

## TMR Digital Input Modules

Each TMR digital input (DI) module has three isolated input channels which independently process all data input to the module. A microprocessor on each channel scans each input point, compiles data, and transmits it to the main processors upon demand. Then input data is voted at the main processors just prior to processing to ensure the highest integrity. All critical signal paths are 100 percent triplicated for guaranteed safety and maximum availability. Each channel conditions signals independently and provides optical isolation between the field and the Tricon.

All TMR digital input modules sustain complete, ongoing diagnostics for each channel. Failure of any diagnostic on any channel activates the module Fault indicator which in turn activates the chassis alarm signal. The module Fault indicator points to a channel fault, *not* a module failure. The module is guaranteed to operate properly in the presence of a single fault and may continue to operate properly with certain kinds of multiple faults.

Models 3502E, 3503E, and 3505E can self-test to detect stuck-ON conditions where the circuitry cannot tell whether a point has gone to the OFF state. Since most safety systems are set up with a

de-energize-to-trip capability, the ability to detect OFF points is an important feature. To test for stuck-ON inputs, a switch within the input circuitry is closed to allow a zero input (OFF) to be read by the optical isolation circuitry. The last data reading is frozen in the I/O communication processor while the test is running.

All TMR digital input modules support hot-spare capability, and require a separate external termination panel (ETP) with a cable interface to the Tricon backplane. Each module is mechanically keyed to prevent improper installation in a configured chassis.

Model Number	3501E/3501T	3502E	3503E	3505E
Type	TMR	TMR with Self-Test	TMR with Self-Test	TMR, Low Threshold
Voltage	115 VAC/VDC	48 VAC/VDC	24 VAC/VDC	24 VDC
Points	32, non-commoned, isolated	32, commoned in groups of 8	32, commoned in groups of 8	32, commoned in groups of 8
AC Range/DC Range	90-155 VAC/VDC	35-95 VAC/VDC	20-42.5 VAC/VDC	20-42.5 VDC
Frequency Range	DC or 47-63 Hz	DC or 47-63 Hz	DC or 47-63 Hz	n/a
Maximum Voltage	155 VAC/VDC	95 VAC/VDC	42.5 VAC/VDC	42.5 VDC
Switching Level				
OFF to ON	> 86 VAC/VDC	> 32 VAC/VDC	> 18 VAC/VDC	> 12 VDC
ON to OFF	< 28 VAC/VDC	< 11 VAC/VDC	< 6 VAC/VDC	< 4 VDC
Nominal Turn-On	6-9 mA	6-9 mA	6-9 mA	3 mA to 5 mA
Typical Hysteresis	32 VAC/VDC	7 VAC/VDC	4 VAC/VDC	2 VDC
Input Delay				
OFF to ON/ON to OFF	< 8 ms/< 15 ms	< 8 ms/< 15 ms	< 8 ms/< 15 ms	< 8 ms/< 15 ms
Point Isolation	1500 VDC/ 2500 VDC <sup>1</sup>	1500 VDC	1500 VDC	1500 VDC
Nominal Input Impedance	> 8.5 K $\Omega$	> 2.9 K $\Omega$	> 1.25 K $\Omega$	> 1.25 K $\Omega$
Nominal Field Power Load				
Per ON point	1.5 watts	1.0 watts	0.5 watts	0.5 watts
@ max. field voltage	2.9 watts	3.2 watts	1.5 watts	1.5 watts
Diagnostic Indicators				
Input Status	1 per point	1 per point	1 per point	1 per point
Module Status	PASS, FAULT, ACTIVE	PASS, FAULT, ACTIVE	PASS, FAULT, ACTIVE	PASS, FAULT, ACTIVE
Stuck Test	n/a	ON	ON	ON
Color Code	Red	Dark Red	Dark Red	Dark Red

1. For 3501T.

# Field Termination Options

Match your I/O module number in the first column with termination options on the right. An I/O module can be wired to a maximum of two termination panels, which may be of two different types—for example, commoned and non-commoned.

Module Part #	Module Description	Commoned Term Panels	Non-Common. Term Panels	Basic Term Panels	Nonincendive Term Panels	Fanned-out Cables	Bypass Panels	ERT Loop-Back Cables/Panels
3501E 3501T	DI, 115 VAC/VDC, 32 pts.	9561-810	9561-110	9551-110	n/a	9101-010	n/a	9141-010
3502E	DI, 48 VAC/VDC, 32 pts.	9562-810	n/a	9552-610	n/a	9101-010	n/a	9142-010
3503E	DI, 24 VAC/VDC, 32 pts.	9563-810	n/a	9553-610	9572-610	9101-010	BP9228-010	9143-010
3504E	DI, 24/48 VDC, non-isolated, 64 pts.	9566-810, 24V 9565-810, 48V	n/a n/a	9750-310, 24V 9750-410, 48V	9570-610, 24V n/a	n/a n/a	BP9229-010 n/a	n/a n/a
3505E	DI, 24 VDC, low threshold, 32 pts.	9563-810	n/a	9553-610	9572-610	9101-010	BP9228-010	9143-010
3510	PI, 20-20,000 Hz, 8 pts.	n/a	n/a	9753-110	n/a	n/a	n/a	n/a
3511	PI, 20-20,000 Hz, 8 pts.	n/a	n/a	9753-110	9793-110	n/a	n/a	n/a
3515	Pulse totalizer, 24 VDC, 32 pts.	n/a	n/a	9753-110	9572-610	n/a	n/a	n/a
3564	DI, 24 VDC, single, 64 pts.	9566-710	n/a	9553-610	9571-610	9101-010	n/a	n/a
3601E	DO, 115 VAC, 16 pts.	9661-610 9663-610	9661-110 9664-110	9651-110	n/a	9101-010	n/a	9670-110 9670-610
3601T	DO, 115 VAC, 16 pts.	9663-610	9664-110	n/a	n/a	n/a	n/a	n/a
3603B	DO, 120 VDC, 16 pts.	n/a	9251-210	n/a	n/a	n/a	n/a	n/a
3603E	DO, 120 VDC, 16 pts.	9661-910 9664-810	n/a	9651-110	n/a	9101-010	n/a	9673-810
3603T	DO, 120 VDC, 16 pts.	9664-810	n/a	n/a	n/a	n/a	n/a	9673-810
3604E	DO, 24 VDC, 16 pts.	9662-810	9662-110	9653-610	9671-610	9101-010	n/a	9671-810
3607E	DO, 48 VDC, 16 pts.	9667-810	9667-110	9652-610	n/a	9101-010	n/a	9672-810
3611E	DO, 115 VAC, 8 pts.	9661-510	n/a	n/a	n/a	n/a	n/a	n/a
3613E	DO, 120 VDC, 8 pts.	9661-810	n/a	n/a	n/a	n/a	n/a	n/a
3614E	DO, 24 VDC, 8 pts.	9662-910	n/a	n/a	n/a	n/a	n/a	n/a
3615E	DO, 24 VDC, low power, 8 pts.	9662-710	n/a	n/a	n/a	n/a	n/a	n/a
3617E	DO, 48 VDC, 8 pts.	9667-910	n/a	n/a	n/a	n/a	n/a	n/a
3623	DO, 120 VDC, 16 pts.	9661-910	n/a	9651-110	n/a	9101-010	n/a	n/a
3623T	DO, 120 VDC, 16 pts.	9664-810	n/a	n/a	n/a	n/a	n/a	n/a
3624	DO, 24 VDC, 16 pts.	9662-610	n/a	9653-610	9671-610	9101-010	n/a	n/a
3625	DO, 24 VDC, 32 pts.	9662-610	n/a	9653-610	9671-610	9101-010	n/a	n/a
3636R 3636T	Relay output (non-triplicated), 32 pts.	n/a	9668-110	9651-110	n/a	9101-010	n/a	n/a
3664	Dual DO, 24 VDC, self-protected, 32 pts.	9662-610	n/a	9653-610	9671-610	9101-010	n/a	9671-810
3674	Dual DO, 24 VDC, self-protected, 32 pts.	9662-610	n/a	9653-610	9671-610	9101-010	n/a	9671-810
3805E	AO, 4-20 mA, 8 pts.	n/a	n/a	9853-610	9861-610	n/a	n/a	n/a
3806E	AO, 6 4-20 mA outputs, 2 20-320 mA outputs	n/a	n/a	9863-710 (special panel)	n/a	n/a	n/a	n/a