

Standard Tricon System Products

Description	Model No.	See
Chassis Assemblies		
Main Chassis, High-Density Configuration, includes the Tricon printed manuals	8110	page 13, page 29
Expansion Chassis, High-Density Configuration	8111	page 13, page 29
Expansion Chassis, Enhanced Low-Density Configuration	8121	page 13, page 29
Remote Expansion Chassis, High-Density Configuration	8112	page 13, page 29
I/O Bus Expansion Cables (Set of 3)	9000 ^a	page 12
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Power Modules		
120 VAC/VDC – 175-Watt Power Module	8310	page 32
24 VDC – 175-Watt Power Module	8311	page 32
230 VAC – 175-Watt Power Module	8312	page 32
Main Processor Modules		
3008 Main Processor, 16 megabytes DRAM	3008	page 33
Communication Hardware and Software		
Tricon Communication Module (TCM), Ethernet (802.3) and serial (RS-232/RS-485) ports	4351A, 4352A, 4351B, 4352B 4353, 4354	page 34
Enhanced Intelligent Communication Module (EICM), serial (RS-232/RS-422/RS-485) ports	4119, 4119A	page 35
Safety Manager Module (SMM), Honeywell UCN Interface	4409	page 36
Network Communication Module (NCM), Ethernet (802.3) ports	4329, 4329G	page 37
Advanced Communication Module (ACM), Foxboro I/A Series Nodebus Interface	4609	page 38
Hiway Interface Module (HIM), Honeywell Data Hiway Interface	4509	page 39
Triconex DDE Server Software	Contact Invensys	page 69
Network Accessory Kit (Ethernet thin cable, connectors and terminators)	7600-3	n/a
Remote Extender Modules		
Primary RXM, Multi-Mode Fiber Optics, Set of 3 Modules	4200-3	page 40
Remote RXM, Multi-Mode Fiber Optics, Set of 3 Modules	4201-3	page 40
Primary SRXM, Single-Mode Fiber Optics, Set of 3 Modules	4210-3	page 40
Remote SRXM, Single-Mode Fiber Optics, Set of 3 Modules	4211-3	page 40
Interface Modules		
HART Analog Input Interface Module with 2071H HART Multiplexer	2770H	page 54
HART Analog Input Interface Module with 2071H HART Multiplexer and Amp-Elco Adapter Cable	2750-2H	page 54
HART Analog Output Interface Module with 2071H HART Multiplexer	2870H	page 54
HART Multiplexer	2071H	page 54
TriStation 1131 and Diagnostic Software		
TriStation 1131 v4.x Software License with printed manuals	Contact Invensys	page 71
Enhanced Diagnostic Monitor v2.x	Contact Invensys	page 72

Voltage	Description	Type	Model No.	Points	For Details, See
0–5 VDC	Single-Ended	TMR	3720	64	page 49
0 to 5 or –5 to +5 VDC	Differential, DC Coupled	TMR	3721	32	page 49
Analog Output Modules					
4-20 mA	Current Loop, DC Coupled	TMR	3805E/3805H	8	page 50
4-20 mA and 20-320 mA	Current Loop, DC Coupled	TMR	3806E	6 and 2	page 50
–60 to 60 mA	Bipolar, Commoned Return, DC Coupled	TMR	3807	4	page 50

Tricon Equipment Certified for Use in Marine Environments

Bureau Veritas (BV) has certified specific Tricon products as being in full compliance with the following internationally recognized standard and qualified for use in marine environments:

BV NR467:2011, Part C, Ch 2-3 Rules for the Classification of Steel Ships; Part C - Machinery, Electricity, Automation and Fire Protection; Chapters 2-3

Bureau Veritas Environmental Category, EC Code: 31C

The following table lists the model numbers of Tricon equipment certified for use in marine environments and identifies the standard model to see for information about the equipment. All of the information (specifications, simplified schematics, installation guidelines, and so on) for standard equipment also applies to marine equipment. Additionally, refer to the *Planning and Installation Guide for Tricon v9–v10 Systems* for application-specific installation instructions.

Model Number	Description	See This Standard Model
Modules and Chassis^a		
8110C	Main Chassis	8110
8111C	Expansion Chassis	8111
8112C	Remote Expansion Chassis	8112
8310C	High-Density Power Module, 120 V	8310
8311C	High-Density Power Module, 24 VDC	8311
8312C	High-Density Power Module, 230 VAC	8312
3008C	Enhanced Main Processor III, 16 Mb	3008
4200C	Remote Extender Module	4200
4200-3C	Remote Extender Module (Set)	4200-3
4201C	Remote Extender Module	4201
4201-3C	Remote Extender Module (Set)	4201-3
4351BC	Tricon Communication Module (TCM), copper	4351B
4352BC	Tricon Communication Module (TCM), fiber-optic	4352B
4353C	Tricon Communication Module (TCM), Embedded OPC Server, copper	4353
4354C	Tricon Communication Module (TCM), Embedded OPC Server, fiber-optic	4354
3703EC	AI, 0–5 VDC or 0–10 VDC, differential, isolated, TMR, 16 pts.	3703E
3721C	AI, 0–5 VDC or –5 to +5 VDC, differential, DC-coupled, TMR, 32 pts.	3721
3700AC	AI, 0–5 VDC, non-commoned, differential, DC-coupled, TMR, 32 pts.	3700A
3720C	AI, 0–5 VDC, single-ended, 64 pts.	3720

Tricon v10.x Equipment Certified for Use in Nuclear 1E Applications

Invensys has qualified specific Tricon version 10 products for use in 1E (safety-related) applications in nuclear power plants in accordance with EPRI Report TR-107330, “Generic Requirements Specification for Qualifying Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants.” EMC testing was performed in accordance with USNRC Regulatory Guide 1.180, Revision 1, “Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems.”

All of the information (specifications, simplified schematics, installation guidelines, and so on) for standard equipment also applies to nuclear equipment. The following table lists the model numbers of Tricon v10.x equipment certified for use in Nuclear 1E applications and identifies the standard model to see for information about the equipment.

Model Number	Description	See This Standard Model
Modules^a		
8110N2	Main Chassis	8110
8111N	Expansion Chassis	8111
8112N	Remote Expansion Chassis	8112
8310N2	High-Density Power Module, 120 V	8310
8311N2	High-Density Power Module, 24 VDC	8331
8312N2	High-Density Power Module, 230 VAC	8312
3008N	Enhanced Main Processor III, 16 Mb	3008
4200N	Remote Extender Module	4200
4200-3N	Remote Extender Module (Set)	4200-3
4201N	Remote Extender Module	4201
4201-3N	Remote Extender Module (Set)	4201-3
4352AN	Tricon Communication Module (TCM)	4352A
4352BN	Tricon Communication Module (TCM)	4352B
3701N2	0–10 VDC, Differential DC Coupled, TMR	3701
3703EN	0–5 VDC or 0–10 VDC, Differential, Isolated, TMR	3703E
3721N	0–5 VDC or –5 to +5 VDC, Differential, DC Coupled, TMR	3721
3805HN	4–20 mA, Current Loop, DC Coupled, TMR	3805H
3501TN2	115 VAC, Opto-isolated, Non-commoned, TMR	3501T
3502EN2	48 VAC/VDC, Commoned in Groups of 8, Self-Test, TMR	3502E
3503EN2	24 VAC/VDC, Commoned in Groups of 8, Self-Test, TMR	3503E
3601TN	115 VAC, Opto-isolated, Non-commoned, TMR	3601T
3603TN	120 VDC, Opto-isolated, Commoned, TMR	3603T
3607EN	48 VDC, Opto-isolated, Non-commoned, TMR	3607
3623TN	120 VDC, Opto-isolated, Commoned, Supervised, TMR	3623T
3625N	24 VDC, Supervised/Non-supervised, Commoned, TMR	3625
3511N	Pulse Input, Differential, AC Coupled, TMR	3511
3708EN	Thermocouple, Differential, Isolated, TMR	3708
3636TN	Relay Output, Normally Open, Non-triplicated	3636T
8105N	Blank Module Panel	8105

Product Specifications

Power Modules

Each Tricon chassis is equipped with two Power Modules—either one is fully capable of running the Tricon controller at full load and rated temperature. Each Power Module can be replaced online. The Power Modules, located on the left side of the chassis, convert line power to DC power appropriate for all Tricon modules. Terminal strips for system grounding, incoming power and hard-wired alarms are located on the lower left corner of the backplane. Incoming power should be rated for a minimum of 240 watts per power supply.

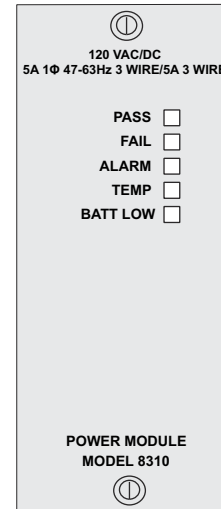
The Power Module alarm contacts are actuated when:

- A module is missing from the system
- The hardware configuration conflicts with the control program’s logical configuration
- A module fails
- A Main Processor detects a system fault
- Primary power to a Power Module fails
- A Power Module has a “Low Battery” or “Over Temperature” warning

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).

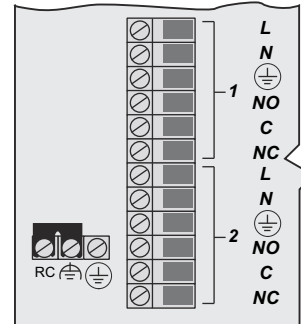
Front Panel of Power Module:
(located on lower left side of chassis)



Power Module Specifications

Isolation	>1,000 VAC or 1,500 VDC, Input to Output
Input Terminations	Protected by safety cover Accepts three 12-gauge wires (3.310mm ²): neutral, hot, and protective earth (chassis ground)
Over-Temp. Sensor	Temperature warning monitor—trips when internal temp. is greater than 181° F (83° C); this typically occurs at ambient temperature 140° F (60° C) or higher
Alarm Contacts	Normally open, normally closed and common Each contact supports 120 VAC @ 1 amp Accepts 12-gauge (3.310mm ²) wire Protected by safety cover
Input Power Required	240 watts minimum per Power Module
Output Power	175 watts at 140° F (60° C)
Output Voltage	6.5 VDC, ±1% under all operating conditions
Output Current	27 amps maximum at 140° F (60° C) ambient

Terminal Strip for Power Module:
(located on backplane above the Power Module)



Power Module Model	8310	8311	8312
Chassis Type	Main/Expansion/RXM	Main/Expansion/RXM	Main/Expansion/RXM
Nominal Voltage	120 VAC/VDC	24 VDC	230 VAC
Input VAC @ 47-63 Hz	85–140	n/a	185–285
Input VDC	95–180	20.4–28.8	n/a
Fuse Rating and Type	5 amps, time-delay	15 amps, time-delay	2.5 amps, time-delay
Output Hold Time (nominal to 0 volts)	20 ms minimum	2.8 ms minimum	20 ms minimum
Diagnostic Indicators	PASS, FAULT, ALARM, TEMP, BAT LOW	PASS, FAULT, ALARM, TEMP, BAT LOW	PASS, FAULT, ALARM, TEMP, BAT LOW

Main Processor Modules

Model 3008 Main Processors (MP) are available for Tricon v9.6 and later systems. For detailed specifications, see the *Planning and Installation Guide for Tricon Systems*.

Three MPs must be installed in the Main Chassis of every Tricon system. Each MP independently communicates with its I/O subsystem and executes the user-written control program.

Sequence of Events (SOE) and Time Synchronization

During each scan, the MPs inspect designated discrete variables for state changes known as *events*. When an event occurs, the MPs save the current variable state and time stamp in the buffer of an SOE block.

If multiple Tricon systems are connected by means of NCMs, the time synchronization capability ensures a consistent time base for effective SOE time-stamping. See page 78 for more information.

Diagnostics

Extensive diagnostics validate the health of each MP, I/O module and communication channel. Transient faults are recorded and masked by the hardware majority-voting circuit. Persistent faults are diagnosed and the errant module is hot-replaced.

MP diagnostics perform these tasks:

- Verify fixed-program memory and static RAM

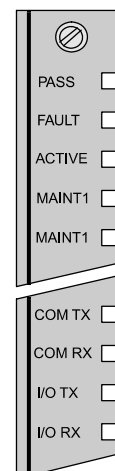
- Test all basic processor and floating-point instructions and operating modes
- Validate user memory by means of the TriBus hardware-voting circuitry
- Verify the shared memory interface with each I/O communication processor and channel
- Verify handshake and interrupt signals between the CPU, each I/O communication processor and channel
- Check each I/O communication processor and channel microprocessor, ROM, shared memory access and loopback of RS-485 transceivers
- Verify the TriClock and TriBus interfaces

Physical Description of Model 3008 Main Processors

Feature	Description
Microprocessor	Motorola MPC860, 32 bit, 50 MHz
Memory	<ul style="list-style-type: none"> • 16 MB DRAM (non-battery backed-up) • 32 KB SRAM, battery backed-up • 6 MB Flash PROM
TriBus Communication Rate	<ul style="list-style-type: none"> • 25 megabits per second • 32-bit CRC protected • 32-bit DMA, fully isolated
I/O Bus and Communication Bus Processors	<ul style="list-style-type: none"> • Motorola MPC860 • 32 bit • 50 MHz

Indicators on Main Processors

PASS	Module has passed self-diagnostic tests
FAULT	Module has a fault and should be replaced
ACTIVE	Module is executing the user-written control program
MAINT1	Maintenance indicator 1
MAINT2	Maintenance indicator 2
COM TX	Transmitting data across COMM bus
COM RX	Receiving data from COMM bus
I/O TX	Transmitting data across I/O bus
I/O RX	Receiving data from I/O bus



Tricon Communication Module

The Tricon Communication Module (TCM), which is compatible with only Tricon v10.0 and later systems, allows the Tricon controller to communicate with the TriStation 1131 software, other Tricon, Trident™, or Tri-GP controllers, Modbus master and slave devices, and external hosts over Ethernet networks.

Each TCM contains four serial ports, two network ports, and one debug port (for Invensys use).

Each serial port is uniquely addressed and can be configured as a Modbus master or slave. Serial Port #1 supports either the Modbus or the Trimble GPS interface. Serial Port #4 supports either the Modbus or the TriStation interface. Each TCM supports an aggregate data rate of 460.8 kilobits per second, for all four serial ports.

Any standard Modbus device can communicate with the Tricon controller through the TCM, provided that aliases are assigned to the Tricon variables.