

Chassis and Terminations Mounted in an Enclosure

- RXM Chassis can be connected to local Expansion Chassis using I/O bus cables.
- Each RXM Chassis must contain two Power Modules.
- Each RXM Chassis provides six logical slots for I/O modules and one blank (unused) slot.

Communication Module Configuration Guidelines

The following rules apply to the TCM, EICM, NCM, HIM, SMM, and ACM in a Tricon system:

- A TriStation 1131 PC communicates with a Tricon controller through a TCM, EICM, NCM or ACM, so at least one of these modules must be installed in the Main Chassis or Chassis 2.
- One logical slot is available for EICMs or ACMs, respectively. Matched pairs of these modules can be installed in both the left and right positions of one logical slot.
- Up to two logical slots can be configured for NCMs. Matched pairs of NCMs can be installed in the left and right positions of each logical slot. If only one logical slot is used, the slot can be in the Main Chassis or Chassis 2. If two logical slots are used, they must be Slot 6 and 7 in the Main Chassis, and Peer-to-Peer cannot be used.
- Up to two logical slots can be configured for TCMs. Matched pairs of TCMs can be installed in the left and right positions of each logical slot, and they can be located in the Main Chassis or Chassis 2.

- Up to three logical slots can be configured for SMMs. A matched pair of SMMs can be installed in the left and right positions of each logical slot. All three slots must be in the Main Chassis or Chassis 2.
- Up to two logical slots can be configured for HIMs. Both slots must be in the Main Chassis.
- The COM slot can be configured only for the EICM, TCM, or NCM.
- You cannot install an NCM and a TCM in the same Tricon system. You also cannot install an EICM and a TCM in the same system.
- Model 4351A, 4351B, 4352A, and 4352B TCMs cannot be installed into a system with Model 4351 or 4352 TCMs, even if they are installed in different chassis.
- If communication modules are housed in Chassis 2, this chassis must be connected directly to the Main Chassis using I/O COMM cables (Model 9001) rather than standard I/O bus cables.
- Chassis 2 can be an I/O Expansion Chassis or a primary RXM Chassis.

Chassis Power Limitations

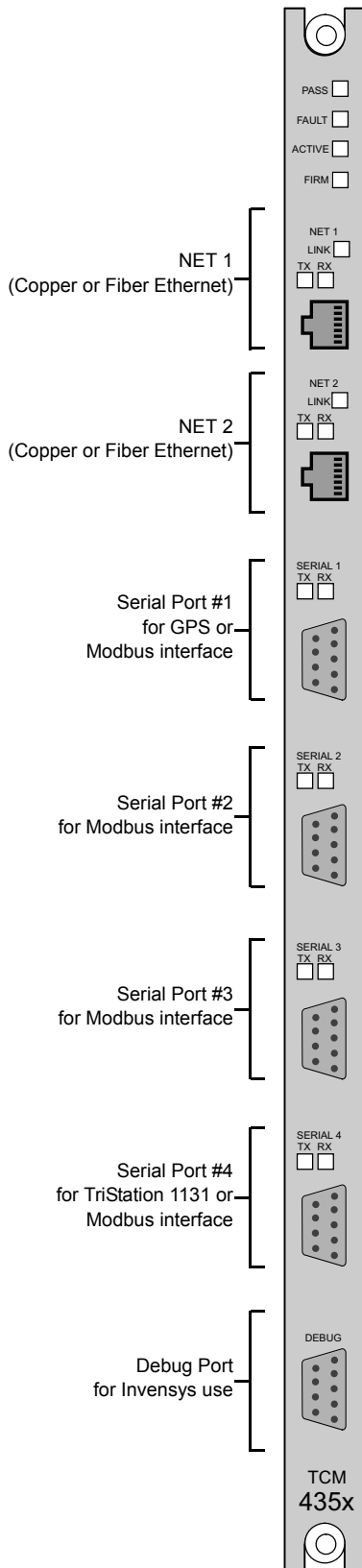
To maintain the safety and reliability of the Tricon controller, each system must be configured for operation under a worst-case scenario. These circumstances include operation with only one functional power supply at 140° F (60° C), ambient. (See “Power Modules” on page 32 for detailed specifications). Under these conditions, the power supply is rated to deliver 175 watts. The table to the right lists the logic power consumption per module in watts.

Module Type	Watts Consumed
ACM	15
Analog Input	10
Analog Input, Models 3720 and 3721	12
Analog Input, Isolated	15
Analog Input, High-Density	10
Analog Output	15
Analog Output, Bipolar	20
Digital Input, High-Density	10
Digital Input, Single	10
Digital Input, TMR	10
Digital Output, AC	10
Digital Output, DC	10
Digital Output, Dual	10
Digital Output, Supervised	15
EICM	10
HART Analog Input Interface	5
HART Analog Output Interface	5
HIM	10
Main Processor, Model 3008	10
NCM	20
Power Module	n/a
SMM	20
TCM	7
Thermocouple Input, Isolated	15
Thermocouple Input, Non-Isolated	10
Pulse Input	20
Pulse Totalizer	10
RXM	5
Relay Output	15

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
I/O-COMM Bus Expansion Cables (Set of 3)	9001	page 12, page 29
Blank I/O Slot Panel	8105	page 30
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

Product Specifications



Alias numbers must also be used when host computers access the Tricon controller through other communication modules. See “Communication Capabilities” on page 67 for more information.

TCM Models 4353 and 4354 have an embedded OPC server on NET 2, which allows up to 10 OPC clients to subscribe to data collected by the OPC Server. The embedded OPC Server supports the Data Access 2.05 standard and the Alarms and Events 1.10 standard.

Each TCM contains two network ports—NET 1 and NET 2. Models 4351A, 4351B, and 4353 have two copper Ethernet (802.3) ports and Models 4352A, 4352B, and 4354 have two fiber-optic Ethernet ports.

On TCM Models 4351A, 4351B, 4352A, and 4352B, NET 1 and NET 2 support the TCP/IP, Modbus TCP/IP Slave/Master, TSAA, TriStation, SNTP, and Jet Direct (for network printing) protocols. NET 1 also

supports the Peer-to-Peer (UDP/IP) and Peer-to-Peer Time Synchronization protocols.

On TCM Models 4353 and 4354, NET 2 supports only the embedded OPC server, TriStation, and SNTP protocols, while NET 1 supports all of the listed protocols except the embedded OPC server.

A single Tricon system supports a maximum of four TCMs, which must reside in two logical slots. Different TCM Models cannot be mixed in one logical slot. Each Tricon system supports a total of 32 Modbus masters or slaves—this total includes network and serial ports. The hot-spare feature is not available for the TCM, though you *can* replace a faulty TCM while the controller is online.

TCM Specifications

Model Number	4351A, 4351B, 4352A, 4352B, 4353, 4354	
Serial ports	4, RS-232/RS-485 ports, DB-9 connectors	
Network ports	2, 10/100BaseT Ethernet ports, RJ-45 connectors (Models 4351A, 4351B, 4353) 2, fiber-optic mode Ethernet ports, MT-RJ connectors with 62.5/125 um fiber cables (Models 4352A, 4352B, 4354)	
Port isolation	500 VDC	
Protocols	TriStation, Modbus, TCP/IP, ICMP, SNTP, TSAA (with support for IP Multicast), Trimble GPS, Embedded OPC Server (Models 4353 and 4354), Peer-to-Peer (UDP/IP), Peer-to-Peer Time Synchronization, Jet Direct (network printing)	
Modbus functions supported	01 — Read Coil Status 02 — Read Input Status 03 — Read Holding Registers 04 — Read Input Registers 05 — Modify Coil Status	06 — Modify Register Content 07 — Read Exception Status 08 — Loopback Diagnostic Test 15 — Force Multiple Coils 16 — Preset Multiple Registers
Communication speed	Copper Ethernet ports: 10/100 Mbps (Model 4353 supports only 100 Mbps) Fiber Ethernet ports: 100 Mbps Serial ports: up to 115.2 Kbps per port	
Status Indicators	PASS, FAULT, ACTIVE, FIRM LINK— 1 per network port, TX (Transmit) — 1 per port, RX (Receive) — 1 per port	

Communication Capabilities

workstation software (PC-based or mini-computer-based) support Modbus RTU and ASCII protocol, as do most DCS vendors, by means of a network-bridging device.

Because the TCM and the EICM can operate as a Modbus master or slave (the EICM can simultaneously act as both), the productivity of the Tricon controller can be expanded in a low-cost manner for non-critical I/O. When the TCM or the EICM operates as the master, it can control slave devices such as annunciators, bypass switches on non-critical PLCs, or other Tricon controllers. When the TCM or the EICM operates as a slave, a computer on the network is the master—this can be a DCS, an operator workstation, or any general-purpose computer programmed to support Modbus devices.

TCM and EICM users can select the RS-232 point-to-point interface for one master and one slave, or the RS-485 interface for one master and up to 32 slaves. The RS-485 network trunk can be one or two twisted-pair wires up to a maximum of 4,000 feet (1,200 meters).

While the TCM and the EICM are appropriate for many applications, Invensys offers alternate communication methods when fast response time or a large amount of data throughput is required.

Networking with Ethernet

The Tricon controller supports Ethernet (802.3) communication through the NET 1 and NET 2 ports on the Tricon Communication Module (TCM), and the NET 2 ports on the Advanced Communication Module (ACM) and the Network Communication Module (NCM). All of these modules support Triconex applications, user-written applications, and “open” networking

Protocols	TCM	EICM	NCM	ACM
Peer-to-Peer	✓	—	✓	—
Time Synchronization	✓	—	✓	—
Trimble GPS (TAIP)	✓	—	—	—
SNTP	✓	—	—	—
Network Printing using Jet Direct	✓	✓	—	—
TriStation	✓	✓	✓	✓
Tricon System Access control program (TSAA)	✓	—	✓	✓
Protocols for User-Written Applications				
Modbus RTU and ASCII	✓	✓	—	—
Modbus TCP	✓	—	—	—
TCP-IP/TCP-UDP	✓	—	✓	✓
Triconex Applications				
Sequence of Events	✓	—	✓	✓
DDE Server	✓	—	✓	✓
TriStation 1131	✓	✓	✓	✓
Enhanced Diagnostic Monitor	✓	—	—	—
OPC Server for Triconex ^a	✓	—	✓	—

Protocols and Applications for Networking

NOTES

^aTCM Models 4351A, 4351B, 4352A, and 4352B, and NCMs rely on an external Matrikon OPC Server. TCM Models 4353 and 4354 have an Embedded OPC Server.

See page 33, page 35, page 37, and page 38 for network port usage on the TCM, EICM, NCM, and ACM

with external systems by means of TCP-IP/UDP-IP protocol.

In addition, the TCM and NCM support the Triconex Peer-to-Peer and Time Synchronization protocols on the NET 1 port. The TCM and NCM also support a fully redundant OPC capability. The table above lists the protocols and applications that can be used with the TCM, NCM, and ACM.

To maximize safety, the Tricon system offers module, media, and workstation redundancy. Module/media redundancy is achieved by installing two TCMs, NCMs, or ACMs in the same logical slot and connecting their network nodes with two sets of cables. This arrangement permits continuous operation in case of broken cables,

intermittent cable connections, port failures, or TCM/ NCM/ACM failures.

External host redundancy is obtained by connecting a spare external host machine to the network. If the primary host fails, it can be shut down and the control program restarted on the spare host. All Triconex applications use PCs as external hosts, so all of the applications could be loaded on the primary and spare hosts without requiring any other PCs.

Triconex Protocols

A protocol is a set of rules for exchanging data between two or more devices. In a Peer-to-Peer protocol, any device on the network can initiate a data transfer operation. In a master/slave protocol, only the master can initiate a