Trusted Communications Interface

Product Overview

The Trusted® Communications Interface (CI) is an intelligent module that provides a range of communication services for the Trusted Controller, minimising communication loading of the Triple Modular Redundant (TMR) Processor.

A user-configurable module, the CI can support multiple communication media.

Up to four Communications Interfaces (CIs) can be supported by a Trusted System.

Features:

- Trusted Operating System.
- Dual Ethernet and four serial ports.
- Support for a wide range of communication protocols.
- Secure, dependable communications via high performance communications links.
- Modbus Slave.
- Optional Modbus Master (with T812X Trusted Processor Interface Adapter).
- Optional Sequence Of Events (SOE) Over Modbus.
- Front Panel serial diagnostic port, fault and status indicators.

Note: This product description refers to modules with firmware version 352020 build 3 onwards and firmware version 353570 only.

For firmware versions up to 2.04 refer to the Issue 6 version of this document.

1. Description

1.1. Module Versions

The Trusted CI has part number T8151B. T8151 is an earlier part number for the same module. Later modules have 100BaseT Ethernet but not 10Base2, as below, have a faster processor, a single printed circuit board (PCB) and also keep a backup system event log.

Module revision	Ethernet	Serial Port	Diagnostic Port
8151 up to rev H, 8151B up to rev B	Dual 10Base2/ 10BaseT	4 isolated ports: 2 x RS232/422/485 2 x RS422/485 On daughter board	1 isolated RS232 port
8151B rev C and above	Dual 10BaseT/ 100BaseT	4 isolated ports: 2 x RS232/422/485 2 x RS422/485 On main board	1 isolated RS232 port

Table 1 Communication Port Configurations

1.2. Associated Equipment and Software

Part Number	Product Name	Description
T8153	Communications Interface Adapter	Provides access to the ports on the CI
T8173	Gateway Adapter	Provides access to the Ethernet ports on the CI
TC-304-01	Maintenance Cable	Connects between CI and Engineering Workstation PC via front diagnostic port
TC-305-0X	Communications Cable	Provides access to the ports on the CI via flying leads
T8122 or T8123	Processor Interface Adapters	Required to implement Modbus Master on the CI

Part Number	Product Name	Description
T8013	Sequence of Events (SOE) and Process Historian	PC Software package for event log collection
T8017	Peer to Peer Communications	Toolset library of communications functions
T8030	Open Platform Communications (OPC) server	PC Software package for third party interface

Table 2 Associated Equipment

1.3. Overview

The Trusted CI provides the Trusted System with an intelligent Communications Interface, acting as a relay between the Processor, other Trusted Systems, the Engineering Workstation and third-party equipment.

1.3.1. Hardware

The module has a Motorola Power PC Processor. Bootstrap software is stored on Erasable Programmable Read Only Memory (EPROM). Operational firmware is stored in flash memory and may be upgraded via the Front Panel Port.

The Trusted Operating System is used on both the TMR Processor and CI. The real time kernel is a high speed, high functionality kernel made for fault tolerant distributed systems. The kernel provides basic services (such as memory management) and interference free software environments.

A module watchdog monitors processor operation and the power supply unit (PSU) output voltages.

The module is supplied with a dual redundant +24 Vdc power feed from the chassis backplane. An on-board power supply unit provides voltage conversion, supply conditioning and protection.

The Trusted CI communicates with the Trusted TMR Processor via the triplicated Inter-Module Bus. When polled by the Trusted TMR Processor, the module's bus interface votes the data 2 out of 3 (2oo3) from the Inter-Module Bus and transmits back its reply via all three Inter-Module Bus channels. The remainder of the Communications Interface is simplex.

All communications transceivers are electrically isolated from each other and the module and have additional transient protection measures.

The module internal supplies are isolated from the dual 24 Vdc feeds.

1.3.2. Communications

Ethernet Media Access Control (MAC) address configuration is held by the CI as part of its configuration information. Other information regarding port and protocol configuration is obtained from the TMR Processor, as part of the System.INI file.

Data is transferred between the TMR Processor and the Communications Interfaces using a common interface called the Network Variable Manager. When data is read from a Trusted System, the data is obtained from the local copy maintained on the Communications Interface, providing a fast response.

Data writes are more complicated. If a data write simply updated the local copy and was then relayed to the processor, the other Communications Interfaces in the system would carry different data. This may cause problems for redundant links.

To overcome this problem, when data is written to a Communications Interface, it is first passed to the TMR Processor and the write is acknowledged immediately by the Communications Interface (to avoid communications delays). The processor updates its own database and then sends the data back to all Communications Interfaces so that they all have the same data. This can take one or two application scans. This means that subsequent reads will receive the old data immediately after the write, until the new data has been distributed.

All changes to CI .INI parameters may be loaded online and will take immediate effect; the Communications Interface disconnects all communications and restarts. Communications is also restarted on an application online update and is shut down when the application is stopped.

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2. Installation

The CI can be installed in any Input / Output (I/O) slot of a controller or expander chassis, however, peer to peer communications is only supported from the processor chassis.

When installed in the chassis, the CI connects to external systems via either a CI Adapter T8153 or a TC-305-01 Communications Cable with flying leads.

2.1. Module Insertion/Removal

CAUTION:

The module contains static sensitive parts. Static handling precautions must be observed. Specifically ensure that exposed connector pins are not touched. Under no circumstances should the module housing be removed.

Before installation, visually inspect the module for damage. Ensure that the module housing appears undamaged and inspect the I/O connector at the back of the module for bent pins. If the module appears damaged or any pins are bent, do not install the module. Do not try to straighten bent pins. Return the module for replacement.

Ensure that the module is of the correct type.

Record the module type, revision and serial number of the module before installation.

To install the module:

1. Ensure that the field cable assembly is installed and correctly located.
2. Release the ejector tabs on the module using the release key. Ensure that the ejector tabs are fully open.
3. Holding the ejectors, carefully insert the module into the intended slot.
4. Push the module fully home by pressing on the top and bottom of the module fascia.
5. Close the module ejectors, ensuring that they click into their locked position.

The module should mount into the chassis with a minimum of resistance. If the module does not mount easily, do not force it. Remove the module and check it for bent or damaged pins. If the pins have not been damaged, try reinstalling the module.

2.2. PCBs and Connectors

2.2.1. External I/O Connector

This connector provides a number of discrete input and outputs. These provide the CI with the Serial and Ethernet connections. The connector is a 78+2-way DIN 41612 M-type connector. See Table 3 for connector pin-out details.

2.3. Module Pin-out Connections

	Row			
Pin	**A**	**B**	**C**	**Description**
1				
2		50 Ω Co-ax		10Base2 Ethernet 1 (fitted on T8151 up to build H and T8151B up to build B only)
3				
4			Link 1	Connector Present Link - wire to A29
5	TXD1 (RS232)			Serial Port 1
6	RTS1 (RS232)	DTR1 (RS232)	RXD1 (RS232)	
7	CTS1 (RS232)	DSR1 (RS232)	DCD1 (RS232)	
8	BIO1 (RS485)	AIO1 (RS485)	RI1 (RS232)	
9	BO1 (RS485)	AO1 (RS485)	GND1	
10				
11	TXD2 (RS232)	RTS2 (RS232)	RXD2 (RS232)	Serial Port 2
12	BIO2 (RS485)	AIO2 (RS485)	CTS2 (RS232)	
13	BO2 (RS485)	AO2 (RS485)	GND2	

	Row			
Pin	**A**	**B**	**C**	**Description**
14				
15	BIO3 (RS485)	AIO3 (RS485)	GND3	Serial Port 3
16	BO3 (RS485)	AO3 (RS485)	GND3	
17				
18	BIO4 (RS485)	AIO4 (RS485)	GND4	Serial Port 4
19	BO4 (RS485)	AO4 (RS485)	GND4	
20				
21	TD+1	TD-1		10/100BaseT Ethernet 1
22	RD+1	RD-1		
23			EARTH1	
24				
25	TD+2	TD-2		10/100BaseT Ethernet 2
26	RD+2	RD-2		
27			EARTH2	
28				
29	LINK2			Connector Present Link - wire to C4
30				
31		50 Ω Co-ax		10Base2 Ethernet 2 (fitted on T8151 up to build H and T8151B up to build B only)
32				

Table 3 External I/O Connector - Pin-Out

2.4. Trusted Module Polarisation/Keying.

All Trusted modules have been keyed to prevent insertion into the wrong position within a chassis. The polarisation comprises two parts: the module and the associated field cable.

Each module type has been keyed during manufacture. The organisation responsible for the integration of the system must key the cable by removing the keying pieces from the cable so that they correspond with the bungs fitted to the associated module prior to fitting.

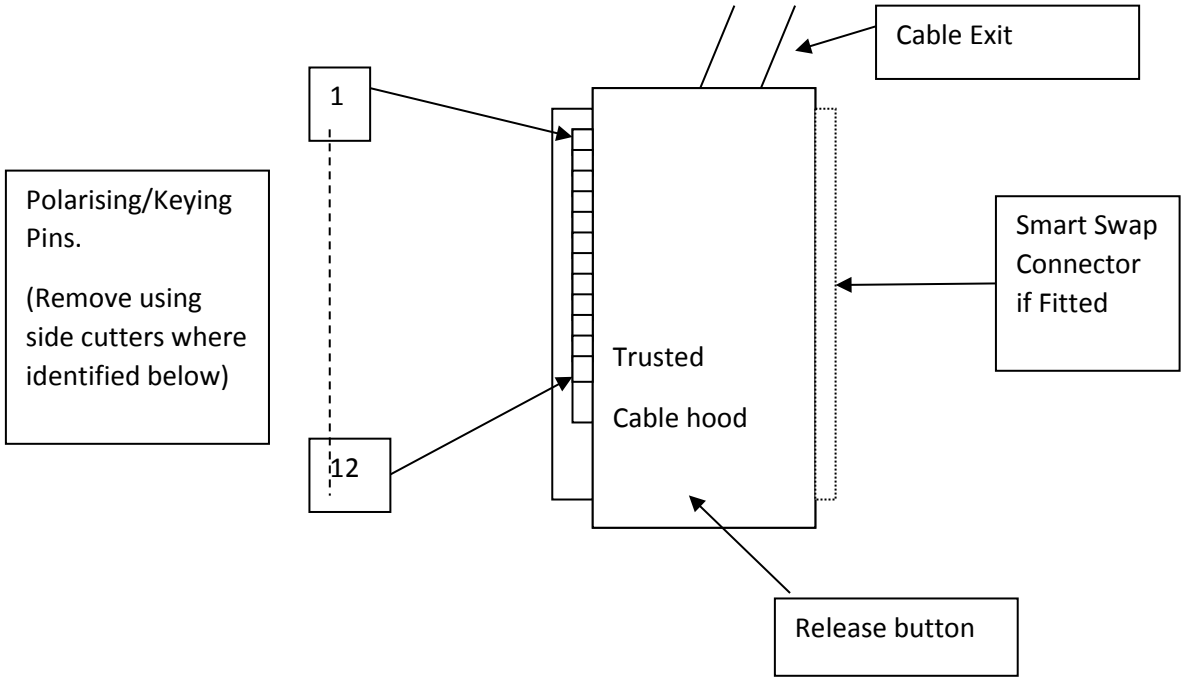

Figure 1 Module Polarisation

For Cables with Companion Slot installations both keying strips must be polarised.

For this module (T8151B) remove keying pins 1, 2 and 3.