

## Module Overview and Specifications

This chapter gives a brief technical overview and technical specification of each module and related termination assemblies.

### T9110 Processor Module

The T9110 processor module is the central processing unit of an AADvance® controller. It carries out the following process and safety controller tasks:

- Execution of the AADvance Safety Kernel to solve application logic
- Interfacing with the controller I/O modules, reading and processing input data and writing output data
- Communication with other processor modules, both locally and across the control network
- Initiation of periodic diagnostics for the controller
- Communication with other systems such as HMIs
- Message encapsulation and verification for secure channel communication to other nodes

Each processor module is galvanically isolated from external power supplies and data links so that any faults developed in the field cannot cause the module to fail. The module will continue to operate if a failure occurs in one of its dual redundant 24 Vdc power supplies. The module incorporates under- and over-voltage protection for its internal power supplies, which show a 'power valid' signal to the module's own diagnostics microprocessor.

The modules regularly initiate internal diagnostic tests which, together with a watchdog circuit, monitor the processor performance. If the tests find a serious fault, the processor module will shut down. A single processor system will fail-safe. If a controller uses two or three processor modules and one processor module develops a fault, you can fit a new processor module while the controller is on-line without interrupting the operation of the other processors. The new processor module automatically carries out self-education and synchronizes with the other processors. Fault detection and fail-over in redundant processor configurations is automatic and has no impact on controller operation.

## T9110 Processor Module Specification

Table 23 – Processor Module Specification

Attribute	Value
<b>Functional Characteristics</b>	
Degradation	1oo1D, 1oo2D and 2oo3D <sup>(1)</sup>
Processor clock	400 MHz
Memory	
Boot flash	512 kB
SRAM	512 kB
Bulk flash	64 MB
SDRAM	32 MB
Sequence of events	(for internal variables)
Event resolution	1 ms
Time-stamp accuracy	Application Scan
Self Test Interval	< 5.5 hours
<b>Performance Characteristics</b>	
Safety Integrity Level (SIL)	1 processor: non-safety applications up to SIL 1 2 Processors: up to SIL 3 safety applications 3 Processors: up to SIL 3 fault tolerant and TMR safety applications
I/O Modules supported	48
<b>Electrical Characteristics</b>	
Module supply voltage	
Voltage	Redundant + 24 Vdc nominal; 18-32 Vdc range
Module supply power dissipation	8 W (27.3 BTU/h)
Typical Surface Temperature of an Operating Module	43 °C ± 5 °C
<b>Mechanical Specification</b>	
Dimensions (height × width × depth)	166 mm × 42 mm × 118 mm (6-½ in. × 1-5/8 in. × 4-5/8 in.)
Weight	430 g (15 oz.)
Casing	Plastic, non-flammable

(1) When a controller's processor modules have degraded to 1oo1D, the system must be restored to at least 1oo2D by replacing the faulty processor module(s) within the MTTR assumed in the PFD calculations; also, unless compensating measures are defined in the Safety Requirements Specification (SRS) and documented in operating procedures, the application program must be designed to shut down safety instrumented functions if a module failure due to dangerous fault has not been replaced within the MTTR.

## T9100 Processor Base Unit

Processor base unit supports up to three processor modules as a redundant group. The processor base unit supplies the electrical connections between the T9110 processor modules, and for the remaining controller modules. Each base unit can be mounted onto standard DIN rails or directly onto a panel or wall. The moldings use slots and clamps for DIN rail mountings, and holes for screw fixing to flat panels.

The processor base unit holds the IP address of each processor module separately in a BUSP component that is installed during manufacture. This allows you to remove a faulty processor module and install a new one without needing to set up the IP address of the replacement module.