

Product Specifications

Digital Output Module

Each TMR Digital Output Module has three isolated sets of electronics, called channels, which independently accept data from the MP associated with each channel. The channels use the patented Quad Voter circuitry to vote on individual output signals as they are applied to the load.

This voter circuitry is based on parallel-series paths which pass power if two out of three switches (channels A and B, or channels B and C, or channels A and C) command them to close. The Quad Voter circuitry has multiple redundancy on all critical signal paths, guaranteeing safety and maximum availability.

For each point, the DO Module periodically executes the Output Voter Diagnostic (OVD) routine. To allow unrestricted safe operation under a variety of multiple-fault scenarios, OVD detects and alarms these types of faults:

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

DO Modules include complete, ongoing diagnostics for each channel. If the diagnostics detect a failure on any channel, the Fault indicator turns on and activates the system alarm. The Fault indicator identifies a channel fault, not a complete module failure. DO Modules are guaranteed to operate properly in the presence of a single fault and may continue to operate properly with certain multiple faults.

DO Modules support a hot-spare module. Each DO Module is mechanically keyed to prevent improper installation in a configured baseplate.

Model 3401 Digital Output Module Specifications

Feature	Specification
Points	16, commoned
Nominal output voltage	24 VDC
Specified operational voltage range	15 to 30 VDC
Absolute maximum output voltage	33 VDC
Absolute maximum reverse input voltage	– 0.6 VDC
Output current	
Switching	<4.8 A, self-limiting 3.0 A, typical
Degraded mode	> 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 VDC = Off region 6–14 VDC = transition region 15–30 VDC = On region
Leakage to load (Off state)	<1 mA
Diagnostic glitch duration	<2 ms, maximum 500 µs, typical
Diagnostic fault coverage	
Maximum toggle rate	>20 ms
Minimum toggle rate	Not applicable
On state voltage drop	<1.0 VDC @ 1.5 A
Loop-back scan time	<1.0 ms for all 16 points
Functional earth to protective earth isolation	500 VDC, minimum
Functional earth to functional earth (logic) isolation	800 VDC, minimum

These baseplates can be used with the Model 3401 DO Module:

- Model 2401, which is used with typical applications.
- Model 2401L, which is used with low-current applications where integral current limiting is required. Each output is provided with a 180 ohm series resistor.
- DO External Termination Baseplate, which is used with the Relay Output External Termination Panel in high-voltage applications, or the Model

9671-610 DO Hazardous Location External Termination Panel.