MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

ICS

T8310

TMR EXPANDER PROCESSOR MODULE

Used with the applicable Trusted TMR configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Rockwell Automation PD-T8310 Issue 15, Trusted TMR Expander Processor; hardware-series power ratings require nameplate check

Trusted TMR Expander Processor

Product Overview

The Trusted® TMR Expander Processor Module resides in the processor slots of the Trusted Expander Chassis and provides the 'slave' interface between the Expander Bus and the Expander Chassis Backplane. The Expander Bus allows multiple chassis systems to be implemented using Unshielded Twisted Pair (UTP) cable connections whilst maintaining the fault tolerant, high bandwidth Inter-Module Bus (IMB) capabilities.

The Module provides fault containment for the Expander Bus, the Module itself and the Expander Chassis, ensuring that the effects of these potential faults are localised and system availability maximised. The Module is fault tolerant with HIFT TMR architecture. Comprehensive diagnostics, monitoring and testing provide rapid fault identification. Hot-standby and module spare configurations are supported, allowing automatic and manual repair strategies

Features:

- Triple Modular Redundant (TMR), fault tolerant (3-2-0) operation.
- Hardware Implemented Fault Tolerant (HIFT) architecture.
- Dedicated hardware and software test regimes which provide very fast fault recognition and response times.
- Automatic fault handling without nuisance alarming.
- Hot replacement.
- Front Panel indicators that show module health and status.

1. Description

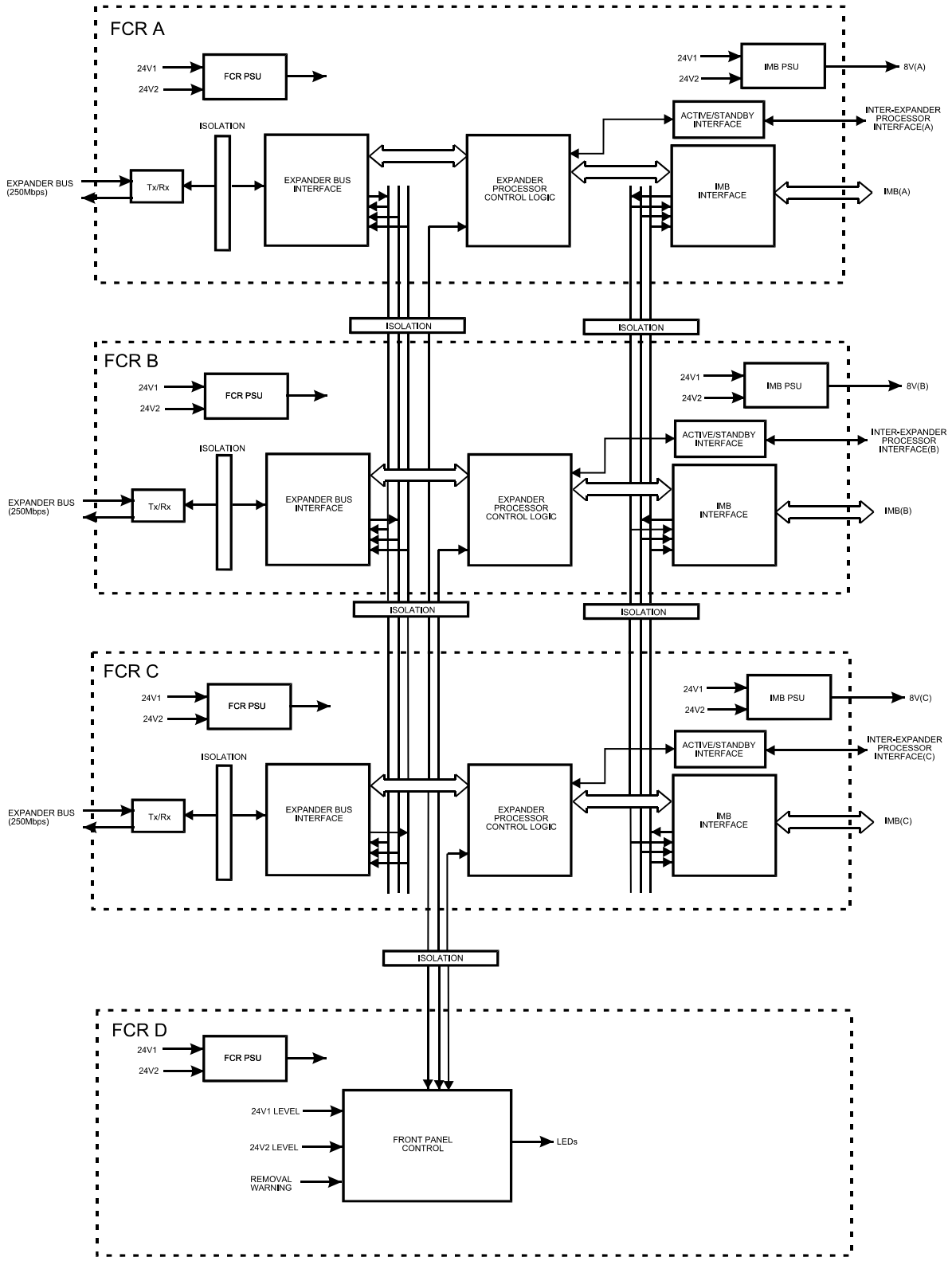


Figure 1 Simplified Block Diagram

1.1. Overview

The TMR Expander Processor is a fault tolerant design based on TMR architecture arranged in a lock-step configuration. Figure 1 shows, in simplified terms, the basic structure of the TMR Expander Processor.

The Module has three main fault containment regions (FCR A, B and C). Each of the main FCRs contains interfaces to the Expander Bus and Inter-Module Bus (IMB), an active/standby interface to the other TMR Expander Processor in the Chassis, control logic, communications transceivers and power supplies.

Communication between the Module and the TMR Processor is via the TMR Expander Interface Module and the triplicated Expander Bus. The Expander Bus is triplicated, point-to-point architecture. Each channel of the Expander Bus comprises separate command and response media. Voting is provided at the Expander Bus Interface to ensure that cable faults are tolerated, and the remainder of the Expander Processor operates in a fully triplicated mode, even in case of cable faults occurring.

Communication between the Module and the I/O Modules in the Expander Chassis is via the IMB on the Backplane of the Expander Chassis. The IMB is identical to that within the Controller Chassis, providing the same fault tolerant, high bandwidth communications between the Interface Modules and the TMR Processor. As with the Expander Bus Interface all transactions are voted, localising faults to the IMB should they occur.

A fourth FCR (FCR D) provides the non-critical monitoring and display functions and is also part of the inter-FCR Byzantine voting structure.

Isolation is provided between FCRs wherever interfaces are required, to ensure that faults cannot propagate between them.

1.2. Power Distribution

The TMR Expander Processor Module derives its internal voltages from dual redundant +24 Vdc power supplied via the module connector from the Trusted Expander Chassis Backplane. Each FCR derives the required supplies independently.

2. Installation

CAUTION:

The Expander Processor Module always resides in one of the two Processor (left most - PL1 and PL2) slots within the Expander Chassis. The Expander Processor must NOT be installed in any other module locations, as this may cause damage to the Module.

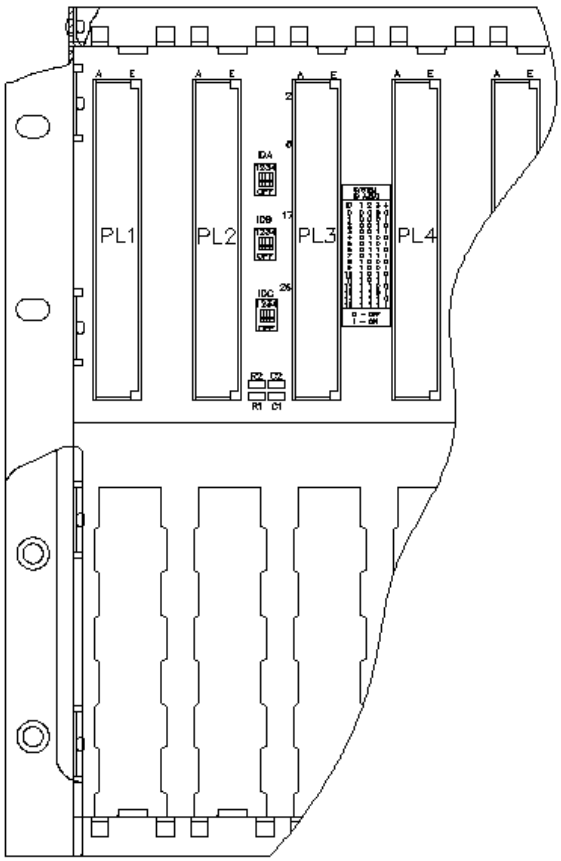


Figure 2 Expander Processor Slots

The two Processor slots must be interconnected using the Cable Hood Assembly shown below.

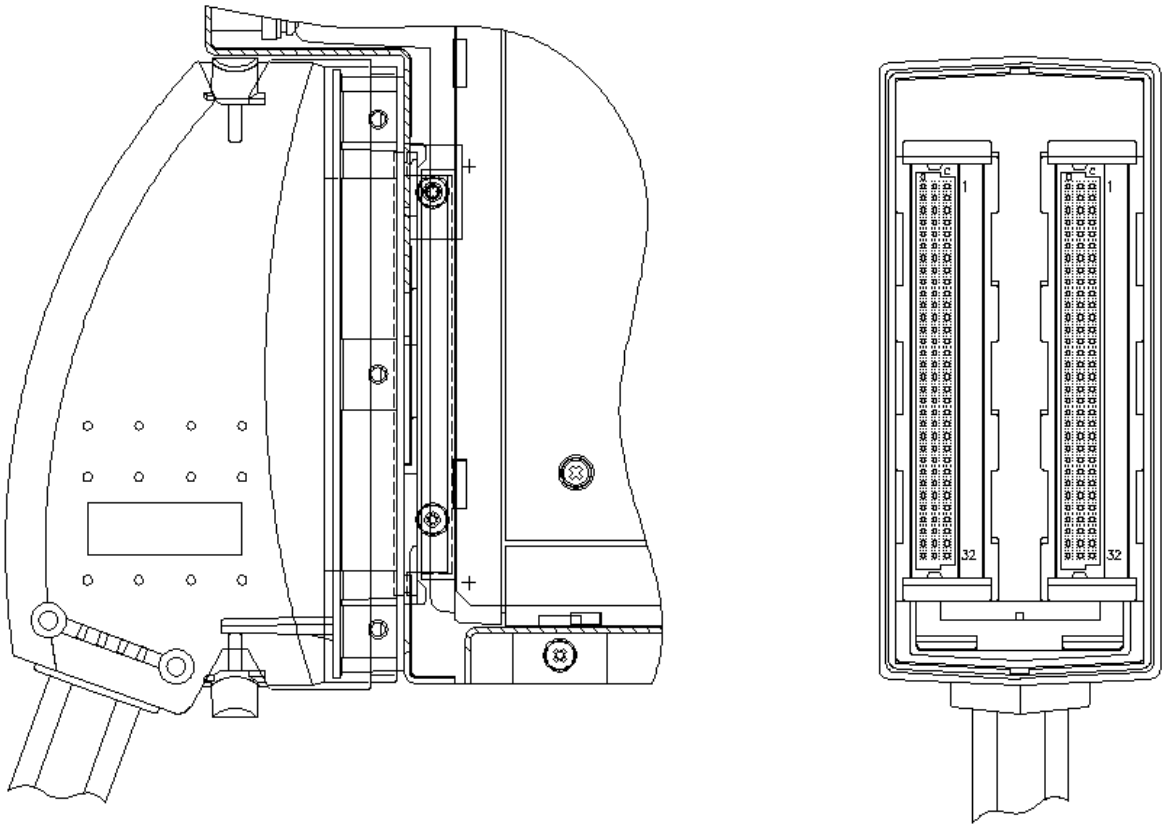


Figure 3 Expander Processor Cable

The Expander Processor Modules are connected to the Expander Interface Modules by the Expander Interface Hot Link Cable TC-301 via the Trusted Expander Interface Adapter Unit T8312.

Remote Expander Processor Modules are connected to the Trusted Fibre Optic Tx/Rx Unit T8314 by the Fibre Tx/Rx Unit to Expander Processor (Remote Expanders) Cable TC-303.

The connection to the Trusted Fibre Optic Tx/Rx Unit from the Expander Interface Modules is via the Trusted Expander Interface Adapter Unit using the Expander Interface Adapter to Fibre Tx/Rx Unit (Remote Expanders) Cable TC-302.

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.

- Received message error, on a per link/FCR basis, including frame error, checksum error and discrepancy.
- HIFT Clock, master and slave clock status, and master/slave switching.
- FCR watchdog status.
- Current active/standby status.
- IMB status information.
- 24 V supply levels.
- Module type code and serial number.
- Module removed flap status.

3.8. Communication Busses

3.8.1. Expander Bus

Each TMR Expander Processor Module contains a Bus Interface, isolation components and transceivers to the Expander Bus. The triplicated Expander Bus provides communication interconnection between the TMR Processor Chassis and the Expander Chassis at a data transfer rate of 1.5 Gbps via unshielded twisted pair (UTP) cables.

3.8.2. Inter-Module Bus

Each TMR Expander Processor Module FCR contains a Bus Interface to the Inter-Module Bus. The triplicated Inter-Module Bus provides communication interconnection between modules in the TMR Expander Chassis, at a data transfer rate of up to 12.5 Mbps.

The Inter-Module Bus handles the following triplicated signals:

Data	-	8-bit, bi-directional bus.
Control	-	Bus clocks, module enables and bus direction control.
System Watchdog	-	System Watchdog signal to the I/O Modules.
Power Fail	-	System power fail warning to I/O Modules.
Slot	-	Indicating the left or right Trusted TMR Expander Processor slot position to the Trusted TMR Processor.
Chassis ID	-	a 4-bit code indicating the chassis number or id.

6. Specifications

Backplane (IMB) Supply	20 Vdc to 32 Vdc
Field Supply	N/A
Power Dissipation	45 W Backplane Supply
Module Location	T8300 Expander Processor Slot
Isolation	50 V Basic Insulation, Module to Backplane Supply
Fusing	Not User Serviceable
Expander Comms Max Distance	
Using TC-301 copper cable	30 m
Using T8314 Fibre TX/RX Units	10 km
Operating Temperature	0 °C to +60 °C (+32 °F to +140 °F)
Storage Temperature	-25 °C to +70 °C (-13 °F to +158 °F)
Relative Humidity - Operating and Storage	10 % – 95 %, non-condensing
Environmental Specifications	Refer to document 552517
Dimensions	
Height	266 mm (10.5 in)
Width	31 mm (1.2 in)
Depth	303 mm (12.0 in)
Weight	1.33 kg (2.9 lb)