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.
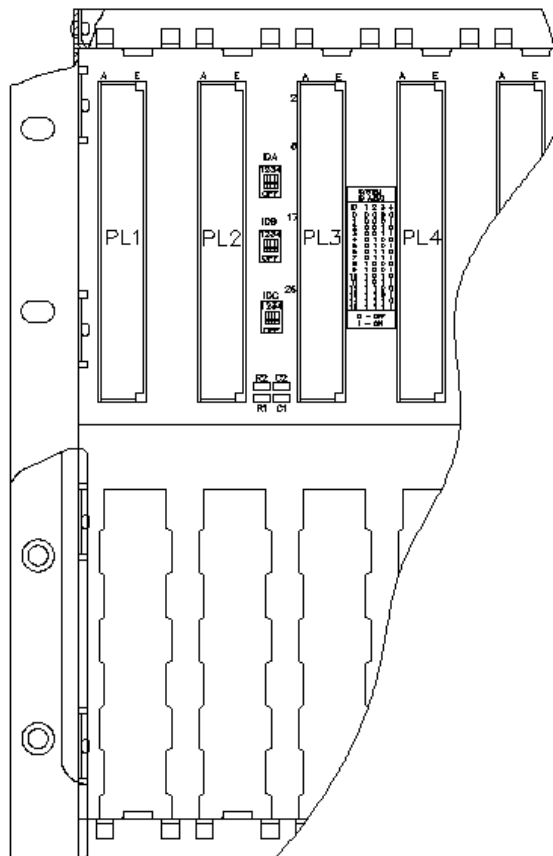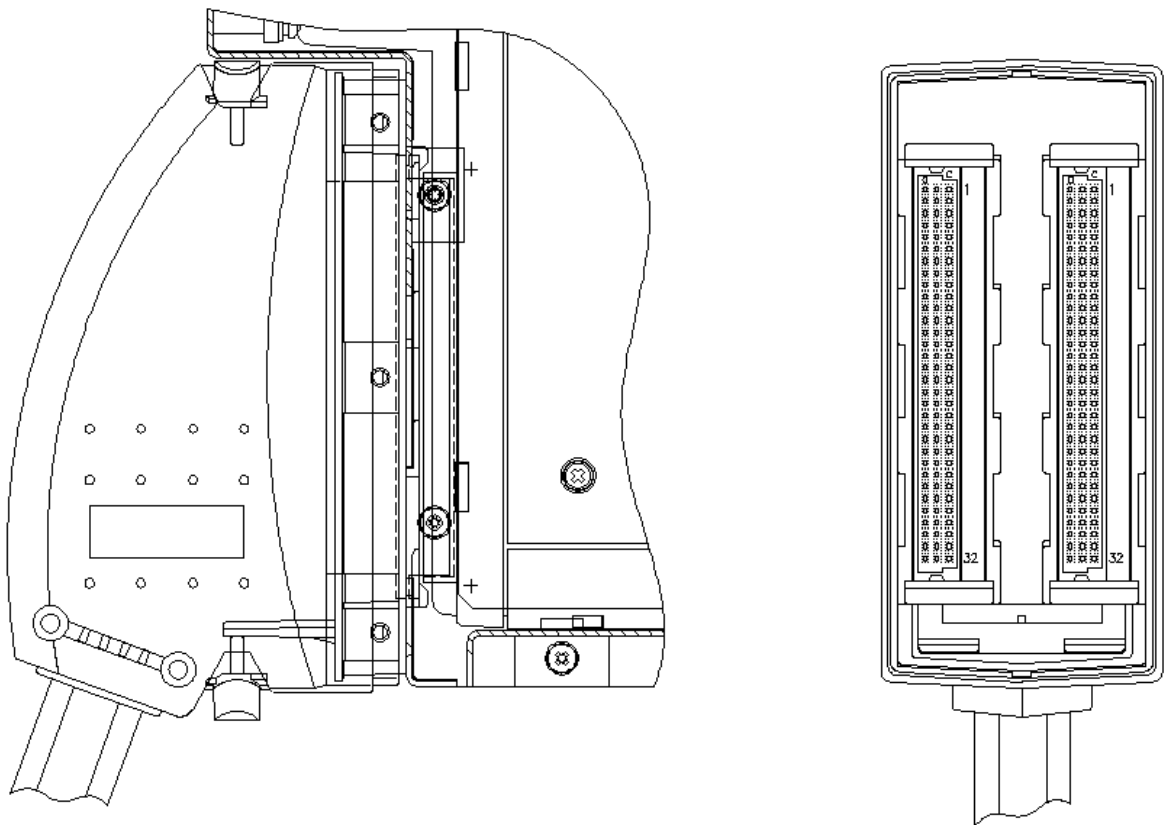

Figure 2 Expander Processor Slots

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.

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.

If the module is to reside in a new chassis, or the system is being configured for the first time, ensure that the chassis address has been set correctly before installing the modules. See Expander Chassis Product Description (PD-T8300) for further details.

To install the module:

1. Ensure that the cable assembly is 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.

2.2.   Module Replacement

The replacement module must be inserted in the vacant Processor slot, ensuring that the module is correctly located and the ejector tabs are closed (see Module Insertion and Removal). The newly installed module will perform its power-up sequence.

Ensure that the Light Emitting Diode (LED) indicators on the newly installed module are as follows:

LED 1	Healthy A	Steady Green
LED 2	Healthy B	Steady Green
LED 3	Healthy C	Steady Green

If the original module has reported faults, the TMR Processor may automatically initiate the changeover to the newly installed module. Manual changeover may be initiated either using the ejector tabs on the original module or using commands via the diagnostic interface. To initiate the changeover using the ejector tabs use the following sequence:

1. Release both the top and bottom ejector tabs on the original module using the ejector release tool. DO NOT remove the module.