

MANUFACTURER DOCUMENT PACKAGE

# Manufacturer's Manual

Reference package for procurement and maintenance review

INVENSYS TRICONEX

## 8311

24 VDC POWER MODULE

Used with the applicable Tricon v9-v10 system configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official pages follow this cover with source pagination retained.

Invensys 9700077-012, February 2009

## Power Modules

Each Tricon Chassis is equipped with two Power Modules — either one is fully capable of running the controller at full load and rated temperature. Power Modules convert line power to DC power appropriate for all Tricon modules. Any combination of Power Module models can be used in Tricon systems.

For more information, see [Planning Power for a Tricon System on page 166](#)

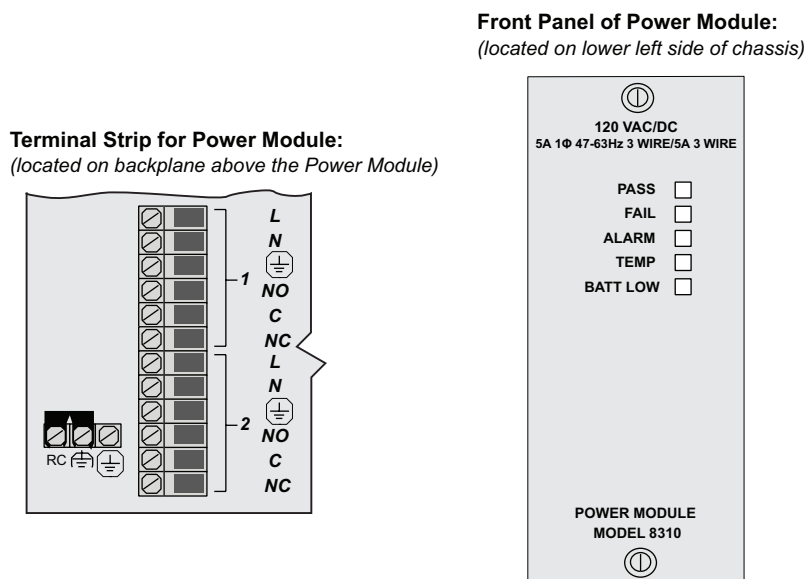
| Model | Power Module            |
|-------|-------------------------|
| 8310  | 120 VAC/DC Power Module |
| 8311  | 24 VDC Power Module     |
| 8312  | 230 VAC Power Module    |

The Power Modules, located on the lower left side of the chassis, convert line power to DC power appropriate for all Tricon controller modules. Two terminal strips on the backplane are used to select controller grounding options, and for incoming power and alarm connections.

Each Power Module provides an in-line, slow-blow fuse for each external power source, mounted inside the module. The module can be replaced without disconnecting any wiring by removing the module from the chassis. The fuse on the Model 8311 24 VDC Power Module is not removable. If this fuse fails, you must return the module to Triconex for fuse replacement.

Each Tricon controller Power Module is a field-replaceable unit that uses high-efficiency DC-DC converters. All models of Power Modules are protected against reverse connection of the DC inputs.

**Figure 13** shows the terminal strip and front panel for the Power Modules. The figure does not show the covers on the terminals for alarm applications, which are required for hazardous locations.



**Figure 13** Power Module Terminals and Front Panel

## 24 Volt Power Module Specifications

This table lists the specifications for model 8311, which is a 24 VDC Power Module.

**Table 5      8311 Power Module Specifications**

| Feature                                   | Description                                                                                                                                                                        |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Isolation                                 | 1000 VAC or 1500 VDC, Input to Output                                                                                                                                              |
| Recommended input voltage range           | 24 VDC, -15% to +20% (protected against reverse connection)                                                                                                                        |
| Extended input voltage range <sup>1</sup> | 19.2 to 36 VDC                                                                                                                                                                     |
| Low line on/off hysteresis                | 1.5 VDC minimum                                                                                                                                                                    |
| Input power required                      | 240 W minimum per power source                                                                                                                                                     |
| Input over-voltage clamp                  | 40 VDC                                                                                                                                                                             |
| Input current                             |                                                                                                                                                                                    |
| Steady-state                              | 5 amps typical, 10 amps maximum                                                                                                                                                    |
| In-rush                                   | 23 amps maximum @ 24 VDC (10 ms)                                                                                                                                                   |
| Input fuse rating and type                | 15 amps, time-delay                                                                                                                                                                |
| Output voltage                            | 6.5 VDC, $\pm 1\%$                                                                                                                                                                 |
| Output current                            | 27 amps maximum at 140° F (60° C) ambient, which is the air temperature measured at the bottom of the chassis                                                                      |
| Output power                              | 175 watts at 140° F (60° C) ambient                                                                                                                                                |
| Output over-voltage protection            | 115%, typical, recycle power to restart                                                                                                                                            |
| Output over-current limit                 | 110%, typical, auto restart                                                                                                                                                        |
| Output hold time @ 0 volts input          | 2.0 milliseconds minimum; 5.6 milliseconds typical                                                                                                                                 |
| Over-temperature warning sensor           | Temperature monitor trips when the internal power module temperature is greater than 181° F (83° C). Typically, this occurs at an ambient temperature of 140° F (60° C) or higher. |

- During normal operation, you should keep the input power within the recommended input voltage range. Operation in the extended voltage range is advisable only for short periods of time.  
Be careful to minimize input transients which are caused by the off/on switching of the redundant power source. Do not allow the power source to drop below the minimum input voltage (19.2 VDC) when its load increases to 100% of the Tricon controller power module requirements, or rise above the maximum voltage (36 VDC) when the load decreases to 40 to 60% of the Tricon controller power module requirements.  
For example, assuming minimal voltage losses to the input wiring and a power source of 24V  $\pm 5\%$ , the transient response to the power source should not exceed these limits.

| Typical Input Current Change | Maximum Input Voltage Deviation |
|------------------------------|---------------------------------|
| +6A/ms                       | -3.6 volts                      |
| -6A/ms                       | 10.8 volts                      |

## Power Module Installation

Each Tricon chassis (Main, Expansion, and RXM) includes two Power Modules, which can be any combination of models (8310, 8311, or 8312). Under normal circumstances, both Power Modules are active, and each contributes power to the Tricon controller; only the Pass and Status indicators are On. Either Power Module is capable of running the Tricon controller for an indefinite length of time.

If one of the Power Modules or its supporting power line fails, the second module increases its output to maintain power for the Tricon controller. If incoming power is interrupted or if one of the modules fails, its Fault indicator goes On. You can disconnect a failed Power Module from field power, remove it from the Tricon controller chassis, and replace it without shutting down the Tricon controller.

A minimum of 240 watts of incoming power is required for each Power Module in a chassis.

### CAUTION

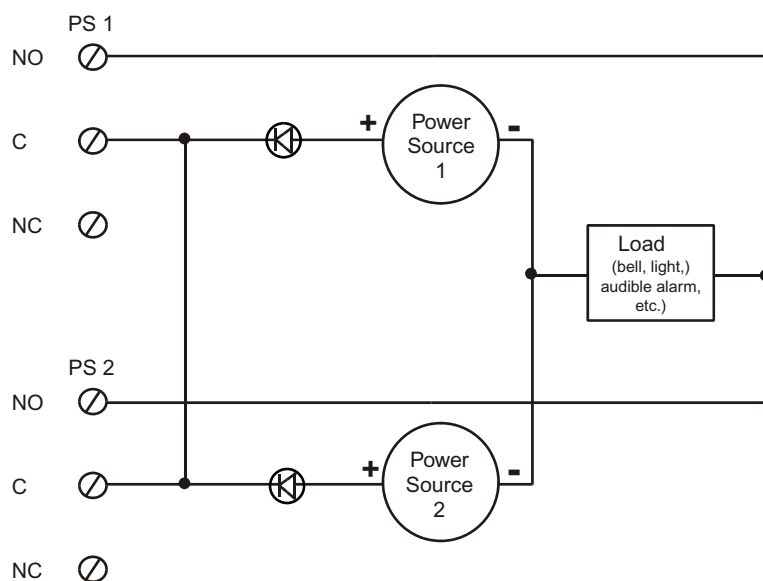
To maintain the security and integrity, source each Power Module separately, and provide independent circuit breakers or switches for each circuit.

## Alarm Circuitry on Power Modules

The alarm circuitry on each Power Module operates independently. You should wire the warning system in a dual-redundant configuration, so that activation does not depend upon power from only one power source. This figure provides an example of this type of wiring.

### WARNING

Do not use alarm contacts in hazardous locations.



**Figure 73** Alarm Sample Wiring

For specifications, see [Power Modules on page 33](#).

## Wiring to Separate Power Source

To ensure the advantages of dual redundant and independent Power Modules, each Power Module should be wired to a separate power source. Wiring to a separate power source permits the replacement of one Power Module, without interrupting field power to the other, so that the Tricon controller can continue operations without a break in service.

The terminals for incoming power and alarm applications are on the backplane above the Power Modules.

Each independent power source, equipped with its own fuse and switch, can be shared by multiple Tricon controller chassis. You should connect every chassis to two independent power sources.

## Wiring to a UPS

In critical applications, it is best to connect at least one Power Module to an Uninterruptible Power Supply (UPS) which can be shared by multiple Tricon chassis. The UPS must be rated for the total number of chassis to be powered, and for the duration of the maximum expected down time.

## Supply Wiring Specifications

Supply wiring should be sized according to applicable local electrical codes, taking into account the current ratings (as specified in [120 Volt Power Module Specifications on page 36](#)), temperatures, wiring lengths, and other applicable considerations.



Do not operate the Tricon controller without a safety earth.

## Alarm Wiring

Each system includes two sets of redundant alarm contacts, one per Power Module, that can be specified as needed. Typically, alarm wiring is connected to a local or remote annunciator. These devices can be wired in parallel with the alarm wiring so that the designated alarm goes off whenever either Power Module signals an alarm condition.



Do not use alarm contacts in hazardous locations.

These are the alarm contacts:

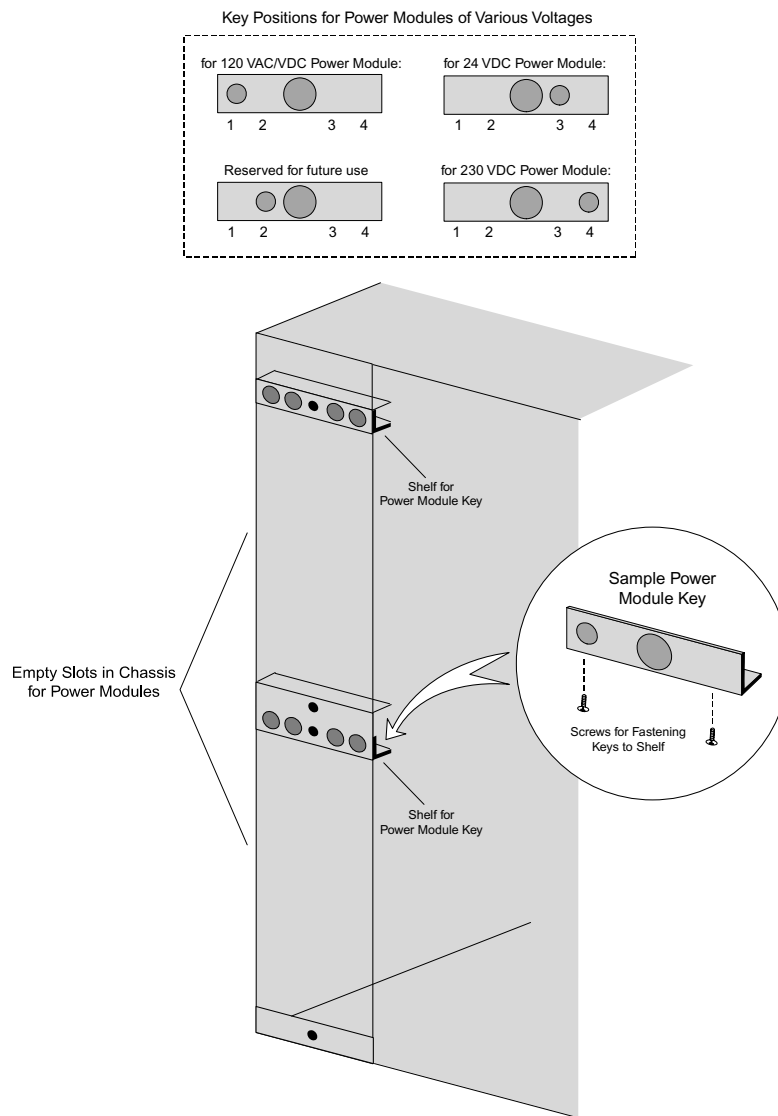
- Normally open contact
- Common
- Normally closed contact

## Installing Power Module Keys

Each Power Module slot is fitted at the top with a key that allows only one type of module to be installed. If you replace the installed Power Modules with a different voltage model, you must install the appropriate keys for the new modules. To do so, remove the screws for the existing keys and pull the keys off their shelves. Then place each new key onto its shelf, insert the two screws, and screw them upward from the bottom of the shelf.

**Table 72** Power Module Key Positions

| Model | Module Name              | Top Key |
|-------|--------------------------|---------|
| 8310  | 120 VAC/VDC Power Module | 001     |
| 8311  | 24 VDC Power Module      | 003     |
| 8312  | 230 VAC Power Module     | 004     |



**Figure 75** Power Module Key Positions

## Replacing Power Modules

This procedure explains how to replace a Power Module. Before taking any action, keep in mind that the alarm contacts on the lower left side of the backplane may be wired to a beacon or audible alarm to alert maintenance personnel that a problem has arisen.

When servicing or replacing a single Power Module, you do not need to interrupt the control process.

Incoming power should be rated for a minimum of 240 watts per power source. The minimum power consumption of a Tricon controller chassis with three Main Processors and one Power Module is 50 watts. Additional power consumption is based on the I/O and communication modules installed in the chassis.

Wiring should be sized according to applicable local electrical codes, taking into account the current ratings, temperatures, wiring lengths, and other applicable considerations. For specifications, see [Power Modules on page 33](#).



- If a power module fails in an ATEX application, you *must* replace it immediately. If you cannot replace the failed module, you must shut down the Tricon. A Tricon with a failed power module can be running *only* in a location that is known to be free of ignitable gas concentrations. Power module failure is indicated on the Tricon by fault indicators (LEDs). Failure information is available at the operator workstation in the form of system variables and Triconex diagnostics information.
- Do not use alarm contacts in hazardous locations.
- Do not remove a power module unless incoming power is disabled and secondary power is performing normally.



If a Power Module has been removed for any reason, do not attempt to re-install for at least 60 seconds.

For fault indicators, see [Power Module Status Indicators on page 235](#).

### Procedure

- 1 Before beginning, ensure you have a 1/4-inch flat-bladed screwdriver.
- 2 Verify that the secondary Power Module is connected to an active power source.
- 3 Use the screwdriver to undo the retractable fasteners of the faulty Power Module. Grasp the fasteners firmly, and slide the module out of the chassis.
- 4 Carefully slide the replacement Power Module into position, then push firmly to seat the module in the bus and tighten the fasteners.

If the module is not properly seated and its fasteners are not adequately tightened, the module may not operate properly.

The Status indicator should go on as soon as Power Module is inserted.

- 5 For the faulty module, identify the model and serial numbers. Contact the IPS Global Client Support (GCS) center to obtain a Returned Material Authorization (RMA) number. Then return the module to Triconex for repair.