

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

TRICONEX

3601E

TMR DIGITAL OUTPUT MODULE

Selected official pages follow this cover with source pagination retained.

REFERENCE PACKAGE

Source: Planning and Installation Guide for Tricon v9-v10 Systems

OFFICIAL MANUFACTURER DOCUMENT

Assembly 9700077-012

Digital Output Modules

This section describes the Digital Output Modules available for use with Tricon v9–v10 systems, which include TMR and Single (non-triplicated) modules. For field wiring information, see [Digital Output Field Wiring Precautions on page 192](#).

Table 30 Digital Output Modules

Model	Voltage	Type
3601E/T	115 VAC	16-point TMR, Non-Commoned
3603B	120 VDC	16-point TMR, Non-Commoned
3603E/T	120 VDC	16-point TMR, Commoned
3604E	24 VDC	16-point TMR, Non-Commoned
3607E	48 VDC	16-point TMR, Non-Commoned
3611E	115 VAC	8-point TMR Supervised, Commoned
3613E	120 VDC	8-point TMR Supervised, Commoned
3614E	24 VDC	8-point TMR Supervised, Commoned
3615E	24 VDC	8-point TMR Supervised, Low Power, Commoned
3617E	48 VDC	8-point TMR Supervised, Commoned
3623/T	120 VDC	16-point TMR Supervised, Commoned
3624	24 VDC	16-point TMR Supervised, Commoned
3625 ¹	24 VDC	32-point TMR Supervised/Non-Supervised, Commoned
3636R/T	Relay, NO	32-point Non-Triplicated, Non-Commoned
3664	24 VDC	32-point Dual Output, Commoned
3674	24 VDC	32-point Dual Output, Commoned

1. The 3625 module can be installed only in Tricon v10.2 and later systems.

Each Digital Output Module houses the circuitry for three identical, isolated channels. Each channel includes an I/O microprocessor which receives its output table from the I/O communication processor on its corresponding Main Processor. All the Digital Output Modules, except the dual DC modules, use special quadruplicated output circuitry which votes 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, 2-out-of-3 drivers voted On. The dual Digital Output Modules provide a single parallel or series path, with the 2-out-of-3 voting process applied individually to each switch.

The quadruplicated output circuitry provides multiple redundancy for all critical signal paths, guaranteeing safety and maximum availability. The dual output module provides just enough redundancy to ensure safe operation. Dual modules are optimized for those safety-critical applications where low cost is more important than maximum availability.

This figure shows the front panels of models 3601E and 3601T.

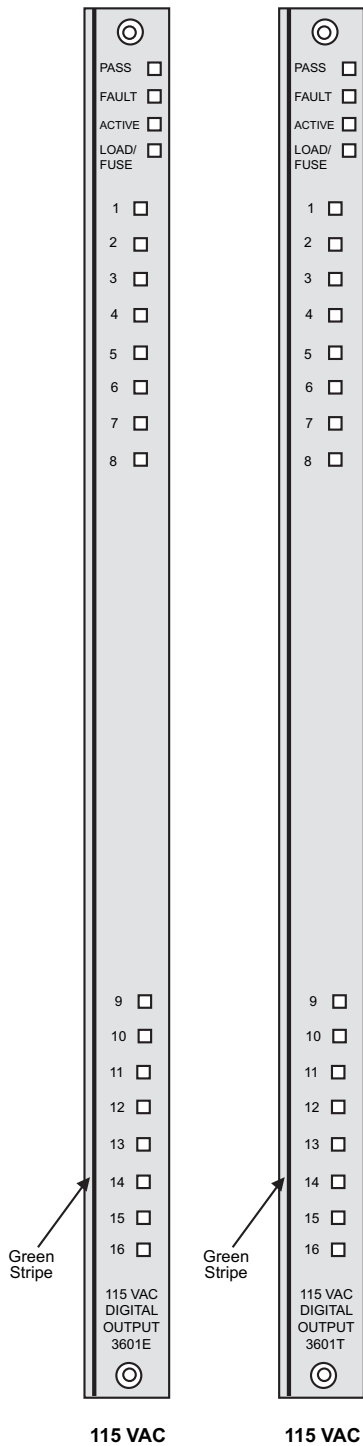


Figure 37 3601E and 3601T Front Panels

3601E and 3601T Specifications

This table lists the specifications for models 3601E and 3601T, which are 16-point, opto-isolated TMR Digital Output Modules with an nominal voltage of 115 VAC. Model 3601T has a higher point-isolation minimum.

Table 31 3601E and 3601T Digital Output Specifications

Feature	Specification
Color code	Green
Number of output signals	16, non-commoned
Input frequency range	47-63 Hz
Voltage range	80-155 VAC
Logic power	< 10 watts
Current ratings, maximum	2 amps/point, 12 amps surge/cycle
Leakage current to load @ 60 Hz	2 mA maximum @ 60 Hz
Leakage current to chassis @ 60 Hz	4 mA maximum @ 60 Hz
Fuses (on field termination module)	1 per output, 3 amps, fast-acting
Status indicator: On or Off state	1 per point
Status indicator: Module status	Pass, Fault, Active
Status indicator: Field alarm ¹	Load/fuse
Point isolation: 3601E	1000 VAC minimum, 1500 VDC minimum
Point isolation: 3601T	1780 VAC minimum, 2500 VDC minimum
Output diagnostic fault coverage ² : Maximum output toggle rate	Every 100 ms plus one scan
Output diagnostic fault coverage ² : Minimum output toggle rate	Every 3 months
Diagnostic glitch duration ³	1/2 AC cycle maximum
On-state voltage drop: At backplane	< 2 VAC typical @ 100mA < 3 VAC maximum @ 2A
On-state voltage drop: With external termination, 10-foot cable	< 3 VAC typical @ 100mA < 5 VAC maximum @ 2A
On-state voltage drop: With external termination, 99-foot cable	< 4 VAC typical @ 100mA < 11 VAC maximum @ 2A
Inductive kick-back protection (reverse EMF)	Zero-crossing TRIACs

1. Power must be supplied to all points, including unused points on non-commoned panels.
2. The maximum output toggle rate enables proper operation of I/O diagnostics and detection of all normally detectable faults. The minimum toggle rate provides fault coverage of normally undetectable faults within 10% of the calculated mean-time-between-faults (MTBF) for the module.
3. Diagnostic glitching can be disabled by using the OVD disable function.

Slot Key Numbers

This table lists the keys for Main Processors and the COM (used for TCM, EICM, or NCM) slots.

Table 73 Main Processor, COM, and Blank Slot Keys

Model	Module Name	Top Key	Bottom Key
3008	Main Processor (MP) Module	007	002
3006, 3007	Main Processor (MP) Module	007	007
	COM Slot (TCM, EICM, or NCM)	001	003
	Blank Logical Slot ¹	001	008

1. Use this key combination or part number 2000508-001 to prevent the insertion of modules into any unused slots in your controller.

This table lists the keys for I/O and communication module slots.

Table 74 I/O and Communication Module Slot Keys

Model	Module Name	Top Key	Bottom Key
3501E/T	115 VAC/DC Digital Input (TMR)	004	004
3502E	48 VAC/DC Digital Input with Self-Test (TMR)	004	005
3503E	24 VAC/DC Digital Input with Self-Test (TMR)	004	006
3504E	24 VDC /48 VDC High Density Digital Input (TMR)	004	007
3505E	24 VDC Low Threshold Digital Input with Self-Test (TMR)	004	006
3510	Pulse Input, AC Coupled (TMR)	004	001
3511	Pulse Input, AC Coupled (TMR)	004	001
3515	Pulse Totalizer Input	004	002
3564	24 VDC Digital Input (Single)	004	006
3601E/T	115 VAC Digital Output (TMR)	006	004
3603B	120 VDC Digital Output (TMR), non-commoned	006	006
3603E/T	120 VDC Digital Output (TMR), commoned	006	006
3604E	24 VDC Digital Output (TMR)	006	007
3607E	48 VDC Digital Output (TMR)	006	003
3611E	115 VAC Supervised Digital Output (TMR)	005	002
3613E	120 VDC Supervised Digital Output (TMR)	005	005
3614E	24 VDC Supervised Digital Output (TMR)	005	004
3615E	24 VDC Low-Power Supervised Digital Output (TMR)	005	004
3617E	48 VDC Supervised Digital Output (TMR)	005	003
3623/T	120 VDC Supervised Digital Output (TMR)	005	005

Toggling Field I/O Points

Once every three to six months, you should toggle the field points from the normal operational state to the opposite state to guarantee complete fault coverage of the digital circuitry. Leave each point in the opposite state for several minutes. Ideally, this type of testing is performed with the controlled process offline—for example, during a normally scheduled plant maintenance period. For instructions, see the *TriStation Developer's Guide*.

This table lists the Digital Input and Digital Output Modules that require toggling the field points for 100 percent fault coverage.

Model	Module Description
3501E/T	115 VAC/VDC Digital Input
3502E	48 VAC/VDC Digital Input, normally off points only
3503E	24 VAC/VDC Digital Input, normally off points only
3505E	24 VDC Digital Input, normally off points only
3601E	115 VAC Digital Output

Verifying Spare Modules

The controller automatically tests all modules installed in the system. The only action needed to guarantee the integrity of a spare module is to periodically install it in an online system. Spare I/O modules should be installed as hot-spare modules because the controller automatically shifts control between the active and hot-spare modules.

Control changes as follows:

- Periodically, approximately once an hour
- After a power failure
- After an MP re-education

Spare MP and I/O modules that are not installed in the system should be periodically rotated into an online system to ensure the integrity of spare inventory. A rotation schedule should be established so that a spare module is not allowed to sit on the shelf more than six months.

Performance Proof Testing Model 3807 BiPolar Analog Output Modules

Triconex recommends that BPAO modules used in critical control applications be performance proof tested during scheduled maintenance. The amount of time between proof tests should not exceed 10 years. To ensure TMR operation of the BPAO module, the test should check the accuracy of each output point by confirming that +60 mA and -60 mA output current values can be maintained for at least 60 seconds.