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.

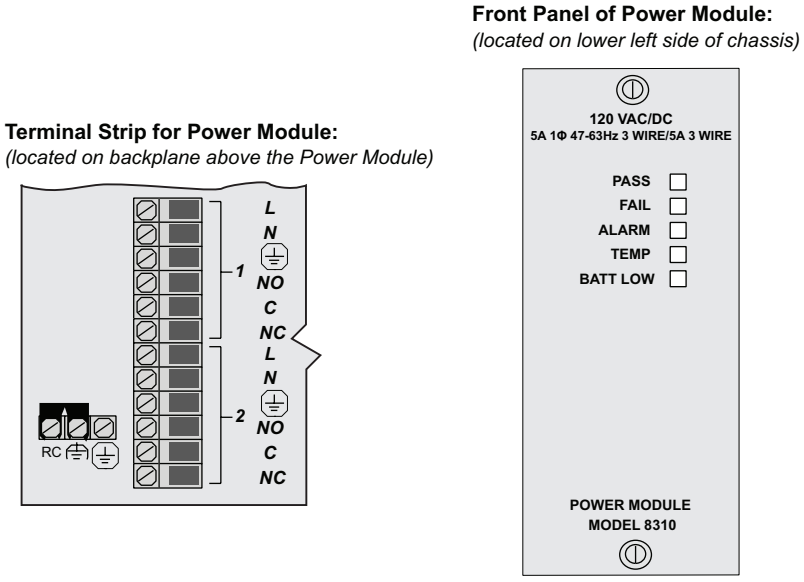

Figure 13 Power Module Terminals and Front Panel

Ground Terminals on Power Modules

This table describes the ground terminals included with the Power Module. Typically, the Tricon controller is delivered with a jumper installed between RC and signal ground. You can remove the jumper to use either a direct connection to signal ground or to chassis ground. For more information, see Controller Grounding on page 208.

- RC—RC network connected to chassis ground.
- ⏚ —Direct connection to Tricon controller internal signal ground (functional earth).
- ⏚ —Direct connection to chassis ground (protective earth).

Alarm and Power Terminals on Power Modules

This table describes the alarm and power terminals included with the Power Modules, which includes 2 sets of 6 terminals for each Power Module.

Terminals 1 and 2	Description
L	Line (hot) or DC+
N	Neutral or DC-
⏚	Chassis ground, protective earth
NO	NO (normally open) chassis alarm contact—opens when an alarm condition occurs
C	Common alarm contact
NC	NC (normally closed) chassis alarm contact—closes when an alarm condition occurs

Main Chassis Alarm Behavior

The alarm contacts on Main Chassis Power Modules are asserted when any of these situations occurs:

- The controller configuration does not match the control program configuration
- A Digital Output (DO) Module experiences a Status/Status error.
- A module is missing somewhere in the controller. (No status indicators warn you of this problem)
- A Main Processor or I/O module in the Main Chassis fails.
- An I/O module in an Expansion Chassis fails.
- A Main Processor detects a system fault. In this case, both alarm contacts may be asserted without a corresponding module failure.
- The inter-chassis I/O bus cables are incorrectly installed—for example, the cable for Channel A is accidentally connected to Channel B.

An alarm contact on at least one of the Main Chassis Power Modules is asserted when any of these situations occurs:

- A Power Module fails.
- Primary power to a Power Module is lost.
- A Power Module has a Low Battery or Over Temperature warning.

Expansion Chassis Alarm Behavior

The alarm contacts on both Power Modules of an Expansion Chassis are asserted when an I/O module fails. An alarm contact on at least one of the Power Modules of an Expansion Chassis is asserted when any of these situations occurs:

- A Power Module fails.
- Primary power to a Power Module is lost.
- A Power Module has an Over Temperature warning.

Alarm Contacts Specifications

This table lists the alarm contacts specifications for all models of Power Modules.

Do not use alarm contacts in hazardous locations.

Table 3 Alarm Contacts for Power Modules

Feature	Specification
Isolation	1000 VAC or 1500 VDC, Input to Output
Voltage range	140 VAC/VDC maximum
Switching power, resistive[1]	125 VAC, 60 W maximum
Current load	2 amp maximum
Maximum cycle rate of contacts	< 20 cycles per minute
Expected life at maximum rated load	> 10,000 cycles

1. When switching reactive loads, de-rate the switching power of the contacts to 25% of maximum—that is, 31.25 volts for AC applications, 15 watts for DC. When switching incandescent lamps, the inrush current can be 10-15 times the rated nominal load current of the lamp. Contact the lamp manufacturer for detailed specifications regarding inrush amplitude and duration. The inrush current must be used when calculating the required contact switching power.

120 Volt Power Module Specifications

This table lists the specifications for model 8310, which is a 120 VAC/VDC Power Module.

Table 4 8310 Power Module Specifications

Feature	Description
Isolation	1000 VAC or 1500 VDC, Input to Output
Recommended input voltage range	120 VAC/VDC (-15% to +10%)
Extended input voltage range	85–140 VAC, 95–180 VDC
Low line on/off hysteresis	15 VAC/VDC
Input power required	240 W (2.75 amps) minimum per power source
Input frequency	47–63 Hz
Power factor	0.70 typical
Crest factor	2.5 typical
Input current	
Steady-state	0.75 amps, typical; 2.75 amps, maximum
In-rush (1/2 AC cycle)	18 amps maximum @ 120 VAC/DC
Input fuse rating and type	5 amps, time-delay
Output voltage	6.5 VDC, ±1%
Output current	27 amps minimum 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 hold time @ 0 volts input	20 ms minimum 80 ms typical
Output over-voltage protection	115% typical, recycle power to restart
Output over-current limit	135%, typical, auto restart
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.

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[1]	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, ±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.

1. 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 ±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

230 Volt Power Module Specifications

This table lists the specifications for model 8312, which is a 230 VAC Power Module.

Table 6 8312 Power Module Specifications

Feature	Description
Isolation	1000 VAC or 1500 VDC, Input to Output
Nominal input voltage	230 VAC (–15% to +10%)
Extended input voltage range	185 to 285 VAC
Low line on/off hysteresis	15 VAC
Input power required	240 W minimum per power source
Input frequency	47 to 63 Hz
Power factor	0.70 typical
Crest factor	2.5 typical
Input current	
Steady-state	0.4 amps, typical; 1.2 amps, maximum
In-rush (1/2 AC cycle)	18 amps maximum @ 230 VAC
Input fuse rating and type	2.5 amps, time-delay
Output voltage	6.5 VDC, ±1% under all operating conditions
Output current	27 amps minimum at140° F (60° C) ambient, which refers to the air temperature measured at the bottom of the chassis.
Output power	175 watts at 140° F (60° C) ambient
Output hold time @ 0 volts input	20 ms minimum; 80 ms typical
Output over-voltage protection	125%, typical, recycle power to restart
Output over-current limit	140%, typical, auto restart
Over-temperature warning sensor	Temperature monitor trips when the internal power module temperature is greater than 181° F (83° C). Typically occurs at an ambient temperature of 140° F (60° C) or higher.

WARNING

Do not use the model 8312 Power Module in Tricon systems that are located in hazardous locations and must meet ATEX requirements. If you have 230 V line voltage and your system must meet ATEX requirements, use the model 8311 24 VDC Power Module along with the ATEX-certified 24 VDC power supply from Phoenix Contact—part number QUINT-PS-100-240AC/24DC/10/EX.