

## TMR Digital Output Modules

A 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 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.

| Model Number                 | 3601E/3601T                     | 3603B/3603E/3603T                                  | 3607E                              | 3604E                             |
|------------------------------|---------------------------------|--|------------------------------------|-----------------------------------|
| Nominal Voltage              | 115 VAC                         | 120 VDC  | 48 VDC                             | 24 VDC                            |
| Type                         | TMR                             | TMR  | TMR                                | TMR                               |
| Output Signals               | 16, non-commoned                | 16, commoned (3603E/T)<br>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 <sup>1</sup>    | < 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<br>12A surge/cycle | 0.8A per point<br>4A surge/10 ms                   | 1A per point<br>5A surge/10 ms     | 2A per point<br>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,<br>3A fast-acting | 1 per output,<br>1.0A fast-acting                  | 1 per output,<br>1.25A fast-acting | 1 per output,<br>2.5A fast-acting |
| Point Isolation              | 1500 VDC/ 2500 VDC <sup>2</sup> | 1500 VDC/ 2500 VDC <sup>3</sup>                    | 1500 VDC                           | 1500 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                         |

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

2. For 3601T.

3. For 3603T.