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# TBCI Contact Input with Group Isolation

## Functional Description

The Contact Input with Group Isolation (TBCI) terminal board accepts 24 dry contact inputs wired to two barrier-type terminal blocks. Dc power is wired to TBCI for contact excitation. The contact inputs have noise suppression circuitry to protect against surge and high-frequency noise.

### Mark VI Systems

In the Mark* VI system, TBCI works with VTCC/VCRC and supports simplex and TMR applications. Cables with molded plugs connect TBCI to VME rack where the VCCC or VCRC processor board is located. Both board versions TBCIH_B and TBCIH_C work correctly with Mark VI and are functionally identical.

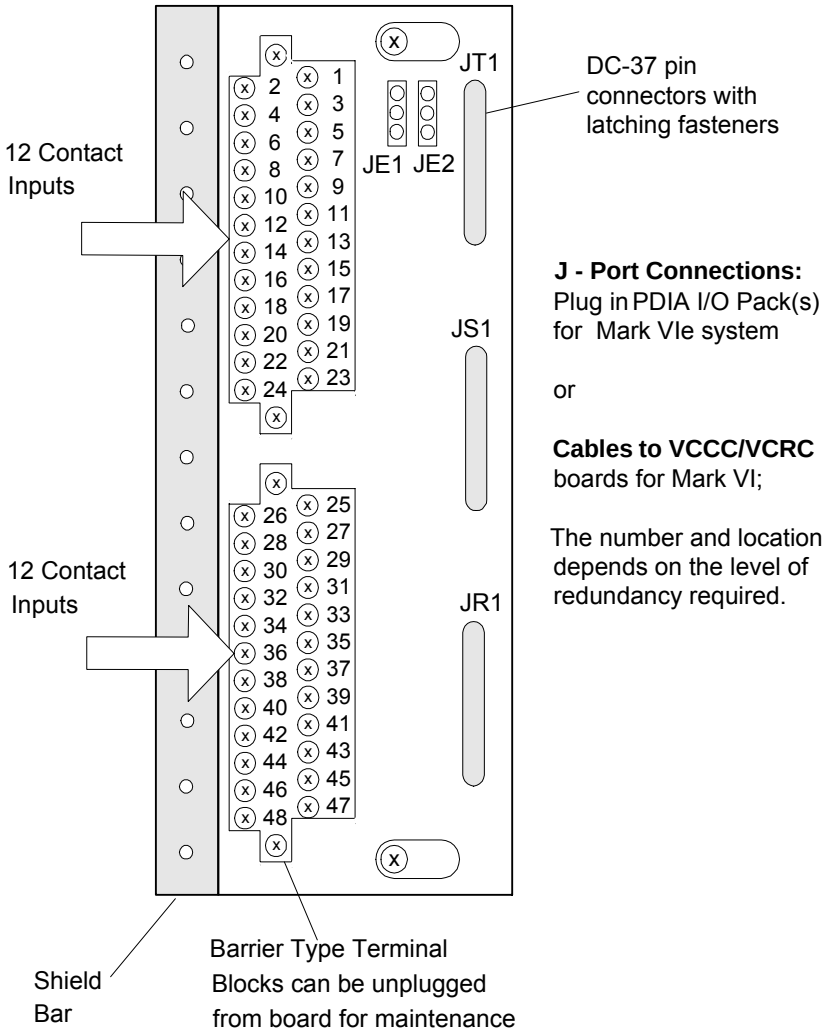
### Mark VIe Systems

In the Mark VIe system, the TBCI works with the PDIA I/O pack and supports simplex, dual, and TMR applications. One, two, or three PDIAs can be plugged directly into the TBCI. Mark VIe requires the C version of this board for correct mechanical alignment of connector JT1 with I/O pack mechanical support.

### Board Versions

Three versions of TBCI are available as follows:

| Terminal Board | Contact Inputs | Excitation Voltage |
|---|---|---|
| TBCIH1C | 24 | Nominal 125 V dc, floating, ranging from 100 to 145 V dc |
| TBCIH2C | 24 | Nominal 24 V dc, floating, ranging from 16 to 32 V dc |
| TBCIH3C | 24 | Nominal 48 V dc, floating, ranging from 32 to 64 V dc |




*TBCI Contact Input Terminal Board*

## Installation

### Wiring

Connect the wires for the 24 dry contact inputs directly to two I/O terminal blocks on the terminal board. These blocks are held down with two screws and can be unplugged from the board for maintenance. Each block has 24 terminals accepting up to #12 AWG wires. A shield terminal strip attached to chassis ground is located immediately to the left of each terminal block.

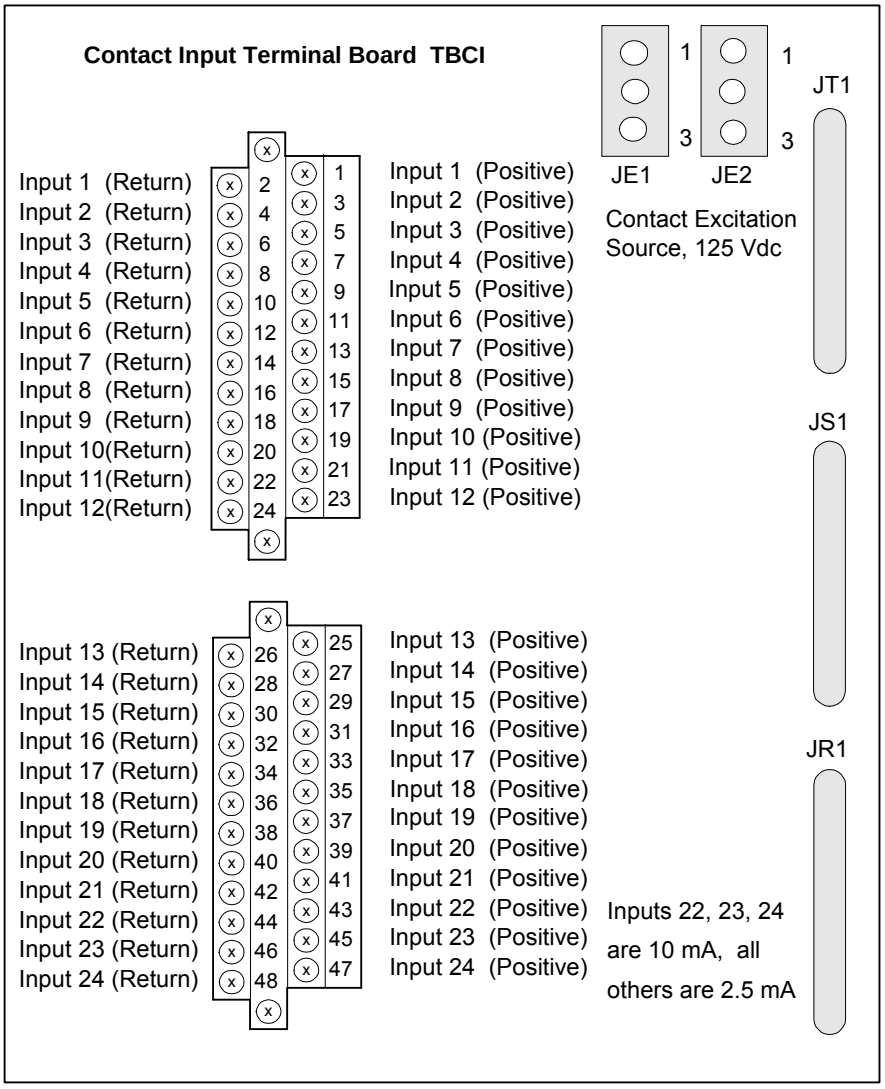
### Power Connection

Connect TBCI to the contact excitation voltage source using plugs JE1 and JE2, as shown in following figure.

### Cabling Connections

In a simplex system, connect TBCI to the I/O processor using connector JR1. In a TMR system, connect TBCI to the I/O processors using connectors JR1, JS1, and JT1. Cables or I/O packs are plugged in depending on the type of Mark VI or Mark VIe system, and the level of redundancy.

**Note** For a Mark VIe system, the I/O packs plug into TBCI and attach to side-mounting brackets. One or two Ethernet cables plug into the pack. Firmware may need to be downloaded. Refer to *GEH-6700, ToolboxST for Mark VIe Control*.




**J - Port Connections:**

Plug in PDIA I/O Pack(s) for Mark VIe system

or

**Cables to VCCC/VCRC** boards for Mark VI;

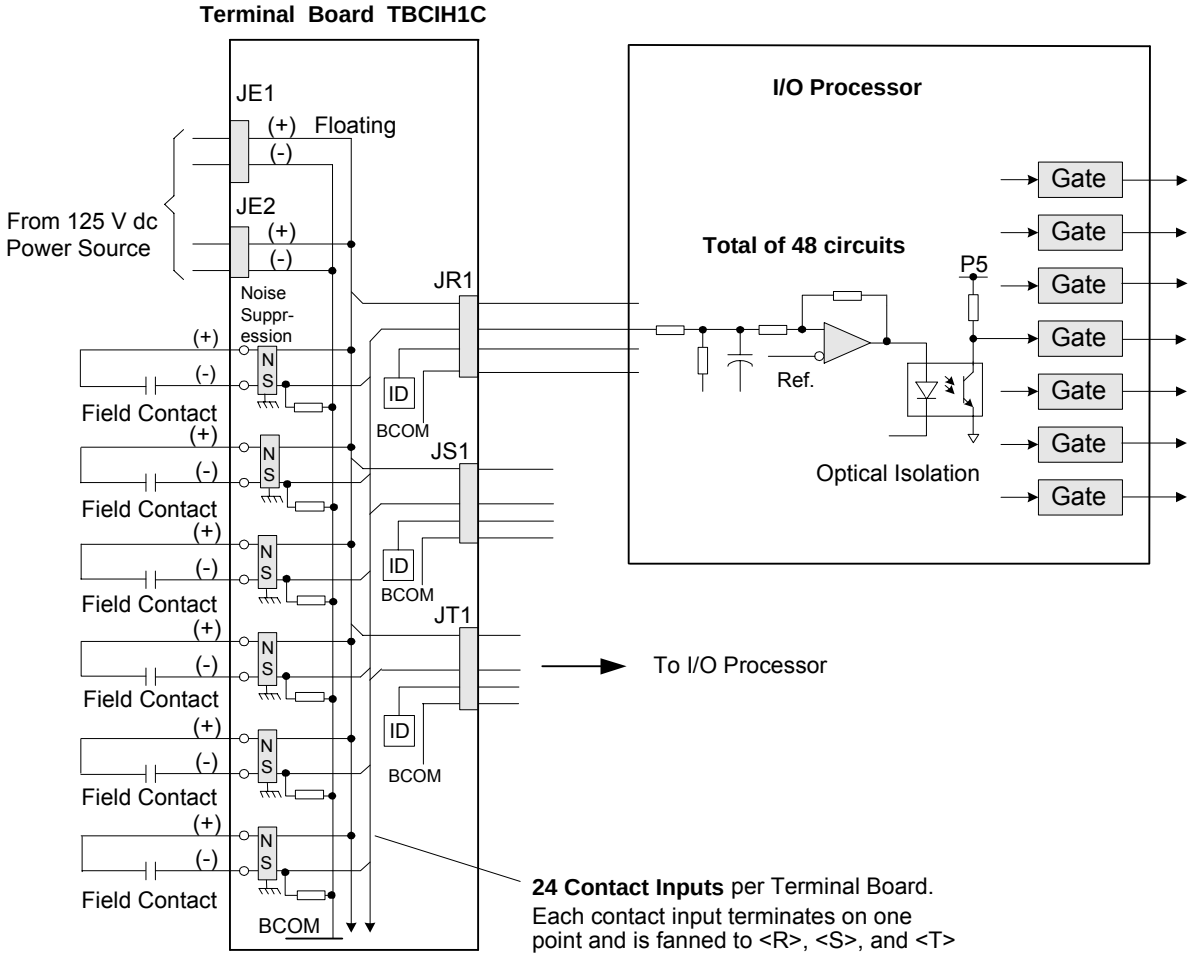
The number and location depends on the level of redundancy required.

*TBCIH1C Terminal Board Wiring and Cabling*

## Operation

Filters reduce high-frequency noise and suppress surge on each input near the point of signal entry. The dry contact inputs on H1 are powered from a floating 125 V dc (100-145 V dc) supply from the turbine control. The 125 V dc bus is current limited in the power distribution module prior to feeding each contact input. H2 and H3 versions use lower voltages as shown in the specification table.

The discrete input voltage signals pass to the I/O processor, which sends them through optical isolators providing group isolation and transfers the signals to the system controller. The reference voltage in the isolation circuits sets a transition threshold that is equal to 50% of the applied floating power supply voltage. The tracking is clamped to go no less than 13% of the nominal rated supply voltage to force all contacts to indicate open when voltage dips below this level.




*Contact Input Circuits*

A pair of terminal points is provided for each input, with one point (screw) providing the positive dc source and the second point providing the return (input) to the board. The current loading is 2.5 mA per point for the first 21 inputs on each terminal board. The last three have a 10 mA load to support interface with remote solid-state output electronics. Contact input circuitry is designed for NEMA Class G creepage and clearance.

## Specifications

| Item | Specification |
|---|---|
| Number of channels | 24 contact voltage input channels |
| Excitation voltage | H1: Nominal 125 V dc, floating, ranging from 100 to 145 V dc |
| | H2: Nominal 24 V dc, floating, ranging from 18.5 to 32 V dc |
| | H3: Nominal 48 V dc, floating, ranging from 32 to 64 V dc |
| Input current | H1: For 125 V dc applications: |
| | First 21 circuits draw 2.5 mA (50 kΩ)<br>Last three circuits draw 10 mA (12.5 kΩ) |
| | H2: For 24 V dc applications: |
| | First 21 circuits draw 2.5 mA (10 kΩ)<br>Last three circuits draw 9.9 mA (2.42 kΩ) |
| | H3: For 48 V dc applications: |
| | First 21 circuits draw 2.5 mA<br>Last three circuits draw 10 mA |
| Input filter | Hardware filter, 4 ms |
| Power consumption | 20.6 W on the terminal board |
| Temperature rating | 0 to 60ºC (32 to 140 ºF) |
| Fault detection | Loss of contact input excitation voltage |
| | Non-responding contact input in test mode |
| | Unplugged cable |
| **Physical** | |
| Size | 33.02 cm high x 10.16 cm wide (13.0 in. x 4.0 in) |
| Temperature | Operating: -30 to 65ºC (-22 to 149 ºF) |

## Diagnostics

Diagnostic tests to components on the terminal boards are as follows:

- The excitation voltage is monitored. If the excitation drops to below 40% of the nominal voltage, a diagnostic alarm is set and latched by the I/O pack/board.
- As a test, all inputs associated with this terminal board are forced to the open contact (fail safe) state. Any input that fails the diagnostic test is forced to the failsafe state and a fault is created.
- If the input from this board does not match the TMR voted value from all three boards, a fault is created.
- Each terminal board connector has its own ID device that is interrogated by the I/O pack/board. The connector ID is coded into a read-only chip containing the board serial number, board type, revision number, and the JR1/JS1/JT1 connector location. When the chip is read by the controller and a mismatch is encountered, a hardware incompatibility fault is created.

## Configuration

There are no jumpers or hardware settings on the board.