Engineering Note H20060405
Muon Power Supply Revision

Details for revising the back panel connections on the L1 Muon Power Supplies.

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Tasks to complete Lev 1 Muon PS

Table 1 Work List

☆	1	Fab aluminum brackets	2 per supply, right & left handed		24 pcs. Bob K.
	1	Add cooling fans	Add fans to circulate air inside the chassis	Location to be determined	Vic
☆	2	Disassemble supplies	Remove back, side, top and bottom	Keep pieces for each supply separated	Bruce
	2	Clean Vicor modules	Remove and clean dust from each module	Do not mix-up module positions	Bruce
☆	3	Drill new holes to move Vicors forward ¾” (Side Panels)	Use the opposite side panel to make the new holes		Vic
☆	4	Trim ribbon cables and terminate with sub. ‘D’	Trim so these connectors mount neatly on the back panel	Re-order the positions as needed to match the back panel	
	4	Trim and terminate the coax cable with a BNC	This cable connects to the feed-thru BNC on the back panel	36” long	-
☆	5	Pre-assemble multipin connector wiring and attach to new back panel	Two sets of 16ga twisted wire. RED & BLACK, GREEN & BLACK	Use Molex connectors on each end	-
	5	Crimp socket pins on sensing leads.	22-20ga socket pins	Sensing cable can be detached from the Vicor	
	5	Move the Monitor board common wire from Vicor and connect to Molex Plug housing pin 5			Bruce/Mike
☆	6	Remove control power ‘brick’ supply and mount on bracket	Attach ‘brick’ to new bracket with flat head screws		Vic
	6	Use a control power bracket to drill and tap rail holes	See power supply Rail Dwg for details		Vic
☆	7	Remove right angle lugs from shunts			Bruce/Mike
	7	Connect cable to shunts then to Power Pole connectors	It is important to make the connector ends at the right orientation, since the cable are short they will not twist much	There should not be stress on the Power Pole connectors	Bruce/Mike
		Backpanel Assembly			Vic/Joshua

Installation work

Table 2 Work List

Crimp Power Pole connectors to the cables in the rack	The correct connector color must be used for the particular rack installation		Vic & Joshua
Add multipin connector to the wires that use to go to the terminal strip	Add the crate ground wire (Black/Green)		Vic & Joshua
Configure Load Test Stand for Muon PS testing	Cable configuration and test procedure		Mike & Dave
Update the test stand for the new interfacing	Add the connectors so the supplies can just plugin. Same as above except using BLACK Power Poles		Mike
RM Ribbon Cables	Each Rack needs to have a custom fit	Measure Lengths	Jeff & Susan

A sample supply is used to guide all operations for these revisions.

Power Supply Disassembly:

- Remove the Top and Bottom Covers
- Use a piece of plywood under the Vicor supplies to hold the unit up so the side panels are not on the bench.
- Remove both side panels. Be aware that there are spacers (washers) on some of the aluminum rails.
- Cut all the wires going to the terminal strip on the back panel
- Remove the plastic cover on the AC input relay. Disconnect the AC line cord from the relay and power supply bricks, then remove the line cord from the back panel.
- Remove the strain relief from the back panel and use it on the new back panel.
- Use one side panel to mark the other panel to move the Vicor rails forward ¾". DO NOT move the holes for the control power rails.
- Drill all holes 0.203" in diameter (#6), total of 6 holes per side. Do this on both panels.
- De-burr all holes.
- Remove all Vicor modules and clean off grim. Use compressed air and/or paint brush.
- Reconfigure three module bus with 4 AWG jumpers.

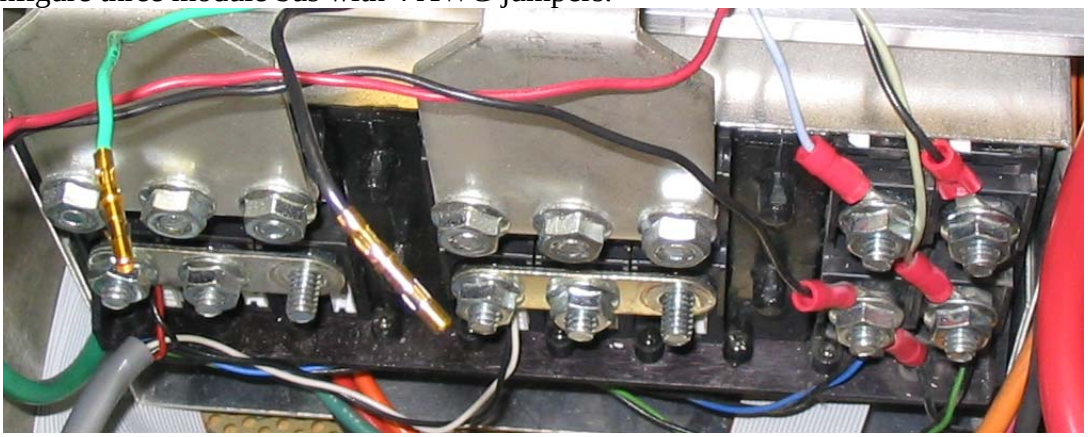


Figure 1 Vicor Back View

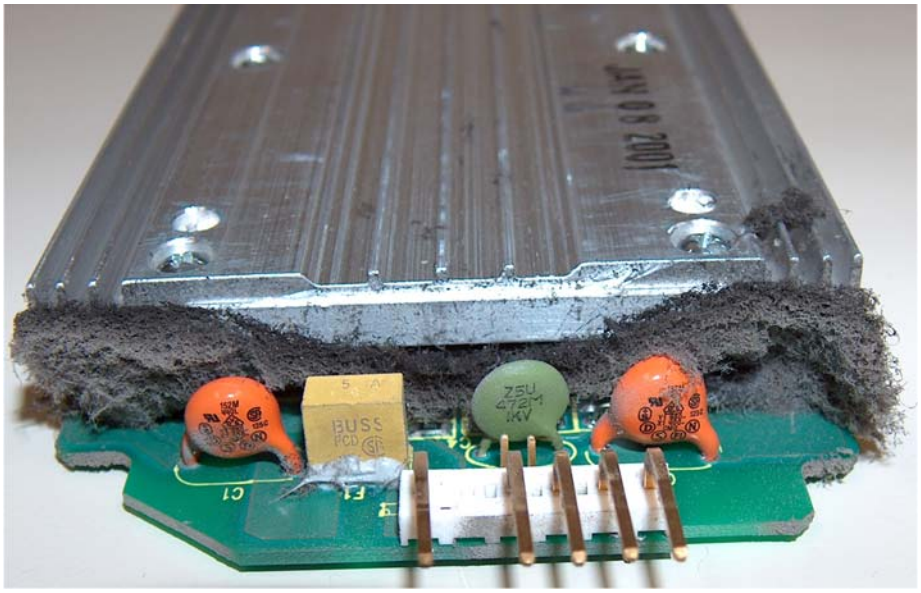


Figure 2 Problems we've seen. Complete Blockage of Air Causes Module Failure

- Remove the right-angled bracket from the fuses.

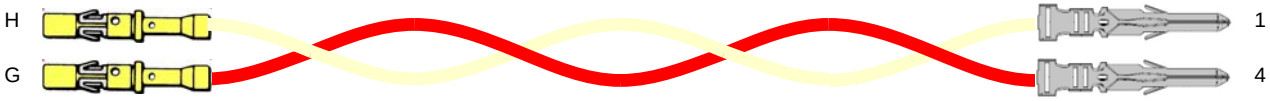
Figure 3 Power Connection

Pre-assemblies:

+12V Molex to Burndy

12” long 18Ga Red & White twisted wire.

Terminate Molex plug pin - Burndy socket pin



-12V Molex to Burndy

12” long 18Ga Green & Brown twisted wire.

Terminate Molex plug pin - Burndy socket pin

Common Molex to Burndy

12” long 18Ga Black/Green wire

Terminate Molex plug pin – Burndy socket pin

Figure 4 Cable Assemblies

The following cables should be made in place to length for each power supply type. Use shrink tubing to cover the crimp areas.

+5V Fuse to Power Pole
8” long 1/0 Red super flexible cable
Terminate 1/0 ring tongue w/1/4” hole – 1/0 Power Pole pin

+5VReturn Vicor to Power Pole
8” long 1/0 Black super flexible cable
Terminate 1/0 ring tongue w/1/4” hole – 1/0 Power Pole pin

+3.3V Fuse to Power Pole
8” long 1/0 White super flexible cable
Terminate 1/0 ring tongue w/1/4” hole – 1/0 Power Pole pin

+3.3VReturn Vicor to Power Pole
8” long 1/0 Black super flexible cable
Terminate 1/0 ring tongue w/1/4” hole – 1/0 Power Pole pin

External Interlock BNC cable
RG-58 36” long
BNC – ¼” Female Disconnect on center conductor and ground braid

+5V Module to Shunt Bus x3
4 AWG
Terminate 4 AWG Ring Tongue w/1/4” hole both ends.

Back Panel:

- Fully bevel the three large openings on the panel.
- Add AC Strain Relief and tighten.
- Add Handles and tighten.
- Add multi-pin ('Burndy' style) round connector.
- Pre-assemble Molex wires (twisted pair) into the Burndy connector
- Add BNC feed-through and tighten
- Add Power Connector Brackets but leave loose.

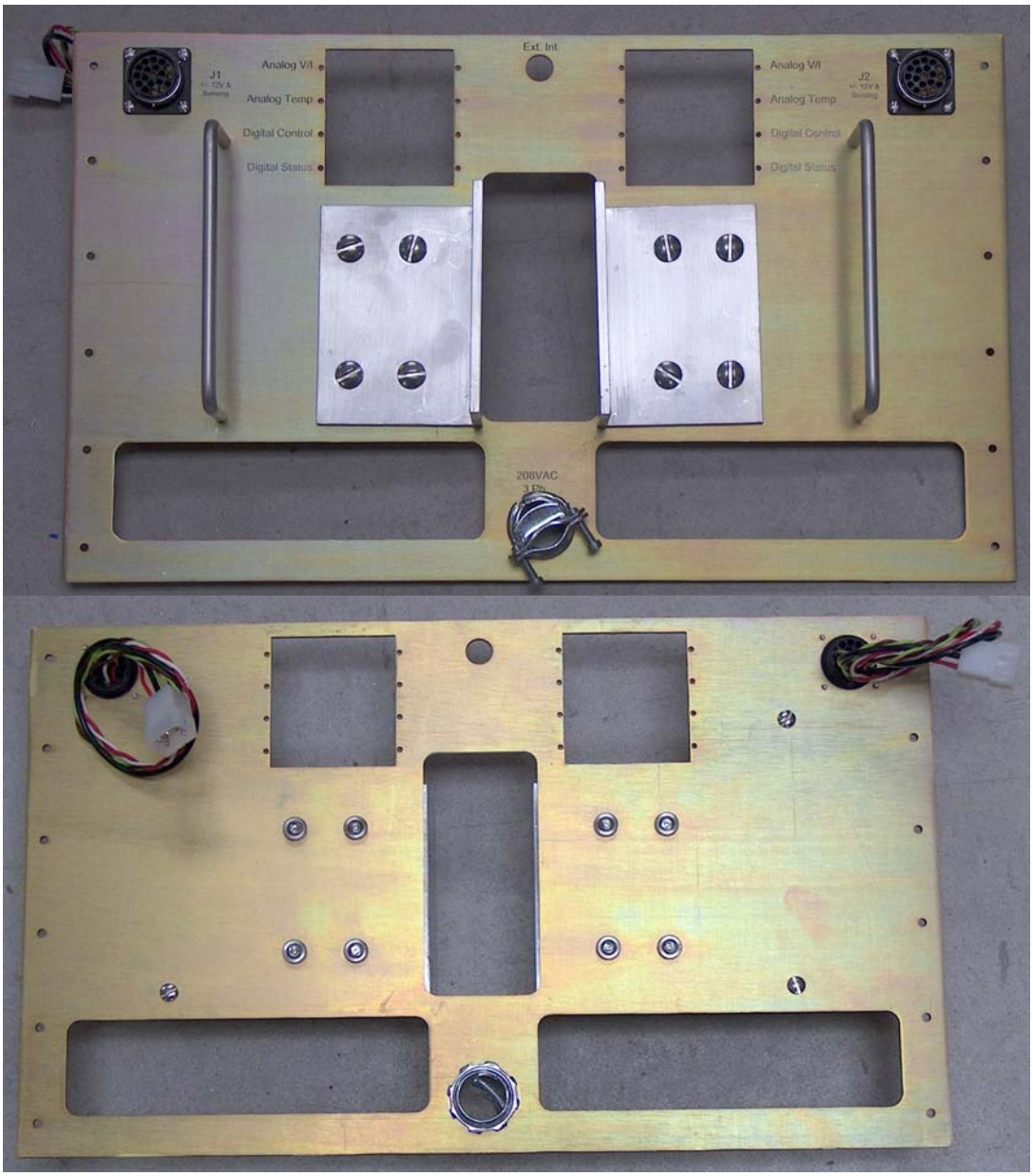


Figure 5 Back Panel Pre-Assembly

Reassembly

- Remove the Control Power Rails and drill for the new bracket. Use the new bracket to mark the holes that need to be drilled and tapped.
- Mount the 'bricks' on the new brackets and mount to the rails.

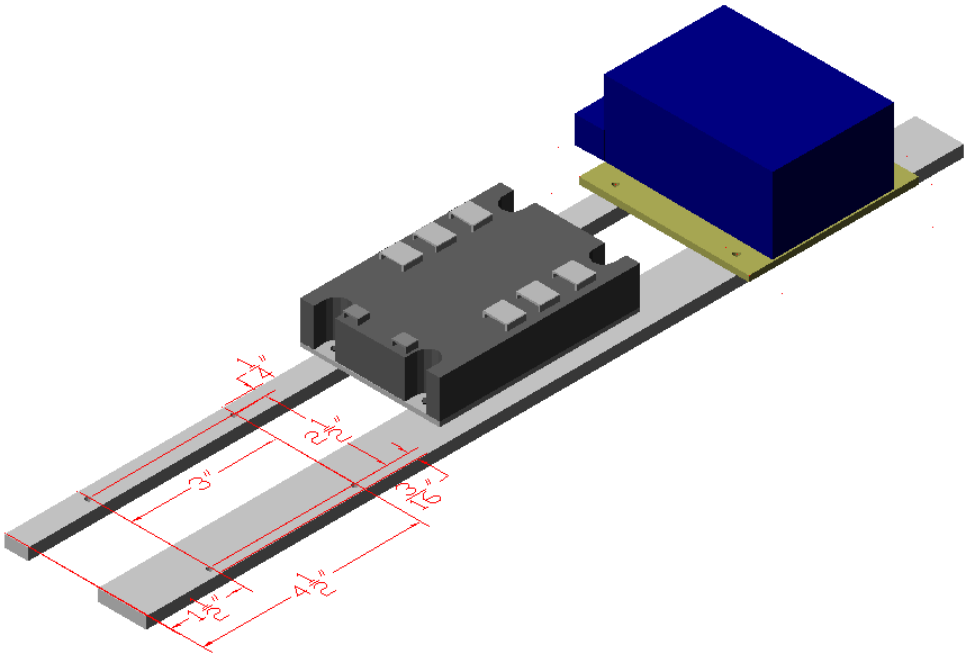


Figure 6 Control Power Assembly & Modification

- Replace sides
- Be sure to order the ribbon cables so they match the back panel.

  ANALOG V/I
  ANALOG TEMP
  DIGITAL CONTROL
  DIGITAL STATUS
- Trim the ribbons with each one successively 5/8" shorter than the ANALOG V/I cable.

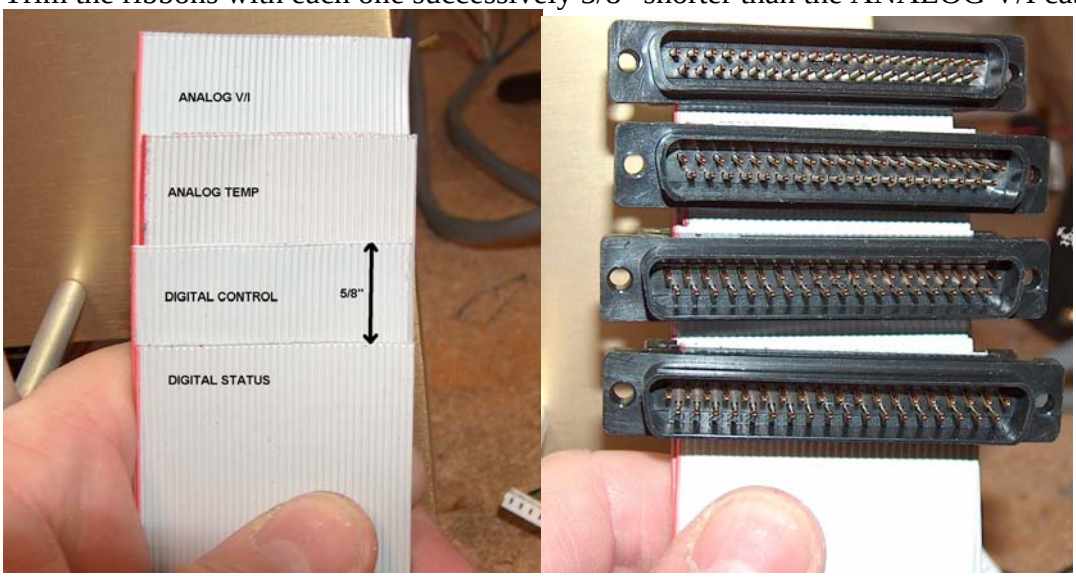


Figure 7 Ribbon Cable Trimming

- Crimp ‘D’ male connector on each ribbon.
- Remove the Monitor Board common (BLACK) wire from the Vicor +12V module and cut off the ring tongue terminal. Crimp on a Molex female pin.
- Crimp Burndy socket pins on the sensing cables

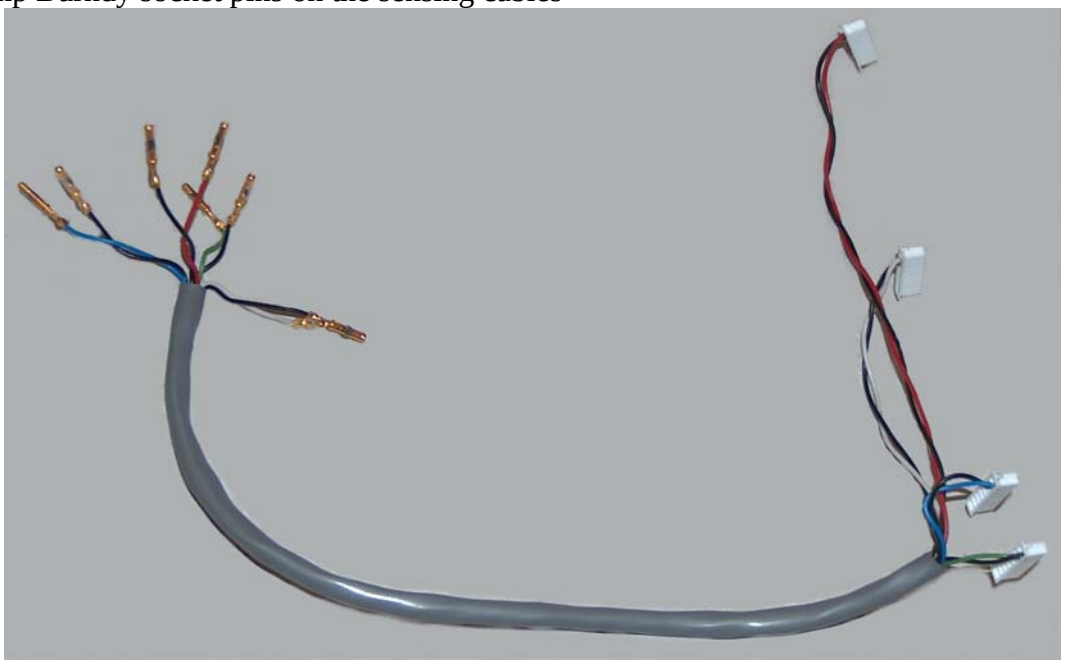


Figure 8 Sensing Cable Termination

- Check the Vicor end of this cable for bad sensing lead crimps. A good crimp has two separate crimp sections on the wire. One that grabs the wire insulation the other that crimps the wire.

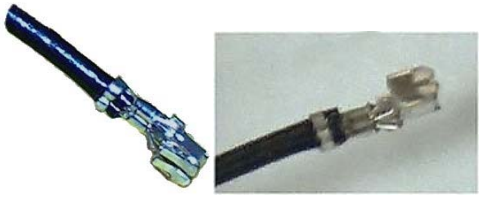


Figure 9 Sensing Cable Crimp Inspection

- Thread the AC line cord into the strain relief on the new Back Panel and connect to the input relay and ‘brick’ supplies.
- Insert the sensing cable socket pins into the correct Burndy connector position.
- Connect power cables to the Vicor/Fuse.
    - Route the power cables into the Power Pole locations and trim to length
    - Crimp Power Pole terminals with the correct orientation then insert into the correct color housing. Have the Back Panel temporarily in place while doing this.
- Fasten the ‘D’ connectors onto the Back panel using 4-40 hex standoffs.

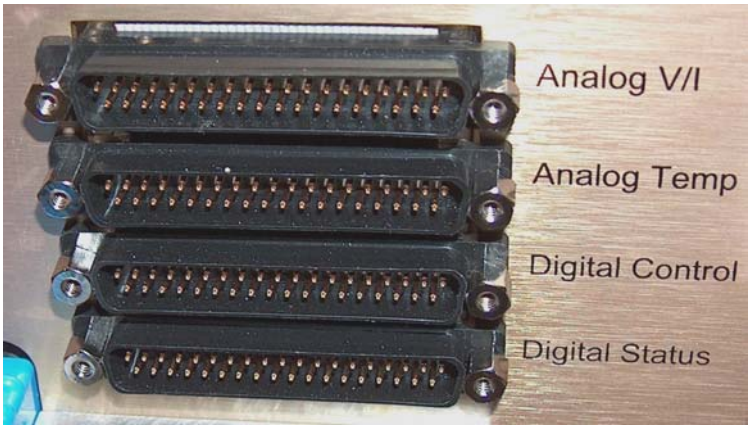
- 

Figure 10 'D' Connector Mounting

- Connect Molex plug & socket
- Connect External Interlock BNC
- Replace Top covers

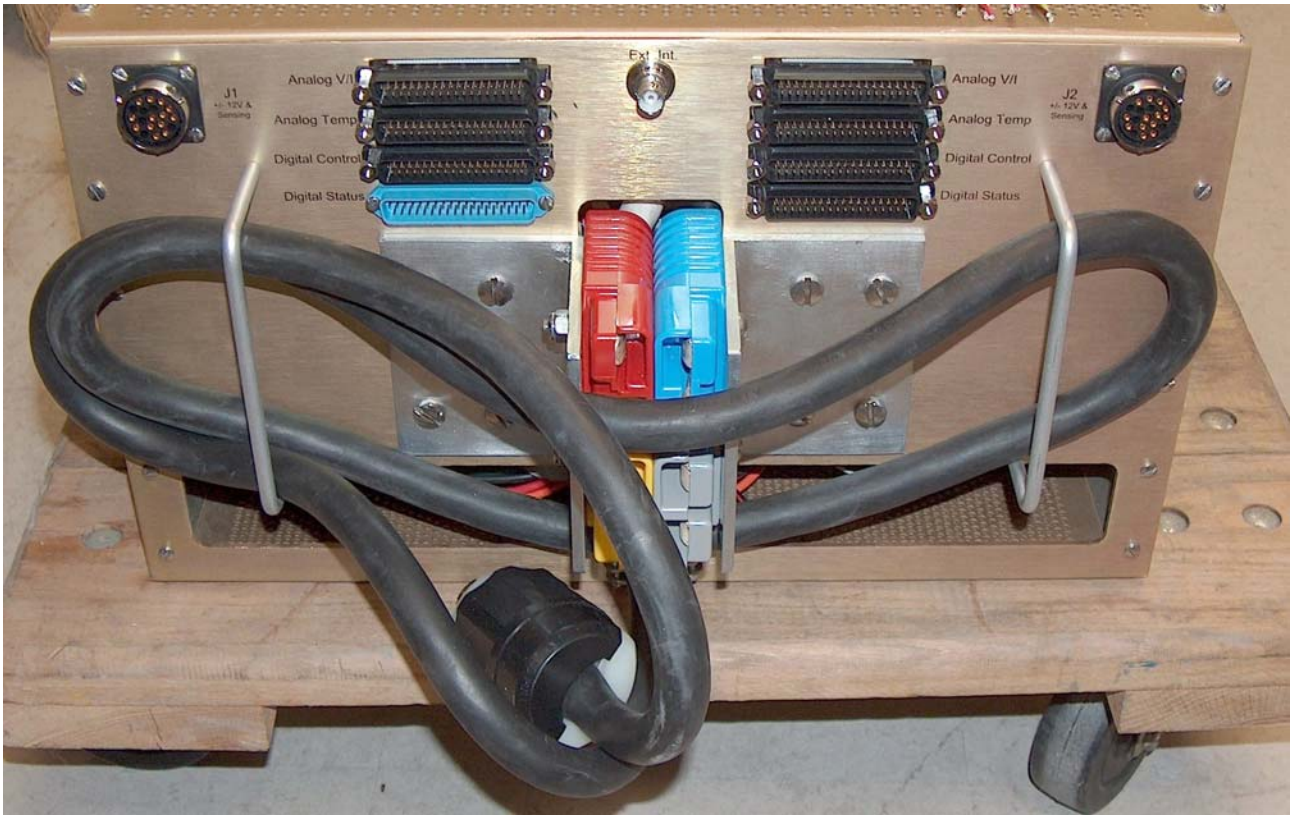


Figure 11 Finished Type 'D' Muon Supply

Rack Installation

1. Terminate sensing and +/- 12V lines with Trim-Trio.
2. Terminate high current lines with Power Pole connector.
3. Make ribbon cables to reach between the 1553 RM and the power supply
4. Make BNC cable to reach between the External Interlock and the power supply.

1) Round Multi-pin connector is used to terminate the 12V output and Remote Sensing. Use the table below to insert the pins in the correct location. There are two sizes of pins, 22-24ga and 16-20ga. The sensing lead use the 22-24ga pins and the +/- 12V outputs use the 16-20ga pins. The connector uses the plug (male) pins.

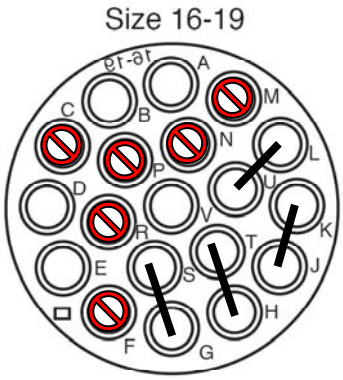


Figure 12 Power Supply End

Table 3 Multi-Pin Connector Details

Pin	Output	Vicor	Color	Size
A	+5Vsen+	V1+Sen	Red	22-24
B	+5Vsen-	V1-Sen	Black	22-24
C				
D	+3.3Vsen+	V2+Sen	White	22-24
E	+3.3Vsen-	V2-Sen	Black	22-24
F				
G	+12V	V3	Red	18 Ga
H	+12Vret	V3Ret	White	18 Ga
J	-12Vsen+	V4+Sen	Black	22-24
K	-12Vret	V4Ret	Brown	18 Ga
L	-12V	V4	Green	18 Ga
M				
N				
P				
R				
S	+12Vsen+	V3+Sen	Blue	22-24
T	+12Vsen-	V3-Sen	Black	22-24
U	-12Vsen-	V4-Sen	Green	22-24
V		Chassis	Black/Grn	18 Ga

2) Power Pole Termination

Platform Rack PE02 uses a Type A power supply. Use an Orange shell for the +5V rail and a Yellow shell for the +3.3V rail on both sides.

Platform Rack PE04 uses a Type A power supply. Use an Orange shell for the +5V rail and a Yellow shell for the +3.3V rail on both sides.

Platform Rack PE05 uses a Type B power supply. Use a Blue shell for the +5V rail and a Gray shell for the +3.3V rail.

Platform Rack PE09 uses a Type C power supply. Use an Orange shell for the +5V rail and a Yellow shell for the +3.3V rail on the left side and use a Blue shell for the +5V rail and a Gray shell for the +3.3V rail on the right side

Platform Rack PE02 uses a Type D power supply. Use a Red shell for the +5V rail and a Yellow shell for the +3.3V rail on both sides.

3) The ribbon cables from the 1553 RM to the power supply should be made or trimmed so they fit without using extender. The cables should be properly labels to avoid any incorrect connections. That is their designations should match the equipment label at each end.

4) A single BNC cable should be used for the External Interlock that is the appropriate length. BNC bullets should not be used to extend the cable.

Final Checkout
The installation should be verified before the supply is install and operated. The sensing leads should have a low resistance between the power terminal and the sensing pin.
NOTE: The +/-12V outputs have more resistance than the high current modules.

You should measure a low resistance between the following pins.

A-Pos-Terminal of the Power Pole (+5V) < 6 Ohms (Old Modules measure 2500 Ohms)
B-Neg-Terminal of the Power Pole (+5V) < 6 Ohms (Old Modules measure 125 Ohms)
D-Pos-Terminal of the Power Pole (+3.3V) < 6 Ohms (Old Modules measure 2500 Ohms)
E-Neg-Terminal of the Power Pole (+3.3V) < 6 Ohms (Old Modules measure 125 Ohms)
G-S (+12V) < 100 Ohms
H-T (+12Vret) < 10 Ohms
J-L(–12V) < 100 Ohms
K-U (–12Vret) < 10 Ohms
V to Chassis >10MegOhm with External Interlock cable off, <1 Ohm with it connected

This will hold true for the crate connections as well, however the resistance should be only the cable resistance and fusing.