RADIAN SERIES
AC & HVDC INPUT
FRONT-ENDS & RECTIFIERS

DESCRIPTION

UNIPOWER's Radian Series are hot-swappable, modular front-ends and rectifiers which produce up to 1360 watts output. There are 16 different models with different output voltages and power levels. The modules are ultra-compact with power density up to 17 watts per cubic inch. Companion 19-inch shelves hold up to three rectifiers which can also be operated in a 2+1 redundant mode. The modules have automatic load sharing and output ORing diodes so they can be hot-swapped while the system is operating. Module output voltage can be controlled by 0V to +5V analog input.

Green LEDs indicate AC and DC power good. The rectifiers also have control and monitoring features and a +5V standby output. Operating temperature range is -20°C to +70°C.

FEATURES

- 1U- High: 1.72"
- -20°C to +70°C Operation
- 85 to 264VAC or 90 to 420VDC Input
- Up to 1360W Module Output
- Up to 4080W Shelf Output
- 0.99 Power Factor
- Output Voltages: 12 to 54.4VDC
- 80-87% Efficiency
- Power Density to 17W/Cu. Inch
- Hot Swappable
- Integral ORing Diodes
- Class B EMI Filter
- LED Indicators
- I²C Serial Data Option
- 19- or 23-Inch Rack Mounting

THREE YEAR WARRANTY

SAFETY CERTIFICATIONS

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

2006/95/EC U8V 11 03 61384 014/15 E130645

FRONT-END / RECTIFIER MODULES

MAX. POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	AC INPUT VOLTAGE [1]	AC INPUT CURRENT [2]	MODEL NO. [3]
1360W	54.4VDC	25.0A	180-264V	7.0A	RPCQ48/25
1200W		22.0A	85-264V	11.8A / 6.2A	RPCP48/22
800W		15.0A	85-264V	7.9A / 4.1A	RPCM48/15
1200W	48.0VDC	25.0A	85-264V	11.8A / 6.2A	TPCP7000 [4]
800W		16.7A	85-264V	7.9A / 4.1A	TPCM7000 [4, 5]
600W		12.5A	85-264V	5.9A / 3.1A	TPCM7000E [4, 5, 6]
900W	27.2VDC	33.0A	85-264V	8.6A / 4.5A	RPCP24/33
690W		25.0A	85-264V	6.6A / 3.5A	RPCM24/25
1000W	28.0VDC	35.7A	85-264V	9.6A / 5.0A	TPCP6000 [4]
1000W	24.0VDC	41.7A	85-264V	9.6A / 5.0A	TPCP5000 [4]
700W		29.2A	85-264V	6.7A / 3.5A	TPCM5000 [4, 5]
525W		21.9A	85-264V	5.0A / 2.6A	TPCM5000E [4, 5, 6]
680W	13.6VDC	50.0A	85-264V	7.1A / 3.7A	RPCP12/50
600W		45.0A	85-264V	6.3A / 3.3A	RPCM12/45
800W	12.0VDC	66.7A	85-264V	8.3A / 4.4A	TPCP3000 [4]
650W		54.2A	85-264V	6.8A / 3.5A	TPCM3000 [4, 5]
480W		40.0A	85-264V	5.0A / 2.6A	TPCM3000E [4, 5, 6]

Notes:
1. All units will also operate from 90-420VDC with the exception of RPCQ48/25 which is limited to 180-420VDC. Use model TPCPR1U3A shelf.
2. Input currents shown are nominal values at 120VAC/240VAC as appropriate.
3. To specify I²C Serial Communications append **-Z** to the model number. Not available for RPCM/RPCP/RPCQ.
4. For chassis-mount applications delete leading '**T**' from model number, e.g. PCM7000.
5. To specify reverse airflow (exhaust at front) add suffix **-R**. Derate output power 20%.
6. These models have a front panel mounted IEC60320-C14 inlet. Derate output power 16.6% when reverse airflow (option **-D**) is fitted.

MODULE ACCESSORIES

DESCRIPTION	PART NUMBER	
	UNIPOWER	POSITRONIC
Mating Connector	355-1597-0000	PCIB24W9F400A1
Evaluation Board	009-3850-0000	

3-BAY 19" SHELF SYSTEM ORDERING GUIDE

MAX. POWER	DESCRIPTION	MAX. CURRENT	MODEL NO. [1, 2]
2400W	IEC60320-C14 AC Input	163A	TPCMR1U3
4080W	Terminal Block AC or DC Input	200A	TPCPR1U3A
4080W	IEC60320-C20 AC Input	200A	TPCPR1U3B
4080W	Filtered IEC60320-C20 AC Input	200A	TPCPR1U3C

Notes:
1. Blanking kit for unused position, order pt. no. 775-1450-0000.
2. To specify I²C Serial Communications append **-Z** to the model number. Not available for RPCM/RPCP/RPCQ.

www.unipowerco.com

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SPECIFICATIONS, MODULE

Typical at Nominal Line, Full Load and 25ºC Unless Otherwise Noted.

INPUT

Voltage Range	See Model Table
Power Factor	>0.99
Total Harmonic Distortion, Max.	5%
Frequency	47-63Hz
Inrush Current Limiting, Max.	50A Peak
EMI Filter, Conducted	FCC20780 pt. 15J Curve B EN55022 Curve B
Fast Transients	EN61000-4-4
Surges	EN61000-4-5
Remote Adjust	0 to +5V
Input Protection [1]	Internal Fuse, 15A

OUTPUT

Current & Voltage	See Table
Output Power	600-1360W
Voltage Adjustment Range	±5%
Standby Output	+5V@250mA
Line & Load Regulation, Max.	2%
Holdup Time	20msec.
Overvoltage Protection	Latch Off
Filtering: Wideband Noise, 20MHz BW	
48V/54.4V	500mV pk-pk
24V/27.2/28V	250mV pk-pk
12V/13.6V	125mV pk-pk
Current Limit	105-110% Rated Current
Efficiency	80-87%

SAFETY UL60950-1 2nd Ed., CSA22.2 No. 60950-1 2nd Ed., EN60950-1 2nd Ed.

STATUS INDICATORS

AC GOOD	Green LED
DC GOOD	Green LED

ALARM SIGNALS (Logic LO, TTL compatible)

ACOK	AC present, 5V standby operating
DCOK	output within -10% of nominal @ 48, 24 or 12VDC

SERIAL COMMUNICATIONS

I²C	Optional, see selection guide

ENVIRONMENTAL

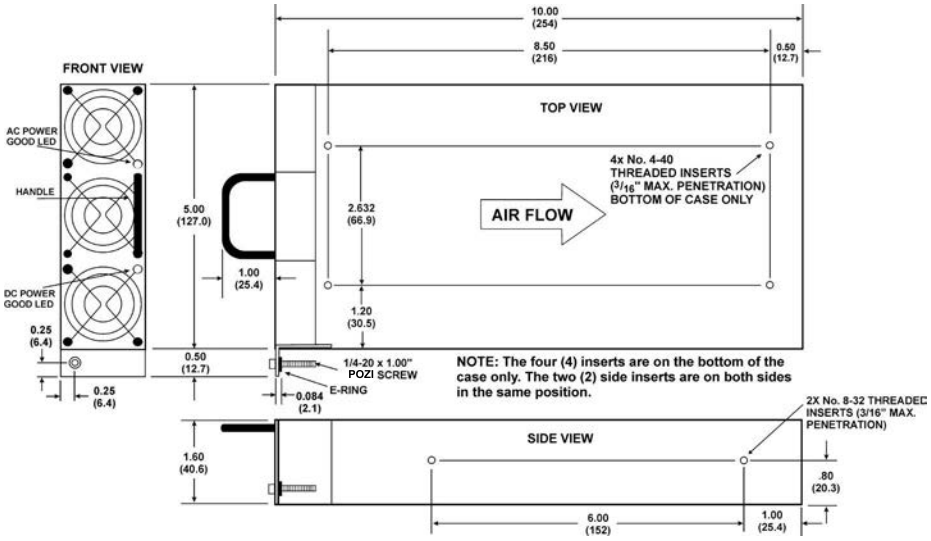
Operating Temp. Range	-20°C to +70°C -40°C start-up, reduced performance
Output Current Derating	2.5%/°C, 50°C to 70°C
Storage Temp. Range	-40°C to + 85°C
Environment	Pollution Degree 2
Humidity	0% to 95%, Non-Condensing
ESD	Bellcore GR-1089-Core and EN61000-4-2
MTBF, 35°C (Bellcore)	200,000 Hours
Cooling	Integral Ball Bearing Fans
Acoustic Noise @ 1m (module) [2]	70dB

PHYSICAL SPECIFICATIONS

Case Material	Aluminum
Case Dimensions, Inches (mm) [3, 4]	1.60 H x 5.00 W x 10.00 D (40.6 x 127.0 x 254.0)
Weight	3.15 lbs. (1.43 kg.)

Notes:
1. External protection required when operating from HVDC.
2. Except RPCQ48/25.
3. RPCQ48/25 depth is 10.32" (262mm).
4. RPCQ48/25 protrudes ~0.32" (~8.1mm) plus handle at front of shelf.

OUTLINE DRAWING

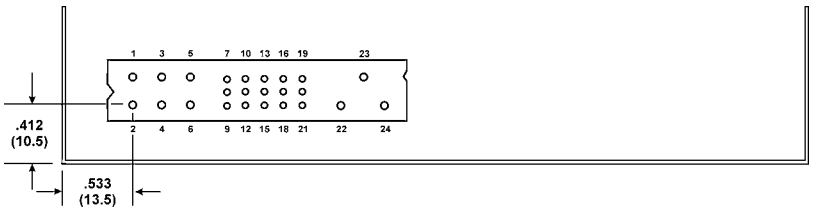


NOTE: Chassis mount units (see note 4 below model selection table on first page) are supplied without the extraction handle and locking bracket.

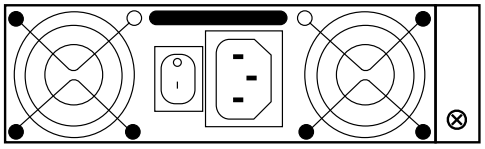
PIN CONNECTIONS			
PIN	**FUNCTION**	**PIN**	**FUNCTION**
1	+V Out [1]	13	Module Present
2	+V Out [1]	14	DC Good/GA1 [3]
3	+V Out [1]	15	AC Good
4	V Return [1]	16	V Trim
5	V Return [1]	17	Overtemp. Warning/GA0 [3]
6	V Return [1]	18	Current Share
7	Enable [2]	19	Current Monitor/GA2 [3]
8	Sense +Ve	20	+5V Standby
9	Sense -Ve	21	Standby Return
10	Inhibit	22	Chassis Ground
11	Spare/SDA [3]	23	AC Line
12	Spare/SCL [3]	24	AC Neutral

NOTES:
1. For proper operation all +V out pins must be connected together and all V Return pins must be connected together.
2. For unit to operate, pin 7 must be at logic LO or shorted to pin 9.
3. These pins provide the I²C functions when option -Z is present. Pin 21 must be connected to pin 9 for I²C operation.

REAR VIEW



FRONT VIEW (TPCMx000E)



ALL DIMENSIONS IN INCHES (mm).

I²C SERIAL BUS SPECIFICATIONS

Three forms of data are available via the I²C 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 I²C that has been utilized in **Radian** 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.

I²C 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 **Radian** modules to be addressed on a single I²C 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 I²C 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 I²C interface as used in **Radian** 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.

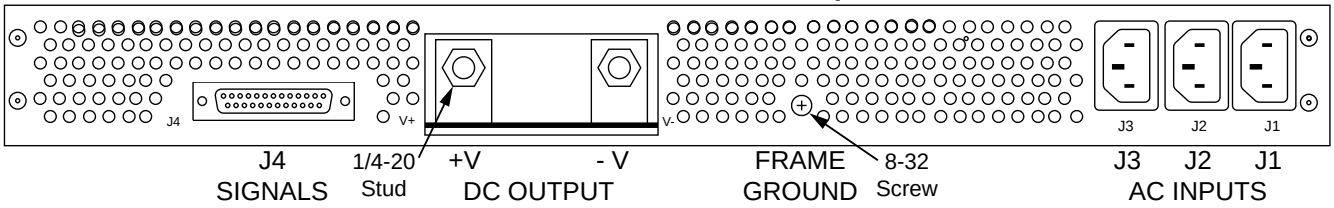
MAX6633 slave address

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

SPECIFICATIONS, RACKS/SHELVES

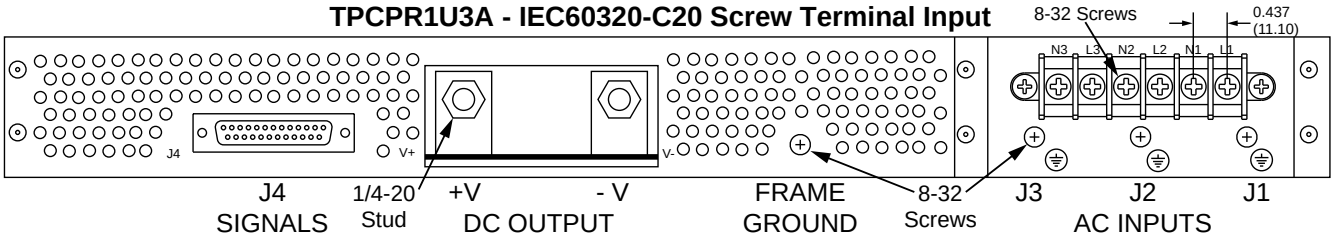
REAR PANEL DETAIL

TPCMR1U3 - IEC60320-C13 Input

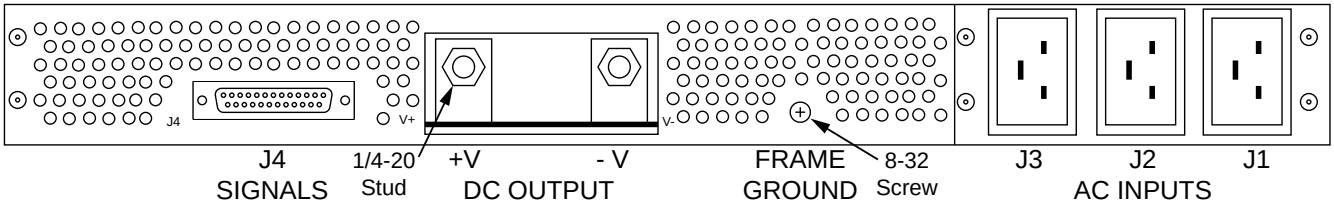


USE WITH TPCM & RPCM

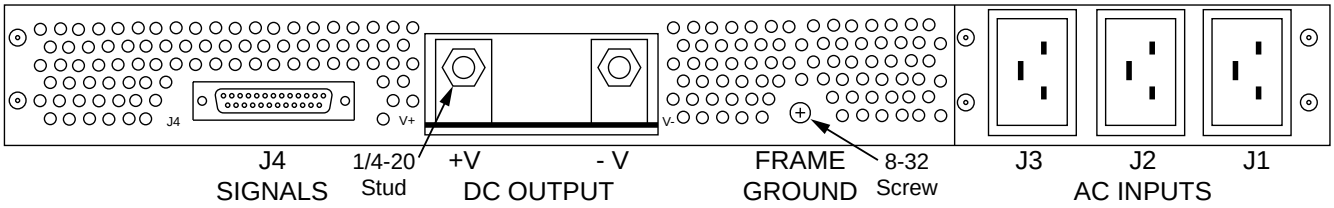
TPCPR1U3A - IEC60320-C20 Screw Terminal Input



TPCPR1U3B - IEC60320-C20 Input



TPCPR1U3C - IEC60320-C20 Filtered Input (extended chassis depth)



USE WITH TPCP, RPCP & RPCQ

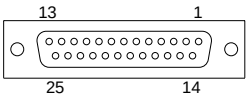
WEIGHT
12.1 lbs. (5.5Kg)

NOTES:
1. All electrical connections are made to the rear of the rack. There is one AC inlet for each module. Connector J1 goes to module A, connector J2 to module B and connector J3 to module C.
2. Module A is on the left, module B in the center and module C on the right as seen from the rack front.
3. The outputs of all modules are connected in parallel in the rack.
4. Output terminals are on 1/4-20 Studs.
5. The input voltage range is 85-264 for maximum power in either redundant or non-redundant operation.
6. The Module Present outputs (J4 pins 20, 21 and 22) are grounded (to -Sense) when the module is plugged in and open when the module is out.
7. Protective covers are provided as standard for the DC output terminals and the input terminal block inputs.
8. For HVDC input applications TPCPR1U3A should be used.

J4 CONNECTION DETAILS

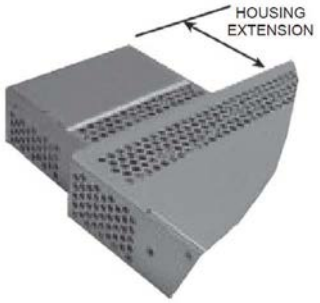
SIGNAL CONNECTOR - J1			
PIN	**FUNCTION**	**PIN**	**FUNCTION**
1	Inhibit	14	AC Power Fail - A
2	Overtemp. Warning - A[1]	15	DC Power Good - A[1]
3	Current Monitor - A	16	AC Power Fail - B
4	Overtemp. Warning - B[1]	17	DC Power Good - B[1]
5	Current Monitor - B	18	AC Power Fail - C
6	Overtemp. Warning - C[1]	19	DC Power Good - C[1]
7	Current Monitor - C	20	Module Present - A
8	5V Standby[2]	21	Module Present - B
9	SDA	22	Module Present - C
10	Current Share	23	Sense -Ve
11	Sense +Ve	24	Remote Adjust - A
12	Remote Adjust - B	25	Remote Adjust - C
13	SCLK		

25-way D-type Socket



NOTES:
1. These pins are open when the I²C option is fitted.
2. Referenced to Sense -Ve.

EXTENSION DETAIL (TPCPR1U3C SHOWN)



SHELF DIMENSIONS

MODEL NUMBER	HEIGHT	WIDTH	HOUSING EXTENSION	TOTAL DEPTH
TPCMR1U3	1.72" (43.7mm)	17.19" (437mm)	1.10" (27.9mm)	12.66" (332mm)
TPCPR1U3A			1.10" (27.9mm)	12.66" (332mm)
TPCPR1U3B			1.59" (40.4mm)	13.15" (334mm)
TPCPR1U3C			3.32" (84.3mm)	14.88" (378mm)

Front panel to back panel depth is 11.56 inches (294mm).
Supplied with mounting kits for 19" and 23" relay racks / cabinets.

SHIPPING WEIGHTS
Shelf: 15.0 lbs. (6.8Kg)
Modules: 8.0 lbs. (3.6Kg)

SHIPPING DIMENSIONS
Shelf: 22" (559mm) x 22" (559mm) x 3" (76mm)
Module: 15" (381mm) x 7" (178mm) x 5" (127mm)

MAXIMUM OUTPUT CAPACITY

TPCMR1U3

3 MODULES NON-REDUNDANT			3 MODULES REDUNDANT		
VOLTAGE	CURRENT	POWER	VOLTAGE	CURRENT	POWER
12V	150.0A	1800W	12V	108.4A	1300W
24V	87.5A	2100W	24V	58.3A	1400W
48V	50.0A	2400W	48V	33.3A	1600W

TPCPR1U3

3 MODULES NON-REDUNDANT			3 MODULES REDUNDANT		
VOLTAGE	CUR-RENT	POWER	VOLTAGE	CUR-RENT	POWER
12V	150.0A	1800W	12V	133.3A	1600W
24V	125.0A	3000W	24V	83.3A	2000W
48V	75.0A	3600W	48V	50.0A	2400W

ALARM & COMMUNICATIONS ADAPTORS

RELAY ALARM ADAPTOR	**Part No.: 009-1005-0000 009-1011-0000 (with voltage trim)**	**Datasheet WEB Link**	**Notes**
	Plugs directly into the 25 way D-Type signal connector J4 on the rack/shelf and converts the DC good signal for each power 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. Part No. 009-1011-0000 includes an output voltage trim facility.	PDF	
SNMP ALARM TRAP ADAPTOR	**Part No.: 009-1006-0000**	**Datasheet WEB Link**	**Notes**
	Plugs directly into the 25 way D-Type signal connector J4 on the rack-shelf and monitors the 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.	PDF	MIB files (.exe) Setup guide
MODULE EVALUATION BOARD	**Part No.: 009-3850-0000**	**RADIAN Manual WEB Link**	**Notes**
	Plugs directly into the Radian module connector to provide industrial connections for testing and evaluation. Provides AC in and DC out plus alarm connections. 2 LEDs: AC good, DC good.	PDF	See page 14 Fig. 5 for details.

AC CORDS & DC CABLE KITS

TPCMR1U3	**AC LINE CORDS - 120V 15A** **Part No.: 364-1412-0000**	**NEMA 5-15**	**IEC-C13**
	One cord per power module for **TPCMR1U3** shelf. Cord length 6ft (1.83m)		
	AC LINE CORDS - 240V 15A **Part No.: 364-1414-0000**	**NEMA 6-15**	**IEC-C13**
	One cord per power module for **TPCMR1U3** shelf. Cord length 6ft (1.83m)		
	AC LINE CORDS - 120/240V 15A **Part No.: 364-1421-0000**	**ROJ-LEADS**	**IEC-C13**
	One cord per power module for **TPCMR1U3** shelf. Cord length 6ft (1.83m) REQUIRES CUSTOMER SUPPLIED PLUG		
TPCPR1U3B & C	**AC LINE CORDS - 120V 20A** **Part No.: 364-1416-0000**	**NEMA 5-20**	**IEC-C19**
	One cord per power module for **TPCPR1U3B** or **TPCPR1U3C** shelf. Cord length 8ft (2.44m)		
	AC LINE CORDS - 240V 20A **Part No.: 364-1413-0000**	**NEMA 6-20**	**IEC-C19**
	One cord per power module for **TPCPR1U3B** or **TPCPR1U3C** shelf. Cord length 8ft (2.44m)		
	AC LINE CORDS - 120/240V 20A **Part No.: 364-1422-0000**	**ROJ-LEADS**	**IEC-C19**
	One cord per power module for **TPCPR1U3B** or **TPCPR1U3C** shelf. Cord length 8ft (2.44m) REQUIRES CUSTOMER SUPPLIED PLUG		
	IEC CONNECTOR - 120/240V 20A **Part No.: 354-1716-0000**	**IEC-C19**	
	Wireable free connector for **TPCPR1U3B** or **TPCPR1U3C** shelf.		
	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. Single hole both ends. Hole size 0.25”, tongue width 0.55”.		
	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. Single hole both ends. 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. Single hole one end, two hole one end. Hole size 0.25”, tongue w = 0.55”, spacing 0.625”		
	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. Single hole one end, two hole one end. Hole size 0.25”, tongue width 0.55”, spacing 0.625”		
	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. Two hole both ends. Hole size 0.25”, tongue width 0.55”, spacing 0.625”		
	2-POST ADAPTOR **Part No.: 775-1495-0000**		
	Attaches to DC output bus bars to provide two post termination compatible with above 3 DC cable kits.		

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