

# RADIAN TPCMQ48 SERIES

48VDC Input 1RU Rack-Mount DC-DC Front-Ends  
 12VDC @ 650W | 24/27VDC @ 700W | 48/54VDC @ 1000W

## INDUSTRIES & APPLICATIONS



## FEATURES

- Isolated 5V, ¼ A Standby Output
- Hot-Swap Operation
- 12, 24 or 48 VDC Output
- Up to 3000 Watts System Output
- Remote Output Adjustment
- Wide Range 40 to 60VDC Input
- Integral LED Status Indicators
- -20°C to +70°C Operating
- I<sup>2</sup>C Serial Data Bus Option
- Up to 12.5 Watts/Cubic Inch Power Density
- Low Profile: 1.6 Inches High
- Single Hot-Swappable Connector
- Reverse Air Flow Option
- Staged Pin Engagement
- ORing Diode on Output
- 1U, 19" Rack/Shelf Holds 3 Units
- 19- or 23-Inch Rack Mounting
- Active Current Sharing
- Optimized Thermal Management
- No Minimum Load
- Control & Monitoring Features



TPCMQ48 Series Module

1U High  
 1.6" x 5" x 10"  
 (41 x 127 x 254 mm)



Three-Unit Rack/Shelf  
 TPCMQR1U3-48  
 TPCMQR1U3-48H



THREE-YEAR WARRANTY  
 Patent Protected

## STANDARD MODULES

OUTPUT POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	INPUT CURRENT	MODULE NUMBER	RACK/SHELF NUMBER
650W	12VDC	54.2A	16.5A @ 48VDC	TPCMQ48-12/54	TPCMQR1U3-48
700W	24VDC 27.2VDC	29.2A 25.7A	16.6A @ 48VDC 19.9A @ 40VDC	TPCMQ48-24/29 TPCMQ48-27/26	
1000W	48VDC 54.4VDC	20.8A 18.4A	20.8A @ 48VDC 25.0A @ 40VDC	TPCMQ48-48/21 TPCMQ48-54/18	TPCMQR1U3-48H or LTPCMQR1U3-48H

- NOTES:**
1. System rack and hot-swap modules must be ordered separately.
  2. Racks mount in 19" and 23" frames.
  3. DC output terminations on the -48 and -48-H differ, see page 5.
  4. LTPCMQR1U3-48H rack is a UL Listed version, consult sales for further details.
  5. The table does not show the independent 5V, ¼A standby output which is standard on all modules.

## OPTIONS

CODE	DESCRIPTION	OUTPUT DERATING	APPLICABILITY
R	Reverse Air Flow (Back to Front)	20%	All modules
Z	I <sup>2</sup> C Serial Data Bus	N/A	All modules TPCMQR1U3-48

**NOTE:** TPCMQR1U3-48H and LTPCMQR1U3-48H will accept modules both with and without the I<sup>2</sup>C option, but modules should not be mixed.

## SAFETY CERTIFICATIONS

UL60950-1  
 CSA22.2, No. 60950-1  
 EN60950-1

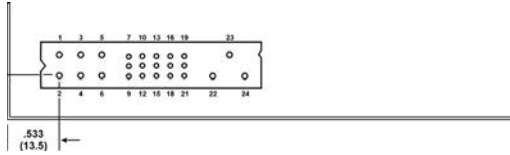
[www.unipowerco.com](http://www.unipowerco.com)



### MODULE PIN CONNECTIONS

#### 12V, 24V and 27.2V Models

MODULE CONNECTOR: POSITRONICS PCIM26W11M400A1  
 MATING CONNECTOR: POSITRONICS PCIM26W11F400A



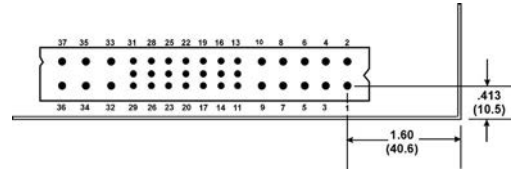
PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	+V Out	14	Output Power Good/ADD GA1
2	+V Out	15	Input Power Fail
3	+V Out	16	Remote Adjust
4	-V Out	17	Overtemp. Warning/ADD GAO
5	-V Out	18	Current Share
6	-V Out	19	Current Monitor/ADD GA2
7	Enable	20	+ 5V Standby
8	+Sense	21	Standby Return
9	- Sense	22	Chassis Ground
10	Inhibit	23	Chassis Ground
11	Spare/SDA	24	- DC Input
12	Spare/SCL	25	- DC Input
13	- Sense	26	+ DC Input

**NOTES:**

- For unit to operate, pin 7 must be at logic LO or shorted to pin 9.
- For proper operation the following pins must be connected together: All V Out pins (1-3); all V Return pins (4-6).
- Pins 11, 12, 14, 17 & 19 carry I<sup>2</sup>C functions when the I<sup>2</sup>C option is fitted.

#### 48V and 54.4V Models

MODULE CONNECTOR: POSITRONICS PCIM37W16RM400A1  
 MODULE CONNECTOR: POSITRONICS PCIM37W16RF400A1



PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	-DC Input	20	Module Present
2	-DC Input	21	N.C.
3	-DC Input	22	Input Power Fail
4	-DC Input	23	N.C.
5	+DC Input	24	GA2
6	+DC Input	25	GA1
7	+DC Input	26	SCL
8	+DC Input	27	SDA
9	Chassis Ground	28	GAO
10	Chassis Ground	29	Remote Adjust
11	N.C.	30	-Sense
12	Standby Return	31	+Sense
13	+5V Standby	32	-V Out
14	Output Power Good	33	-V Out
15	Overtemp. Warning	34	-V Out
16	Inhibit	35	+V Out
17	Enable	36	+V Out
18	Current Share	37	+V Out
19	Current Monitor		

**NOTES:**

- For unit to operate, pin 17 must be at logic LO or shorted to pin 30.
- For proper operation the following pins must be connected together: all +V Out pins (35-37); all -V Out pins (32-34).
- Pins 24-28 carry I<sup>2</sup>C functions when the I<sup>2</sup>C option is fitted.

### EVALUATION BOARDS & MATING CONNECTORS

MODULE EVALUATION BOARD	Models	Part Number
Plugs directly into the TPCM48 module connector to provide industrial connections for testing and evaluation. Provides DC in and DC out plus alarm connections. Includes 2 LEDs to indicate DC in and DC out status.	TPCMQ48-12/54 TPCMQ48-24/29 TPCMQ48-27/26	009-0280-0009
	TPCMQ48-48/21 TPCMQ48-54/18	use connector shown below
MODULE MATING CONNECTORS		Part Number
Right angle PCB mount - Connector for use in OEM design chassis. Positronic part number: PCIM26W11F400A.	TPCMQ48-12/54 TPCMQ48-24/29 TPCMQ48-27/26	354-0094-0009
Right angle PCB mount - Connector for use in OEM design chassis. Positronic part number: PCIM37W16RF400A1.	TPCMQ48-48/21 TPCMQ48-54/18	354-1686-0000

## I<sup>2</sup>C SERIAL BUS SPECIFICATIONS

Three forms of data are available via the I<sup>2</sup>C serial bus, allowing the user to monitor the actual status of an individual unit, manage system loading through measurement of the actual load on the output and also control inventory through an inbuilt EEPROM containing specific data about each individual unit. The implementation of I<sup>2</sup>C that has been utilized in TPCMQ48 is a subset of more complete implementations such as IPMI. The following information provides the information required by the system designer to make decisions on how to utilize the available information within his overall system philosophy.

### I<sup>2</sup>C DEVICES EMPLOYED

**PCF8574** - An 8-bit digital register manufactured by Philips.  
**24C02** - A 256 byte EEPROM manufactured by ST.

**PCF8591** - A Quad A/D converter manufactured by Philips.  
**MAX6633** - A 12-bit temperature measurement device manufactured by Maxim.

For detailed information about the operation of these devices please consult the original manufacturers' datasheets.

## ELECTRICAL INTERFACE

### Addressing (GA0, GA1 and GA2)

Three external address lines are employed allowing up to eight TPCMQ48 modules to be addressed on a single I<sup>2</sup>C bus. Module addressing is achieved through hard-wiring the address lines to -Sense or the +5V auxiliary supply via a 100-ohm resistor on the system back-plane. In this way it is the location or position of the module rather than any particular module that is identified by an individual address.

### Serial Clock (SCLK)

This line is clocked by the processor which controls the I<sup>2</sup>C serial bus. It should

be tied to +5V via a pull-up resistor in the range 3k to 10k.

### Serial Data (SDA)

This line is a bidirectional data line. It should be tied to +5V via a pull-up resistor in the range 3k to 10k.

### BUS speed

The I<sup>2</sup>C interface as used in TPCMQ48 is designed to run with a serial clock speed 100kHz.

## OPERATION AND FUNCTION

### Digital Functions

Digital status functions are provided by a PCF8574 8-bit I/O port device. When this device is read by the serial bus controller a single 8-bit word provides the following information:

BIT	FUNCTION	GOOD STATE	MEANING
0	Input Power Fail	0	A "1" provides warning of input supply failure.
1	Output Power Good	0	Vout is within specified limits.
2	Temperature Warning	1	Temperature exceeds normal operating limit.
3	Fan #1 Good	1	Fan running at >80% nominal speed.
4	Fan #2 Good	1	Fan running at >80% nominal speed.
5	-	1	Not used
6	-	1	Not used
7	Temperature Alarm	1	Ambient temperature exceeds 70°C, unit switched off. Also indicates OVP and Inhibit activated.

### PCF8527 slave address

BIT	7	6	5	4	3	2	1	0
VALUE	0	1	0	0	A2	A1	A0	R/W

Note: If a zero is written to bit 7 in a data byte, the unit will be inhibited. The default state is enabled.

### EEPROM Functions

The EEPROM is a 2048 bit (256 byte) device which is preprogrammed at the factory with the following data:

ADDRESS RANGE	DATA
0-15	Model Number
16-31	Manufacturing Part Number
32-47	Serial Number
48-63	Modification Level
64-79	Manufacturer
80-95	Country of Manufacture
96-255	Not Used

Notes:  
 Data is organized such that each field of data can be accessed by a page read (16 bytes).

Customers may specify other data to special order.

### EEPROM slave address

BIT	7	6	5	4	3	2	1	0
VALUE	1	0	1	0	A2	A1	A0	R/W

### Analogue Functions

Analogue status functions are provided by two PCF8591 4-channel 8-bit A/D converter devices. When these devices are read by the serial bus controller a single 8-bit word provides the following information:

Device: U1			
A/D	FUNCTION	A/D	FUNCTION
1	Vout voltage	3	not used
2	Vout current	4	not used

### PCF8591 slave address

BIT	7	6	5	4	3	2	1	0	Device
VALUE	1	0	0	1	A2	A1	A0	R/W	U1

The PCF8591 devices initially require a control byte (04 Hex) to be written to the configuration register. This control byte sets the device so that on each successive read the data from the next A/D is read. Note that on each read a conversion is started for a particular channel and the result will be read from the previous channel, thus the first result from a sequence of reads should always be discarded.

### A/D Converter Scaling

To obtain a correct voltage or current measurement it is necessary to employ a scaling factor in the controlling software. Note that all voltage measurements are made inside the PSU module, before the 'ORing' diodes, and are typically 0.5V higher than the actual module output voltage. The following calculation should be employed:

Value = (byte read x scaling factor)

Output Voltage	Scaling	Tolerance	
48V	0.24	±2%	V Measure (U1 A/D Chan. 1)
48V	0.125	±10% *	I Measure (U1 A/D Chan. 2)

\* percentage of full scale

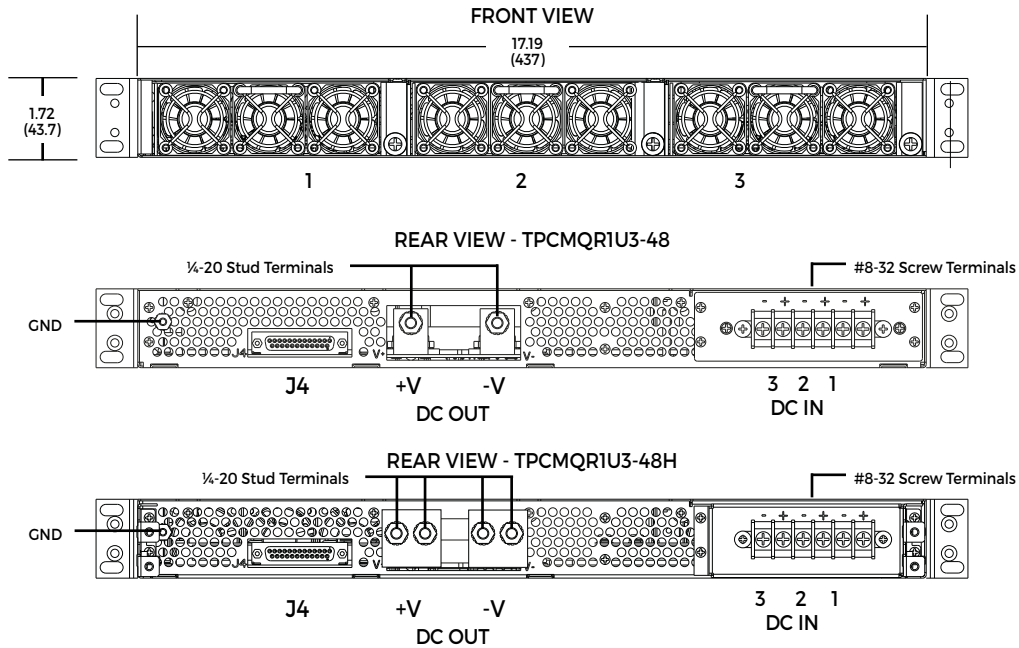
### Temperature Measurement Functions

The internal temperature of the unit is measured using a MAX6633. This device provides a 12-bit measurement at a resolution of 0.0625°C.

### MAX6633 slave address

BIT	7	6	5	4	3	2	1	0
VALUE	1	0	0	0	A2	A1	A0	0

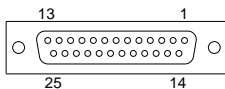
SPECIFICATIONS, RACKS/SHELVES



J4 PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	Inhibit	14	Input Power Fail - 1
2	Overtemp. Warning - 1	15	Output Power Good - 1
3	Current Monitor - 1	16	Input Power Fail - 2
4	Overtemp. Warning - 2	17	Output Power Good - 2
5	Current Monitor - 2	18	Input Power Fail - 3
6	Overtemp. Warning - 3	19	Output Power Good - 3
7	Current Monitor - 3	20	Module Present - 1
8	+5V Standby	21	Module Present - 2
9	SDA	22	Module Present - 3
10	Current Share	23	- Sense
11	+Sense	24	Remote Adjust - 1
12	Remote Adjust - 2	25	Remote Adjust - 3
13	SCL		

NOTES: 1. Standby return is connected to -Sense lead. Current rating of +5Vstandby is 250mA.  
 2. All signals are referenced to -Sense lead. Pins 9 and 13 are I<sup>2</sup>C outputs when that option is present.

J4 SIGNAL CONNECTOR



Standard 25-Pin Subminiature D Connector

NOTES:

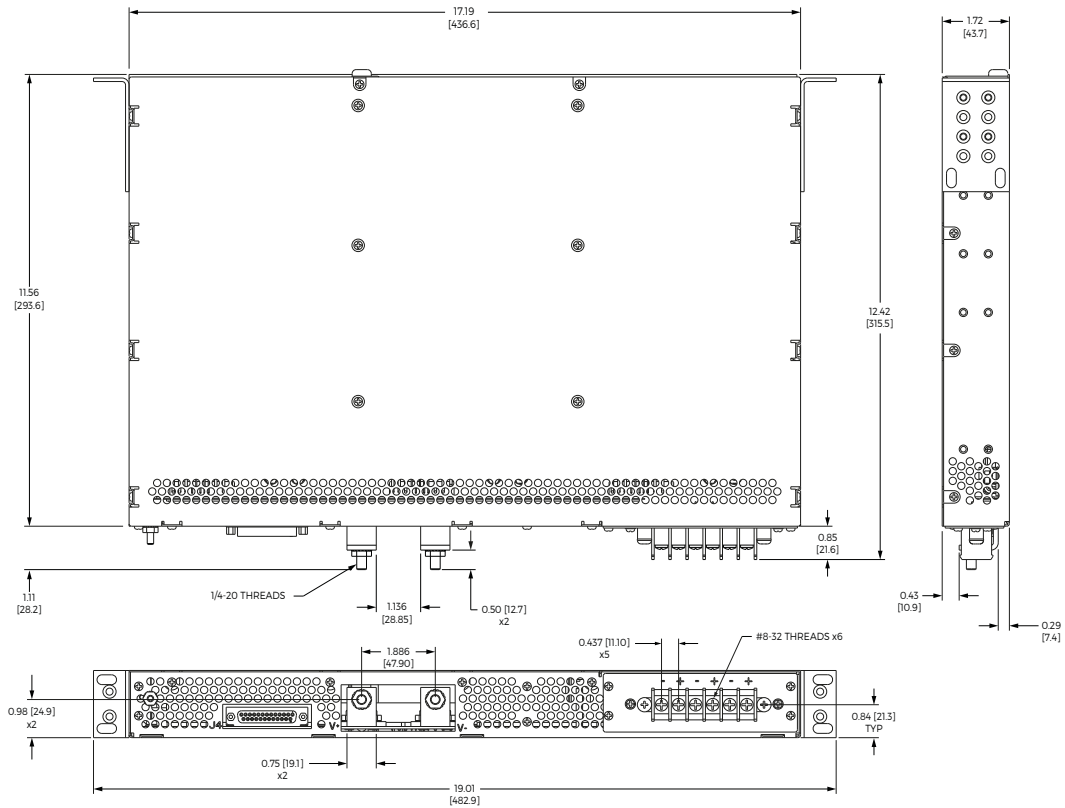
- All connections are made to the rear of the rack/shelf. The modules are 1, 2, 3, from left to right as seen from the front of the rack/shelf.
- All module outputs are connected in parallel in the rack/shelf with active current sharing between them.
- There is a separate DC input for each module, but the inputs may be paralleled by means of an adaptor kit. See accessories list opposite.
- The Module Present outputs (J4 pins 20, 21 & 22) are grounded (to -Sense) when the module is plugged in and open when the module is out.

MAXIMUM RATED OUTPUT - 3 MODULES IN TPCMQR1U3-48H		
MODULES	NON-REDUNDANT	2+1 REDUNDANT
TPCMQ48H-48/21	48VDC @ 62.4A	48VDC @ 41.6A
TPCMQ48H-54/18	54.4VDC @ 55.2A	54.4VDC @ 36.8A

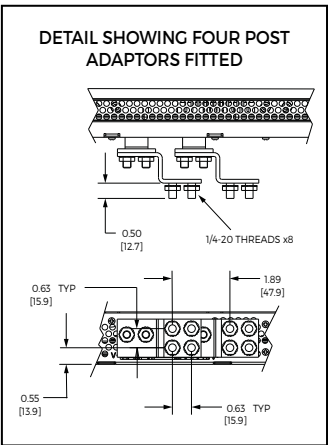
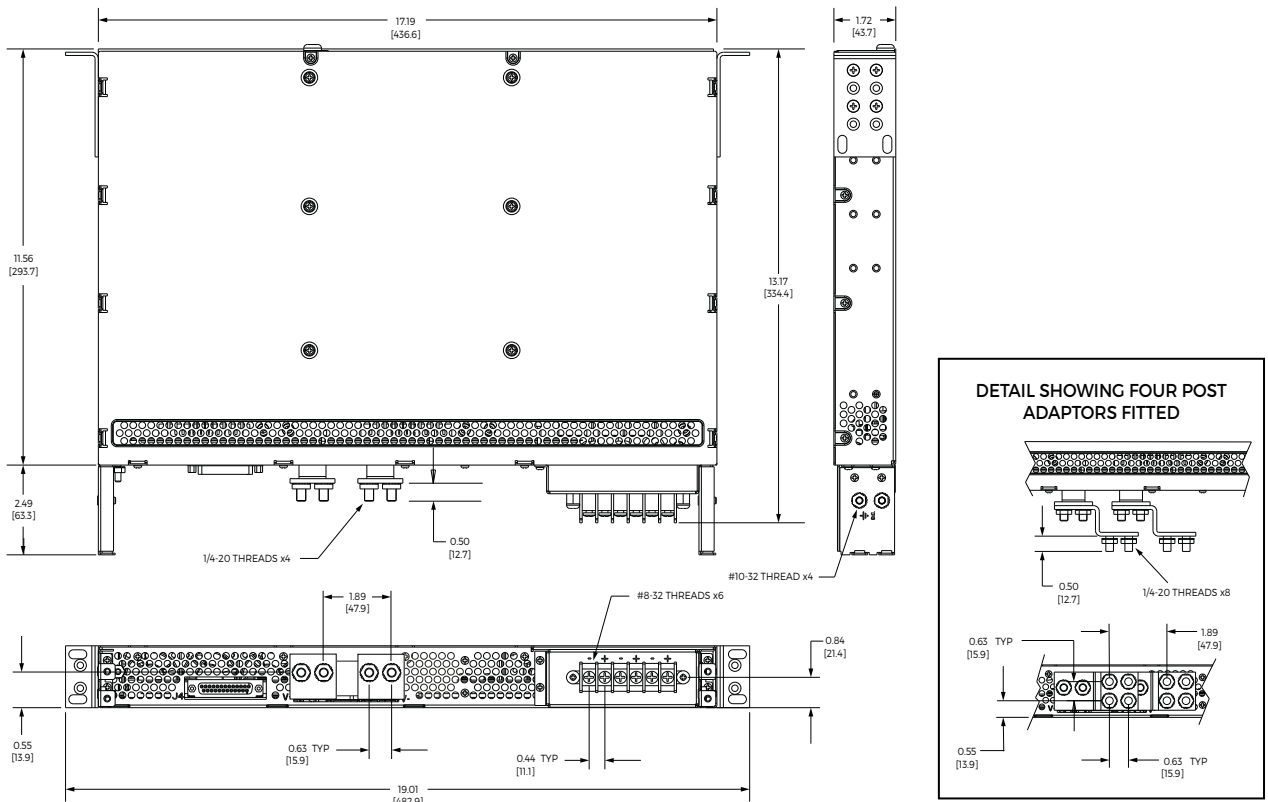
MAXIMUM RATED OUTPUT - 3 MODULES IN TPCMQR1U3-48		
MODULES	NON-REDUNDANT	2+1 REDUNDANT
TPCMQ48-12/24	12VDC @ 150.0A	12VDC @ 108.4A
TPCMQ48-24/29	24VDC @ 87.6A	24VDC @ 58.4A
TPCMQ48-27/26	27.2VDC @ 77.1A	27.2VDC @ 51.4A

ACCESSORY KITS		
Type	Function	PART NO.
Single Feed Adaptor TPCMQR1U3-48	Each kit contains 2 bars to link the 3 x +Ve and 3 x -Ve input terminals respectively.	775-1528-0000
Single Feed Adaptor TPCMQR1U3-48H		Standard
Module Position Blanking Kit	Used to blank off unused module slots. One fitted as standard.	775-1450-0010
DC bus bar converter TPCMQR1U3-48H	Converts output bus bars from 2 post to 4 post terminations.	775-1507-0000

OUTLINE DRAWING - TPCMQR1U3-48 RACK/SHELF









OUTLINE DRAWING - TPCMQR1U3-48H RACK/SHELF















### ALARM & COMMUNICATIONS ADAPTORS

RELAY ALARM ADAPTOR		Part No.: 009-1005-0000	Datasheet WEB Link	Notes
	Plugs directly into the 25 way D-Type signal connector J1 (J2) and converts DC good signal for each module to a Form-C volts-free relay contact output. The module allows daisy chaining of parallel connected shelves for share bus and remote sense.			
SNMP ALARM TRAP ADAPTOR		Part No.: 009-1006-0000	Datasheet WEB Link	Notes
	Plugs directly into the 25 way D-Type signal connector J1 (J2). Monitors DC Good signal of each power module. Plugs directly into the 25 way DType signal connector J1 (J2). Monitors DC Good signal of each power module. When an alarm occurs or clears a built-in processor sends an SNMP alarm trap to the monitoring host and can send an email message. Allows daisy chaining of parallel connected shelves for share bus and remote sense connections.			 MIB files (.exe)   Setup guide

### DC CABLES

DC CABLE KIT - 1 to 1 LUG 30"	Part No.: 775-1497-1130	Start Lug	End Lug
Pair of Black / Red #4AWG copper cable (600V 125A) 30" (76cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55".			
DC CABLE KIT - 1 to 2 LUG 30"	Part No.: 775-1497-1230	Start Lug	End Lug
Pair of Black / Red #4AWG copper cable (600V 125A) 30" (76cm) with lug terminations and heat shrink. Hole size 0.25", tongue w = 0.55", spacing 0.63"			
DC CABLE KIT - 2 to 2 LUG 30"	Part No.: 775-1497-2230	Start Lug	End Lug
One pair Black / Red #4AWG copper cable (600V 125A) 30" (76cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55", spacing 0.63"			
DC CABLE KIT - 1 to 1 LUG 84"	Part No.: 775-1497-1184	Start Lug	End Lug
One pair Black / Red #4AWG copper cable (600V 125A) 84" (213cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55"			
DC CABLE KIT - 1 to 2 LUG 84"	Part No.: 775-1497-1284	Start Lug	End Lug
One pair Black / Red #4AWG copper cable (600V 125A) 84" (213cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55", spacing 0.63"			
4 POST ADAPTOR KIT	Part No.: 775-1507-0000		
2 to 4 post converter kit for output bus bars on TPCMQR1U3-48H.		