



4351A

Copper Ethernet Tricon Communication Module

Product scope

- Combines four RS-232/RS-485 serial interfaces with two copper Ethernet ports.
- Supports 10/100BaseT networking through RJ-45 connectors.
- Carries TriStation, Modbus, TSAA, SNTP and peer-to-peer communication services.

Manufacturer source

Tricon Product Guide 01-9302048-MM-001, TCM Specifications and Communication Capabilities.

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4351A verified technical reference

Copper Ethernet Tricon Communication Module

Exact product identity

Triconex 4351A is a Tricon communication module with four serial ports and two copper 10/100BaseT Ethernet ports for controller and host integration.

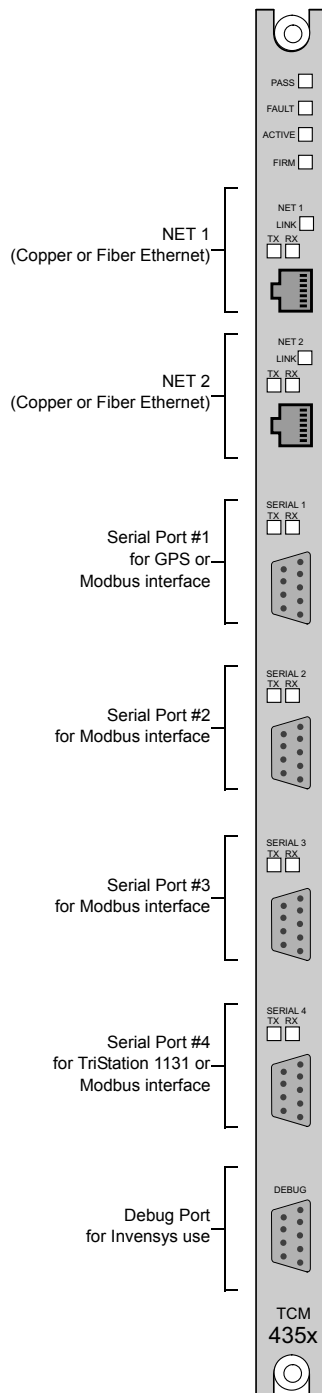
Manufacturer	Triconex
Model	4351A
Product family	Tricon Communication Modules
Product type	Tricon Communication Module
Serial ports	4 RS-232/RS-485, DB-9
Network ports	2 copper 10/100BaseT, RJ-45
Port isolation	500 VDC
Serial speed	Up to 115.2 Kbps per port
Ethernet speed	10/100 Mbps
Protocols	TriStation, Modbus, TCP/IP, ICMP, SNTP, TSAA, Peer-to-Peer, Jet Direct
Maximum TCMs per system	4
Logical slots	2 maximum
Hot spare	Not supported
Indicators	Pass, Fault, Active, Firm, Link, TX, RX

Manufacturer source

Tricon Product Guide 01-9302048-MM-001, TCM Specifications and Communication Capabilities.

Only facts that can be matched to the exact ordering code are included in this product reference.

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	<table border="0"> <tr> <td>01 — Read Coil Status</td><td>06 — Modify Register Content</td></tr> <tr> <td>02 — Read Input Status</td><td>07 — Read Exception Status</td></tr> <tr> <td>03 — Read Holding Registers</td><td>08 — Loopback Diagnostic Test</td></tr> <tr> <td>04 — Read Input Registers</td><td>15 — Force Multiple Coils</td></tr> <tr> <td>05 — Modify Coil Status</td><td>16 — Preset Multiple Registers</td></tr> </table>	01 — Read Coil Status	06 — Modify Register Content	02 — Read Input Status	07 — Read Exception Status	03 — Read Holding Registers	08 — Loopback Diagnostic Test	04 — Read Input Registers	15 — Force Multiple Coils	05 — Modify Coil Status	16 — Preset Multiple Registers
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04 — Read Input Registers	15 — Force Multiple Coils										
05 — Modify Coil Status	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

data exchange. Invensys has developed one peer-to-peer protocol and three master/slave protocols (Time Synchronization, TriStation, and TSAA) to support different types of applications. All of the following Triconex protocols support a maximum of 31 Tricon controllers on a network. Please contact Invensys for application guidelines and potential performance limitations.

Peer-to-Peer

Peer-to-Peer protocol allows Tricon controllers to exchange small amounts of safety and process information on the proprietary network. For information about using the Peer-to-Peer Send and Recv functions in applications, see the *TriStation 1131 Developer's Guide*.

Time Synchronization

Time Synchronization is a master/slave protocol used to maintain a consistent time base for all Tricon controllers connected to each other by means of TCMs or NCMs.

TriStation

The TriStation protocol is a master/slave protocol in which the master (the TriStation 1131 PC) communicates with the slave (the Tricon controller) over an Ethernet network. Although the TriStation protocol supports a maximum of 31 Tricon controllers, the master can

communicate with only one slave at a time.

TSAA

The Tricon System Access control program (TSAA) protocol is a master/slave protocol in which the master (the external host) communicates with one or more slaves (Tricon controllers) over an open network. TSAA specifies the interfaces, commands and data structures used to develop applications that send and receive data to and from Tricon controllers.

TSAA can be used to develop these types of applications:

- Control (read/write) applications such as an operator interface that requires access to Tricon controller status and the ability to write data to the Tricon controller.
- Monitor (read only) applications such as a Sequential Events Recorder, Event Logger or status display that retrieves data from the Tricon controller.

For more information about TSAA, see the *Communication Guide for Tricon v9–v10 Systems*.

Triconex Applications

Invensys offers several applications for Ethernet (802.3) networks, all of which use a PC as the external host. These

applications are briefly described in the table below.

The Tricon controller offers considerable flexibility and functionality in the area of data communication, and can readily be configured to match control program requirements. Invensys is continually striving to advance the state of the art in safety systems. High-speed, redundant network communication is another example of that commitment.

Foxboro's Intelligent Automation Series System

Invensys offers the *Advanced Communication Module (ACM)* for tightly-integrated interfacing with Foxboro's Intelligent Automation (I/A) Series Nodebus. The ACM communicates process information at full network data rates for use anywhere on the I/A Series system, transmitting all Tricon aliased data and diagnostic information to operator workstations in display formats that are familiar to Foxboro operators.

The ACM makes the following functions available to the I/A Series:

- Handles critical I/O points and passes results to the I/A Series
- Processes Tricon controller alarms and propagates them to user-defined

Triconex Application	Description
TriStation 1131	Allows development, testing, and monitoring of applications for the Tricon controller.
Sequence of Events (SOE)	Retrieves events (state changes of discrete variables) from Tricon controllers on a network. For system maintenance and shutdown analysis.
Enhanced Diagnostic Monitor	Allows monitoring the hardware and application status of Tricon controllers.
DDE Server	Allows Windows-based DDE client applications such as Microsoft® Excel® to read and write Tricon aliased data.
OPC Server for Triconex ^a	Allows OPC clients to have read and write access to Triconex controller program variables. Requires the Network Communication Module (NCM) or the Tricon Communication Module (TCM).

^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.



4351A engineering review

Copper Ethernet Tricon Communication Module

Configuration and integration

Triconex 4351A provides four configurable RS-232/RS-485 serial ports and two copper Ethernet interfaces. RJ-45 network connections and DB-9 serial connectors support multiple plant and engineering communication paths.

The module carries TriStation, Modbus, TCP/IP, TSAA, SNTP and peer-to-peer services according to the assigned port. Serial links operate at up to 115.2 Kbps, while copper Ethernet supports 10/100 Mbps.

A Tricon system accepts up to four TCMs in two logical slots, but different TCM models cannot share one logical slot. The module has no hot-spare feature, so replacement planning must account for the affected communication services.

Installation attention

4351A has no TCM hot-spare function; map every Ethernet and serial service before replacement because removing the module interrupts its assigned paths.

Verified functional points

Applications

- Links a Tricon controller to copper Ethernet plant networks and engineering workstations.
- Provides Modbus master or slave paths through network and serial interfaces.
- Distributes controller data and time information through TSAA, SNTP and peer-to-peer services.

Communication

- Two RJ-45 interfaces provide copper 10/100BaseT Ethernet connectivity.
- Four DB-9 ports can be configured for RS-232 or RS-485 serial communication.
- Each serial interface supports transmission rates up to 115.2 Kbps.

Protocols

- TriStation, Modbus, TCP/IP, ICMP, SNTP and TSAA are supported on the documented interfaces.
- NET 1 adds peer-to-peer data exchange and peer time-synchronization services.
- Jet Direct capability supports network printing within the defined TCM configuration.

Placement

- A controller can use no more than four TCMs arranged in two logical slots.
- Different TCM models must not be mixed in the same logical slot.
- The lack of hot-spare capability requires a communication-impact plan before module exchange.

Source record

Tricon Product Guide 01-9302048-MM-001, TCM Specifications and Communication Capabilities.



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