

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

ICS TRIPLEX

T9431

EIGHT-CHANNEL ANALOG INPUT MODULE

Used with the applicable AADvance safety controllers configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: ICS Triplex AADvance safety controllers official technical documentation



AADvance Controller

Catalog Numbers T9110, T9300, T9310, T9401/2, T9431/2, T9451, T9481/2



Allen-Bradley

by ROCKWELL AUTOMATION

Solutions Handbook

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

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WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

About This Publication

This technical manual describes the features, performance and functionality of the AADvance controller and systems. It gives guidance on how to design a system to satisfy your application requirements.

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Disclaimer

It is not intended that the information in this publication covers every possible detail about the construction, operation, or maintenance of a control system installation. You should also refer to your own local (or supplied) system safety manual, installation and operator/maintenance manuals.

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AADvance Release

This technical manual applies to AADvance system release 1.40.

T9431/2 Analogue Input Module, 8/16 Channel

The T9431/2 analogue input has eight (T9431) or sixteen (T9432) isolated analogue input channels and measures input current in the range 0 mA to 24 mA. Each channel supplies digital state and analogue data to the processor for process monitoring. Each input has five configurable voltage bands (there are eight distinct switching thresholds to allow hysteresis), each of which can be adjusted to supply line monitoring and field device diagnostics.

The input module makes local module and channel status indications through its front panel LEDs, the same indications can be connected to application variables and viewed at the Workbench. Comprehensive diagnostics at system and module levels give clear indications which help fast maintenance and repair.

The module incorporates signal and power isolation circuits, which divide each input channel from the remainder of the system, protecting the controller from field faults. An independent watchdog arrangement monitors the module operation and supplies more fault containment by a shutdown mechanism if a fault occurs.

These modules mate with the T9831/2/3 Analogue Input termination assemblies. When analogue modules are installed in a dual or TMR configuration they supply fault tolerant input functionality, enabling you to replace input modules without interrupting the channel input data flow to the processor modules.

This module supports HART commands #03 to collect data from the field device. The application can be configured to use HART information to monitor and respond to device conditions, it may also be used to supply module diagnostic information such as comparison and error reporting.

Analogue Input Line Monitoring

Each analogue input module is set up through the AADvance Workbench. Monitoring levels for each input channel are configurable at both the module and channel level. The default parameters are:

- Fault: 0 mA to 3.8 mA
- Normal: 3.8 mA to 22.0 mA
- Fault: > 22.0 mA

T9431/2 Analogue Input Module Specification

Table 29 - Analogue Input Module Specification

Attribute	Value
Functional Characteristics	
Input channels:	T9431: 8 T9432: 16
Degradation	1oo1D, 1oo2D and 2oo3D
Performance Characteristics	
Safety integrity level	IEC 61508 SIL 3 ⁽¹⁾
Safety level degradation	1oo1D, 1oo2D and 2oo3D
Safety accuracy limit	200 µA

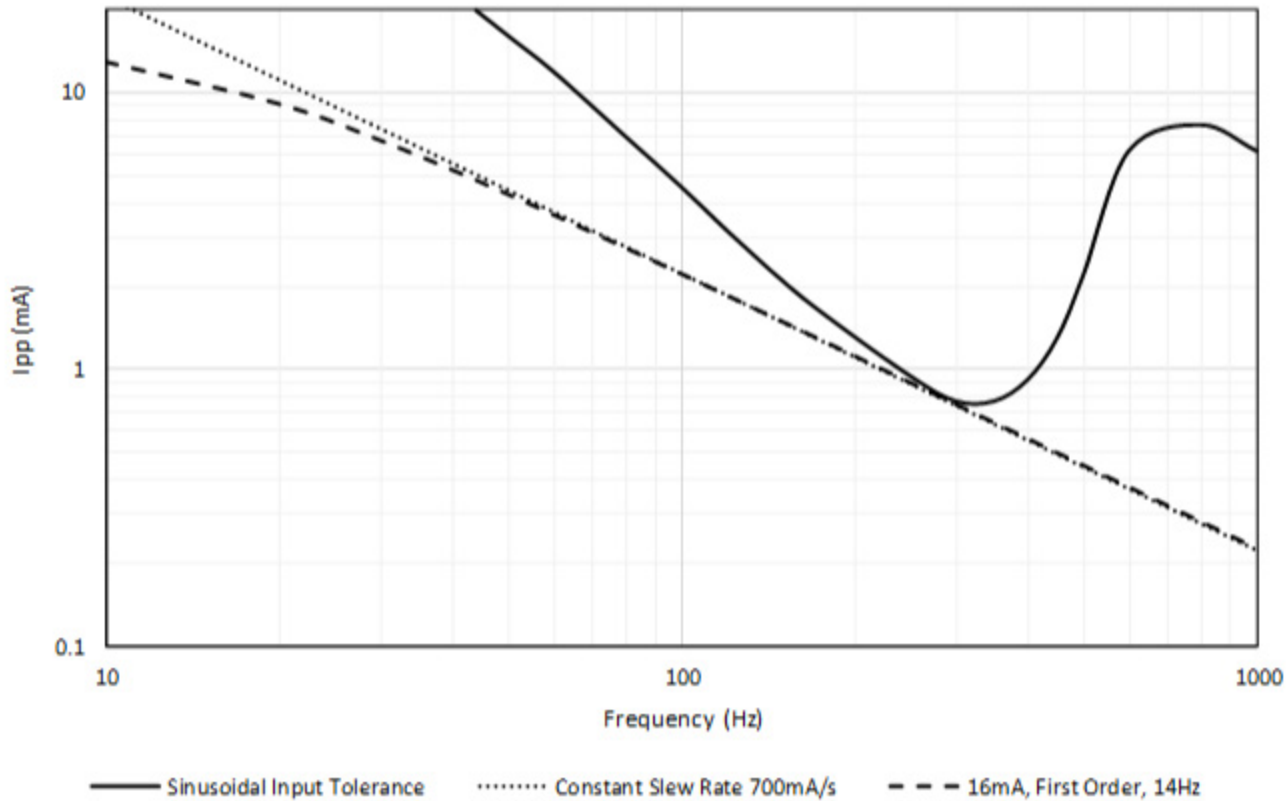
Table 29 - Analogue Input Module Specification

Attribute	Value
Self test interval	< 1 hour; system dependent
Sample update interval (no filter)	6 ms
Value of least significant bit	0.98 μ A
Error at 25 °C $\pm$ 2 °C After 1 year at 40 °C After 2 years at 40 °C After 5 years at 40 °C	0.21 % + 10 μ A 0.22 % + 10 μ A 0.23 % + 10 μ A
Temperature drift	(0.01 % + 0.3 μ A) per °C
Electrical Characteristics	
Module supply voltage:	
Voltage	Redundant + 24 Vdc nominal
Module supply power dissipation	T9431: 3.3 W (11.3 BTU/hr) T9432: 4.0 W (13.6 BTU/hr)
Input Current	
Nominal	4 mAdc to 20 mAdc
Maximum range	0 mAdc to 24 mAdc
Maximum Input Slew Rate	See Figure 32 below ⁽²⁾
Input channel load	see TA Specification
Resolution	0.98 μ A, 15-bit
Measurement calibrated accuracy at 25 °C	$\pm$ 0.05 mA
Field loop power dissipation	see 9831/2/3 TA Specification
Channel isolation - maximum withstanding	$\pm$ 1.5k Vdc for 1 minute
Mechanical Specification	
Dimensions (height $\times$ width $\times$ depth)	166 mm $\times$ 42 mm $\times$ 118 mm (6-1/2 in. $\times$ 1-21/32 in. $\times$ 4-21/32 in.)
Weight	T9431: 280 g (10 oz.) T9432: 340 g (12 oz.)
Casing	Plastic, non-flammable

(1) SIL 3 is the maximum achievable for a single channel. Selected CPU, input and output voting configurations could increase or decrease the correct SIL achieved.

(2) The input slew may exceed the specified levels providing the duration of the transgression is less than the process safety time of the configured module.

Figure 32 - Analogue Input Slew Tolerance



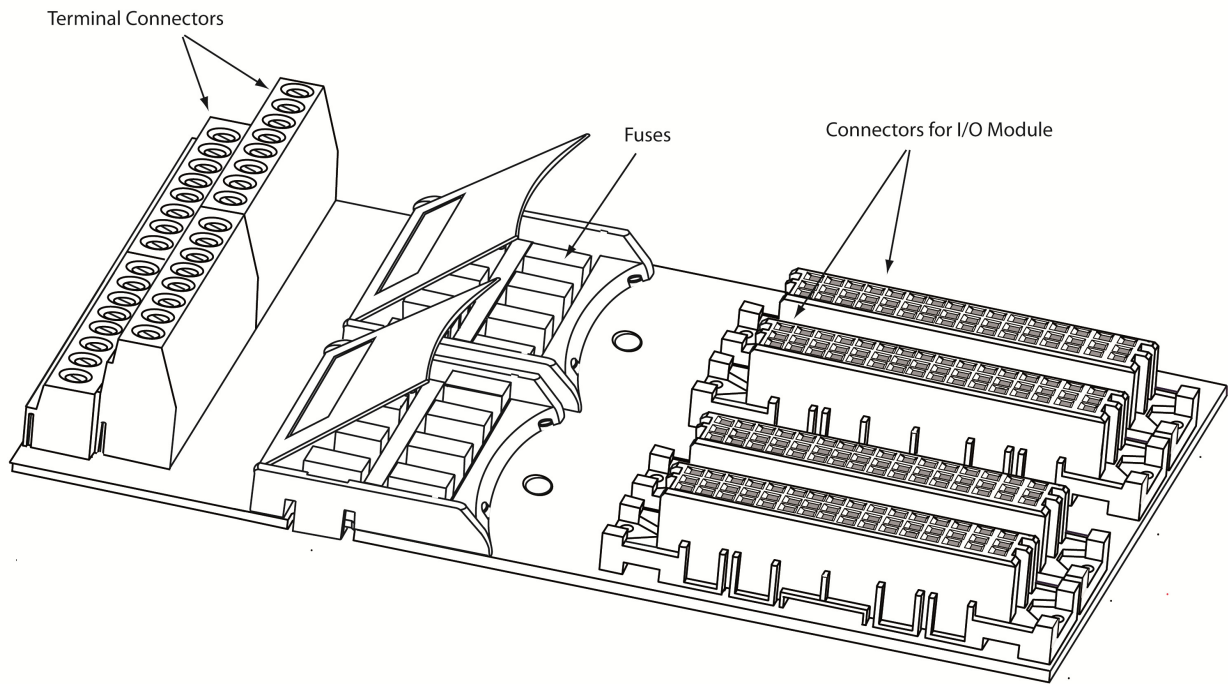
Transgression of the slew rate limits identified above may lead to channel failure resulting from diagnostics otherwise designed to verify that channels are operating within their defined safety accuracy.

T9831/2/3 Termination Assemblies for Analogue Inputs

There are three termination assemblies for use with analogue input modules for simplex, dual and triple modular redundant configurations.

A T9831 termination assembly is for a simplex application and has terminations for 16 non-isolated analogue inputs. It supports one T9431 or T9432 analogue input module. The T9832 and T9833 termination assemblies support 16 isolated analogue inputs for dual and triple modular redundant arrangements of analogue input modules. Illustrated is the T9832 termination assembly:

Figure 33 - Digital/Analogue Input Termination assembly



The termination assembly protects each sensor input signal by a 50 mA fuse. Fuses can be replaced without removing an I/O module or termination assembly.

Analogue Input Termination Assembly

A T9831 termination assembly is for a simplex configuration and has terminations for 16 non-isolated digital inputs. The T9832 and T9833 termination assemblies support 16 isolated digital inputs for dual and triple modular redundant arrangements of digital input modules.

Table 30 - T9831/2/3 Analogue Input TA Specification

Attribute	Value
Functional Characteristics	
Field connections	16; Wiring: Conductor cross section maximum 1.31mm ² (16 AWG); Stripping length 6mm (¼ in.)
Number of input modules supported	
T9831	One
T9832	Two
T9833	Three
Electrical Characteristics	
Input channel fuses	50 mA, 125 V, Type T manufactured by Littelfuse
Channel load	(135 ± 0.2 %) Ω
Channel isolation:	