



# ICS Regent®

PD-6008

## I/O Power Supply Modules

110 VAC, 220/240 VAC and 24 VDC  
(T3510, T3511 and T3512)

Issue 1, March, 06

I/O power supply modules convert main line voltages of either 110 VAC, 220/240 VAC or 24 VDC to +15 VDC power that is used to drive the I/O assembly (I/O chassis, I/O modules, and I/O transceivers).

Three I/O power supply modules installed in an I/O power supply chassis make up a triple redundant power supply unit.

### Features

- Three modules provide triplicated power to as many as four I/O assemblies.
- Hot replaceable.
- Front panel indicator on each module shows DC output status.
- TÜV certified for safety, Risk Class 5 (see Safety Considerations).

Failed I/O power supply modules can be hot replaced without interrupting system operation.

## Module Operation

### Triplicated Power Distribution

Each of the triple redundant I/O power supply modules within the I/O power supply assembly 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-





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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 will lose power: the two remaining legs will maintain proper operation of the Regent. In addition, all the I/O modules will continue to operate properly by drawing their current from the two remaining power supplies within the I/O power supply assembly.

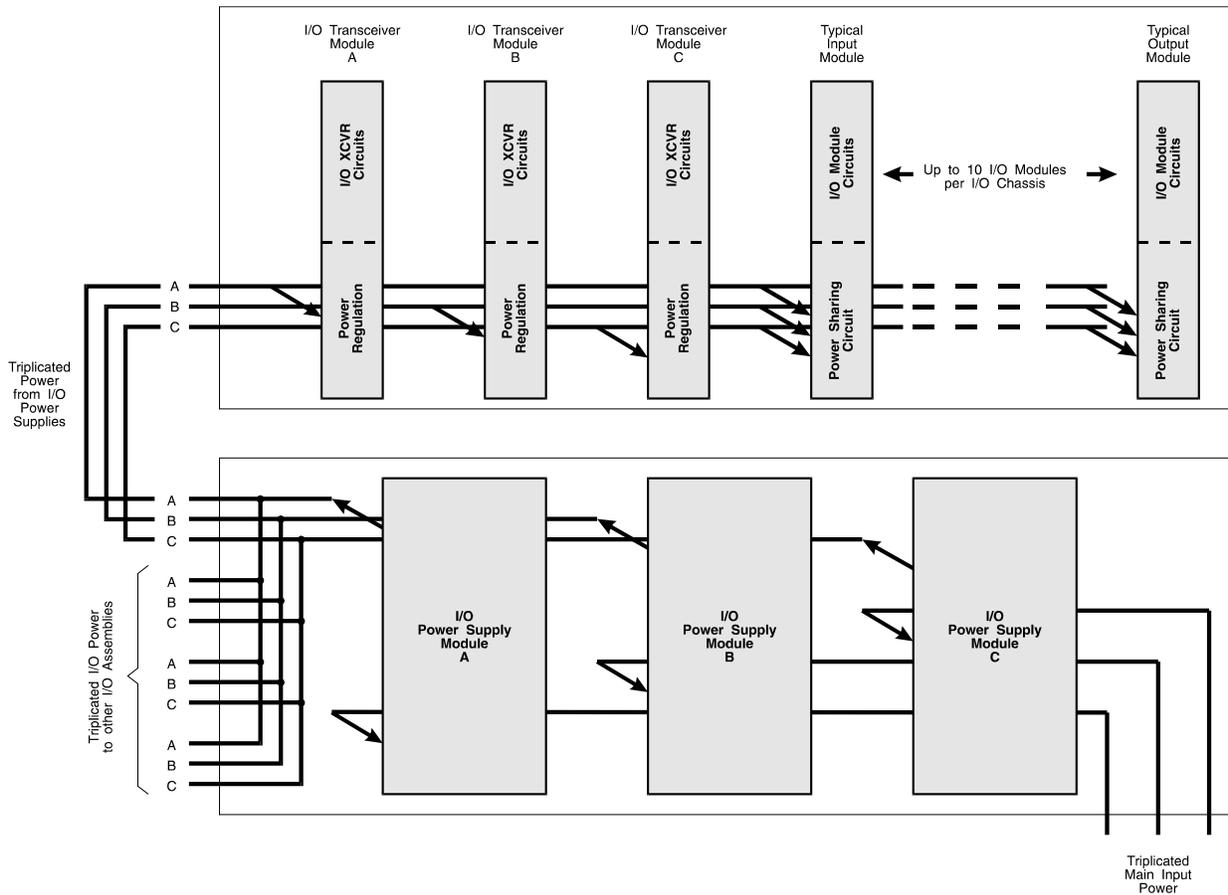
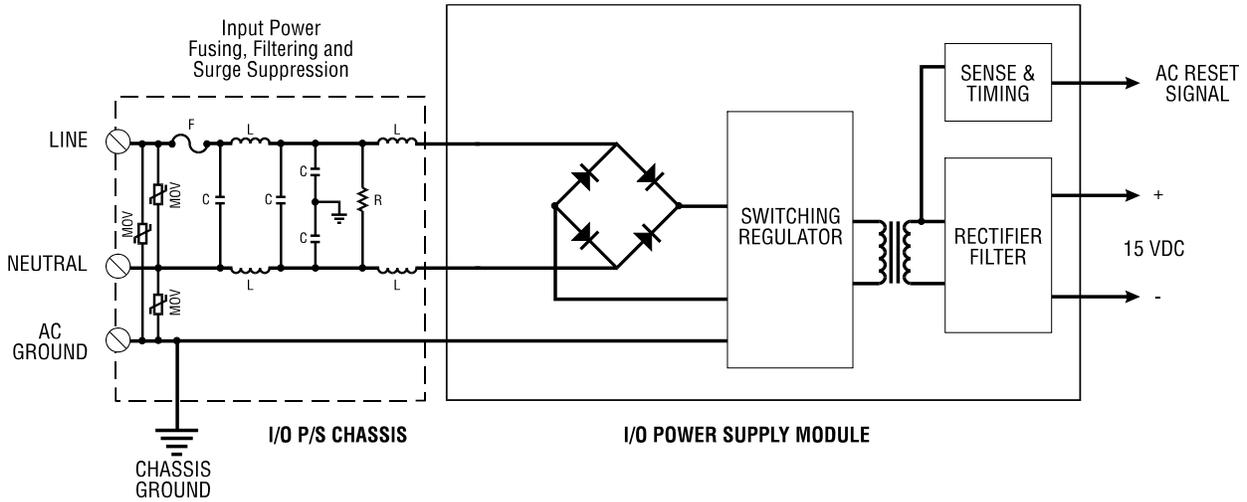


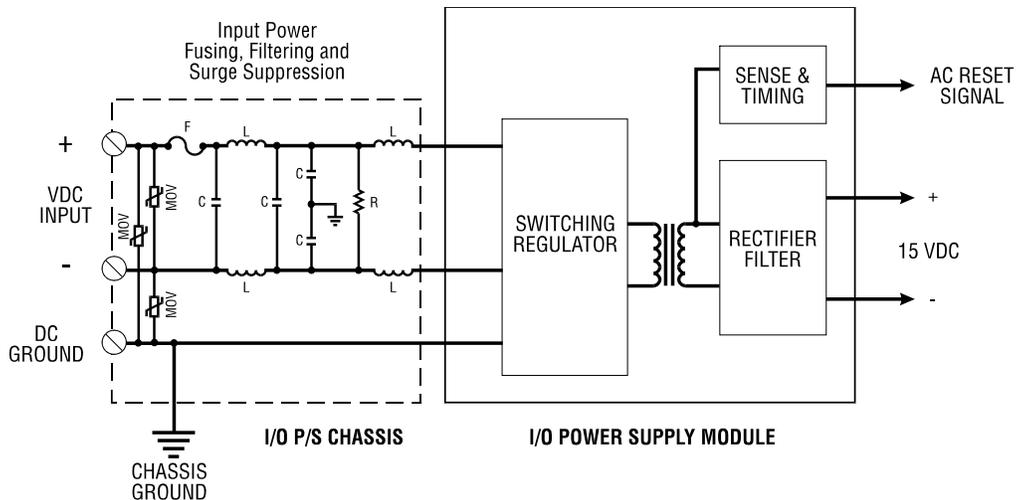
Figure 1. I/O Power Distribution.

### Input Power Regulation

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



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



**Figure 3. 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, or MOVs) at the chassis. The filters are used to attenuate high frequency common mode and normal mode noise that can be



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present in power distribution systems. The MOVs provide clamping of high voltage transients.

On board the power supply module the switching regulator and rectifier filter circuits convert the primary input power to 15 VDC. Sensing and timing circuits monitor for over-voltage, over-current (including current limiting), and power failure.

An AC reset signal is used in the I/O transceivers for power system interlocking within the I/O system. Should a power failure occur (either input power or module fault), the AC reset signal is activated and the front panel indicator is turned off.

### **Front Panel Indicator**

Figure 4 shows the physical features of the I/O power supply modules. The front panel of each module contains an output power indicator.

### **Output Power Indicator**

The green OUTPUT POWER indicator is turned on 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 will cause the OUTPUT POWER indicator to turn off.

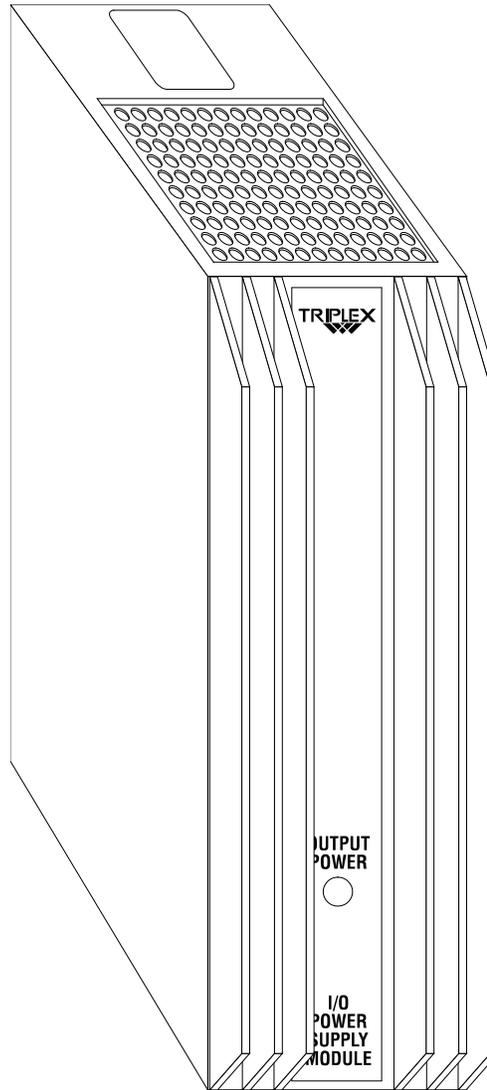


Figure 4. I/O Power Supply Module.

## Application

### Input Power Voltages

Before installing I/O power supply modules, always make certain that their input power voltage matches the voltage of the I/O power supply chassis. All the power supply modules on the chassis must also have the same voltage.



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Use Table 1 to verify voltage compatibility for your I/O power supply chassis and I/O power supply modules.

**Table 1. Matching Input Power Voltages.**

Input Power Voltage	I/O Power Supply Chassis	I/O Power Supply Module
110 VAC	T3500	T3510
220/240 VAC	T3501	T3511
24 VDC	T3502	T3512

## Power Supply Load Units

Power supply unit loading is based on the number of I/O modules in the 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 heading “Safetybus Power.” I/O power supply load units are shown on page 7, as “Available Load Units.”

Calculating the number of load units in your system will help you determine the number of I/O power supplies your system will need. For economic power distribution, and to avoid overloading individual power supply units, power supply loading should be calculated when configuring systems.

## Maintenance

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

When an I/O power supply module fails, it 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 T3510 (110 VAC) and T3512 (24 VDC) I/O power supply modules are TÜV certified for Risk Class 5 safety critical applications. Model T3511 (220 VAC) is excluded as it does



not meet the DIN VDE 0110 specification for creepage and clearance required by TÜV.

## Specifications

### Available Load Units

Number of I/O Units:	1	2	3	4
Load Unit Capacity:	52	48	44	40

### Voltage Range

T3510	85 to 132 VAC
T3511	170 to 263 VAC
T3512	20 to 30 VDC

### Frequency Range

T3510	47 to 63 Hz
T3511	47 to 63 Hz
T3512	—

### Maximum Load

250 VA, per module

### Heat Dissipation

22 Watts, 75 BTUs/hour

### Use with Chassis

T3510	T3500
T3511	T3501
T3512	T3502

### Fusing (on chassis)

T3510 (110 VAC)	4A, 250 V, 3AG Slow Blow
T3511 (220 VAC)	2A, 250 V, 3AG Slow Blow
T3512 (24 VDC)	10 A, 250 V, 3AB Slow Blow

### Output Voltage

+15 volts

### Power Hold-up Time

10 msec, minimum

### Operating Temperature

0° to 60° C  
(32° to 140° F)

### Storage Temperature

-40° to 85° C  
(-40° to 185° F)

### Operating Humidity

0 to 95% relative humidity,  
non-condensing

### Vibration

10 to 55 Hz:	±0.15mm
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## I/O Power Supply Modules (T3510, 11, and 12)

### **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

### **Dimensions**

Height: 13.0" (330 mm)  
Width: 4.12" (105 mm)  
Depth: 10.25" (260 mm)

### **Weight**

7.5 lbs (3.4 kg)