

# MPS 1.0

## DSIGEMRRSPS

# MRI RAMP/SHIM SUPPLY

DSI is proud to introduce MPS 1.0 (DSIGEMRRSPS) that is produced and designed to work with GE 1.5T LCC, HM, and RD series Magnet for Ramp and SHIM(For active shim only).

## USER MANUAL

### TABLE OF CONTENTS

TABLE OF CONTENTS.....	1
1. GENERAL INFORMATION .....	2
2. POWER SUPPLY SET-UP AND CONNECTIONS.....	8
3. GENERAL SAFETY GUIDELINE.....	10
4. FUNCTIONAL DESCRIPTION .....	11
5. FUNCTIONAL CHECKS .....	13
6. REVISION HISTORY.....	16

## 1- GENERAL INFORMATION

### 1.1 INTRODUCTION

The purpose of this manual is to provide the information needed to ramp GE manufactured LCC, HM, and RD series magnets and shim GE manufactured LCC series magnets using the MPS1.0 (DSIGEMRRSPS) Ramp/Shim supply. The Service Engineer should use this manual in conjunction with the applicable procedure as described by the magnet manufacturer.

The MPS1.0 (DSIGEMRRSPS) Ramp/Shim supply consist of a 2 separate boxes. Box#1 contains main ramp/shim power supply unit consisting of 1000A Lambda power supply, 6 750W lambda power supplies and 1 master control module. Box#2 contains a cable set that consist of one main power cable, two positive 4/0 ramp cables, two negative 4/0 ramp cables, one shim cable, one switch heater cable, one auxiliary switch heater cable and one sense lead cable.



### CAUTION

**Make sure that all safety precautions that are mentioned in the applicable magnet manufacturer's manuals are followed.**

## 1.2 SPECIFICATIONS

### 1.2.1 Input Power

The system is designed to operate from 208  $\pm$ 10% volt, 3 phases 5 wire, 55  $\pm$ 8Hz power source rated at 30 amperes.

### 1.2.2. Output

#### 1.2.2.1 Magnet power supply

PARAMETER	VALUE	UNIT
Rated Output Voltage range	0-10	VDC
Rated Output Current	1000	ADC
Rated Output Power	10.0	kW
Output Ripple, rms (5Hz~1MHz), CV mode; (*1)	20	mV
Output Noise, p-p (20MHz), CV mode; (*1)	60	mV
Temperature Coefficient	$\pm 200 (\pm 0.02\% \text{ of } V_o(\text{rated})) / ^\circ\text{C}$	ppm / $^\circ\text{C}$
Temperature Stability	$\pm 0.05\% \text{ of } V_o(\text{rated})$ over 8 hours after 30 minute warm up (constant Line, Load & Temperature)	---

\*\*\* For more information, refer to Genesys™ 3U 10kW Specifications

#### 1.2.2.2 Switch Heater Power supply

PARAMETER	VALUE	UNIT
Rated Output Voltage range	0.1-1.0	ADC
Compliance	30	Volts DC
Current regulation (10% line up)	3	% of full scale
Current regulation (100% load step)	3	% of full scale
Current ripple	10	mA RMS
Voltage ripple	50	mV RMA
Temperature Coefficient	0.1	%/c

## 1.2.2.3 Shim Power supply

PARAMETER	VALUE	UNIT
Rated Output Voltage range	0-30	VDC
Rated Output Current	25	ADC
Rated Output Power	750	W
Ripple and noise p-p 20MHz	60	mV
Ripple r.m.s 5Hz~1MHz	8	mV
Temperature Coefficient	100PPM/°C of rated output voltage following 30 minutes warm up	ppm / °C

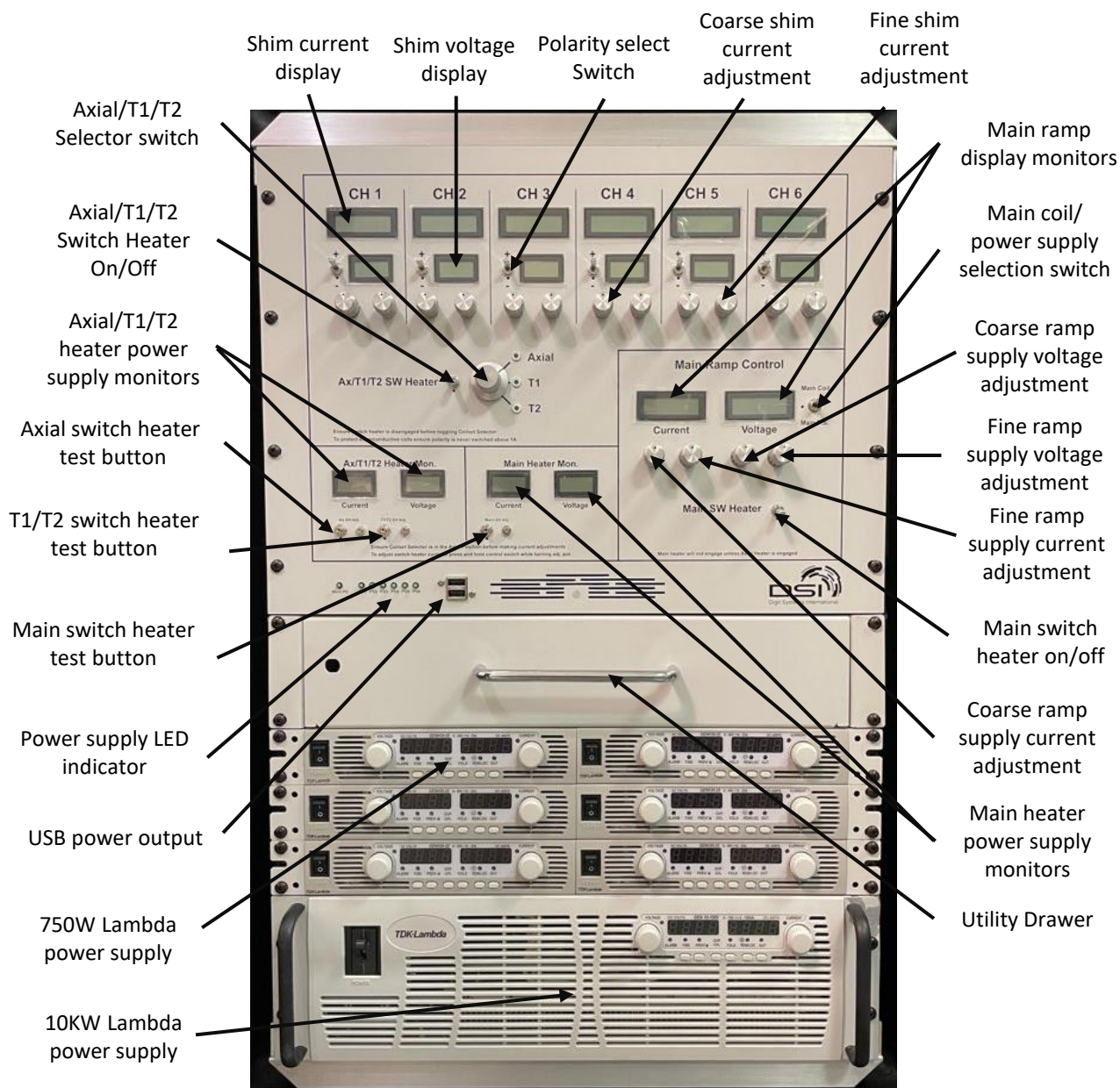
\*\*\* For more information, refer to Genesys™ GENH750W Specifications

## 1.2.3 DIMENSION & WEIGHT

PARAMETER	Length	Width	Height	Weight
Ramp/Shim Supply	36" (w/ cover) 27" (w/o cover)	27"	42" (w/ wheels) 37" (w/o wheels)	341 lbs
Cable Set	33.3"	24.4"	19.3"	257 lbs

## 1.2.4. CONSTRUCTION

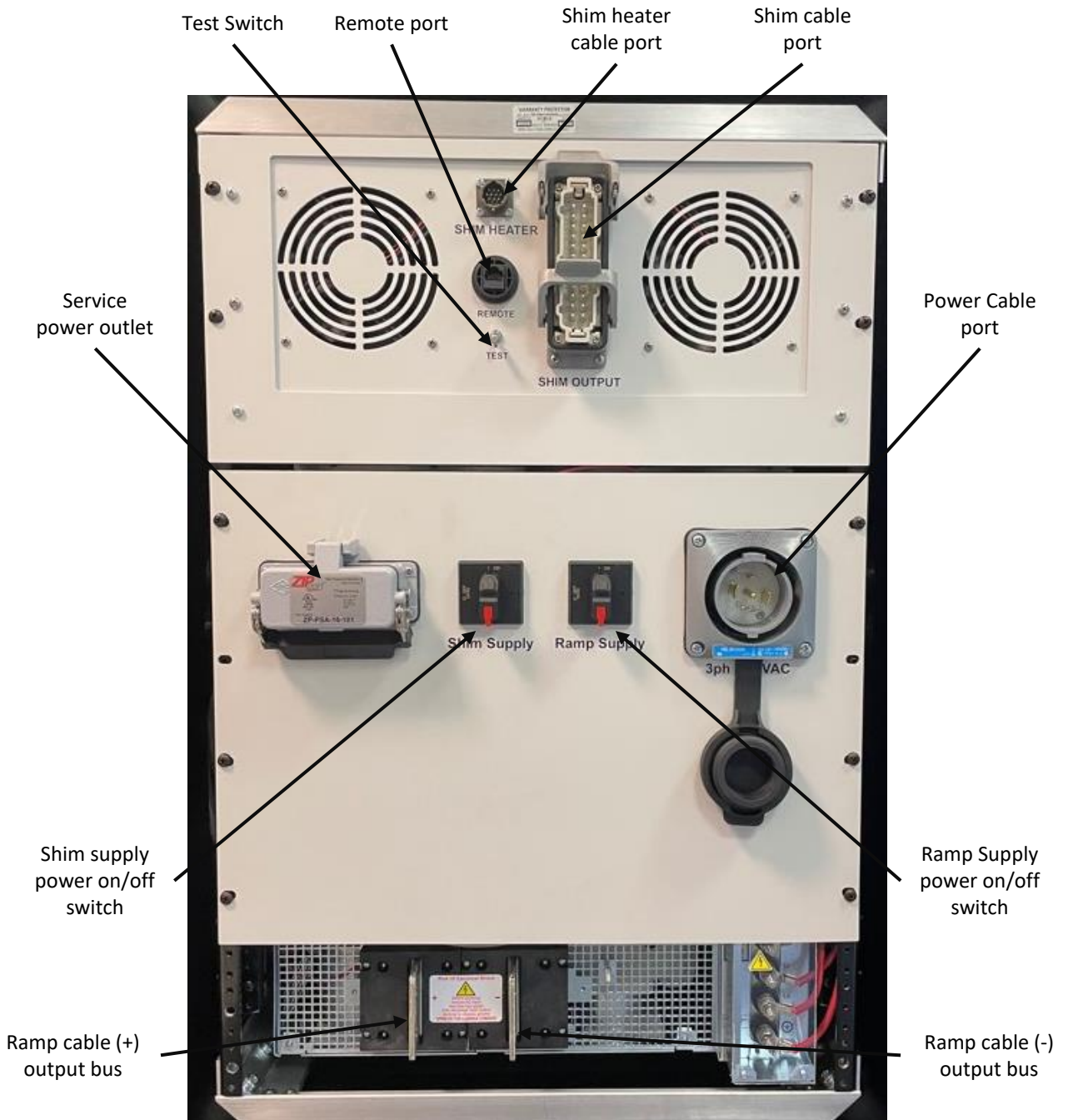
### 1.2.4.1 FRONT CONSTRUCTION



**CAUTION**

**\*\* Lambda power supplies are factory preset with locked front panels and controls. Do not attempt to unlock or tamper with the panel controls.**

## 1.2.4.2 REAR CONSTRUCTION



**CAUTION**

**\*\* Test switch is for factory calibration use only.**

**\*\*Risk of electric shock while connecting and disconnecting Ramp cable (+/-) output bus. Before touching, remove AC Power from the rear panel then discharge each output terminal to the chassis ground.**

## 1.2.5. REQUIREMENTS

### 1.2.5.1 SPACE REQUIREMENTS

The location must allow sufficient room for free air flow around the enclosure. Vents and air inlets must not be obstructed. Air is exhausted at the rear of the Ramp/Shim supply. Hence, at least 6 inches must be allowed behind the Ramp/Shim supply. This is a moveable service unit.

### 1.2.5.2 SUPPORT REQUIREMENT

The unit weighs over 300 lbs. The floor must be designed to support this weight.

### 1.2.5.3 POWER REQUIREMENTS

The unit requires a power supply of 208-volt, 3 phase, 55±8Hz, 5 wire service rated at 30amps.

### 1.2.5.4 GROUND REQUIREMENTS

The national Electrical Code should be followed unless more stringent local codes supersede. Grounding of the enclosure is essential to personal safety. The unit is grounded to the GROUND terminal of the 5 wire, 3 phase power connector. As required by the National Electrical Code and most other codes the corresponding terminal of the service connector must be connected to a suitable earth ground via a green or green with yellow stripe wire. The current carrying capacity of the grounding wire MUST exceed the rating of protective device (fuse or circuit breaker) in the feeder line.

## 2- POWER SUPPLY SET-UP AND CONNECTIONS

### 2.1 PRECONNECTION CHECK

#### 2.1.1 SWITCH AND CONTROL SETTING

Set the various controls as follows:

CONTROL	SETTING
Main PDU Cabinet	Off
Axial/T1/T2 Switch Heater	Off
Ramp Supply power	Off
Shim supply power	Off
Main Switch Heater	Off
Axial/T1/T2 Switch Heater	Off
Test Switch	Off (down position)
Coarse shim current adjustment	Full counterclockwise
Fine shim current adjustment	Full counterclockwise
Coarse ramp supply voltage adjustment	Full counterclockwise
Fine ramp supply voltage adjustment	Full counterclockwise
Coarse ramp supply current adjustment	Full counterclockwise
Fine ramp supply current adjustment	Full counterclockwise
Main coil/ power supply selection switch	Set to power supply

#### 2.1.2 PRELIMINARY CHECK

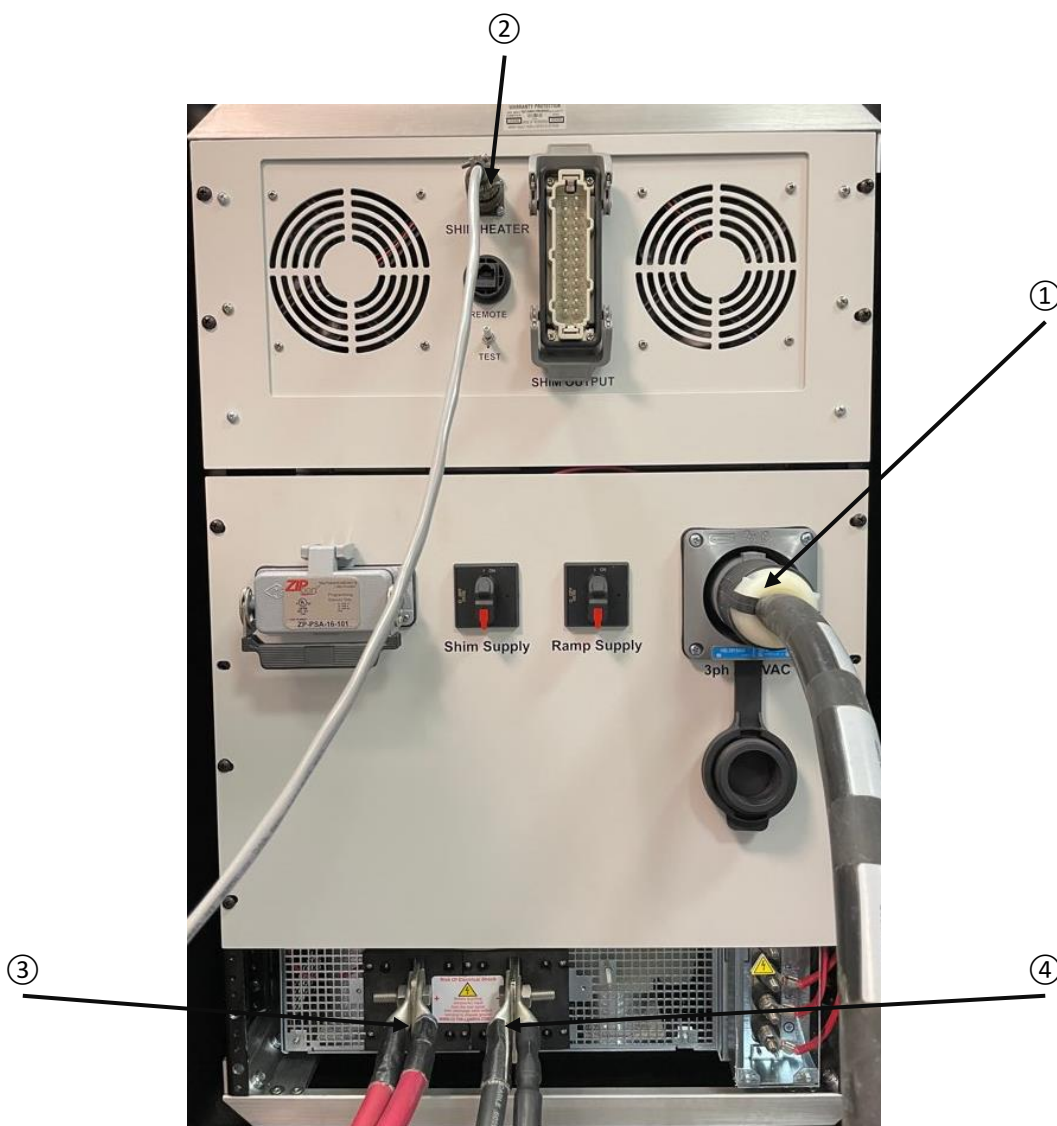
Connect the line power cable connector to the power inlet receptable located on the rear panel (Power cable port). Turn the Ramp Supply power switch and the Shim supply power switch ON. Verify that all the fans are operational, and all Power supply LED indicators glow with green light. Make sure there are no obstructions to either the air inlets or to the vent openings.



## 2.2 SET UP AND CONNECTION

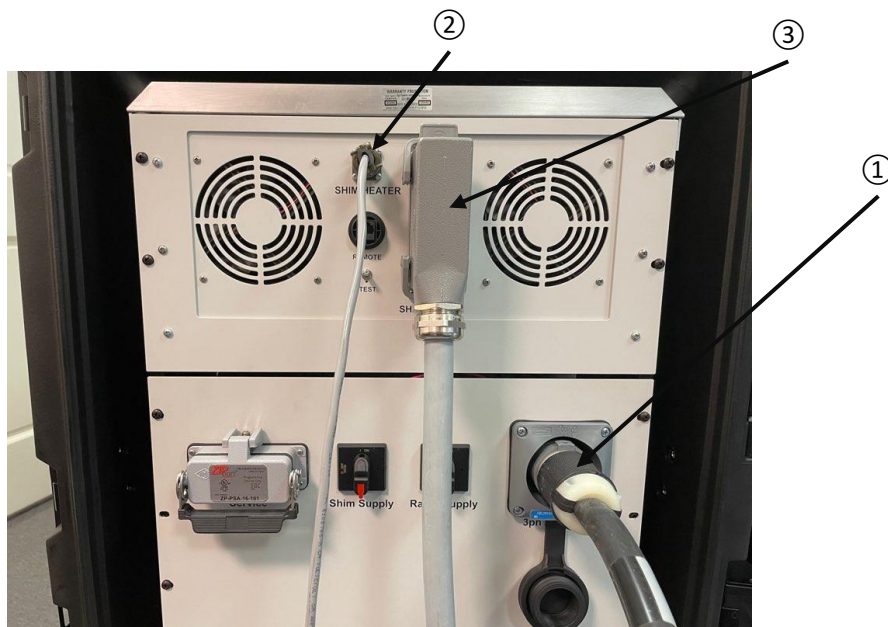
### 2.2.1 SET UP AND CONNECTION FOR RAMPING

1. Connect main power cable from PDU cabinet to power cable port located at the rear side of Ramp/Shim supply.
2. Connect shim heater cable to shim heater cable port.
3. Connect 2 positive 4/0 ramp cables to ramp cable (+) output bus.
4. Connect 2 negative 4/0 ramp cables to ramp cable (-) output bus.



## 2.2.2 SET UP AND CONNECTION FOR SHIMMING

1. Connect main power cable from PDU cabinet to power cable port located at the rear side of Ramp/Shim supply.
2. Connect shim cable to shim cable port.
3. Connect shim heater cable to shim heater cable port.



### CAUTION

**\*\* Do not attempt to ramp up/down the magnet with shim cable connected. Possible risk of quench.**

## 3- GENERAL SAFETY GUIDELINE

Use of this equipment in conjunction with the applied procedures for ramp and shim of super-conductive magnets pose potentially fatal injury risks. This equipment is intended to be used only by trained and authorized personnel. All safety instructions and requirements should be always followed as they are described in the applicable magnet manufacture's manual.

## 4- FUNCTIONAL DESCRIPTION (DISPLAYS AND CONTROLS)

### 4.1 DISPLAYS

DESCRIPTION	FUNCTION
Shim current display	Displays current value of each channel
Shim voltage display	Displays voltage value of each channel
Main ramp display monitor (Voltage)	Displays main ramp voltage
Main ramp display monitor (Current)	Displays main ramp current
Axial/T1/T2 heater power supply monitor(Voltage)	Displays voltage value based selected setting of Axial/T1/T2 selector switch
Axial/T1/T2 heater power supply monitor (Current)	Displays current value based selected setting of Axial/T1/T2 selector switch
Main heater power supply monitor (Voltage)	Displays main heater voltage value
Main heater power supply monitor (Current)	Displays main heater current value
Power supply LED indicator	Indicates power on of main power supply and 6 shim power supplies

### 4.2 CONTROLS

DESCRIPTION	FUNCTION
Polarity select switch	Changes the polarity of voltage on each channel. (+ or -)
Axial/T1/T2 switch heater on/off	Turns on or off the selected option heater (Axial, T1 or T2)
Axial/T1/T2 selector switch	Can be dialed to select the switch to Axial, T1 or T2
Main coil/power supply selection switch	Selects measurement value of main coil or power supply
Main switch heater on/off	Turns on or off the main switch heater
Axial switch heater test button	By pressing the button, displays preset current and voltage of axial switch heater power supply
Axial switch heater power supply output adjustment screw	Adjusts current output of axial switch heater power supply
T1/T2 switch heater test button	By pressing the button, displays preset current and voltage of T1/T2 switch heater power supply
T1/T2 switch heater power supply output adjustment screw	Adjusts current output of T1/T2 switch heater power supply
Main switch heater test button	By pressing the button, displays preset current and voltage of main switch heater power supply
Main switch heater power supply output adjustment screw	Adjusts current output of main switch heater power supply
Test Switch	
Ramp supply On/Off Switch	Turns on and off Ramp supply and main control box
Shim supply On/Off Switch	Turns on and off 6 shim supplies and main control box

**DESCRIPTION****FUNCTION**

Coarse shim current adjustment

Adjust shim current Coarsely

Fine shim current adjustment

Adjust shim current finely

Coarse ramp supply voltage adjustment

Adjust ramp supply voltage Coarsely

Fine ramp supply voltage adjustment

Adjust ramp supply voltage finely

Coarse ramp supply current adjustment

Adjust ramp supply current Coarsely

Fine ramp supply current adjustment

Adjust ramp supply current Finely

## 5- FUNCTIONAL CHECKS

The functional test will check the main power supply, the switch heater supplies, and the 6 shim power supplies. This test is a preliminary test which will check the operational capacity of the MPS1.0 (DSIGEMRRSPS) Ramp/Shim supply .

### 5.1 FUNCTIONAL CHECK FOR RAMPING

#### 5.1.1 PREARATION

1. Before performing the functional checks described in this section, connect the power supply as described in '**2.2.1 SET UP AND CONNECTION FOR RAMPING**'.
2. Connect two positive 4/0 ramp cables with two negative 4/0 ramp cables by using a bolt and a nut which is in the utility drawer.



#### 5.1.2. FUNCTIONAL CHECK

1. Turn on the ramp supply power switch from the rear side of the unit.
2. Check that the main power supply LED indicator light is on.
3. Set the main coil/ power supply selection switch to the Main power supply.
3. Turn the coarse ramp supply voltage adjustment knob full clockwise.
4. Slowly turn the coarse ramp supply current adjustment knob clockwise until 750 amperes are reached.
5. Monitor the main ramp display (Voltage) over a 2-minute period and ensure the voltage remains less than 2.2V.
6. Slowly turn the coarse ramp supply current adjustment knob full counterclockwise over a 2-minute period.
7. Slowly turn the coarse ramp supply voltage adjustment knob full counterclockwise over a 1-minute period.
8. If the voltage is within the specification, turn off the power supply to finalize this functional test procedures.

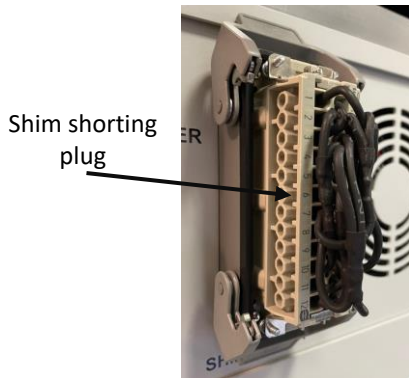
\*\* If you are not within the specification, check the resistant of each individual cable and ensure the connectors are securely fastened.

\*\* Repeat step 4.1.1 and 4.1.2. If voltage is still higher than 2.2V, contact the manufacturer.

## 5.2 FUNCTIONAL CHECK FOR SHIMMING

### 5.2.1 PREARATION

1. Connect the main power cable from the PDU cabinet to the power cable port located at the rear side of the Ramp/Shim supply.
2. Connect the shim shorting plug that is in the utility drawer into the shim cable port



### 5.2.2. FUNCTIONAL CHECK

1. Turn on the shim supply power switch from the rear side of the unit.
2. Check that the 6 Shim power supply LED indicator lights are on.
3. Set the Axial/T1/T2 selector switch to the Axial position.
4. Check the Polarity select switch on each channel to make sure the change of the polarity sign is indicated on the Shim current display when the switch is activated.
5. Slowly turn the coarse shim current adjustment knob clockwise until the shim current displays 2A to verify axial shim current output on each channel.
6. Slowly turn the coarse shim current adjustment knob full counterclockwise.
7. Set Axial/T1/T2 Selector switch to T1 position and repeat the step from 4 to 6.
8. Set Axial/T1/T2 Selector switch to T2 position and repeat the step from 4 to 6.
9. Return Axial/T1/T2 Selector switch to Axial position to finalize the shim current output test procedure.

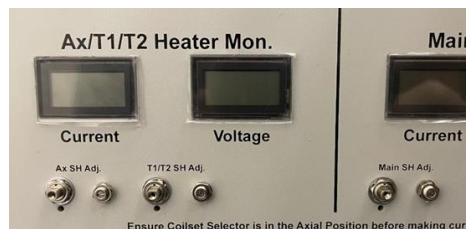
\*\*It is normal for the shim current display to show + or – 0.05A with coarse and fine shim current adjust knob at full counterclockwise.

## 5.3 FUNCTIONAL CHECK FOR THE SWITCH HEATERS

### 5.3.1 PREARATION

1. Connect the main power cable from PDU cabinet to the power cable port located at the rear side of the Ramp/Shim supply.

### 5.3.2. FUNCTIONAL CHECK



1. Turn on both ramp/shim supply power switches on the rear side of the unit
2. Set the Axial/T1/T2 Selector switch to the Axial position
3. Set the Axial/T1/T2 Switch Heater to the on position then set the Main switch heater to the on position to verify the both indicator lights are on.
4. Set the Main switch heater to the off position then set the Axial/T1/T2 Switch Heater to the off position
5. Press Axial switch heater test button and verify that 720mA is displayed on the Axial/T1/T2 heater power supply monitor (Current)  
 \*\*If displayed output is not 720mA, the axial switch heater power supply can be adjusted by holding axial switch heater test button and turning Axial switch heater power supply output adjustment screw clockwise to increase amperes and counterclockwise to decrease.
6. Press the T1/T2 switch heater test button and verify that 620mA is displayed on the Axial/T1/T2 heater power supply monitor (Current)  
 \*\*If displayed output is not 620mA, T1/T2 switch heater power supply can be adjusted by holding T1/T2 switch heater test button and turning T1/T2 switch heater power supply output adjustment screw clockwise to increase amperes and counterclockwise to decrease.
7. Press the Main switch heater test button and verify that 820mA is displayed on the Main heater power supply monitor (Current)  
 \*\*If displayed output is not 820mA, T1/T2 Main heater power supply can be adjusted by holding Main switch heater test button and turning Main switch heater power supply output adjustment screw clockwise to increase amperes and counterclockwise to decrease.

## 6. REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASON FOR CHANGE
01	12/04/2020	MONTE LEONA	PRELIMINARY