
TDBS Simplex Discrete Input/Output

Functional Description

The Simplex Discrete Input/Output (TDBS) terminal board is a simplex contact input/output terminal board designed for DIN-rail or flat mounting. The TDBS board accepts 24 group isolated contact inputs that are supplied with a nominal 24, 48, or 125 V dc wetting voltage from an external source. The contact inputs have noise suppression to protect against surge and high-frequency noise. TDBS provides 12 form-C relay outputs and accepts different option cards to expand relay functions.

Mark VIe Systems

In the Mark* VIe systems, the PDIO I/O pack works with the TDBS. The I/O pack plugs into the D-type connector and communicates with the controller over Ethernet. A single connection point for PDIO is provided with one or two network connections possible from PDIO to the controllers.

Board Versions

Three versions of TDBS are available as follows:

Terminal Board	Contact Inputs	TB Type	Wetting Voltage
TDBSH2A	24	Pluggable	Nominal 24 V dc, floating, ranging from 16 to 32 V dc
TDBSH4A	24	Pluggable	Nominal 48 V dc, floating, ranging from 32 to 64 V dc
TDBSH6A	24	Pluggable	Nominal 125 V dc, floating, ranging from 100 to 145 V dc

There are three option boards available that plug on to TDBS:

- IS200WROB turns the relay portion of TDBS into the functional equivalent of IS200TRLYH1B. This option provides fused and sensed power distribution to the first six relay outputs and dedicated power to the last relay output.
- IS200WROF puts a single fuse in series with each relay common connection. Fuse voltage feedback is included.
- IS200WROG distributes power from an input connector to each relay through a single fuse. Fuse voltage feedback is included.

Installation

The TDBS plus a plastic insulator mounts on a sheet metal carrier that then mounts on a DIN rail. Optionally the TDBS plus insulator mounts on a sheet metal assembly that then bolts in a cabinet. The connections are wired directly to two sets of 48 point terminal blocks, typically using #18 AWG wires. The upper set of terminals, TB1, connects to the relay portion of the board and the lower set of terminals, TB2, connect to the contact input circuits. Shields should be terminated on a separate bracket.

If a relay option board is used, it plugs onto TDBS connectors JW1 and JW2 and is held in place by the force of the connectors. The following table identifies the function of each relay terminal point grouped as TB1 as it relates to the presence of an option board. If external power is to be supplied it is wired to a connector provided on the option board.

- NC - normally closed contact of a form C relay
- COM - common point of a form C relay contact
- NO - normally open contact of a form C relay
- SOL - return circuit path for a solenoid that is powered by the relay board
- VSENSE - the input to a voltage sensor that looks between VSENSE and COM
- RETURN - return power path for devices powered by the WROG option

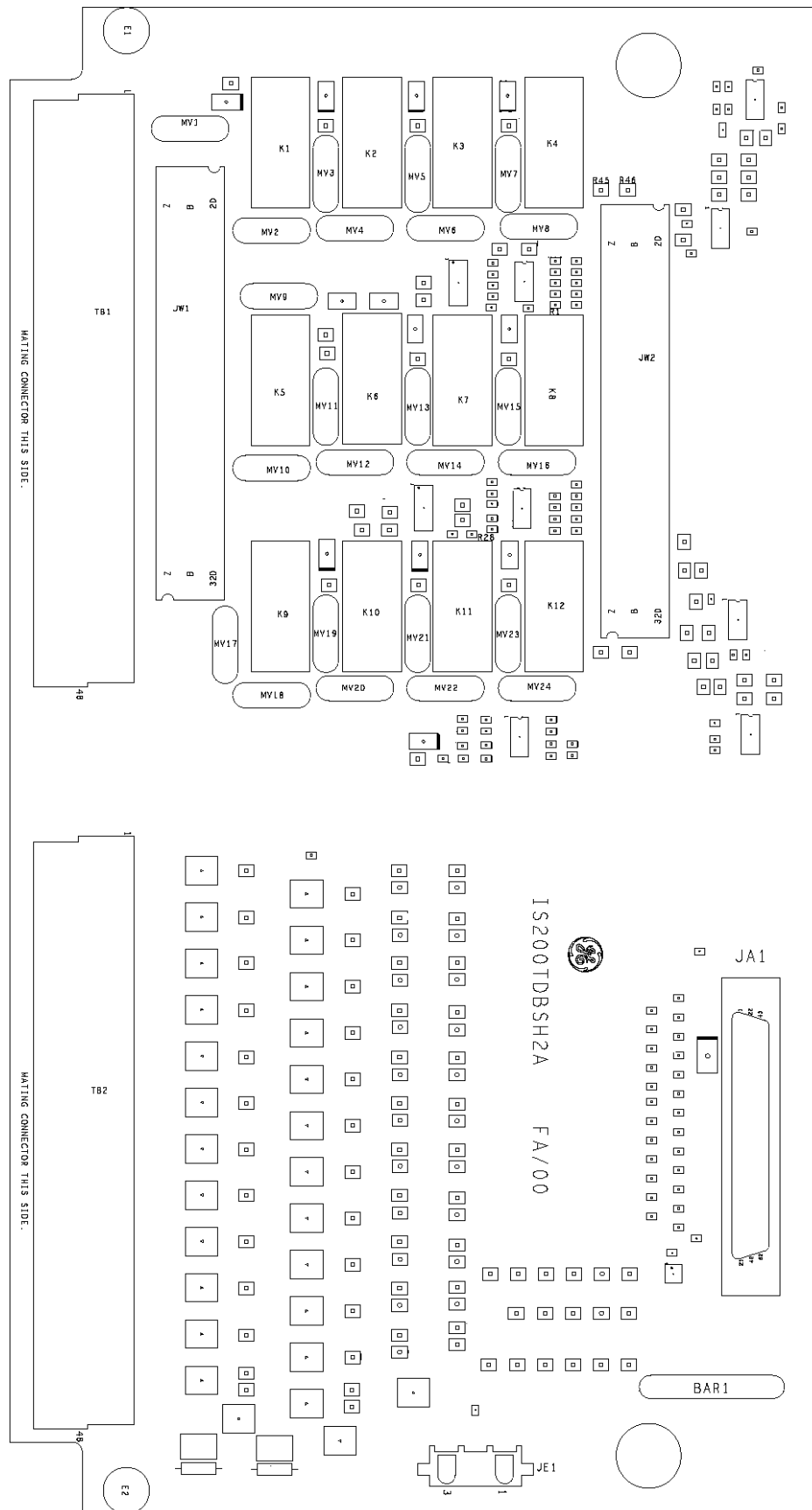
Output Terminal	Relay	TDBS	TDBS + WROB	TDBS/WROF with FUSES	TDBS/WROF without Fuses	TDBS + WROB
1	1	NC	NC	NC	NC	NC
2		COM	COM	COM (unfused)	COM	POWER
3		NO	NO	NO	NO	NO
4			SOL	COM (fused)	VSENSE	RETURN
5	2	NC	NC	NC	NC	NC
6		COM	COM	COM (unfused)	COM	POWER
7		NO	NO	NO	NO	NO
8			SOL	COM (fused)	VSENSE	RETURN
9	3	NC	NC	NC	NC	NC
10		COM	COM	COM (unfused)	COM	POWER
11		NO	NO	NO	NO	NO
12			SOL	COM (fused)	VSENSE	RETURN
13	4	NC	NC	NC	NC	NC
14		COM	COM	COM (unfused)	COM	POWER
15		NO	NO	NO	NO	NO
16			SOL	COM (fused)	VSENSE	RETURN
17	5	NC	NC	NC	NC	NC
18		COM	COM	COM (unfused)	COM	POWER
19		NO	NO	NO	NO	NO
20			SOL	COM (fused)	VSENSE	RETURN
21	6	NC	NC	NC	NC	NC
22		COM	COM	COM (unfused)	COM	POWER

Output Terminal	Relay	TDBS	TDBS + WROB	TDBS/WROF with FUSES	TDBS/WROF without Fuses	TDBS + WROB
23		NO	NO	NO	NO	NO
24			SOL	COM (fused)	VSENSE	RETURN
25	7	NC	NC	NC	NC	NC
26		COM	COM	COM (unfused)	COM	POWER
27		NO	NO	NO	NO	NO
28				COM (fused)	VSENSE	RETURN
29	8	NC	NC	NC	NC	NC
30		COM	COM	COM (unfused)	COM	POWER
31		NO	NO	NO	NO	NO
32				COM (fused)	VSENSE	RETURN
33	9	NC	NC	NC	NC	NC
34		COM	COM	COM (unfused)	COM	POWER
35		NO	NO	NO	NO	NO
36				COM (fused)	VSENSE	RETURN
37	10	NC	NC	NC	NC	NC
38		COM	COM	COM (unfused)	COM	POWER
39		NO	NO	NO	NO	NO
40				COM (fused)	VSENSE	RETURN
41	11	NC	NC	NC	NC	NC
42		COM	COM	COM (unfused)	COM	POWER
43		NO	NO	NO	NO	NO
44				COM (fused)	VSENSE	RETURN
45	12	NC	NC	NC	NC	NC
46		COM	COM	COM (unfused)	COM	POWER
47		NO	NO	NO	NO	NO
48			SOL	COM (fused)	VSENSE	RETURN

Contact input connections are made to the 48 terminals on the lower portion of the terminal board, grouped as TB2. Contact wetting voltage is provided to the board through the JE1 3-pin Mate-N-Lok® connector on the lower portion of the board.

Terminal	Signal		Terminal	Signal
1	Wet 1		25	Wet 13
2	In 1		26	In 13
3	Wet 2		27	Wet 14
4	In 2		28	In 14
5	Wet 3		29	Wet 15
6	In 3		30	In 15
7	Wet 4		31	Wet 16
8	In 4		32	In 16
9	Wet 5		33	Wet 17
10	In 5		34	In 17
11	Wet 6		35	Wet 18
12	In 6		36	In 18
13	Wet 7		37	Wet 19
14	In 7		38	In 19
15	Wet 8		39	Wet 20
16	In 8		40	In 20
17	Wet 9		41	Wet 21
18	In 9		42	In 21
19	Wet 10		43	Wet 22
20	In 10		44	In 22
21	Wet 11		45	Wet 23
22	In 11		46	In 23
23	Wet 12		47	Wet 24
24	In 12		48	In 24

The wetting voltage output terminals are all connected in parallel and fed from the positive voltage applied to JE1 pin 1. It is permissible to run a single wetting voltage lead from the board terminal to a group of remote contacts and then bring the individual contact wires back to the inputs. Negative or return wetting voltage is supplied by JE1 pin 3.



TDBS Layout

Operation

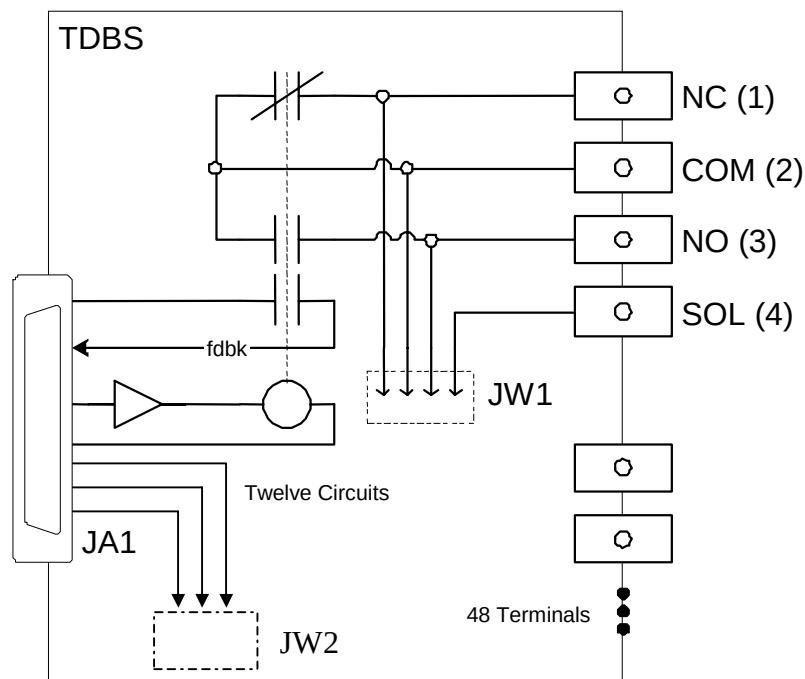
Contact Inputs

The contact input function and on-board signal conditioning are scaled for 24, 48, and 125 V dc wetting voltage. The input wetting voltage range is 16 to 32 V dc, 32 to 64 V dc, and 100 to 145 V dc respectively. The threshold voltage is 50% of the wetting voltage. The contact sensing circuits are shown in the I/O pack description. Contact input currents are resistance limited to 2.5 mA on the first 21 circuits, and 10 mA on circuits 22 through 24. The 24 V dc supply on TDBSH2 is current limited to 0.5 A using polymer positive temperature coefficient fuses that can be reset.

Filters reduce high-frequency noise and suppress surge on each input near the point of signal entry. The discrete input voltage signals go to the I/O processor which passes them through optical isolators, converts them to digital signals, and transfers them to the controller.

Relay Outputs

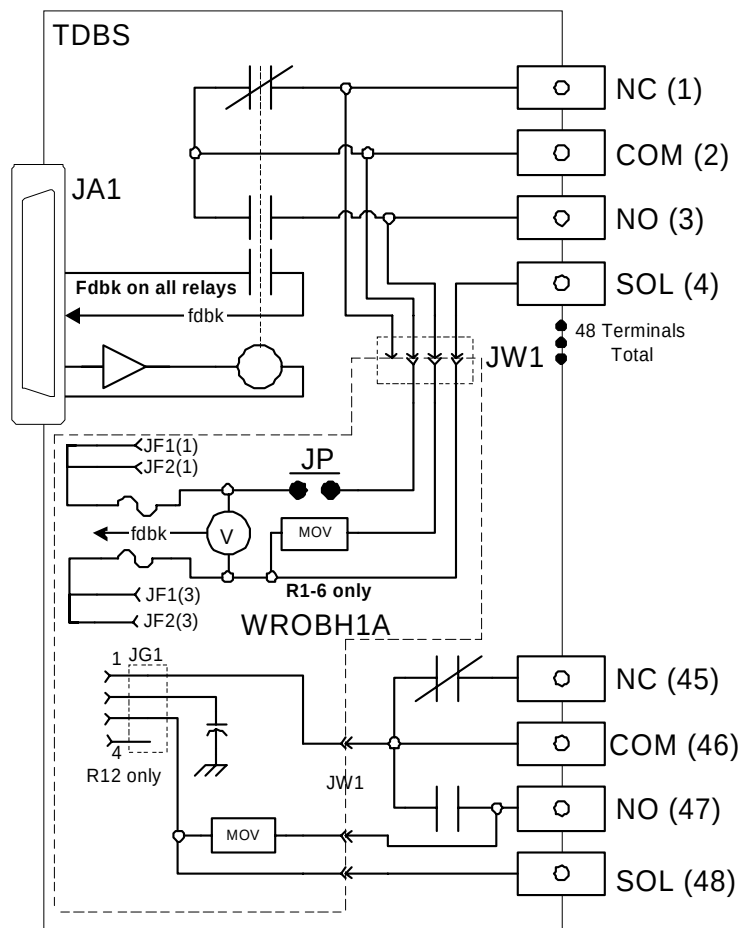
TDBS uses pluggable type terminals and has connectors JW1 and JW2 supporting option board connection. The relay portion of TDBS does not change between groups H2, H4, and H6, only the contact input circuits change. TDBS relays may be used at any specified ac or dc voltage without regard to board group. Electrically TDBS has the following circuit for each of the 12 relays:



Without an option board, the SOL terminal associated with each relay has no connection. TDBS is designed to support a current rating of 5 A and voltage clearance greater than is needed for 250 V ac on all customer screw and JW1 circuits. The relay rating is the limiting item for each application.

TDBS +WROB

Option board IS200WROBH1A adds capability to TDBS to yield a combination that has the same relay circuit functionality as an IS200TRLYH1B terminal board when used simplex. Included are fused sensed power distribution to the first six relays and dedicated power to the last relay. Electrically IS200TDBS plus IS200WROBH1 has the following circuit. IS200WROBH1 has default fuse values of 3.15 A. Connector JW2 and its connections to JA1 are omitted for clarity.



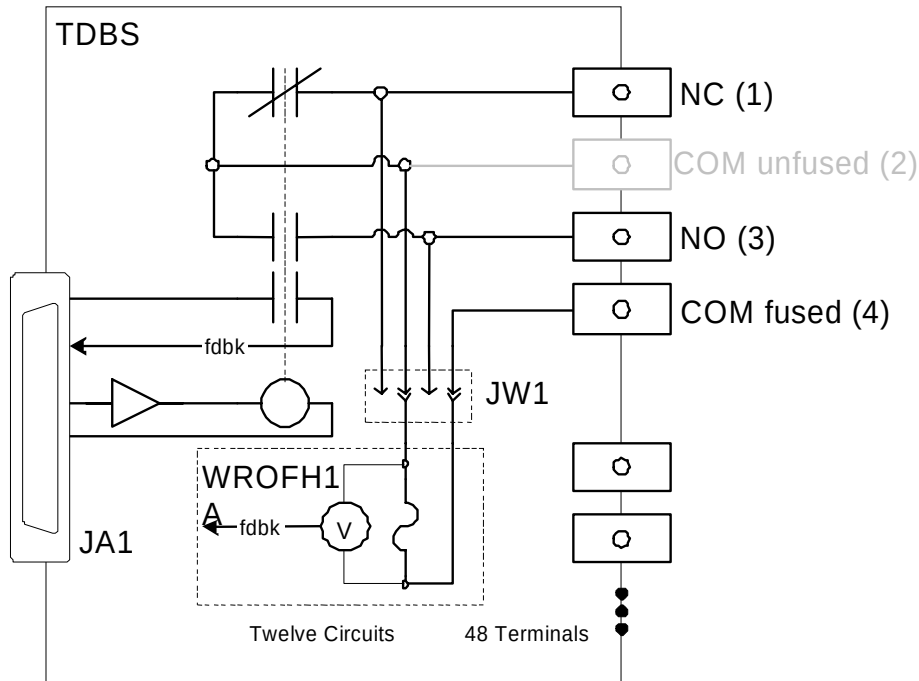
Both sides of the power distribution on relays 1-6 are fused allowing the board to be used in systems where dc power is floating with respect to earth. Fuse voltage feedback is compatible with 24 V, 48 V, and 125 V dc applications as well as 120 V and 240 V ac applications.

The following table lists the relationship between fuses, jumpers, relays, and terminals.

Relay	+Fuse	-Fuse	Jumper	Terminals
1	FU7	FU1	JP1	1-4
2	FU8	FU2	JP2	5-8
3	FU9	FU3	JP3	9-12
4	FU10	FU4	JP4	13-16
5	FU11	FU5	JP5	17-20
6	FU12	FU6	JP6	21-24

TDBS + WROF

Option board IS200WROFH1A adds an optional fuse in series with the COM connection for each relay output by using the SOL terminal in place of COM. Isolated voltage sensing that is not polarity sensitive is provided for each fuse. Fuse voltage feedback is compatible with 24 V, 48 V, and 125 V dc applications as well as 120 V and 240 V ac applications. IS200WROFH1 has default fuse values of 3.15 A. Electrically IS200TDBS plus IS200WROFH1 has the following circuit. Connector JW2 and its connections to JA1 are omitted for clarity.

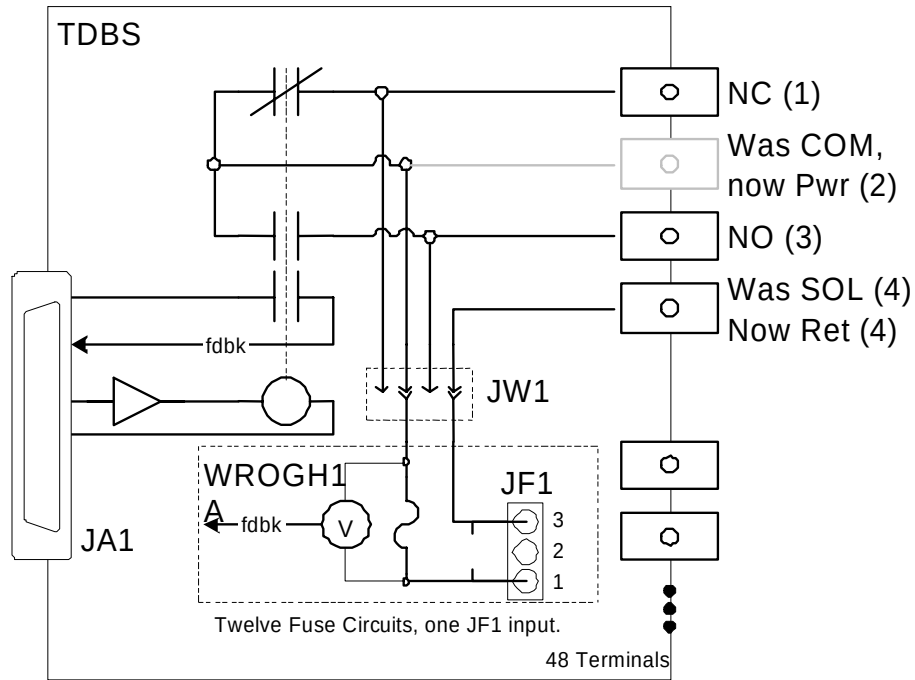


The normal application for this board is when it is desired that each relay output have a fuse in series and power applied from an external source. The board has a second potential application. If the fuse is removed from a circuit, the isolated voltage detector remains. The fourth terminal may now be wired to either the NC or NO terminal to provide isolated contact voltage feedback. I/O pack firmware has a configuration option to turn off fuse blown alarm generation for a given relay if it is being used in this fashion. The terminal table identifies this application as making the fourth screw Vsense.

Fuses FU1 through FU12 are associated with relay circuits 1 through 12 respectively.

TDBS + WROG

Option board IS200WROGH1A adds fused power distribution for all twelve relay outputs. Isolated voltage sensing that is not polarity sensitive is provided for each fuse. Fuse voltage feedback is compatible with 24 V, 48 V, and 125 V dc applications, as well as 120 V and 240 V ac applications. IS200WROGH1 has default fuse values of 3.15 A. Electrically IS200TDBS plus IS200WROGH1 has the following circuit. Connector JW2 and its connections to JA1 are omitted for clarity.



Fuses FU1 through FU12 are associated with relay circuits 1 through 12 respectively.

Specifications

Item	Specification
Number of input channels	24 dry contact voltage input channels
Wetting voltage	H2: Nominal 24 V dc, floating, ranging from 18.5 to 32 V dc (Pluggable TB) H4: Nominal 48 V dc, floating, ranging from 32 to 64 V dc (Pluggable TB) H6: Nominal 125 V dc, floating, ranging from 100 to 145 V dc (Pluggable TB)
Input current	H2: For 24 V dc applications: First 21 circuits draw 2.5 mA Last three circuits draw 10 mA H4: For 48 V dc applications: First 21 circuits draw 2.5 mA Last three circuits draw 10.4 mA H6: For 125 V dc applications: First 21 circuits draw 2.55 mA Last three circuits draw 10 mA
Input filter	Hardware filter, 4 ms
Fault detection in I/O board	Loss of contact input wetting voltage Non-responding contact input in test mode
Ac voltage rejection	12 V rms at 24 V dc wetting voltage. (H2) 24 V rms at 48 V dc wetting voltage. (H4) 60 V rms at 125 V dc wetting voltage. (H6)
Number of relay channels	12 relays
Rated voltage on relay contacts	a: Nominal 24 V dc, 48 V dc, or 125 V dc b: Nominal 120 V ac or 240 V ac
Max load current	a: 0.6 A for 125 V dc operation b: 1.2 A for 48 V dc operation c: 3.15 A for 24 V dc operation d: 3.15 A for 120/240 V ac, 50/60 Hz operation
Max response time on	25 ms typical
Max response time off	25 ms typical
Contact material	Silver cad-oxide
Contact life	Electrical operations: 100,000 Mechanical operations: 10,000,000
Fault detection	Relay position feedback using contact pair separate from load contacts.
WROBH1 Option Board Powered Output Circuits	
	6 fused, associated with relays 1-6, fed from parallel connectors JF1 and JF2. Both sides of the power source are fused for each output. MOV suppression on NO contact. 1 unfused, associated with relay 12, fed from connector JG1. MOV suppression on NO contact.
WROFH1 Option Board	
Fused Output Circuits	12 fused circuits, one per relay.
WROGH1 Option Board	
Powered Output Circuits	12 fused circuits, one associated with each relay. Single side fusing of the power is associated with the power input on JF1 pin 1. Return power path through JF1pin 3 is not fused.

Item	Specification
Physical	
Size - TDBS	17.8 cm wide x 33.02 cm high (7.0 in x 13.0 in)
Temperature	-30 to + 65°C (-22 to 149 °F)
Technology	Surface-mount

Diagnostics

The I/O processor monitors the following functions on TDBS:

- The contact input wetting voltage is monitored. If the wetting voltage drops to below 40% of the nominal voltage, a diagnostic alarm (fault) is set and latched.
- The TDBS provides diagnostic feedback to PDIO indicating the state of each relay by monitoring an isolated set of contacts on each relay.
- When WROB is used with TDBS isolated voltage feedback is used to detect fuse status for the six fuse pairs on the board.
- When WROF is used with TDBS isolated voltage feedback is used to monitor each fuse. If voltage is present and the fuse is open a diagnostic is generated. The diagnostic may be disabled in PDIO configuration should it be desired to use the feedback circuit with the fuse removed.
- When WROG is used with PDIO isolated voltage feedback is used to monitor each fuse. If voltage is present and the fuse is open a diagnostic is generated.
- The terminal board connector has an ID device that is interrogated by the I/O processor. The connector ID is coded into a read-only chip containing the board serial number, board type, and revision number. Any relay option card also contains an ID. If a mismatch is encountered, a hardware incompatibility fault is created.

Configuration

There are no jumpers or hardware settings on TDBS.

Option board WROBH1 includes six jumpers that are used to apply or remove power from a relay. Boards are produced with all six jumpers in place. The jumper is removed from the board when a relay is to be used as dry contacts and power distribution is not desired.

There are no jumpers associated with the WROFH1 board. For each relay the inclusion or exclusion of a series fuse is determined by the terminal point used as the relay common. For each relay the associated WROF fuse may be removed to allow direct use of the fuse voltage sensing circuit as a voltage detector.

There are no jumpers associated with the WROGH1 board. For each relay the corresponding fuse may be removed if the relay is to be used to provide dry contacts.