THR4

Installation, Operation, and Maintenance Manual

THR4
THR400
August 2009
Version A4

TDK-Lambda

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1 Safety and Recommended Practices

1.1 General practices

For use in restricted access locations only.
Suitable for mounting on concrete or other non-combustible surfaces

This product accepts a nominal AC Voltage between 100 and 240 VAC, 47 to 63 Hz, and produces a regulated output of 10.5-14 VDC capable of delivering a max of 400 Amperes (300 amps continuous) DC for 12V rectifiers, 21-28 VDC capable of delivering a max of 200 Amperes DC for 24V rectifiers, 28-42V
capable of delivering a max of 160 amperes DC for 36V rectifiers, 42-56 VDC capable of delivering a max of 200 Amperes DC for 48V rectifiers, in an ambient operating temperature range of -40°C to +70°C (depending upon deployed rectifiers and shelf).

HAZARDOUS VOLTAGE AND ENERGY LEVELS ARE PRESENT WHICH CAN PRODUCE SERIOUS SHOCKS AND BURNS.

Only authorized, qualified, and trained personnel should attempt to work on this equipment. Refer to datasheets for full product specifications.

Observe all local and national electrical, environmental, and workplace codes.
Each power shelf should be fed from a dedicated AC branch circuit of a Terra Neutral (TN) power system.

If a line cord(s) is (are) used as the AC connection means, the plug end of the cord is considered to be the primary disconnect means, and reasonable access must be given to the plug and receptacle area. The receptacle must be fed with a breaker or fuse according to Table 4.

For hard-wired AC connections, a readily accessible disconnect device shall be incorporated in the building installation wiring. Select a wall breaker and wire sizes according to Table 4.

CAUTION: ALL RECTIFIERS EMPLOY INTERNAL DOUBLE POLE/NEUTRAL FUSING

Use double hole, UL listed lugs for all DC connections to prevent lug rotation and inadvertent contact with other circuits.

Class 1 wire is recommended for all DC connections. Minimum wire sizes are shown in Table 5. In practice, loop voltage drop considerations will usually dictate larger than minimum safe wire size.

Connection and mounting torque requirements are listed in Table 7.

Lambda does not recommend shipping the rack with the power modules installed. Power modules should be shipped in separate boxes.

1.2 FCC Compliance Statement

Note: This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1.2.1 Warning

Changes or modifications to this unit not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment.

2 Product Section

2.1 Power Module Specification

2.1.1 DC Output Voltage

Table 1 shows the DC voltage range and max current for each model of power module for this system.

DC Output Voltage		
Model	Voltage min/max	Max Current
TH120048	42-56	25
TH200048	42-56	40
TH250048	42-56	50
TH200036*	28-42	40
TH120024	21-28	50
TH120012	10.5-14	100

*max power 1440 watts

Table 1

2.1.2 Heat Dissipation

Table 2 displays the max and typical BTU/hr of heat dissipated for each power module. Max is calculated at 180VAC, Max VDC and current values for the power module, and typical is calculated at 240 VAC, typical VDC and current values.

Heat Dissipation		
Model	Typical BTU/hr	Max BTU/hr
TH120048	451	833
TH200048	635	897
TH250048	794	1106
TH200036	423	648
TH120024	564	856
TH120012	735	992

Table 2

2.2 AC Input Requirement

2.2.1 AC Input Voltage

Table 3 shows the required AC input voltages for the available power modules. The power modules under wide line (WL) can be connected to a nominal input voltage between 100 V & 240V. The power modules under high line (HL) can be connected to a nominal input voltage between 200 V & 240V.

Power Module Input Voltages	
Wide Line (100V - 240V)	High Line (200V - 240V)
TH120048	TH200048
TH120024	TH200036
TH75012	TH250048
TH120012	

Table 3

Table 3 - Power Module Input Voltages

2.2.2 AC Input Wire Diagrams

This system utilizes a dual or individual feed AC architecture (Figure 1 & Figure 2).

2.2.2.1 Dual feed

A system with a dual feed AC architecture feeds power module slots 0 & 1 with feed 1, and power module slots 2 & 3 with feed 2. The AC connections on the shelf are made via rear accessed compression style terminal blocks see Figure 6. These terminal blocks will accept up to a maximum of a 10 AWG wire, and should be torqued to 6 in-lbs. Keep this wire size limitation in mind when sizing the quantity and size of the power modules. Size your AC breaker and wiring according to Table 4.

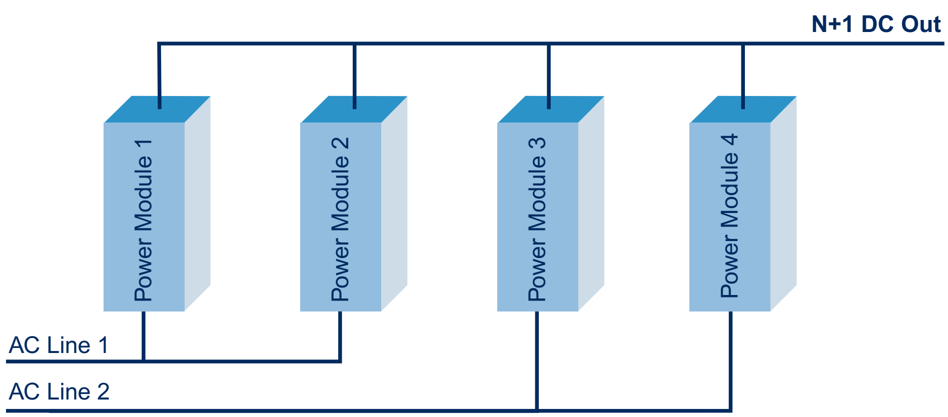

Figure 1 - Dual Feed AC wiring architecture

2.2.2.2 Individual feed

A system with an individual feed AC architecture feeds each power module slot with an AC feed. There are two different styles of individual feeds for this system.

The first style of connection is made via rear accessed compression style terminal blocks see Figure 6. These terminal blocks will accept up to a maximum of a 10 AWG wire, and should be torqued to 6 in-lbs.

The second style is made via rear accessed IEC320 receptacles, see Figure 8. The connections should be sized with an AC service no larger than 15 amps. Keep this limitation in mind when sizing the power modules. Securing brackets are available to hold the IEC320 AC cords to the shelf, see Figure 9 for more information. Size your AC breaker and wiring according to Table 4.

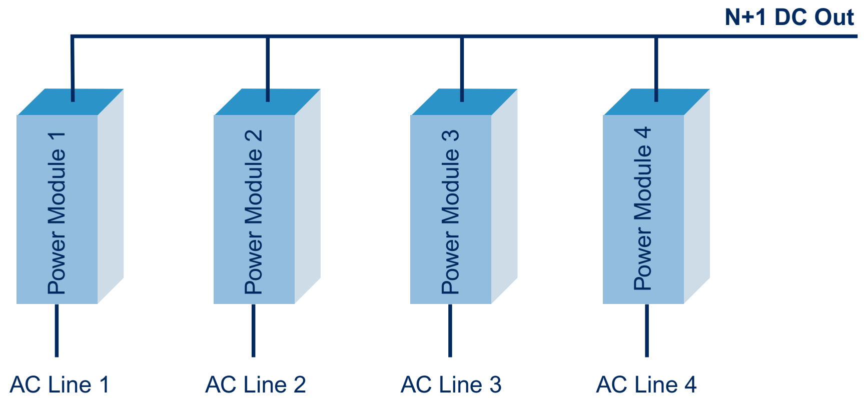

Figure 2 - Individual feed AC wiring architecture

2.2.3 AC current and cable sizing

To size your AC feeds properly, use the example below. Failure to size the AC breaker and wiring properly can result in nuisance breaker trips or even fire. If you anticipate future growth, size the AC breaker and wiring for the expected future capacity.

Use section 2.2.2 to determine your AC input architecture, for example a dual feed.

Determine the quantity and model number of the power modules that will be used, for example two TH120048 (48V, 25A).

Determine the sites AC input nominal AC voltage and compare it to Table 3 for power module compatibility, for example, the TH120048 power module will accept either low line or high line AC voltage.

For this example we will assume that future growth is necessary so we will size the AC feed for four power modules. Using Table 4, each AC feed, to the pair of TH120048, power modules will require will require a 20 amp breaker with 12 AWG wire, at high line, per feed.

NOTE: Under-sizing your AC breaker and wiring could cause nuisance breaker trips and system outages. **ALWAYS FOLLOW NEC RULES AND YOUR LOCAL COMPANY PRACTICES WHEN SELECTING DC WIRING AND PROTECTION.**

The Table 4 below uses a minimum nominal input voltage to determine AC current requirements. 90 V corresponds to a nominal low line voltage of 100VAC and 180 V corresponds to a nominal highline voltage of 200VAC.

Recommended AC Circuit Breaker & Wire Sizes

Type of Feed	Number of Power Modules on AC Feed	Model # of Power Module	Minimum Input Voltage	Maximum *rated* AC Current (Amps)	Circuit Breaker Minimum Value to use (Amps)	90°C Minimum Wire Gauge to use at 30°C ambient (AWG)
Individual Feed	**1**	TH120048	90	17.6	20	12
		TH120048	180	8.8	15	14
		TH200048	180	13.8	15	14
		TH250048	180	16.9	20	12
		TH200036	180	9	15	14
		TH120024	90	17.4	20	12
		TH120024	180	8.7	15	14
		TH120012*	90	15	15	12
		TH120012	180	8.9	15	14
Dual Feed	**2**	TH120048	90	35.2	N/A	N/A
		TH120048	180	17.6	20	12
		TH200048	180	27.6	30	10
		TH250048	180	33.8	N/A	N/A
		TH200036	180	9	20	12
		TH120024	180	17.4	20	12
		TH120012*	90	30	30	10
		TH120012	180	17.8	20	12

*1200W

Table 4

2.3 DC Output Wire Requirements

2.3.1 Circuit Drawings

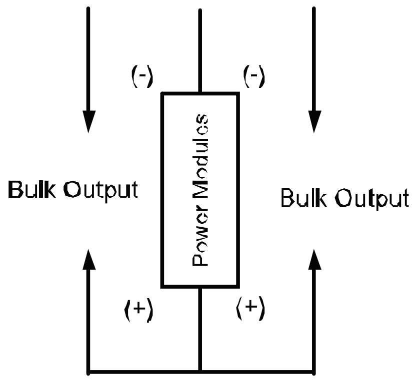

Figure 3 - DC Wire Diagram

Each system is equipped with 2 unprotected bulk output connections; one set located on each side of the rear of the shelf. The THR4 rack will only accept lugs and THR400 will accept lugs or bus bars. Unprotected bulk connections are double, ¼"-20 (M6) studs with 5/8" centers. The maximum tongue width for bulk connections is 0.67". Select a wire or bus bar size for the bulk outputs according to the current rating as shown in Table 5. Choose lugs according to section Table 6. The polarity of the system is universal; therefore the polarity of the output is determined by the system grounding. See section 2.3.2 for more detail. The THR4 is capable of delivering a max of 200 amps total, 100 amps per side. The THR400 is capable of delivering a max of 400 amps total (300 amps continuous), 200 amps per side.

2.3.2 DC Reference Ground

The Lambda Power system is a fully floating system. This means that neither the positive nor the negative are tied to the chassis or an earth ground. An external reference or earth ground may be connected to either the positive output or the negative output depending the desired output polarity. As always follow your company's guidelines for sizing and attaching a reference ground.

2.3.3 DC Wire Sizing

There are two main considerations for sizing DC wire, ampacity and voltage drop. Ampacity refers to a safe current carrying level as specified by non-profit organizations such as Underwriters Laboratories and the National Fire Prevention Association, which publishes the National Electric Code. Voltage drop is simply the amount of voltage loss in a length of wire due to ohmic resistance of the conductor. DC wire may be sized for either ampacity or voltage drop depending on branch load loop length and conductor heating. In general, ampacity considerations will drive wire selection for short loop lengths (less than 50 feet) and voltage drop will drive wire selection for long loop lengths (greater than 50 feet).

The National Electric Code table 310.16 provides ampacity values for various sizes, bundles, and insulation temperature rated wire. **ALWAYS FOLLOW NEC RULES AND YOUR LOCAL COMPANY PRACTICES WHEN SELECTING DC WIRING AND PROTECTION.** Table 5 shows recommended wire sizes.

Unprotected DC output wires shall be based on the total power module capacity of the rack. For example, using Table 5 below, a system with two V1000A (48V, 20A) rectifiers for a total capacity of 40 A requires one 10 AWG set of cables.

Min. Recommended DC AWG for 90°C Cabling	
Total Power Module Current Rating (A)	Wire & Lug Gauge (AWG) using 90°C wire (NEC Table 310.16)
10	16 AWG*
20	14 AWG
30	12 AWG
40	10 AWG
50	8 AWG
75	6 AWG
100	2 AWG
125	2 AWG
150	(1)1 AWG or (2) 6 AWG
175	(1)2/0 AWG or (2) 4 AWG
200	(1)3/0 AWG or (2) 2 AWG

Table 5

* For wire sizes less than 15 A not covered in NEC Table 310.16 use Table 3B - Sizes of Conductors, UL60950, "Safety of Information Technology Equipment", Dec., 2000 for non-building wiring.

2.3.4 DC lug requirements

Table 5 below is a list of lug part numbers from Burndy that can be used for DC connections. Wire type should be considered when determining the type of lug to use. These part numbers are based on flex style cable. Follow your company practices when determining the exact lug required. Systems requiring more than a 2 AWG (max 125 A) connection will need custom bus bars. Note: ¼" holes will work on M6 studs.

Lug Part Number for DC Output				
Total Power Supply Capacity	Wire AWG	Burndy Lug Part #	Amp Ring Terminal Part #	Desciption
10 AMPS	16 AWG		321045	SH Ring Terminal 1/4 Stud
15 AMPS	14 AWG		321045	SH Ring Terminal 1/4 Stud
20 AMPS	12 AWG		323763	SH Ring Terminal 1/4 Stud
30 AMPS	10 AWG		323763	SH Ring Terminal 1/4 Stud
30 AMPS	10 AWG	YAV102TC14		DH Lug Standard Barrel 1/4 Stud, 5/8 Center
50 AMPS	8 AWG	YA8CL2TC14		DH Lug Standard Barrel 1/4 Stud, 5/8 Center
75 AMPS	6 AWG	YAV6C-L2TC14-FX		DH Lug Standard Barrel 1/4 Stud, 5/8 Center
100 AMPS	2 AWG	YAV2C-L2TC14-FX		DH Lug Standard Barrel 1/4 Stud, 5/8 Center
125 AMPS	2 AWG	YAV2C-L2TC14-FX		DH Lug Standard Barrel 1/4 Stud, 5/8 Center

Table 6

2.4 Torque Settings

Table 7 shows recommended torque settings for all mechanical and electrical connections according to screw or nut size.

Recommended Torque Settings	
Screw or Nut Size	Torque (in-lbs)
4-40	6
6-32	12
8-32	22
10-32	37
12-24	50
¼-20/M6	65

Table 7 - Recommended Torque Settings

3 Required Tools

Lambda power modules are designed to be installed with a minimum number of commonly available tools:

- #1 & #2 Phillips screwdrivers
- Torque wrench
- 5/16" and 7/16" box wrenches, sockets, and/or nut drivers
- Wire and cable strippers
- Wire and cable crimpers

4 Site and Equipment Preparation

After removing equipment from boxes and packing material, inspect for shipping and/or other damage. Contact sales or technical support immediately if any damage is present. Have all tools, wire, cables, hardware, etc., within easy reach. To the extent possible, ensure a clean (free of debris, dust, foreign material, etc.) work environment. Care should be taken in the installation process to prevent exposure of the equipment to wire clippings. If possible, the power modules should remain sealed in their shipping boxes until the shelf wiring is complete. Ensure all AC and DC power sources are off and disconnected.

5 Power Plant Mounting and Wiring

5.1 Mechanical Mounting

This equipment is intended for normal operations and is to be installed in a standard 19" enclosure. It is recommended that one person lift the shelf into place while another installs using the supplied mounting hardware. Torque mounting hardware according to Table 7.

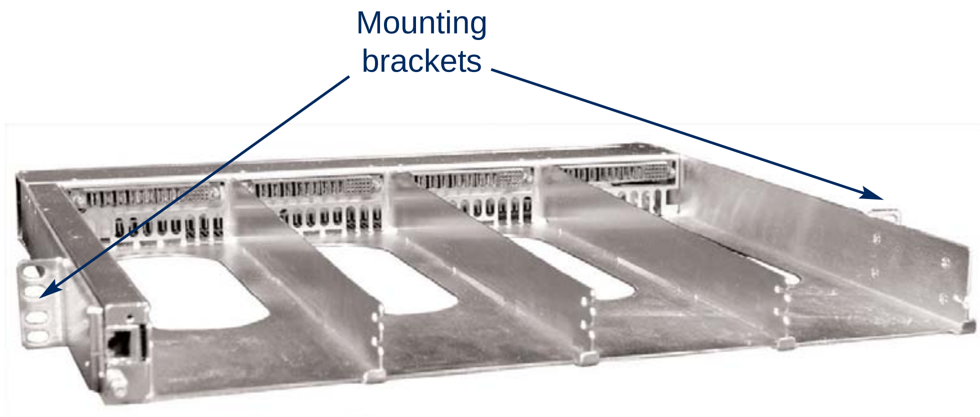

Figure 4 - Mounting brackets

5.2 AC input

5.2.1 Dual feed with terminal blocks

Remove safety cover over the terminal block shown in Figure 5. Feed AC wires through hole on terminal block cover and connect wires from AC cord into appropriate positions labeled in Figure 6. Connect your first line/hot to L1, your second line or neutral to L2/N, and finally your AC ground to GRD. Tighten screws to 6 in-lbs, tie AC cord to safety cover, and replace terminal block safety cover.

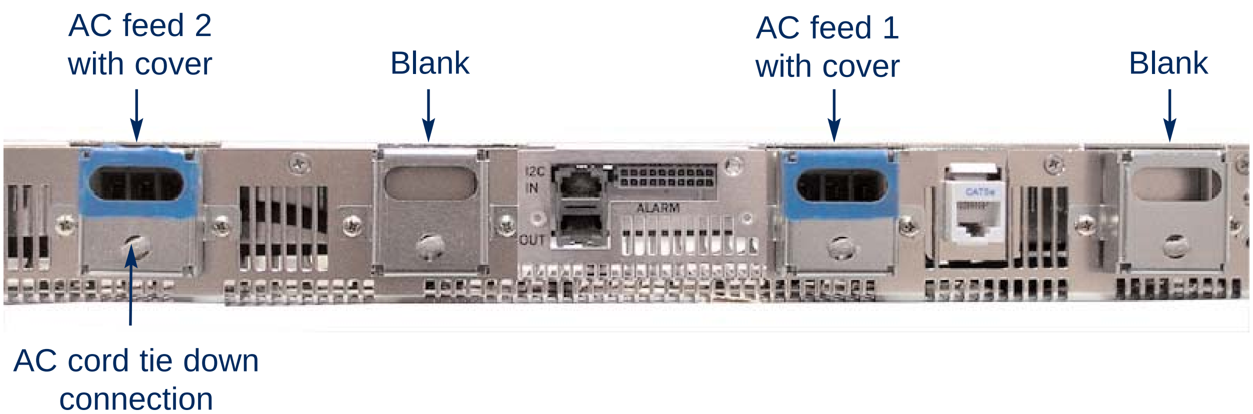

Figure 5 - Dual Feeds (with covers) (THR400)

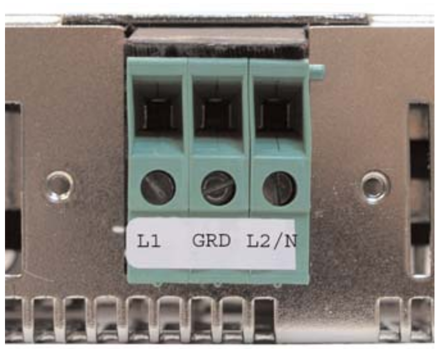

Figure 6 - AC terminal block with cover removed

5.2.2 Individual feed with terminal blocks

Remove safety cover over the terminal block shown in Figure 6. Feed AC wires through hole on terminal block cover and connect wires from AC cord into appropriate positions labeled in Figure 6. Connect your first line/hot to L1, your second line or neutral to L2/N, and finally your AC ground to GRD. Tighten screws to 6 in-lbs, tie AC cord to safety cover, and replace terminal block safety cover.

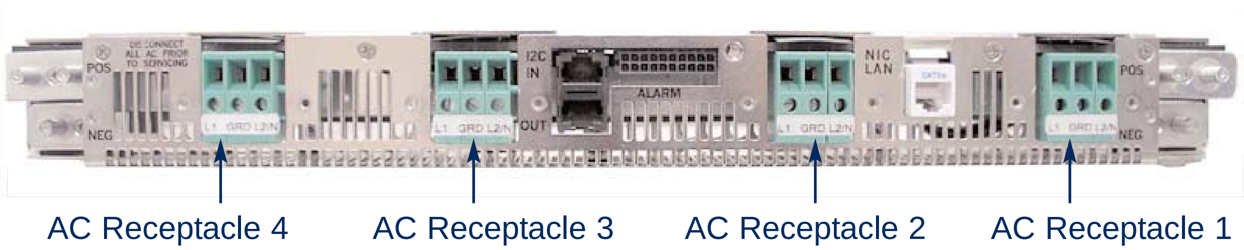

Figure 7 - Rear view (Terminal block individual feed) (Special Order)

5.2.3 Individual feed with IEC320 receptacle

Plug in the appropriate cord in to the AC connections on the back of the shelf and secure with the AC cord brackets provided.

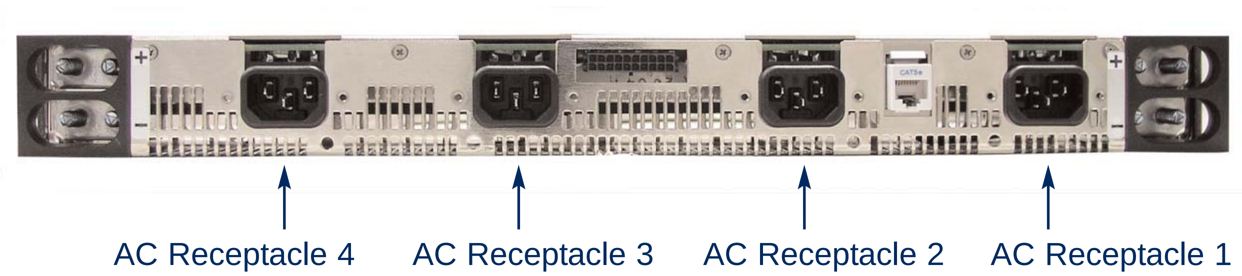

Figure 8 - Rear View (IEC320 AC Connections) (THR4)

5.2.4 AC Cord Brackets

Optional brackets are available to secure the IEC320 plugs to the shelf on an individual feed system. Follow the instructions below for using these brackets.

Place the bracket on the plug as shown in Figure 9. You can secure it to the plug by tightening with the screw on the bracket

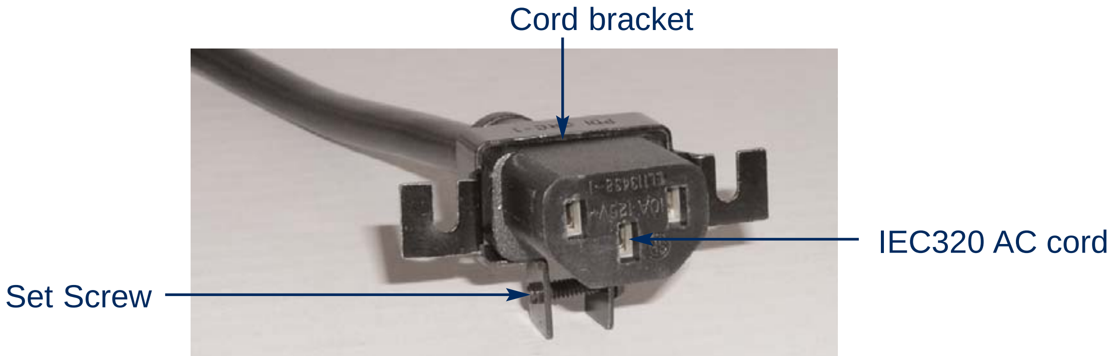

Figure 9 - AC cord bracket

After plugging the cords into the shelf, secure the brackets to the shelf with #4-40 screws provided as seen in Figure 10.

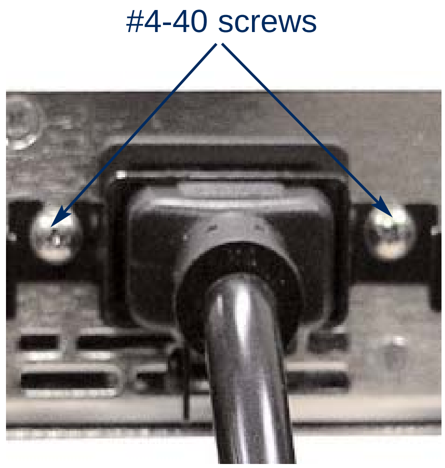

Figure 10 - Securing bracket to shelf

5.3 DC Output

DC connections are accomplished via the two rear bulk output connection as shown in Figure 11 (THR4) & Figure 12 (THR400). Torque connections according to Table 7. DO NOT exceed the current rating of the shelf from section 2.3.

5.3.1 Circuit 1

Remove plastic knockouts from DC cover. Connect lugged wires to the rear accessed bulk outputs. Verify polarity of connections before power units on. Outputs are labeled "+" for positive and "-" for negative. A DC reference ground should be connected to the appropriate output for desired polarity of the system. Repeat connections for the other side.

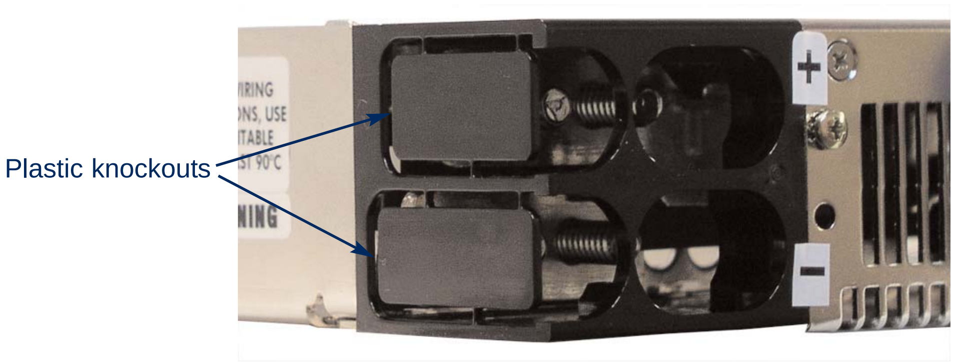

Figure 11 - DC output connections (THR4)

5.3.2 Circuit 23

Connect lugged wires or bus bars to the rear accessed bulk outputs. Verify polarity of connections before power units on. Outputs are labeled "+" for positive and "-" for negative. A DC reference ground should be connected to the appropriate output for desired polarity of the system. Repeat connections for the other side.

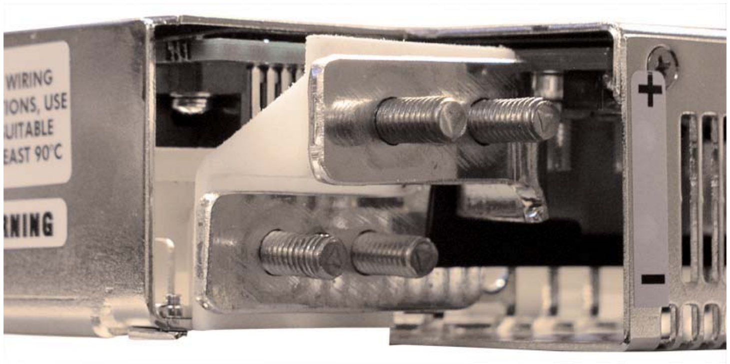

Figure 12 - DC output connections (THR400)

5.4 Alarm Connections

Access to alarms and control signals is accomplished by plugging a via rear mounted alarm cable into connector as shown on Figure 13. The alarm cable from Lambda has a part number of TLRC01. See section 7 for more information on alarms. See section 7 for more information on the alarm cable.

Figure 13 - Alarm Connection

5.5 NIC interface (optional)

An optional NIC interface is available. The Nic card has a 10/100 baseT (RJ45) connection in the front of the shelf with a RS232 (RJ45) in the rear. Follow directions in NIC "Quick Start Guide".

5.6 Multiple Shelf Connection

Input and output 12C communication ports are available to daisy chain multiple shelves together for single controller communication. Multiple shelf communication through the web interface is only available with a special NIC controller. This controller is limited to a maximum of four shelves. Contact factory for assistance.

Inter-shelf communication is available for multiple shelf configuration purposes through two RJ45 ports, pointed out in Figure 14, on the rear side of the shelf. Connect the first cable from the output of the top power shelf to the input of the next shelf. Repeat this procedure until all shelves are connected in a connected in a chain. In addition, a termination cable must be inserted into the 12C input port of the top most shelf. Finally, all outputs, both positive and negative, must be tied to a single DC bus.

Figure 14 - I2C communication ports

6 Test and Turn-Up

6.1 Power Up

Once all AC and DC connections have been secured and checked, install each power module sequentially by sliding and latching each power module into a rack position as shown in Figure 17. The power module latches must be open for installation. Attempting to install the power modules with the latches closed will result in mechanical damage to the power modules and the rack. The power modules will start in high fan speed mode and reduce their speed according to the ambient and plant conditions within 10 seconds. If an optional NIC card is not installed the power modules will ship from the factory with a default voltage value of 12VDC, 24 VDC, or 48 VDC depending on power modules deployed. This value can be changed at the factory upon request or via an optional NIC card (see NIC Information section at end of document).

7 Alarm Cable Pinout

Access to alarms and control signals is accomplished via a rear mounted connector with a mating cable part number TLRC01 (Figure 16). Table 8 provides a pin functional description.

- The pin out of the alarm connector on the shelf is a 180° different from a standard Molex connector, see Figure 15.
- AC fail, DC fail, and Thermal limit fail alarms are all open collector, opto-coupled, active high on failure/active low normally, and referenced to pin 17. The pin is able to sink 10 mA of current at 5 V and 5 mA at TTL voltages.
- Applying 5 V between pins 16 and 17 will shut all power modules down. Removing the 5V will cause the power module to power back up.
- Tie pin 9 from multiple racks to current share between racks.
- Parallel alarms and signals together for multiple racks.

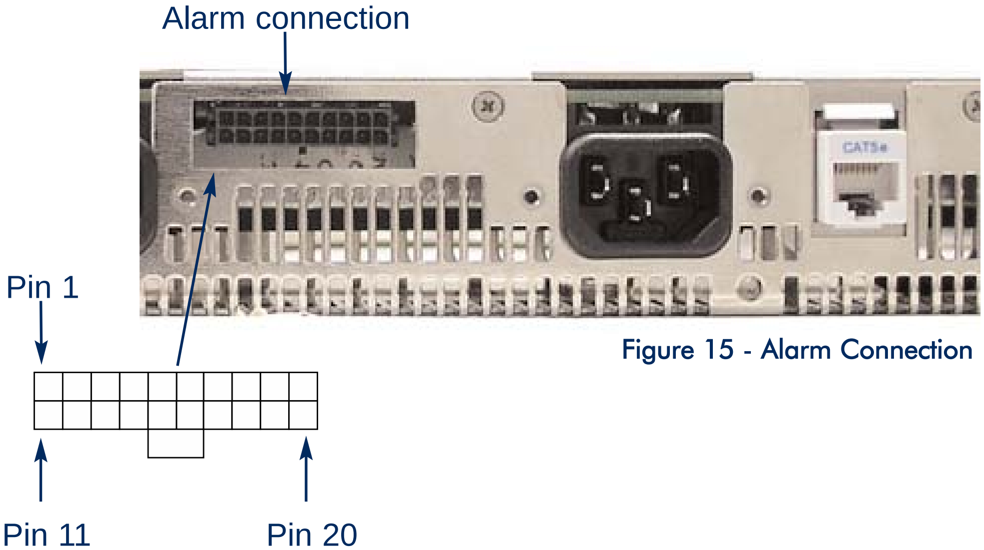

Figure 15 - Alarm Connection

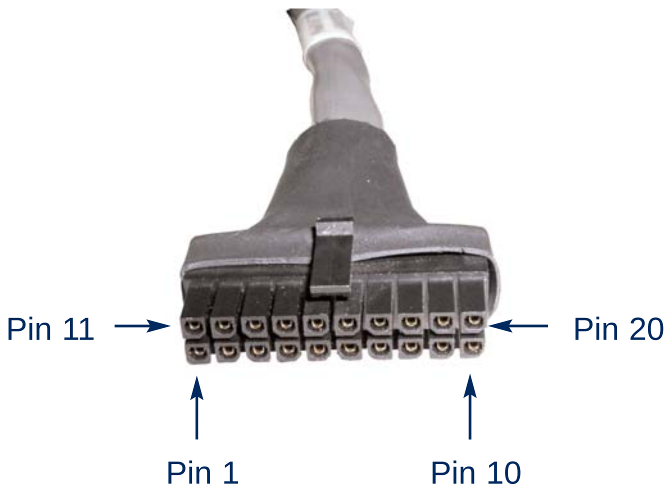

Figure 16 - Alarm cable pin out (TLRC01)

J1 Pin	Wire Color	Description
20	BLK	Shelf Bias: A regulated 12V/100ma bias supply. Referenced to Pin 10.
19	RED	SCL: I^2C clock line. Referenced to Pin 10.
18	RED/WHT	SDA: I^2C clock line. Referenced to Pin 10.
17	RED/BLK	Logic Ground: Isolated ground for opto-coupled alarms, connect to Pin 10.
16	GRN/WHT	Module Disable: Opto-coupled input. Applying 5V between this pin and Pin 17 will disable all modules in the rack.
15	LT BL	Module 0 (leftmost slot) AC Fail.
14	LT BL/WHT	Module 1 AC Fail
13	LT BL/BLK	Module 2 AC Fail
12	YLW/WHT	Module 3 AC Fail
11	YLW/BLK	Not Used
10	TAN/WHT	V Main Output (-). DC power ground.
9	TAN/BLK	I Shelf: Indicates average rack current. Ratio varies with power module type. Call factory for details.
8	TAN	Open
7	GRN/BLK	Open
6	GRN	Module Thermal Limit Failure
5	OR/WHT	Module 0 (leftmost slot) DC Fail.
4	OR/BLK	Module 1 DC Fail
3	OR	Module 2 DC Fail
2	WHT	Module 3 DC Fail
1	YLW	Module Present

Table 8

8 Replacement Items

The power modules are modular field replaceable (hot swappable) units. In the event that a power module needs to be removed, press the latch button on the front of the power module, and pull the handle until the power module slides out of the slot. Open the latch on the new power module and slide it into an empty slot. Close the latch and the power module will start up automatically and will begin sharing current.
If an optional NIC is installed the power module will automatically set the voltage specified by the NIC, otherwise it will be at the factory default.

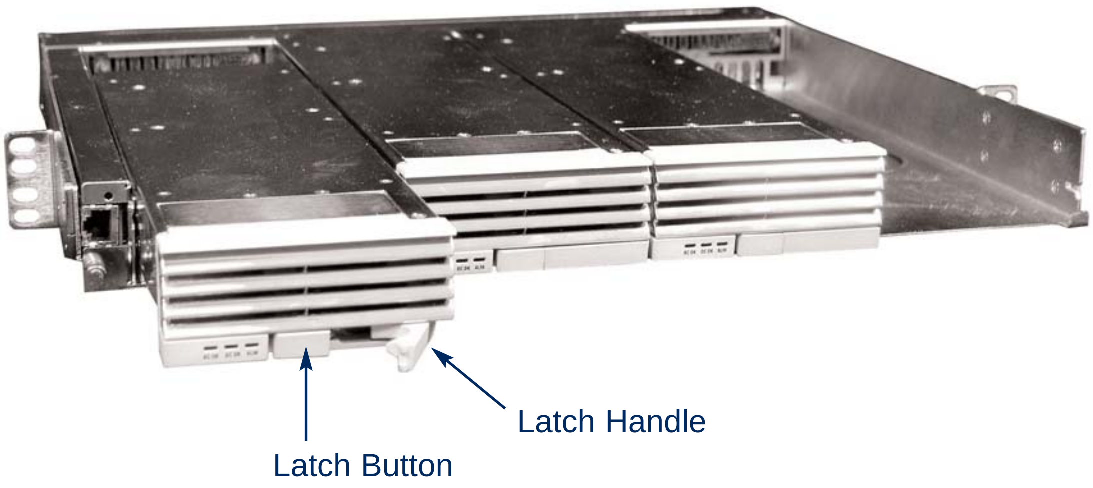

Figure 17 - Power Module Removal

9 Troubleshooting

9.1 Problems and Solutions

The modular, plug-n-play nature of this plant makes diagnostics and repair very easy. Make sure that all power modules are properly seated and latched into their respective slots. Make sure that all power and signal connectors are properly mated. Table 9 lists problems and potential solutions.

Problems and Solutions	
Problem	Solution
DC OK LED extinguished or Module DC fail fromalarm cable	Replace bad power module unit - unlatch, remove and replace with spare. System short circuit - inspect and replace load and wiring.
AC OK LED Extinguished or Module AC fail from alarm cable	Reset commercial circuit breaker to the dedicated AC circuit that feeds system. Seek alternative power source until power is restored.
Thermal Limit Failure	Power module has shut down because it has exceeded the maximum rated temperature. The power modules will automatically restart.

Table 9 - Problems and Solutions

9.2 Short Circuit & Current Limit

ILimit can be adjusted up to +105% of the rated current of the power module. The system voltage will remain constant up to ILimit at which point the system voltage will drop quickly toward 0 VDC, as in Figure 18. Once a 24V or 48V power module drops below 12 VDC for more than 5 seconds, the system will shut down. For a 12V system, once the power module drops below 4V for more than 60 seconds, the system will shut down. The system will automatically restart after 60 seconds, and will continue until the short circuit is cleared.

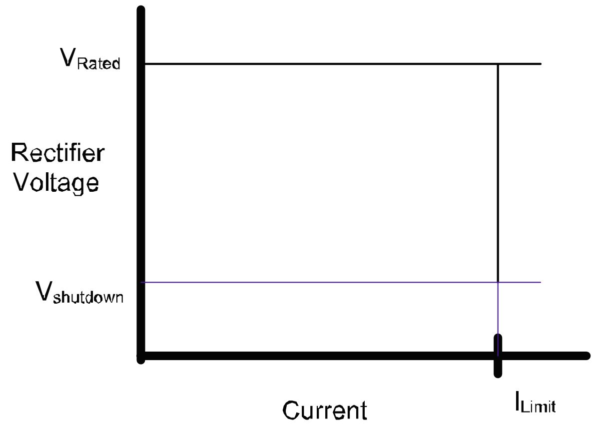

Figure 18 - Short Circuit & Current Limit

10 NIC Information (Optional)

An optional NIC is available for additional control of the system. You can connect a computer to the NIC card via a straight through patch cable through a hub or router, or via a crossover cable for direct connection. Once a connection is made, connect to the Webpage via IPSetup.exe on the CD provided. The NIC card will also work with Telnet or SNMP. See "Quickstart Guide" provided with the CD for more information on connecting to the NIC.

10.1 NIC Card Settings

The controller is factory equipped with default settings as shown in Table 10 to assure safe power up operation.

Controller Settings

System Parameters	Description	12V Nominal	24V Nominal	48V Nominal	36V Nominal
Plant Settings					
Float Voltage	The voltage to which the power modules will regulate the plant voltage during float mode (Volts)	13.5 Vdc	27 Vdc	54 Vdc	
High Voltage Shutdown	The NIC will shut down the power modules if the plant voltage exceeds this set point. (Volts)	14.5 Vdc	29 Vdc	58 Vdc	
System Current Limit	Enables the system current limit feature	Disabled	Disabled	Disabled	
Current per Rectifier	The NIC will limit the current of the power modules to this value (Amps)	220 A	220 A	220 A	
Language	The language the webpage is displayed.	English	English	English	
Alarm Settings					
High Voltage Alarm	The NIC will issue a High Voltage Alarm if the plant voltage exceeds this set point (Volts)	14.25 Vdc	28.5 Vdc	57 Vdc	
Battery on Discharge	The NIC will issue a Battery-On-Discharge alarm if the plant voltage falls below this set point (Volts)	12 Vdc	24 Vdc	48 Vdc	
Low Voltage Alarm	The controller will issue a Low Voltage Alarm if the plant voltage falls below this set point (Volts)	11 Vdc	22 Vdc	44 Vdc	
Presets					
Preset A	Preset setpoints A, B, and C	A	A	A	
Battery Boost Settings					
Boost Voltage	The voltage at which the equalize / boost charge will begin (Volts)	14 Vdc	28 Vdc	56 Vdc	
Boost Duration	Duration of time the equalize/boost charge is active (H:M:S)	6:00:00	6:00:00	6:00:00	
Boost Stop Current	The lower limit at which the boost test will stop. 0 = disabled. Requires battery shunt (Amps)	0 A	0 A	0 A	
Battery Boost Start Modes					
Manual Mode	Enables or disables the manual boost mode feature	Disabled	Disabled	Disabled	
Periodic Mode	Enables or disables automatic boost mode that runs a boost test every x number of days	Disabled	Disabled	Disabled	
Period	The number of days in between periodic boost tests	30 days	30 days	30 days	
Time of Day	The time of day the periodic boost mode will start (H:M:S). 24 hour format	8:00:00	8:00:00	8:00:00	
Auto Current Mode	Enables or disables the current based autoboost test. When enabled the boost feature will automatically start if the start current value is exceeded	Disabled	Disabled	Disabled	

Table 10

Controller Settings

System Parameters	Description	12V Nominal	24V Nominal	48V Nominal	36V Nominal
Battery Boost Start Modes					
Current Delay	The amount of time the start current must be exceeded before the test will start. (Minutes)	0 minutes	0 minutes	0 minutes	
Start Current	The value at which the current autoboost test will start. (Amps)	40 Amps	40 Amps	40 Amps	
AC Fail Mode	Enables or disables the AC fail based autoboost test. When enabled the boost feature will automatically start if an AC failure lasted longer than the AC fail duration	Disabled	Disabled	Disabled	
AC Fail Duration	The length of time (H:M:S) the AC failure must last to trigger the autoboost feature	0:15:00	0:15:00	0:15:00	
DC Drop Voltage	The voltage the batteries must drop below during the AC failure to trigger the autoboost feature (Volts)			44 Vdc	
Battery Discharge Test					
Battery Discharge Test	Enables or Disables the battery discharge test feature	Disabled	Disabled	Disabled	
Duration	Sets the length of time (H:M:S) that the battery discharge test will run.	1:00:00	1:00:00	1:00:00	
Alarm Voltage	Sets the voltage at which an alarm will be generated if the battery voltage falls below it during the Battery Discharge Test.	11.25 V	22.5 V	45 V	
Abort Voltage	The voltage at which the battery discharge test will abort at when the system voltage drop below this point.	10.75V	21.5V	43 V	
Thermal Comp Adjust	Enabling this value will take thermal compensation effects into account during the test. Disabling this value will disable Thermal Compensation effects during the test. Both Thermal Compensation, and T Comp BDT have to be Enabled for thermal comp. effects to take place during BDT.	Disabled	Disabled	Disabled	
Password	User/Admin	1001/5001	1001/5001	1001/5001	

* - Requires LVD & proper shunt

** - Requires LVD

Table 10

10.2 NIC Card Replacement

In the event the NIC card needs to be replaced, the system will remain at the last known settings until a new card is installed. To replace the NIC card, loosen the set screw and slide the NIC card out of the shelf. Insert new NIC card and tighten set screw. Any settings changed from default will need to be reset on the new card.

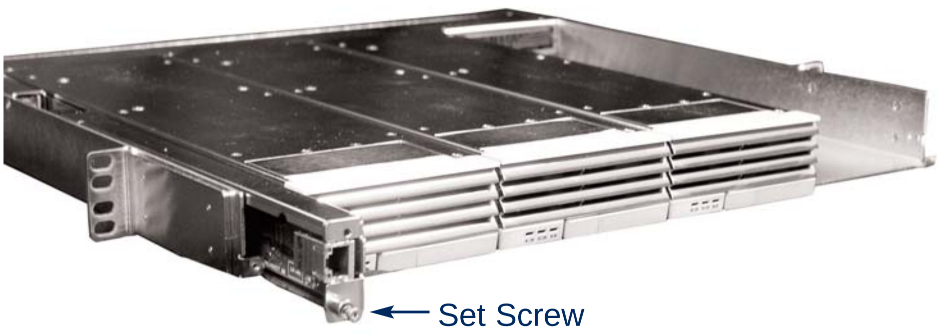

Figure 19 - NIC card removal