ICS Regent+Plus®

PD-6050

High Integrity Power Supply Assembly

110-240 VAC and 24 VDC
(T8060, T8062)

Issue 2, March, 06

The power supply assembly (see Figure 1) converts redundant main-line voltages of either 110-240 VAC or 24 VDC to +15 VDC or +24 VDC output power for ICS product power requirements.

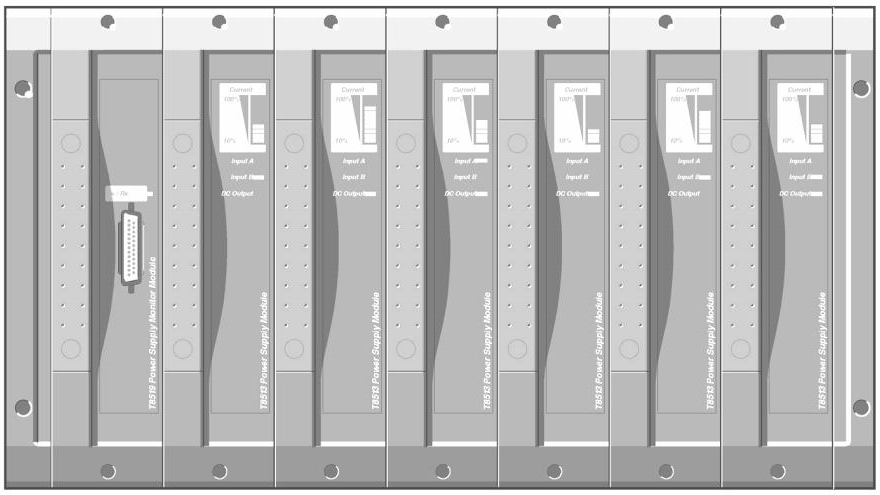


Figure 1. Power Supply Assembly

Features

- Redundant power inputs
- 250 W
- Hot replaceable
- Current sharing
- Power factor correction
- Front panel indicators for input, output voltage status and output current level on each module
- External status signals
- TÜV certified for safety, Risk Class 5

Structure

The power supply assembly consists of a power supply chassis containing up to six power supply modules. The chassis may be configured to distribute power in various combinations. For example, a chassis containing six power supply modules may be set up with three modules providing triplicated power for Regent+Plus I/O assemblies and three modules providing field power in a N+1 configuration.

Power Supply Chassis

The power supply chassis houses a maximum of six power supply modules. It may be mounted in a 19-inch rack or flush mounted on a panel. Table 1 identifies the available types of chassis.

Table 1. Chassis Types

Catalog No.	Chassis Unit	Input Power Voltage	Configuration
T8200	I/O Power Supply Chassis	110-240 VAC, 50/60 Hz	Straight Bussed
T8201	I/O Power Supply Chassis	110-240 VAC, 50/60 Hz	Cross Bussed
T8202	I/O Power Supply Chassis	24 VDC	

Power Supply Modules

The power supply assembly modules are single (if redundant inputs are not required) and dual input, hot swap, user-replaceable AC and DC units. Table 2 identifies the available types of modules.

Table 2. Module Types

Catalog No.	Input Type	Input Power Voltage	Output Power Voltage
T8220	Dual	110-240 VAC	15 VDC
T8222	Dual	24 VDC	15 VDC
T8223	Single	110-240 VAC	24 VDC
T8224	Single	110-240 VAC	15 VDC
T8225	Dual	110-240 VAC	24 VDC
T8226	Dual	24 VDC	24 VDC

The dual inputs on the AC modules are galvanically isolated from each other. The inputs on the DC modules are diode isolated and share a common return.

Input Power Regulation

A block diagram of a typical dual AC input I/O power supply module is shown in Figure 2. A block diagram of a typical dual DC input I/O power supply module is shown in Figure 3.

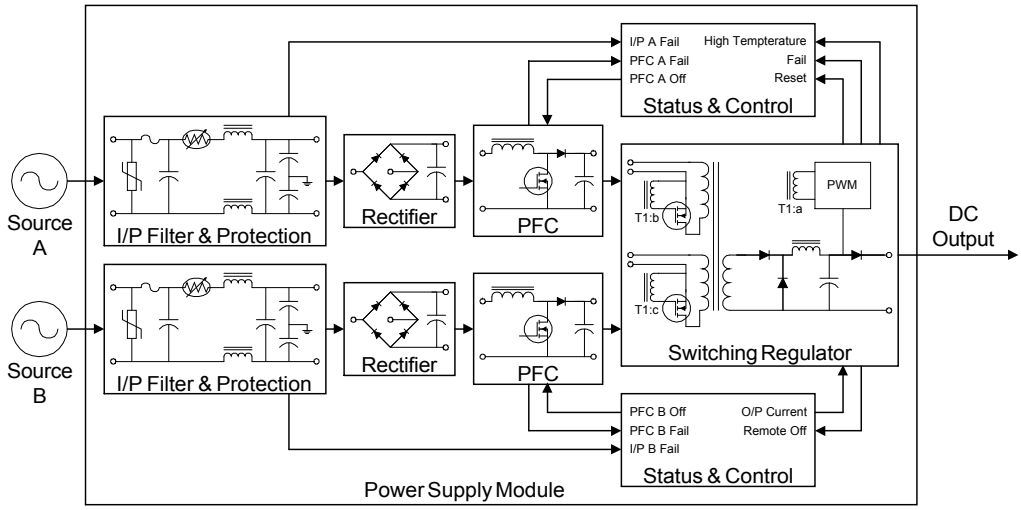


Figure 2. Block Diagram of an AC I/O Power Supply Module

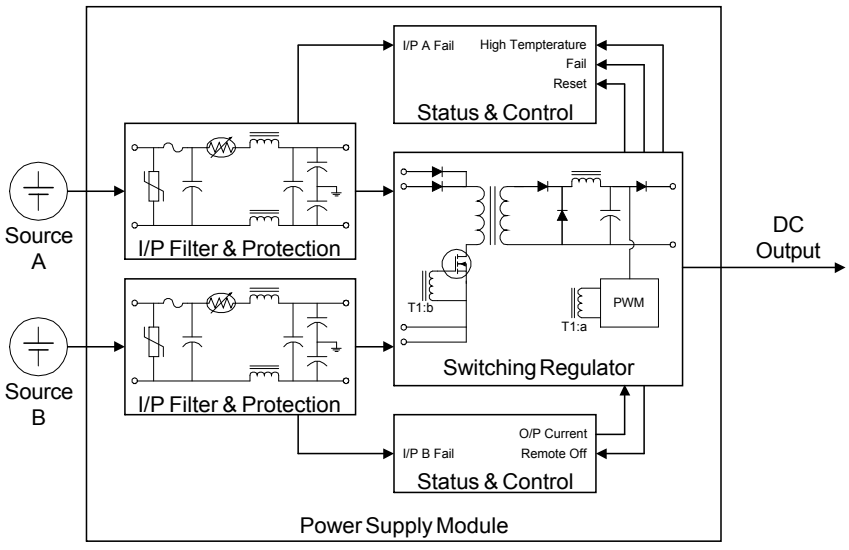


Figure3. Block Diagram of a DC I/O Power Supply Module.

Each primary power input is individually fused and filtered with both standard line filters and metal oxide varistors (MOVs). The filters attenuate any high-frequency common mode and normal mode noise present in the power distribution system. The MOVs clamp high-voltage transients.

Filter, rectifier, and power factor correction circuits convert primary AC input power to bulk DC voltage. The switching regulator converts bulk DC power to regulated DC output voltage. Sensing, status, control, and timing circuits provide for the following:

- **Input power failure** - Active low status output. Indicates when the input voltage is below 85 VAC or 18 VDC. There is a separate signal for each input.
- **Bulk power failure** - Active high status output on AC input modules only. Indicates the DC bulk voltage (PFC output) is outside the specified range. There is a separate signal for each input.
- **High-temperature warning alarm** - Both an active high and active low status output are provided. Indicates the module temperature exceeds 75°C. The temperature is sensed near the air inlet (bottom) of the module.
- **High-temperature shutdown** - Internal signal that will shut down the switching regulator if module temperature is above 85 °C. The temperature is sensed near the air inlet (bottom) of the module.
- **Output overvoltage** - Internal signal that will shut down the switching regulatorif the output voltage exceeds +18 VDC or +28 VDC for 15 volt and 24 volt modules respectively. Over-voltage protection circuitry activation is a permanent error condition, requiring manual intervention to return module to normal operation.
- **DC output fail** - Active high status output indicates the DC output voltage has gone out of regulation. The DC output fail threshold is 13.75 VDC and 21.75 VDC (±0.25 VDC) for the 15 and 24 volt module respectively.
- **Output current limiting** - Internal signal limits output current in excessive current demand situations.

- **POWER FAIL** - Active high status signal that indicates impending loss of output power due to one of the following:

- Both inputs have indicated power failure
- Remote off control signal activated
- Thermal shutdown
- Output overvoltage

- **RESET** - Active high status signal that is generated a minimum of 10 ms (AC input module) or 0.5 ms (DC input module) after a POWER FAIL signal. RESET remains asserted for 200 ms (minimum) after module power-up.

- **PFC off** - Active low input that turns off the power factor correction of an individual input. This signal provides the capability to test the input circuitry of a module by turning off each input independently while monitoring the module fail signal

- **Remote off** - Active low input that turns off the output power of a module.

Note: Bulk Power Fail, PFC Off and Remote Off are accessed through the monitor module connector on the chassis backplane. The monitor module connector allows for a future development of a monitor card that would provide remote control and enhanced monitoring of the power supply chassis.

Active low signals are not maintained while RESET is active. All status signals are open collector and require external pull-up resistors.

RESET is used in the Regent I/O transceivers for power system interlocking within the I/O system. A power failure (either input power or module fault) activates RESET and turns off the DC output front panel indicator.

The POWER FAIL and RESET signals are required for proper operation of Regent I/O transceivers and I/O modules during power up, power down, and loss of power. Refer to **Assembly Installation** for details on how to connect these signals to a Regent I/O chassis.

Front Panel Indicators

The front panel of each I/O power supply module contains the following indicators:

- **Input Power Voltage Indicator**

  Each green INPUT POWER indicator is lighted when the associated input (Input A, Input B) is above the lower input voltage threshold.

- **Output Power Display**

  The 10-segment LED indicator bar displays the approximate output current level percentage (0 - 100%)

- **Output Power Indicator**

  The DC Output indicator is lighted when the I/O power supply module's DC output is within tolerance. Out-of-tolerance conditions, loss of input power or brown-out, and module failures turn off this indicator.

Installation

Chassis Mounting

Figures 4 and 5 show the front and rear views of the power supply chassis.

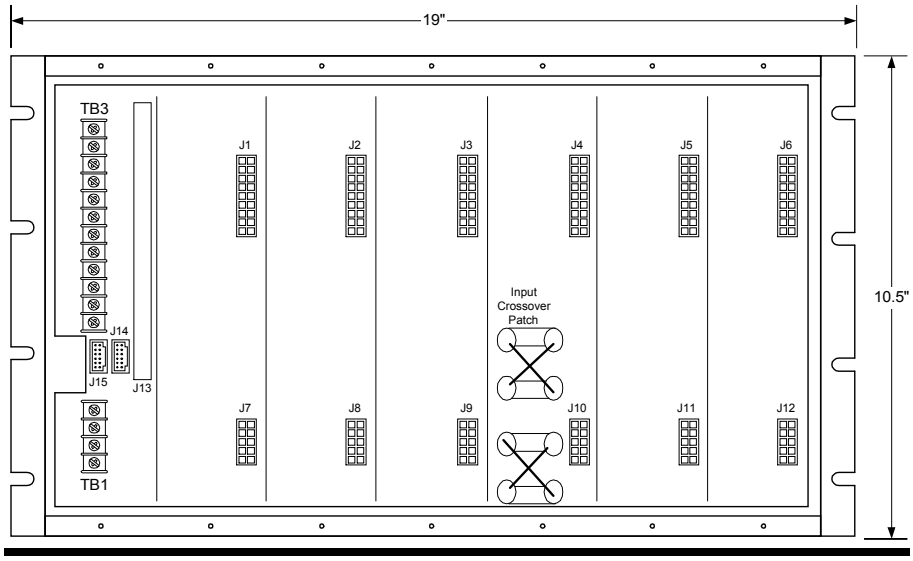


Figure 4. Power Supply Chassis Front View

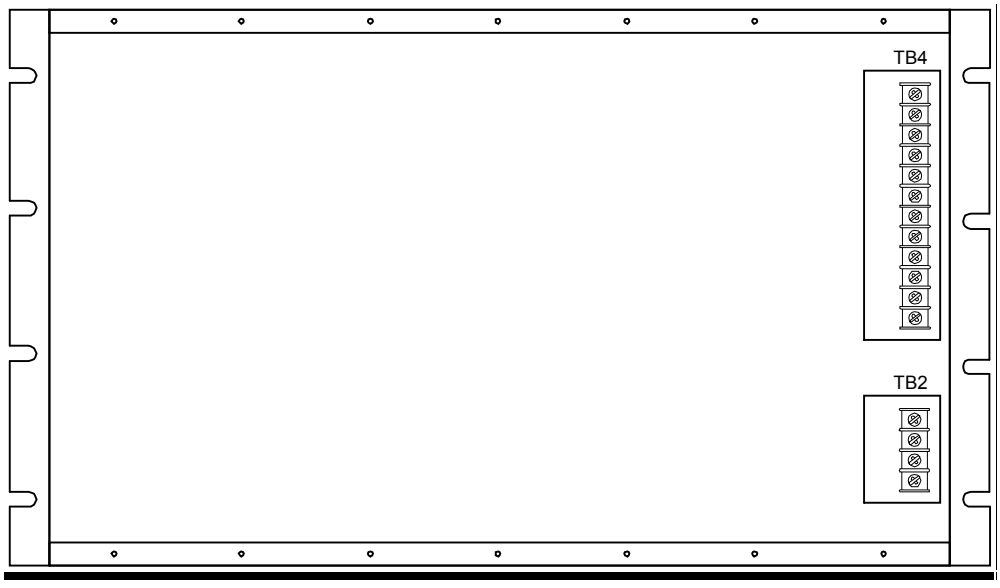
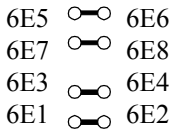
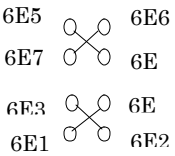


Figure 5. Power Supply Chassis Rear View

Mounting flanges can be attached to either the rear or the front of the chassis. This allows flush mounting the chassis to a panel or mounting in a 19-inch rack.

The input crossover patch is on the T8200 chassis only.

Input Crossover Patch configured for no crossover, source 1 and source 2 are connected to input A and input B respectively for all modules slots.	
Input Crossover Patch configured to swap source 1 and source 2 for modules slots 4 through 6. Source 1 and source 2 are connected to input A and input B respectively for slots 1-3. Source 1 and source 2 are connected to input B and input A respectively for slots 4-6.	

Backplane Versions and Module Keying

Connector placement on AC input modules and backplanes differ from DC modules and backplanes. This prohibits insertion of the wrong input module type into a backplane.

Module slots in a chassis can be individually keyed to only accept a module of an particular output voltage.

Input Power Terminals: TB1, TB2 (#8 screw terminals)

Terminal No.	T8200	T8202	Source
1	N	DC-	B
2	L	DC+	
3	N	DC-	A
4	L	DC+	

Output Power Terminals: TB3, TB4 (#6 screw terminals)

Terminal No.	Module Slot	T8200, T8202
12	6	+ DC Output
11	5	
10	4	
9	3	
8	2	
7	1	
6	1-6	DC Return (terminals 1-6 are Connected together on Backplane)
5		
4		
3		
2		
1		

Status Connectors: J14, J15

Type: 10 pin Shrouded Header, Double-Row, 0.100 x 0.100 Centers

Mfg.: AMP P/N: 102618-3

Mating Connector: AMP 87631-5

Pin Out:

Pin	J14		J15	
	Slot	Signal	Slot	Signal
1				
2	All	Input 'A' Fail		
3	All	Input 'B' Fail		
4	All	Hi Temperature		
5	1	Reset	4	Reset
6	1	Power Fail	6	Reset
7	2	Reset	4	Power Fail

8	3	Power Fail	6	Power Fail
9	2	Power Fail	5	Power Fail
10	3	Reset	5	Reset

Monitor Connector: J13

Type: 72 pin Edge Connector, 0.125" centerline

Mfg.: AMP

Mfg. P/N: 1-530844-9

Pin Out: TBD

Configuration

Current Sharing

The modules are capable of current sharing by connecting their outputs together in parallel. This can be done external to the chassis or by using a shorting bar that mounts directly to the output terminals on the chassis backplane. This allows separate groups of modules from within a single chassis to have their outputs configured as: Single, Dual or N+1. The module uses a passive "droop" method of current sharing and will share to within 25% of the rated load.

Regent Power Supply Load Units

When using the power supply system with Regent and Regent+Plus , power supply loading is based on the number of I/O modules in the I/O chassis and the load imposed by each I/O module. Load units for each I/O module are shown in that module's product description and specification sheet under the **Safetybus Power** heading. A set of three power supply modules will provide the following load units:

Available Load Units (for a set of 3 power supplies)

Number of I/O Units (Chassis):	1	2	3	4
Load Unit Capacity:	82	78	74	70

Calculating the number of load units in your system helps you to determine the number of I/O power supplies your system needs. For economic power distribution, and to avoid overloading individual power supply units, calculate power supply loading when configuring systems.

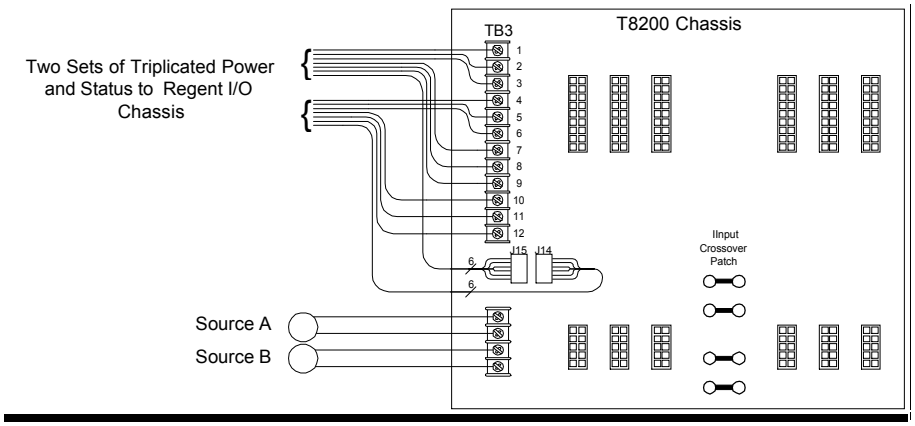
Regent I/O Triplicated Power Distribution

A chassis can contain two sets of triple-redundant power supplies for Regent I/O. Each of the triple-redundant I/O power supply modules within the I/O power supply chassis provides power for one leg of the three redundant legs of the I/O Safetybus transceivers, and provides power to all the I/O modules within its associated I/O chassis. Each I/O module contains a diode OR power-sharing circuit that receives power from all three I/O power supply modules.

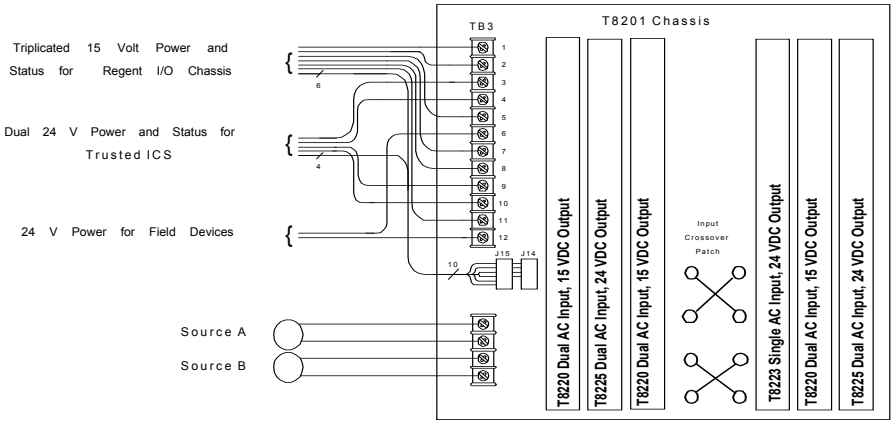
Should any I/O power supply module fail, only one leg of the transceiver modules loses power: the two remaining legs maintain proper Regent operation. In addition, all the I/O modules continue to operate properly by drawing their current from the two remaining power supplies within the I/O power supply assembly.

I/O transceivers and I/O modules require power fail and reset status signals for proper operation.

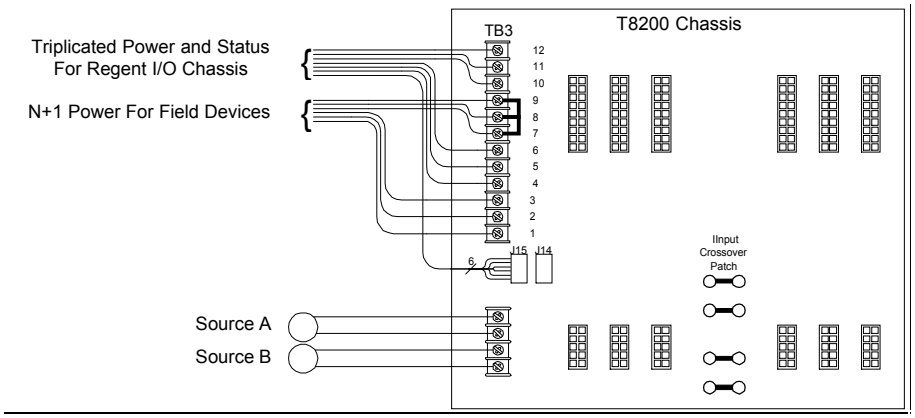
Sample Chassis Configurations



Two Sets of Triplicated 15 V Regent Power



Triplicated 15 V Regent and Redundant 24 V Trusted ICS Power



Triplicated 15 V Regent and 24 V N+1 Field Power

Maintenance

No periodic maintenance or calibration is required for I/O power supply modules. There are no user-replaceable parts.

A failed I/O power supply module can be hot-replaced without disrupting system operations. Main power wiring and I/O power cables (connected to the chassis) are not disturbed during module replacement.

Safety Considerations

TÜV The power supply modules and chassis are TÜV certified for Risk Class 5 safety critical applications.

Specifications

Voltage Range	
T8220, T8223, T8224, T8225	85 to 264 VAC
T8222, T8226	20 to 30 VDC
Frequency Range	
T8220, T8223, T8224, T8225	47 to 63 Hz
Inrush Current (120/260 Vac)	
T8220, T8223, T8224, T8225	20/40A (peak) Cold, 35/65A (peak) Hot
Power Factor	0.95 min.
Efficiency	70%
Use with Chassis	
T8220, T8223, T8224, T8225	T8200
T8222, T8226	T8202
Fusing (Internal to module)	
T8220, T8223, T8224, T8225	6A, 250 V, 3AG Slow Blow
T8222, T8226	20 A, 250 V, 3AB Slow Blow
Output Voltage	
T8220, T8223, T8224, T8225	+15 volts
T8222, T8226	+24 volts
Output Power	250W, per module
Power Hold-up Time	
T8220, T8223, T8224, T8225	20 msec, minimum
T8222, T8226	1 msec, minimum
Operating Temperature	
Natural Convection	-20° to 50° C
Forced Air (>20 lf/min)	-20° to 70° C
Storage Temperature	-40° to 85° C (-40° to 185° F)

Specifications (Continued)

Operating Humidity	0 to 95% relative humidity, non-condensing
Vibration	
10 to 55 Hz:	±0.15mm
Shock	
Operating:	15 g, ½ sine wave, 11 msec
Electromagnetic Interference	
• IEC 801 Part 2 - Electrostatic Discharges	Level 3: Contact discharge of 6 kV
• IEC 801 Part 3 - Radiated Electromagnetic Fields	Level 3: 10 V/M, 27 MHz - 500 MHz
• IEC 801 Part 4 - Transients and Bursts	Level 4: 2 kV, 2.5 kHz for t = 60 sec
• IEC 801 Part 5 - Surge Immunity	Level 3: 2 kV
• ANSI/IEEE C37.90 - Surge Withstand Capability	2.5 kV damped 1 MHz sine wave 4 kV bi-directional impulse, 10 nsec rise time, fast transient
Safety	Certified to DIN V VDE 0801 for Risk Class 5. Also designed to meet UL 508 and CSA 22.2, No. 142-M1981
Module Dimensions	
Height:	10.47" (266 mm)
Width:	2.38" (61 mm)
Depth:	12.5" (318 mm)
Chassis Dimensions	
Height:	10.47" (266 mm)
Width:	19" (483 mm)
Depth:	13.5" (343 mm)

Module Weight	6.9 lbs (3.2 kg)