

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

TRICONEX

3625N

NUCLEAR DIGITAL OUTPUT MODULE

Used with the applicable Triconex safety system configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Tricon Technical Product Guide

Tricon v10.x Equipment Certified for Use in Nuclear 1E Applications

Invensys has qualified specific Tricon version 10 products for use in 1E (safety-related) applications in nuclear power plants in accordance with EPRI Report TR-107330, “Generic Requirements Specification for Qualifying Commercially Available PLC for Safety-Related Applications in Nuclear Power Plants.” EMC testing was performed in accordance with USNRC Regulatory Guide 1.180, Revision 1, “Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems.”

All of the information (specifications, simplified schematics, installation guidelines, and so on) for standard equipment also applies to nuclear equipment. The following table lists the model numbers of Tricon v10.x equipment certified for use in Nuclear 1E applications and identifies the standard model to see for information about the equipment.

Model Number	Description	See This Standard Model
Modules^a		
8110N2	Main Chassis	8110
8111N	Expansion Chassis	8111
8112N	Remote Expansion Chassis	8112
8310N2	High-Density Power Module, 120 V	8310
8311N2	High-Density Power Module, 24 VDC	8331
8312N2	High-Density Power Module, 230 VAC	8312
3008N	Enhanced Main Processor III, 16 Mb	3008
4200N	Remote Extender Module	4200
4200-3N	Remote Extender Module (Set)	4200-3
4201N	Remote Extender Module	4201
4201-3N	Remote Extender Module (Set)	4201-3
4352AN	Tricon Communication Module (TCM)	4352A
4352BN	Tricon Communication Module (TCM)	4352B
3701N2	0–10 VDC, Differential DC Coupled, TMR	3701
3703EN	0–5 VDC or 0–10 VDC, Differential, Isolated, TMR	3703E
3721N	0–5 VDC or –5 to +5 VDC, Differential, DC Coupled, TMR	3721
3805HN	4–20 mA, Current Loop, DC Coupled, TMR	3805H
3501TN2	115 VAC, Opto-isolated, Non-commoned, TMR	3501T
3502EN2	48 VAC/VDC, Commoned in Groups of 8, Self-Test, TMR	3502E
3503EN2	24 VAC/VDC, Commoned in Groups of 8, Self-Test, TMR	3503E
3601TN	115 VAC, Opto-isolated, Non-commoned, TMR	3601T
3603TN	120 VDC, Opto-isolated, Commoned, TMR	3603T
3607EN	48 VDC, Opto-isolated, Non-commoned, TMR	3607
3623TN	120 VDC, Opto-isolated, Commoned, Supervised, TMR	3623T
3625N	24 VDC, Supervised/Non-supervised, Commoned, TMR	3625
3511N	Pulse Input, Differential, AC Coupled, TMR	3511
3708EN	Thermocouple, Differential, Isolated, TMR	3708
3636TN	Relay Output, Normally Open, Non-triplicated	3636T
8105N	Blank Module Panel	8105

Product Specifications

16-Point Supervised and 32-Point Supervised/Non-Supervised Digital Output Modules

Designed for the most critical control programs, Supervised Digital Output (SDO) modules meet the needs of systems whose outputs remain in a single state for extended periods of time (in some applications, for years). An SDO module receives output signals from the Main Processors on each of three channels. Each set of three signals is then voted upon by a fully fault-tolerant quadruplicated output switch whose elements are power transistors,

so that one voted output signal is passed to the field termination.

Each SDO module has voltage and current loopback circuitry coupled with sophisticated online diagnostics that verify the operation of each output switch, the field circuit and the presence of a load. This design provides complete fault coverage without the need to influence the output signal.

The modules are called “supervised” because fault coverage is extended to include potential field problems. In other words, the field circuit is *supervised* by the SDO module so that the following field faults can be detected:

- Loss of power or blown fuse
- Open or missing load
- A field short resulting in the load being energized in error
- A shorted load in the de-energized state

Failure to detect field voltage on any output point energizes the power alarm indicator. Failure to detect the presence of a load energizes the load alarm indicator.

All SDO modules support hot-spare modules and require a separate external termination panel (ETP) with a cable interface to the Tricon controller backplane.

16-Point and 32-Point Supervised Digital Output Module Specifications

Model Number	3623/3623T ^a	3624	3625/3625A ^b
Nominal Voltage	120 VDC	24 VDC	24 VDC
Type	TMR, Supervised DO	TMR, Supervised DO	TMR, Supervised/Non-Supervised DO
Output Signals	16, commoned	16, commoned	32, commoned
Voltage Range	90-150 VDC	16-30 VDC	16-32 VDC
Maximum Voltage	160 VDC	36 VDC	36 VDC
Voltage Drop	< 1.5 VDC, typical	< 1.5 VDC, typical	< 2.8 VDC @ 1.7A, typical
Power Module Load	< 10 watts	< 10 watts	< 13 watts
Current Ratings, Maximum	0.8A per point 4A surge per 10 ms	0.7A per point 4.8A surge per 10 ms	1.7A per point 7A surge per 10 ms
Minimum Required Load	30 mA	30 mA	10 mA
Load Leakage	4 mA maximum	4 mA maximum	4 mA maximum
Fuses (on Field Termination)	1A fast-acting	n/a—self-protecting	n/a—self-protecting
Point Isolation	1,500 VDC/ 2500 VDC ^c	1,500 VDC	1,500 VDC
Diagnostic Indicators			
On or Off State	1 per point	1 per point	1 per point
Module Status	PASS, FAULT, ACTIVE	PASS, FAULT, ACTIVE	PASS, FAULT, LOAD, ACTIVE
Field Alarm	POWER, LOAD (1 per point)	POWER, LOAD (1 per point)	LOAD (1 per point)
Color Code	Steel blue	Turquoise green	Dark blue

a. CAUTION: Invensys highly recommends that you perform compatibility testing before selecting the Model 3623T module for use in applications that have field wiring lengths over 328 feet (100 meters), cable that is not twisted pair, or atypical loads such as smart devices, strobe lights, or klaxons.

b. CAUTION: Invensys highly recommends using a single set of redundant field power supplies for the 3625/3625A termination panels. For the 3625A module, if field power is supplied to the termination panels using four independent power sources, the voltage from all power sources must be maintained within 5% of the highest voltage supplied.

c. For 3623T.

TMR Digital Output Modules

Each TMR Digital Output (DO) module receives output signals from the Main Processors on each of three channels. Each set of three signals is then voted by special quadruplicated output circuitry on the module. The circuitry produces one voted output signal and passes it to the field termination. The quadruplicated voter circuitry provides multiple redundancy for all critical signal paths, guaranteeing safety and maximum availability.

Each TMR Digital Output Module has a voltage-loopback circuit which verifies the operation of each output switch independently of the presence of a load and determines whether latent faults

exist. Failure of the detected field voltage to match the commanded state of the output point activates the LOAD/FUSE alarm indicator.

In addition, ongoing diagnostics are performed on each channel and circuit of a TMR Digital Output Module. Failure of any diagnostic on any channel activates the Fault indicator, which in turn activates the chassis alarm signal. The Fault indicator merely indicates 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.

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

Digital outputs are designed to source the current to field devices, so field power must be wired to each output point on the field termination.

16-Point Digital Output Module Specifications

Model Number	3601E/3601T	3603B/3603E/3603T	3607E	3604E
Nominal Voltage	115 VAC	120 VDC	48 VDC	24 VDC
Type	TMR, DO	TMR, DO	TMR, DO	TMR, DO
Output Signals	16, non-commoned	16, commoned (3603E/T) 16, non-commoned (3603B)	16, non-commoned	16, non-commoned
Voltage Range	80-155 VAC	90-150 VDC	44-80 VDC	22-45 VDC
Voltage Drop ^a	< 3V, typical	< 1.5V, typical	< 3V, typical	< 4V, typical
Frequency Range	47-63 Hz	n/a	n/a	n/a
Current Ratings, Maximum	2A per point 12A surge/cycle	0.8A per point 4A surge/10 ms	1A per point 5A surge/10 ms	2A per point 10A surge/10 ms
Load Leakage	2 mA maximum @ 60 Hz	2 mA maximum	2 mA maximum	2 mA maximum
Chassis Leakage	4 mA maximum @ 60 Hz	n/a	n/a	n/a
Fuses (on Field Termination)	1 per output, 3A fast-acting	1 per output, 1.0A fast-acting	1 per output, 1.25A fast-acting	1 per output, 2.5A fast-acting
Point Isolation	1,500 VDC/ 2500 VDC ^b	1,500 VDC/ 2500 VDC ^c	1,500 VDC	1,500 VDC
Diagnostic Indicators				
On or Off state	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
Field Alarm	LOAD/FUSE	LOAD/FUSE	LOAD/FUSE	LOAD/FUSE
Color Code	Green	Blue	Light blue	Dark blue

a. **WARNING:** The voltage drop may be significantly higher in some applications.

b. For 3601T.

c. For 3603T.