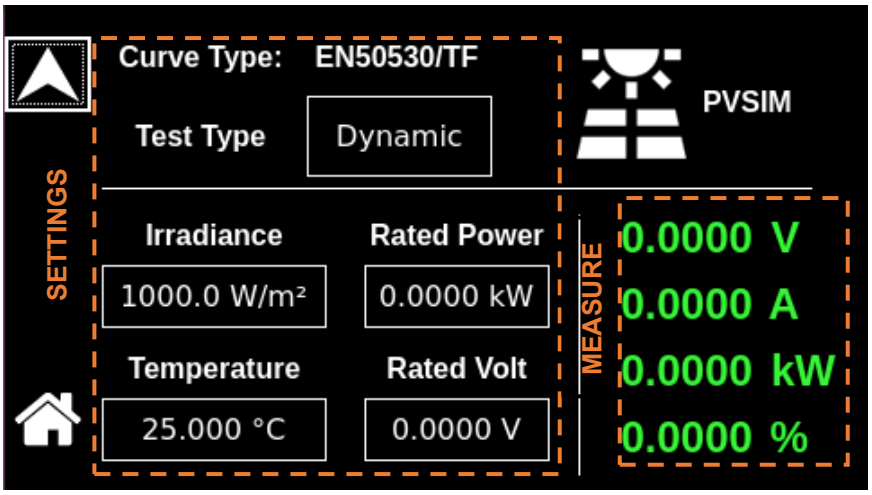


Figure 10-9. Dashboard Screen in Dynamic Test Type

The following selections are available in the DASHBOARD screen top-level menu of Test Type 'Dynamic':

SETTINGS	DESCRIPTION
Test Type	Programs the test type for the EN50530 Curve. Refer to Figure 10-72. **a) Dynamic:** Programs the test type to Dynamic for the EN50530 Curve.
Irradiance	Programs the irradiance value for the curve. Real-time setting is possible using the rotary encoder.
Temperature	Programs the temperature value for the curve. Real-time setting is possible using the rotary encoder.
Rated Power	Programs the rated power value for the curve. Real-time setting is possible using the rotary encoder.
Rated Voltage	Programs the rated voltage value for the curve. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.

Table 10-4. Dashboard screen top-level menu – Dynamic Test Type

10.2.1.2.3 CURVE TYPE – USER

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type – Steady State

b) Oper. Mode – Standard

c) Curve type – User

The dashboard screen will appear with options ‘Curve Type’, ‘Curve Selection’, ‘Irradiance’, and ‘Temperature’. Refer to Figure 10-10.

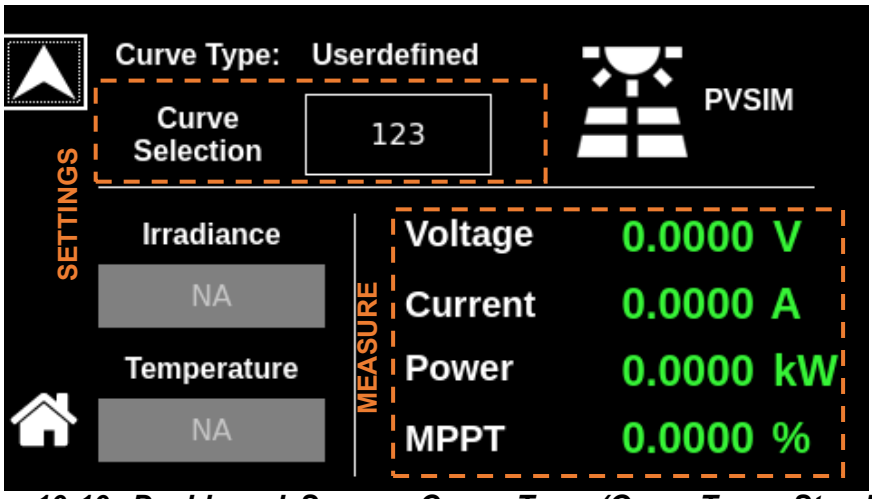


Figure 10-10. Dashboard Screen, Curve Type (Oper. Type -Steady State, Oper. Mode - Standard and Curve Type - Userdefined)

SETTINGS	DESCRIPTION
Curve Selection[1] [2] [3]	The selected curve will be displayed. Users can select, load or delete the curve. Refer to Figure 10-49.
Irradiance	This setting is not valid and will be displayed as NA.
Temperature	This setting is not valid and will be displayed as NA.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.
[1] *The ‘*’ symbol before the curve name indicates that the curve is selected but not yet loaded. To load the curve, click the load button available in the ‘Curve Selection Setting’. To turn ON the output of the power supply, selected curve must be loaded* [2] *The ‘NONE’ indicates that no curve is selected.* [3] *Users cannot create or edit the curve (when the curve selection is User Defined) from front panel, this operation can be performed only from virtual panels.*	

Table 10-5. Dashboard screen top-level menu (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type - Userdefined)

10.2.1.3 DASHBOARD SCREEN – OPER. TYPE : STEADY STATE AND OPER. MODE: ARRAY

When ‘PVSIM Mode Selection’ is configured as below:

a) Oper. Type – Steady State

b) Oper. Mode – Array

The dashboard screen will appear with options 'PV Mode', 'Curve Name', 'Curve Type', 'Irradiance', and 'Temperature'. Refer to Figure 10-11.

NOTE: The Dashboard Screen is only used to view measurements. All other options are invalid and can only be edited from Virtual panels.

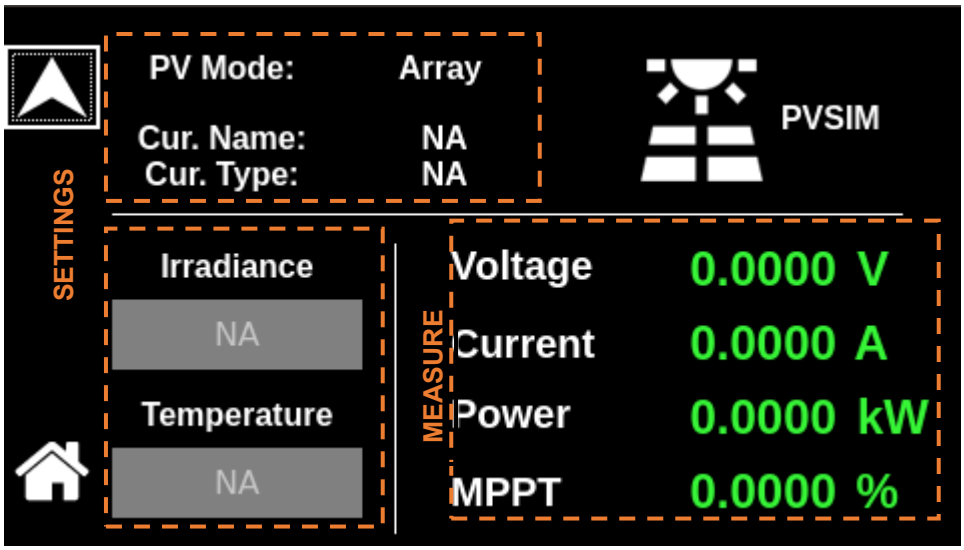


Figure 10-11. Dashboard Screen (Oper. Type – Profile and Curve Type –Array)

SETTINGS[1]	DESCRIPTION
PV Mode	The programed mode in 'PVSIM Mode Selection' menu will be displayed.
Cur. Name	This setting is not valid and will be displayed as NA.
Cur. Type	This setting is not valid and will be displayed as NA.
Irradiance	This setting is not valid and will be displayed as NA.
Temperature	This setting is not valid and will be displayed as NA.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.
[1] *None of the settings can be changed through the front panel screen; the settings can only be displayed on the front panel for user's reference.*	

Table 10-6. Dashboard screen top-level menu (Oper. Type – Profile, Curve Type – Array)

10.2.1.4 DASHBOARD SCREEN - OPER. TYPE – PROFILE

When the 'Oper. Type – **Profile**' is selected in the 'PVSIM Mode Selection' menu, the following curve types applicable:

a) SNL

b) EN50530

The ‘Dashboard Screen’ will change based on the selected curve type, as described below.

NOTE: The Dashboard Screen is only used to view measurements. All other options are invalid and can only be edited from Virtual panels.

10.2.1.4.1 CURVE TYPE –SNL

When ‘PVSIM Mode Selection’ is configured as below:

a) Oper. Type - Profile

b) Curve type – SNL

The dashboard screen will appear with options ‘PV Mode’, ‘Curve Name’, ‘Curve Type’, ‘Irradiance’, and ‘Temperature’. Refer to Figure 10-12.

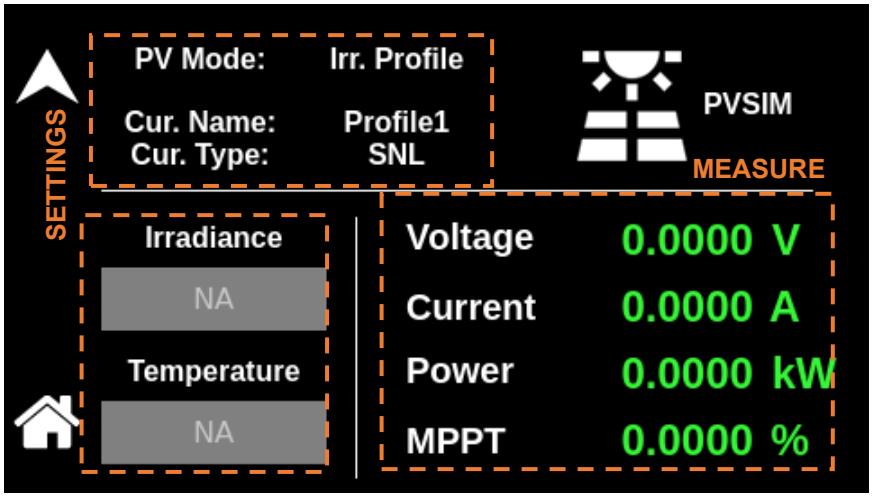


Figure 10-12. Dashboard Screen (Oper. Type – Profile and Curve Type – SNL)

SETTINGS[1]	DESCRIPTION
PV Mode	The programed mode in ‘PVSIM Mode Selection’ menu will be displayed.
Cur. Name	The selected current name will be displayed.
Cur. Type	The programed curve type will be displayed.
Irradiance[2]	This will be displayed as NA.
Temperature[2]	This will be displayed as NA.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.
[1] *None of the settings can be changed through the front panel screen; the settings can only be displayed on the front panel for user’s reference.*	

SETTINGS[1]	DESCRIPTION
[2] *The values are adjusted from Virtual panels and will not be displayed in the front panel.*	

Table 10-7. Dashboard screen top-level menu (Oper. Type – Profile and Curve Type - SNL)

10.2.1.4.2 CURVE TYPE –EN50530

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type - Profile

b) Curve type – EN50530

the dashboard screen will appear with 'Test Type (Static or Dynamic)', 'Irradiance', 'Temperature', 'Rated Power' and 'Rated Voltage'. Refer to Figure 10-13 and Figure 10-14.

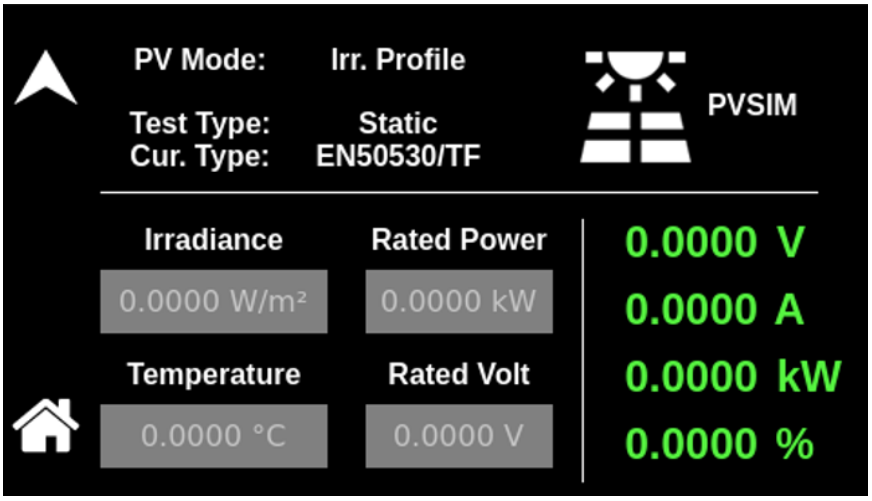


Figure 10-13. EN50530 Test Type Settings - Static

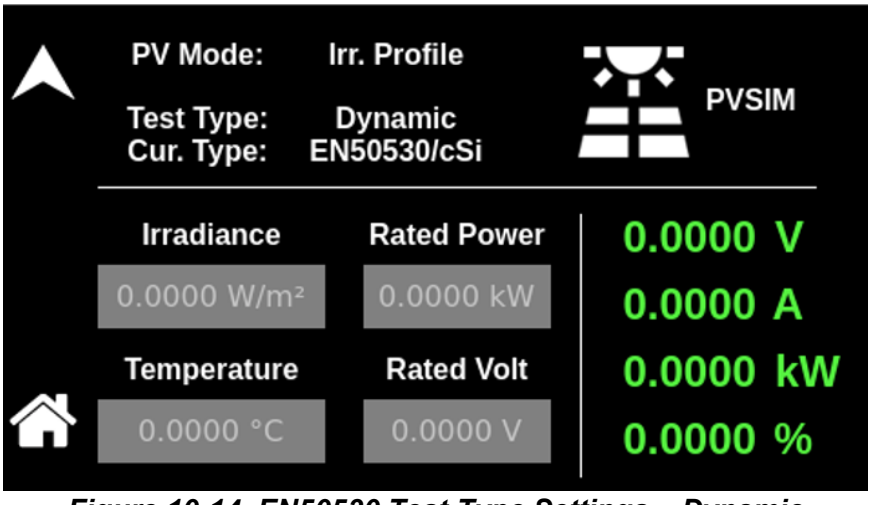


Figure 10-14. EN50530 Test Type Settings – Dynamic

a) EN50530 Test Type- Static/ Dynamic

The top-level menu of the DASHBOARD screen is shown in Figure 10-15 and Figure 10-16. Refer to Section 6.4.2.1 for navigating to the Dashboard Screen.

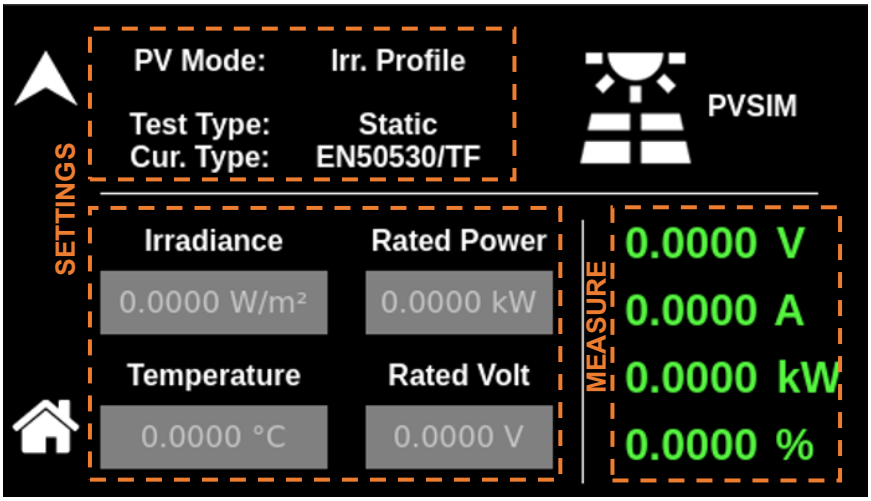


Figure 10-15. Dashboard Screen (Oper. Type – Profile, Test type – Static and Curve Type – EN50530)

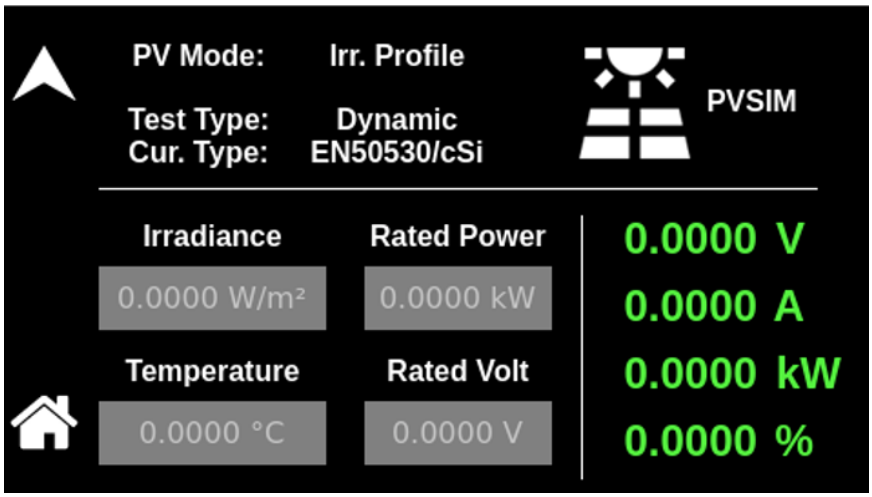


Figure 10-16. Dashboard Screen (Oper. Type – Profile, Test Type – Dynamic and Curve Type – EN50530)

The following selections are available in the DASHBOARD screen top-level menu of Test Type 'Static' or 'Dynamic':

SETTINGS(1)	DESCRIPTION
PV Mode	The programed mode in 'PVSIM Mode Selection' menu will be displayed.
Cur. Name	The selected curve name will be displayed.
Cur. Type	The programed curve type will be displayed.
Irradiance	The programmed irradiance value from the virtual panel is displayed.
Temperature	The programmed temperature value from the virtual panel is displayed.
Rated Power	The programmed rated power value from the virtual panel is displayed.

SETTINGS[1]	DESCRIPTION
Rated Volt	The programmed rated volt value from the virtual panel is displayed.
MEASURE	**DESCRIPTION**
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.
MPPT	Displays the floating-point value of Maximum Power Point Tracking of the loaded curve in percentage.
[1] *None of the settings can be changed through the front panel screen; the settings can only be displayed on the front panel for user's reference.*	

Table 10-8. Dashboard screen top-level menu (Oper. Type - Profile and Curve Type - EN50530 and Test Type – Static/Dynamic)

10.2.1.5 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 10-17. 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.

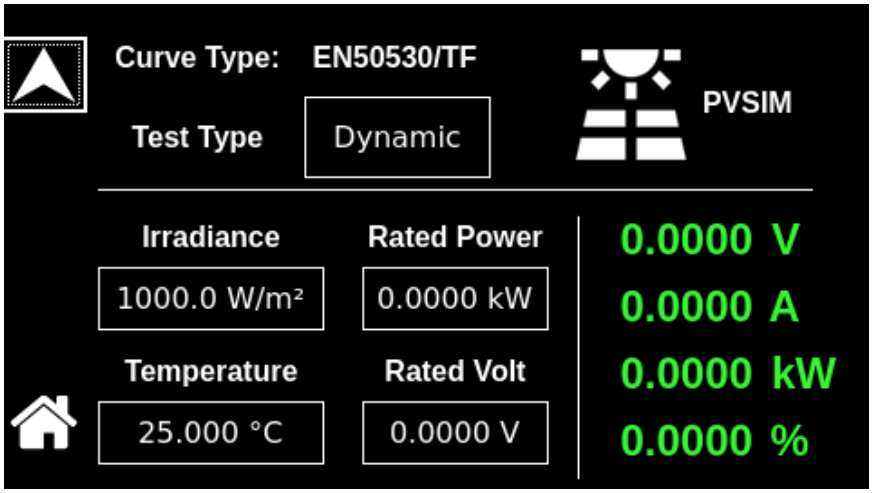


Figure 10-17. Real-Time, Immediate Output Parameter Adjustment

10.2.1.6 DEFAULT SCREEN

The Default screen provides measurement of the DC output voltage, current, power and MPPT, refer to Figure 10-18. When the Dashboard screen is idle for an interval equal to a set time delay, refer to Figure 10-143 and Figure 10-144. The display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen.

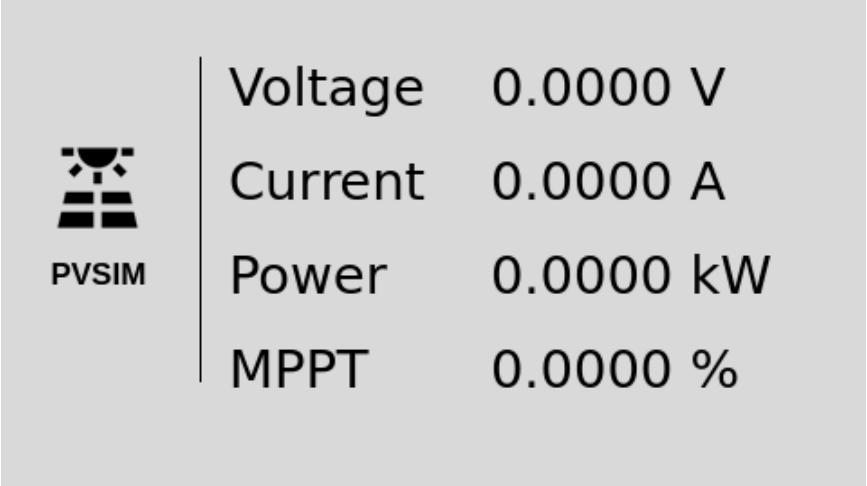


Figure 10-18. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage, current, power and MPPT in various modes of operation.

10.2.2 OUTPUT PROGRAM SCREEN

10.2.2.1 OPER. TYPE - STEADY STATE AND OPER. MODE - STANDARD

When the 'Oper. Type – **Steady State**' and 'Oper. Mode - **Standard**' is selected in the 'PVSIM Mode Selection' menu, the following curve types applicable:

a) SNL

b) EN50530

c) Userdefined

The 'Output Program' screen will change based on the selected curve type, as described below.

10.2.2.1.1 CURVE TYPE – SNL

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type - Steady State

b) Oper. Mode - Standard

c) Curve Type – SNL

The Output Program screen provides the settings of 'Irradiance', 'Temperature', and 'Output State'. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

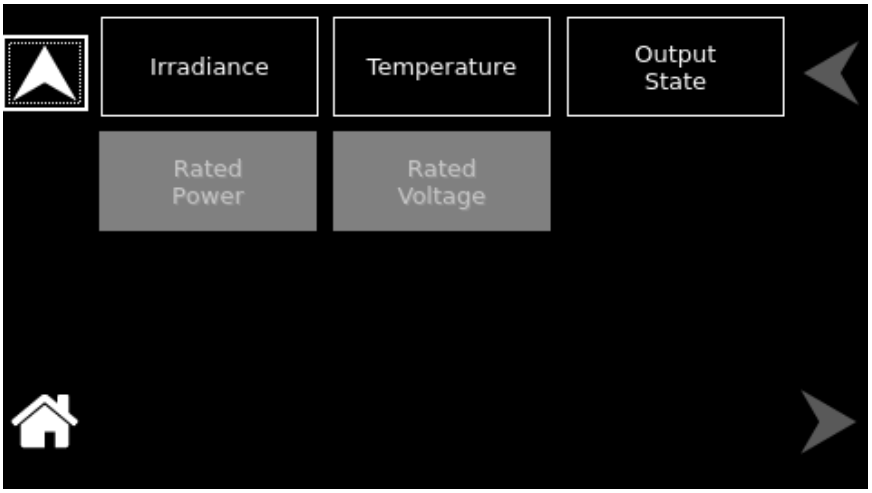


Figure 10-19. Output Program Screen (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type – SNL)

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Irradiance	User can set the irradiance value for the curve. Refer to Figure 10-20.

Figure 10-20. Irradiance Setting

ENTRY	DESCRIPTION
Temperature	User can set the temperature value for the curve. Refer to Figure 10-21.

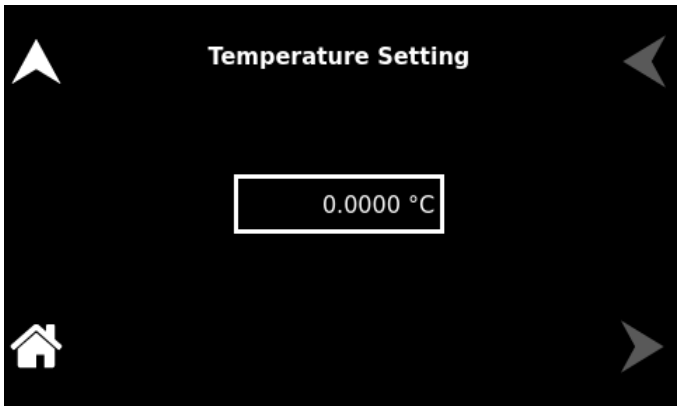


Figure 10-21. Temperature Setting

Output State	User can program the output to ON or OFF state. Refer to Figure 10-22.

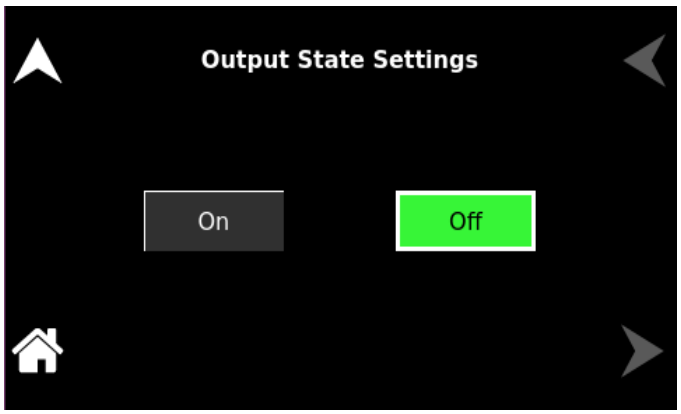


Figure 10-22. Output State Settings

Table 10-9. Output Program screen

10.2.2.1.2 CURVE TYPE – EN50530

a) TEST TYPE – STATIC

When 'PVSIM Mode Selection' is configured as below:

- Oper. Type - Steady State
- Oper. Mode – Standard
- Curve Type – EN50530

- Test Type - Static

The Output Program screen provides the settings of ‘Rated power’, ‘Rated Voltage’ and ‘Output State’. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

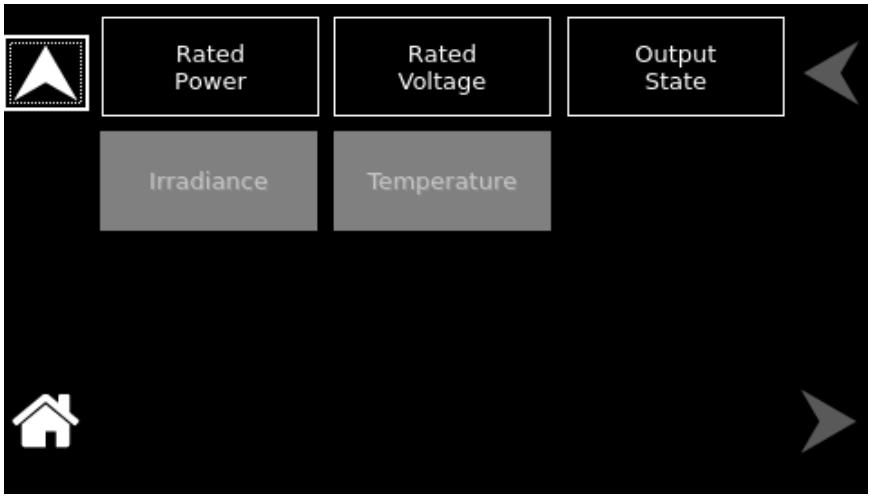


Figure 10-23. Output Program Screen (Curve type – EN50530 and Test type - Static)

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Rated Power	Users can set the rated power value for the curve. Refer to Figure 10-24.

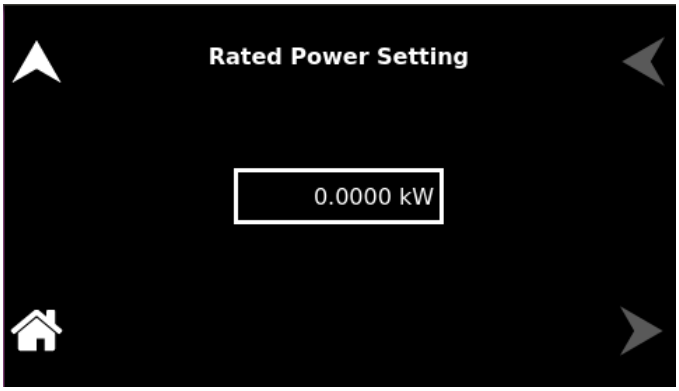


Figure 10-24. Rated Power Setting

Rated Voltage	Users can set the rated voltage value for the curve. Refer to Figure 10-25.

ENTRY	DESCRIPTION

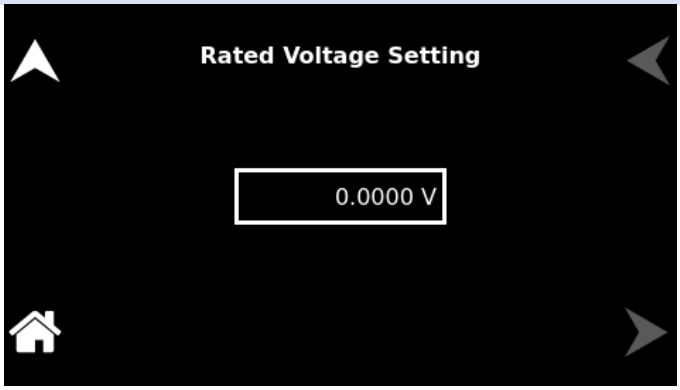


Figure 10-25. Rated Voltage Setting

Output State Users can program the output to ON or OFF state. Refer to Figure 10-26.

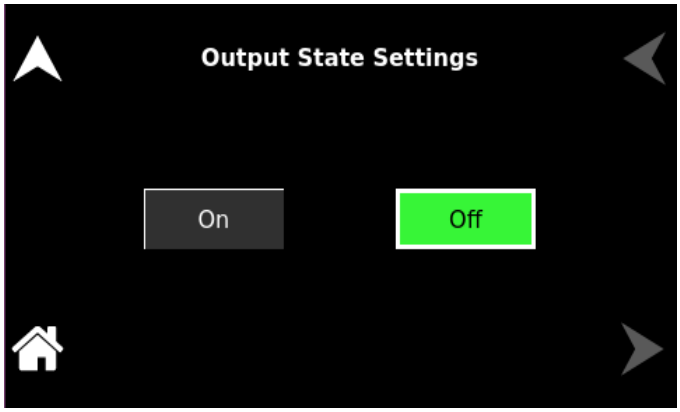


Figure 10-26. Output State Settings

Table 10-10. Output Program screen

b) TEST TYPE – DYNAMIC

When the settings selected ‘PVSIM Mode selection’:

- Oper. Type - Steady State
- Oper. Mode – Standard
- Curve Type – EN50530
    - Test type - ‘Dynamic’

The Output Program screen provides the settings of ‘Irradiance’, ‘Temperature’, ‘Rated power’, ‘Rated Voltage’ and ‘Output State’. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

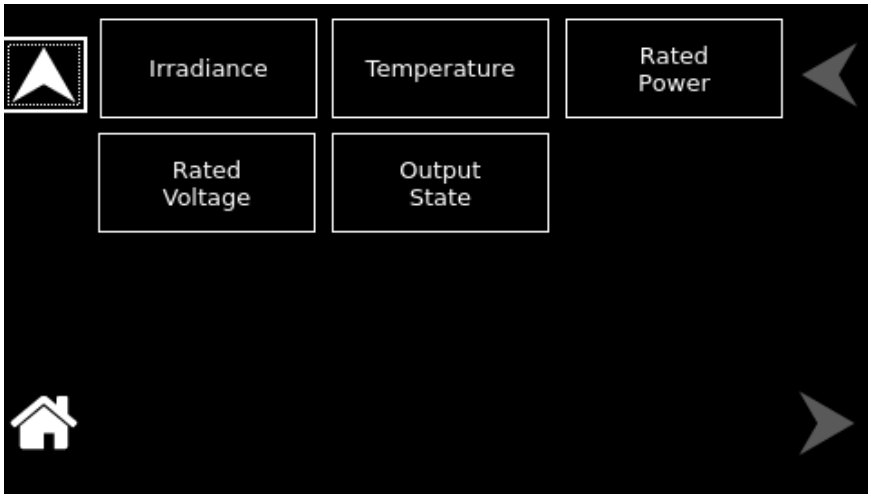


Figure 10-27. Output Program Screen

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Irradiance	Users can set the irradiance value for the curve. Refer to Figure 10-28.

Figure 10-28. Irradiance Setting

ENTRY	DESCRIPTION
Temperature	Users can set the temperature value for the curve. Refer to Figure 10-29.

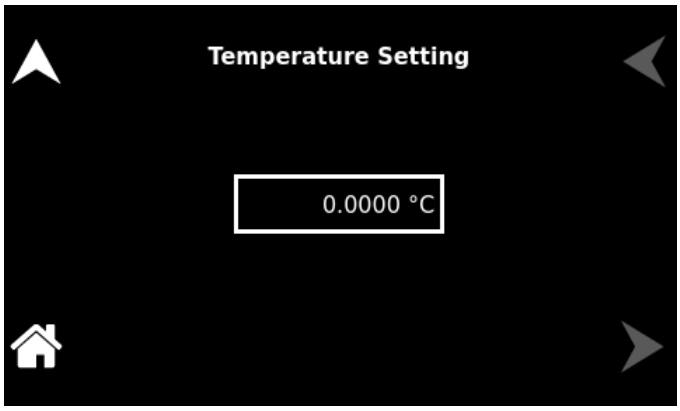


Figure 10-29. Temperature Setting

Rated Power Users can set the rated power value for the curve. Refer to Figure 10-30.

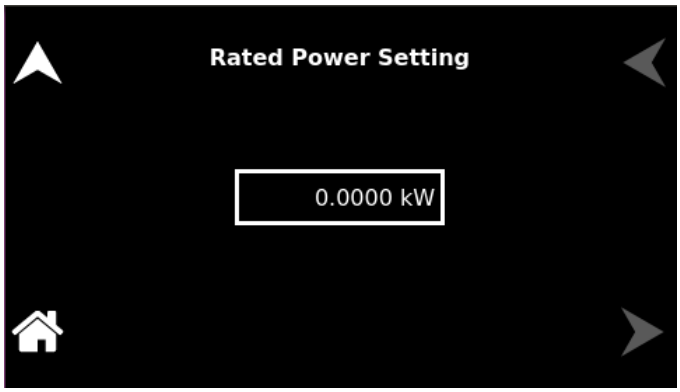


Figure 10-30. Rated Power Setting

Rated Voltage Users can set the rated voltage value for the curve. Refer to Figure 10-31.

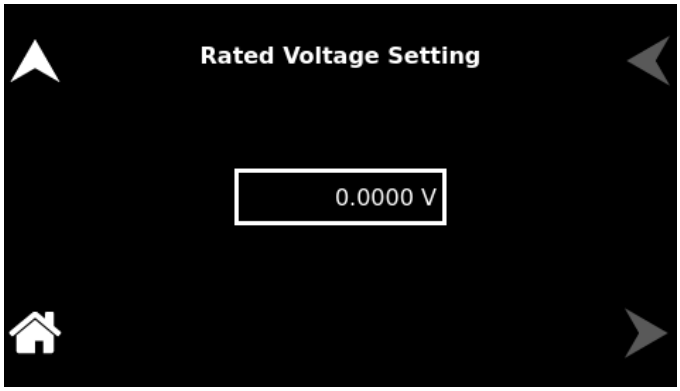


Figure 10-31. Rated Voltage Setting

Output State Users can program the output to ON or OFF state. Refer to Figure 10-32.

ENTRY	DESCRIPTION

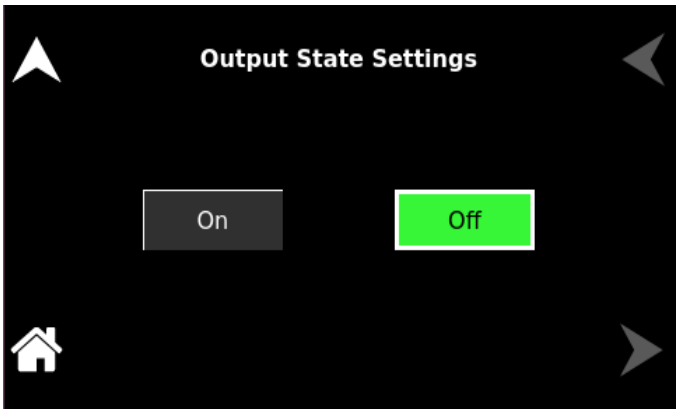


Figure 10-32. Output State Settings

Table 10-11. Output Program screen

10.2.2.1.3 CURVE TYPE – USER

When ‘PVSIM Mode Selection’ is configured as below:

a) Oper. Type - Steady State

b) Oper. Mode – Standard

c) Curve Type - User

The Output Program screen provides the setting of ‘Output State’. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

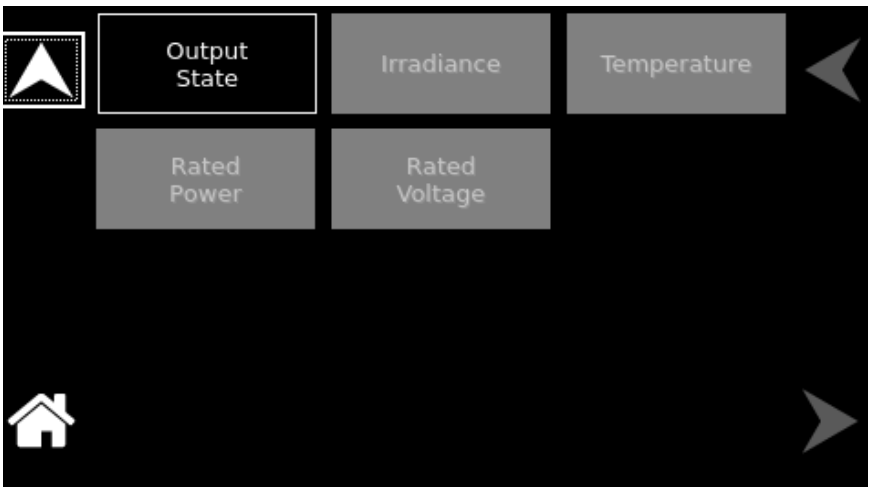


Figure 10-33. Output Program Screen (Oper. Type - Steady State, Oper. Mode - Standard and Curve Type - User)

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 10-34.

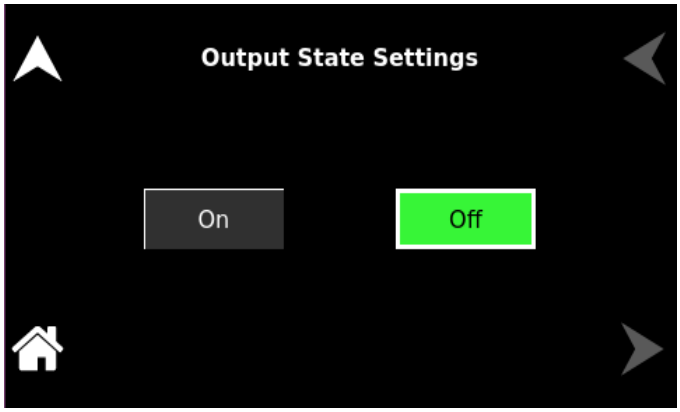


Figure 10-34. Output State Settings

Table 10-12. Output Program screen

10.2.2.2 OPER. MODE – STEADY STATE AND OPER. MODE - ARRAY

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type - Steady State

b) Oper. Mode – Array

The Output Program screen provides the setting of 'Output State'. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

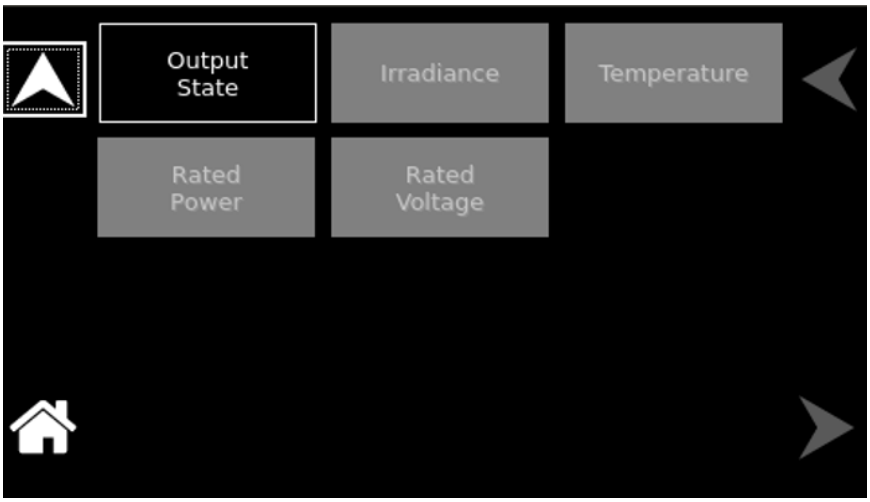


Figure 10-35. Output Program Screen (Oper. Type – Array)

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 10-36.

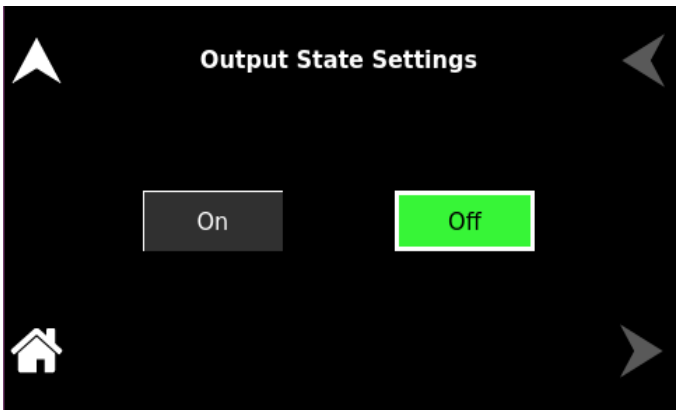


Figure 10-36. Output State Settings

Table 10-13. Output Program screen

10.2.2.1 OPER. TYPE – PROFILE

When the 'Oper. Type – **Profile**' is selected in the 'PVSIM Mode Selection' menu, the following curve types become available:

a) SNL

b) EN50530

The Output Program' screen will change based on the selected curve type, as described below.

10.2.2.1.1 CURVE TYPE – SNL OR EN50530

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type – Profile

b) Curve Type - SNL or EN50530

The Output Program screen provides the setting of 'Output State'. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

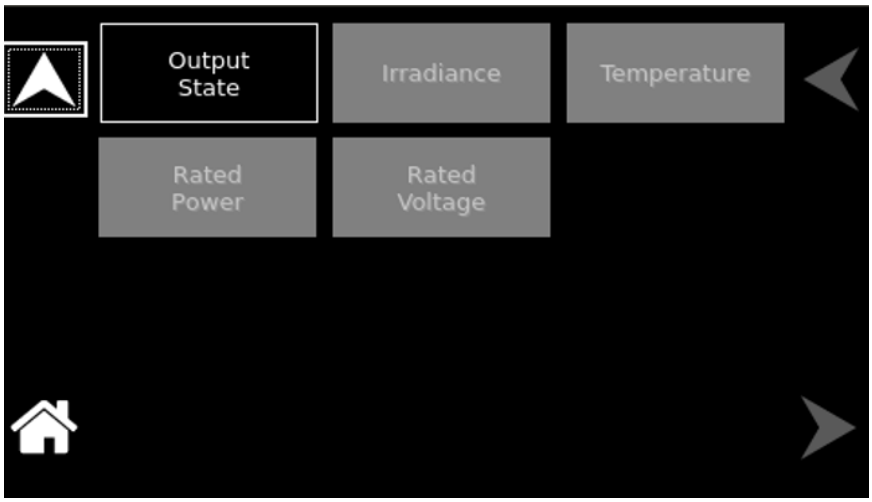


Figure 10-37. Output Program Screen (Oper. Type – Profile and Curve Type – SNL or EN50530)

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 10-38.

ENTRY	DESCRIPTION

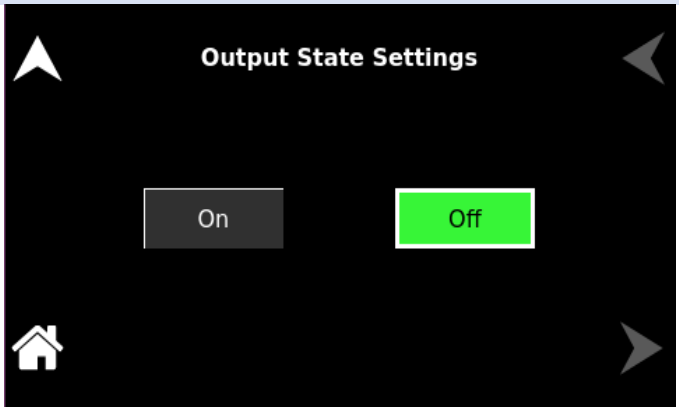


Figure 10-38. Output State Settings

Table 10-14. Output Program screen

10.2.3 MEASUREMENTS SCREEN

The Measurements screen displays the floating-point values for Output ‘Voltage’, Output ‘Current’, Output ‘Power’ and Output ‘MPPT’. For the Measurement screen refer to Figure 10-39 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

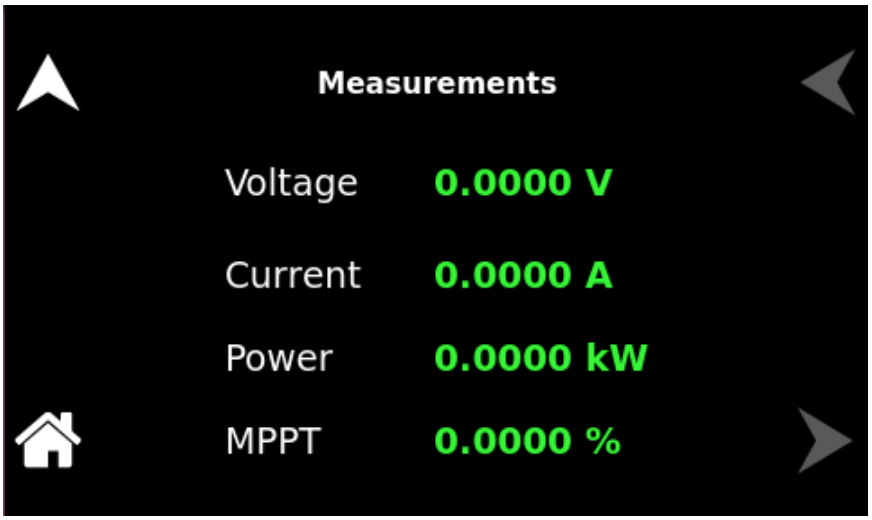


Figure 10-39. Measurement Screen

10.2.4 CONFIGURATION SCREEN

The ‘PVSIM Mode Selection’ menu in the ‘Configuration’ Screen allows the user to configure the settings below:

a) Oper. Type

- Steady State
- Profile

b) Oper. Mode

- Standard
- Array

c) Curve Type

- SNL
- EN50530
- User

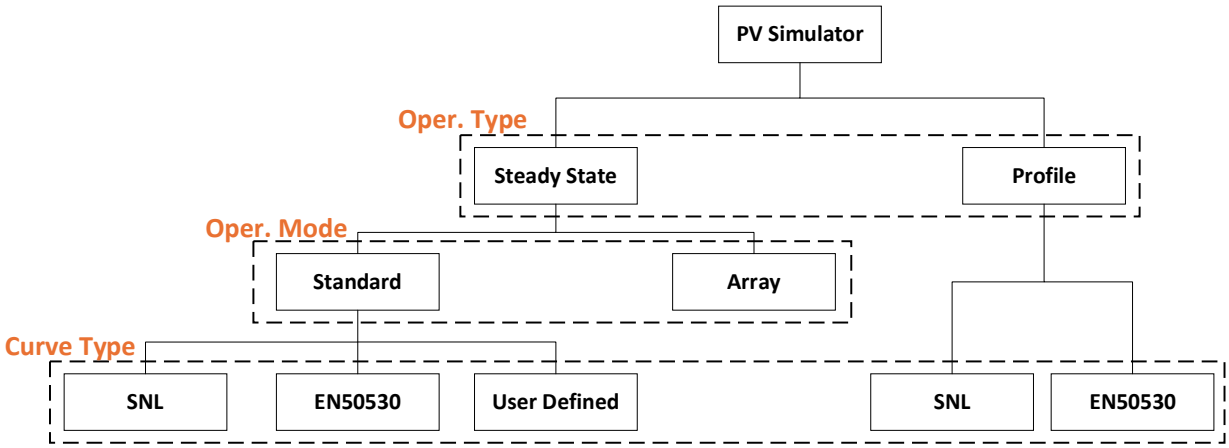


Figure 10-40. PVSIM mode Selection Setting

The front panel will not support all the modes in PV Simulator, to operate all the modes Virtual panels can be used. Refer to Figure 10-40 for the available PV Simulator modes and the Table 10-15 for the front panel support. The configuration screen will change based on the user's selection.

Oper. Type	Oper. Mode	Curve Type	Front Panel Support
Steady State	Standard	SNL	Yes
Steady State	Standard	EN50530	Yes
Steady State	Standard	Userdefined	Partial
Steady State	Standard	NA	Only view in the dashboard
Profile	NA	SNL	Only view in the dashboard
Profile	NA	EN50530	Only view in the dashboard

Table 10-15. PVSIM mode Selection Setting – Front Panel Support

10.2.4.1 PVSIM MODE SELECTION

The 'PVSIM Mode Selection' menu is used to configure different operating types, operating modes and curve types of PV simulator operation. Depending on the selection made in these settings, the 'Dashboard', 'Output program' and 'Configuration Screen' will change. Refer the Figure 10-41 to Figure 10-43.

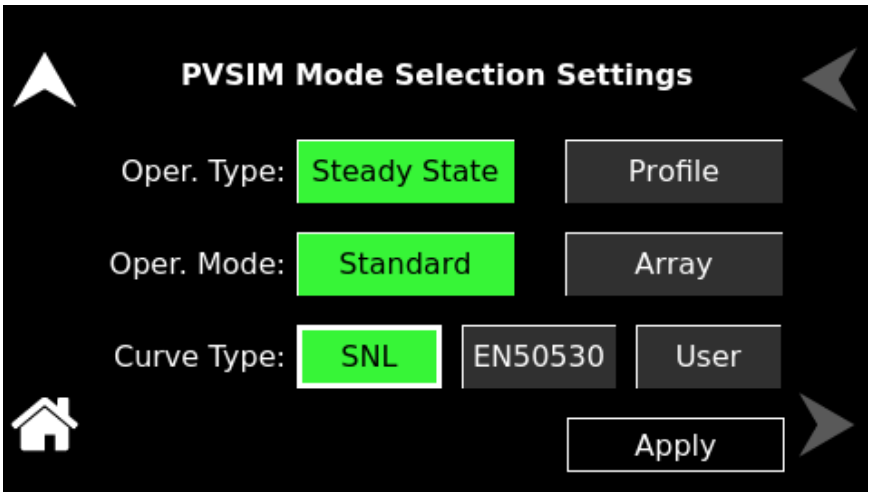


Figure 10-41. PVSIM Mode Selection Settings (Oper. Type -Steady State, Oper. Mode- Standard and Curve type – SNL)

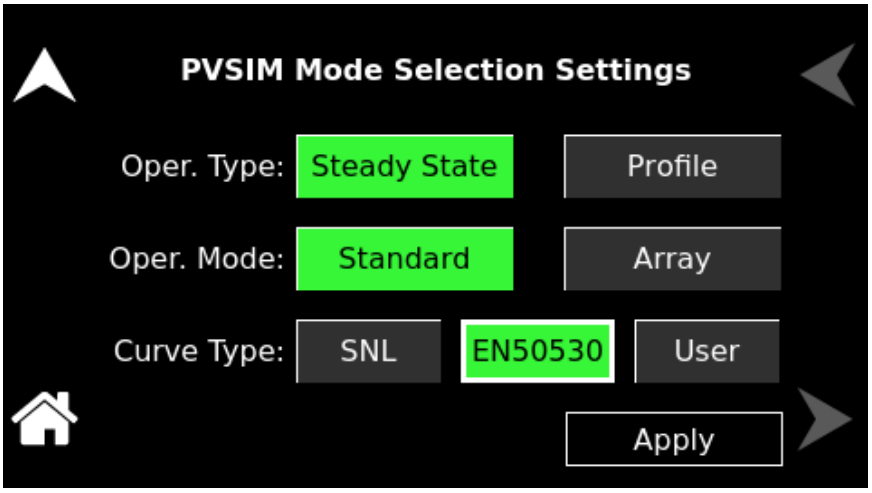


Figure 10-42. PVSIM Mode Selection Settings (Oper. Type -Steady State, Oper. Mode- Standard and Curve type – EN50530)

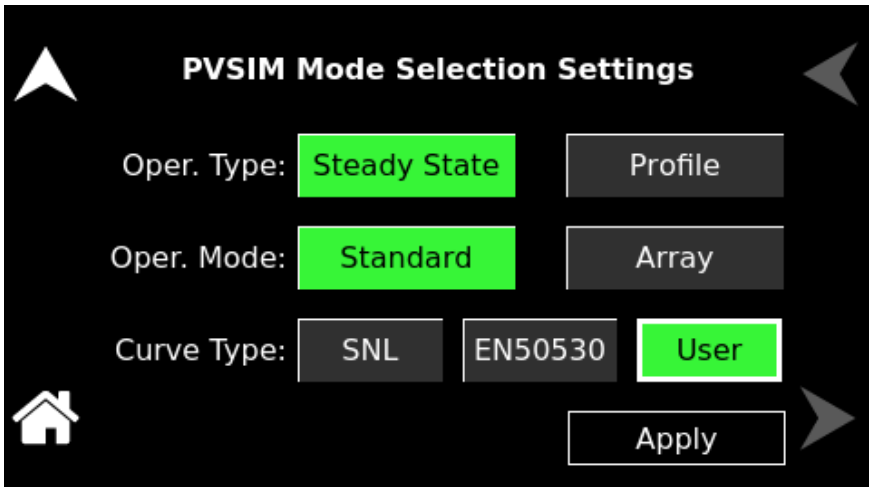


Figure 10-43. PVSIM Mode Selection Settings (Oper. Type -Steady State, Oper. Mode- Standard and Curve type – User)

The 'Oper. Type - **Profile**' and 'Oper. Mode - **Array**' cannot be configured through the front panel of the Mi-Beam. If these settings are selected through the front panel, the screen will display as 'This feature is not supported in Front Panel'. Refer to Figure 10-44.

Figure 10-44. PVSIM Mode Selection Settings (Oper. Type -Profile or Oper. Mode - Array)

The 'Oper. Type - **Profile**' and Oper. Mode - **Array**' can only be configured through the Virtual panel. If these settings are selected through the Virtual panel, the selected settings will be displayed on the Mi-beam front panel screen. Refer to Figure 10-45 to Figure 10-49.

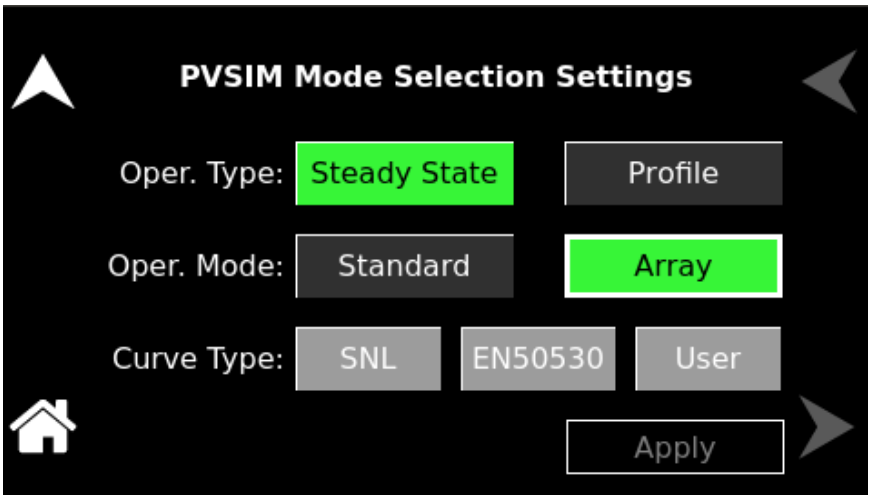


Figure 10-45. PVSIM Mode Selection Settings (Oper. Type -Steady State and Oper. Mode - Array)

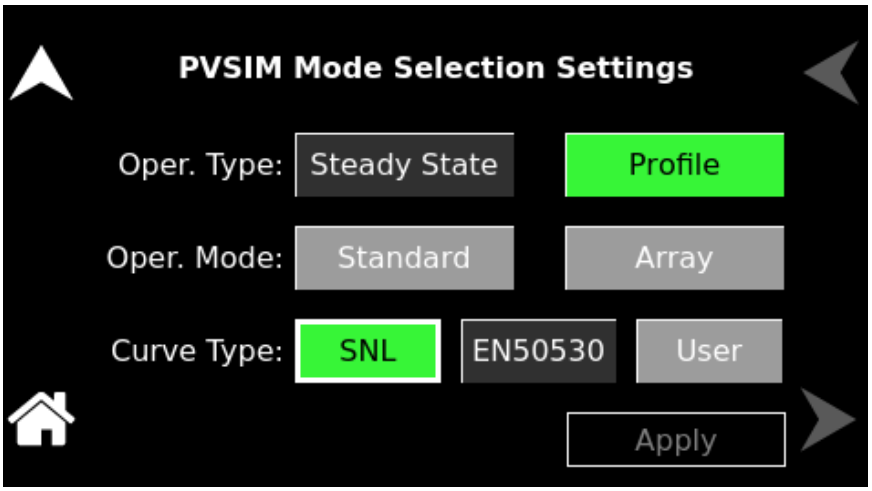


Figure 10-46. PVSIM Mode Selection Settings (Oper. Type -Profile and Curve Type - SNL)

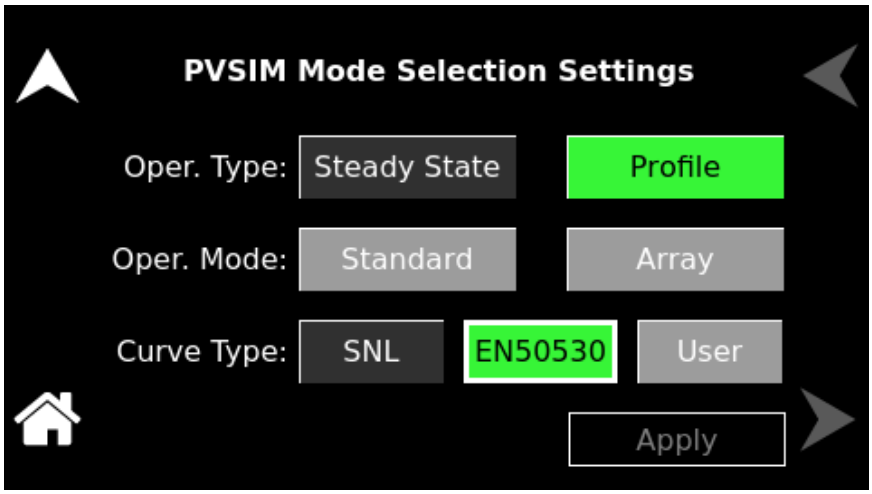


Figure 10-47. PVSIM Mode Selection Settings (Oper. Type -Profile and Curve Type – EN50530)

ENTRY[1]	DESCRIPTION
Oper. Type	Sets the operating type of the PV Simulator. **a) Steady State:** User can change the parameters of a PV Curve when required in real time. **b) Profile:** User can set the irradiance and temperature values of the PV curve (only SNL and EN50530 curves) using an irradiance and temperature profile, which will change with respect to time.
Oper. Mode	Sets the operating Mode of the PV Simulator for Steady State Operating Type ('Oper. Mode' is not applicable when the 'Oper. Type' is selected to 'Profile') **a) Standard:** Used to simulate a single PV cell, various types of PV curves supported are; • SNL(Standard No Load) Curve • EN50530 Curve • User Defined curve. **b) Array:** Simulates multiple PV cells connected in an array.
Curve Type	Sets the Curve type of the PV simulator: **a) SNL:** Standard No Load **b) EN50530:** Standard for measuring the efficiency of MPPT in grid-connected photovoltaic inverters.

ENTRY[1]	DESCRIPTION
	c) User: User can create customized PV curve by entering V (Voltage) vs I (Current) points.
[1] *Explanation provided for individual settings, for possible combinations that can be done in PVSIM mode Refer to Figure 10-40.*	

Table 10-16. PVSIM Mode Selection Settings

10.2.4.2 OPER. TYPE - STEADY STATE AND OPER. MODE - STANDARD

10.2.4.2.1 CURVE TYPE – SNL OR USER

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type - Steady State

b) Oper. Mode - Standard

c) Curve type - SNL or User

The Configuration Screen provides the settings of 'PVSIM Mode Selections', 'Curve Selection', 'Protection', 'Output Sense', 'PONS' and 'Measurement Average Samples'.

For the top-level menu of the 'Configuration screen', refer to Figure 10-48 and for the instructions on how to navigate, refer to Section 6.4.2.1.

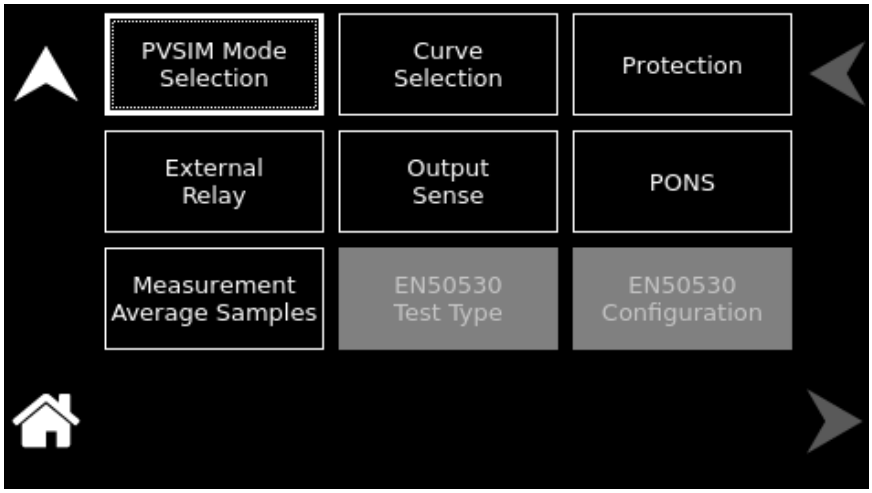


Figure 10-48. Configuration Screen (Curve Type – SNL or User)

10.2.4.2.1.1 CURVE SELECTION

a) SNL CURVE

The curve selection function is set to ‘Curve type - **SNL**’, enabling users to simulate various PV module characteristics by adjusting key parameters such as open circuit voltage, short circuit current, maximum power voltage, and maximum power current.

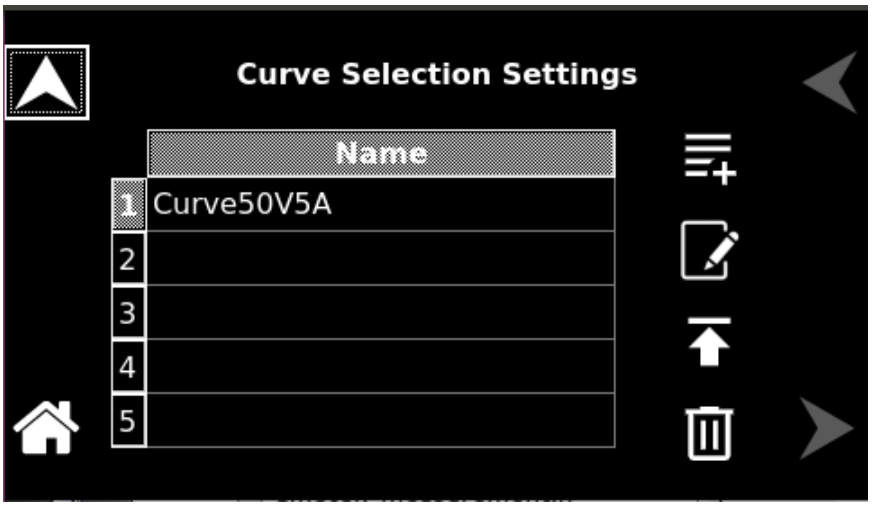


Figure 10-49. Curve Selection Settings - Upload button enabled (Curve Type - SNL)

- **Adding a Curve in ‘Curve Selection Settings’**
    - Open the Curve Selection Settings and select the ‘Add Curve’ option on the right side of the screen. Refer to Figure 10-50.

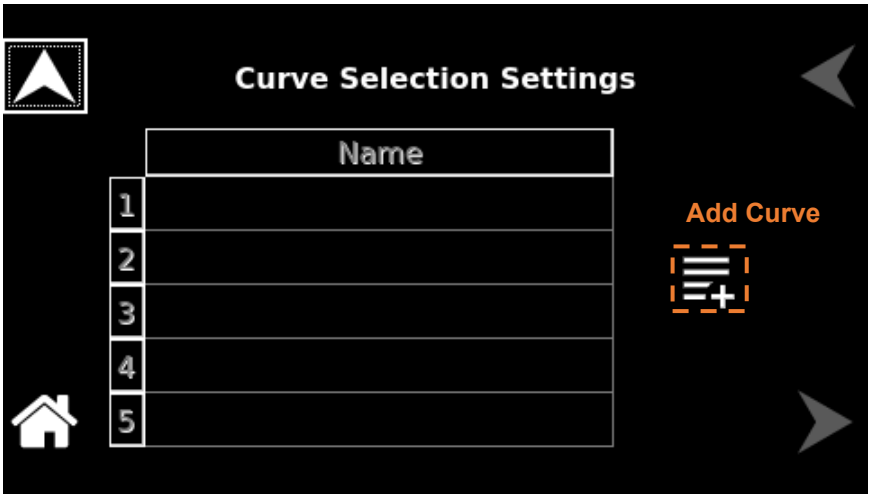


Figure 10-50. Curve Selection

    - An alphanumeric keypad will open, allowing the user to enter a curve name and click ‘OK’ to confirm the entered name. Refer to Figure 10-51.

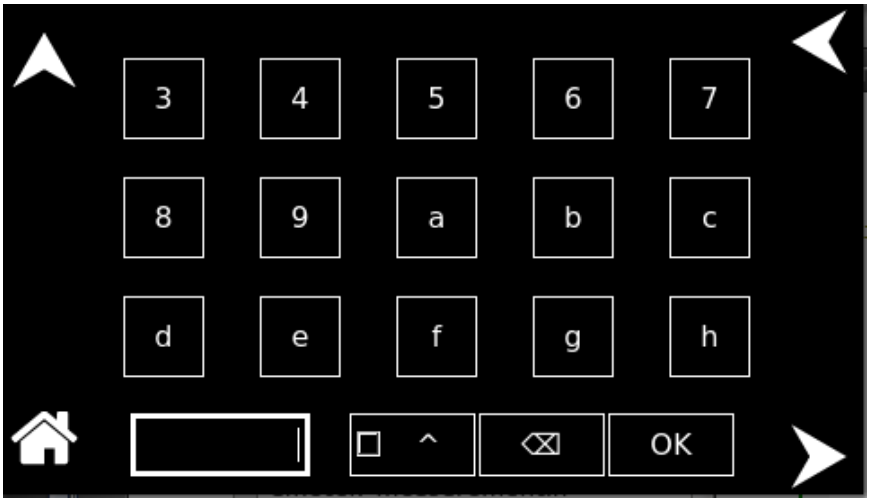
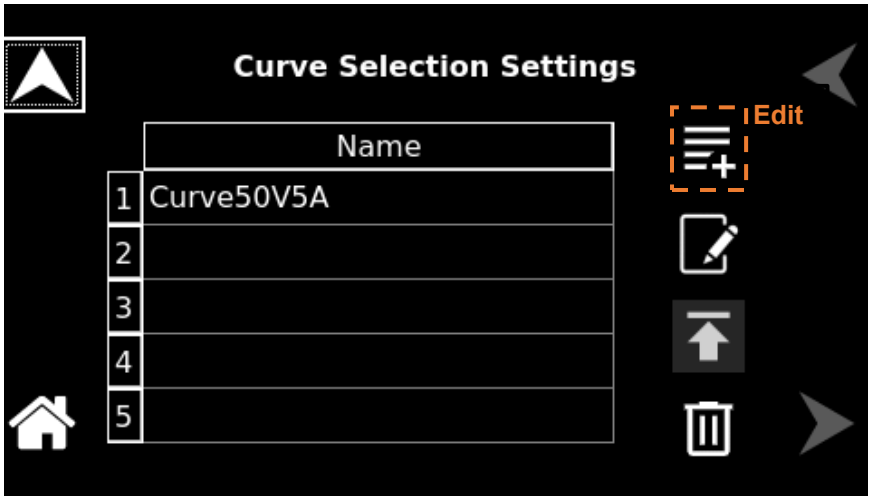


Figure 10-51. Alpha - numeric keypad

- **Edit the values of the Curve in 'Curve Selection Settings'**
    - The created curve will have default values. If the user want to change the default values, click on the 'Edit' option.
    - The created curve name will be displayed at the top of the screen when the 'Edit' option is clicked. Refer to Figure 10-52.
    - The functions available in 'Screen 1' are 'Open Circuit Voltage (Voc) , Short Circuit Current (Isc), Current at Maximum Power (Imp) and Fill Factor'. Refer to Figure 10-52.
    - 'Vmp' and 'Imp' will only be available when the 'Fill Factor' checkbox is unchecked. The fill factor value will be automatically calculated by analyzing the entered values of 'Vmp' and 'Imp'. Refer to Figure 10-52.



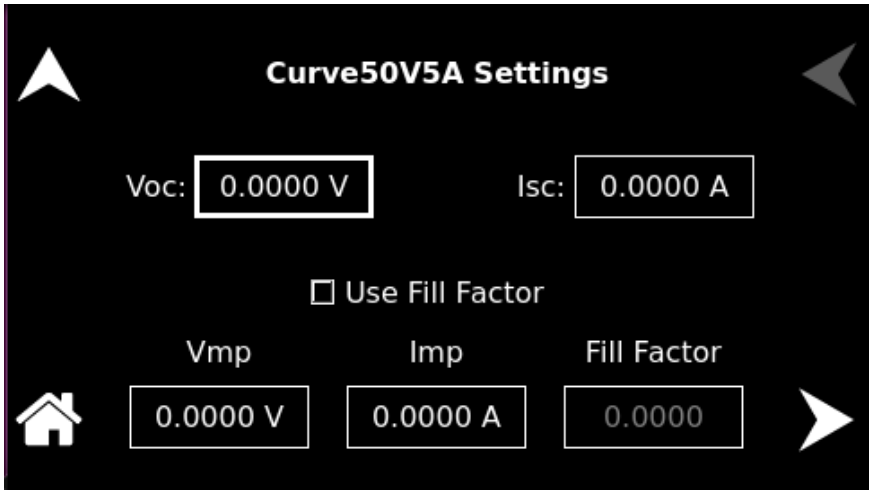


Figure 10-52. Curve Settings

- If the user has the fill factor value, select the 'Use Fill Factor' checkbox option to enable and to enter the 'Fill Factor' value. The 'Vmp' and 'Imp' values will be automatically calculated. Refer to Figure 10-53.

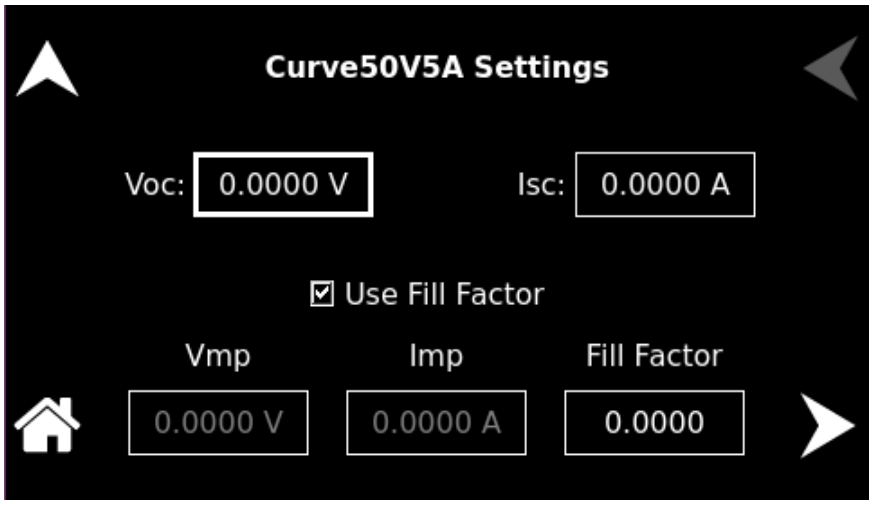


Figure 10-53. Curve Setting - Fill factor enabled

- Use the navigation arrows to change the screen to 'Screen 2' and enter the values of 'Temperature Coefficients' and 'Irradiance Correction'. Refer to Figure 10-54.

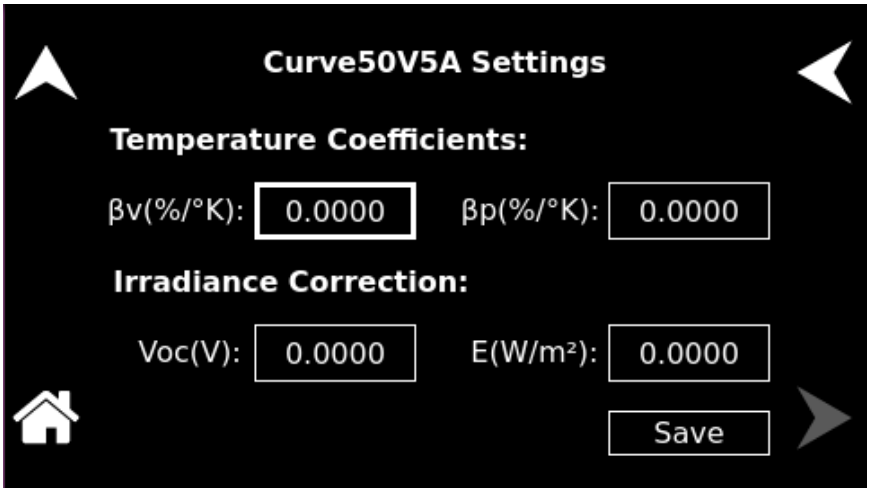


Figure 10-54. Curve Setting - Screen 2

ENTRY	DESCRIPTION
Voc	Maximum voltage from a solar panel without a load
Isc	Maximum current from a solar panel when short-circuited.
Vmp	Voltage when the panel operates at peak performance.
Imp	Current at the panel's maximum power point.
Fill Factor	Ratio of maximum power to the product of Voc and Isc.
βv (%/°K)	The temperature coefficient for voltage shows how voltage changes with temperature.
βp (%/°K)	The temperature coefficient for power shows how power changes with temperature.
Voc (V)	Open circuit voltage for irradiance correction.
E (W/m²)	Power of sunlight per square meter.

Table 10-17. Screen 1 and 2 – Profile Settings

- Once curve is configured, click on the ‘Save’ option to save the settings.

NOTE: When multiple setting screens are present, the ‘Save’ option will only be available on the last screen. Ensure to click the ‘Save’ option to save the settings.

- **Load the Curve in ‘Curve Selection Settings’**
  - Load the defined Curve by clicking the ‘Upload’ option. Refer to Figure 10-55.

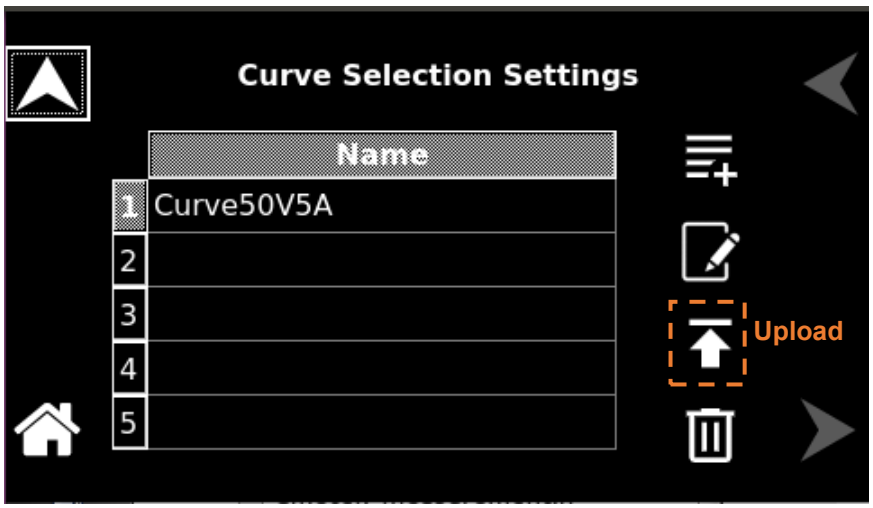


Figure 10-55. Curve Selection Settings - Upload button enabled

- The 'Upload button' will be disabled when the curve is loaded to the unit. Refer to Figure 10-56.

- **Delete the Curve in 'Curve Selection Settings'**

  - Click on 'Delete' to remove the existing or loaded curve. Refer to Figure 10-56.

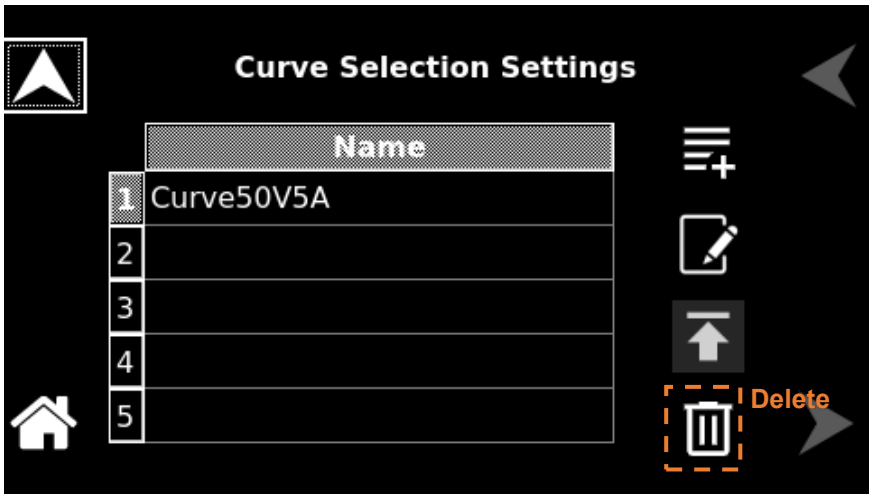


Figure 10-56. Curve Setting - Upload Disabled and Delete Option

b) USERDEFINED CURVE

The user-defined curve, IV curve of the PV simulator, can be directly configured by uploading 1024 points of current (I) and corresponding voltage (V) from a file. This configuration is only possible through virtual panels. Once configured, these user-defined curves can be selected and uploaded from the front panel.

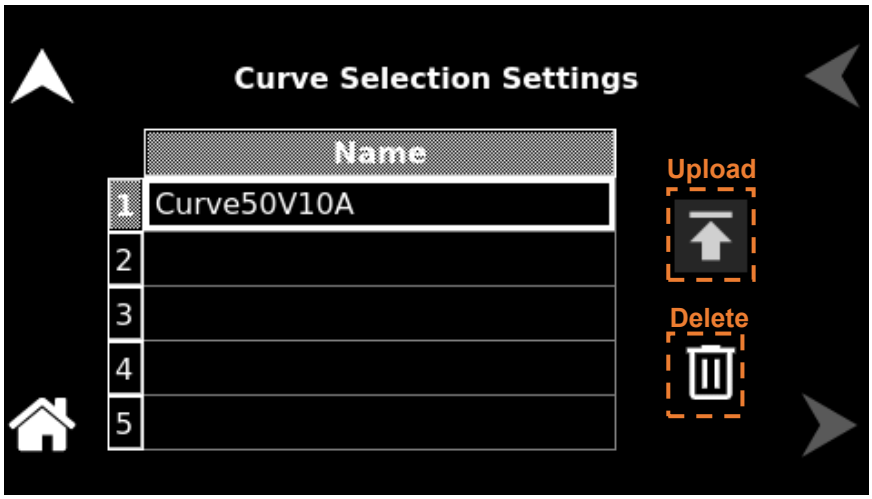


Figure 10-57. Curve Selection Settings - Upload button disabled (Curve Type - User)

- **Load the Curve in 'Curve Selection Settings'**
  - The user can load a curve defined in the virtual panel by selecting the 'Upload' button. Refer to the Figure 10-57.
- **Delete the Curve in 'Curve Selection Settings'**
  - Click on 'Delete' to remove the existing or loaded curve if it is not needed. Refer to Figure 10-57.

10.2.4.2.1.2 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 10-58.

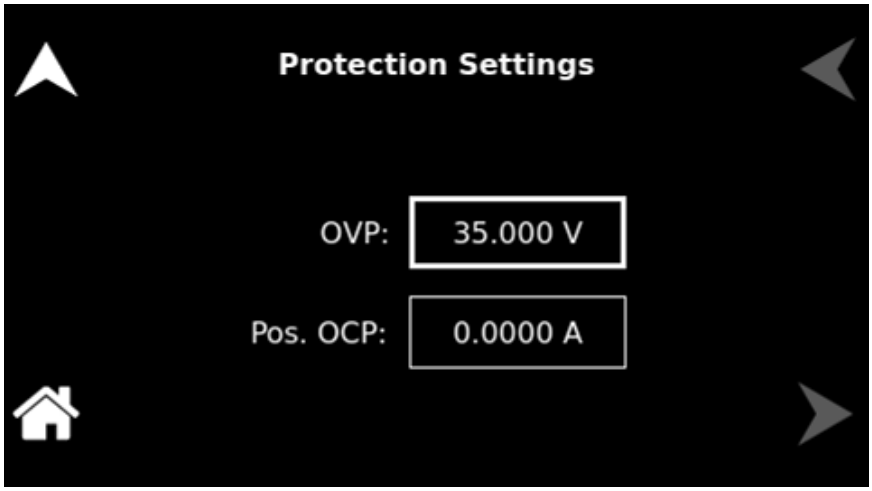


Figure 10-58. Protection Settings

10.2.4.2.1.3 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits.

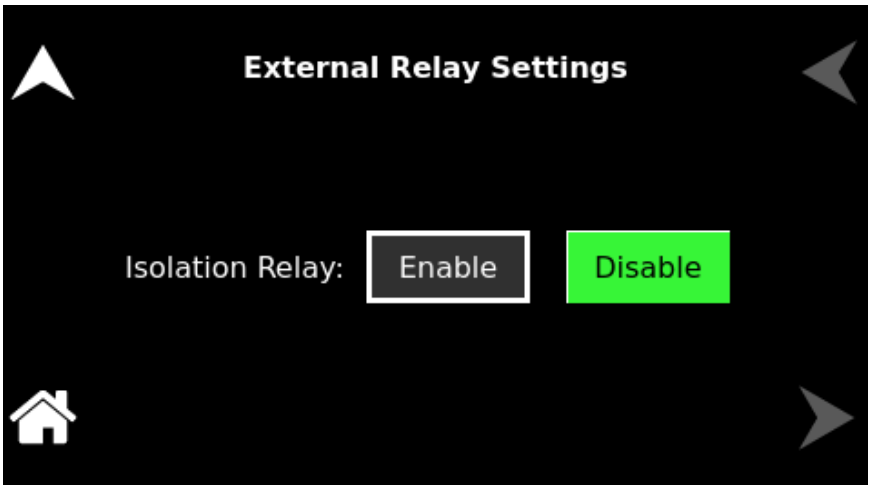


Figure 10-59. External Relay Settings

10.2.4.2.1.4 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS connector. Refer to Figure 10-60.

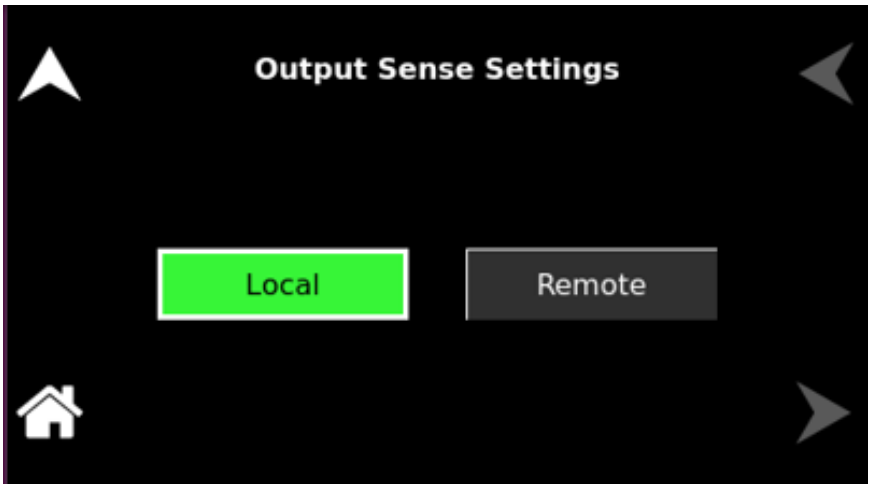


Figure 10-60. Output Sense Settings

10.2.4.2.1.5 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings. Refer to Figure 10-61.

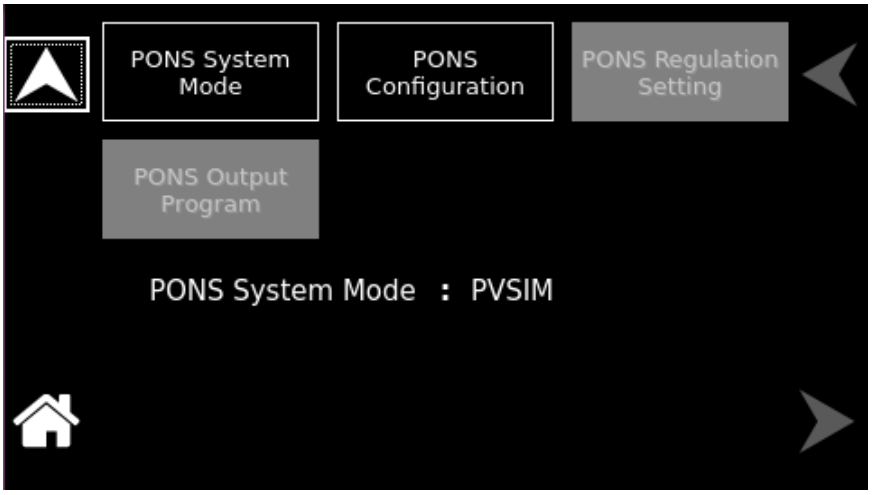


Figure 10-61. PONS – Main Screen

a) PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the 'Operating Mode' settings on the Home screen. Users must separately select the ‘PVSIM’ mode in the 'PONS Operating Mode Settings', which will update both the 'PONS Operating Mode Settings' screen and the 'PONS Configuration' screen. Refer to Figure 10-62 and Figure 10-63.

The same applies to other modes such as Bi-DIR, SOUR, ELOAD, BATSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 9.2.5.7.1, 11.2.4.7.1 and 12.2.4.6.

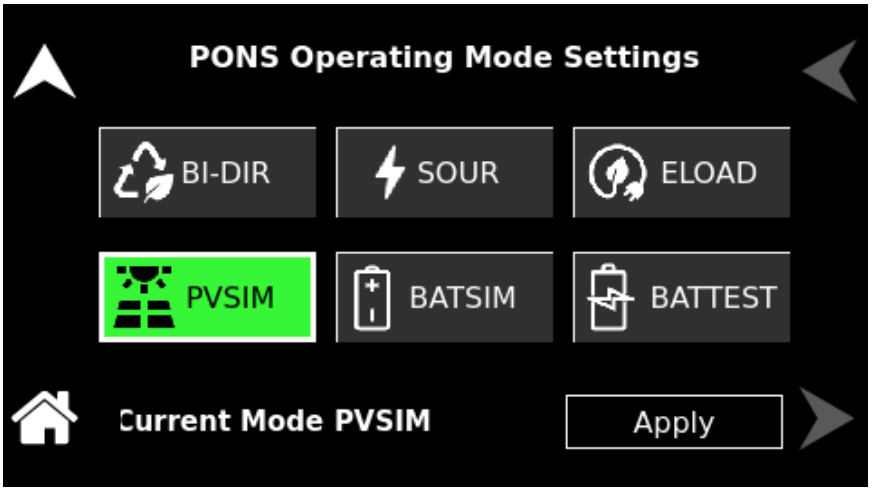


Figure 10-62. PONS Operating Mode Settings

b) PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select PONS Protection, PONS Slew Rate, PONS Output Sense, PONS Measurement Average Samples PONS Remote Inhibit and PONS AC Input Line. Refer to Figure 10-63.

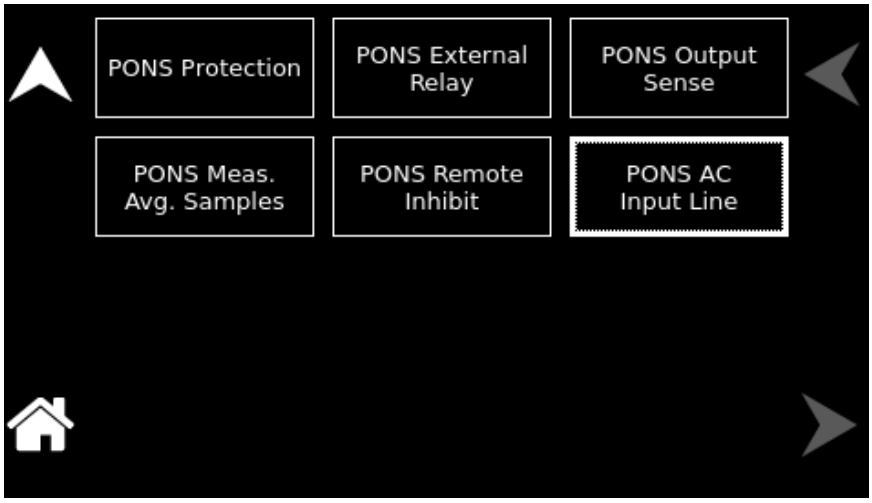


Figure 10-63. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	User can define OVP and Pos. OCP to help safeguard their devices from electrical anomalies. Refer to Figure 10-64.

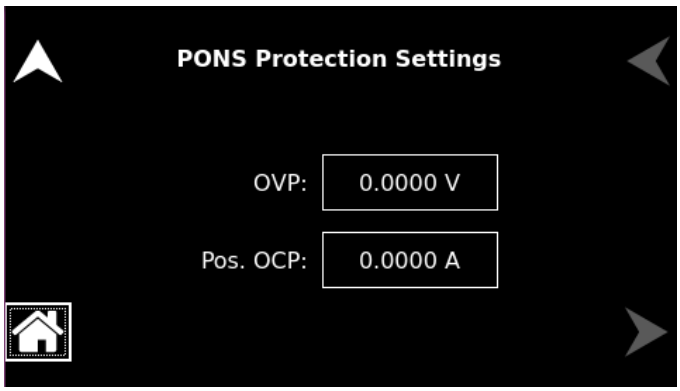


Figure 10-64. PONS Protection Settings

PONS Slew Rate	User can configure the voltage slew rate. This allows for precise control over the voltage, ensuring smoother transitions and better performance of the power supply. Adjusting this settings can help in optimizing the response time and stability of the system. Refer to Figure 10-65.

ENTRY	DESCRIPTION

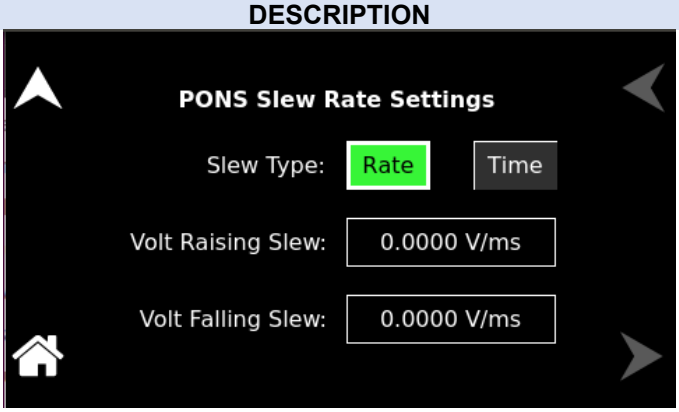


Figure 10-65. PONS Slew Rate Settings – Voltage

PONS Output Sense

User can program the PONS output to ON or OFF state Refer to Figure 10-66.

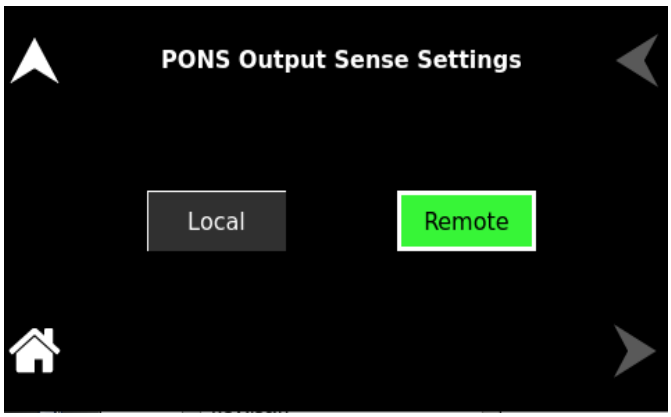


Figure 10-66. PONS Output Sense Settings

PONS Measurement Average Samples

User can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-67.

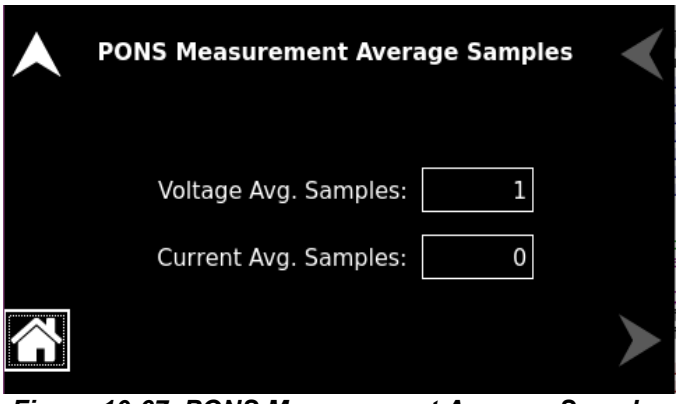


Figure 10-67. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can

ENTRY	DESCRIPTION

be particularly useful for safety and operational control in various applications. Refer to Figure 10-68.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

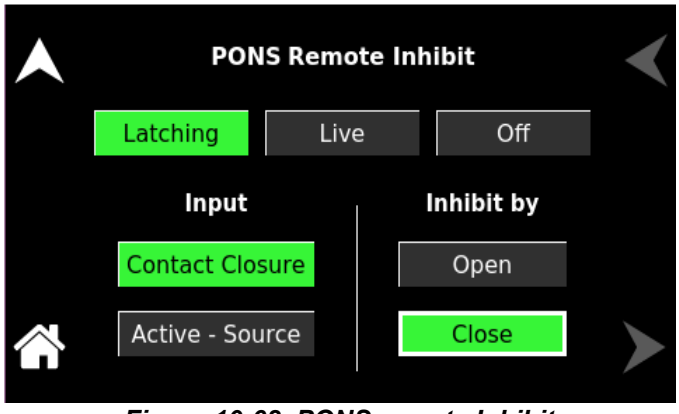


Figure 10-68. PONS remote Inhibit

PONS AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 10-69.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

ENTRY	DESCRIPTION

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

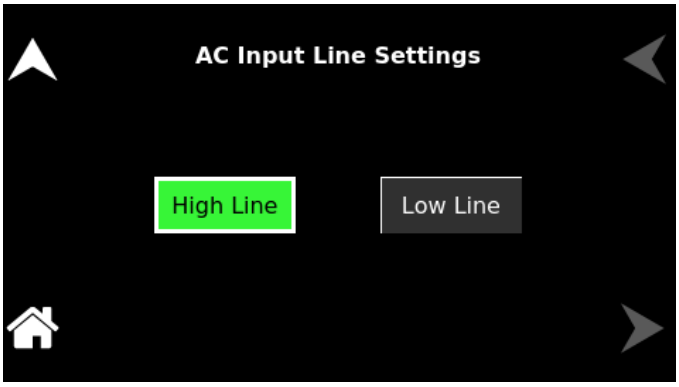


Figure 10-69. AC Input Line Settings

Table 10-18. PONS Configuration mode

10.2.4.2.1.6 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-70.

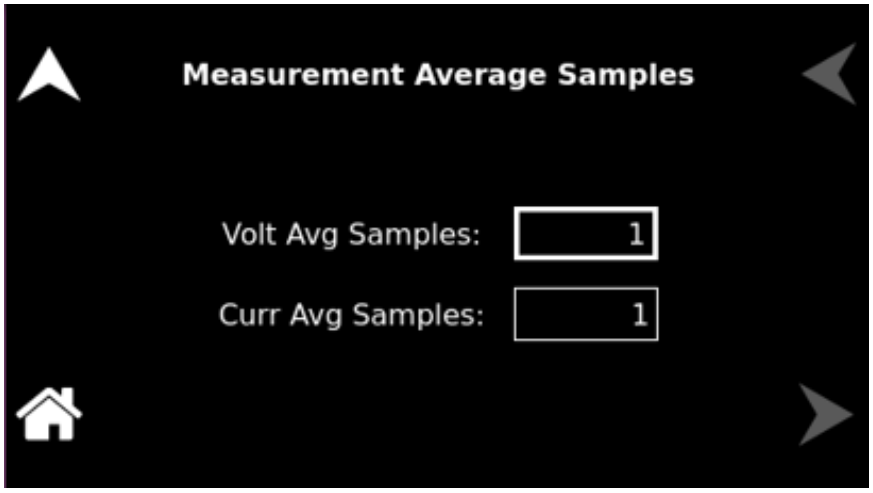


Figure 10-70. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory

ENTRY	DESCRIPTION
	default) provides the fastest response time in the readings, but less rejection of noise.

Table 10-19. Measurement Average Samples

10.2.4.2.2 CURVE TYPE – EN50530

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type - Steady State

b) Oper. Mode - Standard

c) Curve type – EN50530

The Configuration Screen' provides the settings of PVSIM Mode Selections, EN50530 Test Type, EN50530 Configuration, Protection, Output Sense, PONS and Measurement Average Samples.

For the top-level menu of the Configuration screen, refer to Figure 10-71 and for the instructions on how to navigate, refer to Section 6.4.2.1.

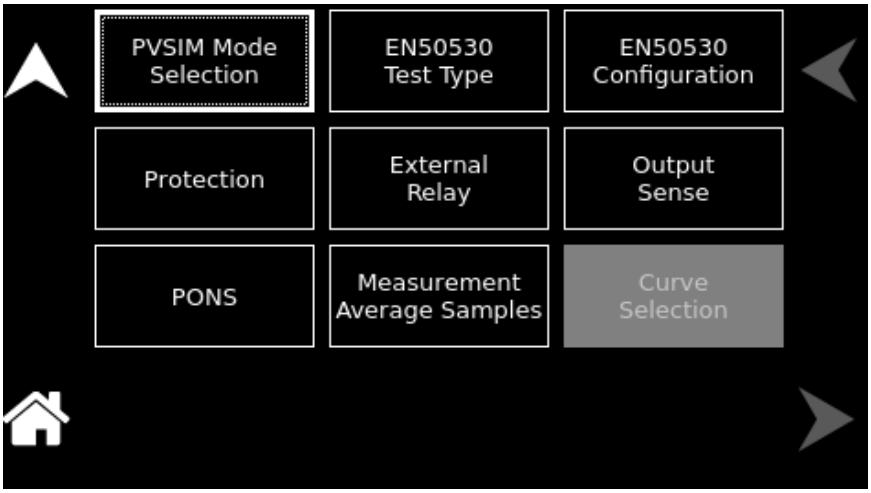


Figure 10-71. Configuration Screen (Curve Type – EN50530)

10.2.4.2.2.1 EN50530 TEST TYPE

The 'EN50530 Test Type' setting in the Configuration Screen enables users to select 'Static' or 'Dynamic' test types for EN50530 curve. Refer to the Figure 10-72.

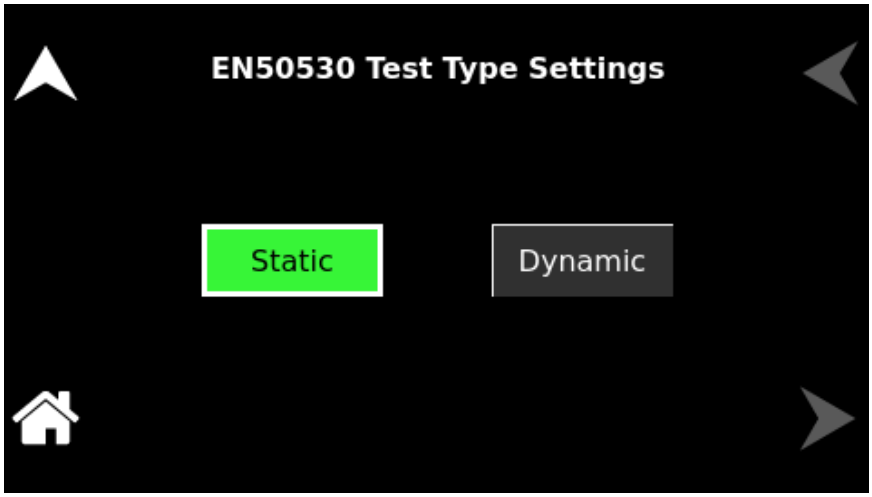


Figure 10-72. Configuration Screen

10.2.4.2.2.2 EN50530 CONFIGURATION

The 'Tech. Type' setting on the EN50530 'Configuration Screen' enables users to select between Rated Power, Rated Voltage, and cSi and Thin Film technology types and its Edit Coefficients. Refer to Figure 10-73 and Figure 10-74.

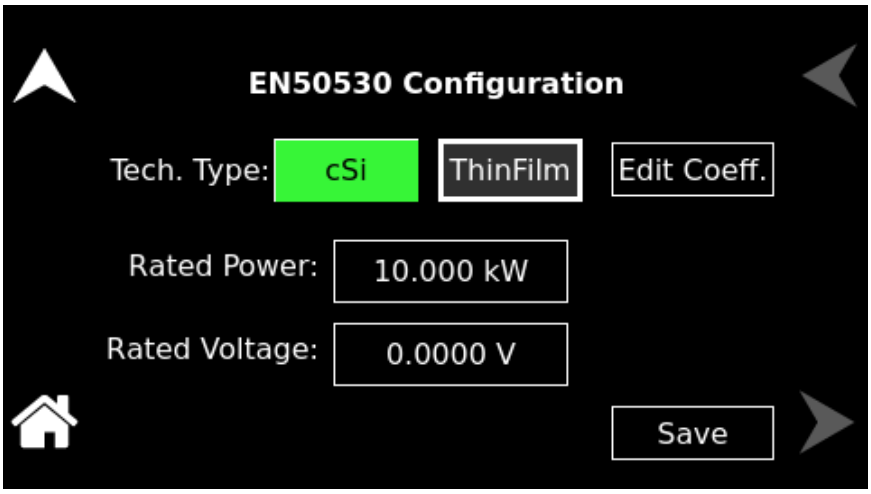


Figure 10-73. EN50530 Configuration (Tech. Type – cSi)

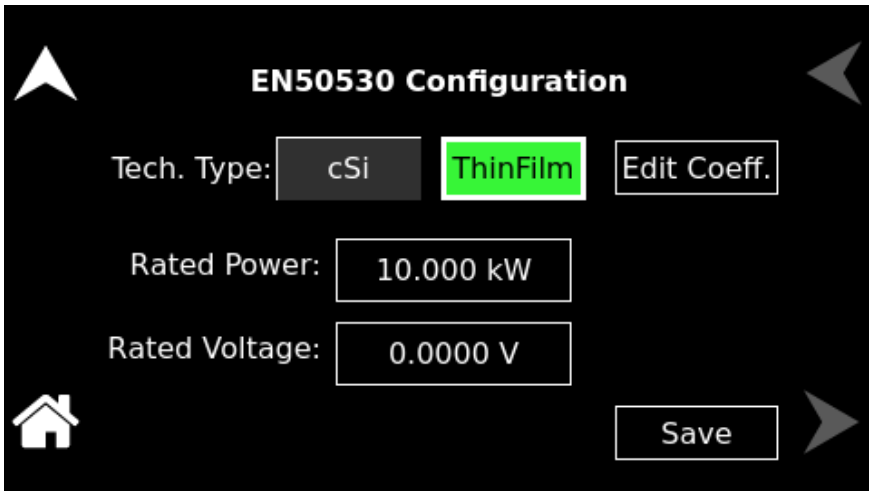


Figure 10-74. EN50530 Configuration (Tech. Type – Thin Filim)

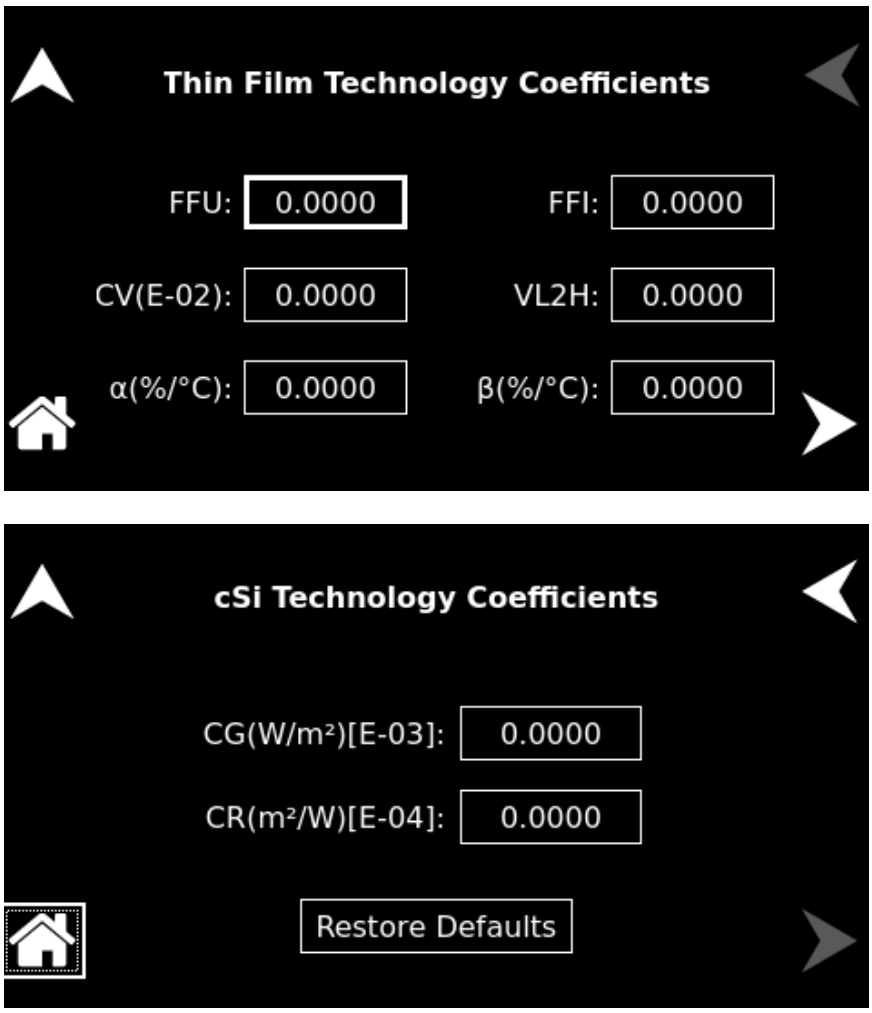


Figure 10-75. cSi and Thin Filim Technology Coefficients

ENTRY	DESCRIPTION
Tech. Type	This technology type defines the overall operational behavior of the system: **a) Thin Film:** User can set the technology type to Thin Film. Refer to Figure 10-74. **b) cSi:** User can set the technology type to cSi. Refer to Figure 10-73.
Edit Coeff.	These settings specify the operational conditions used in the simulation, ensuring consistency and comparability across different tests: **a) FFU:** User can set the Fill Factor Unit. Refer to Figure 10-75. **b) CV(E-02):** User can set the Coefficient of Variation. Refer to Figure 10-75. **c) α (%/°C):** User can set the Temperature Coefficient of Power. Refer to Figure 10-75. **d) FFI:** User can set the Fill Factor Index. Refer to Figure 10-75. **e) VL2H:** User can set the Voltage Level to Height. Refer to Figure 10-75. **f) β (%/°C):** User can set the Temperature Coefficient of Voltage. Refer to Figure 10-75. **g) CG(W/m^2)[E-03]:** User can set the Global irradiance. Refer to Figure 10-75. **h) CR(m2/W)[E-04]:** User can set the Conversion Ratio. Refer to Figure 10-75. **i) Restore Default:** User can click on 'Restore Default' to reset all settings to their original factory values. Refer to Figure 10-75.
Rated Power	User can set the rated power value for the curve. Refer to Figure 10-73 and Figure 10-74.
Rated Voltage	User can set the rated voltage value for the curve. Refer to Figure 10-73 and Figure 10-74.

Table 10-20. EN50530 Configuration

10.2.4.2.2.3 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 10-76.

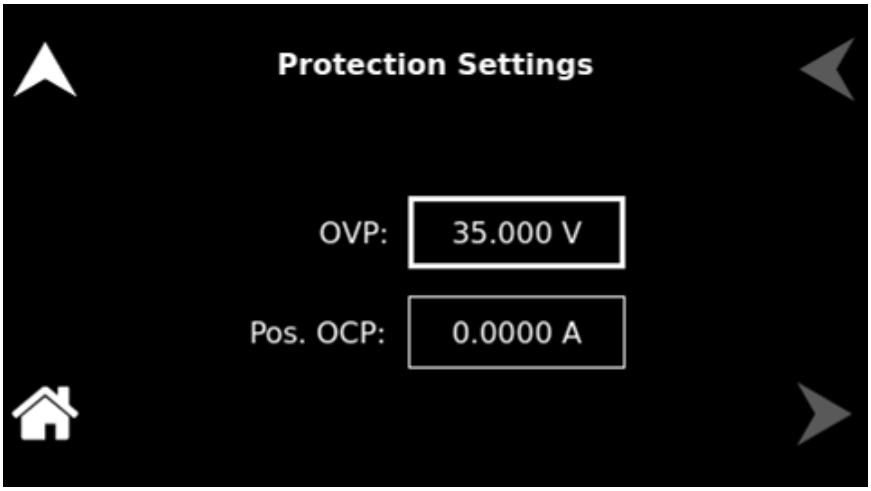


Figure 10-76. Protection Settings

10.2.4.2.2.4 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits.

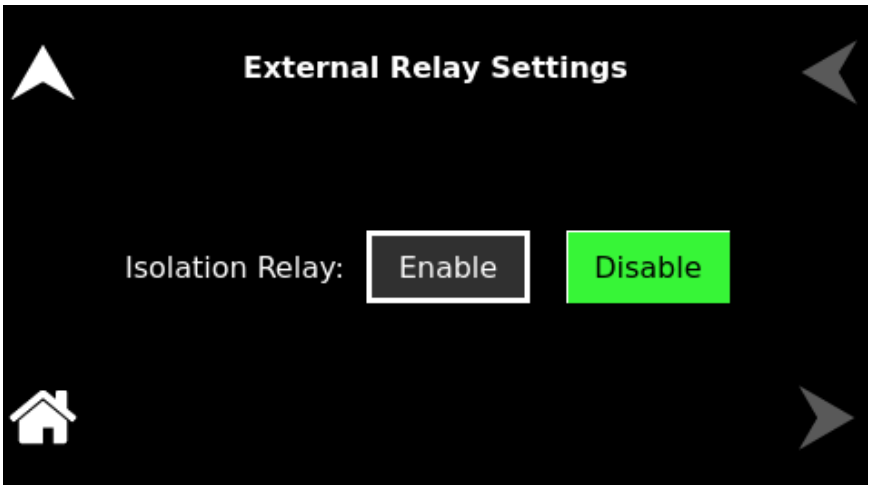


Figure 10-77. External Relay Settings

10.2.4.2.2.5 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS connector. Refer to Figure 10-78.

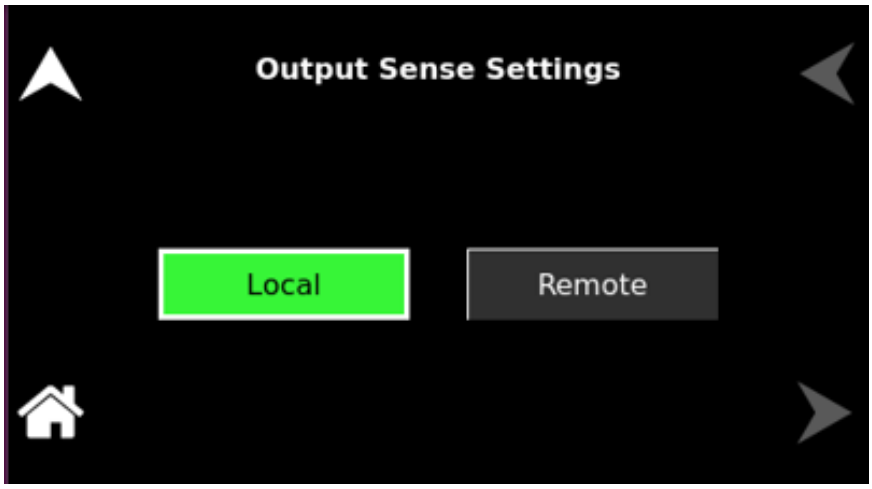


Figure 10-78. Output Sense Settings

10.2.4.2.2.6 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings. Refer to Figure 10-79.

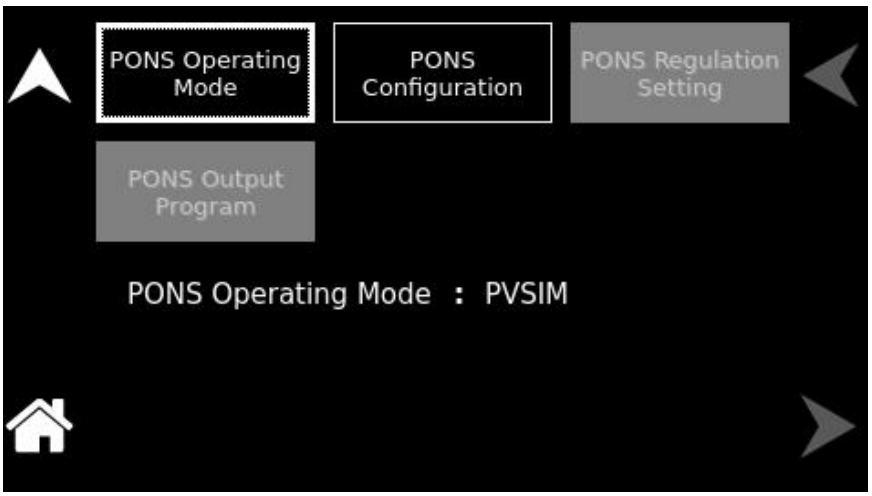


Figure 10-79. PONS – Main Screen

a) PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the 'Operating Mode' settings on the Home screen. Users must separately select the 'PVSIM' mode in the 'PONS Operating Mode Settings', which will update both the 'PONS Operating Mode Settings' screen and the 'PONS Configuration' screen. Refer to Figure 10-80 and Figure 10-81.

The same applies to other modes such as Bi-DIR, SOUR, ELOAD, BATSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 9.2.5.7.1, 11.2.4.7.1 and 12.2.4.6.

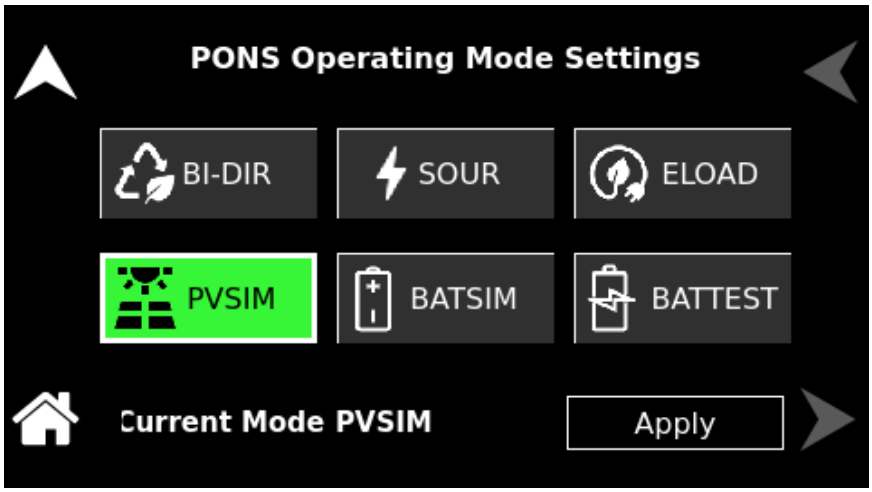


Figure 10-80. PONS Operating Mode Settings

b) PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select PONS Protection, PONS Slew Rate, PONS Output Sense, PONS Measurement Average Samples PONS Remote Inhibit and PONS AC Input Line. Refer to Figure 10-81.

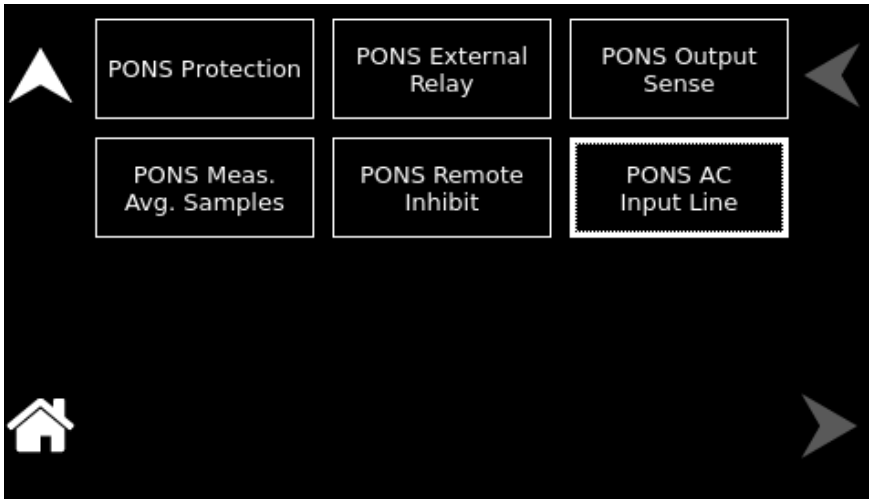


Figure 10-81. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	User can define OVP and Pos. OCP to help safeguard their devices from electrical anomalies. Refer to Figure 10-82.

ENTRY	DESCRIPTION

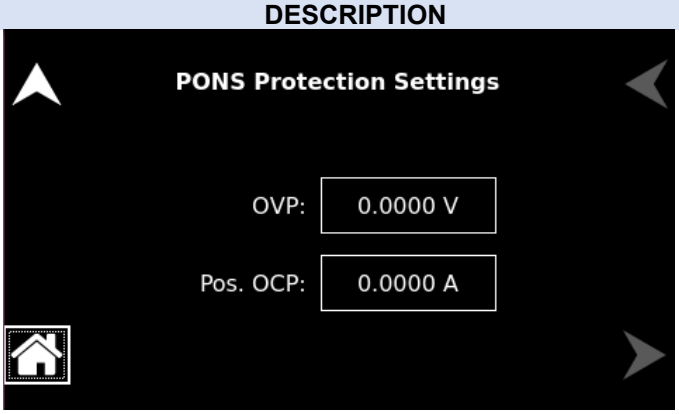


Figure 10-82. PONS Protection Settings

PONS Slew Rate

User can configure the voltage slew rate. This allows for precise control over the voltage, ensuring smoother transitions and better performance of the power supply. Adjusting this settings can help in optimizing the response time and stability of the system. Refer to Figure 10-83.

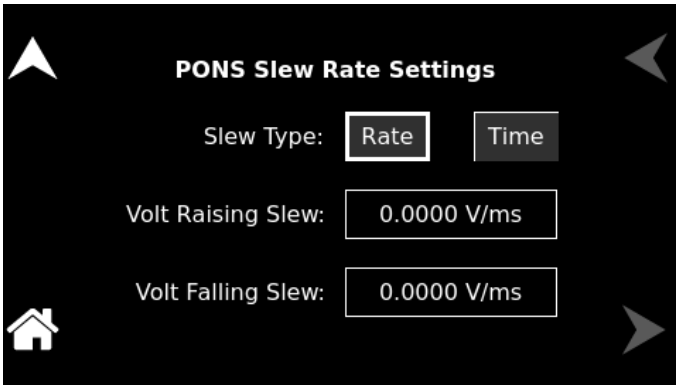


Figure 10-83. PONS Slew Rate Settings – Voltage

PONS Output Sense

User can program the PONS output to ON or OFF state Refer to Figure 10-84.

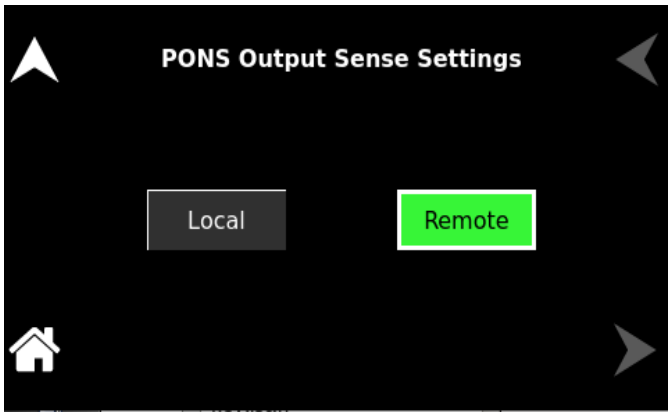


Figure 10-84. PONS Output Sense Settings

ENTRY	DESCRIPTION
PONS Measurement Average Samples	User can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-85.

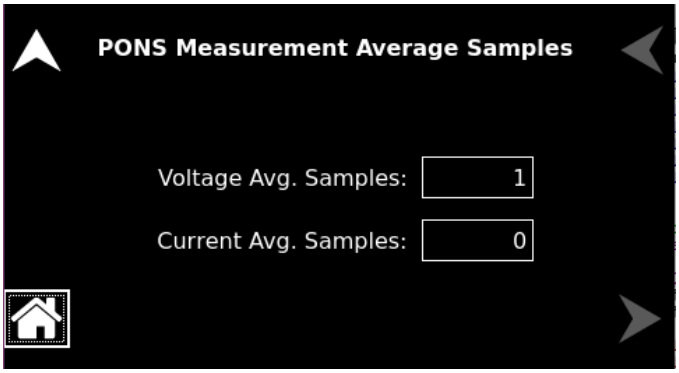


Figure 10-85. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 10-86.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

ENTRY	DESCRIPTION

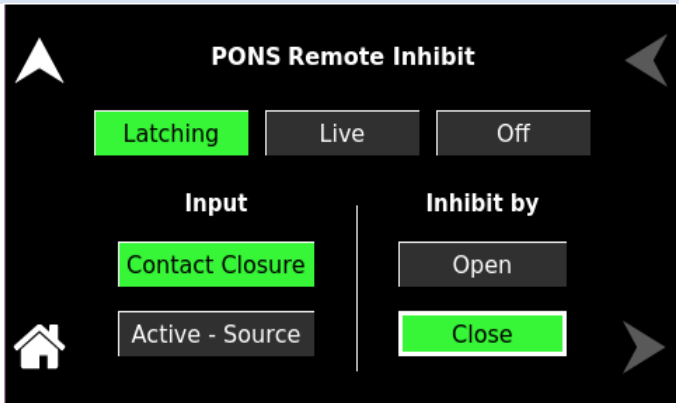


Figure 10-86. PONS remote Inhibit

PONS AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 10-87.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

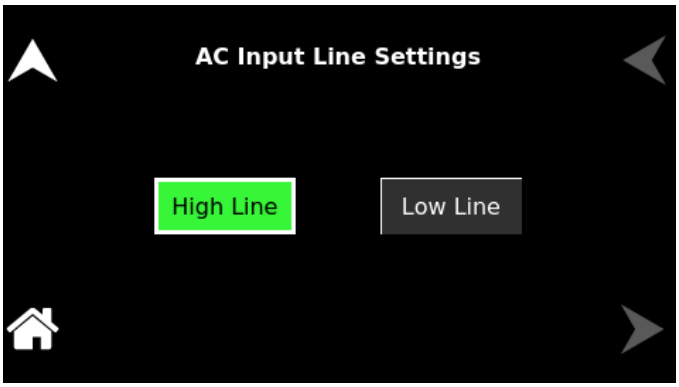


Figure 10-87. AC Input Line Settings

Table 10-21. PONS Configuration mode

10.2.4.2.2.7 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-88.

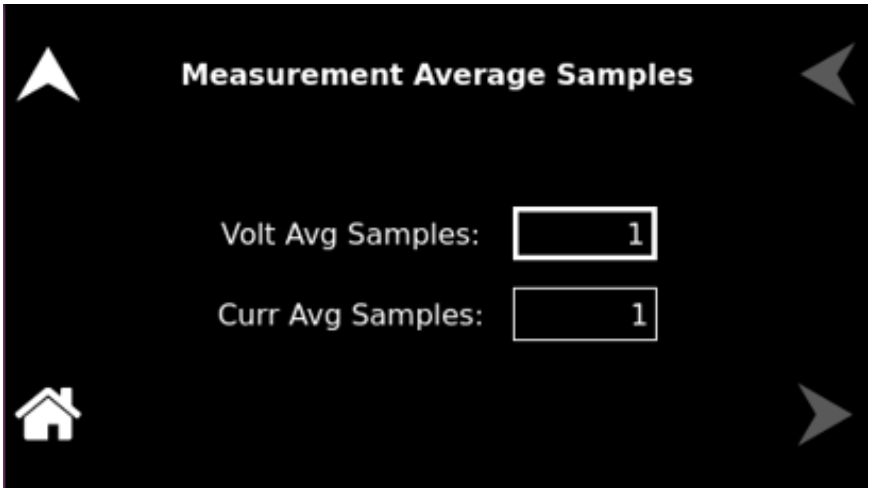


Figure 10-88. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 10-22. Measurement Average Samples

10.2.4.3 OPER. TYPE – STEADY STATE AND OPER. MODE– ARRAY

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type – Steady,
b) Oper. Mode - Array

The 'Configuration Screen' provides 'PVSIM Mode Selections', 'Protection', 'Output Sense', 'PONS' and 'Measurement Average Samples'.

NOTE: The 'Oper. Mode - **Array**' selected in 'PVSIM Mode Selection' can only be done through the virtual panel. When it is selected, only generic configuration like 'Protection', 'Output Sense', 'PONS' and 'Measurement Average Samples' can be set through the front panel.

For the top-level menu of the Configuration screen, refer to Figure 10-89 and for the instructions on how to navigate, refer to Section 6.4.2.1.

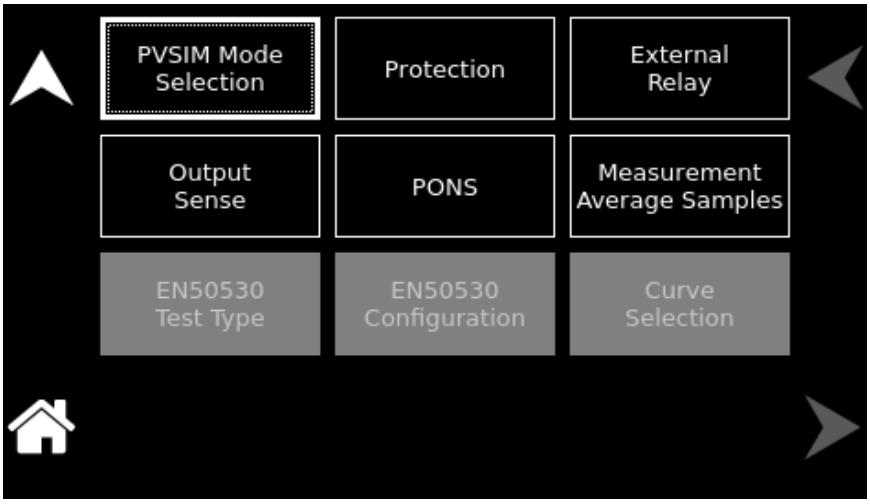


Figure 10-89. Configuration Screen (Oper. Type – Steady State and Oper. Mode – Array)

10.2.4.3.1.1 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 10-90.

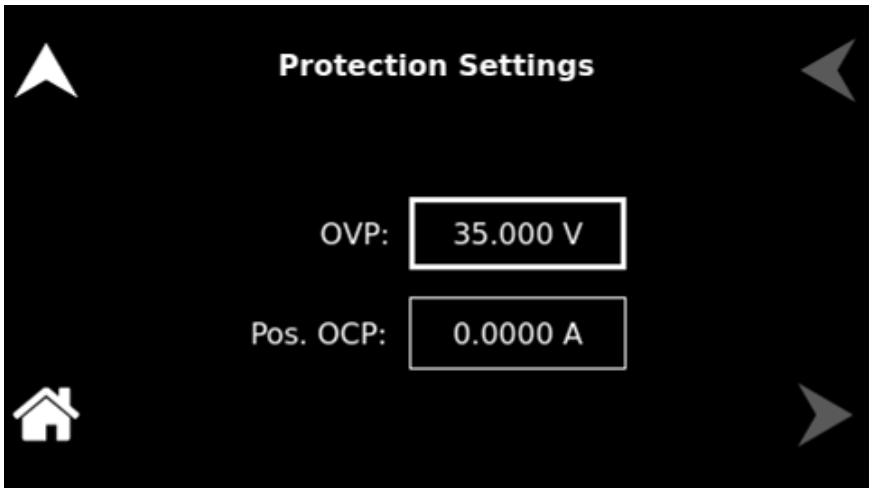


Figure 10-90. Protection Settings

10.2.4.3.1.2 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits.

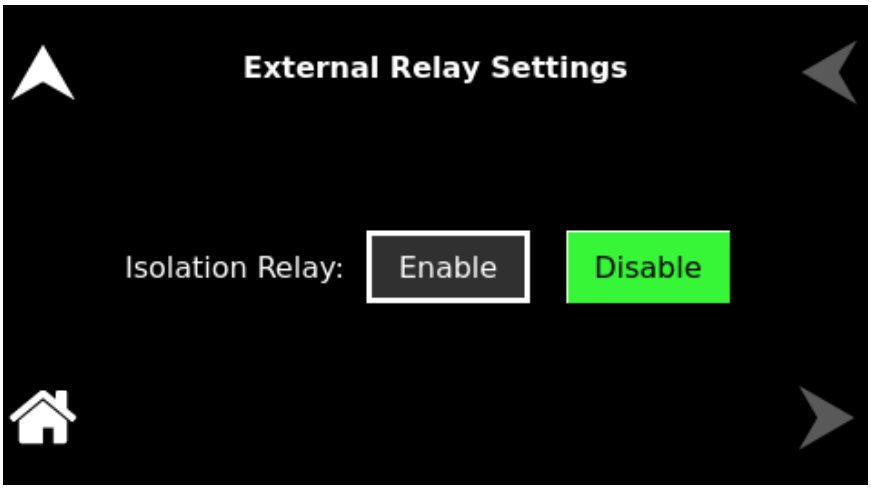


Figure 10-91. External Relay Settings

10.2.4.3.1.3 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS connector. Refer to Figure 10-92.

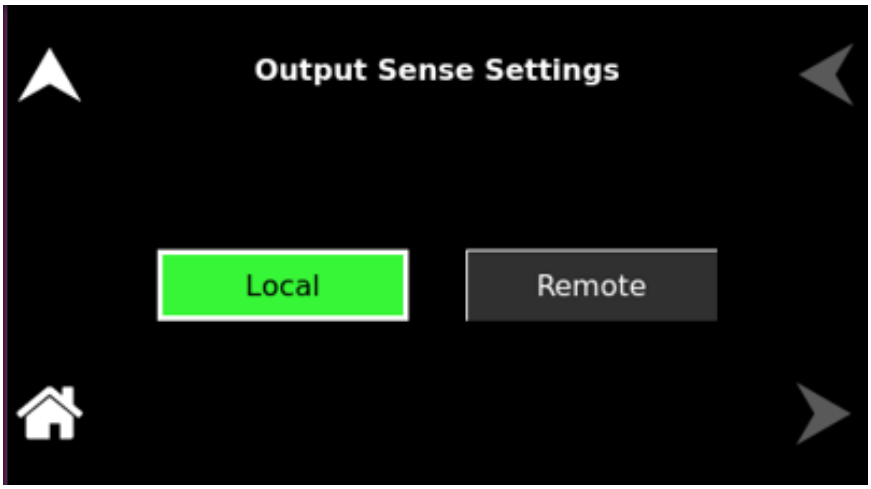


Figure 10-92. Output Sense Settings

10.2.4.3.1.4 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings. Refer to Figure 10-93.

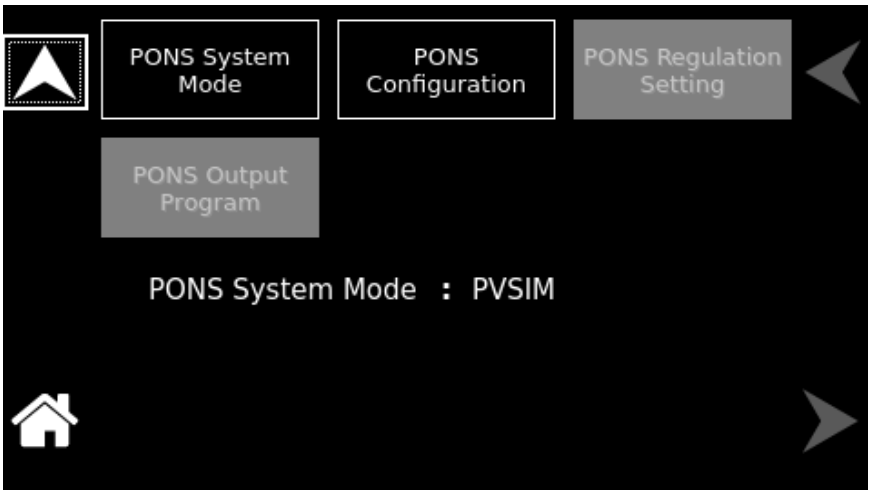


Figure 10-93. PONS – Main Screen

a) PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the 'Operating Mode' settings on the Home screen. Users must separately select the 'PVSIM' mode in the 'PONS Operating Mode Settings', which will update both the 'PONS Operating Mode Settings' screen and the 'PONS Configuration' screen. Refer to Figure 10-94 and Figure 10-95.

The same applies to other modes such as Bi-DIR, SOUR, ELOAD, BATSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 9.2.5.7.1, 11.2.4.7.1 and 12.2.4.6.

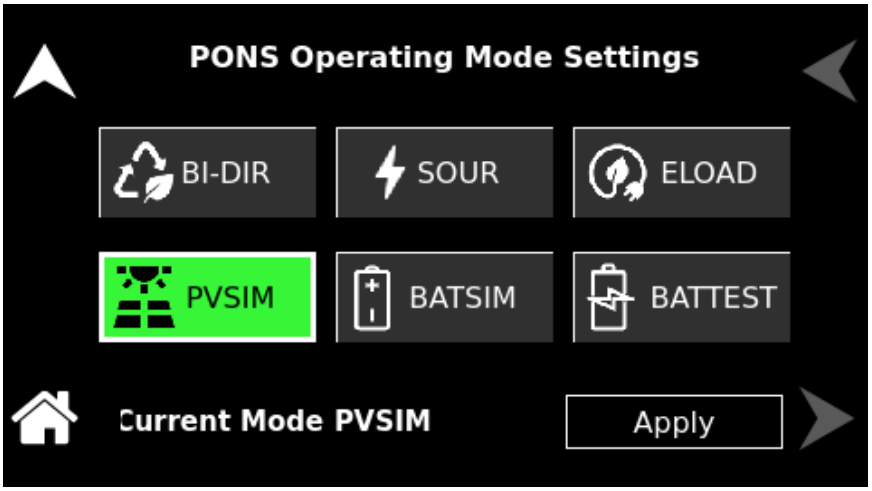


Figure 10-94. PONS Operating Mode Settings

b) PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select PONS Protection, PONS Slew Rate, PONS Output Sense, PONS Measurement Average Samples PONS Remote Inhibit and PONS AC Input Line. Refer to Figure 10-95.

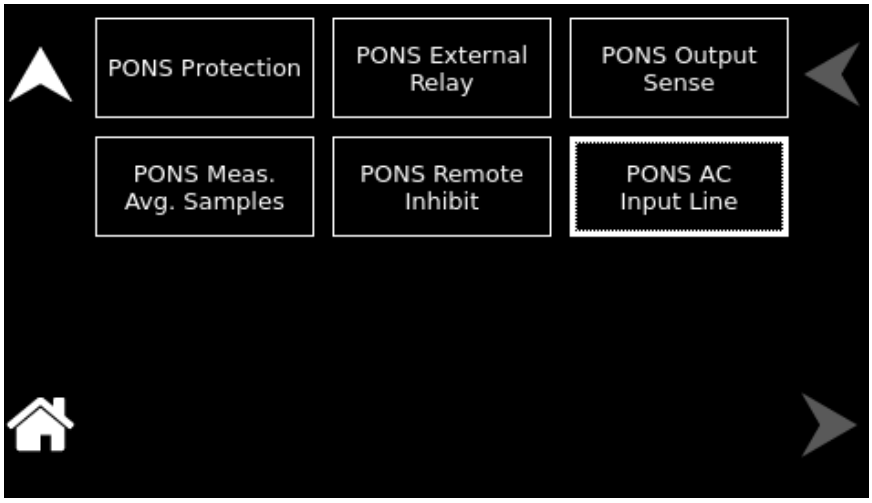


Figure 10-95. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	User can define OVP and Pos. OCP to help safeguard their devices from electrical anomalies. Refer to Figure 10-96.

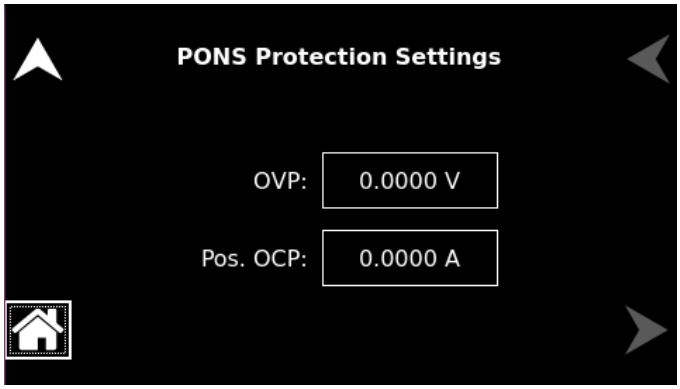


Figure 10-96. PONS Protection Settings

PONS Slew Rate	User can configure the voltage slew rate. This allows for precise control over the voltage, ensuring smoother transitions and better performance of the power supply. Adjusting this settings can help in optimizing the response time and stability of the system. Refer to Figure 10-97.

ENTRY	DESCRIPTION

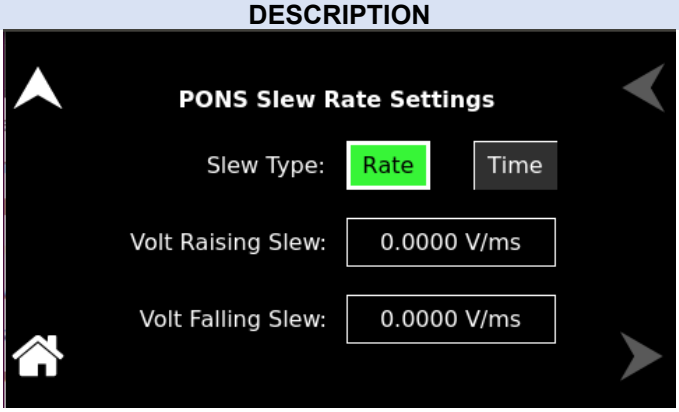


Figure 10-97. PONS Slew Rate Settings – Voltage

PONS Output Sense

User can program the PONS output to ON or OFF state Refer to Figure 10-98.

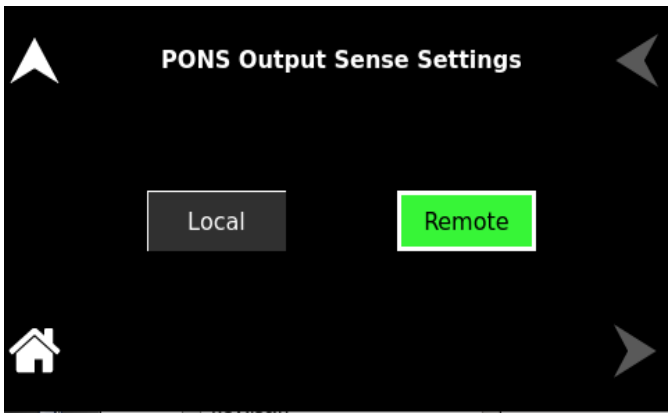


Figure 10-98. PONS Output Sense Settings

PONS Measurement Average Samples

User can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-99.

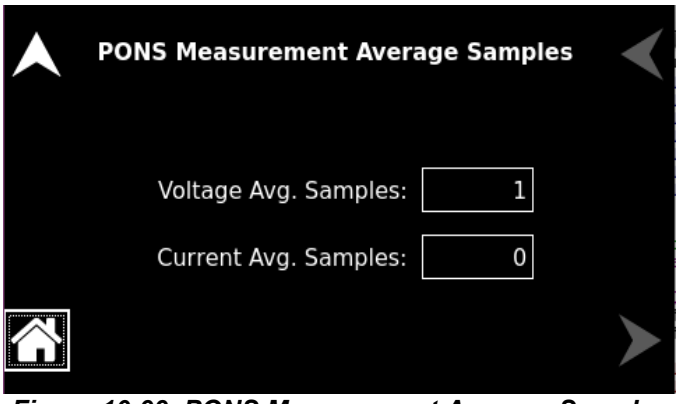


Figure 10-99. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can

ENTRY	DESCRIPTION

be particularly useful for safety and operational control in various applications. Refer to Figure 10-100.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

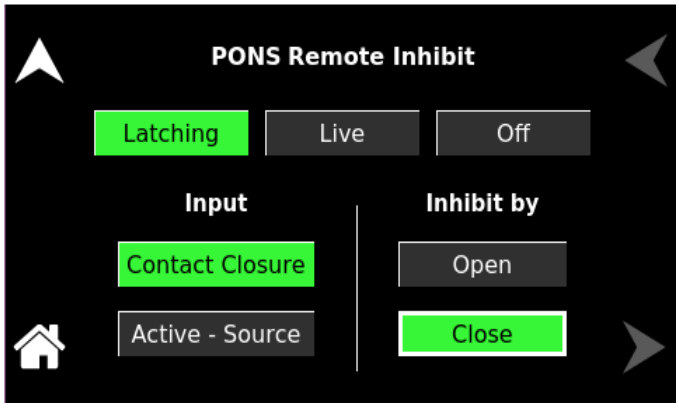


Figure 10-100. PONS remote Inhibit

PONS AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 10-101.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

ENTRY	DESCRIPTION

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

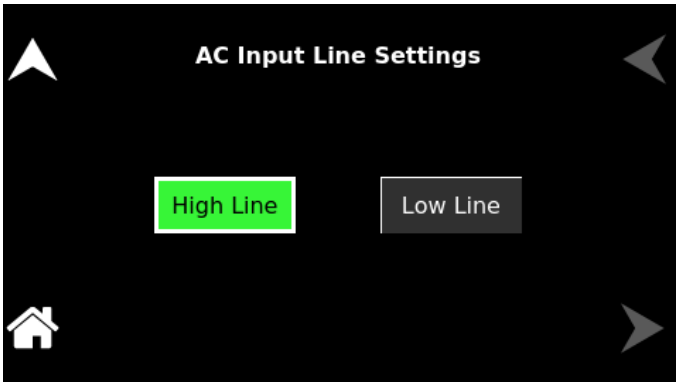


Figure 10-101. AC Input Line Settings

Table 10-23. PONS Configuration mode

10.2.4.3.1.5 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-102.

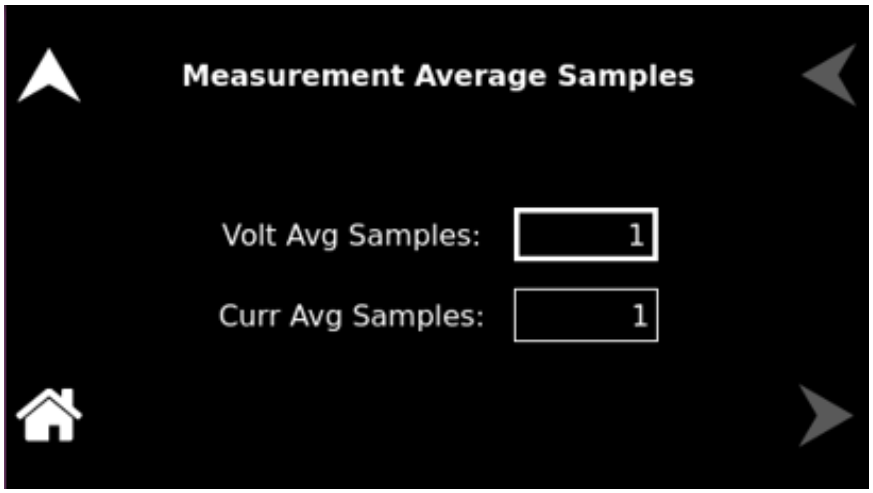


Figure 10-102. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory

ENTRY	DESCRIPTION
	default) provides the fastest response time in the readings, but less rejection of noise.

Table 10-24. Measurement Average Samples

10.2.4.4 OPER. TYPE - PROFILE

10.2.4.4.1 CURVE TYPE – SNL OR EN50530

When 'PVSIM Mode Selection' is configured as below:

a) Oper. Type – Profile
b) Curve type – SNL or EN50530

The Configuration Screen provides the settings of PVSIM Mode Selections, Protection, Output Sense, PONS and Measurement Average Samples.

NOTE: The 'Oper. Mode - **Profile**' selected in 'PVSIM Mode Selection' can only be done through the virtual panel. When it is selected, only generic configuration like Protection, Output Sense, PONS and Measurement Average Samples can be set through the front panel.

For the top-level menu of the Configuration screen, refer to Figure 10-103 and for the instructions on how to navigate, refer to Section 6.4.2.1.

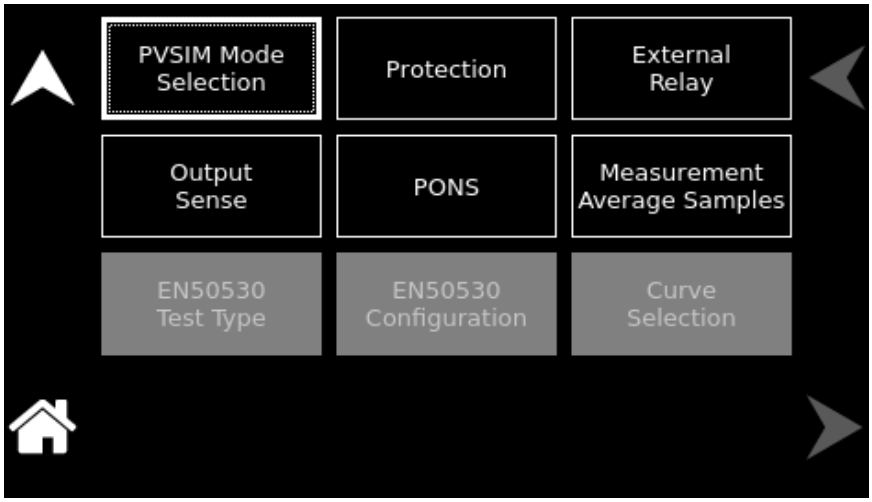


Figure 10-103. Configuration Screen (Oper. Type – Profile and Curve type – SNL or EN50530)

10.2.4.4.1.1 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 10-104.

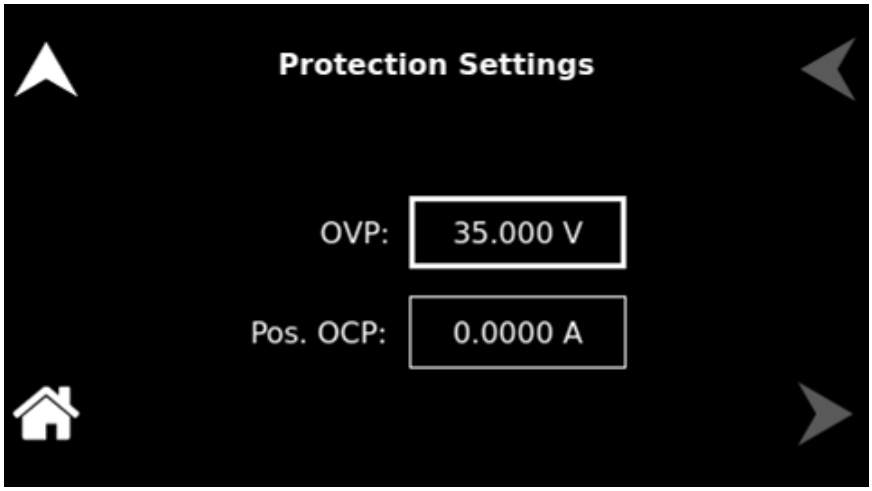


Figure 10-104. Protection Settings

10.2.4.4.1.2 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 10-112.

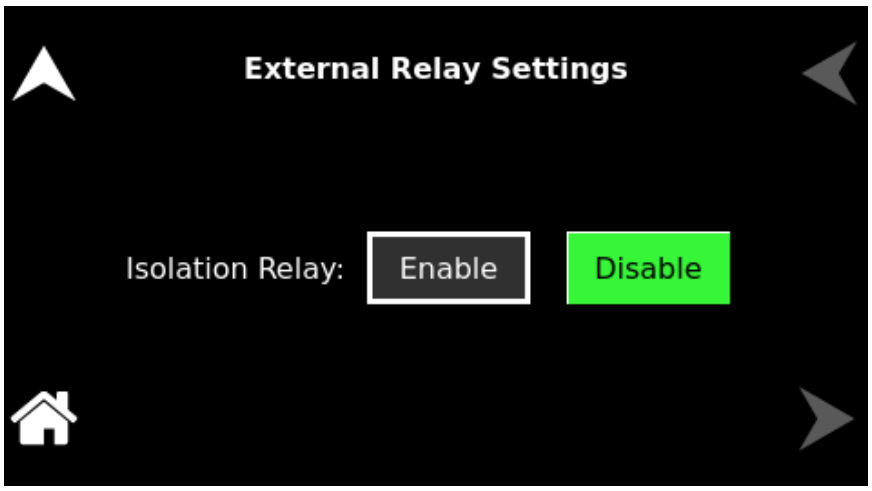


Figure 10-105. External Relay Settings

10.2.4.4.1.3 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS connector. Refer to Figure 10-106.

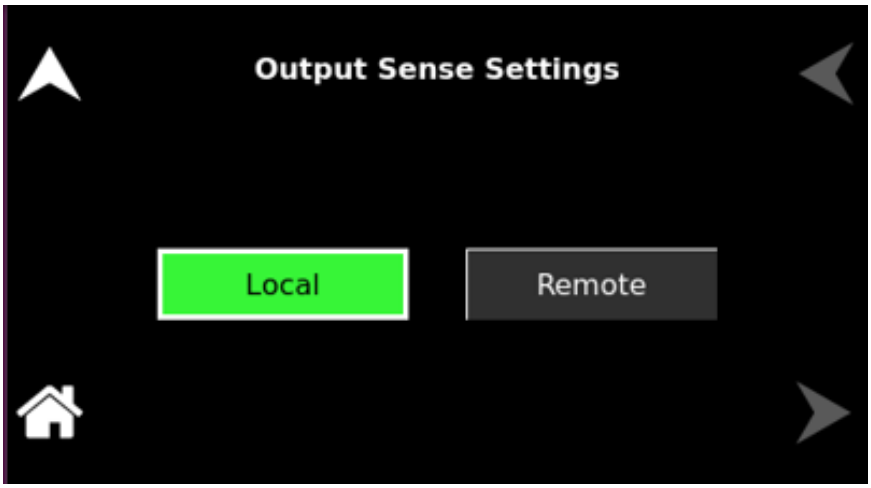


Figure 10-106. Output Sense Settings

10.2.4.4.1.4 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings. Refer to Figure 10-107.

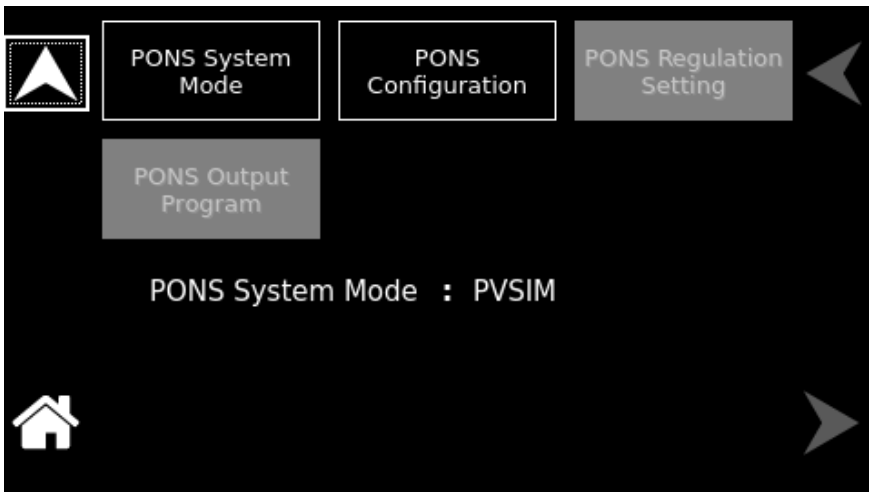


Figure 10-107. PONS – Main Screen

a) PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the 'Operating Mode' settings on the Home screen. Users must separately select the ‘PVSIM’ mode in the 'PONS Operating Mode Settings', which will update both the 'PONS Operating Mode Settings' screen and the 'PONS Configuration' screen. Refer to Figure 10-108 and Figure 10-108.

The same applies to other modes such as Bi-DIR, SOUR, ELOAD, BATSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 9.2.5.7.1, 11.2.4.7.1 and 12.2.4.6.

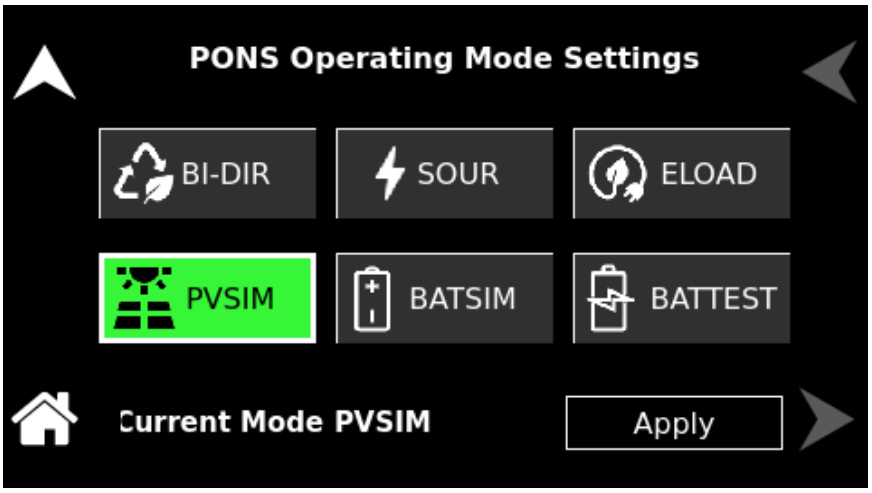


Figure 10-108. PONS Operating Mode Settings

b) PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select PONS Protection, PONS Slew Rate, PONS Output Sense, PONS Measurement Average Samples PONS Remote Inhibit and PONS AC Input Line. Refer to Figure 10-109.

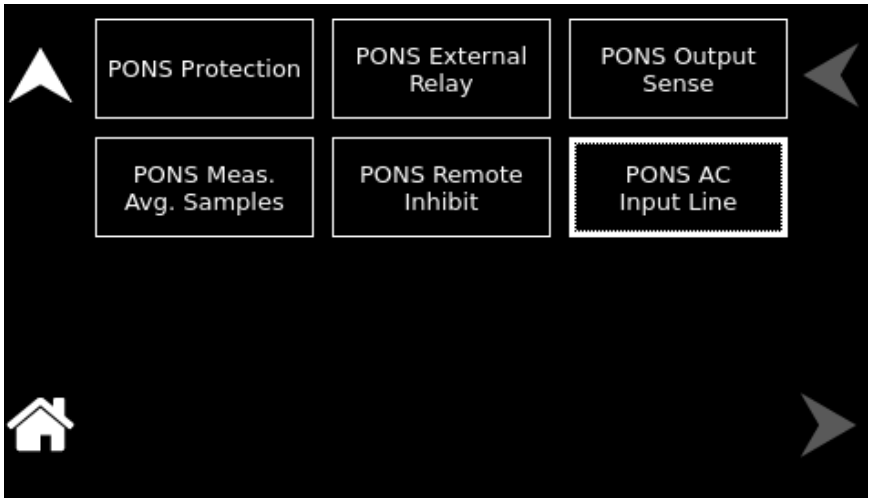


Figure 10-109. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	User can define OVP and Pos. OCP to help safeguard their devices from electrical anomalies. Refer to Figure 10-110.

ENTRY	DESCRIPTION

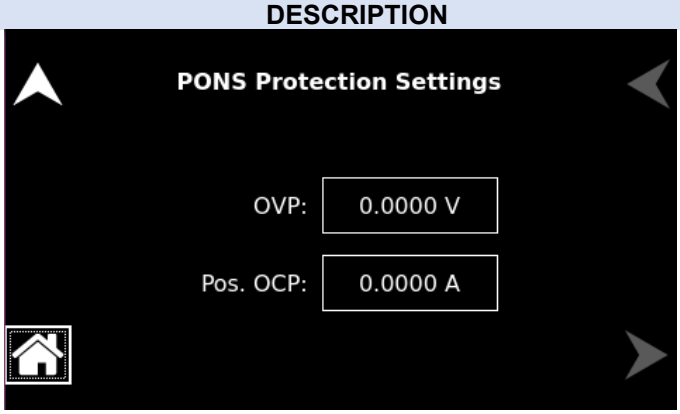


Figure 10-110. PONS Protection Settings

PONS Slew Rate

User can configure the voltage slew rate. This allows for precise control over the voltage, ensuring smoother transitions and better performance of the power supply. Adjusting this settings can help in optimizing the response time and stability of the system. Refer to Figure 10-111.

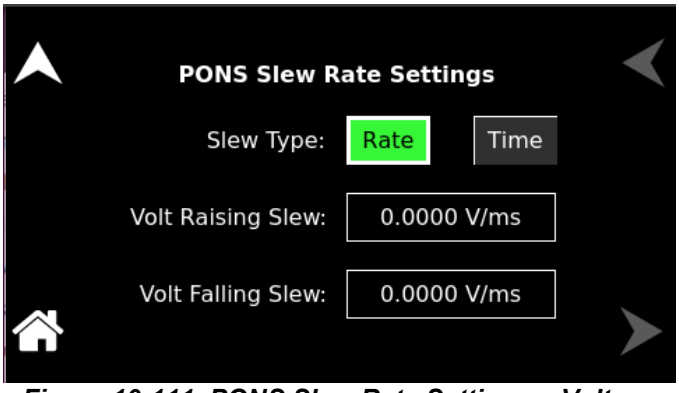


Figure 10-111. PONS Slew Rate Settings – Voltage

PONS Output Sense

User can program the PONS output to ON or OFF state Refer to Figure 10-112.

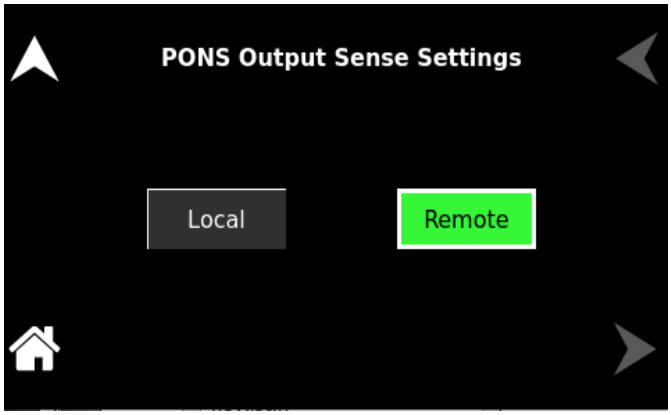


Figure 10-112. PONS Output Sense Settings

ENTRY	DESCRIPTION
PONS Measurement Average Samples	User can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-113.

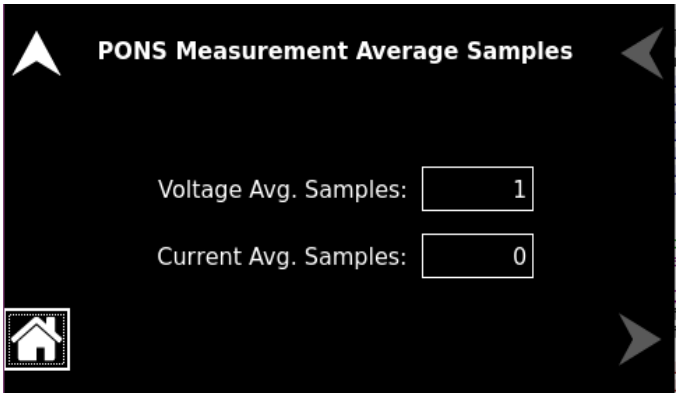


Figure 10-113. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 10-114.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

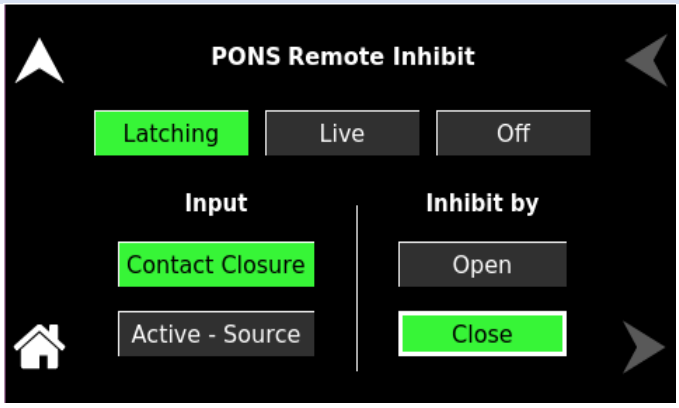
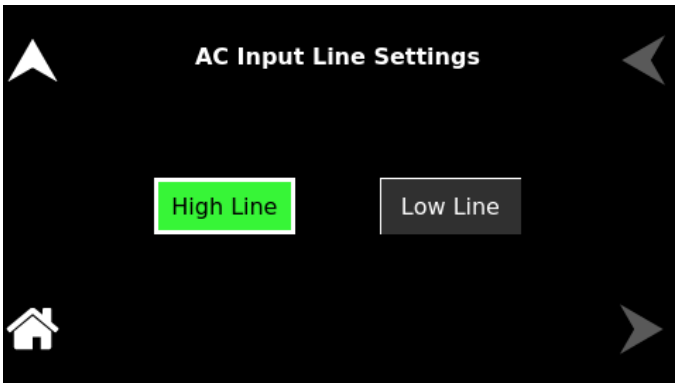
ENTRY	DESCRIPTION
	 *Figure 10-114. PONS remote Inhibit*
PONS AC Input Line	User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 10-115. **a) High Line:** The nominal High Line Input range is 380 to 480 VAC. **b) Low Line:** The nominal Low line input range is 200 to 240 VAC.  *Figure 10-115. AC Input Line Settings*

Table 10-25. PONS Configuration mode

10.2.4.4.1.5 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 10-116.

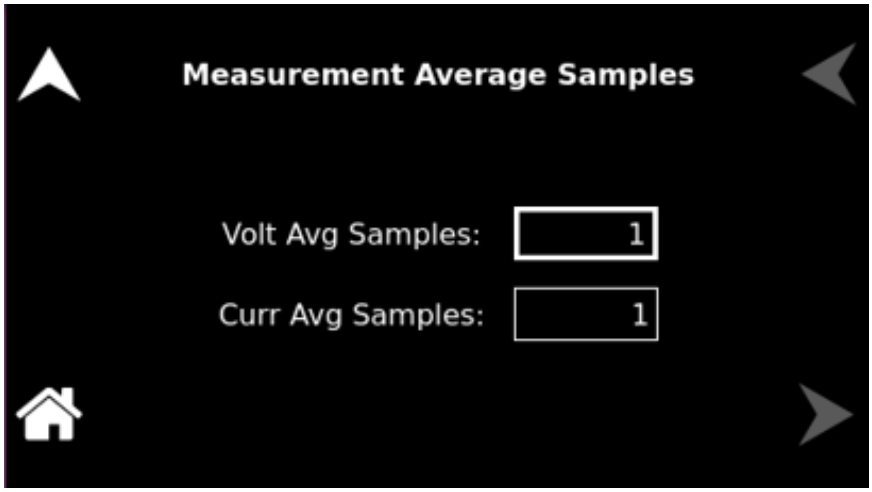


Figure 10-116. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 10-26. Measurement Average Samples

10.2.5 CONTROL INTERFACE SCREEN

The Control Interface screen provides the ability to configure the power supply for remote control through the data communications interfaces. For the top-level menu of the Control Interface Screen, refer to

Figure 10-117 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

Figure 10-117. Control Interface Screen Top-Level Menu

The Control interface Settings menu has the following fields:

ENTRY	DESCRIPTION
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 10-118. After settings are changed, the unit must be turned OFF/ON for them to take effect.

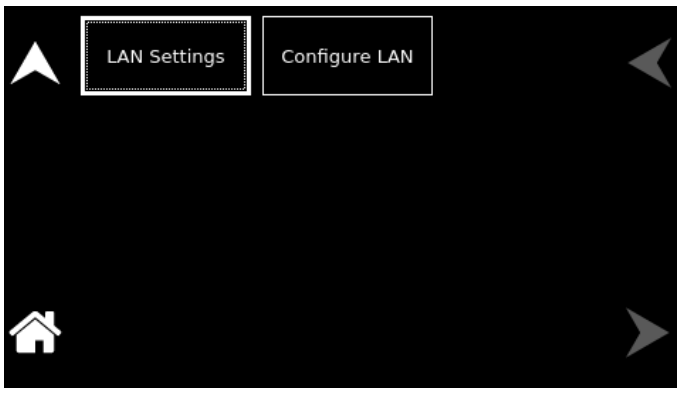


Figure 10-118. LAN Screen

a) LAN SETTINGS

ENTRY	DESCRIPTION

Lists the configuration settings of the LAN interface, and the DNS-SD service name; a number, (n), would be appended to the service name, if necessary, to differentiate duplicate power supply names. Refer to Figure 10-119.

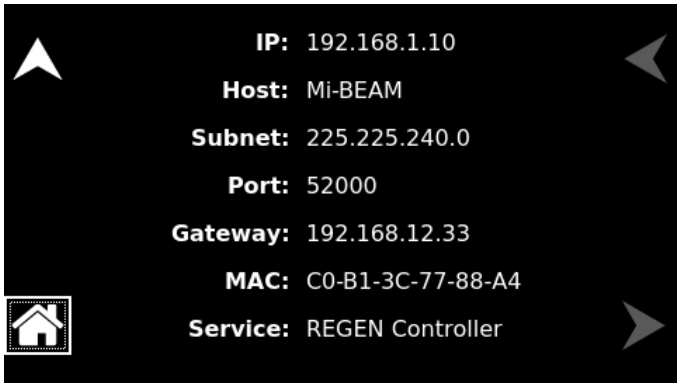


Figure 10-119. LAN Settings

b) LAN CONFIGURE

Sets parameter values and controls operation of the LAN interface, refer to Figure 10-120.

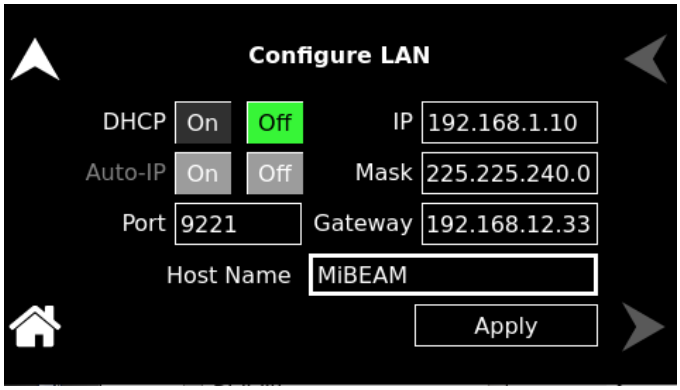


Figure 10-120. Configure LAN

- **DHCP**: Selects whether DHCP is enabled or disabled. Refer to Figure 10-121.

ENTRY	DESCRIPTION

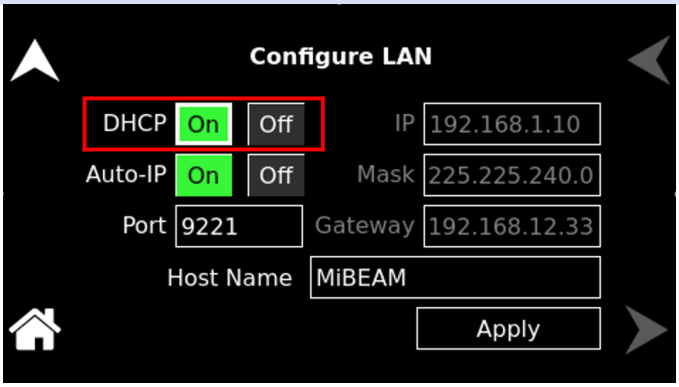


Figure 10-121. LAN Screen – DHCP

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.

- **Auto-IP**: Enables or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 10-122.

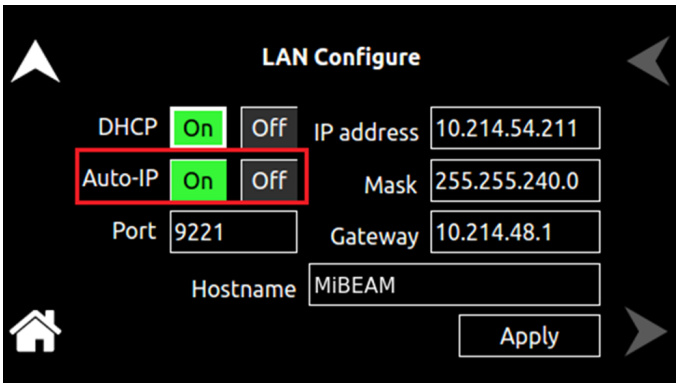


Figure 10-122. LAN Screen - Auto -IP

- **IP Address**: Sets the static IP address for the unit. When DHCP is turned off in the LAN CONFIG sub-menu, AUTO IP is selected, set the IP address to all zeros so that the IP address would be requested from the network; when DHCP is selected, the IP address is assigned by the network DHCP server. Refer to Figure 10-123.

ENTRY	DESCRIPTION

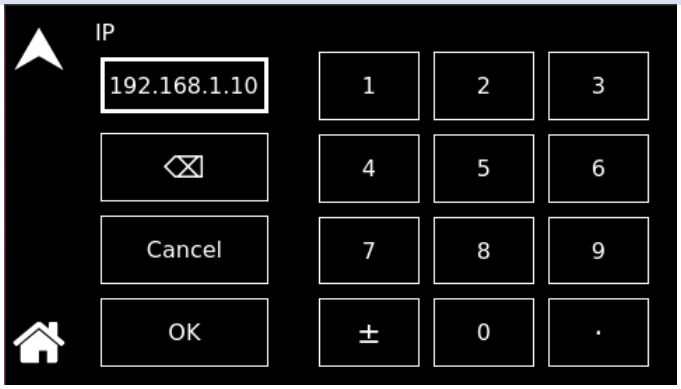


Figure 10-123. LAN Screen - IP Address

- **Subnet Mask**: Sets the subnet mask for use in static IP configuration. Refer to Figure 10-124.

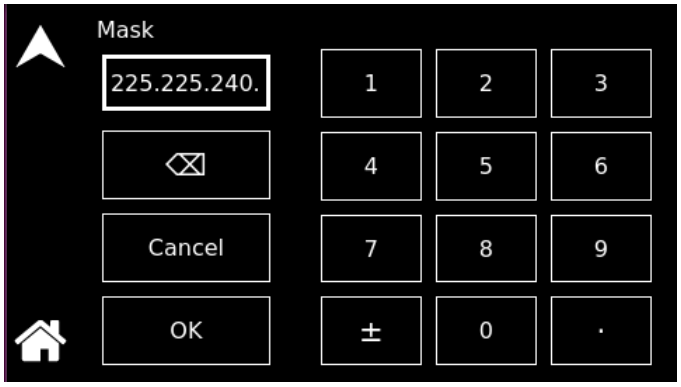
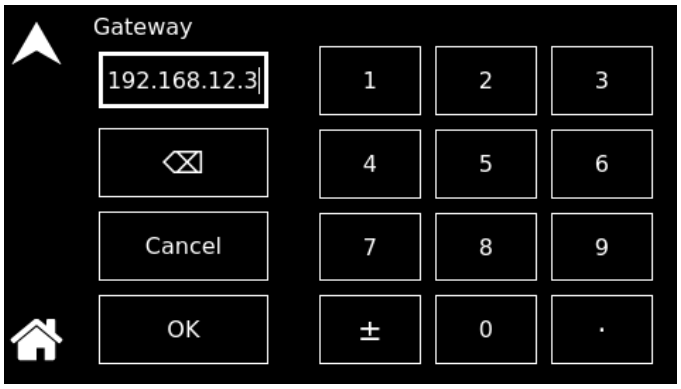


Figure 10-124. LAN Screen - Subnet Mask

- **Gateway Address**: Sets the gateway address when DHCP is turned off in the LAN CONFIG sub-menu and when AUTO IP is selected, set the gateway address to all zeros so that the gateway address would be requested from the network; when DHCP is selected, the gateway address is assigned by the network DHCP server. Refer to Figure 10-125.



ENTRY	DESCRIPTION

Figure 10-125. LAN Screen - Gateway Address

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

- **Port**: sets the port number; the factory-default value is 9221. Refer to Figure 10-126.

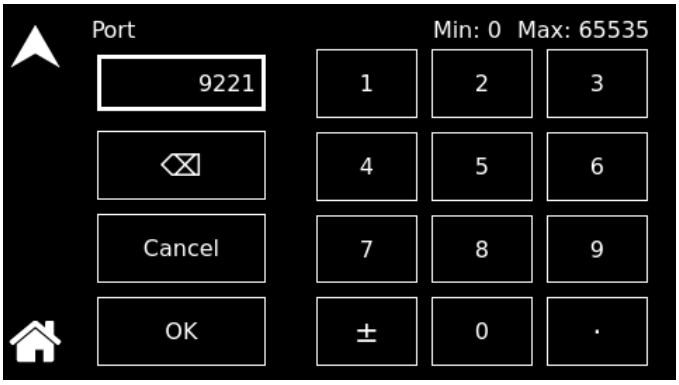


Figure 10-126. LAN Screen -Port

- **MAC Address:** Displays the MAC address; the MAC address is listed on a label on the chassis of the unit. Refer to Figure 10-127.

Figure 10-127. MAC Address

- **Host Name**: Allows setting a unique alpha-numeric host name. Refer to Figure 10-128.

ENTRY	DESCRIPTION

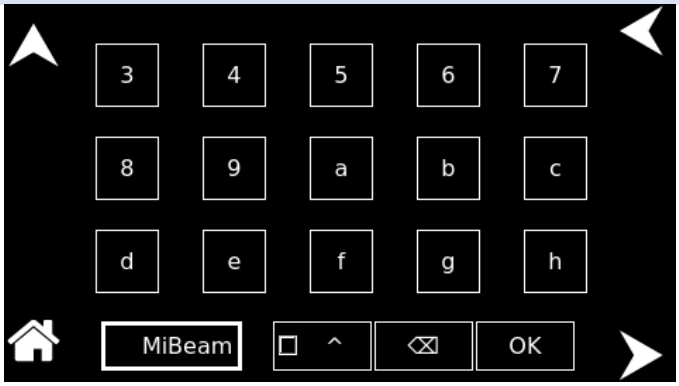


Figure 10-128. LAN Screen - Host Name

- **Apply**: Applies the LAN settings to the supply. Refer to Figure 10-129 and Figure 10-130.

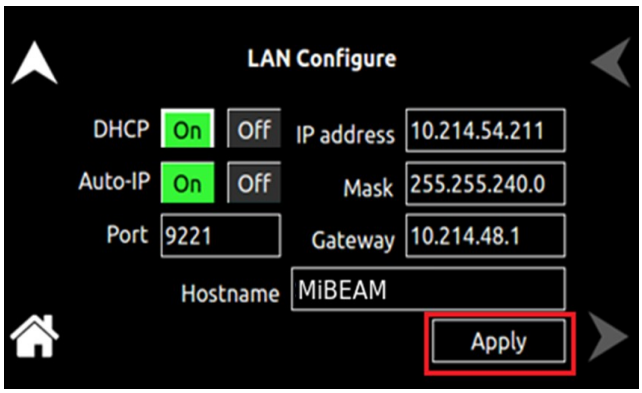


Figure 10-129. LAN Screen – Apply

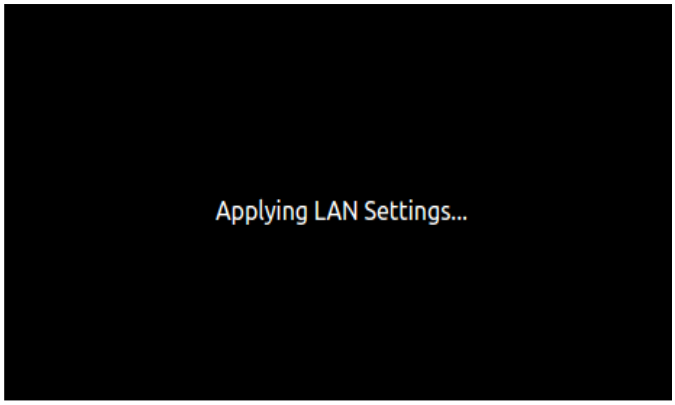


Figure 10-130. LAN Screen - Applying LAN Settings

RS232 Configures the RS-232C communications interface.RS232 has two sub-menus: RS232 Settings and RS232 Configure

ENTRY	DESCRIPTION

a) RS232 Settings: Lists the configured Baud Rate, Stop Bits, Bits and Parity for the RS232 digital interface, refer to Figure 10-131.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.
- **Stop Bits** sets the number of stop bits to either 1 or 2 bits. The default setting is 1 stop bit.
- **Data**: sets the number of data bits to either 7 or 8. The default setting is 8 bits.
- **Parity**: sets the parity to either Even, Odd, or no parity, None. The default setting is no parity, None.

Figure 10-131. RS232 Screen -Settings

b) Configure RS232: Configures the RS-232 Baud Rate, refer to Figure 10-132 and Figure 10-133. This setting must match those set for the communications port of the user external controller.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.

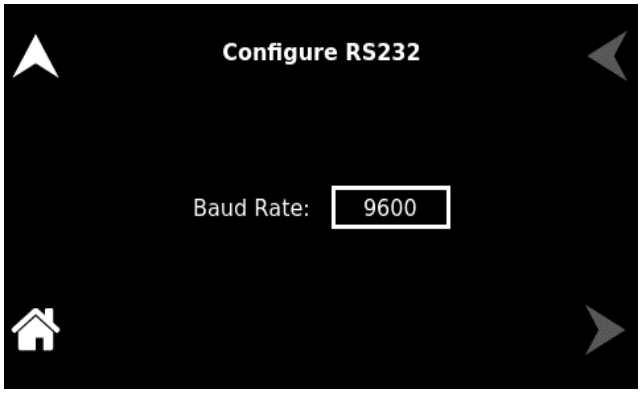


Figure 10-132. RS232 Screen -Configure

ENTRY	DESCRIPTION

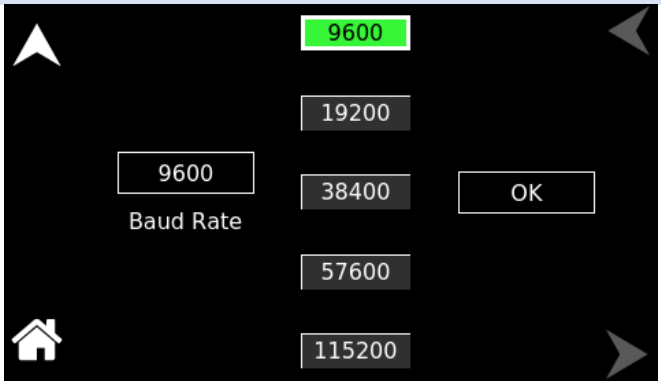


Figure 10-133. Baud Rate Selection

Remote Inhibit

Sets the control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 10-134.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

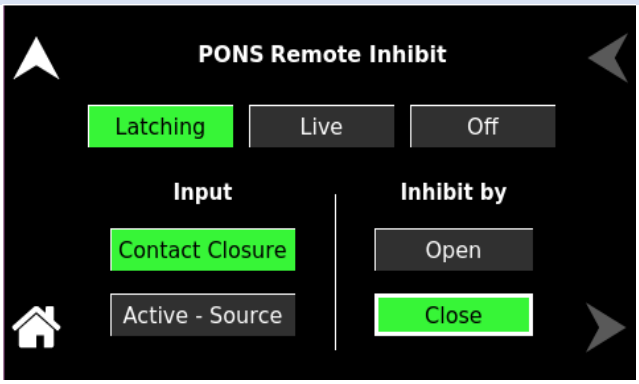
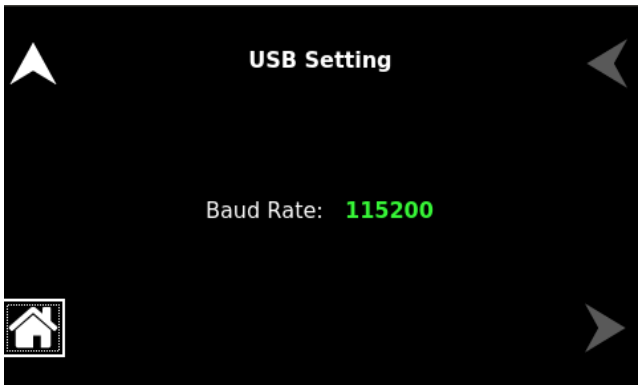
ENTRY	DESCRIPTION
	
	Figure 10-134. PONS remote Inhibit
USB	Displays the configured Baud Rate. Refer to Figure 10-135.
	
	Figure 10-135. USB Setting

Table 10-27. System Setting Screen

10.2.6 OPERATING MODE

The Operating Mode Settings screen offers comprehensive guidance on the system modes of the Mi-BEAM Series power supply. This model is engineered for versatile and reliable performance across various applications, ensuring precise and efficient power delivery through its advanced control features. Depending on user requirements, the Mi-BEAM Series supports multiple modes of operation. Refer to the Figure 10-136.

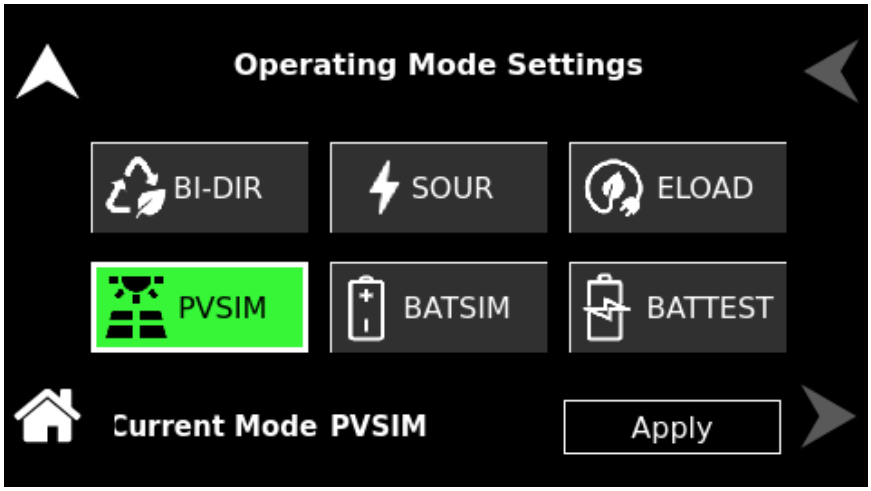


Figure 10-136. Operating Mode

10.2.7 SYSTEM SETTINGS SCREEN

The System Settings screen provides the settings of 'Hardware Limits', 'System Details' 'Firmware Version', 'LCD', 'Default Screen' and 'Factory Default'. The top-level menu of the System Settings menu is shown in Figure 10-137. Refer to Section 6.4.2.1 for navigating to System Settings Screen.

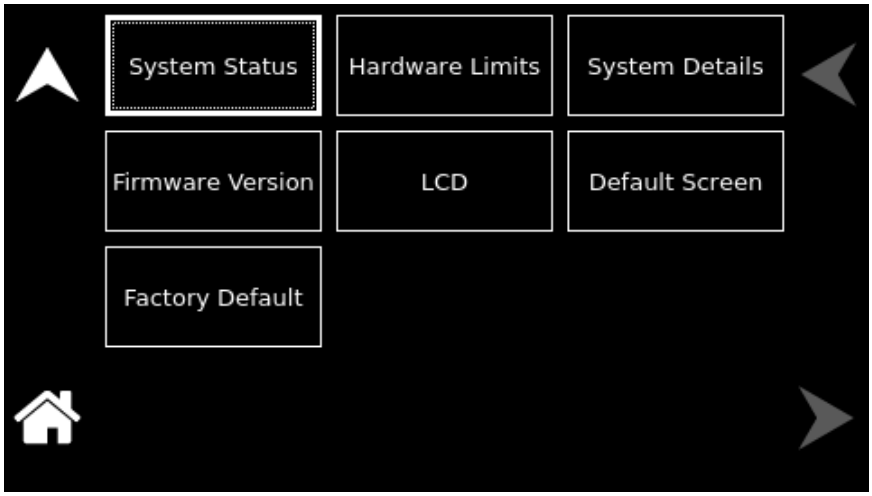


Figure 10-137. System Settings Screen

The System Settings menu has the following fields:

ENTRY	DESCRIPTION
System Status	Displays the present system status information of the power supply, including the Input Line, Output Sense, Isolation and No. of chassis. Refer to Figure 10-138.

ENTRY	DESCRIPTION

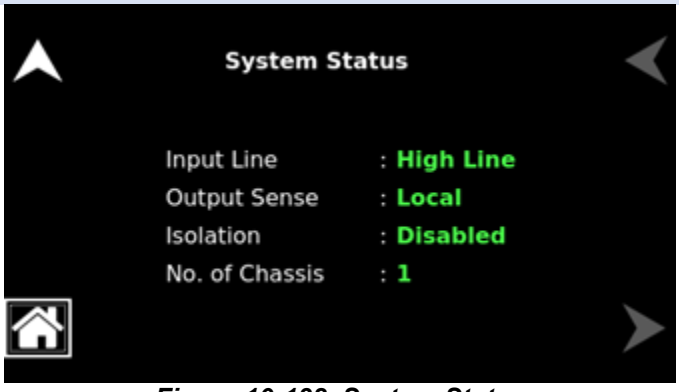


Figure 10-138. System Status

Hardware Limits Displays the hardware parameter limit values. Refer to Figure 10-139.

Figure 10-139. Hardware Limits

System Details Displays information about the user's device, including the Manufacturer, Model Number, Serial Number, Last Calibration Date, and Operating Mode. Refer to Figure 10-140.

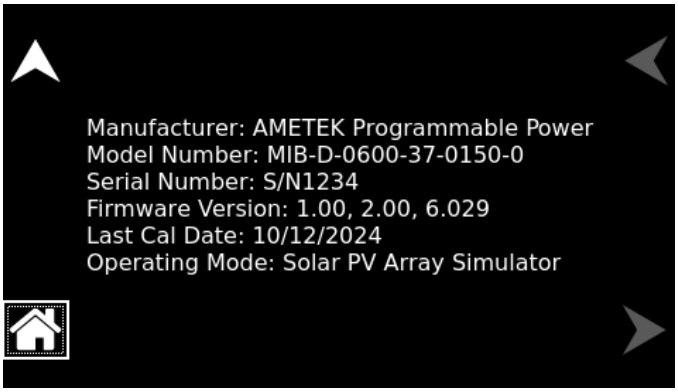


Figure 10-140. System Details

Firmware Version Displays information about the configuration of the power supply, including the Communication Controller, System Interface, Front Panel, Fan Controller, Mod 1 Primary Controller, Mod 1 Secondary Controller, Mod 2 Primary Controller, Mod 2

ENTRY	DESCRIPTION

Secondary Controller, Mod 3 Primary Controller, Mod 3 Secondary Controller. This information helps identify the unit. Refer to Figure 10-141.

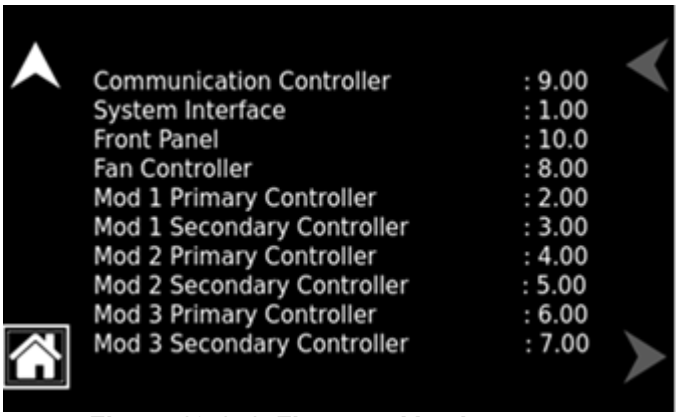


Figure 10-141. Firmware Version

LCD Provides settings for the calibration of the display touchscreen. Refer to Figure 10-142.

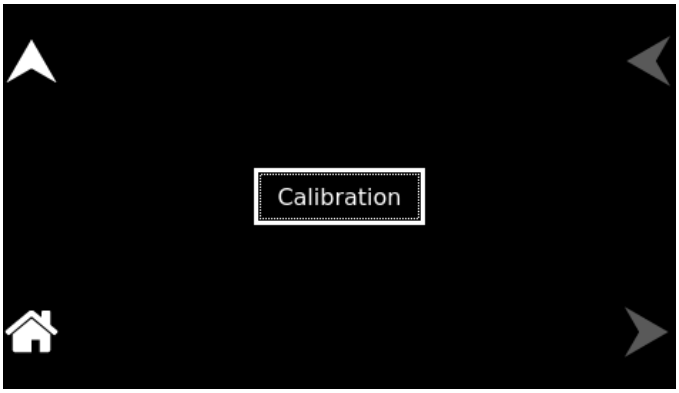


Figure 10-142. LCD

Default Screen Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 10-143 and Figure 10-144. 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.

ENTRY	DESCRIPTION

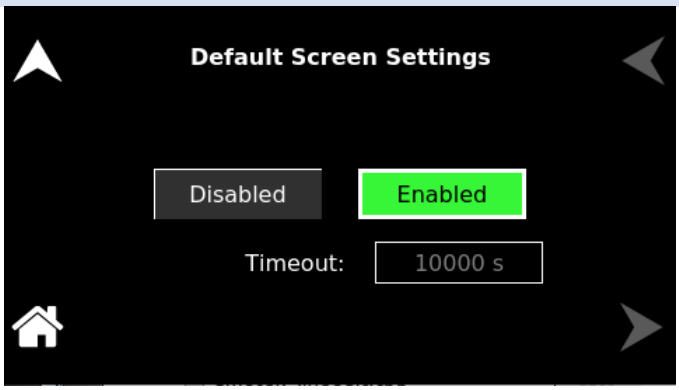


Figure 10-143. Default Screen Settings

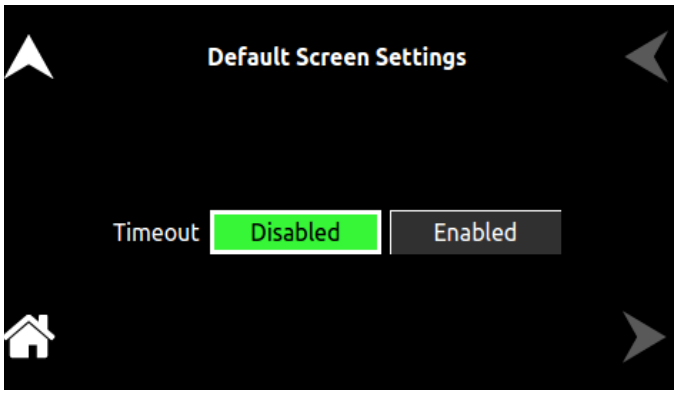


Figure 10-144. System Settings Screen - Default Screen Disabled

Factory Default Set the device to its original factory settings, as it was when it left the manufacturer. Refer to Figure 10-145.

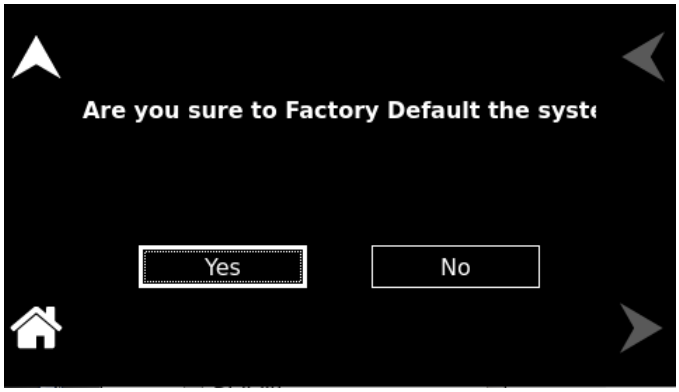


Figure 10-145. Factory Default

Table 10-28. System Setting Screen

10.2.8 SYSTEM FAULTS SCREEN

The System Faults screen provides descriptions of faults that have occurred in a power module. The fault screen appear if any supply fault conditions occur, refer to Figure 10-146. The user should press ‘Clear’ to clear the fault and continue the operations of the power supply and press the ‘Reload’ to refresh the system faults and check for errors. If no fault has occurred, the screen will show 'No Fault Occurred', refer to Figure 10-147.

NOTE: These conditions might resolve themselves; however, if they continue to occur after pressing 'Clear', refer to Chapter 14.

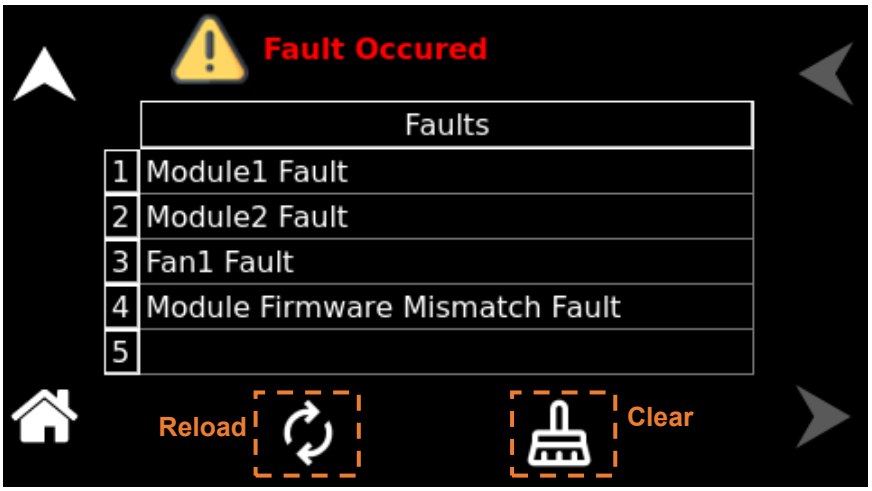


Figure 10-146. System Faults

Figure 10-147. No Fault Occurred Screen

10.3 PARALLEL OPERATION

Parallel mode of operation is used for applications that require more current or power than a single power supply can provide. To meet these higher output requirements, up to six power supplies can be connected in parallel, effectively combining their capacities to achieve the desired performance.

NOTE: Up to six units can be connected in parallel, contact factory to connect more than six units in parallel.

10.3.1 SETTING UP PARALLEL OPERATION

Each power supply has two separate 15-pin connectors on the upper left rear panel, labeled ‘PARALLEL INTERFACE IN’ and ‘PARALLEL INTERFACE OUT’. To connect power supplies in parallel, use a ‘Leader’ or ‘Follower’ daisy-chain wiring configuration . Refer to Figure 10-148. For parallel cable information refer to Section 2.25.

a) Using an interface cable (P/N 890-015-01), connect the 'PARALLEL INTERFACE OUT' port of the Leader power supply to the 'PARALLEL INTERFACE IN' port of the second power supply (Follower 1).

NOTE: In parallel operation, the Leader unit manages all programming, readback, and control functions. Remote analog control is not supported in this mode.

NOTE: Units with the same model number are allowed to be connected in parallel.

b) On the second power supply (Follower 1), connect another interface cable from its 'PARALLEL INTERFACE OUT' port to the 'PARALLEL INTERFACE IN' port of the third power supply (Follower 2). Continue this daisy-chain connection for up to a maximum of six power supplies.

c) Connect the positive output terminals of all power supplies together, along with the positive terminal of the load.

d) Connect the negative output terminals of all power supplies together, along with the negative terminal of the load.

e) Ensure that there are no shorts between the Positive and Negative output terminals.

f) Ensure all cables are kept as short as possible and connect twisted-pair sense cables as follows.

- For remote sensing at the load, only the Leader unit should have a twisted-pair cable running from its sense terminals to the load terminals.

g) After all the successful connection, power ON all the follower units followed by leader.

NOTE: Doing Parallel operation for the first time, make sure to reset the power supply units by selecting ‘Factory default’ in ‘System Settings’ Screen. This step is essential to prevent setting conflicts caused by pre-existing PONS settings.

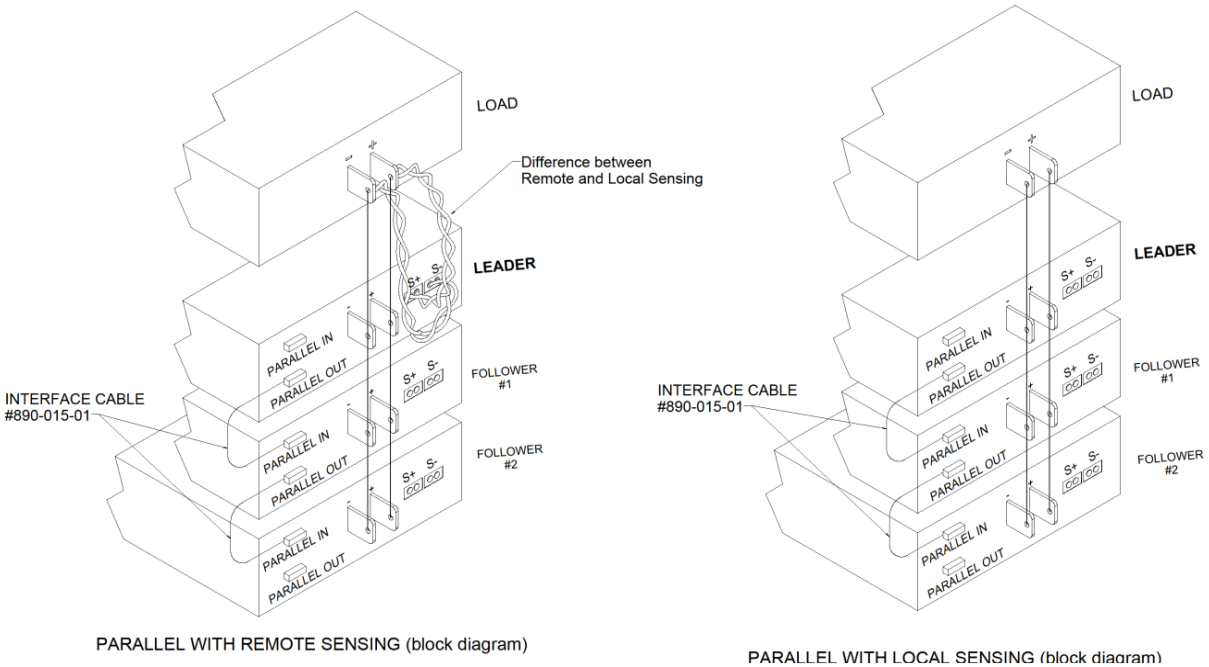


Figure 10-148. Parallel Connection

11 BATTERY SIMULATOR MODE OPERATION

This chapter provides comprehensive information on the front panel display in Battery Simulator mode, designed to offer an intuitive interface for seamless setup, control, and monitoring of various battery simulation parameters.

11.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION

11.1.1 CONFIGURING CURRENT TYPE UUT

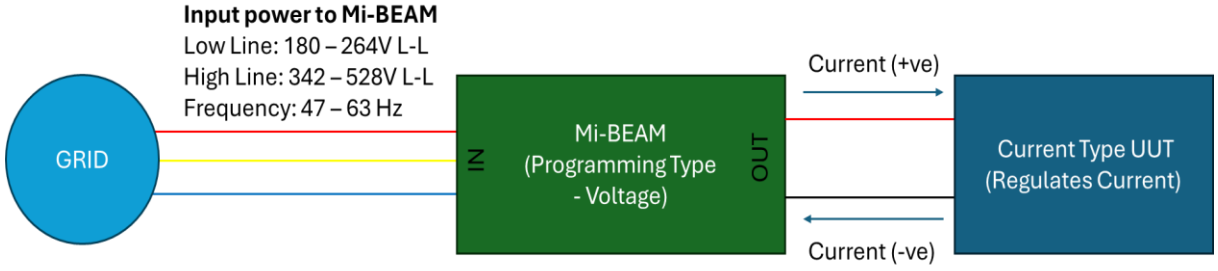


Figure 11-1. Current Type UUT

The Mi-BEAM Series power supply in BATSIM operates with a fixed Programming Type (Current) and the Regulation Setting is 'Constant Voltage Series Resistance (CV Ser. Res).

11.1.1.1 BATSIM PROFILE TYPE – BATTERY

When the settings selected in 'BATSIM Profile Type Settings - Battery' are applied in the Configuration Screen, the settings in top-level screens will appear with various options. Refer to Section 11.2.4.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must

be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 11-24.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 11-24.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 11-24.

- **BATSIM Profile Type:** Select the Test Type to 'Battery' in 'BATSIM Profile Type Settings'. Refer to Figure 11-12.

b) BATSIM Configuration: Create a configuration and define the characteristics of the battery to be simulated. Refer to Figure 11-15.

c) BATSIM Stop Conditions: Set the stop conditions of the battery simulation process. Refer to Figure 11-17 and Figure 11-18.

d) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 11-26.

e) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Figure 11-10.

h) End the Test: Once the test is complete, power down the system and safely disconnect the UUT from the Mi-BEAM.

11.1.1.2 BATSIM PROFILE TYPE – TABLE

When the settings selected in 'BATSIM Profile Type Settings - Table' are applied in the Configuration Screen, the settings in top-level screens will appear with various options. Refer to Section 11.2.4.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure the safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow from Mi-BEAM to UUT. Refer to Figure 11-24.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 11-24.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 11-24.

- **BATSIM Profile Type:** Select the Test Type to 'Table' in 'BATSIM Profile Type Settings'. Refer to Figure 11-22.

b) BATSIM Configuration: Load a defined configuration which simulates the multiple battery characteristics. Refer to Figure 11-22.

c) BATSIM Stop Conditions: Set the stop conditions of the battery simulation process. Refer to Figure 11-13.

d) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 10-32.

e) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Figure 11-10.

h) End the Test: Once the test is complete, power down the system and safely disconnect the UUT from the Mi-BEAM.

11.2 FRONT PANEL OPERATION

This section provides detailed information on the front panel operation in Battery Simulator (BATSIM) mode. Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder. Refer to Figure 11-2.

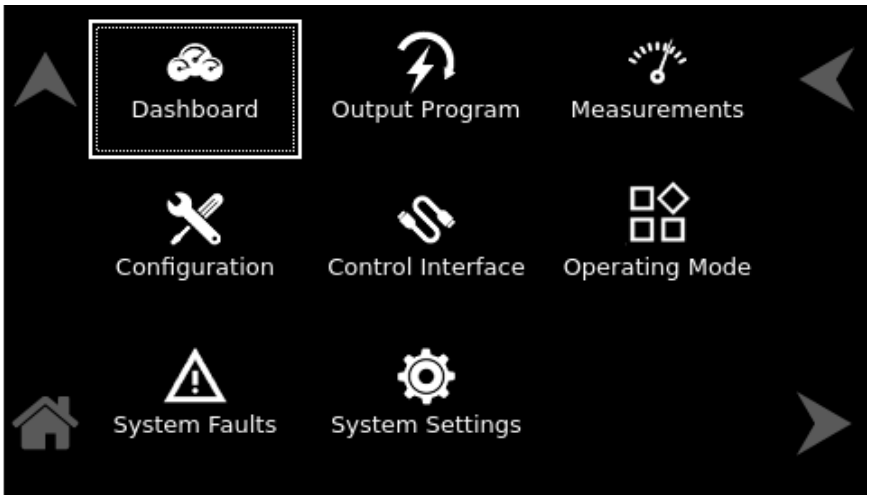


Figure 11-2. Home Screen Top-Level Menu

11.2.1 DASHBOARD SCREEN TOP-LEVEL MENU

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

11.2.1.1 DASHBOARD SCREENS BASED ON BATSIM PROFILE TYPE

Dashboard screen will be updated based on the selection in 'BATSIM Profile Type' Settings. The 'BATSIM Profile Type' settings in the 'Configuration' allows the user to switch between the 'Battery' or 'Table' profile of the BATSIM operation. Refer to Section 11.2.4.

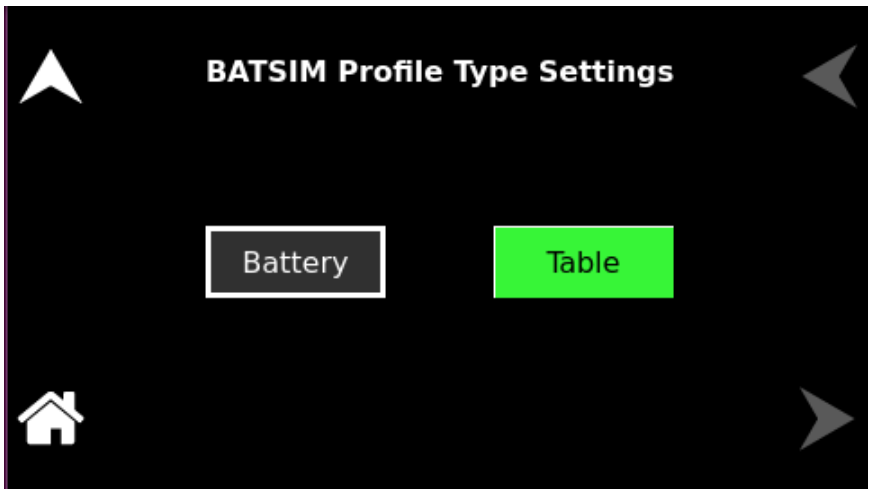


Figure 11-3. Configuration Screen

11.2.1.2 BATSIM PROFILE TYPE - BATTERY

When the setting selected is 'BATSIM Profile Type - **Battery**', the dashboard screen will display options to set the 'Battery Profile', 'Cut-Off Conditions', and the options to 'Start', 'Pause', and 'Stop' the simulation. Refer to Figure 11-4 for dashboard screen and refer to Section 6.4.2.1 for navigating to Dashboard-Screen.

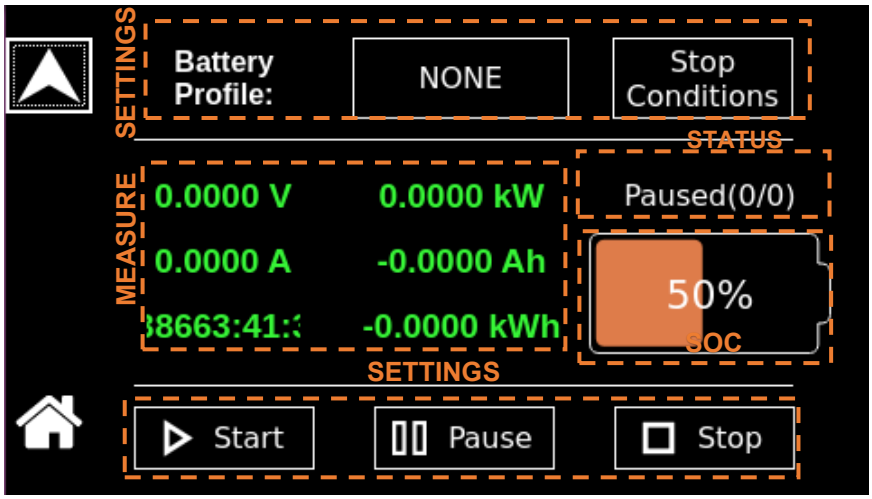


Figure 11-4. Dashboard Screen (BATSIM Profile Type – Battery)

SETTINGS	DESCRIPTION
Battery Profile[1][2]	The selected battery profile will be displayed. Users can also select, edit, delete, and load the battery profiles. After loading the battery profile to the unit, resultant battery pack values can be viewed under this setting.
Stop Conditions	Stop conditions for the battery simulation can be configured from this menu. Refer to Figure 11-13. **a) SOC High:** On measured SOC reaching this high limit, battery simulation will be terminated. **b) SOC Low:** On measured SOC reaching this low limit, battery simulation will be terminated. **c) Cap High:** On measured Capacity reaching this high limit, battery simulation will be terminated. **d) Cap Low:** On measured Capacity reaching this low limit, battery simulation will be terminated.
Start	Starts the battery simulation.
Pause	Pauses the battery simulation.
Stop	Stops the battery simulation.
MEASURE	**DESCRIPTION**

SETTINGS	DESCRIPTION
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.
Energy	Displays the floating-point value of the energy in kWh.
Capacity	Displays the floating-point value of the battery capacity in Ah.
Time	Displays the time elapsed to complete the test in hh:mm:ss.
Status	Displays the status of the battery simulation.
SOC	Displays the State of Charge of the battery in percentage.
(1) The '' symbol before the battery profile name indicates that the profile is selected but not yet loaded. To load the profile, click the load button available in the 'BATSIM Configuration Setting'. To turn ON the output of the power supply, selected profile must be loaded.* *(2) The 'NONE' indicates that no profile is selected.*	

Table 11-1. Dashboard screen top-level menu – (BATSIM Profile Type – Battery)

'Status' in the Dashboard screen will update dynamically. Refer to the Table 11-2 below;

STATUS	DESCRIPTION
Idle	When the system is Idle (not performing any battery simulation).
Initializing	When the selected Battery Profile loading to the unit is in progress.
Initialized	When the selected Battery profile load is successful.
Running	When the battery simulation is in progress.
Running Clipped – Res	When the battery simulation is in progress and the inner resistance value of the battery pack exceeds Mi-BEAM 'Series Resistance' limit. Consequently, the battery pack's inner resistance will be clipped to Mi-BEAM Series Resistance limit.
Running Clipped – Volt	When the battery simulation is in progress and the Open Circuit Voltage value of the battery pack exceeds Mi-BEAM voltage limit. Consequently, the battery pack's Open Circuit Voltage will be clipped to Mi-BEAM Series Voltage limit.
Running Clipped – Res, Volt	When the battery simulation is in progress and both the Open Circuit Voltage and inner resistance values of the battery pack exceed Mi-BEAM voltage and 'Series Resistance' limits. Consequently, the battery pack's Open Circuit Voltage and inner resistance will be clipped to Mi-BEAM voltage and 'Series Resistance' limits.
Paused	When the simulation is paused by user.
Paused Clipped – Res	When the simulation is paused by user and the inner resistance value of the battery pack exceeds the Mi-BEAM 'Series Resistance' limit. Consequently, the battery pack's inner resistance will be clipped to the Mi-BEAM Series Resistance limit.
Paused Clipped – Volt	When the simulation is paused by user and the voltage value of the battery pack exceeds the Mi-BEAM 'Series voltage' limit. Consequently, the battery pack's inner voltage will be clipped to the Mi-BEAM 'Series voltage' limit.
Paused Clipped – Res, Volt	When the simulation is paused by user, the voltage and inner resistance value of the battery pack exceeds the Mi-BEAM 'Series voltage' and 'resistance' limit. Consequently, the battery pack's inner voltage and resistance will be clipped to the Mi-BEAM 'Series voltage' and 'resistance' limit.
Stopped	When the simulation is stopped.
Stopped Cap – H	When battery simulation is terminated on measured capacity reaches capacity high limit.

STATUS	DESCRIPTION
Stopped Cap – L	When battery simulation is terminated on measured capacity reaches capacity low limit.
Stopped SOC – H	When battery simulation is terminated on measured SOC reaches SOC high limit.
Stopped SOC – L	When battery simulation is terminated on measured SOC reaches SOC low limit.
Aborted	When battery simulation is aborted by the user and none of the stop conditions are met.
Tripped	When battery simulation is terminated due to fault.

Table 11-2. Status

11.2.1.3 BASTIM PROFILE TYPE - TABLE

When the settings selected is 'BATSIM Profile Type - **Profile**', the dashboard screen will display options to set the 'Table Profile', 'Cut-Off Conditions', and the options to 'Start, 'Pause', and 'Stop' the test. Refer to Figure 11-5.

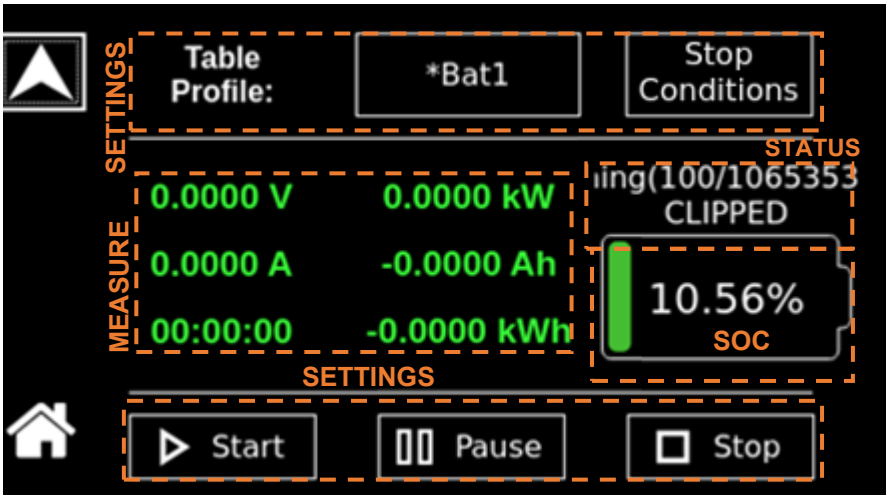


Figure 11-5. Dashboard Screen (BATSIM Profile Type – Battery)

SETTINGS	DESCRIPTION
Table Profile[1][2]	The selected table profile will be displayed. Users can load and delete the profiles. After loading the table profile to the unit, resultant battery pack values can be viewed under this setting.

SETTINGS	DESCRIPTION
Stop Conditions	Stop conditions for the battery simulation can be configured from this menu. Refer to Figure 11-13. **a) SOC High:** On measured SOC reaching this high limit, battery simulation will be terminated. **b) SOC Low:** On measured SOC reaching this low limit, battery simulation will be terminated. **c) Cap High:** On measured Capacity reaching this high limit, battery simulation will be terminated. **d) Cap Low:** On measured Capacity reaching this low limit, battery simulation will be terminated.
Start	Starts the battery simulation.
Pause	Pauses the battery simulation.
Stop	Stops the battery simulation.
MEASURE	**DESCRIPTION**
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.
Energy	Displays the floating-point value of the energy in kWh.
Capacity	Displays the floating-point value of the battery capacity in Ah.
Time	Displays the time elapsed to complete the test in hh:mm:ss.
Status[3]	Displays the operational status of the battery simulation.
SOC	Displays the State of Charge of the battery in percentage.

[1] The '' symbol before the battery profile name indicates that the profile is selected but not yet loaded. To load the profile, click the load button available in the 'BATSIM Configuration Setting'. To turn ON the output of the power supply, selected profile must be loaded.*
[2] The 'NONE' indicates that no profile is selected.

Table 11-3. Dashboard screen top-level menu (BATSIM Profile Type – Table)

'Status' in the Dashboard screen will update dynamically. Refer to the Table 11-4 below;

STATUS	DESCRIPTION
Idle	When the system is Idle (not performing any battery simulation).
Initializing	When the selected Battery Profile loading to the unit is in progress.
Initialized	When the selected Battery profile load is successful.
Running (current index/total index)	When the battery simulation is in progress, the progress will be shown near the running status, indicating the current table index that is executing / total indices of the table.
Running (current index/total index) Clipped – Res	When the battery simulation is in progress and the inner resistance value of the battery pack exceeds Mi-BEAM 'Series Resistance' limit. Consequently,

STATUS	DESCRIPTION
	the battery pack's inner resistance will be clipped to Mi-BEAM ‘Series Resistance’ limit.
Running (current index/total index) Clipped – Volt	When the battery simulation is in progress and the Open Circuit Voltage value of the battery pack exceeds Mi-BEAM voltage limit. Consequently, the battery pack's Open Circuit Voltage will be clipped to Mi-BEAM ‘Series Voltage’ limit.
Running (current index/total index) Clipped – Res, Volt	When the battery simulation is in progress and both the Open Circuit Voltage and inner resistance values of the battery pack exceeds Mi-BEAM voltage and ‘Series Resistance’ limits. Consequently, the battery pack's Open Circuit Voltage and inner resistance will be clipped to Mi-BEAM voltage and ‘Series Resistance’ limits.
Paused (current index/total index)	When the simulation is paused by user, the progress will be shown near the running status, indicating the current table index that is executing / total indices of the table.
Paused (current index/total index) Clipped – Res	When the simulation is paused by user and the inner resistance value of the battery pack exceeds the Mi-BEAM Series Resistance limit. Consequently, the battery pack's inner resistance will be clipped to the Mi-BEAM ‘Series Resistance’ limit.
Paused (current index/total index) Clipped – Volt	When the simulation is paused by user and the voltage value of the battery pack exceeds the Mi-BEAM ‘Series voltage’ limit. Consequently, the battery pack's inner voltage will be clipped to the Mi-BEAM ‘Series voltage’ limit.
Paused (current index/total index) Clipped – Res, Volt	When the simulation is paused by user and the voltage and inner resistance value of the battery pack exceeds the Mi-BEAM ‘Series voltage’ and ‘resistance’ limit. Consequently, the battery pack's inner voltage and resistance will be clipped to the Mi-BEAM ‘Series voltage’ and ‘resistance’ limit.
Stopped	When the simulation is stopped.
Stopped Cap – H	When battery simulation is terminated on measured capacity reaches capacity high limit.
Stopped Cap – L	When battery simulation is terminated on measured capacity reaches capacity low limit.
Stopped SOC – H	When battery simulation is terminated on measured SOC reaches SOC high limit.
Stopped SOC – L	When battery simulation is terminated on measured SOC reaches SOC low limit.
Aborted	When battery simulation is aborted by the user and none of the stop conditions are met.
Tripped	When battery simulation is terminated due to fault.

Table 11-4. Status

11.2.1.4 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 11-6. The rotary encoder could then be used to continuously adjust the parameter value, up and down, as it is rotated. The value change has immediate effect at the output.

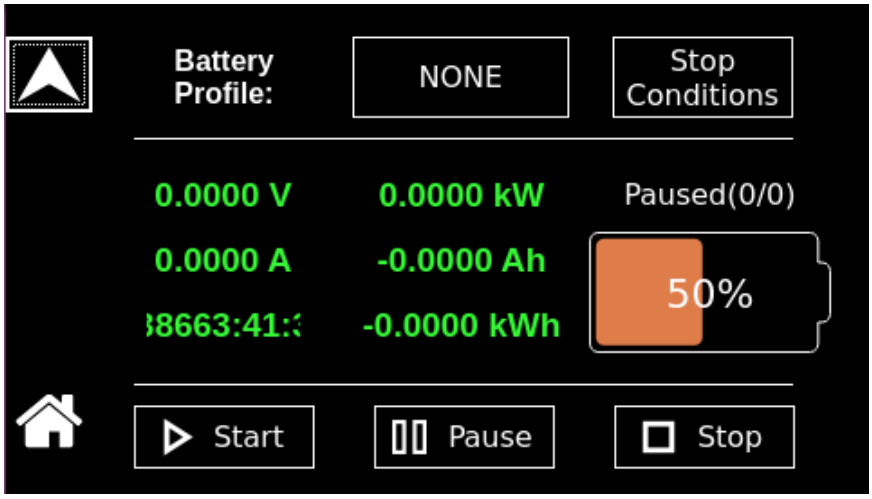


Figure 11-6. Real-Time, Immediate Output Parameter Adjustment

11.2.1.5 DEFAULT SCREEN

The Default screen provides measurement of the DC output ‘Voltage’, ‘Current’, ‘Power’ and ‘SOC’, refer to Figure 11-7. When the Dashboard screen is idle for an interval equal to a set time delay, refer to Figure 11-64 and Figure 11-65. The display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen.

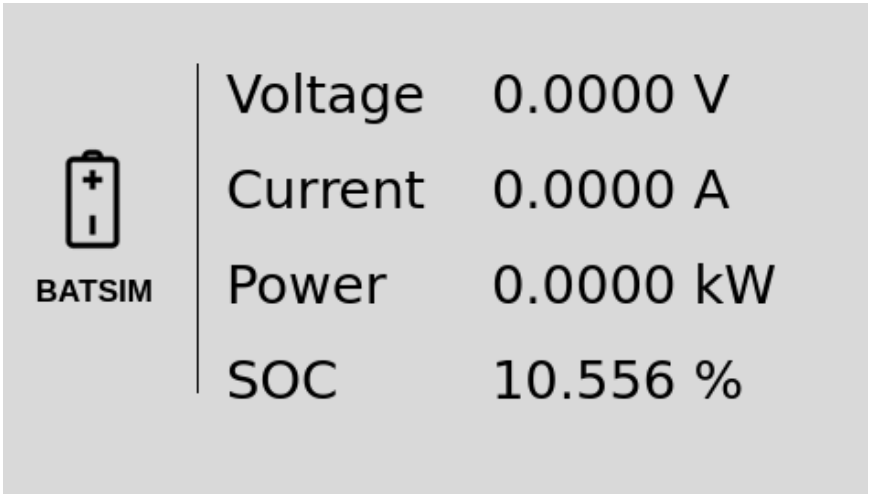


Figure 11-7. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage, current, power and SOC in various modes of operation.

11.2.2 OUTPUT PROGRAM SCREEN

The Output Program screen provides the settings of Output State. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

Figure 11-8. Output Program Screen

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Output State	Users can program the output to ON or OFF state. Refer to Figure 11-9.

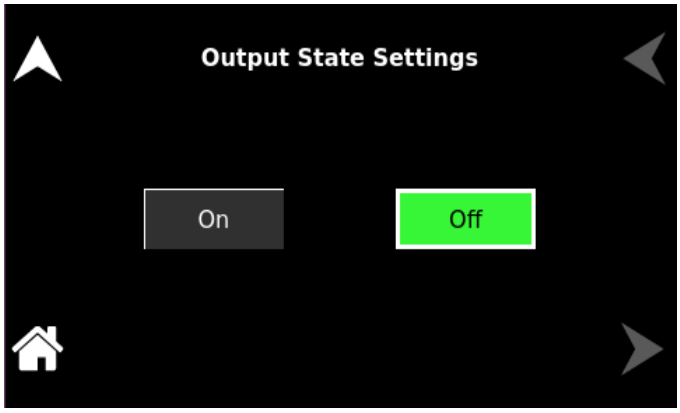


Figure 11-9. Output State Settings

Table 11-5. Output Program screen

11.2.3 MEASUREMENTS SCREEN

The Measurements screen displays the floating-point values for Output Voltage, Output Current, Output Power and Output Capacity, Output Energy, Output SOC. For the Measurement screen refer to Figure 11-10 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

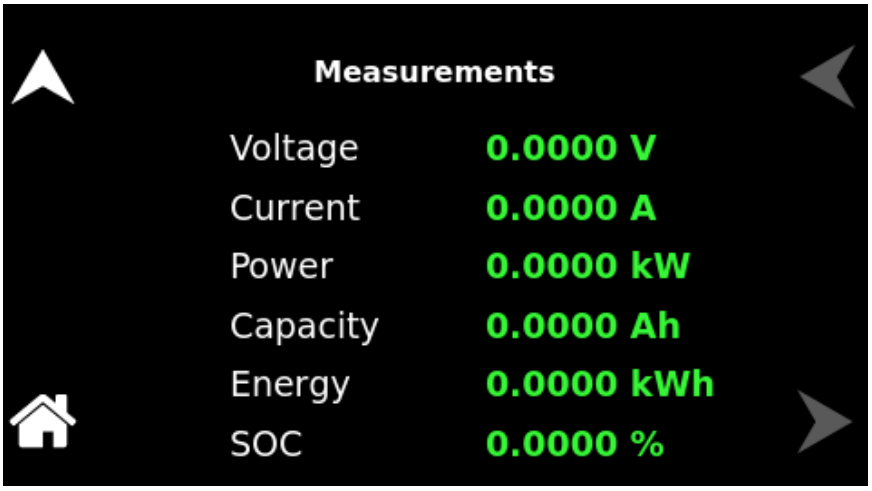


Figure 11-10. Measurement Screen

11.2.4 CONFIGURATION SCREEN

The 'Configuration screen' provides 'BATSIM Profile Type', 'BATSIM Cut-Off Conditions', 'BATSIM Configuration', 'Protection', 'Output Sense', 'PONS', 'Measurement Average Samples'. For the top-level menu of the Configuration screen, refer to Figure 11-11 and for instructions on how to navigate, refer to Section 6.4.2.1.

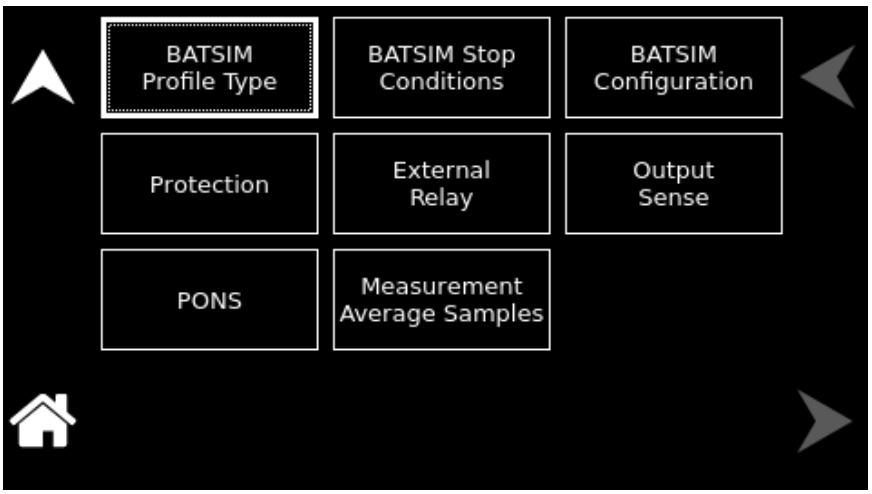


Figure 11-11. Configuration Screen Top-Level Menu

11.2.4.1 BATSIM PROFILE TYPE SETTINGS

The ‘BATSIM Profile Type’ setting in the ‘Configuration’ Screen enables users to switch between ‘Battery’ and ‘Table’ profile types. Refer to Figure 11-12.

For the top-level menu of the Configuration screen, refer to Figure 11-11 and for the instructions on how to navigate, refer to Section 6.4.2.1.

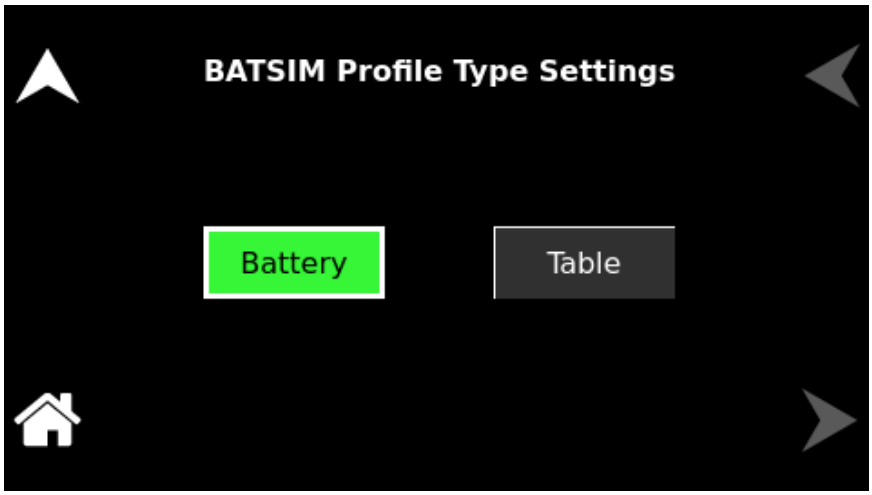


Figure 11-12. BATSIM Profile Type Setting

ENTRY	DESCRIPTION
Battery	Users can create and simulate battery models by configuring the battery parameters.
Table	Users can create and simulate battery models by configuring the SoC (State of Charge) vs OCV (Open Circuit Voltage) vs Inner Resistance points, with a maximum of 100 points.

Table 11-6. BATSIM Profile Type Settings

11.2.4.2 BATSIM CUT-OFF CONDITIONS SETTINGS

The ‘BATSIM Cut-Off Conditions Settings’ are used to configure various stop conditions for the battery simulation, such as ‘SOC High’, ‘SOC Low’, ‘Cap High’, and ‘Cap Low’. Refer to Figure 11-13.

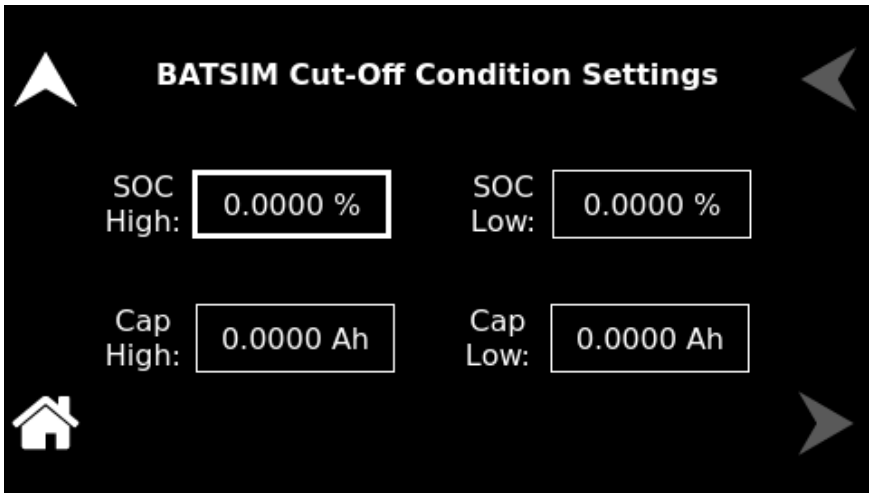


Figure 11-13. BATSIM Cut-Off Condition Settings

ENTRY (1)	DESCRIPTION
SOC High	On measured SOC reaching this high limit, battery simulation will be terminated.
SOC Low	On measured SOC reaching this low limit, battery simulation will be terminated.
Cap High	On measured Capacity reaching this high limit, battery simulation will be terminated.
Cap Low	On measured Capacity reaching this low limit, battery simulation will be terminated.
(1) The battery simulation will be terminated on reaching any configured stop condition.	

Table 11-7. BATSIM Cut-Off Condition Settings

11.2.4.3 BATSIM CONFIGURATION

a) BATTERY

The 'BATSIM Configuration' enables users to simulate various battery characteristics by adjusting key parameters like ‘Full Volt’, ‘Empty Volt’, ‘Parallel’, ‘Capacity’, ‘Inner Res. ’, ‘Series’, ‘Charge Current’, ‘Discharge Current’ and ‘Initial SOC’.

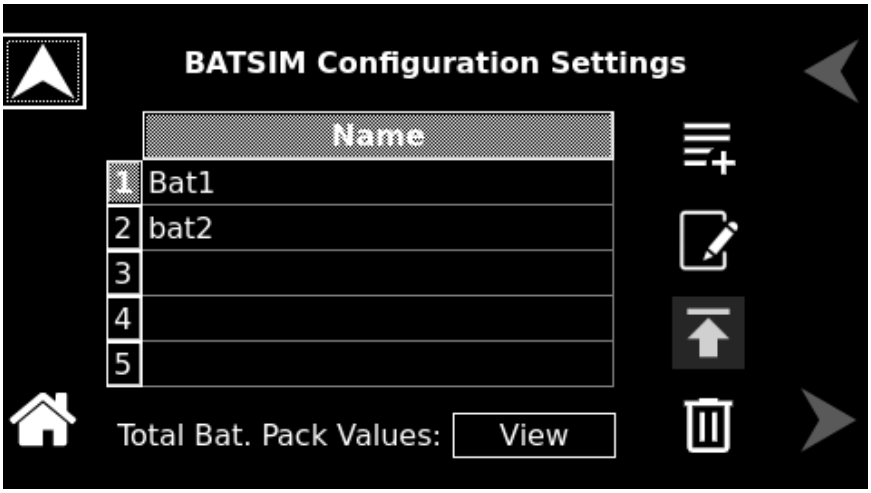


Figure 11-14. BATSIM Configuration Settings - Battery

- **Adding a configuration in 'BATSIM Configuration Settings'**
  - Open the 'BATSIM Configuration Settings' and select the 'Add Configuration' option on the right side of the screen. Refer to Figure 11-15.

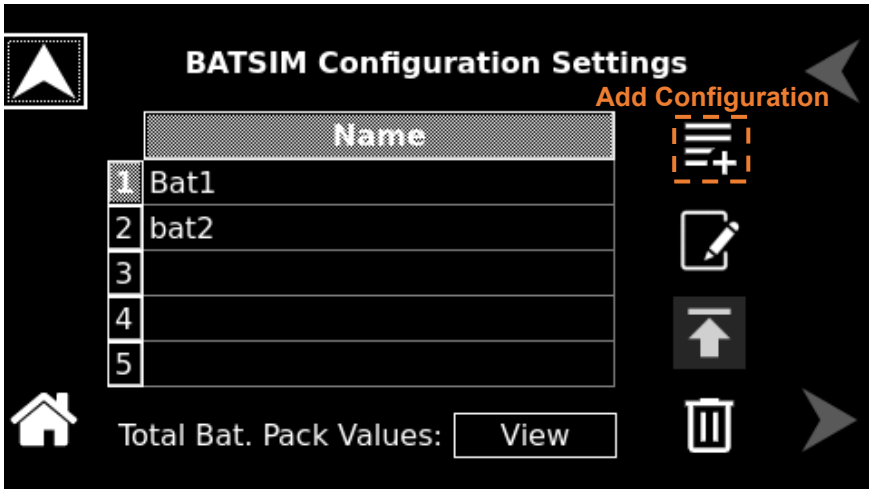


Figure 11-15. Profile Selection

  - An alphanumeric keypad will open, allowing the user to enter a configuration name and click 'OK' to confirm the profile name. Refer to Figure 11-16.

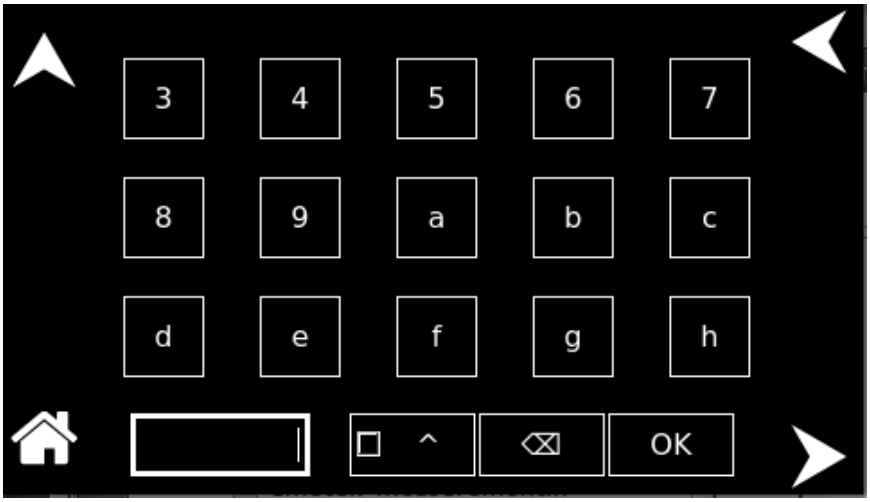
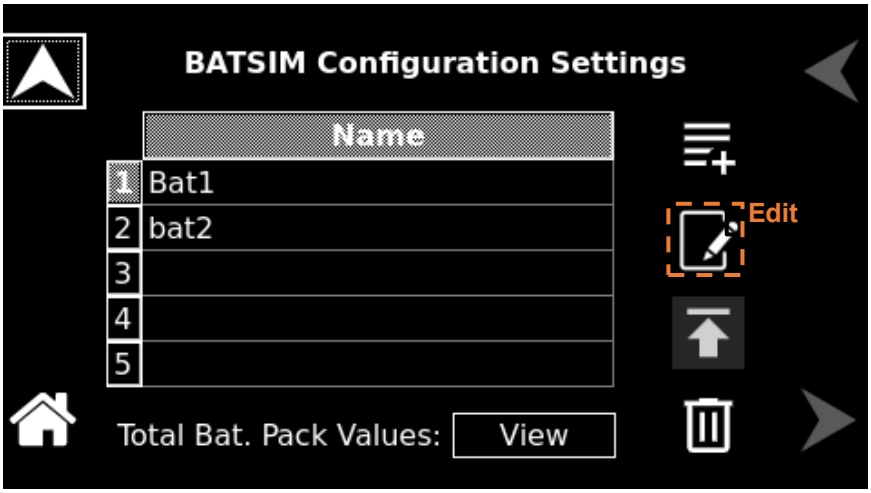


Figure 11-16. Alpha - numeric keypad

- **Edit the profile in 'BATSIM Configuration Settings'**
    - The created configuration will have default values. If the user wants to change the default values, click on the 'Edit' option.
    - The selected configuration name will be displayed at the top of the screen when the 'Edit' option is clicked. Refer to Figure 11-17.
    - The functions available in 'Screen 1' are 'Full Volt', 'Empty Volt', 'Parallel', 'Capacity', 'Inner Res. ' and 'Series '. Refer to Figure 11-17.



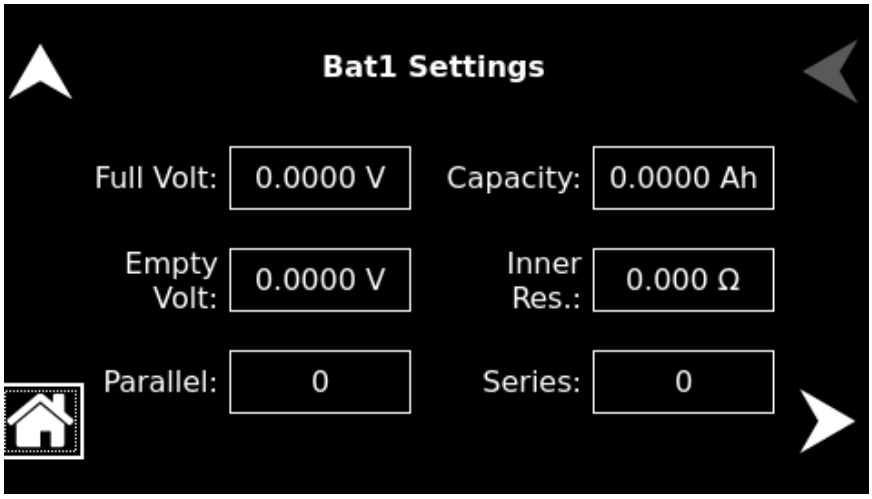


Figure 11-17. Cut- Off Conditions Settings

- Use the navigation arrows to change the screen to 'Screen 2' and enter the values of 'Charge Current', 'Discharge Current' and 'Initial SOC'. Refer to Figure 11-18.

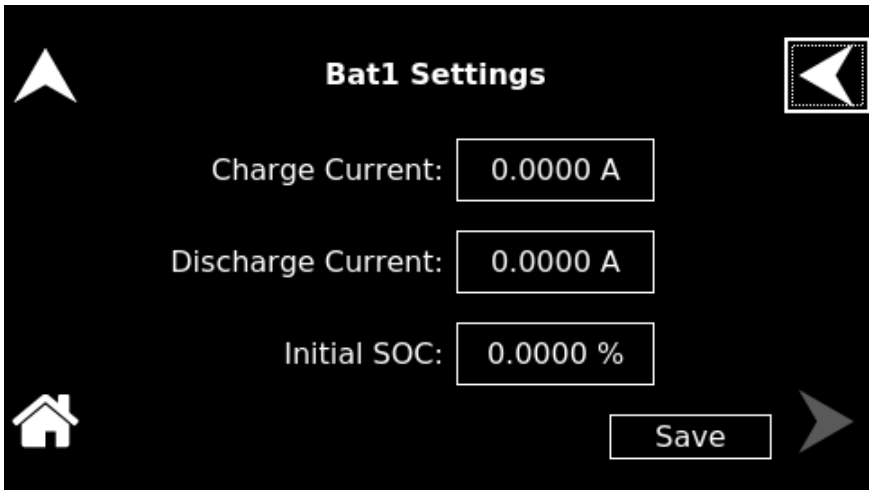


Figure 11-18. Cut- Off Conditions Settings

ENTRY	DESCRIPTION
Full Volt	Battery voltage at 100% SoC
Empty Volt	Battery voltage at 0% SoC
Capacity	Total Capacity of the battery, capacity when SoC is 100%
Inner Res	Battery inner resistance
Series[1]	Number of batteries connected in series
Parallel[2]	Number of batteries connected in parallel
Charge Current	Maximum charge current that the battery pack allows
Discharge Current	Maximum discharge current that the battery pack allows
Initial SoC	Battery SoC when the simulation starts
[1] Connecting battery cells end-to-end, increasing the overall voltage. *[2] Connecting battery cells side-by-side, increasing the overall capacity.*	

Table 11-8. Screen 1 and 2 – Profile Settings

- Once the profile is configured, click on the ‘Save’ option to save the settings.

NOTE: When multiple setting screens are present, the ‘Save’ option will only be available on the last screen. Ensure to click the 'Save' option to save the settings.

- **Load the Profile in ‘BATSIM Configuration Settings’**
  - Load the defined configuration by clicking the ‘Upload’ option. Refer to Figure 11-19.

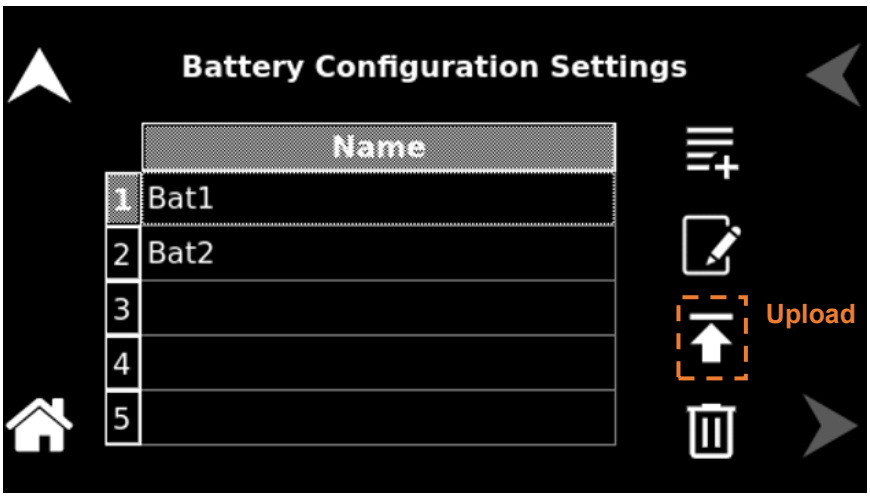


Figure 11-19. BATSIM Configuration Settings - Upload option

  - The ‘Upload button’ will be disabled when the configuration is uploaded to the unit. Refer to Figure 11-21.
  - The ‘Total Bat. Pack Values’ will show the total battery pack values of the loaded configuration. Refer to Figure 11-20.

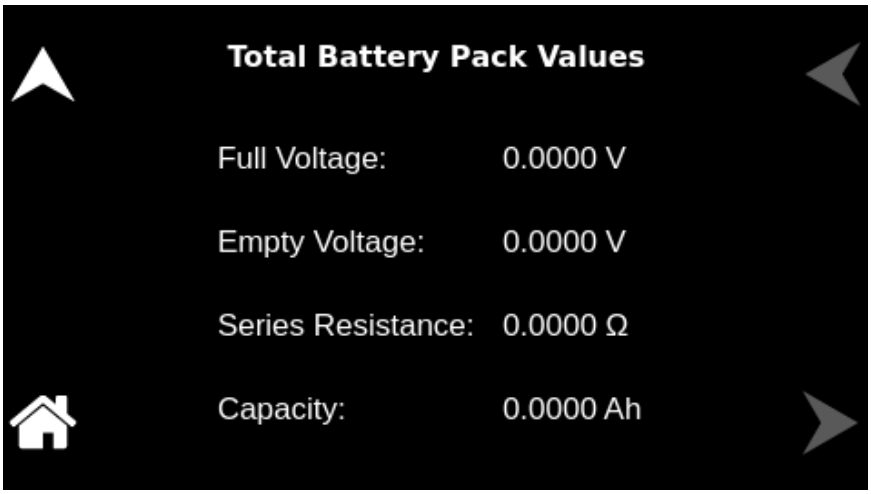


Figure 11-20. Total Battery Pack Values – Battery

- **Delete the Profile in 'BATSIM Configuration Settings'**
  - Click on 'Delete' to remove the selected BATSIM configuration. Refer to Figure 11-21.

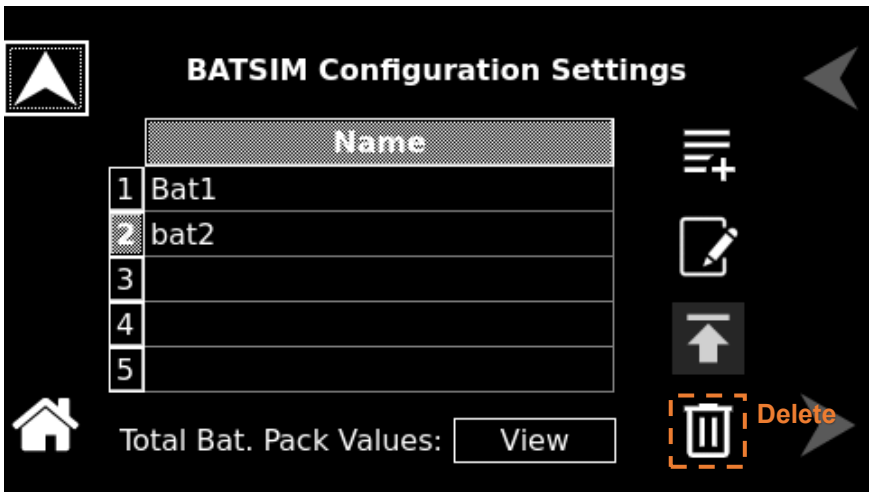


Figure 11-21. BATSIM Configuration Settings - Upload Disabled and Delete option

b) TABLE

When the Profile type is selected as 'TABLE' in the 'BATSIM Configuration' menu, the upload and delete option only be available. The user can create and edit configurations from the virtual panel.

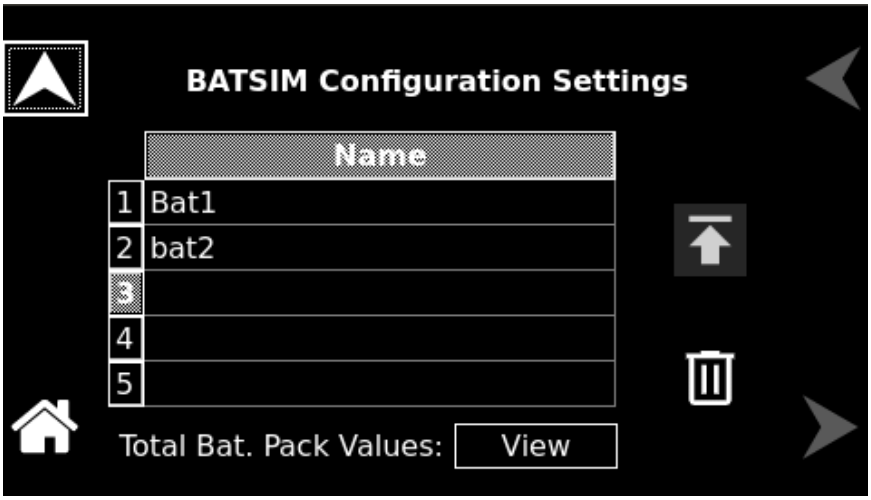


Figure 11-22. BATSIM Configuration Settings - Table

- **Load the profile in 'BATSIM Configuration Settings'**
  - The user can load a configuration, defined in the virtual panel by selecting the 'Upload' button. Refer to the Figure 11-22.

- The ‘Total Bat. Pack Values’ will show the total battery pack values of the loaded configuration. Refer to Figure 11-23.

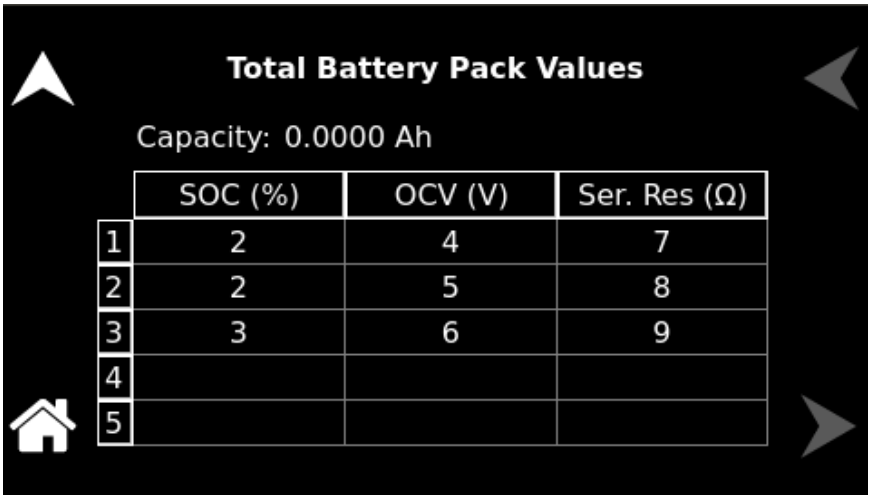


Figure 11-23. Total Battery Pack Values – Table

- **Delete the profile in ‘BATSIM Configuration Settings’**
  - Click on ‘Delete’ to remove the selected BATSIM configuration. Refer to Figure 11-22.

11.2.4.4 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) and Negative Overcurrent Protection (Neg. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 11-24.

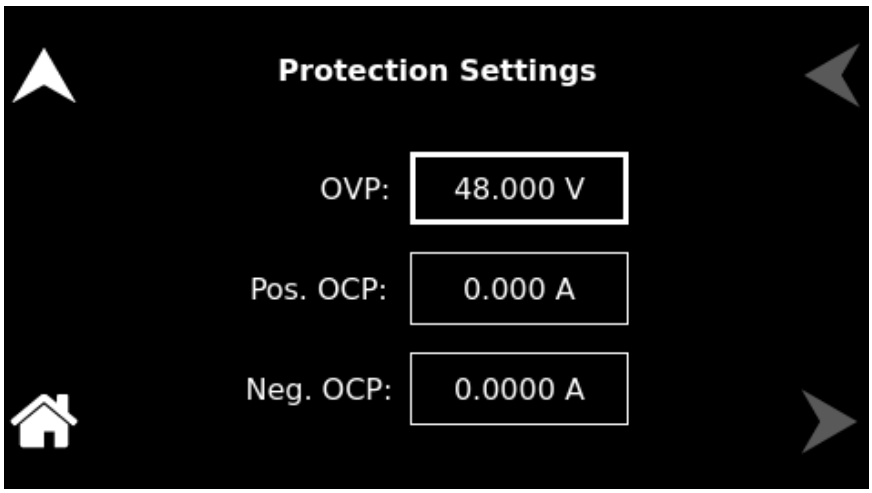


Figure 11-24. Protection Settings

11.2.4.5 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 11-25.

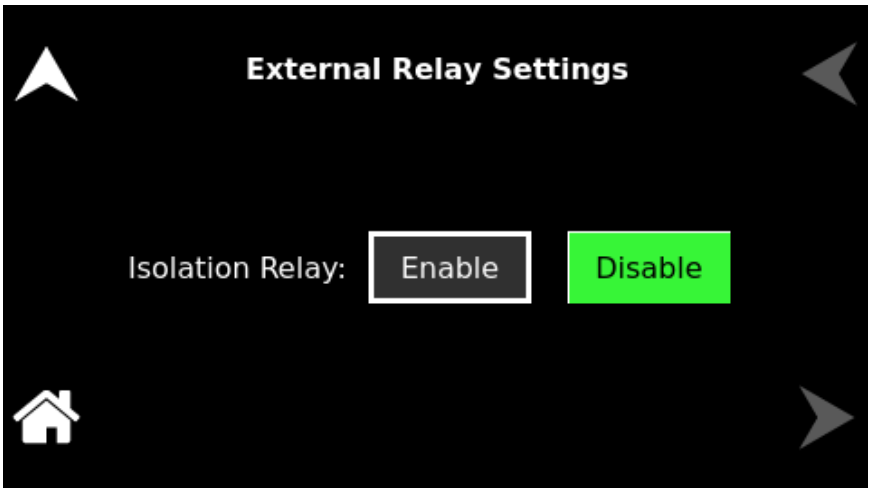


Figure 11-25. Isolation relay

11.2.4.6 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS connector. Refer to Figure 11-26.

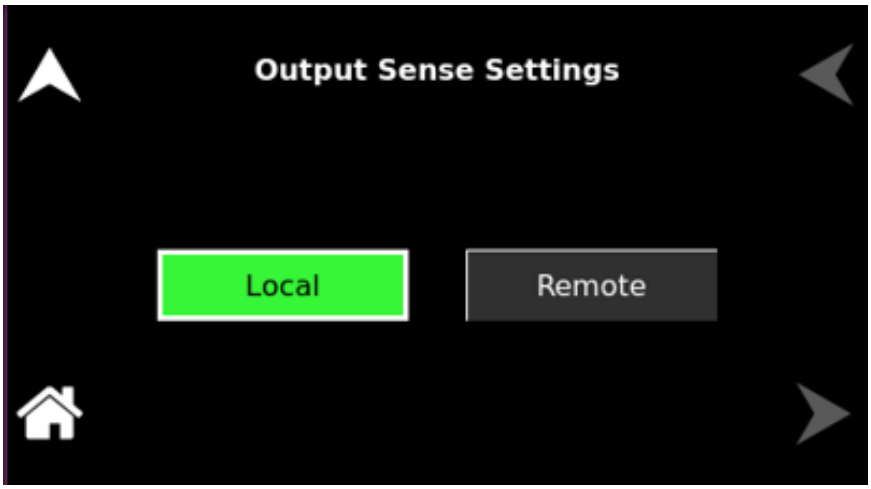


Figure 11-26. Output Sense Settings

11.2.4.7 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings. Refer to Figure 11-27.

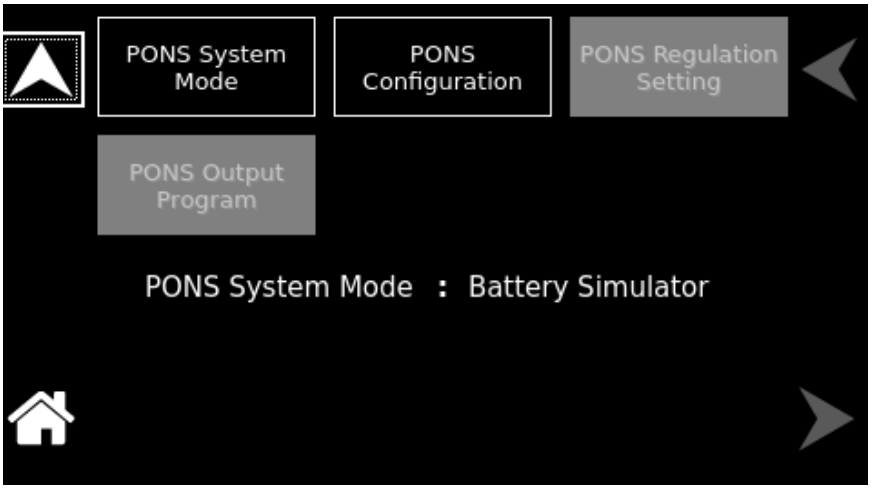


Figure 11-27. PONS – Main Screen

11.2.4.7.1 PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the ' Operating Mode' settings on the Home screen. Users must separately select the 'BATTEST' mode in the 'PONS Operating Mode Settings', which will update the 'PONS Operating Mode Settings' screen and the 'PONS Configuration' screen. Refer to Figure 11-28 and Figure 11-29.

The same applies to other modes such as Bi-DIR, SOUR, ELOAD, PVSIM and BATTEST. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 9.2.5.7.1, 10.2.4.2.1.5 and 12.2.4.6.1

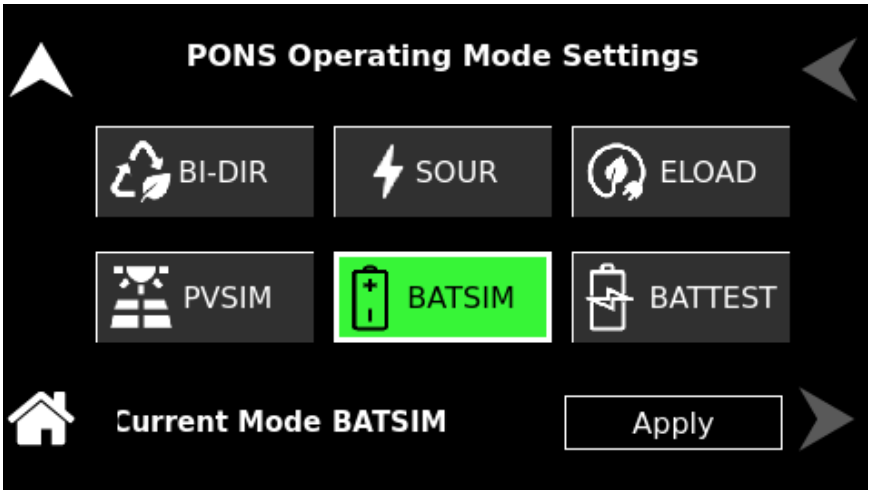


Figure 11-28. PONS Operating Mode Settings

11.2.4.7.2 PONS CONFIGURATION

In the PONS Configuration settings, the menu enables users to select ‘PONS Protection’, ‘PONS External Relay’, ‘PONS Slew Rate’, ‘PONS Output Sense’, ‘PONS Measurement Average Samples’ and ‘PONS Remote Inhibit’. Refer to Figure 11-29.

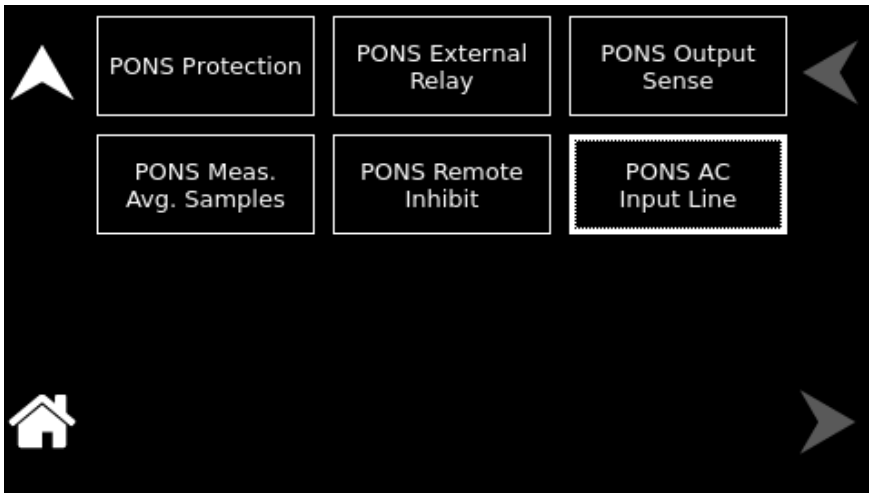


Figure 11-29. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	Users can define OVP, Pos. OCP and Neg. OCP to help safeguard their devices from electrical anomalies. Refer to Figure 11-30.

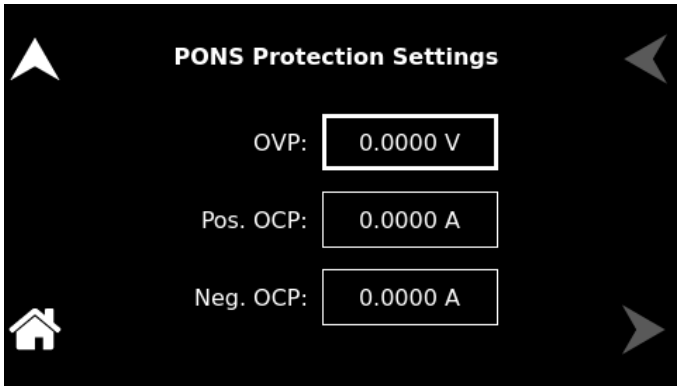


Figure 11-30. PONS Protection Settings

ENTRY	DESCRIPTION
PONS External Relay	Users can set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 11-31.

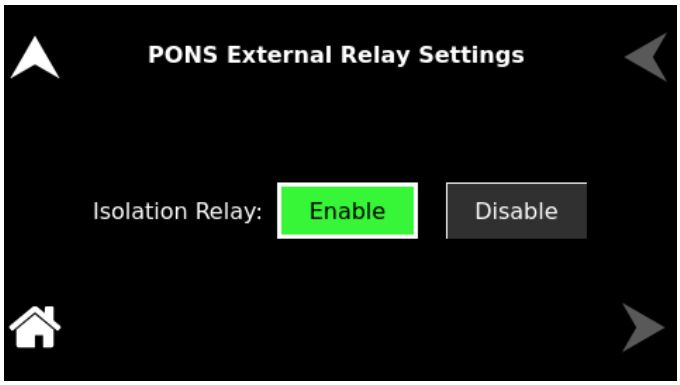


Figure 11-31. PONS External Relay Settings

PONS Slew Rate

Users can configure the voltage slew rate. This allows for precise control over the voltage, ensuring smoother transitions and better performance of the power supply. Adjusting this settings can help in optimizing the response time and stability of the system. Refer to Figure 11-32.

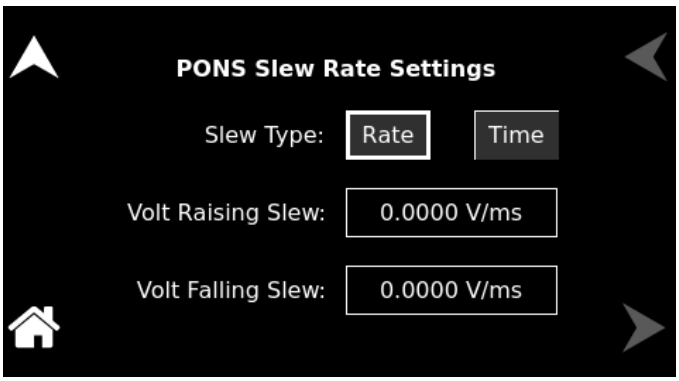


Figure 11-32. PONS Slew Rate Settings – Voltage

PONS Output Sense

Users can program the PONS output to ON or OFF state Refer to Figure 11-33.

ENTRY	DESCRIPTION

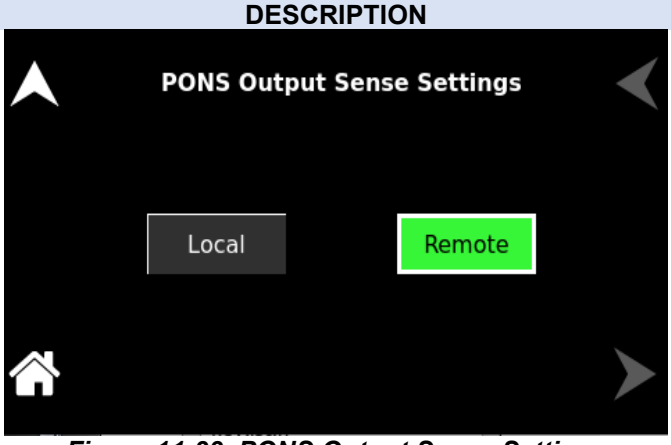


Figure 11-33. PONS Output Sense Settings

PONS Measurement Average Samples

Users can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 11-34.

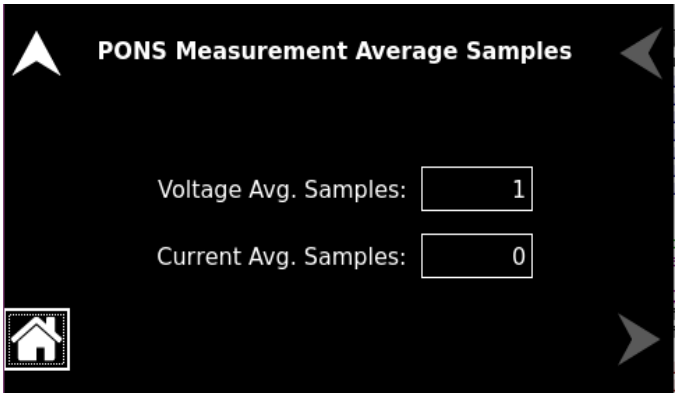


Figure 11-34. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 11-35.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

ENTRY	DESCRIPTION

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

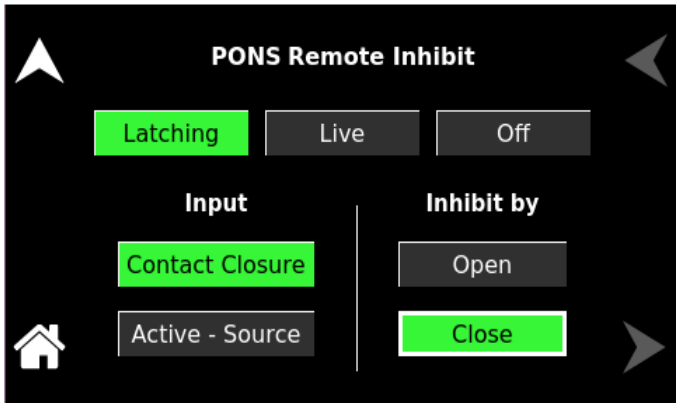


Figure 11-35. PONS remote Inhibit

PONS AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 11-36.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

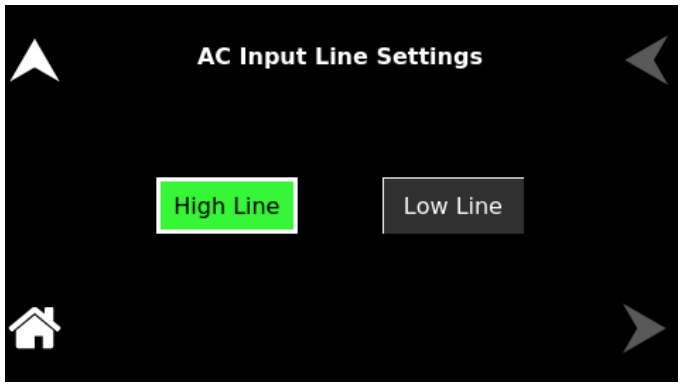


Figure 11-36. AC Input Line Settings

Table 11-9. PONS Configuration mode

11.2.4.8 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 11-37.

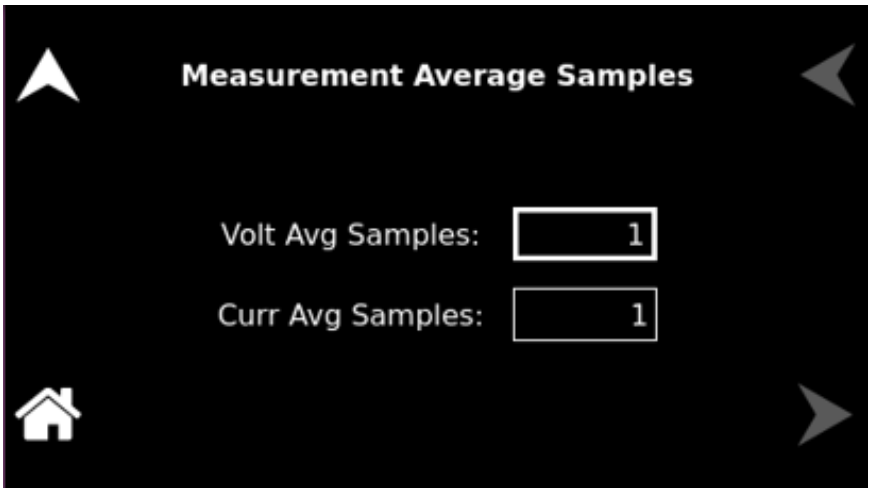


Figure 11-37. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 11-10. Measurement Average Samples

11.2.5 CONTROL INTERFACE SCREEN

The Control Interface screen provides the ability to configure the power supply for remote control through the data communications interfaces. For the top-level menu of the Control Interface Screen, refer to Figure 11-38 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

Figure 11-38. Control Interface Screen Top-Level Menu

The Control interface Settings menu has the following fields:

ENTRY	DESCRIPTION
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 11-39. After settings are changed, the unit must be turned OFF/ON for them to take effect.

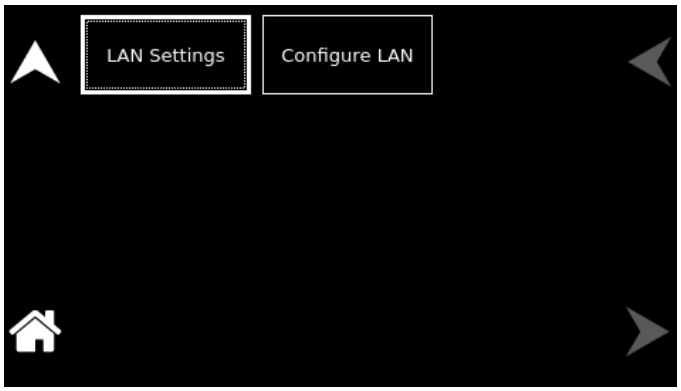


Figure 11-39. LAN Screen

a) LAN SETTINGS

Lists the configuration settings of the LAN interface, and the DNS-SD service name; a number, (n), would be appended to the service name, if necessary, to differentiate duplicate power supply names. Refer to Figure 11-40.

ENTRY	DESCRIPTION

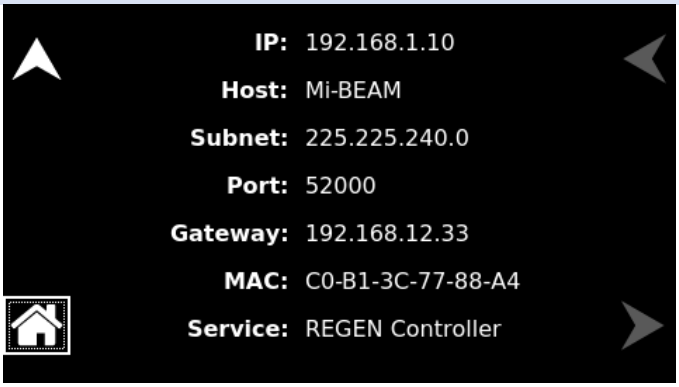


Figure 11-40. LAN Settings

b) LAN CONFIGURE

Sets parameter values and controls operation of the LAN interface. Refer to Figure 11-41.

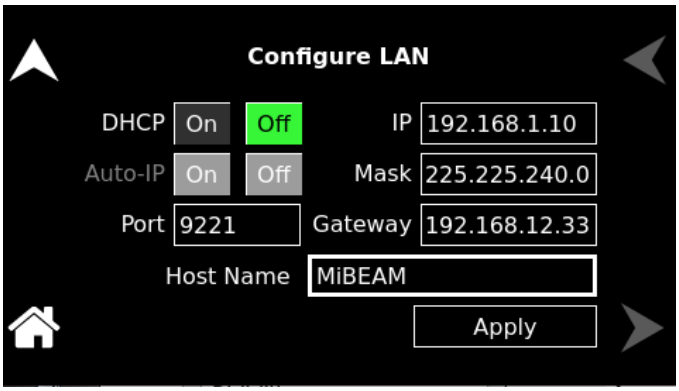


Figure 11-41. Configure LAN

- **DHCP**: Selects whether DHCP is enabled or disabled. Refer to Figure 11-42.

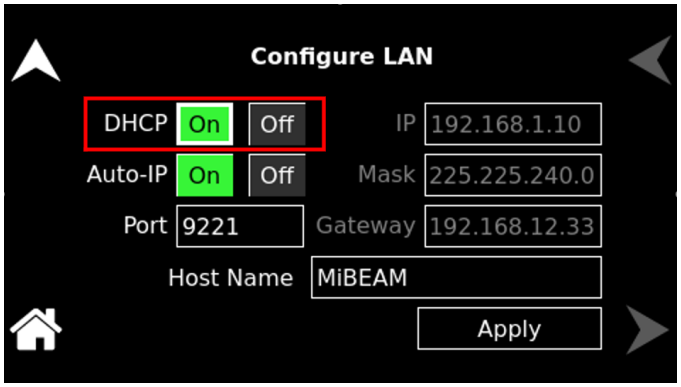


Figure 11-42. LAN Screen – DHCP

ENTRY	DESCRIPTION

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.

- **Auto-IP**: Enable or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 11-43.

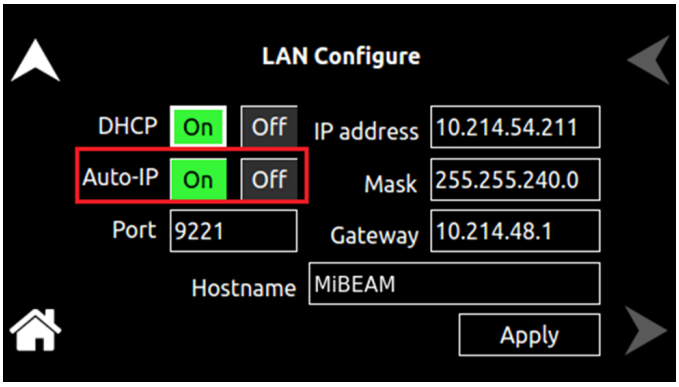


Figure 11-43. LAN Screen - Auto -IP

- **IP Address**: Sets the static IP address for the unit. When DHCP is turned off in the LAN CONFIG sub-menu, AUTO IP is selected, set the IP address to all zeros so that the IP address would be requested from the network; when DHCP is selected, the IP address is assigned by the network DHCP server. Refer to Figure 11-44.

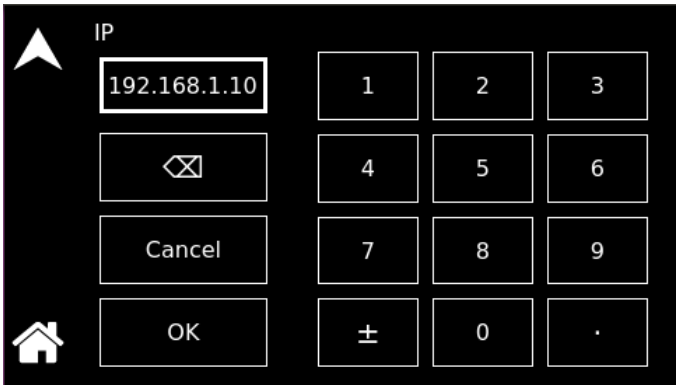


Figure 11-44. LAN Screen - IP Address

- **Subnet Mask**: Sets the subnet mask for use in static IP configuration. Refer to Figure 11-45.

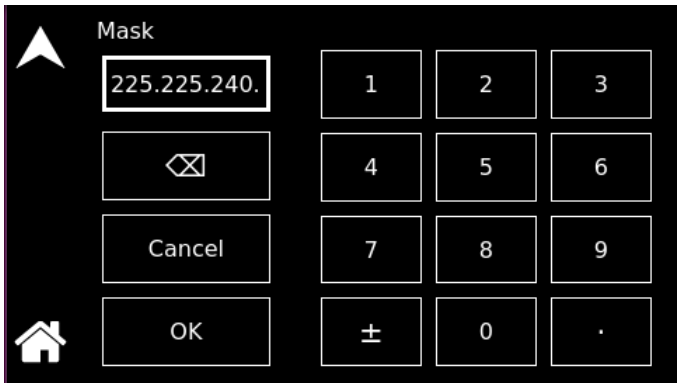


Figure 11-45. LAN Screen - Subnet Mask

- **Gateway Address**: Sets the gateway address when DHCP is turned off in the LAN CONFIG sub-menu and when AUTO IP is selected, set the gateway address to all zeros so that the gateway address would be requested from the network; when DHCP is selected, the gateway address is assigned by the network DHCP server. Refer to Figure 11-46.

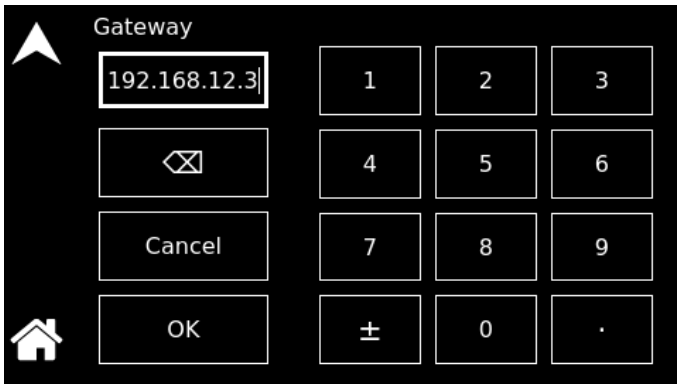


Figure 11-46. LAN Screen - Gateway Address

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

- **Port**: sets the port number; the factory-default value is 9221. Refer to Figure 11-47.

ENTRY	DESCRIPTION

Figure 11-47. LAN Screen -Port

- **MAC Address:** Displays the MAC address; the MAC address is listed on a label on the chassis of the unit. Refer to Figure 11-48.

Figure 11-48. MAC Address

- **Host Name**: Allows setting a unique alpha-numeric host name. Refer to Figure 11-49.

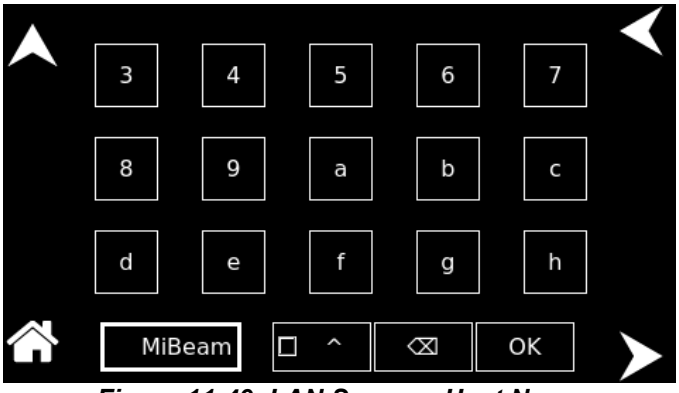


Figure 11-49. LAN Screen - Host Name

- **Apply**: Applies the LAN settings to the supply. Refer to Figure 11-50 and Figure 11-51.

ENTRY	DESCRIPTION

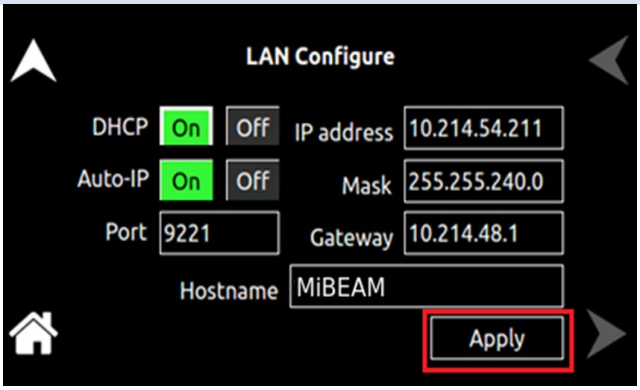


Figure 11-50. LAN Screen – Apply

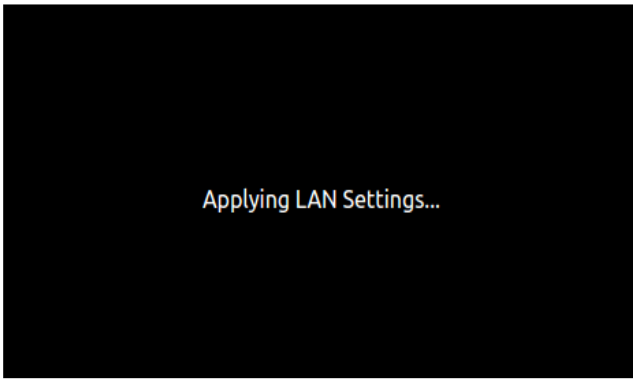


Figure 11-51. LAN Screen - Applying LAN Settings

RS232

Configures the RS-232C communications interface.RS232 has two sub-menus: RS232 Settings and RS232 Configure

a) RS232 Settings: Lists the configured Baud Rate, Stop Bits, Bits and Parity for the RS232 digital interface, refer to Figure 11-52.

- **Baud Rate**: sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.
- **Stop Bits:** sets the number of stop bits to either 1 or 2 bits. The default setting is 1 stop bit.
- **Data:** sets the number of data bits to either 7 or 8. The default setting is 8 bits.
- **Parity:** sets the parity to either Even, Odd, or no parity, None. The default setting is no parity, None.

ENTRY	DESCRIPTION

Figure 11-52. RS232 Screen -Settings

b) Configure RS232: Configures the RS-232 Baud Rate, refer to Figure 11-53 and Figure 11-54. This setting must match those set for the communications port of the user external controller.

- **Baud Rate:** sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.

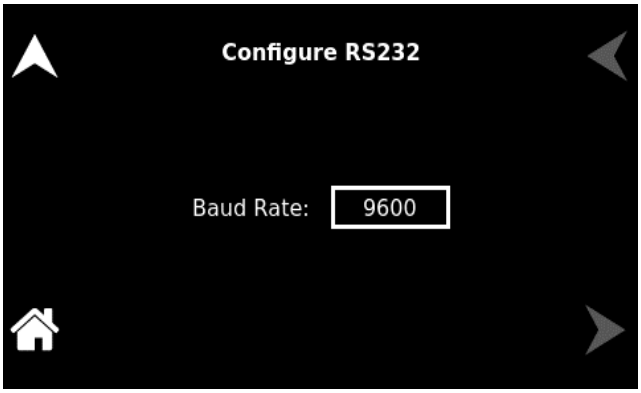


Figure 11-53. RS232 Screen -Configure

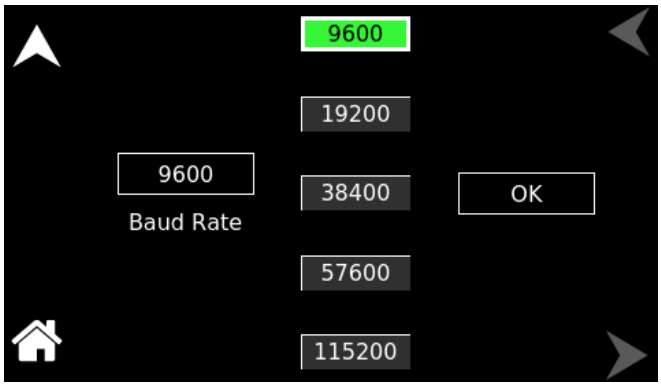


Figure 11-54. Baud Rate Selection

ENTRY	DESCRIPTION
Remote Inhibit	Sets the control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 11-55. **a) Remote Inhibit Input – Contact Closure** Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output. Remote inhibit can be configured in three modes; • **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output. • **Live:** after reclosing the contact, user needs to turn ON the output. • **OFF:** inhibit function would be disabled. **b) Remote Inhibit Input – Active Source** An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply. Remote inhibit can be configured in three modes; • **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output. • **Live:** after removing the active voltage source, user needs to turn ON the output. • **OFF:** inhibit function would be disabled.
USB	Displays the configured Baud Rate. Refer to Figure 11-56.

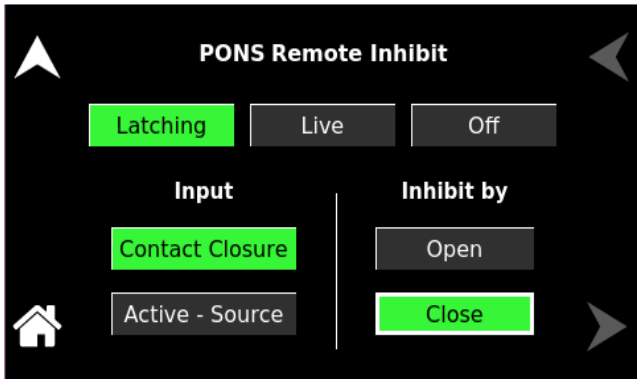


Figure 11-55. PONS remote Inhibit

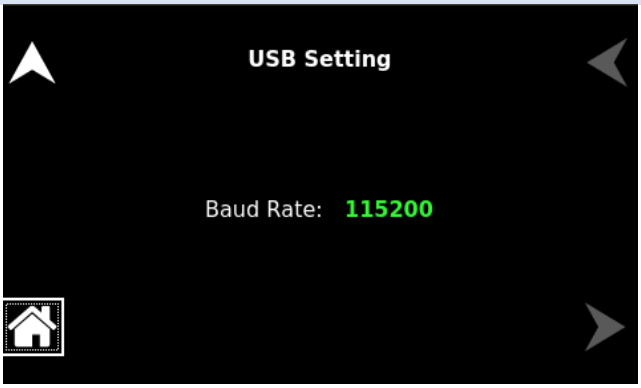
ENTRY	DESCRIPTION
	

Figure 11-56. USB Setting

Table 11-11. System Setting Screen

11.2.6 OPERATING MODE

The Operating Mode Settings screen offers comprehensive guidance on the system modes of the Mi-BEAM Series power supply. This model is engineered for versatile and reliable performance across various applications, ensuring precise and efficient power delivery through its advanced control features. Depending on user requirements, the Mi-BEAM Series supports multiple modes of operation. Refer to the Figure 11-57.

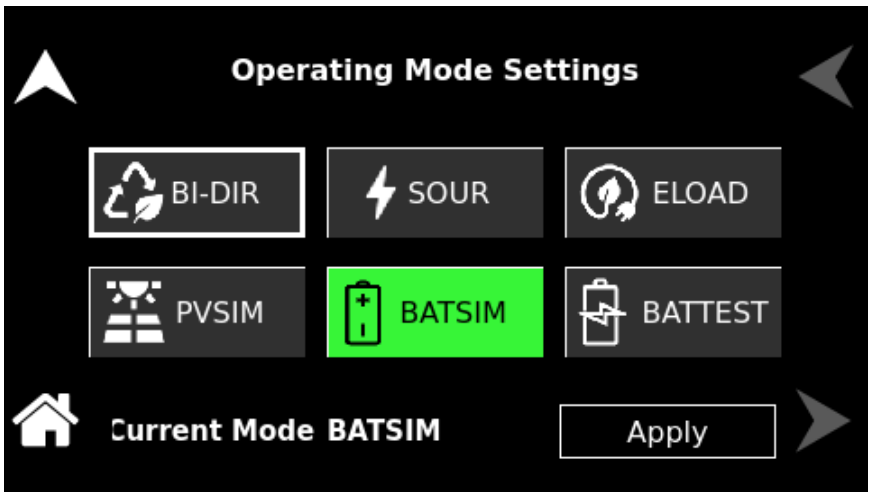


Figure 11-57. Operating Mode

11.2.7 SYSTEM SETTINGS SCREEN

The System Settings screen provides the settings of ‘Hardware Limits’, ‘System Details’ ‘Firmware Version’, ‘LCD’, ‘Default Screen’ and ‘Factory Default’. The top-level menu of the System Settings menu is shown in Figure 11-58. Refer to Section 6.4.2.1 for navigating to System Settings Screen.

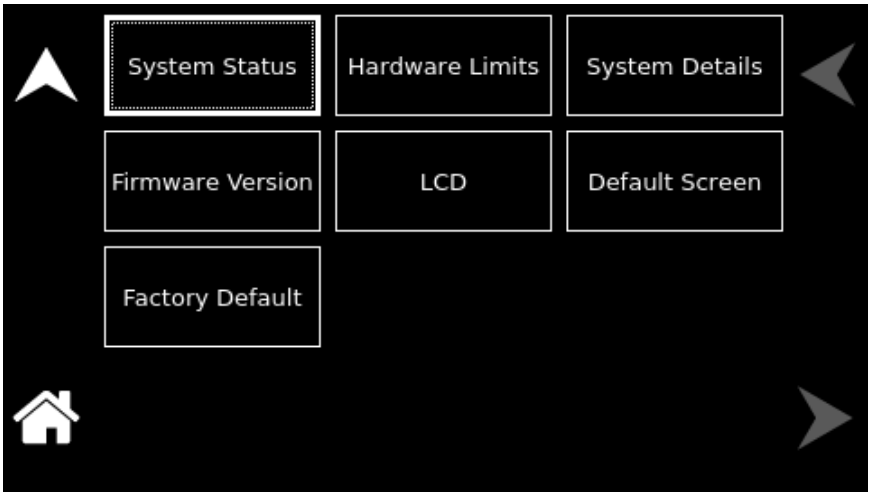


Figure 11-58. System Settings Screen

The System Settings menu has the following fields:

ENTRY	DESCRIPTION
System Status	Displays the present system status information of the power supply, including the Input Line, Output Sense, Isolation and No. of chassis. Refer to Figure 11-59.

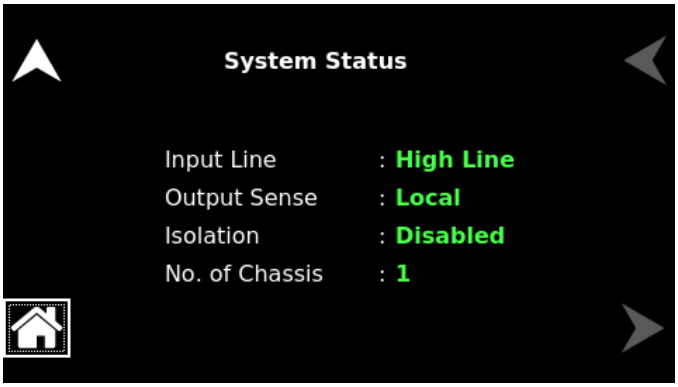


Figure 11-59. System Status

Hardware Limits	Displays the hardware parameter limit values. Refer to Figure 11-60.

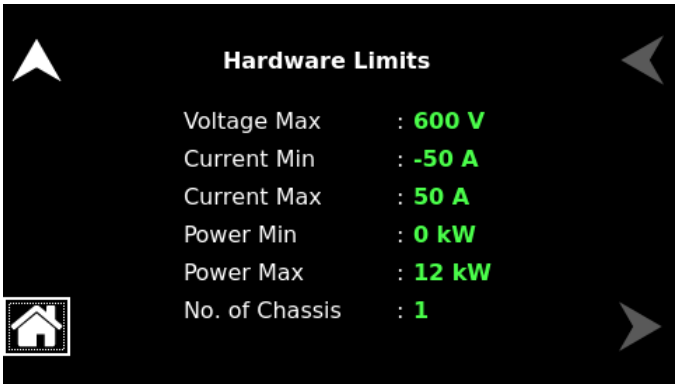


Figure 11-60. Hardware Limits

ENTRY	DESCRIPTION

System Details

Displays information about the user's device, including the Manufacturer, Model Number, Serial Number, Last Calibration Date, and Operating Mode. Refer to Figure 11-61.

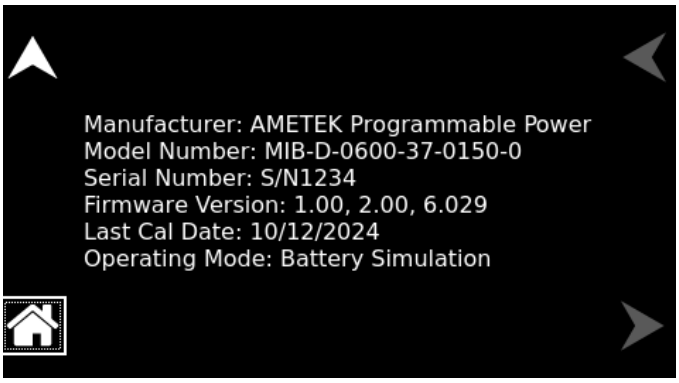


Figure 11-61. System Details

Firmware Version

Displays information about the configuration of the power supply, including the Communication Controller, System Interface, Front Panel, Fan Controller, Mod 1 Primary Controller, Mod 1 Secondary Controller, Mod 2 Primary Controller, Mod 2 Secondary Controller, Mod 3 Primary Controller, Mod 3 Secondary Controller. This information helps identify the unit. Refer to Figure 11-62.

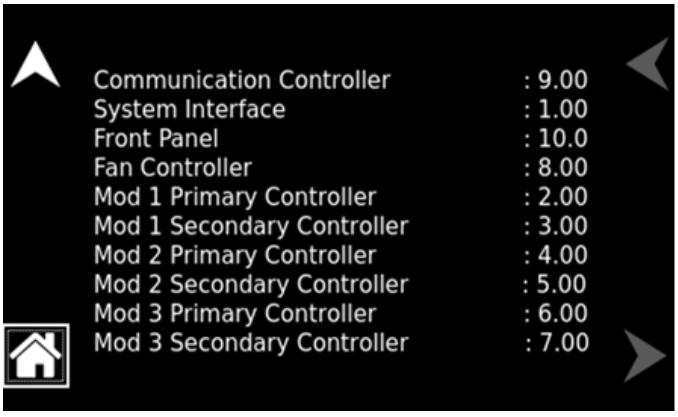


Figure 11-62. Firmware Version

LCD

Provides settings for the calibration of the display touchscreen. Refer to Figure 11-63.

ENTRY	DESCRIPTION

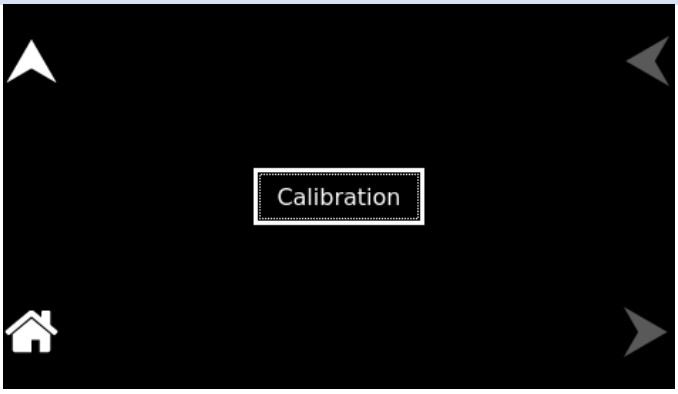


Figure 11-63. LCD

Default Screen

Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 11-64 and Figure 11-65. It allows to set the time out if the default screen is enabled.

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

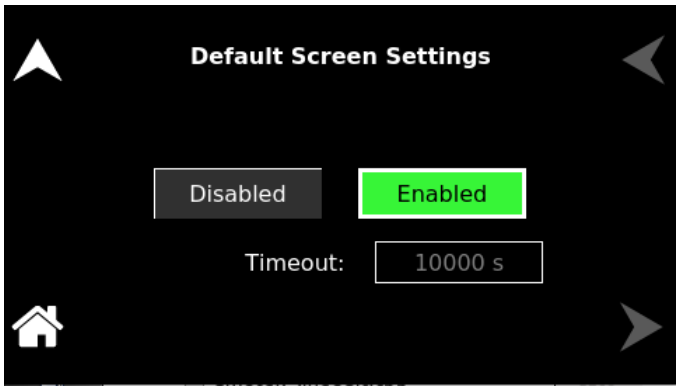


Figure 11-64. Default Screen Settings

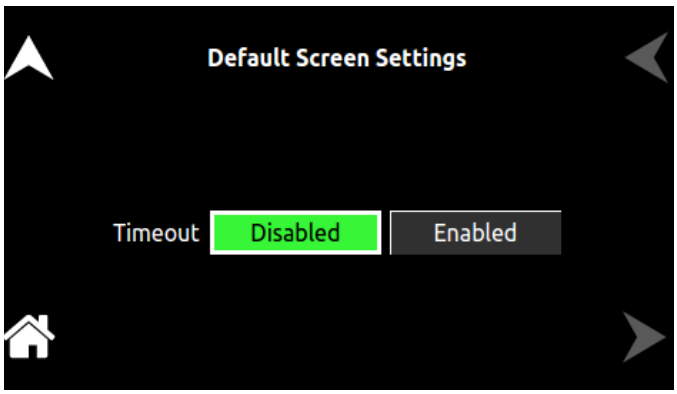


Figure 11-65. System Settings Screen - Default Screen Disabled

Factory Default

Set the device to its original factory settings, as it was when it left the manufacturer. Refer to Figure 11-66.

ENTRY	DESCRIPTION

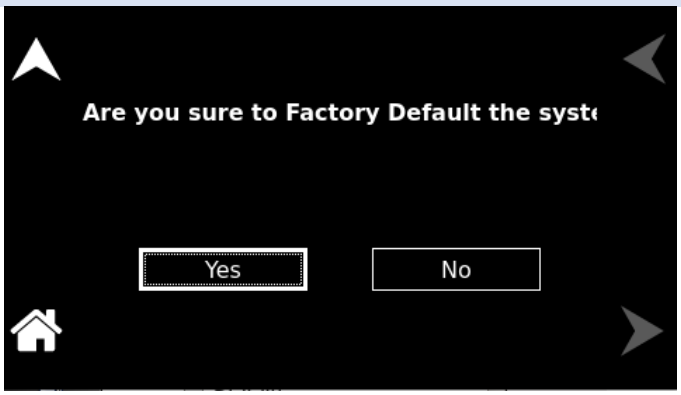


Figure 11-66. Factory Default

Table 11-12. System Setting Screen

11.2.8 SYSTEM FAULTS SCREEN

The System Faults screen provides descriptions of faults that have occurred in a power module. The fault screen appears if any supply fault conditions occur, refer to Figure 11-67. The user should press ‘Clear’ to clear the fault and continue the operations of the power supply and press the ‘Reload’ to refresh the system faults and check for errors. If no fault has occurred, the screen will show 'No Fault Occurred', refer to Figure 11-68.

NOTE: These conditions might resolve themselves; however, if they continue to occur after pressing 'Clear', refer to Chapter 14.

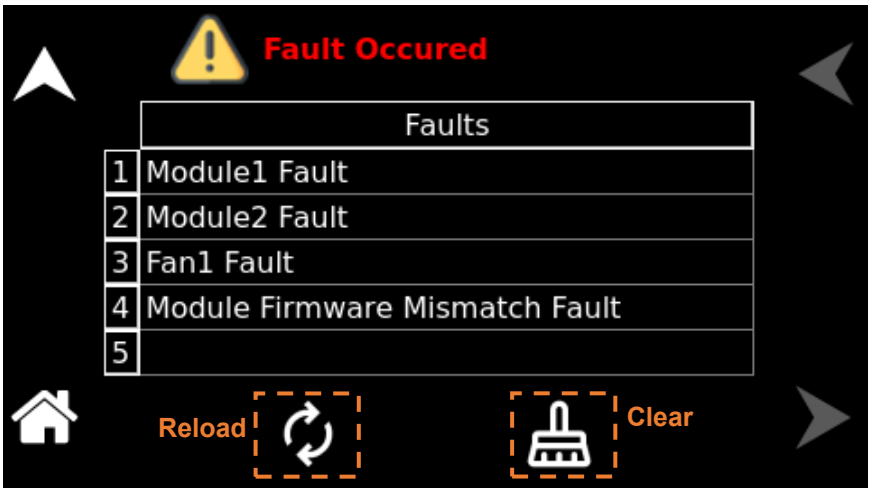


Figure 11-67. System Faults

Figure 11-68. No Fault Occurred Screen

11.3 PARALLEL OPERATION

Parallel mode of operation is used for applications that require more current or power than a single power supply can provide. To meet these higher output requirements, up to six power supplies can be connected in parallel, effectively combining their capacities to achieve the desired performance.

NOTE: Up to six units can be connected in parallel, contact factory to connect more than six units in parallel.

11.3.1 SETTING UP PARALLEL OPERATION

Each power supply has two separate 15-pin connectors on the upper left rear panel, labeled ‘PARALLEL INTERFACE IN’ and ‘PARALLEL INTERFACE OUT’. To connect power supplies in parallel, use a ‘Leader’ or ‘Follower’ daisy-chain wiring configuration . Refer to Figure 11-69. For parallel cable information refer to Section 2.25.

a) Using an interface cable (P/N 890-015-01), connect the 'PARALLEL INTERFACE OUT' port of the Leader power supply to the 'PARALLEL INTERFACE IN' port of the second power supply (Follower 1).

NOTE: In parallel operation, the Leader unit manages all programming, readback, and control functions. Remote analog control is not supported in this mode.

NOTE: Units with the same model number are allowed to be connected in parallel.

b) On the second power supply (Follower 1), connect another interface cable from its 'PARALLEL INTERFACE OUT' port to the 'PARALLEL INTERFACE IN' port of the third power supply (Follower 2). Continue this daisy-chain connection for up to a maximum of six power supplies.

c) Connect the positive output terminals of all power supplies together, along with the positive terminal of the load.

d) Connect the negative output terminals of all power supplies together, along with the negative terminal of the load.

e) Ensure that there are no shorts between the Positive and Negative output terminals.

f) Ensure all cables are kept as short as possible and connect twisted-pair sense cables as follows.

- For remote sensing at the load, only the Leader unit should have a twisted-pair cable running from its sense terminals to the load terminals.

g) After all the successful connection, power ON all the follower units followed by leader.

NOTE: Doing Parallel operation for the first time, make sure to reset the power supply units by selecting 'Factory default' in 'System Settings' Screen. This step is essential to prevent setting conflicts caused by pre-existing PONS settings.

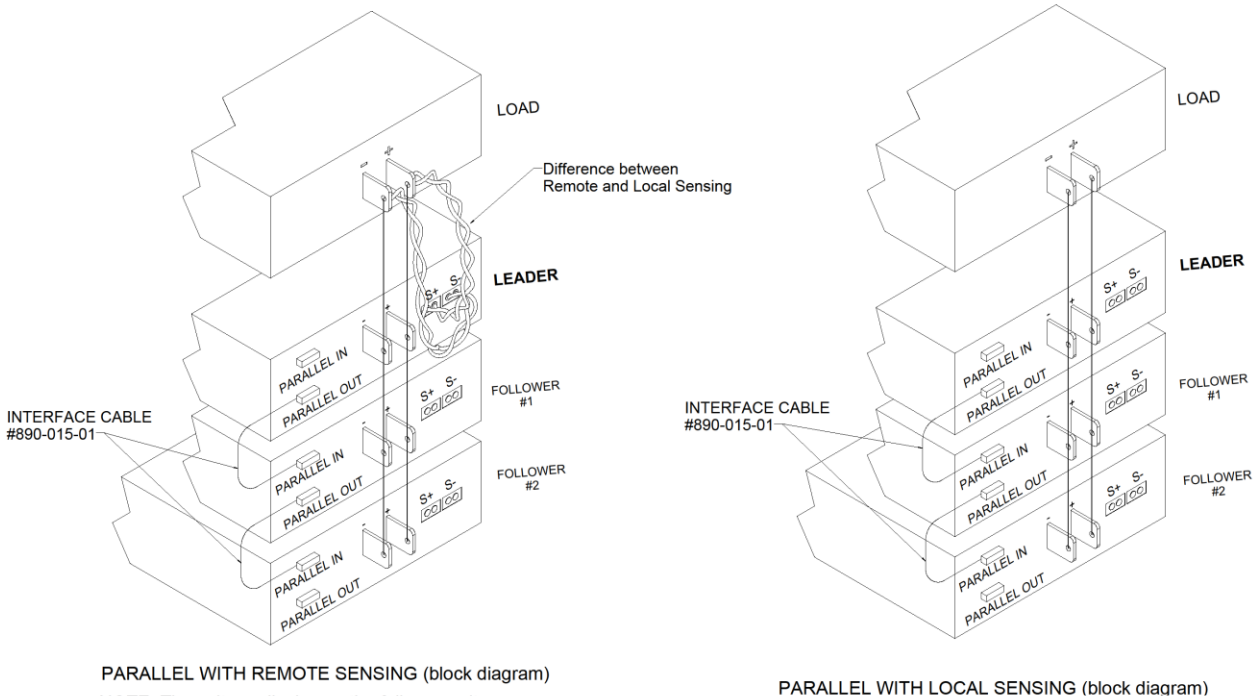


Figure 11-69. Parallel Connection

12 BATTERY TEST MODE OPERATION

This chapter provides comprehensive information on the front panel display in Battery Test mode. It is designed to offer an intuitive interface for seamless setup, control, and monitoring of various battery testing parameters.

12.1 Mi-BEAM CONNECTION TO UUT AND CONFIGURATION

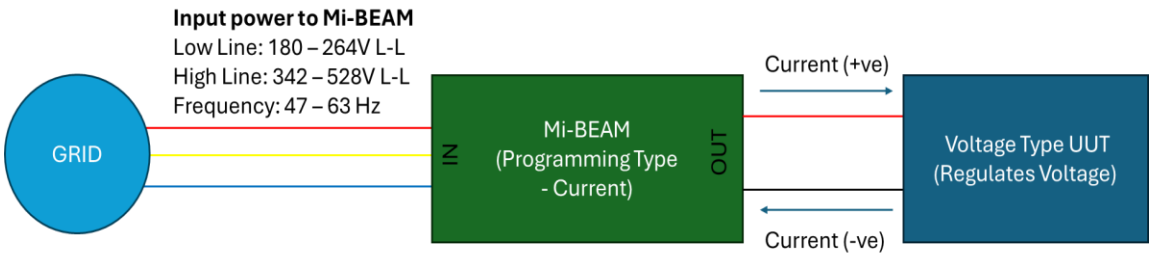


Figure 12-1. Voltage Type UUT

The Mi-BEAM Series power supply in BATSIM operates with a fixed Programming Type (Current) and the Regulation Setting is 'Constant Current / Constant Voltage(CC/CV)'.

a) Configuration: Before turning ON the Mi-BEAM output, various protection parameters and user soft limits need to be configured to ensure safety of the Mi-BEAM and UUT.

- **Positive Overcurrent Protection (Pos. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set higher than the expected current flow form Mi-BEAM to UUT. Refer to Figure 12-24.

- **Negative Overcurrent Protection (Neg. OCP):** Mi-BEAM output turns OFF when the measured current reaches this value (instantaneous current measured). This value must be set lower than the expected current flow from UUT to Mi-BEAM. Refer to Figure 12-24.

- **Overvoltage Protection (OVP):** Mi-BEAM output turns OFF when the measured voltage reaches this value (instantaneous voltage measured). This value must be set higher than the expected voltage from Mi-BEAM or UUT. Refer to Figure 12-24.

b) Battery Configuration: Create a configuration and define the characteristics of the battery to be tested. Refer to Figure 12-19 and Figure 12-21.

c) Battery Operating Type: Configure the operating conditions of the battery. Refer to Figure 12-15.

d) Output State: Once all the parameters are configured as mentioned above output can be turned ON. Refer to Figure 12-26.

e) Connect the UUT to the Mi-BEAM: Ensure all connections are secure and correctly aligned with the UUT port type.

f) Start the Test: Initiate the output from the Mi-BEAM and monitor the performance to ensure the UUT operates within the desired parameters.

g) Monitoring and Adjustments: Monitor the output and make any necessary adjustments to the settings, using the built-in measurement screen to track the performance and ensure safety limits are not exceeded. Refer to Figure 12-13.

h) End the Test: Once the test is complete, safely disconnect the UUT from the Mi-BEAM.

12.2 FRONT PANEL OPERATION

This section provides detailed information on the front panel operation in Battery Test (BATTEST) mode. Each menu of a screen could be selected by tapping its associated selection-field box through the touchscreen, or by selecting it with the rotary encoder. Refer to Figure 12-2.

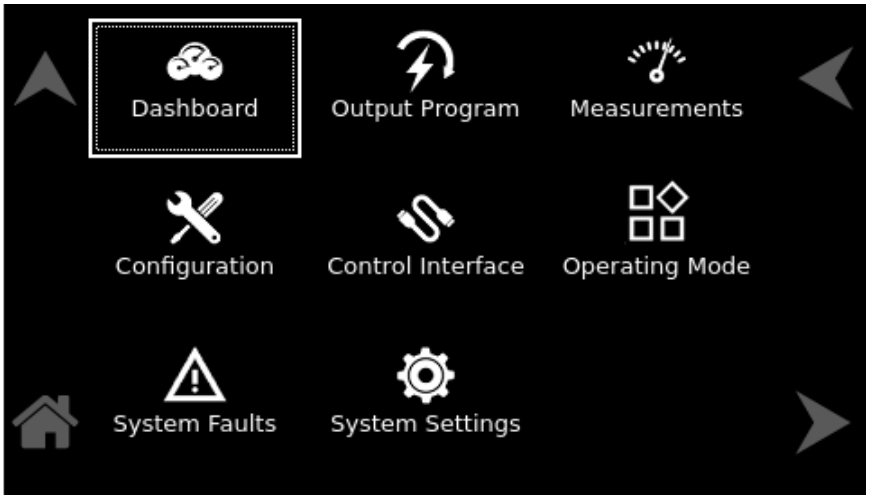


Figure 12-2. Home Screen Top-Level Menu

12.2.1 DASHBOARD SCREEN TOP-LEVEL MENU

The DASHBOARD screen top-level menu is used to change output parameters and simultaneously view output measurements. The most used output parameters are in the

DASHBOARD screen menu. The DASHBOARD screen is the default menu that is displayed after power-on.

12.2.1.1 DASHBOARD SCREEN

The dashboard screen will display options to set the ‘Oper. Type’, ‘Initial Cap’, ‘Voltage’, and ‘Current’. Refer to Figure 12-3 for dashboard screen and refer to Section 6.4.2.1 for navigating to Dashboard-Screen.

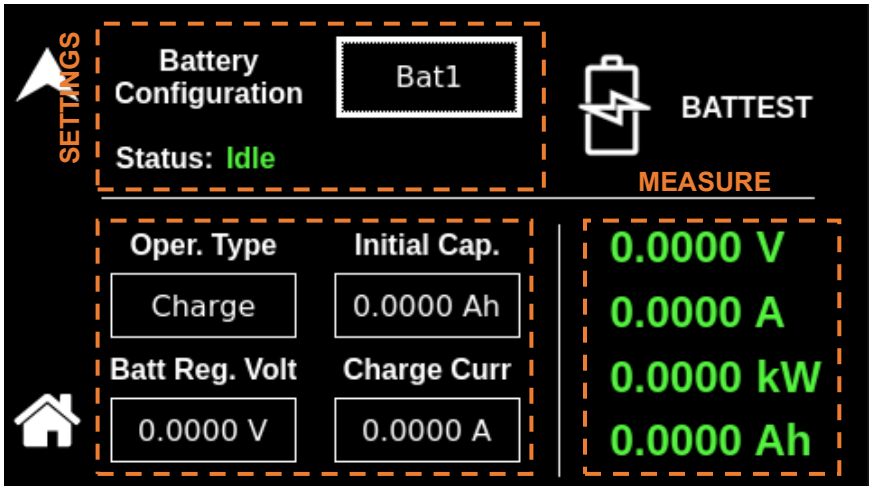


Figure 12-3. Dashboard Screen

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

SETTINGS	DESCRIPTION
Battery Configuration	The selected battery configuration will be displayed. Users can also select, edit, delete, and load the battery profiles for the battery to be tested.
Oper. Type	Battery operating type settings can be configured from this menu. Refer to Figure 12-15. **a) Charge:** Programs the supply to charge the battery. **b) Discharge:** Programs the supply to discharge the battery. **c) Charge Stop Cond.:** Programs the stop conditions of the supply while charging. **d) Discharge Stop Cond.:** Programs the stop conditions of the supply while discharging.
Initial Cap.	Programs the initial capacity of battery to be tested in ampere hour. Real-time setting is possible using the rotary encoder.

SETTINGS	DESCRIPTION
Batt Reg. Volt	Programs the output voltage of the supply in volts. Real-time setting is possible using the rotary encoder.
Charge Curr	Programs the output current of the supply in ampere. Real-time setting is possible using the rotary encoder.
MEASURE	**DESCRIPTION**
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.
Capacity	Displays the floating-point value of the battery capacity in Ah.
Status	Displays the status of the operation.
(1) The '' symbol before the battery configuration indicates that the configuration is selected but not yet loaded. To load the profile, click the load button available in the 'BATTEST Configuration Setting'. To turn ON the output of the power supply, selected profile must be loaded.* *(2) The 'NONE' indicates that no configuration is selected.*	

Table 12-1. Dashboard screen top-level menu

'Status' in the Dashboard screen will update dynamically. Refer to the Table 12-2 below;

STATUS	DESCRIPTION
Idle	When the system is in Idle (not performing any task).
Initializing	When the selected Battery Configuration loading to the unit is in progress.
Initialized	When the selected Battery Configuration load is successful.
Running	When the battery test is in progress.
Stopped	When the battery test is stopped.
Stopped Term Curr	When the measured current reaches the termination current value or below it, charging is terminated.
Stopped Char Cap	When the battery reaches the charging capacity value or below it, charging is terminated.
Stopped Time	When the elapsed time reaches the set time value or below it, the battery test is terminated.
Stopped Char Volt	When the measured voltage reaches the charging voltage value or below it, charging is terminated.
Stopped Dischar Volt	When the measured voltage reaches the discharge voltage value or below it, discharging is terminated.
Stopped Dischar Cap	When the battery reaches the discharge capacity value or below it, discharging is terminated.
Aborted	When battery simulation is aborted by the user and none of the stop conditions are met.
Tripped	When battery simulation is terminated due to fault.

Table 12-2. Status

12.2.1.2 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 12-4. 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.

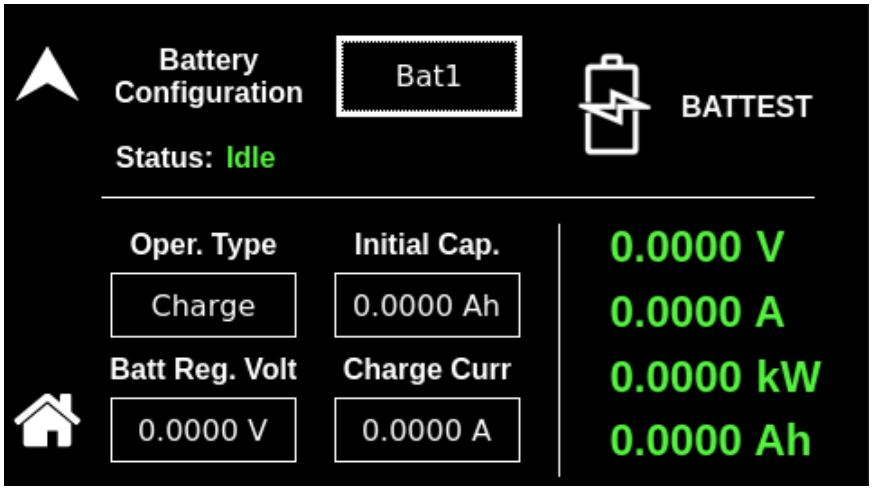


Figure 12-4. Real-Time, Immediate Output Parameter Adjustment

12.2.1.3 DEFAULT SCREEN

The Default screen provides measurement of the DC output ‘Voltage’, ‘Current’, ‘Power’ and calculated ‘Capacity’, refer to Figure 12-5. When the Dashboard screen is idle for an interval equal to a set time delay, refer to Figure 12-63 and Figure 12-64. The display will automatically switch to the Default screen. Tap anywhere on the screen to return to the Dashboard screen.

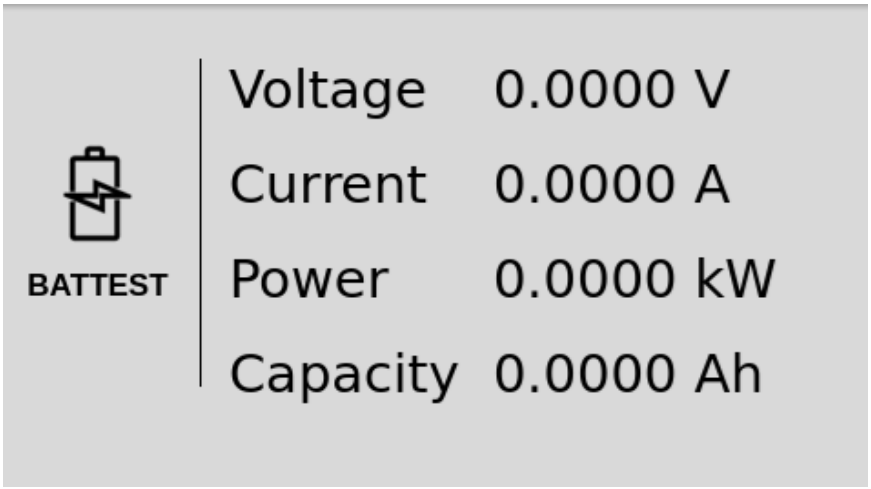


Figure 12-5. Default Screen

With the understanding of the dashboard screen features, user can perform basic functionality and verify the output voltage, current, power and capacity in various modes of operation.

12.2.2 OUTPUT PROGRAM SCREEN

The Output Program screen provides the settings of 'Initial Capacity', 'Charge Voltage', 'Charge Current', 'Discharge Voltage', 'Discharge Current' and 'Output State'. Refer to Section 6.4.2.1 for navigating to Output Program Screen Top-Level Menu.

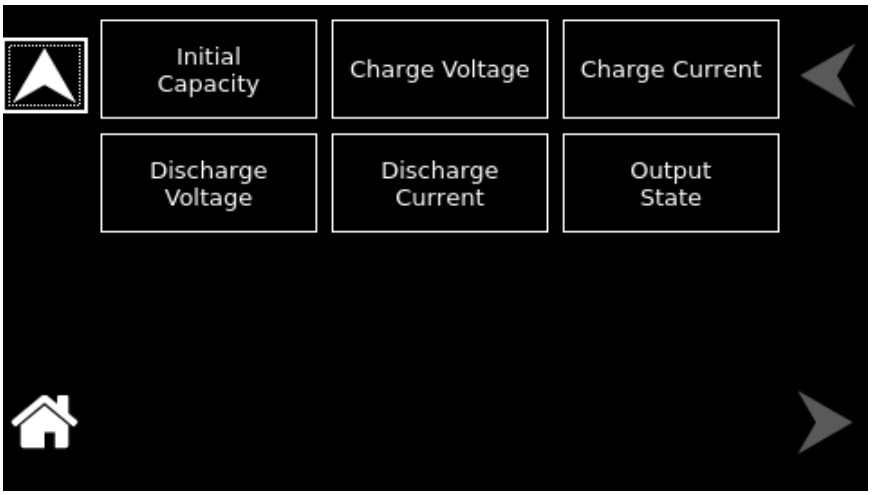


Figure 12-6. Output Program Screen

NOTE: Functions that accept a numeric value require the value to be within the allowed range, otherwise, an error will be generated, and the value will not be accepted.

The Output Program Screen includes the following functions:

ENTRY	DESCRIPTION
Initial Capacity	User can set the initial capacity of the battery to be tested. Refer to Figure 12-7.

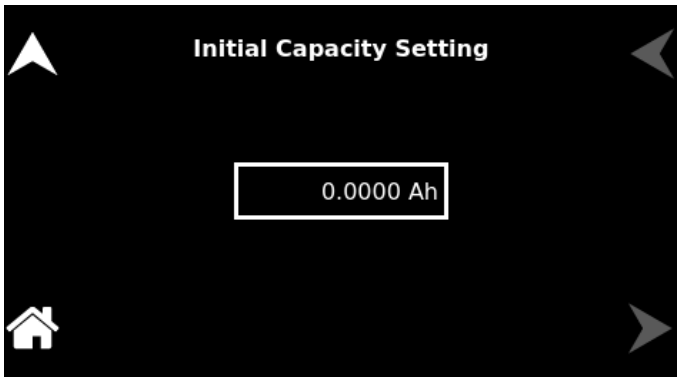


Figure 12-7. Initial Capacity Setting

ENTRY	DESCRIPTION
Charge Voltage	User can set the Charge Voltage value, which acts as the voltage high limit for the supply. The maximum voltage of the battery under test is expected to be entered. Refer to Figure 12-8.

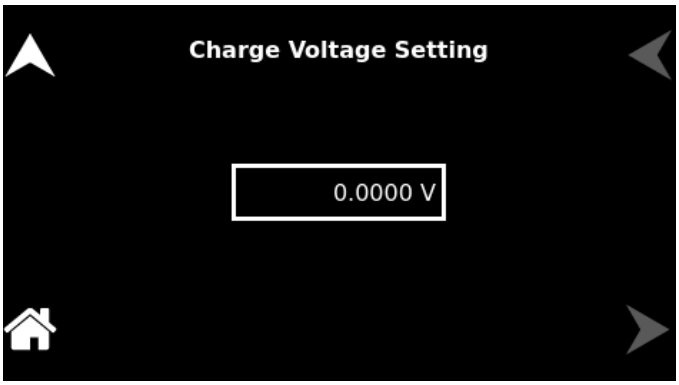


Figure 12-8. Charge Voltage Setting

Charge Current	User can set the charge current value to the current at which the battery under test will be charged. Refer to Figure 12-9.

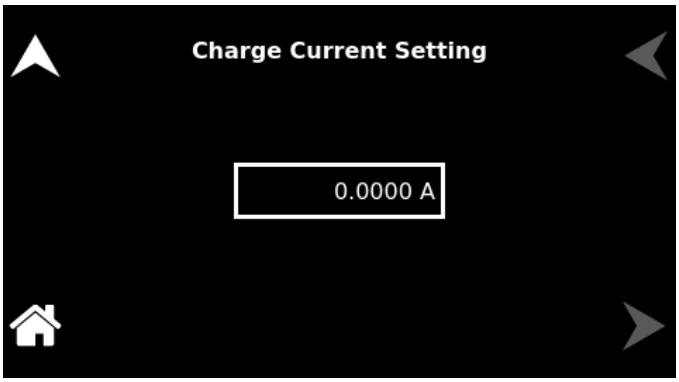


Figure 12-9. Charge Current Setting

Discharge Voltage	Users can set the Discharge Voltage value, which acts as the voltage high limit for the supply. The maximum voltage of the battery under test is expected to be entered. Refer to Figure 12-10.

ENTRY	DESCRIPTION

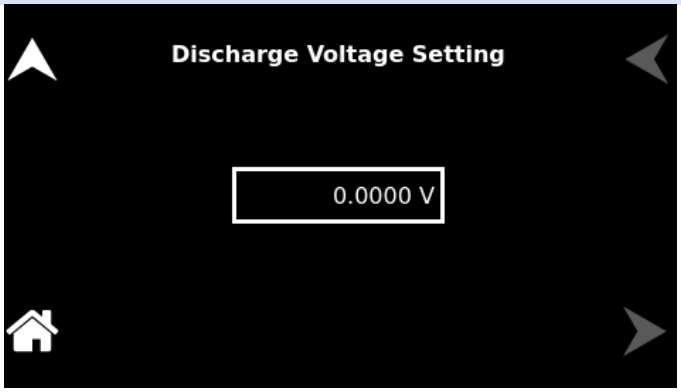


Figure 12-10. Discharge Voltage Setting

Discharge Current Users can set the discharge current value to the current at which the battery under test will be discharged. Refer to Figure 12-11.

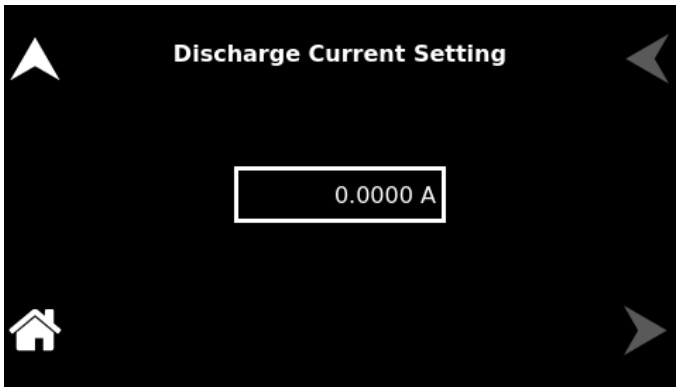


Figure 12-11. Discharge Current Setting

Output State Users can program the output to ON or OFF state. Refer to Figure 12-12.

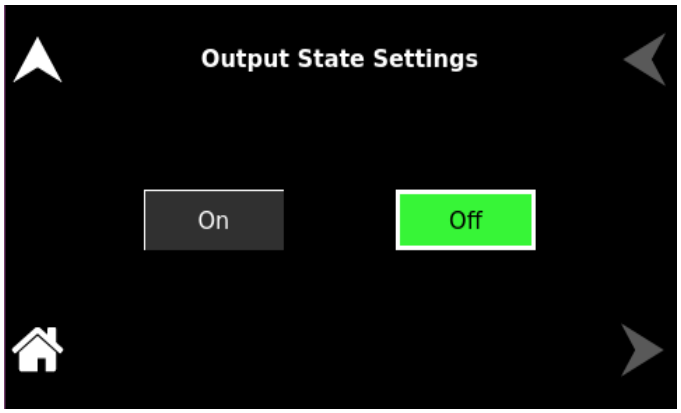


Figure 12-12. Output State Settings

ENTRY	DESCRIPTION

Table 12-3. Output Program screen

12.2.3 MEASUREMENTS SCREEN

The Measurements screen displays the floating-point values for Output ‘Voltage’, Output ‘Current’, Output ‘Power’ and Calculated ‘Capacity’. For the Measurement screen refer to Figure 12-13 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

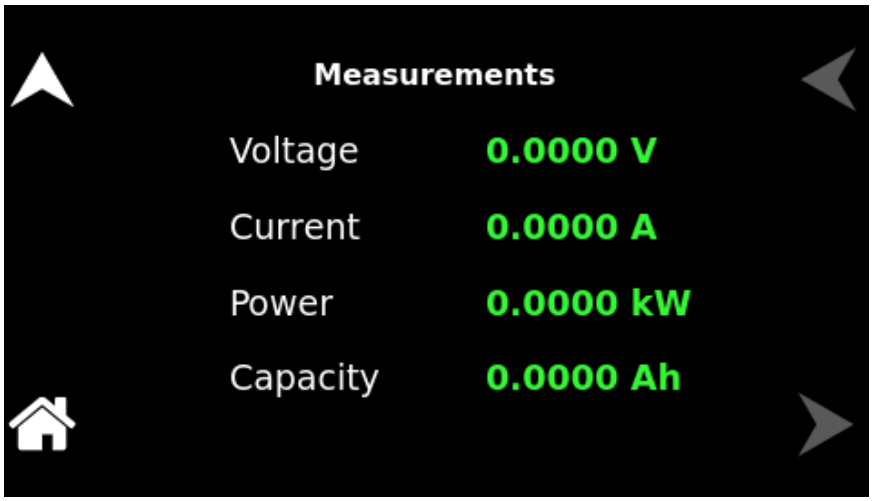


Figure 12-13. Measurement Screen

12.2.4 CONFIGURATION SCREEN

The ‘Configuration Screen’ provides the settings of ‘Battery Mode’, ‘Battery Operating Type’, ‘Battery Configuration’, ‘Output Sense’, ‘Protection’, ‘PONS’ and ‘Measurement Average Samples’.

For the top-level menu of the ‘Configuration screen’, refer to Figure 12-14 and for instructions on how to navigate, refer to Section 6.4.2.1.

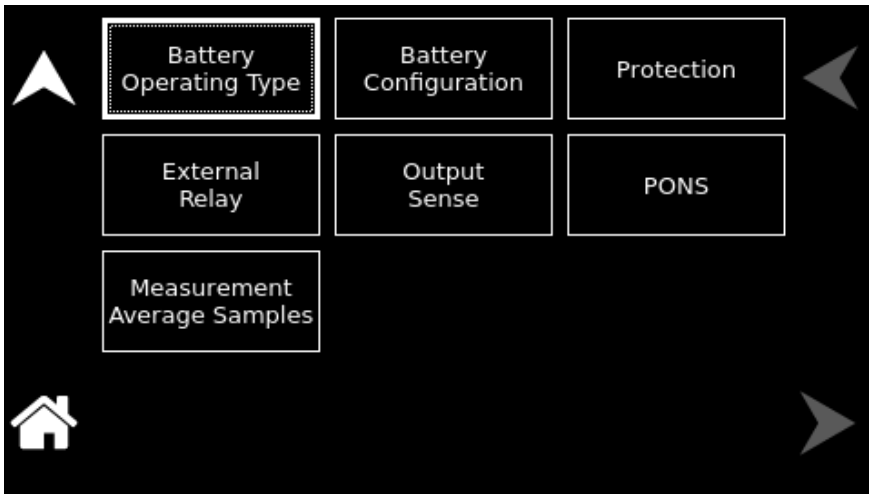


Figure 12-14. Configuration Screen Top-Level Menu

12.2.4.1 BATTERY OPERATING TYPE

The ‘Battery Operating Type’ is used to configure various conditions for the battery testing, such as ‘Charge’, ‘Discharge’, ‘Charge Stop Condition’ and ‘Discharge Stop Condition’. Refer to Figure 12-15.

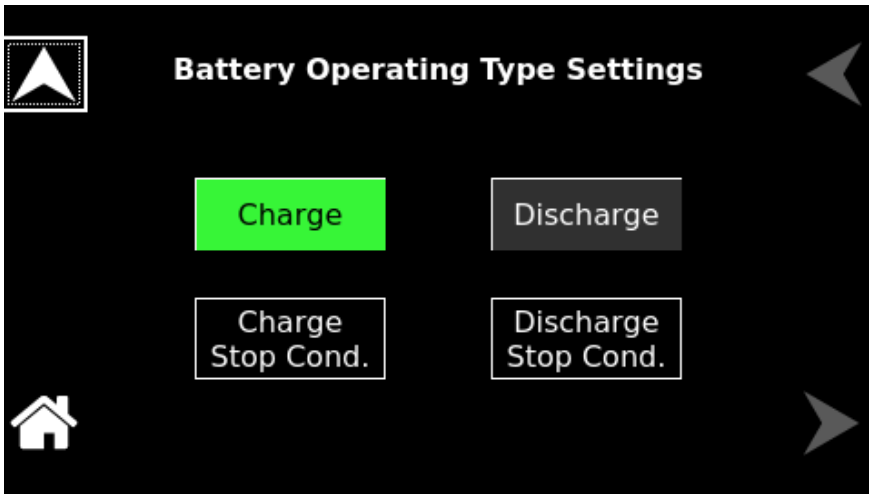


Figure 12-15. Battery Operating Type Settings

ENTRY	DESCRIPTION
Charge	User can set the supply to charge the battery.
Discharge	User can set the supply to discharge the battery.
Charge Stop Cond.	User can program the stop conditions of the supply while charging. **a) Battery charge Type:** User can set the battery charge type to ‘CC’ or ‘CC/CV’.

ENTRY	DESCRIPTION

b) Charge to Volt: On measured voltage reaching this maximum value charging of the battery under test will be terminated.

c) Time: On elapsed time reaches this value battery test will be terminated.

d) Term Curr: When the supply is regulating voltage, on measured current reaching the termination value or below it, the charging of battery under test will be terminated.

e) Charge to Cap: On calculated capacity reaching this maximum value charging of the battery under test will be terminated.

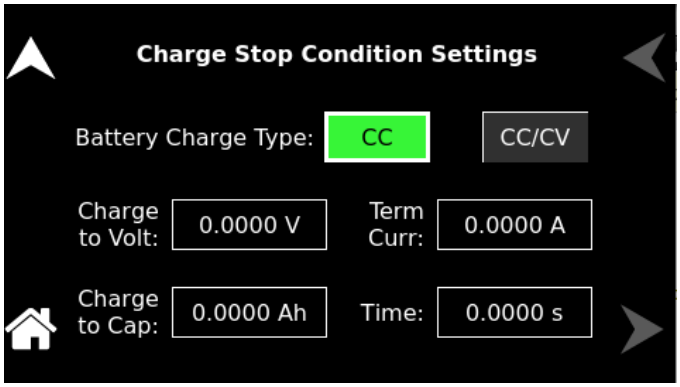


Figure 12-16. Charge Stop Condition Settings

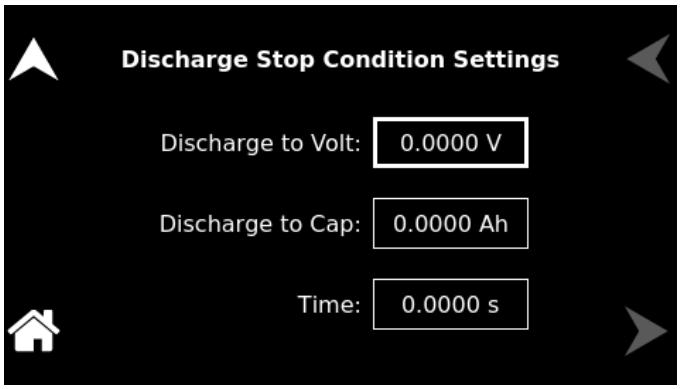
Discharge Stop Cond.

User can program the stop conditions of the supply while discharging.

a) Discharge to Volt: On measured voltage reaching this minimum value discharging of the battery under test will be terminated.

b) Time: On elapsed time reaches this value battery test will be terminated.

c) Discharge to Cap: On calculated capacity reaching this minimum value discharging of the battery will be terminated.



ENTRY	DESCRIPTION

Figure 12-17. Discharge Stop Condition Settings

Table 12-4. BATSIM Cut-Off Condition Settings

12.2.4.2 BATTERY CONFIGURATION

The 'Battery Configuration' enables users to create various battery configurations with parameters like ‘Volt Max’, ‘Volt Min’, ‘Cap Max’, ‘Charge Curr Lim’, ‘Discharge Curr Lim’. To perform any operation in battery test mode, battery configuration must be selected. These battery configuration parameters will act as limits for all the steady state parameters.

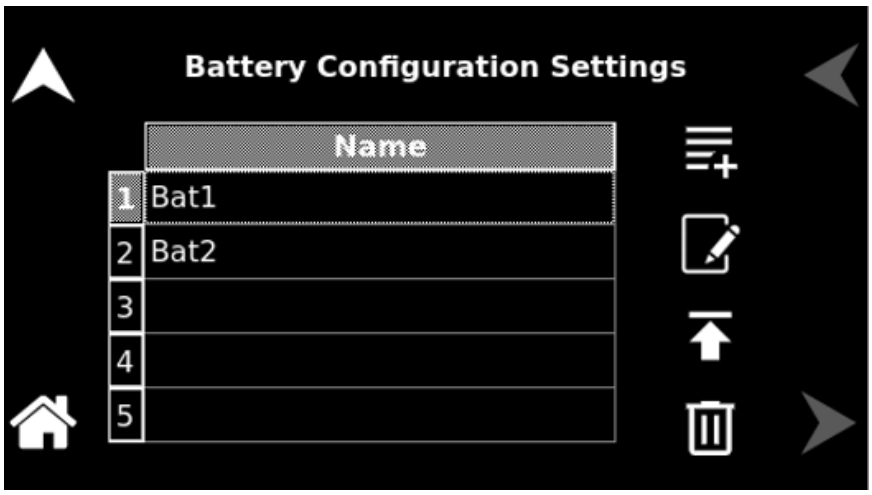


Figure 12-18. BATSIM Configuration Settings - Battery

- **Adding a configuration in ‘Battery Configuration Settings’**
  - Open the ‘Battery Configuration Settings’ and select the ‘Add Configuration’ option on the right side of the screen. Refer to Figure 12-19.

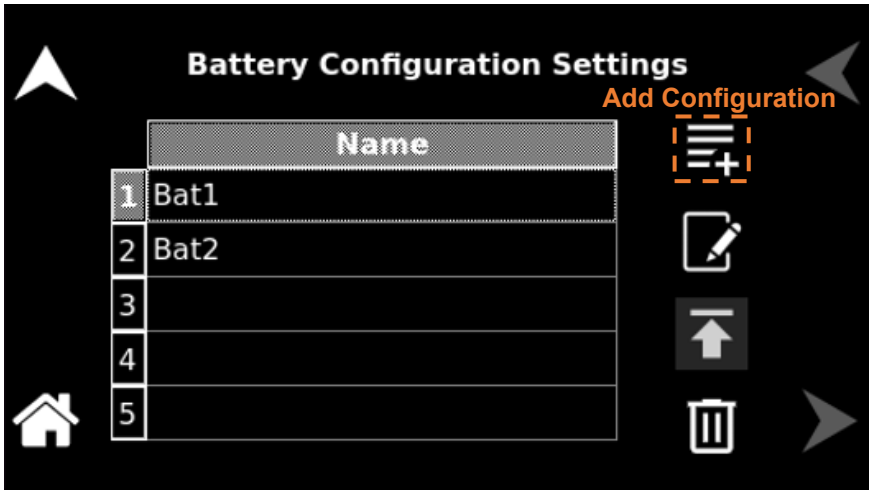


Figure 12-19. Profile Selection

- An alphanumeric keypad will open, allowing the user to enter a configuration name and click ‘OK’ to confirm the profile name. Refer to Figure 12-20.

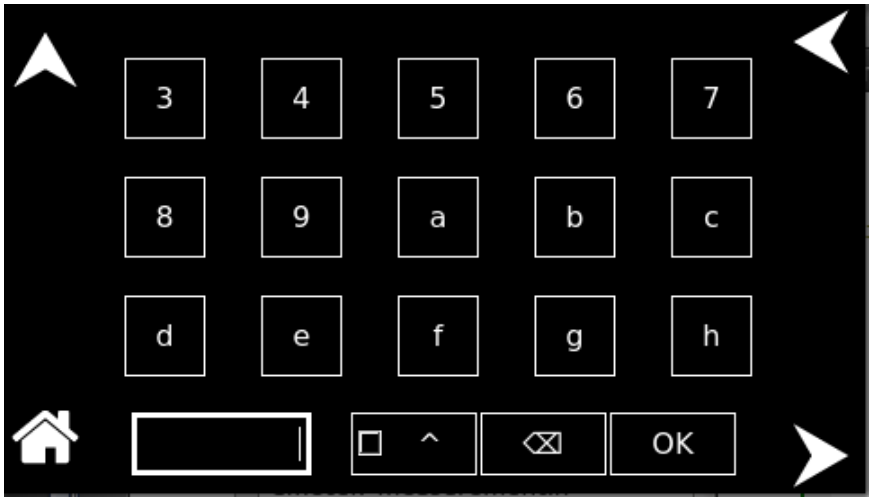


Figure 12-20. Alpha - numeric keypad

- **Edit the configuration in ‘Battery Configuration Settings’**

  - The created configuration will have default values. If the user wants to change the default values, click on the ‘Edit’ option.

  - The selected configuration name will be displayed at the top of the screen when the ‘Edit’ option is clicked. Refer to Figure 12-21.

  - The parameters available in screen are ‘Volt Max’, ‘Volt Min’, ‘Cap Max’, ‘Charge Curr Lim’, ‘Discharge Curr Lim’. Refer to Figure 12-21.

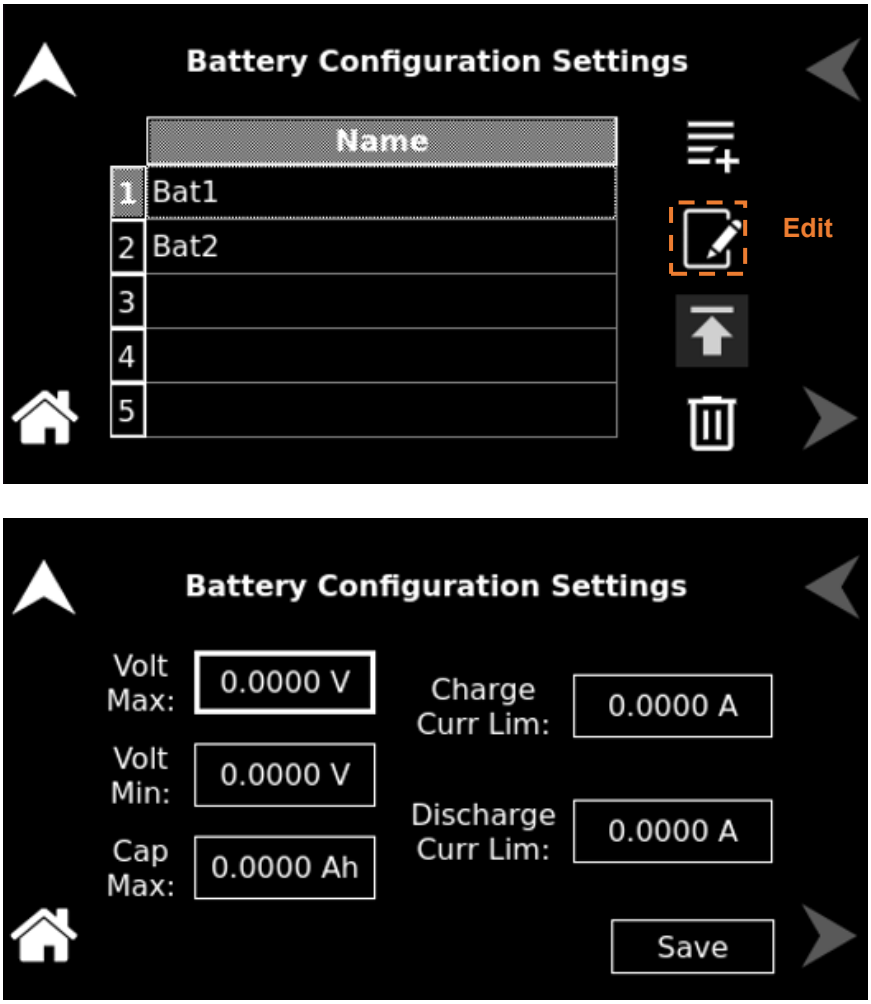


Figure 12-21. Cut- Off Conditions Settings

ENTRY	DESCRIPTION
Volt Max	Maximum voltage of the battery under test
Volt Min	Minimum voltage of the battery under test
Cap Max	Capacity of the battery under test
Charge Curr Lim	Maximum charge current of the battery under test
Discharge Curr Lim	Maximum discharge current of the battery under test

Table 12-5. Profile Settings Screen

- Once the configuration is completed, click on the ‘Save’ option to save the battery configuration.

- **Load the Configuration in ‘Battery Configuration Settings’**

  - Load the selected Battery Configuration by clicking the ‘Upload’ option. Refer to Figure 12-22.

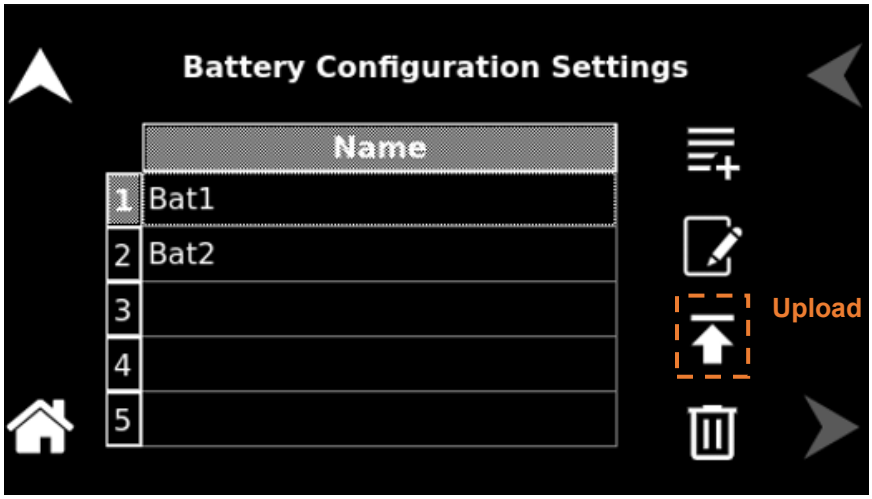


Figure 12-22. BATSIM Configuration Settings - Upload option

- The 'Upload button' will be disabled when the battery configuration is uploaded to the unit. Refer to Figure 12-23.

- **Delete the configuration in 'Battery Configuration Settings'**

  - Click on 'Delete' to remove the selected battery configuration. Refer to Figure 12-23.

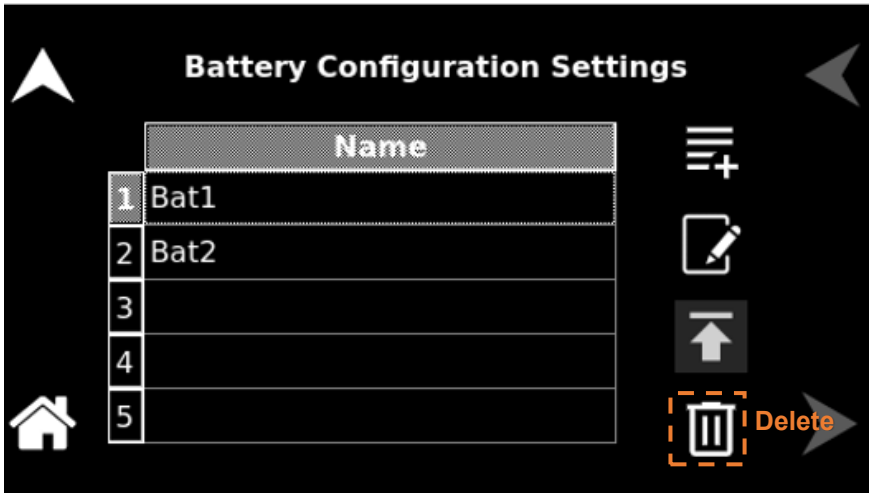


Figure 12-23. BATSIM Configuration Settings - Upload Disabled and Delete option

12.2.4.3 PROTECTION

In protection settings, users can define Output Overvoltage Protection (OVP) and Positive Overcurrent Protection (Pos. OCP) and Negative Overcurrent Protection (Neg. OCP) to help safeguard their devices from electrical anomalies. Refer to Figure 12-24.

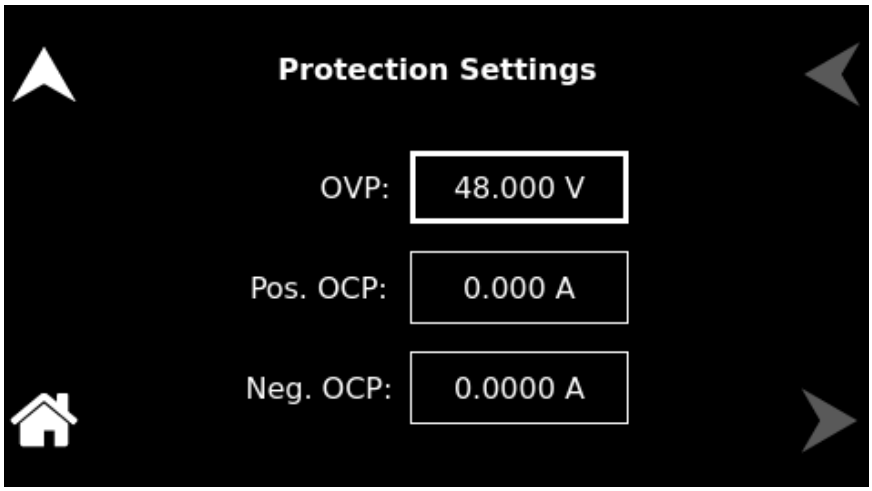


Figure 12-24. Protection Settings

12.2.4.4 EXTERNAL RELAY

The External relay Settings allows the user to set the isolation relay to either ‘Enable’ or ‘Disable’. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 12-25.

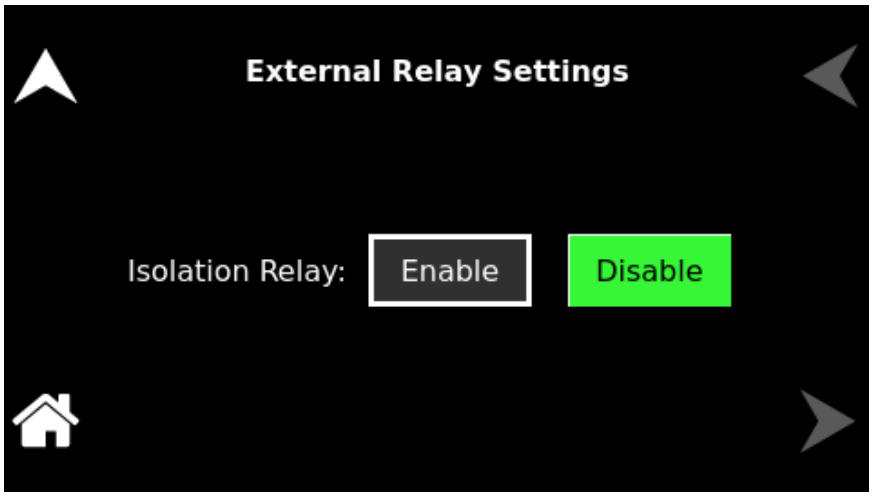


Figure 12-25. Isolation Relay

12.2.4.5 OUTPUT SENSE

The Output Sense menu allows user to set the output voltage sense of the unit to either local or remote. When Remote is selected as output sense, voltage sense cables must be connected to rear panel of power the supply at RVS connector. Refer to Figure 12-26.

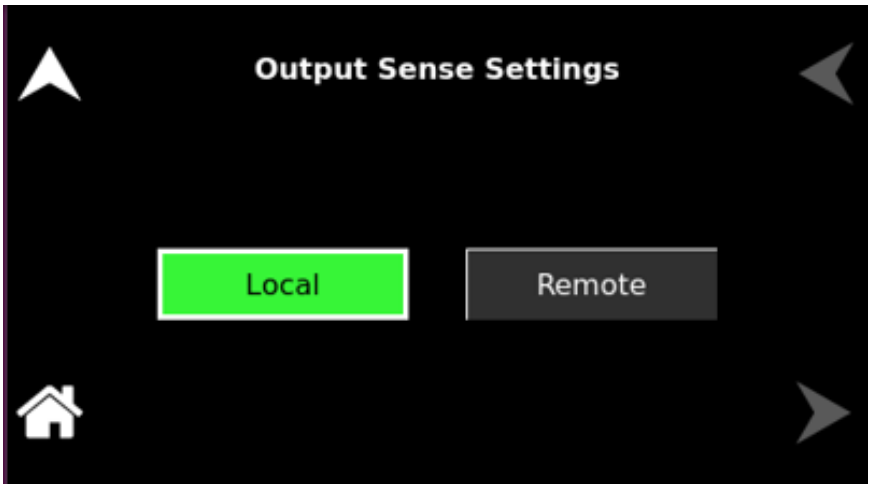


Figure 12-26. Output Sense Settings

12.2.4.6 PONS

The PONS Menu enables users to configure the Power-ON values and set up the power supply based on the chosen mode settings. Refer to Figure 12-27.

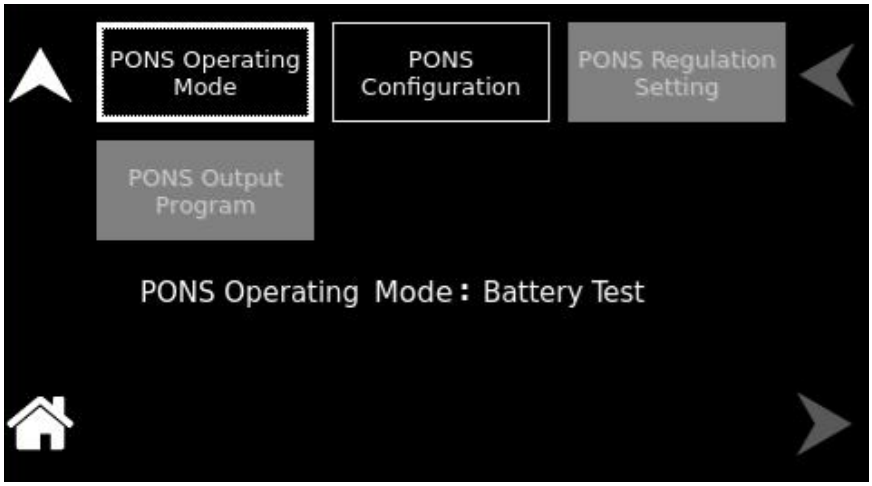


Figure 12-27. PONS – Main Screen

12.2.4.6.1 PONS OPERATING MODE

The 'PONS Operating Mode Settings' will not change automatically when the user changes the mode in the 'Operating Mode' settings on the Home screen. Users must separately select the ‘BATTEST’ mode in the 'PONS Operating Mode Settings', which will update the 'PONS Operating Mode Settings' screen and the 'PONS Configuration' screen. Refer to Figure 12-28 and Figure 12-29.

The same applies to other modes such as Bi-DIR, SOUR, ELOAD, PVSIM and BATSIM. Refer to the Sections 7.2.5.7.1, 8.2.5.7.1, 9.2.5.7.1, 10.2.4.2.1.5 and 11.2.4.7.1.

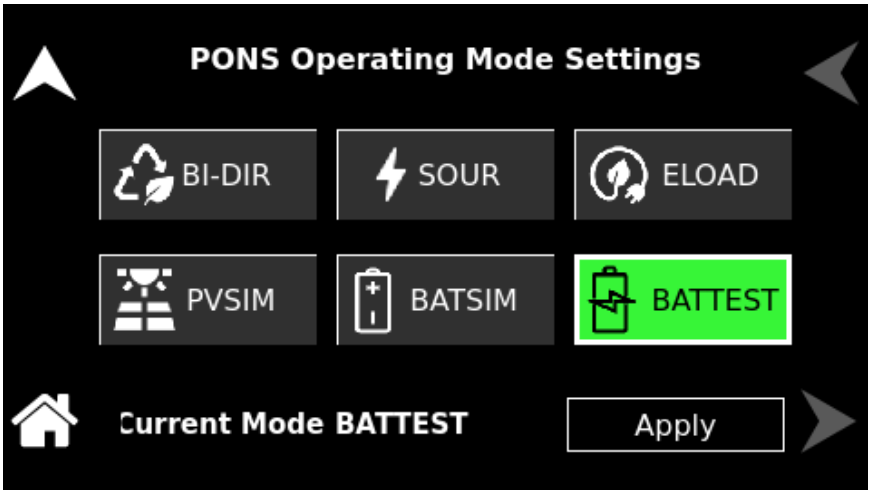


Figure 12-28. PONS Operating Mode Settings

12.2.4.6.2 PONS CONFIGURATION

In the 'PONS Configuration' settings, the menu enables users to select 'PONS Protection' , 'PONS External Relay, 'PONS Output Sense', 'PONS Measurement Average Samples' and 'PONS Remote Inhibit'. Refer to Figure 12-29.

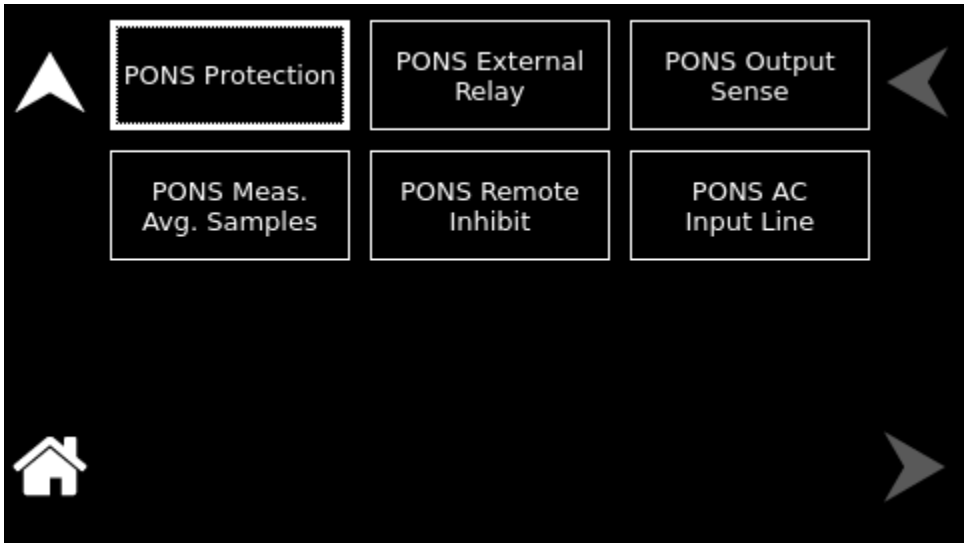


Figure 12-29. PONS Configuration mode

The PONS Configuration Settings menu has the following fields:

ENTRY	DESCRIPTION
PONS Protection	Users can define OVP, Pos. OCP and Neg. OCP to help safeguard their devices from electrical anomalies by shutting down the output if it exceeds the preset voltage. Refer to Figure 12-32.

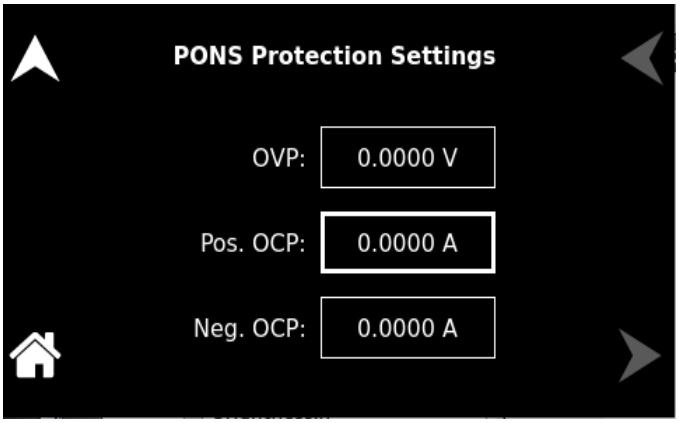


Figure 12-30. PONS Protection Settings

PONS External Relay	Users can set the isolation relay to either 'Enable' or 'Disable'. When Enable is selected, the relay activates to isolate control and power circuits. When Disable is selected, the relay remains inactive, allowing direct operation of the circuits. Refer to Figure 12-31.

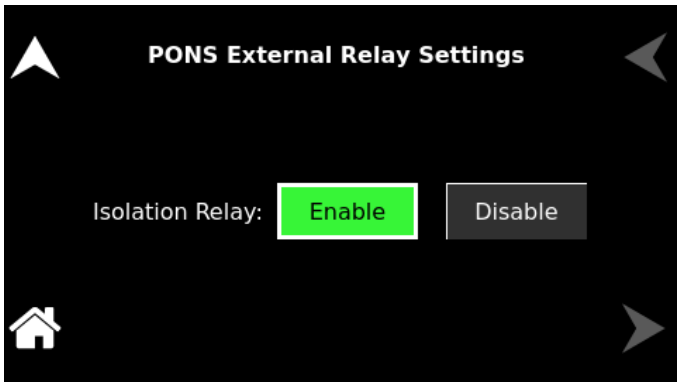


Figure 12-31. PONS External Relay Settings

PONS Output Sense	Users can program the PONS output to ON or OFF state Refer to Figure 12-32.

ENTRY	DESCRIPTION

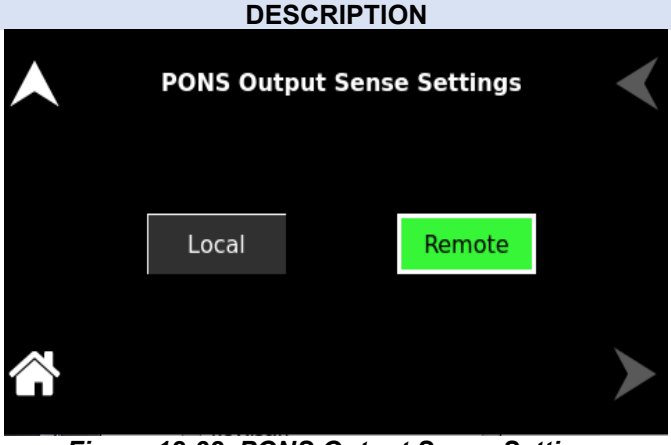


Figure 12-32. PONS Output Sense Settings

PONS Measurement Average Samples

Users can specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 12-33.

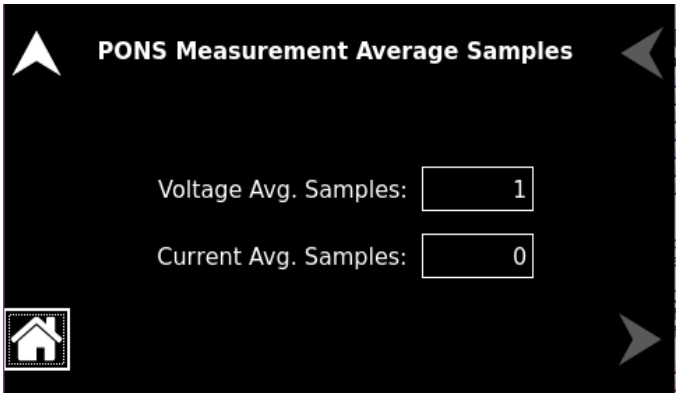


Figure 12-33. PONS Measurement Average Samples

PONS Remote Inhibit

User can control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 12-34.

a) Remote Inhibit Input – Contact Closure

Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output.

Remote inhibit can be configured in three modes;

- **Latch:** after reclosing the contact, user needs to clear the fault and turn ON the output.
- **Live:** after reclosing the contact, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

ENTRY	DESCRIPTION

b) Remote Inhibit Input – Active Source

An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply.

Remote inhibit can be configured in three modes;

- **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output.
- **Live:** after removing the active voltage source, user needs to turn ON the output.
- **OFF:** inhibit function would be disabled.

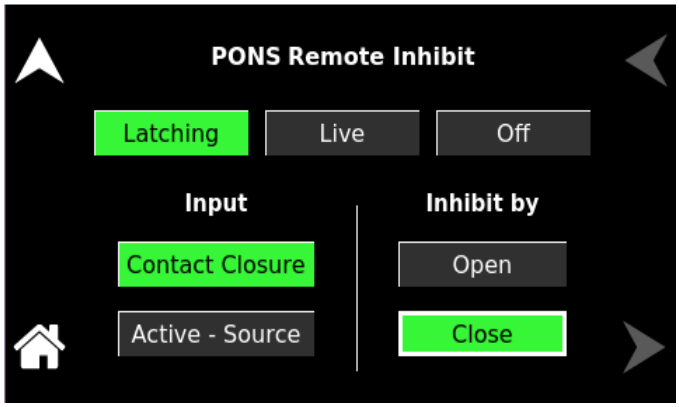


Figure 12-34. PONS remote Inhibit

PONS AC Input Line

User can select either the High Line or Low Line option based on the required input voltage range. Refer to Figure 12-35.

a) High Line: The nominal High Line Input range is 380 to 480 VAC.

b) Low Line: The nominal Low line input range is 200 to 240 VAC.

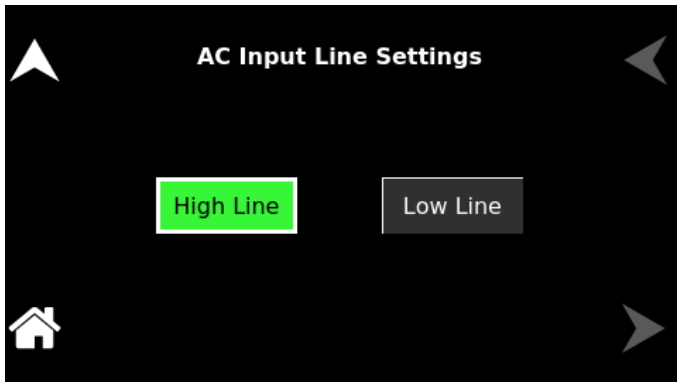


Figure 12-35. AC Input Line Settings

Table 12-6. PONS Configuration mode

12.2.4.7 MEASUREMENT AVERAGE SAMPLES

The Measurement Average Samples Settings Menu allows the user to specify how many readings should be averaged together to minimize noise in the output. Refer to Figure 12-36.

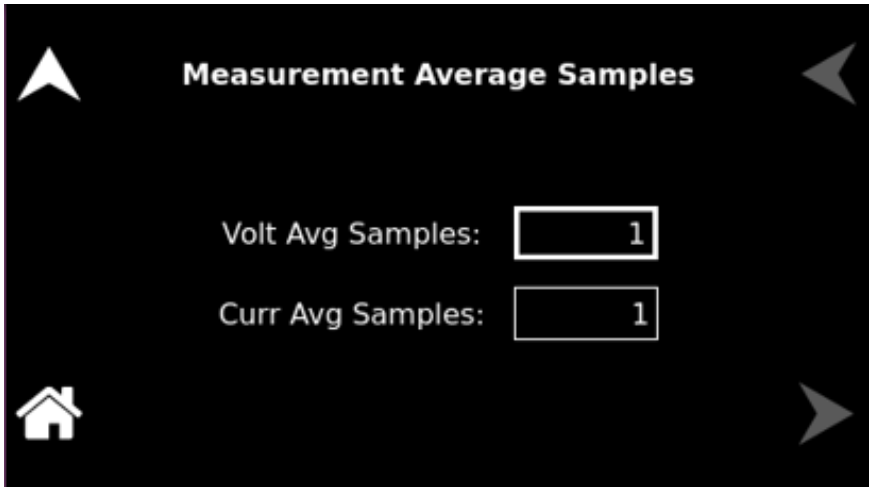


Figure 12-36. Measurement Average Samples

The Measurement Average Samples 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 8.
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 8. The value of 1 (factory default) provides the fastest response time in the readings, but less rejection of noise.

Table 12-7. Measurement Average Samples

12.2.5 CONTROL INTERFACE SCREEN

The Control Interface screen provides the ability to configure the power supply for remote control through the data communications interfaces. For the top-level menu of the Control Interface Screen, refer to Figure 12-37 and for instructions on how to navigate to the Measurements screen, refer to Section 6.4.2.1.

Figure 12-37. Control Interface Screen Top-Level Menu

The Control interface Settings menu has the following fields:

ENTRY	DESCRIPTION
LAN	Configures the LAN (LXI Ethernet) communications interface, refer to Figure 12-38. After settings are changed, the unit must be turned OFF/ON for them to take effect.

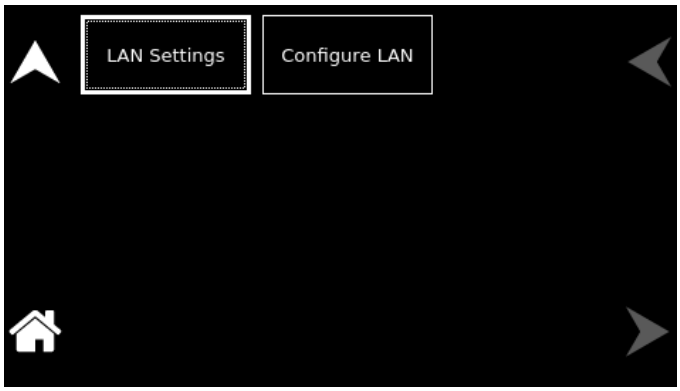


Figure 12-38. LAN Screen

a) LAN SETTINGS

Lists the configuration settings of the LAN interface, and the DNS-SD service name; a number, (n), would be appended to the service name, if necessary, to differentiate duplicate power supply names. Refer to Figure 12-39.

ENTRY	DESCRIPTION

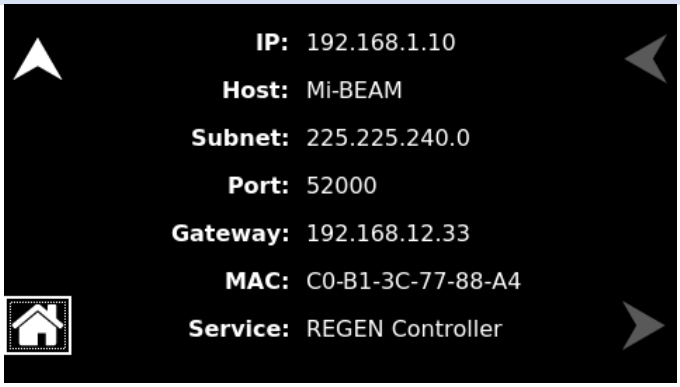


Figure 12-39. LAN Settings

b) LAN CONFIGURE

Sets parameter values and controls operation of the LAN interface. Refer to Figure 12-40.

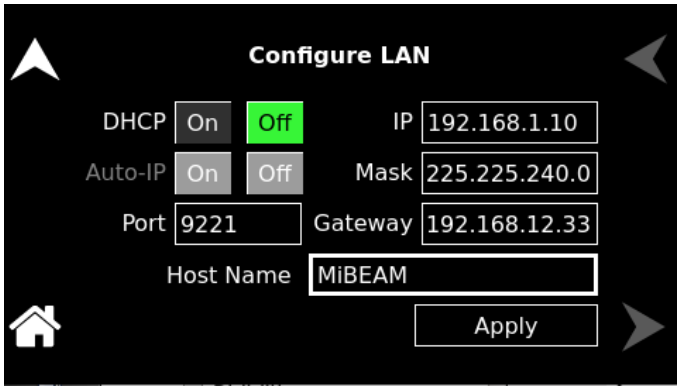


Figure 12-40. Configure LAN

- **DHCP**: Selects whether DHCP is enabled or disabled. Refer to Figure 12-41.

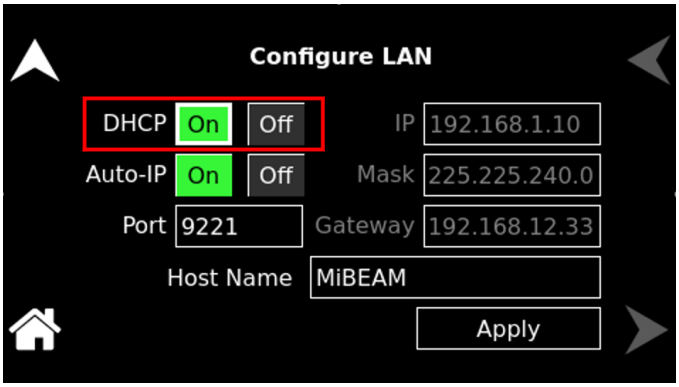


Figure 12-41. LAN Screen – DHCP

ENTRY	DESCRIPTION

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.

- **Auto-IP**: Enable or disable the Auto-IP configuration, when DHCP is ON. Refer to Figure 12-42.

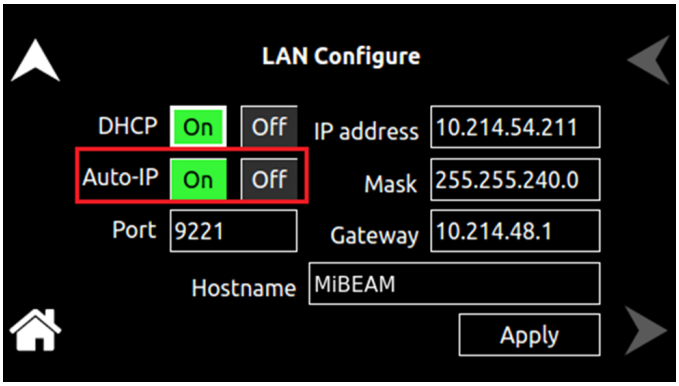


Figure 12-42. LAN Screen - Auto -IP

- **IP Address**: Sets the static IP address for the unit. When DHCP is turned off in the LAN CONFIG sub-menu, AUTO IP is selected, set the IP address to all zeros so that the IP address would be requested from the network; when DHCP is selected, the IP address is assigned by the network DHCP server. Refer to Figure 12-43.

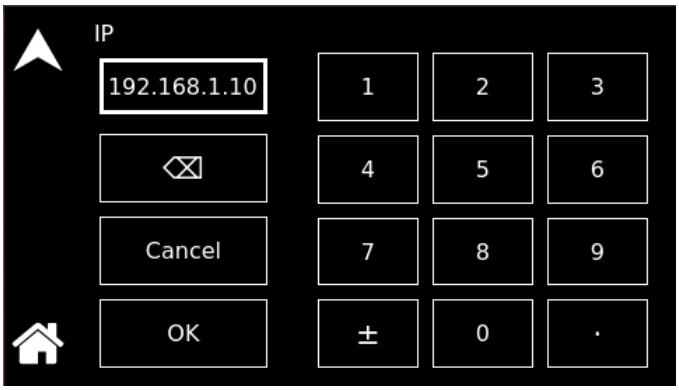


Figure 12-43. LAN Screen - IP Address

- **Subnet Mask**: Sets the subnet mask for use in static IP configuration. Refer to Figure 12-44.

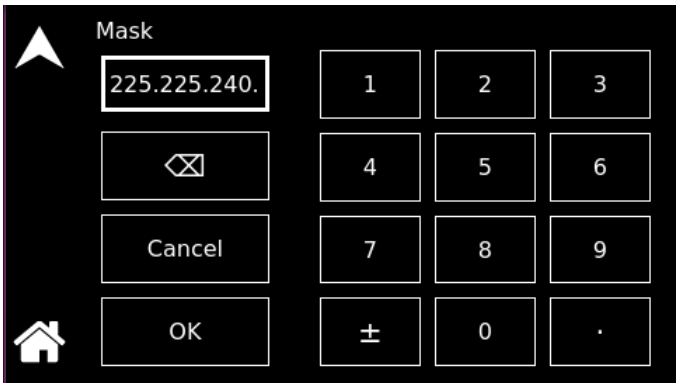


Figure 12-44. LAN Screen - Subnet Mask

- **Gateway Address**: Sets the gateway address when DHCP is turned off in the LAN CONFIG sub-menu and when AUTO IP is selected, set the gateway address to all zeros so that the gateway address would be requested from the network; when DHCP is selected, the gateway address is assigned by the network DHCP server. Refer to Figure 12-45.

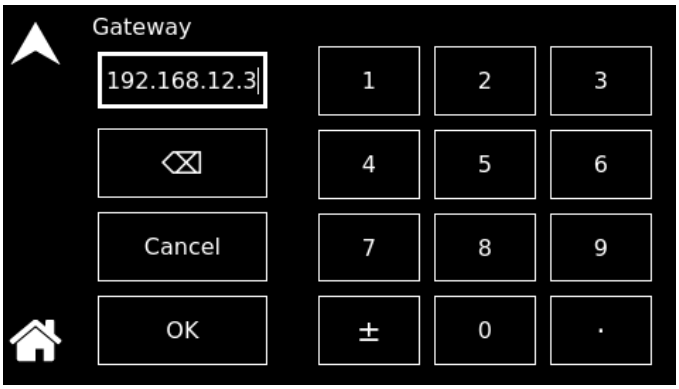


Figure 12-45. LAN Screen - Gateway Address

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

- **Port**: sets the port number; the factory-default value is 9221. Refer to Figure 12-46.

ENTRY	DESCRIPTION

Figure 12-46. LAN Screen -Port

- **MAC Address:** Displays the MAC address; the MAC address is listed on a label on the chassis of the unit. Refer to Figure 12-47.

Figure 12-47. MAC Address

- **Host Name**: Allows setting a unique alpha-numeric host name. Refer to Figure 12-48.

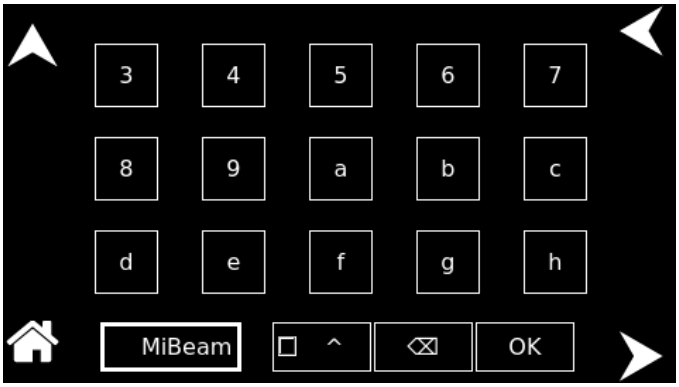


Figure 12-48. LAN Screen - Host Name

- **Apply**: Applies the LAN settings to the supply. Refer to Figure 12-49 and Figure 12-50.

ENTRY	DESCRIPTION

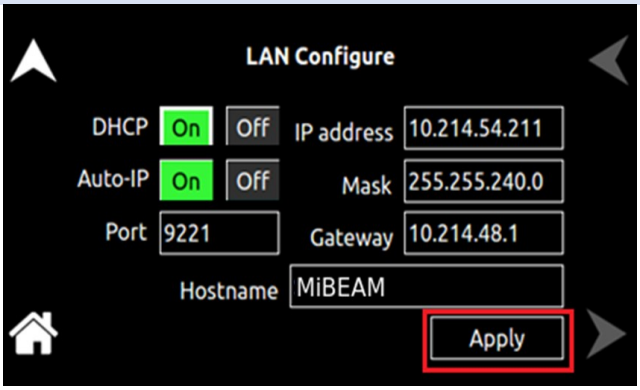


Figure 12-49. LAN Screen – Apply

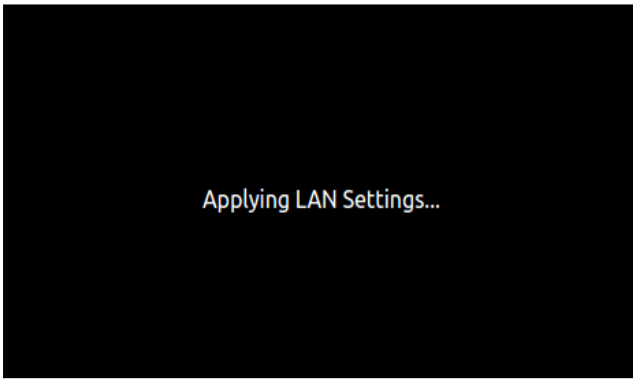


Figure 12-50. LAN Screen - Applying LAN Settings

RS232

Configures the RS-232C communications interface.RS232 has two sub-menus: RS232 Settings and RS232 Configure

a) RS232 Settings: Lists the configured Baud Rate, Stop Bits, Bits and Parity for the RS232 digital interface, refer to Figure 12-51.

- **Baud Rate:** sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.
- **Stop Bits:** sets the number of stop bits to either 1 or 2 bits. The default setting is 1 stop bit.
- **Data:** sets the number of data bits to either 7 or 8. The default setting is 8 bits.
- **Parity:** sets the parity to either Even, Odd, or no parity, None. The default setting is no parity, None.

ENTRY	DESCRIPTION

Figure 12-51. RS232 Screen -Settings

b) **Configure RS232:** Configures the RS-232 Baud Rate, refer to Figure 12-52 and Figure 12-53. This setting must match those set for the communications port of the user external controller.

- **Baud Rate:** sets baud rate to either 9600, 19,200, 38,400, 57600 or 115,200 baud. The default setting is 115,200 baud.

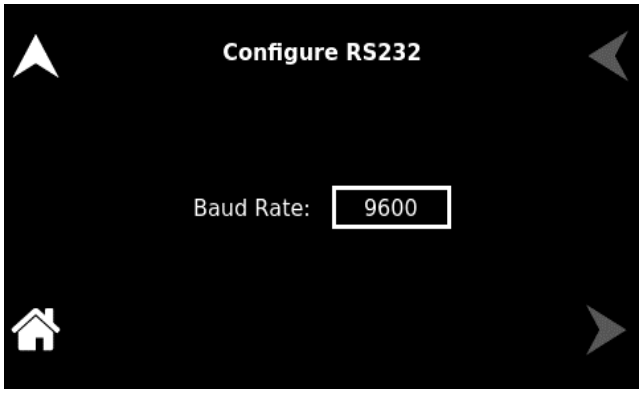


Figure 12-52. RS232 Screen -Configure

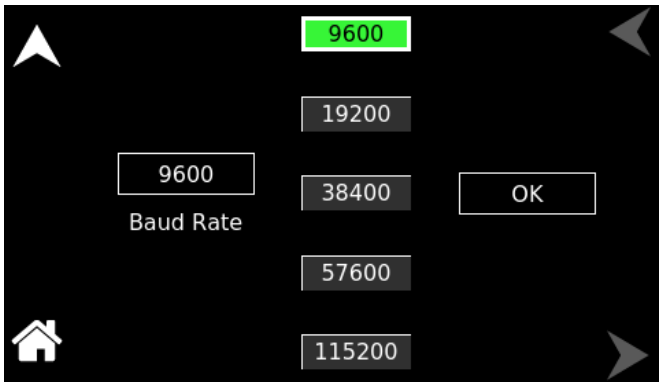


Figure 12-53. Baud Rate Selection

ENTRY	DESCRIPTION
Remote Inhibit	Sets the control the power supply output remotely by either closing a contact or applying an active voltage source, depending on the configuration. This can be particularly useful for safety and operational control in various applications. Refer to Figure 12-54. **a) Remote Inhibit Input – Contact Closure** Switch or Relay contact closure or direct short from this terminal to signal return is required to Turn ON the output of power supply. Opening the contact would shut down the output. Remote inhibit can be configured in three modes; • **Latch**: after reclosing the contact, user needs to clear the fault and turn ON the output. • **Live**: after reclosing the contact, user needs to turn ON the output. • **OFF**: inhibit function would be disabled. **b) Remote Inhibit Input – Active Source** An active voltage source from this terminal to signal return is required to Turn OFF the output of power supply. Remote inhibit can be configured in three modes; • **Latch:** after removing the active voltage source, user needs to clear the fault and turn ON the output. • **Live:** after removing the active voltage source, user needs to turn ON the output. • **OFF:** inhibit function would be disabled.

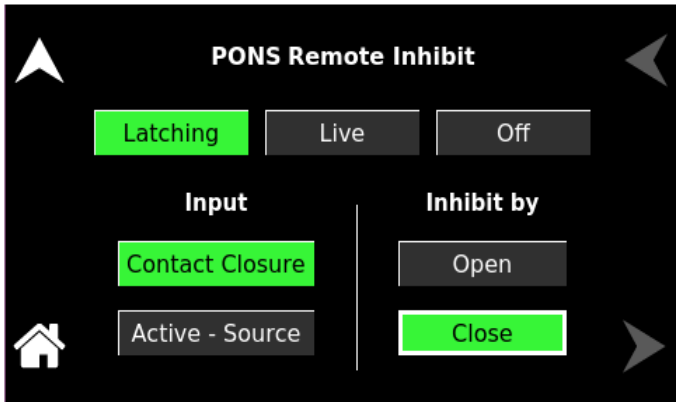


Figure 12-54. PONS remote Inhibit

USB	Displays the configured Baud Rate. Refer to Figure 12-55.

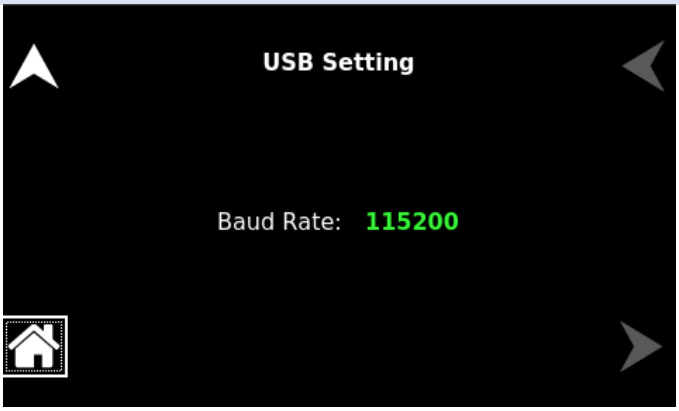
ENTRY	DESCRIPTION
	

Figure 12-55. USB Setting

Table 12-8. System Setting Screen

12.2.6 OPERATING MODE

The Operating Mode Settings screen offers comprehensive guidance on the system modes of the Mi-BEAM Series power supply. This model is engineered for versatile and reliable performance across various applications, ensuring precise and efficient power delivery through its advanced control features. Depending on user requirements, the Mi-BEAM Series supports multiple modes of operation. Refer to the Figure 12-56.

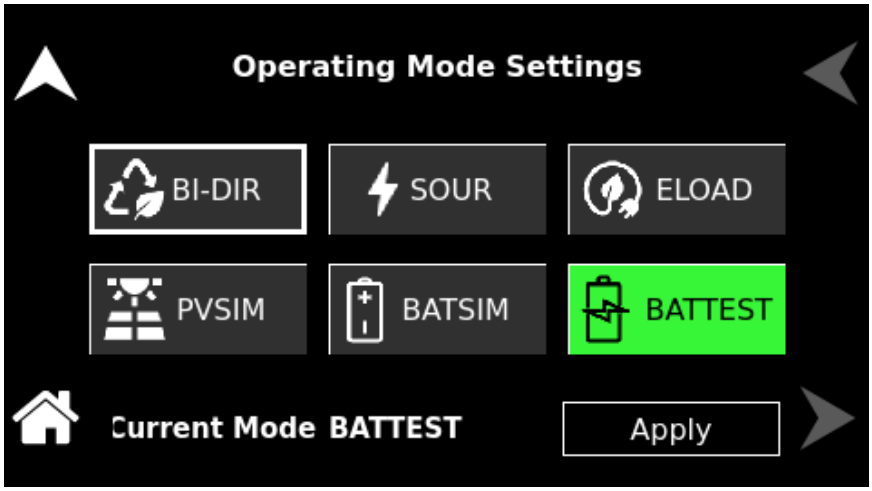


Figure 12-56. Operating Mode

12.2.7 SYSTEM SETTINGS SCREEN

The System Settings screen provides the settings of ‘Hardware Limits’, ‘System Details’ ‘Firmware Version’, ‘LCD’, ‘Default Screen’ and ‘Factory Default’. The top-level menu of the System Settings menu is shown in Figure 12-57. Refer to Section 6.4.2.1 for navigating to System Settings Screen.

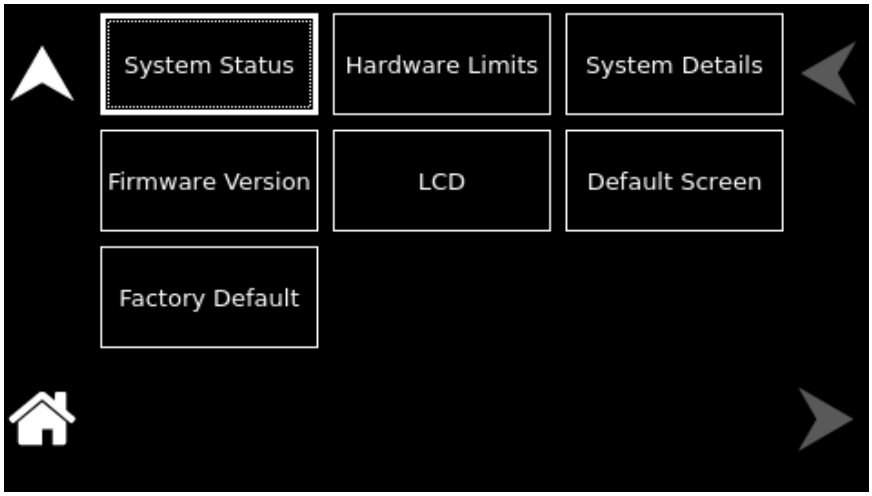


Figure 12-57. System Settings Screen

The System Settings menu has the following fields:

ENTRY	DESCRIPTION
System Status	Displays the present system status information of the power supply, including the Input Line, Output Sense, Isolation and No. of chassis. Refer to Figure 12-58.

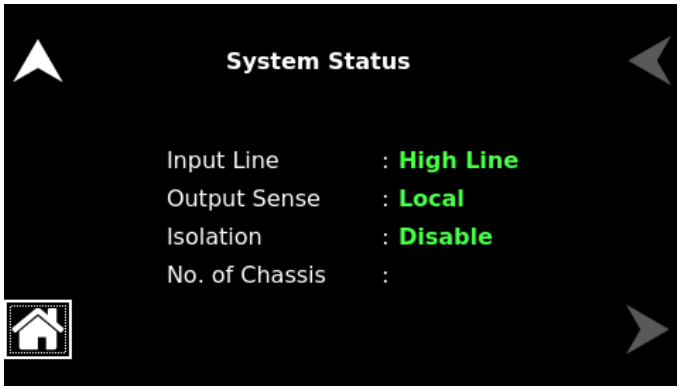
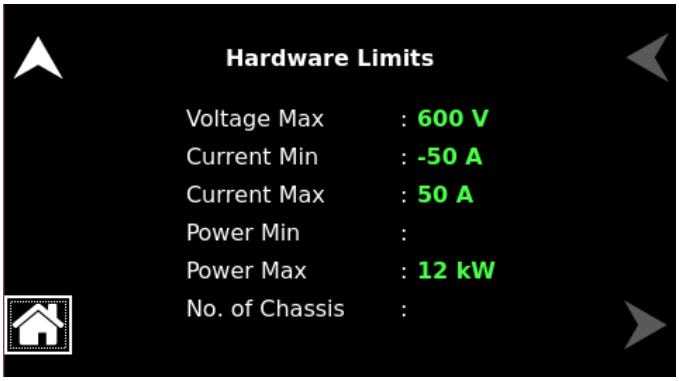


Figure 12-58. System Status

Hardware Limits	Displays the hardware parameter limit values. Refer to Figure 12-59.



ENTRY	DESCRIPTION

Figure 12-59. Hardware Limits

System Details Displays information about the user's device, including the Manufacturer, Model Number, Serial Number, Last Calibration Date, and Operating Mode. Refer to Figure 12-60.

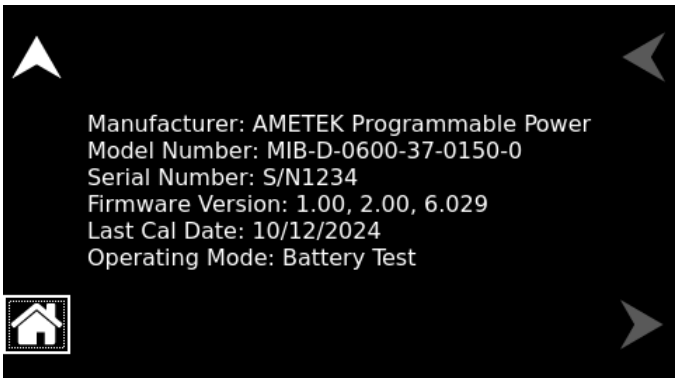


Figure 12-60. System Details

Firmware Version Displays information about the configuration of the power supply, including the Communication Controller, System Interface, Front Panel, Fan Controller, Mod 1 Primary Controller, Mod 1 Secondary Controller, Mod 2 Primary Controller, Mod 2 Secondary Controller, Mod 3 Primary Controller, Mod 3 Secondary Controller. This information helps identify the unit. Refer to Figure 12-61.

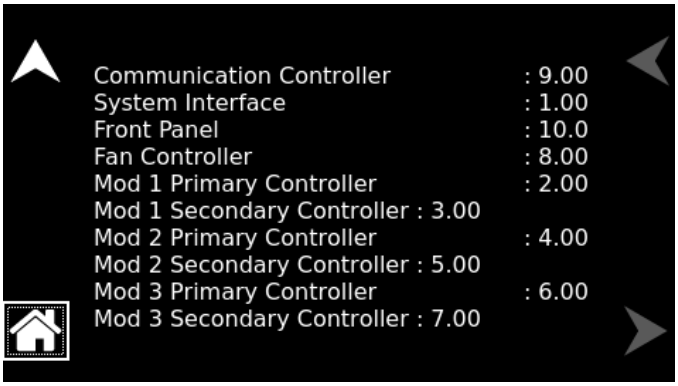


Figure 12-61. Firmware Version

LCD Provides settings for the calibration of the display touchscreen. Refer to Figure 12-62.

ENTRY	DESCRIPTION

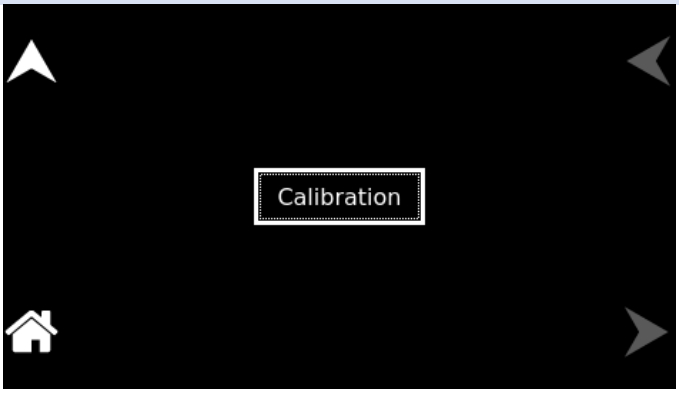


Figure 12-62. LCD

Default Screen

Selects whether the Default screen (showing measured voltage, current and power) is enabled or disabled, refer to Figure 12-63 and Figure 12-64. It allows to set the time out if the default screen is enabled.

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

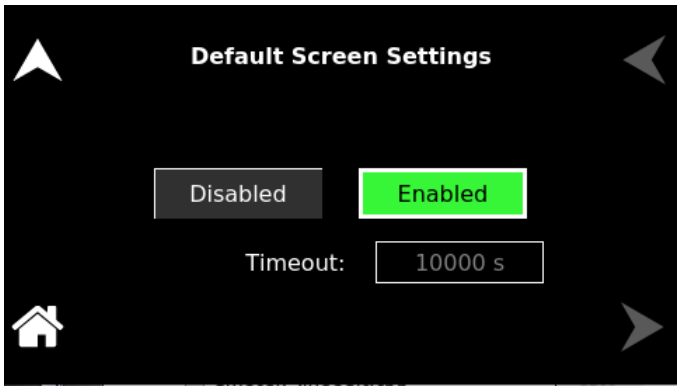


Figure 12-63. Default Screen Settings

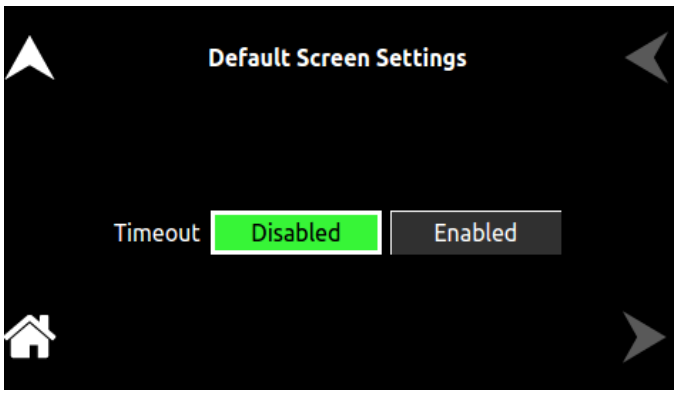


Figure 12-64. System Settings Screen - Default Screen Disabled

Factory Default

Set the device to its original factory settings, as it was when it left the manufacturer. Refer to Figure 12-65.

ENTRY	DESCRIPTION

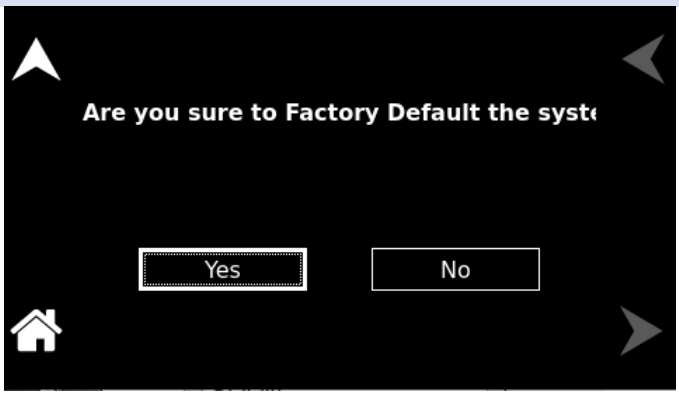


Figure 12-65. Factory Default

Table 12-9. System Setting Screen

12.2.8 SYSTEM FAULTS SCREEN

The System Faults screen provides descriptions of faults that have occurred in a power module. The fault screen appears if any supply fault conditions occur, refer to Figure 12-66. The user should press ‘Clear’ to clear the fault and continue the operations of the power supply and press the ‘Reload’ to refresh the system faults and check for errors. If no fault has occurred, the screen will show 'No Fault Occurred', refer to Figure 12-67.

NOTE: These conditions might resolve themselves; however, if they continue to occur after pressing 'Clear', refer to Chapter 14.

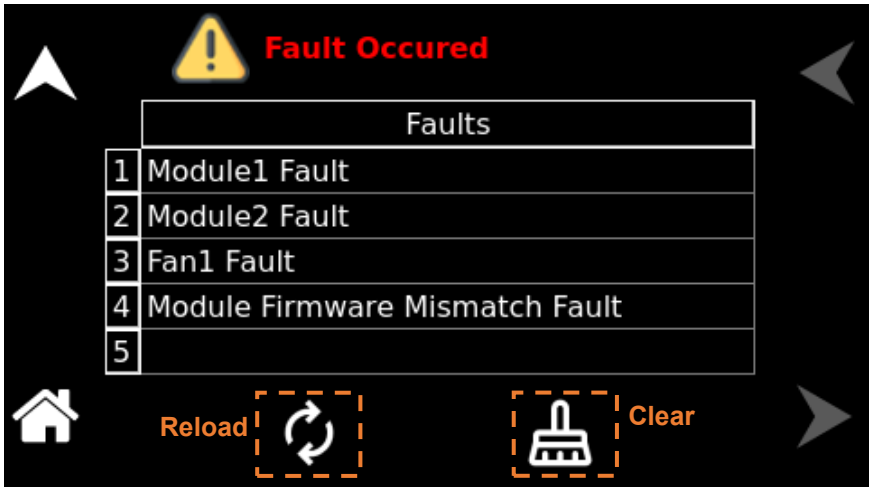


Figure 12-66. System Faults

Figure 12-67. No Fault Occurred Screen

12.3 PARALLEL OPERATION

Parallel mode of operation is used for applications that require more current or power than a single power supply can provide. To meet these higher output requirements, up to six power supplies can be connected in parallel, effectively combining their capacities to achieve the desired performance.

NOTE: Up to six units can be connected in parallel, contact factory to connect more than six units in parallel.

12.3.1 SETTING UP PARALLEL OPERATION

Each power supply has two separate 15-pin connectors on the upper left rear panel, labeled ‘PARALLEL INTERFACE IN’ and ‘PARALLEL INTERFACE OUT’. To connect power supplies in parallel, use a ‘Leader’ or ‘Follower’ daisy-chain wiring configuration . Refer to Figure 12-68. For parallel cable information refer to Section 2.25.

a) Using an interface cable (P/N 890-015-01), connect the 'PARALLEL INTERFACE OUT' port of the Leader power supply to the 'PARALLEL INTERFACE IN' port of the second power supply (Follower 1).

NOTE: In parallel operation, the Leader unit manages all programming, readback, and control functions. Remote analog control is not supported in this mode.

NOTE: Units with the same model number are allowed to be connected in parallel.

b) On the second power supply (Follower 1), connect another interface cable from its 'PARALLEL INTERFACE OUT' port to the 'PARALLEL INTERFACE IN' port of the third power supply (Follower 2). Continue this daisy-chain connection for up to a maximum of six power supplies.

c) Connect the positive output terminals of all power supplies together, along with the positive terminal of the load.

d) Connect the negative output terminals of all power supplies together, along with the negative terminal of the load.

e) Ensure that there are no shorts between the Positive and Negative output terminals.

f) Ensure all cables are kept as short as possible and connect twisted-pair sense cables as follows.

- For remote sensing at the load, only the Leader unit should have a twisted-pair cable running from its sense terminals to the load terminals.

g) After all the successful connection, power ON all the follower units followed by leader.

NOTE: Doing Parallel operation for the first time, make sure to reset the power supply units by selecting 'Factory default' in 'System Settings' Screen. This step is essential to prevent setting conflicts caused by pre-existing PONS settings.

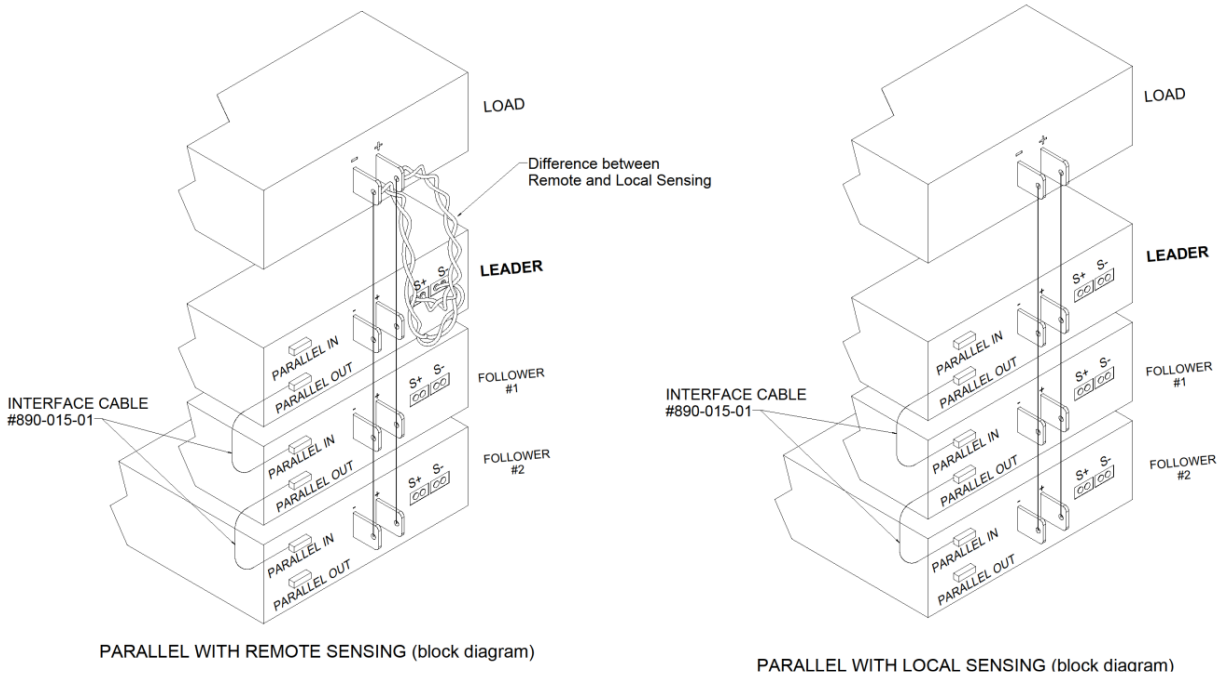


Figure 12-68. Parallel Connection

This page intentionally left blank

13 CALIBRATION

This chapter provides the procedures required to calibrate the Mi-Beam power supply. It is recommended that calibration should be performed at 12-month intervals, or following service if subassemblies are replaced. The procedures are performed using SCPI commands through the remote digital interface using either the Virtual Panels GUI program or another suitable communication program. For details related to operation through the remote digital interface, refer to the Mi-Beam Programming Manual M487352-01.

13.1 CALIBRATION EQUIPMENT

Table 13-1 lists the equipment needed to conduct the calibration procedure.

EQUIPMENT	MODEL
DMM	Fluke 8558A
Data Acquisition/Switch UUT	Agilent 34980A with 34980A Multiplexer
Oscilloscope	Tektronix MDO34 3-BW-200
Shunt High Accuracy	100A (Guildline 9230A-100)
AC Source 45kVA	AMETEK SQ0045C1D1-000000
DC Power Supply Bidirectional	ITECH IT6018C-2250-25
DC Hi-pot Tester	0-3100Vdc, 2 mA trip current
Computer Controller	RS232, USB, and Ethernet cards
Final Test Fixture	5580240-01R
Differential probe	Tektronix, THDP0100

Table 13-1. Calibration Equipment

13.2 CALIBRATION PROCEDURES

13.2.1 PREPARATION FOR CALIBRATION

WARNING!

Hazardous voltages exist at the rear of the power supply; avoid contact with the AC input and AC/DC output terminals and be aware that filter capacitors store potentially dangerous energy for some time after power is removed.

TECHNICIAN SYMBOL

Only qualified personnel should perform maintenance or service tasks.

The calibration procedures require precision instrumentation to measure voltage and current; when substituting for the recommended test equipment, ensure that the accuracy is adequate so that excessive error is not incurred, compared to the specifications of the parameters that are to be calibrated. To set up the alignment procedures, perform the following initial steps:

a) Disconnect the UUT AC input power.

b) Disconnect all loads from the UUT's output terminals.

c) Connect the UUT sense lines to the output terminals.

d) Connect the DVM to the UUT output terminals.

e) Set the UUT to REMOTE mode by the rear panel Remote or Local Configuration Switch.

f) Perform one of the following:

- For **RS232**: Connect the RS232 controller to the rear panel of the UUT using the RS232 null modem cable.
- For **Ethernet**: Set up the Ethernet communication by connecting the Ethernet cable to the rear panel of the UUT.

g) Reconnect the AC input power. Turn the unit ON and allow the unit to warm up for at least 30 minutes.

13.2.2 LOCAL SENSE VOLTAGE PROGRAMMING CALIBRATION

a) Perform the calibration in no load condition.

b) Configure the UUT to Voltage programming type and regulation into CV by sending the command:

```
OUTP: PROG: TYPE VOLT
OUTP: PROT: FOLD CV
```

c) Set the current and over voltage protection value to 100%, and sense to local by sending the SCPI commands:

```
OUTP: SENS 0
CAL: OUTP: CURR: PROT: POS: PER 100
CAL: OUTP: CURR: PROT: NEG: PER 100
CAL: OUTP: VOLT: PROT: PER 100
```

d) Enable the Output of the UUT:

```
OUTP: STAT 1
```

e) Set the voltage value to 5% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 5
```

f) Measure the output voltage using a DMM. It should be approximately 5% of the rated output voltage. Set the 1st point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 1 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

g) Set the voltage value to 25% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 25
```

h) Measure the output voltage using a DMM. It should be approximately 25% of the rated output voltage. Set the 2nd point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 2 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

i) Set the voltage value to 50% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 50
```

j) Measure the output voltage using a DMM. It should be approximately 50% of the rated output voltage. Set the 3rd point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 3 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

k) Set the voltage value to 75% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 75
```

l) Measure the output voltage using a DMM. It should be approximately 75% of the rated output voltage. Set the 4th point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 4 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

m) Set the voltage value to 100% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 100
```

n) Measure the output voltage using a DMM. It should be approximately 100% of the rated output voltage. Set the 5th point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 5 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

o) Set the voltage DAC to zero and store the calibrated value by sending the following SCPI commands:

```
CAL: OUTP: VOLT: PER 0
CAL: OUTP: VOLT: FIVEPOINT?
OUTP: STAT 0
CAL: OUTP: VOLT: CALC
CAL: UNLOCK "6867"
CAL: STORE
CAL: LOCK
```

p) Program the DC bidirectional power supply output voltage to 0 V and disable the output.

13.2.3 REMOTE SENSE VOLTAGE PROGRAMMING CALIBRATION

a) Perform the calibration in no load condition.

b) Configure the UUT to Voltage programming type and regulation into CV by sending the commands:

```
OUTP: PROG: TYPE VOLT
OUTP: PROT: FOLD CV
```

c) Set the current and over voltage protection value to 100%, and sense to remote by sending the SCPI commands:

```
OUTP: SENS 1
CAL: OUTP: CURR: PROT: POS: PER100
CAL: OUTP: CURR: PROT: NEG: PER100
CAL: OUTP: VOLT: PROT: PER 100
```

d) Enable the Output of the UUT:

```
OUTP: STAT 1
```

e) Set the voltage value to 5% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 5
```

f) Measure the output voltage using a DMM. It should be approximately 5% of the rated output voltage. Set the 1st point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 1 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

g) Set the voltage value to 25% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 25
```

h) Measure the output voltage using a DMM. It should be approximately 25% of the rated output voltage. Set the 2nd point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 2 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

i) Set the voltage value to 50% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 50
```

j) Measure the output voltage using a DMM. It should be approximately 50% of the rated output voltage. Set the 3rd point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 3 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

k) Set the voltage value to 75% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 75
```

l) Measure the output voltage using a DMM. It should be approximately 75% of the rated output voltage. Set the 4th point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 4 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

m) Set the voltage value to 100% by sending the SCPI command:

```
CAL: OUTP: VOLT: PER 100
```

n) Measure the output voltage using a DMM. It should be approximately 100% of the rated output voltage. Set the 5th point of the calibration by sending the command:

```
CAL: OUTP: VOLT: FIVEPOINT 5 <data>
```

NOTE: where '<data>' is the measured output voltage from the DMM.

o) Set the voltage DAC to zero and store the calibrated value by sending following SCPI commands:

```
CAL: OUTP: VOLT: PER 0
CAL: OUTP: VOLT: FIVEPOINT?
OUTP: STAT 0
CAL: OUTP: VOLT: CALC
CAL: UNLOCK "6867"
CAL: STORE
CAL: LOCK
```

p) Program the DC bidirectional power supply output voltage to 0 V and disable the output.

13.2.4 CURRENT PROGRAMMING CALIBRATION

a) Connect the DC bidirectional power supply (ITECH) as load to the output of the UUT and Current Shunt in series.

b) Connect the DMM to the sense terminals of the Current Shunt.

c) Configure the DC bidirectional power supply to voltage priority and set Positive current limit, Negative current limit, and voltage as follows:

- Set Current positive = 101% FSC of the UUT
- Set Current negative = - 101% FSC of the UUT
- Set Voltage = 30% of the UUT rated

d) Configure the UUT programming type into Current and regulation settings into CC/CV.

```
OUTP: PROG: TYPE CURR
OUTP: PROT: FOLD CCCV
```

e) Set the DAC value of the over voltage to 35% of the rated voltage, enable the output of the UUT by sending the SCPI commands:

```
CAL: OUTP: VOLT: PROT: PER 35
CAL: OUTP: CURR: PROT: POS: PER 100
CAL: OUTP: CURR: PROT: NEG: PER 100
OUTP: STAT 1
```

f) Set the output current to -90% for the 1st Point, by sending SCPI command:

```
CAL: OUTP: CURR: PER -90
```

g) Measure the output voltage of the shunt using the DMM and calculate output current, Set the 1st point of the calibration by sending the command:

```
CAL: OUTP: CURR: FIVEPOINT 1 <data>
```

NOTE: where '<data>' is the calculated output current from DMM value.

h) Set the output current to -40% for the 2nd Point, by sending SCPI command:

```
CAL: OUTP: CURR: PER -40
```

i) Measure the output voltage of the shunt using the DMM and calculate output current, Set the 2nd point of the calibration by sending the command:

```
CAL: OUTP: CURR: FIVEPOINT 2 <data>
```

NOTE: where '<data>' is the calculated output current from DMM value.

j) Set the resistance for the 3rd Point and current DAC value to 0%, by sending SCPI command:

```
CAL: OUTP: CURR: PER 0
```

k) Measure the output voltage of the shunt using the DMM and calculate output current, Set the 3rd point of the calibration by sending the command:

```
CAL: OUTP: CURR: FIVEPOINT 3 <data>
```

NOTE: where '<data>' is the calculated output current from DMM value.

l) Set the resistance for the 4th Point and current DAC value to 30%, by sending SCPI command:

```
CAL: OUTP: CURR: PER 30
```

m) Measure the output voltage of the shunt using the DMM and calculate output current, Set the 4th point of the calibration by sending the command:

```
CAL: OUTP: CURR: FIVEPOINT 4 <data>
```

NOTE: where '<data>' is the calculated output current from DMM value.

n) Set the resistance for the 5th Point and current DAC value to 90%, by sending SCPI command:

```
CAL: OUTP: CURR: PER 90
```

o) Measure the output voltage of the shunt using the DMM and calculate output current, Set the 5th point of the calibration by sending the command:

```
CAL: OUTP: CURR: FIVEPOINT 5 <data>
```

NOTE: where '<data>' is the calculated output current from DMM value.

p) Set the current DAC to zero and store the calibrated value by sending the following SCPI commands:

```
CAL: OUTP: CURR: PER 0
CAL: OUTP: CURR: CALC
```

```
CAL: OUTP: CURR: FIVEPOINT?
OUTP: STAT 0
CAL: UNLOCK "6867"
CAL: STORE
CAL: LOCK
```

q) Program the DC bidirectional power supply output voltage to 0V and disable the output.

14 ERROR MESSAGES AND SYSTEM FAULTS

This chapter provides information on error messages and system faults that occur during operation from either the front panel or the remote digital interface.

14.1 ERROR MESSAGES

Errors that occur during operation from either the front panel or the remote digital interface will result in error messages. Error messages are stored in memory allocated to the error message queue. The error messages in the queue can be read using the SCPI query command, `SYST: ERR?`. The error queue has a finite depth; if more error messages are generated than can be held in the queue, a queue overflow message will be put in the last queue location. To empty the queue, read out the error queue until the message "No Error" is received.

The table below displays a list of possible error messages along with their possible cause and remedy. Refer to the Mi-Beam Programming Manual for more details. Refer to the AMETEK Programmable Power website, www.programmablepower.com, to download latest version.

NUMBER	MESSAGE STRING	CAUSE	REMEDY
000	No error	No errors in the queue	Normal operation
001	Self-test pending	Self-test in progress	Wait for the self-test to complete
008	Feature Not Supported	The command might be inconsistent with the current device settings.	Check the Programming Manual to ensure if the command is supported in current device setting.
-101	System too Busy	System is busy performing previously requested operation.	Wait for the operation to complete.
-102	Syntax error	SCPI command syntax incorrect, unrecognized command or data type	Correct command syntax, e.g. misspelled or unsupported commands.
-200	Execution error	The command could not be executed	Error occurred executing the command.
-203	Command protected	The command is locked out	Some commands are supported by the unit but are locked out for the protection of settings and are not user accessible until it is unlocked.
-221	Settings conflict	Requested setting conflicts with other settings in effect	Check settings: e.g., changing regulation setting, CC/CV is not allowed if the programming type is voltage.
-222	Parameter out of range	Parameter data outside of the allowable range	Check the Programming Manual for allowable parameter values.
-250	Directory full	No sufficient space to save new files.	Delete one or more files from the unit to make room.

NUMBER	MESSAGE STRING	CAUSE	REMEDY
-251	Directory not found	Unable to find the directory where the files are stored	Reboot the unit, contact factory if the issue persists.
-252	File name error	Incorrect filename	Check file (profile/list) name definition exceeds 29 characters.
-253	File not found	Unable to find the selected file name.	Ensure that the file is available in unit before selection.
-254	File read error	Error while reading the file (profile/list) data from the unit.	Retry, if the issue persists, delete and create a new file.
-255	Parameters count not matching as per configured size	Size declared and number of entered parameters are not matching.	Ensure that the declared size and parameter count matches.
-257	CRC value for file contents changed	Saved file (profile/list) data is corrupted.	Retry, if the issue persists, delete and create a new file.
-258	Battery configuration not loaded	Battery configuration file (profile/list) is not loaded.	Ensure that the battery configuration is loaded before turning ON the output.
-260	Name already exist	Creating the file (profile/list) with a name that already exists.	Ensure that the file (profile/list) name is not same as the previously saved file (profile/list).
-331	System error	Error occurred during performing the requested operation.	Ensure that the operation requested does not conflict the state system is in.
-350	Queue overflow	Message queue full	Read status using `SYST:ERR` query until 0; 'No Error' is received indicating queue empty.
-351	Data not saved	Trying to load a file (profile/list) which is not saved.	Ensure that the data is saved
-352	Model identification in progress, please retry again	Cannot execute command, module identification in progress.	Wait for the module identification to complete.
-353	File not selected	Cannot execute file (profile/list) operation command.	Ensure that the file (profile/list) is selected before sending any file (profile/list) related commands such as load or delete.
-354	Data not initialized or loaded	Selected file (profile/list) is not loaded before output ON.	After selecting the file ensure it is loaded before turning ON the output.
-357	Command not supported in selected operating mode	Command not supported in selected operating mode.	Ensure that the command sent is related to the selected operating mode.

Table 14-1. Error Messages

14.2 SYSTEM FAULTS

The table below displays a list of possible system faults along with their possible cause and remedy. Refer to the Mi-Beam Programming Manual for more details. Refer to the AMETEK Programmable Power website, www.programmablepower.com, to download latest version.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
0x00000001	Overvoltage Protection Fault	Output voltage of Mi- BEAM has exceeded the programmed Over Voltage protection (OVP) limit. OVP is an instantaneous trip. Hence, applying (or generating) an output voltage close to OVP limit may trigger this fault. Hence, always program the OVP trip limit well above the set voltage and applied output voltage. The OVP trip limit ensures that unit voltage will never exceed the programmed OVP limit, thus protecting the connected UUT from overvoltage failure.	**a)** Check if sufficient margin is available between voltage applied (or generated) at the output and OVP limit. If possible, increase the set value of OVP to resolve the trip. Else, restrict the applied (or generated) voltage at the output terminal well within the OVP limit. **b)** If OVP limit is set from external Analog source, ensure that sufficient margin is provided between the set voltage (corresponding to the applied analog voltage) and the OVP limit.
0x00000002	Overcurrent Protection Fault	Output Current exceeded Over Current trip limit. OCP is an instantaneous trip. Hence, supplying (or drawing) an output current close to OCP limit may trigger this fault. Hence, always program the OCP trip limit well above the set current and load current. The OCP trip limit ensures that unit current will never exceed the programmed OCP limit, thus protecting the connected UUT from overcurrent failure.	Check if sufficient margin is available between current supplied or drawn from the output and OCP limit. If possible, increase the set value of OCP to resolve the trip. OCP can be accessed as follows from front panel (Dashboard Home button -> Configuration -> Protection -> Pos. OCP/Neg. OCP.) Else, restrict the current supplied or drawn from the output terminal well within the OCP limit.
0x00000004	Foldback Fault	Output trip is activated due to foldback operation setting. Foldback operation corresponds to the regulation operation other than the main regulation operation. **E.g.**: Assume that user has selected CC mode as the regulation setting. Then, both CV and CP modes are foldback regulation operation. If the protection limit corresponding to Volt high or Volt low or	Check the foldback operation setting from `OUTP:PROT:FOLD?` Query and modify as required

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		Power high or Power low is hit during a Current control (CC) operation occurs, then a foldback fault is displayed. Similarly in CC/CV mode of operation, Power high or Power low is hit, then also a foldback fault is triggered. It is to be noted that in CC/CV mode if voltage high limit is hit, then present regulation operation is changed from current control to voltage control.	
0x00000008	External Shutdown	External Shutdown activated from External Analog Programming Connector (contact closure or Vsource)	Check the external shutdown configuration and the signals are connected as per the configuration
0x00000010	Module 1 Fault	Internal Module-1 Fault. It can happen when module power stage parameter (like voltage current, power or temperature) exceeds the limit.	**a)** Try restarting the power supply and it may go away if it was caused due to a sudden supply input or an output load transient. **b)** To understand what fault occurred, query '`SYSTEM<CHASSNO>: MODULE1 :FAULT:STATUS?`'
0x00000020	Module 2 Fault	Internal Module-2 Fault. It can happen when module power stage parameter (like voltage current, power or temperature) exceeds the limit.	**a)** Try restarting the power supply and it may go away if it was caused due to a sudden supply input or an output load transient. **c)** To understand what fault occurred, query '`SYSTEM<CHASSNO>: MODULE2:FAULT:STATUS?`'
0x00000040	Module 3 Fault	Internal Module-3 Fault. It can happen when module power stage parameter (like voltage current, power or temperature) exceeds the limit.	**a)** Try restarting the power supply and it may go away if it was caused due to a sudden supply input or an output load transient.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
			b) To understand what fault occurred, query 'SYSTEM<CHASSNO>: MODULE3 :FAULT:STATUS?'
0x00000080	Module 1 Over temperature fault	Internal Module 1 Over temperature fault. This refers to an increased temperature more than the specified limit in one of the power stages of module-1. The over-temperature fault would occur due to following reasons; **a)** Blockage of airflow in chassis air vents. **b)** Fan not running at sufficient speed. **c)** The chassis is operated at an elevated room temperature more than that specified level **d)** Due to hardware issue.	**a)** Try restarting the power supply. **b)** To understand what fault occurred, query 'SYSTEM<n>:MODULE1 :TEMPERATURE:FAULT:STATUS? ' command to know detailed temperature fault status
0x00000100	Module 2 Over temperature fault	Internal Module 2 Over temperature fault. This refers to an increased temperature more than the specified limit in one of the power stages of module-2. The over-temperature fault would occur due to following reasons; **a)** Blockage of airflow in chassis air vents. **b)** Fan not running at sufficient speed. **c)** The chassis is operated at an elevated room temperature more than that specified level	**a)** Try restarting the power supply **b)** To understand what fault occurred, query 'SYSTEM<n>:MODULE2 :TEMPERATURE:FAULT:STATUS? ' command to know detailed temperature fault status

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		d) Due to hardware issue.	
0x00000200	Module 3 Over temperature fault	Internal Module 3 Over temperature fault. This refers to an increased temperature more than the specified limit in one of the power stages of module-3. The over-temperature fault would occur due to following reasons; **a)** Blockage of airflow in chassis air vents. **b)** Fan not running at sufficient speed. **c)** The chassis is operated at an elevated room temperature more than that specified level. **d)** Due to hardware issue.	**a)** Try restarting the power supply **b)** To understand what fault occurred, query '`SYSTEM<n>:MODULE3:TEMPERATURE:FAULT:STATUS?`' command to know detailed temperature fault status
0x00000400	Remote Analog Programming Error	Remote programming Analog signal level is out of the specified range. Remote Analog Programming error can occur when the applied voltage/connected resistance in any of the analog programming pins of 26-Pin Digital I/O interface (e.g.: VPRG_VOLT, VPRG_CURR, IPRG_VOLT, IPRG_CURR, or OVPRG_VOLT) has exceeded the full scale rated output voltage or is lower than minimum limit specified.	Ensure that the analog reference value given is within the Full-scale value configured in the analog programming
0x00000800	AC input Line Fault	AC input voltage to the power supply is not in specified operating range. This fault will be triggered if a unit configured as Low line and is supplied with input voltage corresponding to High line. The fault will also be triggered if the input supply voltage	**a)** Check if input voltage to the supply is within specified range (allowed input voltage ranges are, Low line: 180-264V, High line: 342-528V). **b)** Try restarting the power supply.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		goes out of limit due to a voltage swell or sag during operation.	
0x00001000	NEG_POLARITY_FAULT	Negative voltage polarity is applied at the output of isolation relay. Since the unit can have only positive voltage applied at the output, the isolation relay will be operated only when there is positive voltage at its terminal. Applying a negative voltage at the load side of isolation relay terminal will trigger this fault.	Check if voltage at the load side of isolation relay terminal is not negative and is within the range specified in datasheet.
0x00002000	Fan1 Fault	Fault from cooling Fan-1. This condition is caused when Fan is not running at the required speed for cooling the unit.	**c)** Check if the fan is running. **d)** Clear the fault or try restarting the power supply.
0x00004000	Fan2 Fault	Fault from cooling Fan-2. This condition is caused when Fan is not running at the required speed for cooling the unit.	**a)** Check if the fan is running. **b)** Clear the fault or try restarting the power supply.
0x00008000	Fan3 Fault	Fault from cooling Fan-3. This condition is caused when Fan is not running at the required speed for cooling the unit.	**a)** Check if the fan is running. **b)** Clear the fault or try restarting the power supply.
0x00010000	Calibration Fault	Calibration data is not within the required range. **Reasons:** Calibration data is corrupted or EEPROM is not working, or calibration data is invalid.	Restart the unit and do the calibration by following the procedure as mentioned in Chapter 13.
0x00020000	Remote Sense Fault	Remote voltage sense fault occurs if; **a)** The remote sense voltage is out of range from power supply voltage specification. **b)** There is a difference between the sensed voltage at the output terminal	**a)** Check if the cable connected to remote voltage sense connector at rear side of the power supply is intact and polarity is correct. **b)** Check the output cable line voltage drop and make sure line voltage

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		and the sensed voltage of the remote sense terminal.	drop across cable is not exceeding limit specified in datasheet.
0x00040000	Module Output Mismatch Fault	Module output currents or voltages are not equal. This fault is triggered when there is a mismatch in the current sharing between the modules in 600 V chassis or a mismatch in module voltages in 1500/2000 V chassis. The modules are expected to share the output current/voltage equally. However, during large output transients or during a hardware fault, the current/voltage sharing may not be equal resulting in module output mismatch fault. This fault protects the individual module from current/voltage overload.	Try restarting the power supply.
0x00080000	OPP_FAULT	Output power of the unit has exceeded the Overpower protection (OPP) limit. OPP is an instantaneous trip and is not a programmable feature. The OPP trip limit is kept higher than the model power limit. The OPP trip limit ensures that unit power will never exceed the unit's power rating, even during output transient conditions, thus protecting the unit and the connected UUT from overpower failure.	Ensure that the unit is operated within the model power limit.
0x00100000	VSNS_OUTP_SYNC_FAULT	Not able to synchronize Mi-BEAM output voltage with isolation relay output voltage. This fault is checked only when Isolation relay feature of the unit is enabled. The fault occurs when the unit is not able to produce an output voltage equal to the load side voltage of isolation relay when the unit output is turned ON. This would happen if the load side voltage is either	**a)** Check if voltage applied at the load side of isolation relay is negative or more than the model voltage limit. **b)** Clear the fault or try restarting the power supply.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		negative or is set more than the model voltage limit.	
0x00200000	Module Firmware Mismatch Fault	Firmware versions of the Module Controllers are not matching	**a)** Check if all the primary module controller firmware versions are the same. **b)** Check if all the Secondary module controller firmware versions are same. **c)** Try restarting the power supply if fault persists Contact factory.
0x00400000	CHASSIS_MOD_ENUMERATION_FAULT	Module present signal not matching with Number of modules	Try restarting the power supply if fault persists Contact factory.
0x00800000	CHASSIS STARTUP SEQ FAULT	Startup sequence of power modules is not completed within stipulated time. This would happen under the following conditions: **a)** If the AC input line voltage is not sufficient for charging the DC bus **b)** There is a hardware fault	**a)** Check if input voltage to the supply is within specified range in datasheet; Allowed input voltage range: Low line: 180-264 V, High line: 342-528 V **b)** Try restarting the power supply if fault persists Contact factory
0x01000000	Parallel Cable Fault	This fault occurs if: **a)** Chassis Parallel cables PARALLEL IN/ PARALLEL OUT cables are disconnected. **b)** Enumeration does not complete within the specified time during bootup.	**a)** Reset the PARALLEL IN/ PARALLEL OUT cables as required and power cycle the units of parallel chassis configuration. **b)** Check if there is any damage in the parallel cable
0x02000000	Paralleled System Incompatible	Voltage and Power Model limits are different in paralleled units. Parallel operation is allowed only for units with the same voltage rating, power rating and firmware versions only.	Check the Unit model details of all the paralleled system and make sure all units are of same Voltage model, Power model and all units are in same AC input line setting (Low/High).
0x04000000	Parallel System Fault	Fault occurred in any one of the parallel systems including leader	**a)** Get the chassis address of the parallel units having fault using SCPI command.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
			b) Query command 'SYSTEM<LEADER CHASSIS ADDRESS>:FAULT:CHASSIS?' will give you which Parallel chassis has detected fault. **c)** Query 'SYSTEM<Chassis Address>:FAULT:STATUS?' for individual unit faults **d)** Power cycle all the units of Parallel chassis configuration
0x08000000	Parallel chassis current sharing fault	Any of the unit's current is out of 10% margin from the current reference value given by the LEADER unit.	**a)** Power cycle all the units of Parallel chassis configuration. **b)** Check if there is damage in the parallel cable. **c)** Recalibrate the units (measurement calibration)
0x10000000	RESERVED	RESERVED	RESERVED
0x20000000	RESERVED	RESERVED	RESERVED
0x40000000	RESERVED	RESERVED	RESERVED
0x80000000	RESERVED	RESERVED	RESERVED

Table 14-2. System Fault Messages

14.2.1 OUTPUT REGULATION FAULTS

The table below displays a list of possible Output Regulation Faults along with their possible cause and remedy. Refer to the Mi-Beam Programming Manual for more details. Refer to the AMETEK Programmable Power website, www.programmablepower.com, to download latest version.

NUMBER	DESCRIPTION	APPLICABLE REGULATION MODES	EXPLANATION	ACTION TO BE TAKEN
0x01	Voltage High Limit	CC, CC/CP, CP/CC, CR/CC	The operating voltage has reached the 'Voltage High Limit'	Clear the fault and make sure the output voltage does not reach

NUMBER	DESCRIPTION	APPLICABLE REGULATION MODES	EXPLANATION	ACTION TO BE TAKEN
				the set 'VOLT_HIGH' limit.
0x02	Voltage low Limit	CC, CC/CP, CP/CC, CR/CC	The operating voltage has reached the 'Voltage Low Limit'	Clear the fault and make sure the output voltage does not reach the set 'VOLT_LOW' limit.
0x04	Current pos Limit	CV, CV-Ser. Res, CV/CP	The operating voltage has reached the 'Positive Current Limit'	Clear the fault and make sure the output current does not reach the set 'POS_CURR' limit.
0x08	Current Neg Limit	CV, CV-Ser. Res, CV/CP	The operating voltage has reached the 'Negative Current Limit'	Clear the fault and make sure the output current does not reach the set 'NEG_CURR' limit.
0x10	Power pos Limit	CV, CV-Ser. Res, CV/CC, CC, CR/CC	The operating voltage has reached the 'Positive Power Limit'	Clear the fault and make sure the output current does not reach the set 'POS_POW' limit.
0x20	Power Neg Limit	CV, CV-Ser. Res, CV/CC, CC, CR/CC	The operating voltage has reached the 'Negative Power Limit'	Clear the fault and make sure the output current does not reach the set 'NEG_POW' limit.
0x40	RESERVED		RESERVED	
0x80	RESERVED		RESERVED	

Table 14-3. Output Regulation Faults

14.2.2 MODULE FAULTS

The table below displays a list of possible Module Faults along with their possible cause and remedy. Refer to the Mi-Beam Programming Manual for more details. Refer to the AMETEK Programmable Power website, www.programmablepower.com, to download latest version.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
0x00000001	PFC fault	Fault in PFC side of the module. Along with this fault bit, any one of the bits corresponding to PFC side faults will also be high.	**a)** Check which fault is present along with PFC fault. Go to description of the corresponding fault bit and take the corresponding actions. **b)** Try restarting the unit and run the same test condition again.
0x00000002	DAB fault	Fault in isolated DC-DC converter side of the module. Along with this fault bit, any one of the bits corresponding to DAB faults will also be high.	**a)** Check which fault is present along with DAB fault. Go to description of the corresponding fault bit and take the corresponding actions. **b)** Try restarting the unit and run the same test condition again.
0x00000004	Buck fault	Fault in Buck converter side of the module. Along with this fault bit, any one of the bits corresponding to DAB faults will also be high.	**a)** Check which fault is present along with Buck fault. Go to description of the corresponding fault bit and take the corresponding actions. **b)** Try restarting the unit and run the same test condition again.
0x00000008	AC_LINE_INSTANTANEOUS_OVR_VOLT_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the instantaneous input AC voltage is more than the peak voltage corresponding to specified	**a)** Check the selected voltage range in PONS (HIGH_LINE or LOW_LINE). **b)** Check if the voltage applied at the AC input terminals is within the specified range.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		voltage ranges (High Line or Low Line).	**c)** Check if there is any possibility for AC voltage to increase during the operation. **d)** Try restarting the unit.
0x00000010	AC_LINE_UNDR_VOLT_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the RMS value of the input AC voltage is less than the specified range limit.	**a)** Check the selected voltage range in PONS (HIGH_LINE or LOW_LINE). **b)** Check if the voltage applied at the AC input terminals is within the specified range. **c)** Check if there is any possibility for AC voltage to decrease during the operation. **d)** Try restarting the unit.
0x00000020	AC_LINE_OVR_VOLT_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the RMS value of the input AC voltage is higher than the specified range limit.	**a)** Check the selected voltage range in PONS (HIGH_LINE or LOW_LINE). **b)** Check if the voltage applied at the AC input terminals is within the specified range. **c)** Check if there is any possibility for AC voltage to decrease during the operation. **d)** Try restarting the unit.
0x00000040	AC_INPUT_FREQ_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the frequency of the input AC	**a)** Check if the frequency of the voltage applied at the AC input terminals is within the specified range.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		voltage is out of range (47 to 53 and 57 to 63)	**b)** Check if there is any possibility for the frequency to deviate during the operation. **c)** Try restarting the unit.
0x00000080	PHASE_MISSING_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if any one phase of the AC input is not connected/present	**a)** Check the connections of all three phases at the AC input terminals. **b)** Check if the voltages between each phase are as per expected. **c)** Try restarting the unit.
0x00000100	PFC_OVR_CURR_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the AC current of the corresponding module is more than the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00000200	PFC_DC_BUS_UNDR_VOLT_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the PFC DC bus voltage falls below the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00000400	PFC_DC_BUS_OVR_VOLT_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the PFC DC bus voltage rises above the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00000800	DAB_DC_BUS_UNDRVOLT_FAULT	This fault comes along with 'DAB Fault'. This fault bit is set high if the DAB DC bus voltage falls below the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
0x00001000	DAB_DC_BUS_OVRVOLT_FAULT	This fault comes along with 'DAB Fault'. This fault bit is set high if the DAB DC bus voltage rises above the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00002000	DAB_OVR_CURR_FAULT	This fault comes along with 'DAB Fault'. This fault bit is set high if the DAB current (primary or secondary) is more than the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00004000	BUCK_OVR_CURR_FAULT	This fault comes along with 'Buck Fault'. This fault bit is set high if the current through any of the buck leg is more than the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00008000	BUCK_OVR_VOLT_FAULT	This fault comes along with 'Buck Fault'. This fault bit is set high if the output voltage of the corresponding module is more than the limit	**a)** Check if the operating conditions (at the output) are within the limit. **b)** Try restarting the unit.
0x00010000	MODULE_STARTUP_SEQ_FAULT	This fault comes if either the PFC or DAB DC bus voltage is not able to build up to the required value	**a)** Check if the input voltage applied is within the specified range. **b)** Try restarting the unit.
0x00020000	MODULE_AUX_FAULT	This fault comes if the required bias voltage at either the primary or secondary controller is not present	**a)** Check if the input voltage applied is within the specified range. **b)** Try restarting the unit.
0x00040000	AC_LINE_INSTANTANEOUS_UNDER_VOLT_FAULT	This fault comes along with 'PFC Fault'. This fault bit is set high if the instantaneous input AC	**a)** Check if there is any possibility for AC voltage to increase during the operation. **b)** Try restarting the unit.

NUMBER	DESCRIPTION	EXPLANATION	ACTION TO BE TAKEN
		voltage is less than the peak voltage corresponding to specified voltage ranges (High Line or Low Line)	
0x00080000	BUCK_CURR_SHARING_FAULT	This fault comes along with 'Buck Fault'. This fault bit is set high if there is mismatch in the currents flowing through buck legs	**a)** Try restarting the unit.
0x00100000	RESERVED		
0x00200000	RESERVED		
0x00400000	RESERVED		
0x00800000	RESERVED		
0x01000000	MODULE_ENUMERATION_FAULT	This fault bit is set high if the enumeration of the modules is not correct inside the chassis	**a)** Try restarting the unit.
0x02000000	RESERVED		
0x04000000	RESERVED		
0x08000000	RESERVED		
0x10000000	RESERVED		
0x20000000	RESERVED		
0x40000000	RESERVED		
0x80000000	RESERVED		

Table 14-4. Module Faults

14.2.3 TEMPERATURE FAULTS DETAILS

The table below displays a list of possible Temperature Faults Details along with their possible cause and remedy. Refer to the Mi-Beam Programming Manual for more details. Refer to the AMETEK Programmable Power website, www.programmablepower.com, to download latest version.

NUMBER	DESCRIPTION	EXPLANATION	ACTIONS TO BE TAKEN
0x00000001	PFC side heatsink over temperature fault	PFC side heatsink over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000002	DAB primary side heatsink over temperature fault	DAB primary side heatsink over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000004	DAB transformer winding over temperature fault	DAB transformer winding over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000008	DAB transformer core over temperature fault	DAB transformer core over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000010	DAB leakage inductor winding over temperature fault	DAB leakage inductor winding over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000020	DAB leakage inductor core over temperature fault	DAB leakage inductor core over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.

NUMBER	DESCRIPTION	EXPLANATION	ACTIONS TO BE TAKEN
0x00000040	RESERVED	RESERVED	
0x00000080	RESERVED	RESERVED	
0x00000100	DAB secondary side heatsink over temperature fault	DAB secondary side heatsink over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000200	BUCK side heatsink over temperature fault	Buck side heatsink over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000400	Buck inductor-1 winding over temperature fault	Buck inductor-1 winding over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00000800	Buck inductor-2 winding over temperature fault	Buck inductor-2 winding over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00001000	Buck inductor-3 winding over temperature fault	Buck inductor-3 winding over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits. **b)** Try restarting the unit.
0x00002000	Buck inductor-4 winding over temperature fault	Buck inductor-4 winding over temperature fault	**a)** Make sure the ambient temperature and operating conditions are within the specified limits.

NUMBER	DESCRIPTION	EXPLANATION	ACTIONS TO BE TAKEN
			b) Try restarting the unit.
0x00004000	RESERVED	RESERVED	
0x00008000	RESERVED	RESERVED	

Table 14-5. Temperature Faults

15 MAINTENANCE

This chapter contains preventive maintenance information for the MI-BEAM Series power supplies.

15.1 PREVENTIVE MAINTENANCE

WARNING!

All maintenance requiring removal of the unit cover should only be performed 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 wiring connections to the chassis must be accomplished at least 5 minutes after AC input power has been removed using an external disconnect switch. Do not touch any circuits or terminals that are energized.

WARNING!

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

WARNING!

Before handling the DC output connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live DC output can result in fatal electric shock and may cause death.

WARNING!

Before handling the remote sense connector, always verify that it is fully discharged using a properly rated multimeter or voltage tester, as direct contact with a live remote sense connector can result in fatal electric shock and may cause death.

CAUTION!

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 may result in internal damage. Ensure the rear and sides of the unit are free of obstructions to maintain proper ventilation.

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

a) Once a unit is removed from service, vacuum all air vents, including the front panel grill.

b) 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.

c) Check external connections for integrity of insulation, loose contacts, and proper torque.

d) If there is any evidence of short-circuits or arcing, overheating, or corrosion, contact the factory for recommended service.

15.2 FUSES

There are no user-replaceable components in the power supply. Internal fuses are listed in Table 15-1. Fuses are sized for fault isolation, and 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 those of the same type and rating.

ASSEMBLY	REFERENCE	RATING	MANUFACTURER	PART NO.
Bias PWA	F1, F2, F3	6.3A, 500V	LITTELFUSE	051406.3MXP
AC Input PWA	F1, F2, F3	30A, 500V	LITTELFUSE	0505030.MXP

Table 15-1. Fuse Ratings

ACRONYMS

This section provides a list of acronyms used throughout the manual, along with their full forms and descriptions. These acronyms are essential for understanding the terminology related to the Mi-Beam series.

Acronym	Full Form	Description
A	Ampere	A unit of electric current in the International System of Units
V	Voltage	The electric potential difference between two points.
AC	Alternating Current	Electric current that periodically reverses direction.
DC	Direct Current	Electric current that flows in one direction.
CC	Constant Current	A power supply mode where the current remains constant regardless of voltage changes.
CP	Constant Power	A power supply mode where the power remains constant regardless of voltage or current changes.
CR	Constant Resistance	A mode where the resistance remains constant regardless of voltage or current changes
CV	Constant Voltage	A power supply mode where the voltage remains constant regardless of current changes.
ft	Foot	A unit of length in the British imperial and United States customary systems of measurement.
Hz	Hertz	The unit of frequency, equal to one cycle per second.
mA	Milliampere	A unit of electric current equal to one thousandth of an ampere.
mm	Millimeter	A unit of length in the metric system equal to one thousandth of a meter.
ms	Millisecond	A unit of time equal to one thousandth of a second.
PV	Photovoltaic	Related to the conversion of light into electricity using semiconducting materials.
dBA	A-weighted Decibels	A unit of sound level adjusted to reflect the ear's sensitivity to different frequencies.
EMF	Electromotive Force	The energy provided by a source, such as a battery or generator, to move electric charge through a circuit.
LCD	Liquid Crystal Display	A flat panel display technology commonly used in TVs, monitors, and smartphones
RMS	Root Mean Square	A statistical measure of the magnitude of a varying quantity.
SoC	State of Charge	The level of charge in a battery relative to its capacity.
TFT	Thin Film Transistor	A type of transistor used in LCD screens for improved image quality.
UUT	Unit Under Test	The device being tested in an automated test setup.
USB	Universal Serial Bus	An industry standard for cables, connectors, and protocols for connection, communication, and power supply between computers and devices.
VAC	Volts Alternating Current	The voltage of an alternating current circuit.
VDC	Volts Direct Current	The voltage of a direct current circuit.
bi-DIR	Bi-directional	Capable of operating in both directions.

Acronym	Full Form	Description
BMS	Battery Management Systems	Systems that manage and monitor battery performance and safety.
CAN	Controller Area Network	A robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other without a host computer.
DSP	Digital Signal Processor	A specialized microprocessor designed for digital signal processing tasks.
EVs	Electric Vehicles	Vehicles powered by electric motors using energy stored in batteries.
Gnd	Ground	A reference point in an electrical circuit from which voltages are measured.
GUI	Graphical User Interface	A user interface that includes graphical elements, such as windows, icons, and buttons.
kHz	Kilohertz	A unit of frequency equal to one thousand hertz.
kΩ	Kilo Ohm	A unit of electrical resistance equal to one thousand ohms.
kW	Kilowatts	A unit of power equal to one thousand watts.
LED	Light-emitting Diodes	Semiconductor devices that emit light when an electric current passes through them.
LXI	LAN Extensions for Instrumentation	A standard for using Ethernet to control and communicate with instrumentation.
MHz	Megahertz	A unit of frequency equal to one million hertz.
MPPT	Maximum Power Point Tracking	A technique used to maximize the power output of photovoltaic systems.
OVP	Output Overvoltage Protection	A feature that protects electronic devices from voltage spikes.
Pk-Pk	Peak-to-peak	The difference between the maximum and minimum values of a waveform.
SCPI	Standard Commands for Programmable Instruments	A standard for controlling programmable test and measurement devices.
ATE	Automatic Test Equipment	Computerized machinery that performs tests on electronic devices to ensure functionality and performance.
EtherCAT	Ethernet for Control Automation Technology	An Ethernet-based fieldbus system for real-time control in automation.

Table 15-1. Acronyms