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TTURH1C Primary Turbine Protection Input

Functional Description

The Primary Turbine Protection Input (TTURH1C) terminal board works with the PTUR turbine I/O packs as part of the Mark* VIe system. The inputs and outputs are as follows:

- 12 pulse rate devices sensing a toothed wheel to measure the turbine speed
- Generator voltage and bus voltage signals taken from potential transformers
- 125 V dc output to the main breaker coil for automatic generator synchronizing
- Inputs from shaft voltage and current sensors to measure induced shaft voltage and current
- Three overspeed trip signals to the trip board
- Additional I/O signals from the trip board

TTUR has three relays, K25, K25P, and K25A, that all have to close to provide 125 V dc power to close the main breaker 52G.

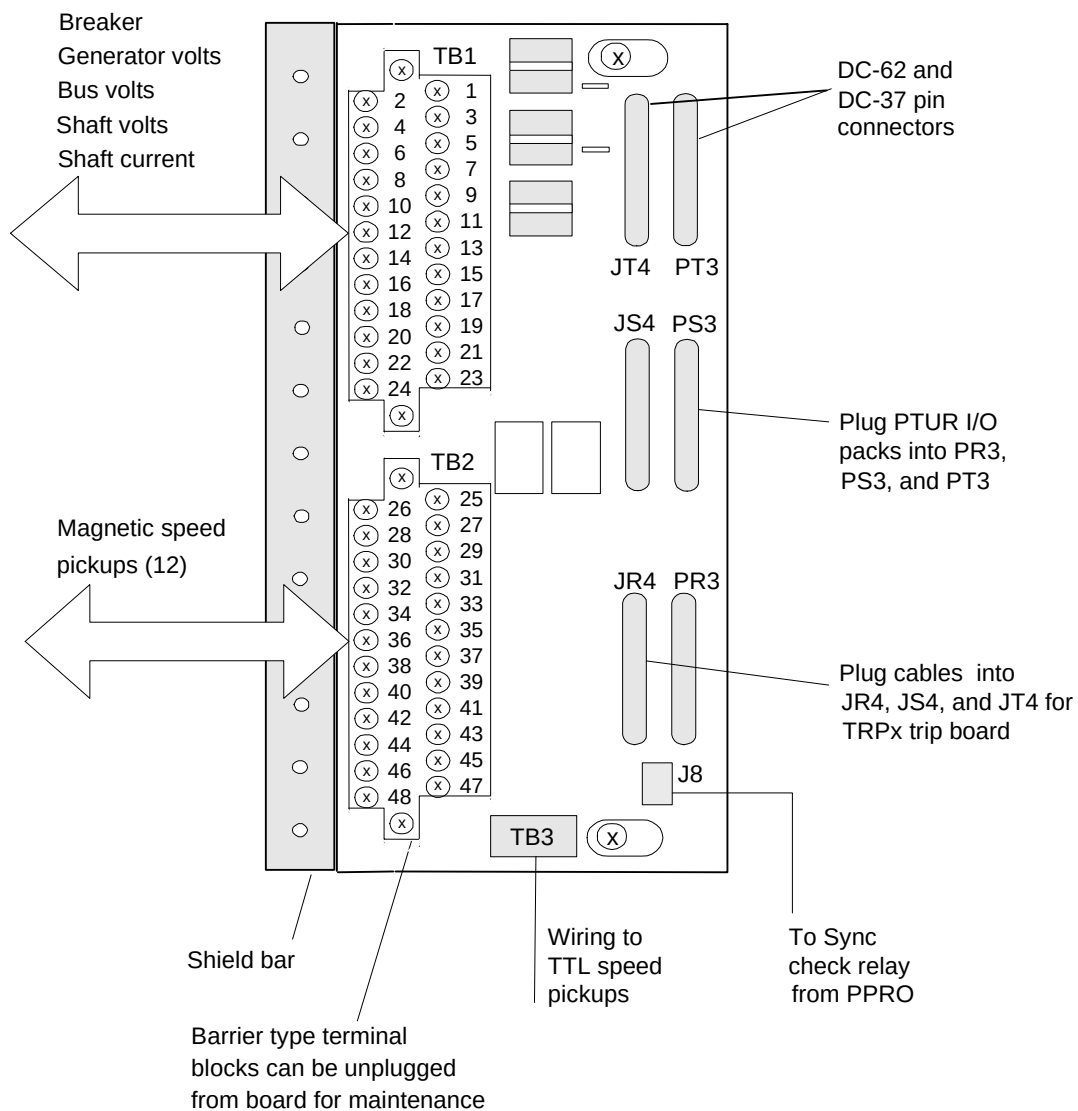
The signals to PTUR use the PR3 and JR4 connector for simplex systems. For TMR systems, signals fan out to the PR3, PS3, PT3, JR4, JS4, and JT4 connectors.

Mark VI Systems

TTURH1C cannot be used with the Mark VI system. For Mark VI, use the TTURH1B terminal board.

Mark VIe Systems

TTURH1C supports connection of TRPG, TRPS, TRPA boards and accommodates PTUR I/O pack.

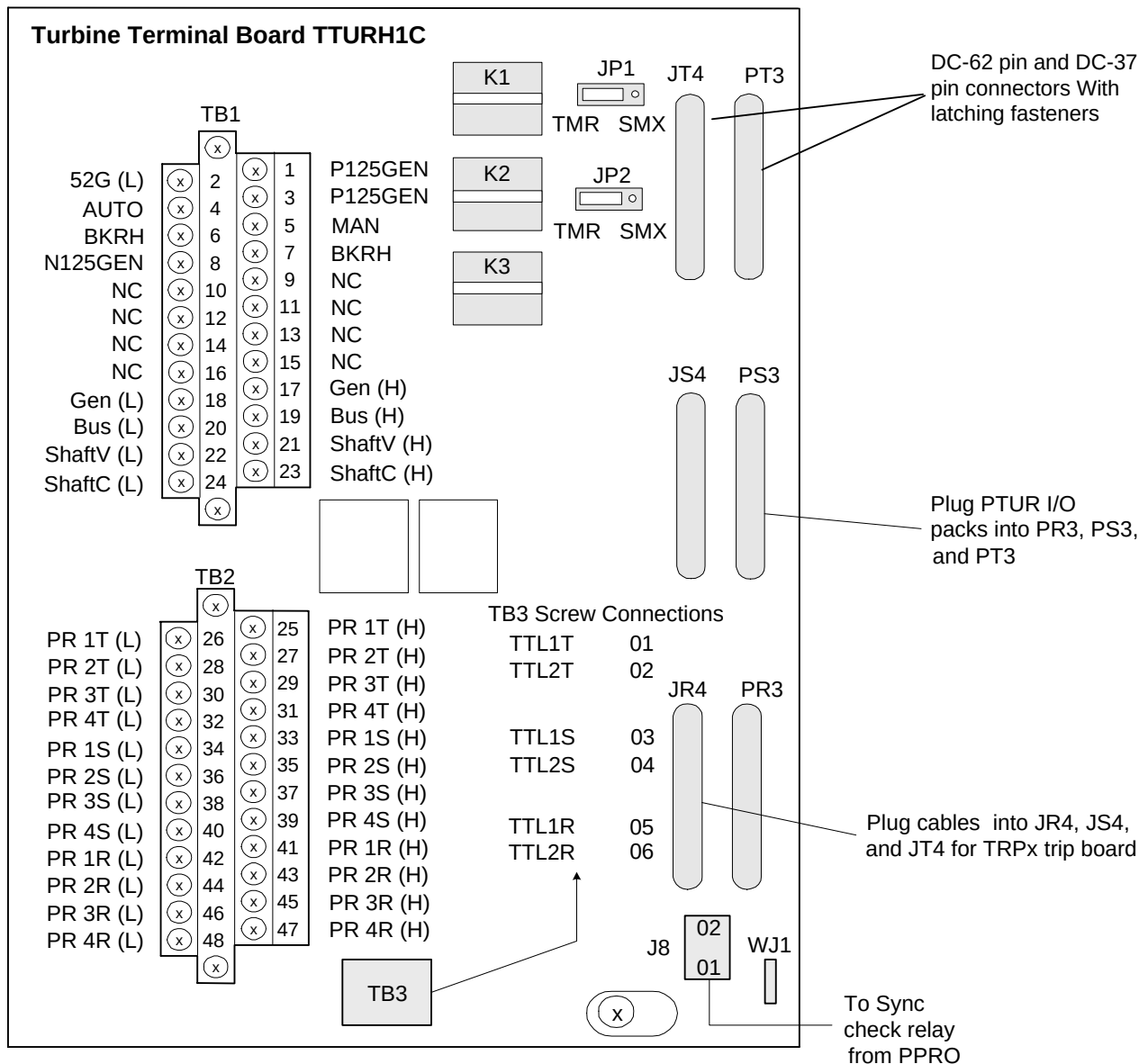


TTURH1C Turbine Terminal Board

Installation

Pulse rate pick ups, shaft pick ups, potential transformers, and the breaker relay are wired to the two terminal blocks TB1 and TB2. Each block is held down with two screws and 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.

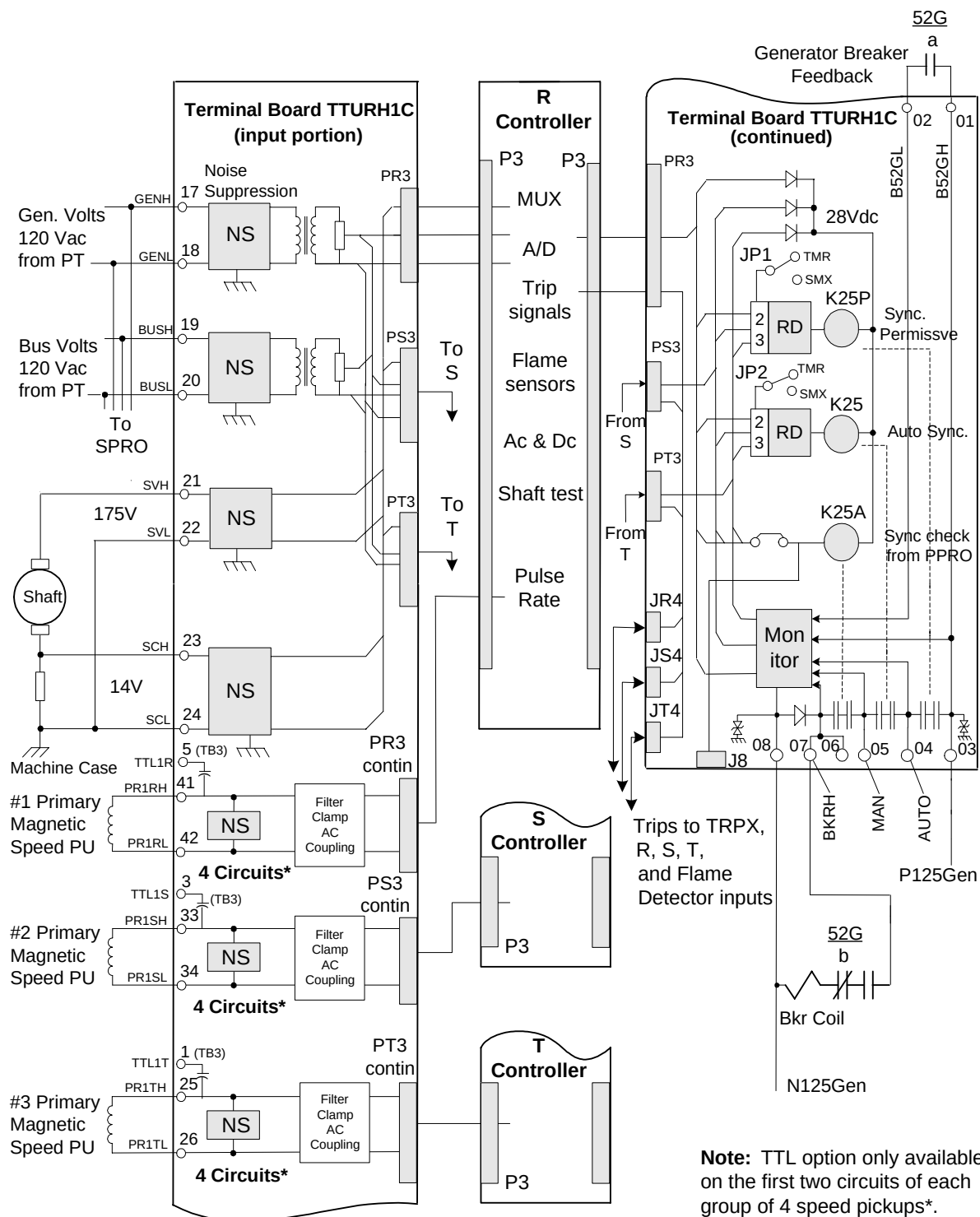
Jumpers JP1 and JP2 select either simplex or TMR for relay drivers K25 and K25P. Removing wire jumper WJ1 isolates the K25A control line to the TRPX board. TB3 is for optional TTL connections to active speed pickups; these devices require an external power supply. Simplex systems use cable connectors PR3 and JR4. TMR systems use all six cable connectors.



TTUR Terminal Board Wiring

Operation

PTUR turbine control packs plug into TTURH1C as shown in the figure. Either one or three can be used. The TRPX trip board connects to the J4 connectors.



TTUR and Controller, TMR system

Note Passive or active Pulse rate devices can be used.

In the simplex application, up to four pulse rate signals may be used to measure turbine speed. Generator and bus voltages are brought into TTUR for automatic synchronizing in conjunction with PTUR, the turbine controller, and excitation system. TTUR has permissive generator synchronizing relays and controls the main breaker relay coil 52G.

Note All three relays have two normally open contacts in series with the breaker close coil.

In TMR applications, all inputs, except speed, fan to the three PTUR packs. Control signals coming into TTUR from R, S, and T are voted before they actuate permissive relays K25 and K25P. Relay K25A is controlled by the PPRO and TREG boards through J8.

Specifications

Item	Specification
Number of inputs	12 passive speed pickups 1 shaft voltage and 1 shaft current measurement 1 generator and 1 bus voltage. Generator breaker status contact. Signal to K25A relay from PPRO
Number of outputs	Generator breaker coil, 5 A at 125 V dc
Power supply voltage	Nominal 125 V dc to breaker coil
MPU pulse rate range	2 Hz to 20 kHz
MPU pulse rate accuracy	0.05% of reading
MPU input circuit sensitivity	27 mV pk (detects 2 rpm speed)
Shaft voltage monitor	Signal is frequency of ± 5 V dc (0 – 1 MHz) pulses from 0 to 2,000 Hz
Shaft voltage wiring	Up to 300 m (984 ft), with maximum two-way cable resistance of 15 Ω
Shaft voltage dc test	Applies a 5 V dc source to test integrity of the external turbine circuit and measures dc current flow.
Shaft voltage ac test	Applies a test voltage of 1 kHz to the input of the PTUR shaft voltage circuit (R module only).
Shaft current input	Measures shaft current in amps ac (shunt voltage up to 0.1 V pp)
Generator and bus voltage sensors	Two single phase potential transformers, with secondary output supplying a nominal 115 V rms Each input has less than 3 VA of loading. Each PT input is magnetically isolated with a 1,500 V rms barrier. Cable length can be up to 1,000 ft. of 18 AWG wiring.
Generator breaker circuits (synchronizing)	External circuits should have a voltage range within 20 to 140 V dc. The external circuit must include a NC breaker auxiliary contact to interrupt the current. Circuits are rated for NEMA class E creepage and clearance. 250 V dc applications require interposing relays.
Contact voltage sensing	20 V dc indicates high and 6 V dc indicates low. Each circuit is optically isolated and filtered for 4 ms.
Physical	
Size	33.0 cm high x 17.8 cm wide (13 in x 7 in)
Technology	Surface mount
Temperature	-30 to 65°C (-22 to +149 °F)

Diagnostics

Diagnostic tests are made on the terminal board as follows:

- Feedback from the solenoid relay drivers is checked; if there is a problem with the control signal a fault is created.
- Feedback from the relay contacts; if there is a problem with the control signal a fault is created.
- Loss of solenoid power creates a fault.
- Slow sync check relay, slow auto sync relay, slow breaker, and locked up K25 relay; all of these create a fault.
- If any one of the above signals goes unhealthy, a composite diagnostic alarm L3DIAG_PTUR occurs. The diagnostic signals can be individually latched and then reset with the RESET_DIA signal if they go healthy.
- Terminal board connectors have their own ID device that is interrogated by the I/O pack. The ID device is a read-only chip coded with the terminal board serial number, board type, revision number, and plug location. When the chip is read by PTUR and a mismatch is encountered, a hardware incompatibility fault is created.

Configuration

Jumpers JP1 and JP2 select either simplex (SMX) or TMR for relay drivers K25 and K25P. Wire jumper WJ1 is installed; removing this will isolate the K25A control line to the TRPX board. There are no switches on the board.