

Digital Output Module

The following digital output components are available.

Model	Description	Voltage	Type
3401	Digital Output Module	24 V DC	Commoned
2401	Digital Output Baseplate		Direct Termination
2402	Digital Output Baseplate		Current Limited

The Digital Output (DO) Module contains the circuitry for three identical, isolated channels. Each channel includes a proprietary ASIC which receives its output table from the I/O communication processor on its corresponding main processor. DO Modules use special quad output circuitry to vote on the individual output signals just before they are applied to the load. This voter circuitry is based on parallel-series paths which pass power if the drivers for channels A and B, or channels B and C, or channels A and C command them to close; in other words, two out of three drivers are voted on. The quad output circuitry provides multiple redundancy for all critical signal paths, guaranteeing safety and maximum availability.

The DO Module periodically executes an output voter diagnostic (OVD) routine on each point. This safety feature allows unrestricted operation under a variety of multiple-fault scenarios.

OVD detects and provides alarms for the following:

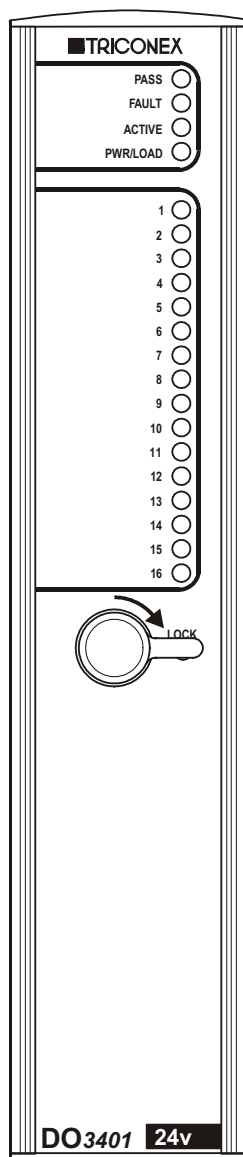
- Points— all stuck-on and stuck-off points are detected in less than 500 milliseconds
- Switches—all stuck-on or stuck-off switches or their associated drive circuitry are detected

During OVD execution, the commanded state of each point is momentarily reversed sequentially on one of the output drivers. Loop-back on the module allows each ASIC to read the output value for the point to determine whether a latent fault exists within the output circuit. The output signal transition is guaranteed to be less than two milliseconds (500 microseconds is typical) and is transparent to most field devices. For devices that cannot tolerate a signal transition of any length, OVD can be disabled.

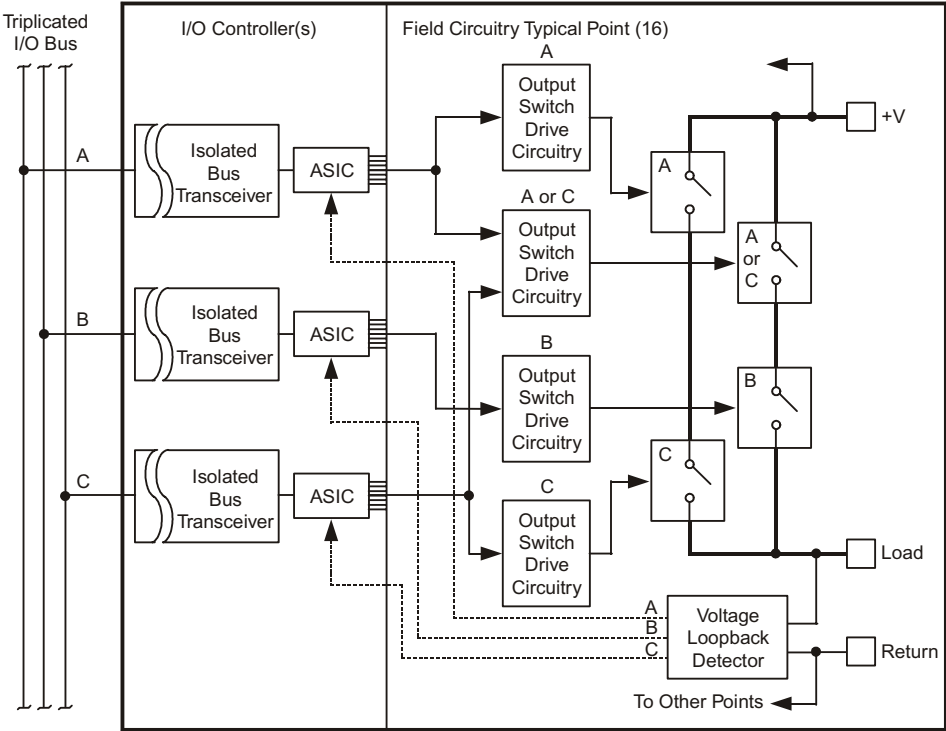
The DO Module supports hot sparing for online replacement of a faulty module or continuous back-up to an active module. The DO Module is mechanically keyed to prevent improper installation in a configured baseplate.

Model 3401 Digital Output Module

DO Module
Front Panel



Model 3401 Digital Output Module Simplified Schematic

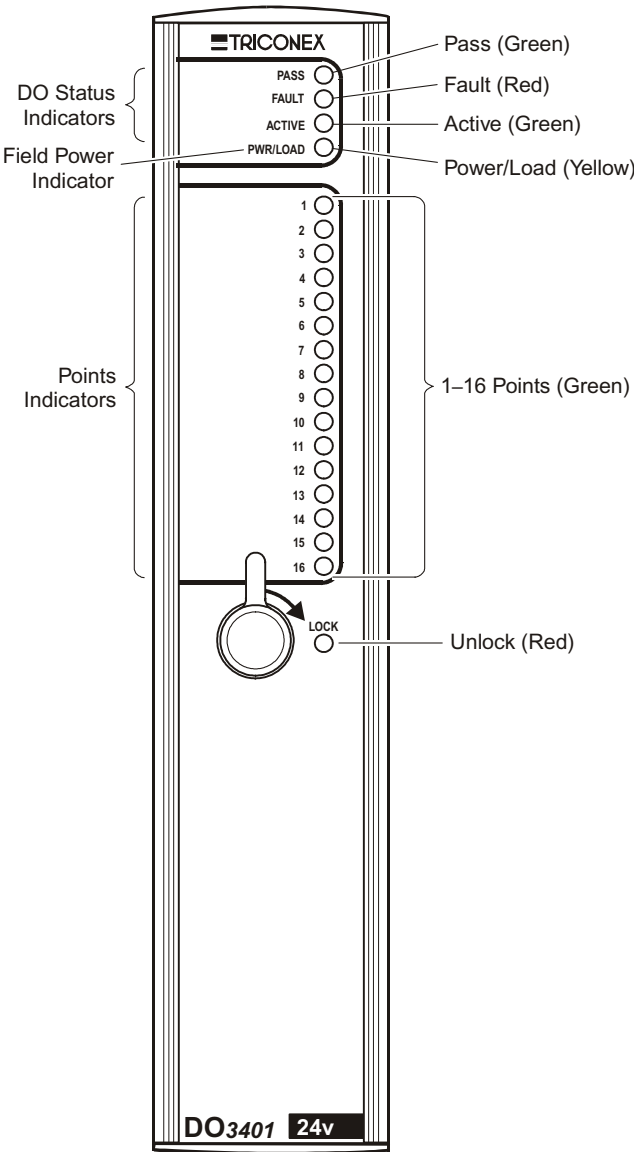


Model 3401 Digital Output Module Specifications

Feature	Specification
Points	16, commoned
Nominal output voltage	24 V DC
Operational voltage range	15–30 V DC
Absolute maximum output voltage	33 V DC
Absolute maximum reverse input voltage	–0.6 V DC
Output current	
Switching	<4.8 A, self-limiting 3 A, typical
Carry	>0.7 A, self-limiting 1.5 A, typical
Field alarms	Loss of field power, output point shorted On or Off
Loop-back thresholds	0–5 V DC = Off region 6–14 V DC = transition region 15–30 V DC = On region
Leakage to load (Off-state)	<1 mA
Diagnostic glitch duration	<2 ms, maximum 500 μ s, typical
Diagnostic fault coverage	
Maximum toggle rate	>20 ms
Minimum toggle rate	Not applicable
On-state voltage drop	<1 V DC @ 1.5 A
Loop-back scan time	<1 ms for all 16 points
Functional-to-protective-earth isolation	500 V DC, minimum
Functional-to-functional-earth (logic) isolation	800 V DC, minimum

Digital Output Module Indicators

This section describes the DO Module indicators and recommends actions for fault conditions.



DO Status Indicators

The DO status indicators identify the processing state for the DO Module. A fault light indicates that the module has an internal fault. If you have a field fault and a module fault, resolve the field fault first.

Normal State

Pass	Fault	Active	Lock	Description	Action
Green steady	No light	Green steady	No light	Module is operating normally.	No action is required.

Fault States

Pass	Fault	Active	Lock	Description	Action
Green steady	No light	No light	No light	Possible conditions include: Application has not been loaded into the MP. Application has been loaded into the MP, but has not been started up. Module has just been installed and is currently running start-up diagnostics. Other module is active.	If the module is the hot spare, no action is required. If the module is active, replace module.
No light	Red steady	— ¹	No light	Possible conditions include: Module may be in the process of power-up self-test. Excessive load current required. Module has detected a fault.	If the Pass indicator does not go on within five minutes, replace the module. Correct field fault condition. Module is operational, but should be replaced.
—	—	—	Red steady	Module is unlocked from the baseplate.	Lock module using a #2 flat-blade screwdriver.
Green steady	Red steady	—	—	Indicators/signal circuitry on the module are malfunctioning.	Replace the module.

1. This symbol (—) means the indicator is not important for this condition.

DO Power/Load Indicator

The DO power/load indicator is lit when a power/load problem has occurred.

Power/ Load	Description	Action
Yellow steady	For at least one point, the commanded state and the measured state do not agree.	To isolate the suspected point, use the TriStation Diagnostic Panel. To determine the commanded state of the output point, use the TriStation Control Panel. To determine the actual state of the output, use a voltmeter, then correct the problem in the external circuit. Verify that load current is within product specification. If these steps do not solve the problem, replace the module.

DO Point Indicator

The DO point indicators identify whether the point is energized or not energized.

Point (1-16)	Description
Green steady	Field circuit is energized.
No light	Field circuit is not energized.