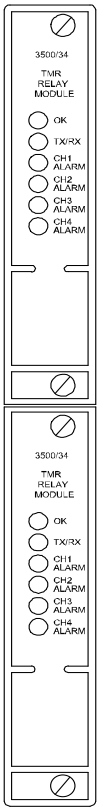
3500/34 TMR Relay Module

Bently Nevada™ Asset Condition Monitoring



Description

For applications that require extremely high availability comparable to safety instrumented systems described in ISA S84.01-1996, the 3500 Series Machinery Protection System supports a Triple Modular Redundant (TMR) Relay Module. The TMR Relay Module uses three independent relays to drive a single relay output. The TMR Relay Module works in conjunction with a special TMR Rack Interface Module and three monitor modules to provide 2-out-of-3 voting for inputs.

Each relay utilized on the TMR Relay Module includes "Alarm Drive Logic". The Alarm Drive Logic is programmed using AND and OR logic, and can utilize alarming inputs (alerts and dangers) from any monitor channel or any combination of monitor channels in the rack. This Alarm Drive Logic programming uses the 3500 Rack Configuration Software to meet the specific needs for the application.

How the TMR Relay Module functions:
The 3500/34 TMR Relay Module consists of two main components: the TMR Relay Module (quantity of two) and the TMR Relay I/O Module. Once programmed, the two TMR Relay Modules perform the same functions in parallel, effectively providing redundant functionality between the two.

The following describes the purpose of each component (see Figure 3):

TMR Relay Module: The TMR Relay Module drives 3 independent Alarm Contact Signals for each of the 4 relay channels, based on the user-programmed Alarm Drive Logic. Alarm Drive Logic is programmed for each relay channel via the 3500 Rack Configuration Software. Within a TMR Rack, three monitors simultaneously provide the alarm signals (Channel Alerts, Channel Dangers, Monitor Alerts, etc.) used for this Alarm Drive Logic via three separate data paths. The TMR Relay Module evaluates each data path independently, produces three Alarm Contact Signals, and passes these Alarm Contact Signals to the TMR Relay I/O Module. If the OK Status for a data path is NOT OK, the Alarm Contact Signal associated with that data path is set as invalid.

TMR Relay I/O Module: The TMR Relay I/O Module contains 12 relays arranged in 4-channel groups of 3 relays each. This arrangement provides 2-out-of-3 relay voting for each of the 4 relay channels. For each relay channel, the TMR Relay Module provides 3 Alarm Contact Signals. Each Alarm Contact Signal is input to one of the relays in the channel group. The design of these relay channel groups provide the 2-out-of-3 voting as listed in the Table. Additionally, each TMR Relay Module provides an OK status which is evaluated on the TMR Relay I/O Module. If the module is NOT OK, the TMR Relay IO Module does not evaluate the Alarm Contact Signals from that module.

Specifications

Inputs

Power Consumption:

9.6 Watts typical.

Outputs

The TMR Relay Module contains six LEDs used to communicate operating status.

OK LED:

Illuminated when module is functioning properly.

TX/RX LED:

Transmit and Receive. Flashes to indicate proper communications between this module and other modules within the rack.

CH ALARM LEDs:

Illuminated when the Relay Channel is in an alarm state.

Relays:

Type

Three double-pole, double-throw (DPDT) relays connected in a single-pole, single-throw (SPST) configuration.

Arc Suppressor

Not supported.

Environmental Sealing

Epoxy-sealed.

Contact Life

100,000 cycles @ 1.5 A, 24 Vdc or 1 A, 120 Vac.

Operation

Each channel is Normally Energized.

Environmental Limits

Operating Temperature:

-30 °C to +65 °C

(-22 °F to +150 °F)

Storage Temperature:

-40 °C to +85 °C

(-40 °F to +185 °F)

Humidity:

95%, non-condensing.

CE Mark Directives

EMC Directives:

EN50081-2:

Radiated Emissions

EN 55011, Class A

Conducted Emissions

EN 55011, Class A EN50082-2:

Electrostatic Discharge

EN 61000-4-2, Criteria B

Radiated Susceptibility

ENV 50140, Criteria A

Conducted Susceptibility

ENV 50141, Criteria A

Electrical Fast Transient

EN 61000-4-4, Criteria B

Surge Capability

EN 61000-4-5, Criteria B

Magnetic Field

EN 61000-4-8, Criteria A

Power Supply Dip

EN 61000-4-11, Criteria B

Radio Telephone

ENV 50204, Criteria B

Low Voltage Directives:

EN 61010-1

Safety Requirements

Hazardous Area Approvals

CSA/NRTL/C

Approval Option (01)

Class I, Div 2

Groups A, B, C, D

T4 @ Ta = -20 °C to +65 °C

(-4 °F to +150 °F)

Certification Number

CSA 150268-1002151 (LR 26744)

Contact Ratings

Resistive load

Maximum switched power:

dc: 60 W

ac: 125 VA

Minimum switched current:

100mA @ 5 Vdc

Maximum switched current:

2 A

Maximum switched voltage:

dc: 150 Vdc

ac: 220 Vac

Physical

Relay Module

Dimensions (Height x Width x Depth):

120.4 mm. x 24.6 mm x 241.8mm

(4.74 in x 0.97 in x 9.52 in)

Weight:

0.34 kg (0.74 lb.)

I/O Module

Dimensions (Height x Width x Depth):

241 mm x 24.4 mm x 99.1 mm

(9.50 in x 0.96 in x 3.90 in)

Weight:

0.5 kg (1.0 lb.)

Rack Space Requirements

Relay Module:

1 half-height front slot.

I/O Modules:

1 full-height rear slot.

Ordering Considerations

General

When ordered as a new system, the TMR Relay Module includes two half-height modules and all mounting hardware. When a spare is ordered, a single half-height TMR Relay Module is shipped.

Ordering Information

TMR Relay Module

3500/34-AXX-BXX

A: I/O Module Type

0 1 TMR Relay I/O Module

B: Agency Approval Option

0 0	None
0 1	CSA/NRTL/C

Spares

125696-01

3500/34 TMR Relay Module.

125704-01

TMR Relay I/O Module.

04425545

Grounding Wrist Strap (single use)

132317-01

Firmware IC

00580438

Connector Header, Internal Termination, 4-position, Green

129771-01

TMR Relay Module Manual.Ordering Information

Graphs and Figures

Legs in Alarm	Legs Not in Alarm	Legs Faulted	Alarm Status
3	0	0	Alarm
2	1	0	Alarm
1	2	0	No Alarm
0	3	0	No Alarm
2	0	1	Alarm
1	1	1	Alarm
0	2	1	No Alarm
1	2	1	No Alarm
1	0	2	Alarm
0	1	2	No Alarm
0	0	3	Alarm*
* Default is Alarm but can be configured for No Alarm			
Alarm Drive Logic Table			

Figure 1

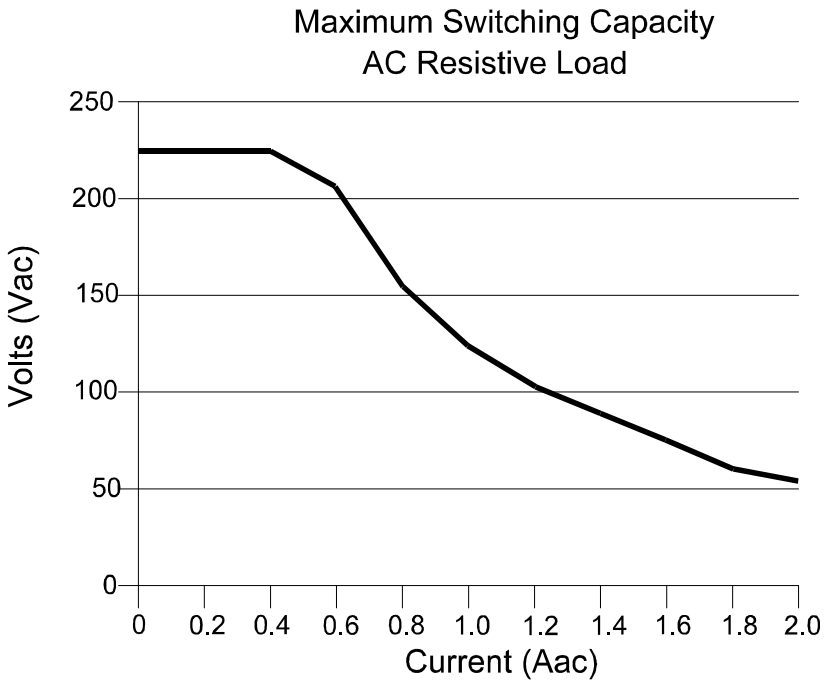


Figure 2

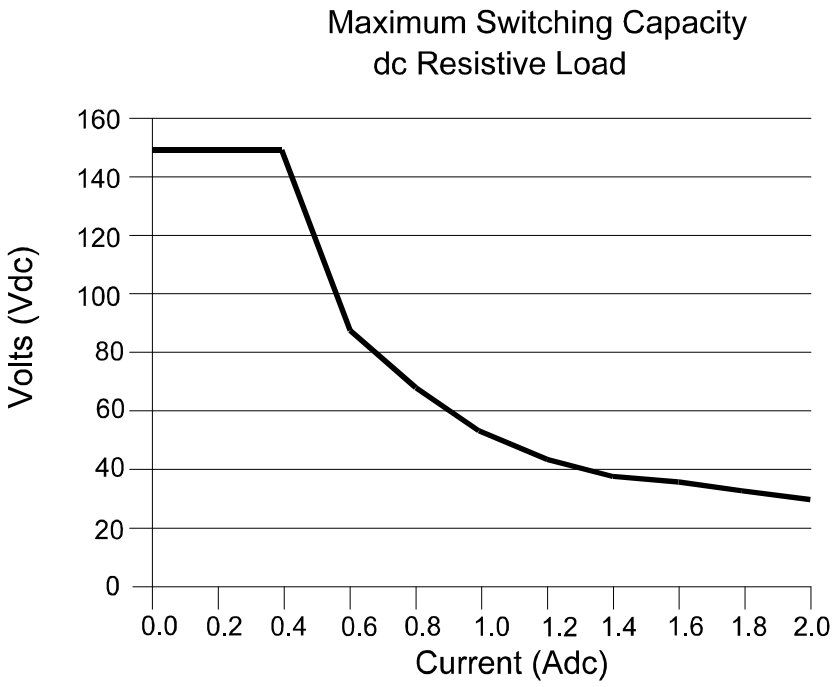

Maximum Switching Capacity
dc Resistive Load
Volts (Vdc)
160
140
120
100
80
60
40
20
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Current (Adc)

Figure 3

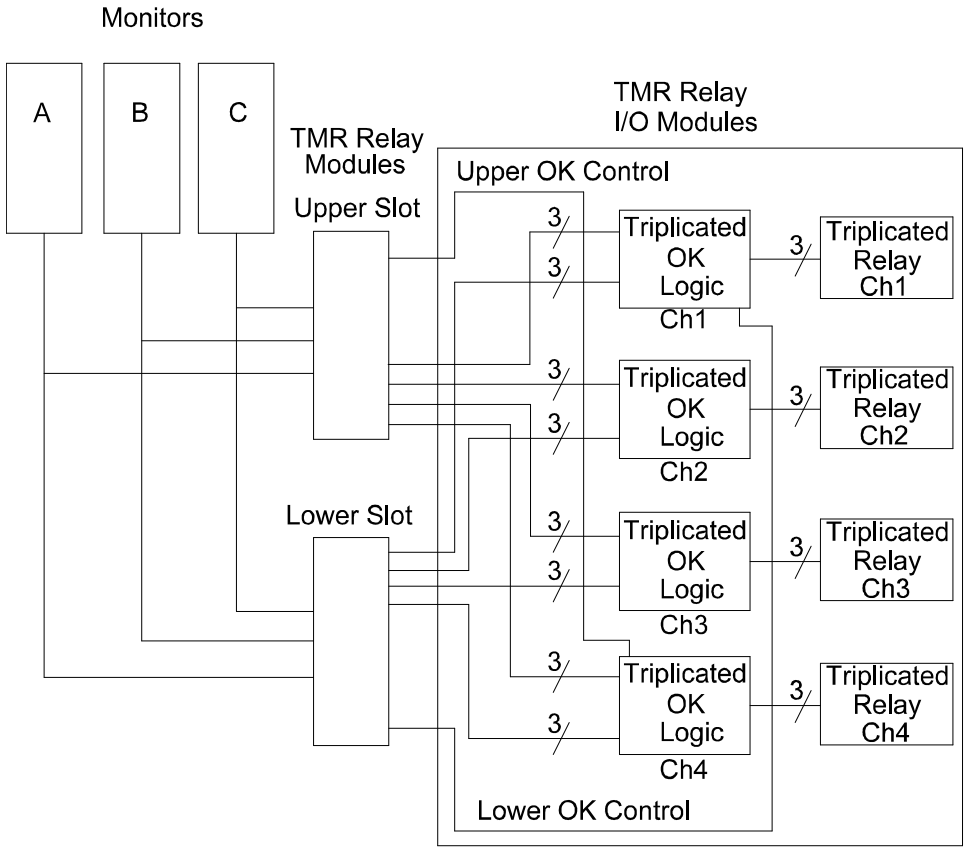
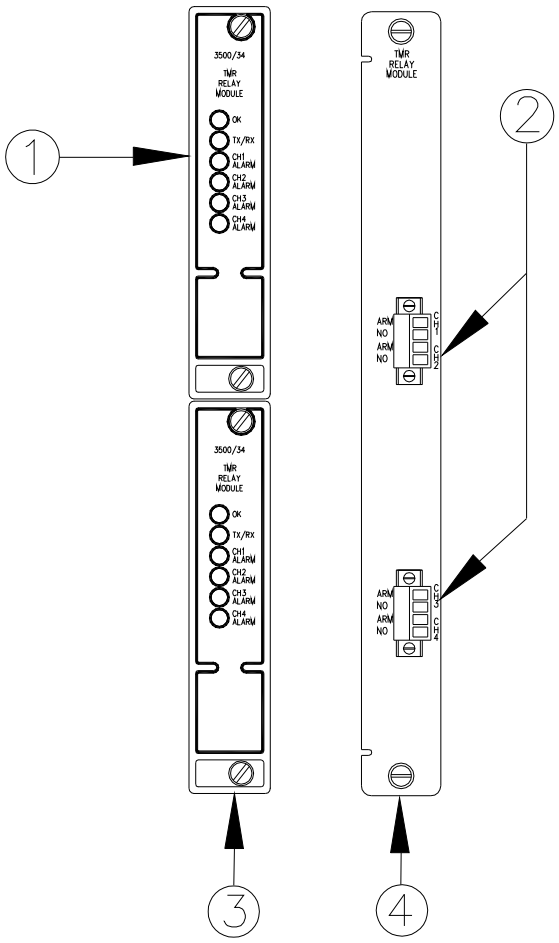

Monitors
A
B
C
TMR Relay
Modules
Upper Slot
Lower Slot
TMR Relay
I/O Modules
Upper OK Control
Lower OK Control
3
Triplicated
OK
Logic
Ch1
Ch2
Ch3
Ch4
Triplicated
Relay
Ch1
Ch2
Ch3
Ch4

Figure 4



1) Status LEDs
2) Terminals for connecting relay contacts to external devices
3) Main Module, Font View
4) TMR I/O Module

Figure 5: Front and Rear View of TMR Relay Module