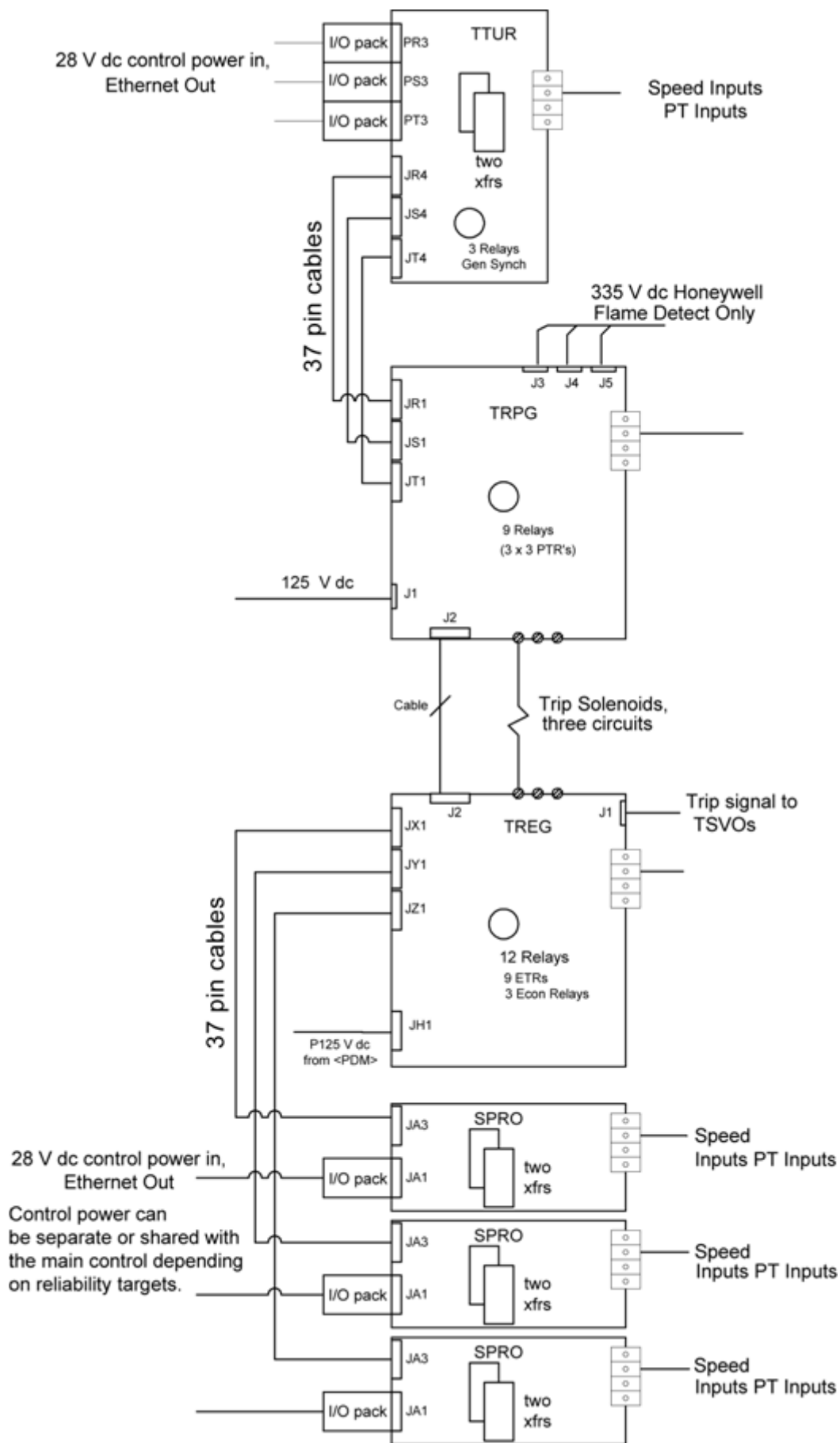

SPRO Emergency Protection

Functional Description

The Emergency Protection (SPRO) terminal board hosts a PPRO or YPRO I/O pack. It conditions speed signal inputs for the I/O pack and contains a pair of potential transformers (PTs) for bus and generator voltage input. It has a DC-37 pin connector adjacent to the PPRO or YPRO I/O pack connector that accepts a cable leading to a backup trip relay terminal board.

The following figure displays how the SPRO and PPRO / YPRO with cabling into a trip relay board form the backup protection in a Mark VIe or Mark VIeS control system. Primary protection is provided by PTUR or YTUR, TTUR, and a primary trip relay terminal board.



Turbine Control and Protection Boards

Compatibility

BoardRevision	Mark VI control IS200VPRO	Mark VIe control IS220PPRO	Mark VIeS Safety control IS220YPRO	Features
SPROH1A	No	Yes, all versions	No	24 Barrier terminals in a pluggable block
SPROH2A	No	Yes, all versions	No	24 pluggable Euro-style box terminals
SPROS1A	No	Yes, all versions	Yes, all versions	Barrier terminals, safety certified

The SPRO accepts direct mounting of one PPROH1A or YPROS1A and provides DC-37 connector for a cable to the selected backup trip relay terminal board. SPRO is cable-compatible with the trip boards listed in the following table.

Board	TMR	Simplex	Output Contacts 125 V dc	Output Contacts 24 V dc	ESTOP	Input Contacts 125 V dc	Input Contacts 24 V dc	Economy Resistor
TREGH1B	Yes	No	Yes	Yes	Yes	Yes	No	Yes
TREGH2B	Yes	No	Yes	Yes	Yes	No	Yes	Yes
TRELH1A	Yes	No	Yes	Yes	No	Yes	No	No
TRELH2A	Yes	No	Yes	Yes	No	No	Yes	No
TRESH1A	Yes	Yes	Yes	Yes	No	Yes	No	No
TRESH2A	Yes	Yes	Yes	Yes	No	No	Yes	No
* TREGS1B	Yes	No	Yes	Yes	Yes	Yes	No	Yes
* TREGS2B	Yes	No	Yes	Yes	Yes	No	Yes	Yes
* Mark VIeS Safety control compatible version								

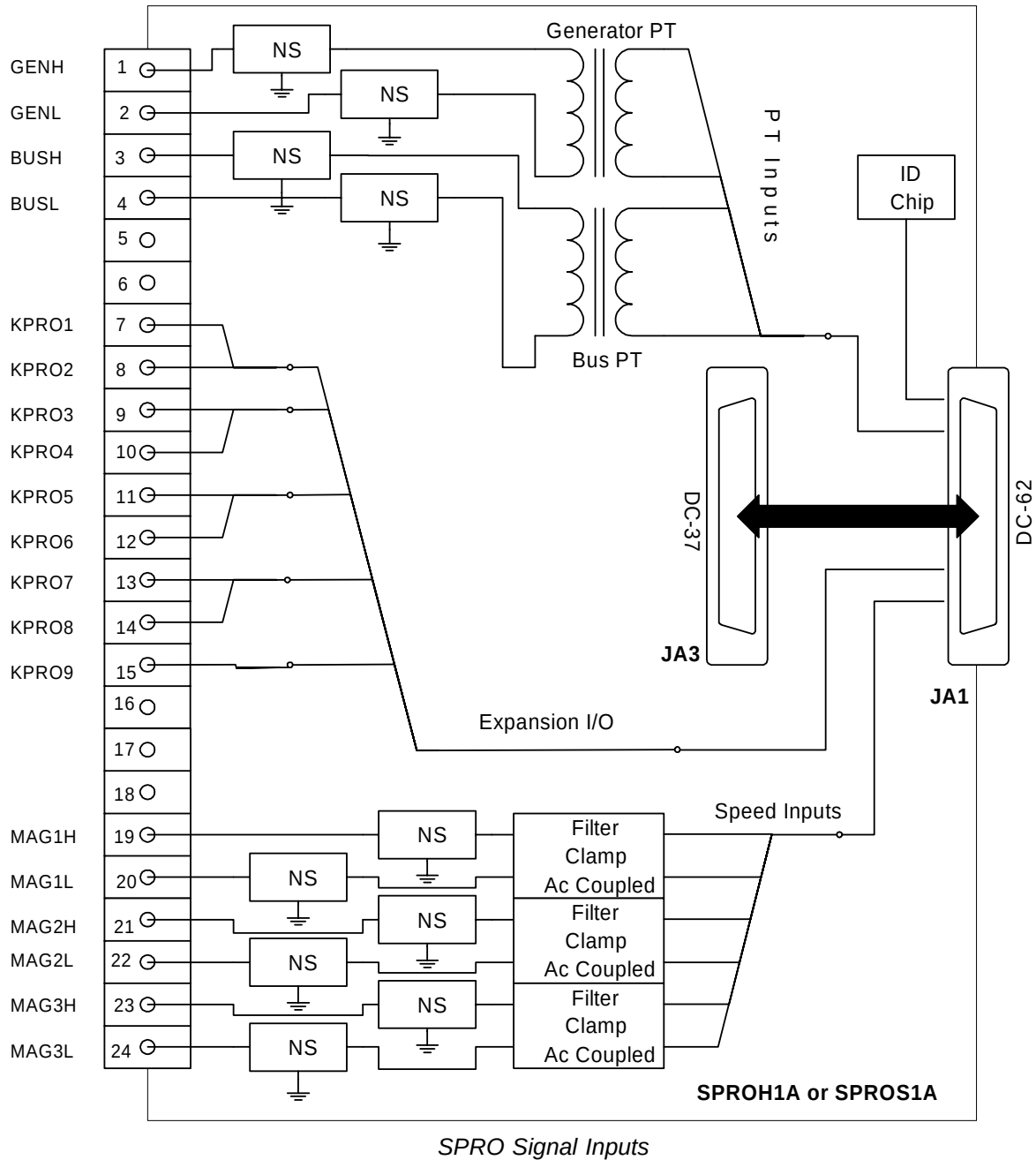
Installation

The SPRO and a plastic insulator mount on a sheet metal carrier, which mounts on a DIN-rail. Optionally, the SPRO and insulator mount on a sheet metal assembly, which bolts directly in a panel. Speed signals and PT inputs are wired directly to the terminal block using typical #18 AWG wires. The SPRO1A barrier terminal block is removable for board replacement. The SPRO2A Euro-block type terminal block has terminals that can be removed for board replacement.

The I/O pack mounts directly on connector JA1 of the SPRO. A DC-37 pin conductor cable plugs into connector JA3 of SPRO with the other end attached to the selected backup trip terminal board.

Operation

In the following drawing, the PT inputs to SPRO are displayed on terminals 1-4. Three speed inputs are displayed on terminals 19-24. Terminals 7-15 are reserved for future control feature expansion and are routed to the JA1 I/O pack connector. Terminals 5-6 and 16-18 have no board connection. The JA1 and JA3 connectors provide locations for the I/O pack and the trip terminal board cables.



SPRO Inputs

Terminal	Signal Name	Variable Name	Description
1	GENH	GenPT_KVolts	Generator PT input high.
2	GENL		Generator PT input low
3	BUSH	BusPT_KVolts	Bus PT input high
4	BUSL		Bus PT input low
5			Not connected
6			Not connected
7	KPRO1		Unused, left for future control feature expansion.
8	KPRO2		Unused, left for future control feature expansion.
9	KPRO3		Unused, left for future control feature expansion.
10	KPRO4		Unused, left for future control feature expansion.
11	KPRO5		Unused, left for future control feature expansion.
12	KPRO6		Unused, left for future control feature expansion.
13	KPRO7		Unused, left for future control feature expansion.
14	KPRO8		Unused, left for future control feature expansion.
15	KPRO9		Unused, left for future control feature expansion.
16			Not connected
17			Not connected
18			Not connected
19	MAG1H	PulseRate1	Magnetic pickup-1 high input
20	MAG1L		Magnetic pickup-1 low input
21	MAG2H	PulseRate2	Magnetic pickup-2 high input
22	MAG2L		Magnetic pickup-2 low input
23	MAG3H	PulseRate3	Magnetic pickup-3 high input
24	MAG3L		Magnetic pickup-3 low input

Specifications

Item	Specification
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. Allowable voltage range for synch is 75 to 130 V rms 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.
Magnetic speed pickup pulse rate range	2 Hz to 20,000 Hz
Magnetic speed pickup pulse rate accuracy	0.05% of reading
Speed input sensitivity	Required peak-peak voltage rises as a function of frequency: 0 – 2 kHz requires 27 mV 2 kHz – 6 kHz requires 50 mV 6 kHz – 10 kHz requires 100 mV 10 kHz – 15 kHz requires 160 mV Above 15 kHz requires 250 mV
Physical	
Size	15.9 cm high x 17.8 cm wide (6.25 in. x 7.0 in.)
Technology	Surface-mount
Temperature	Operating: -30 to 65°C (-22 to +149 °F)

Note Speed input sensitivity is such that turning gear speed may be observed on a typical turbine application.

Diagnostics

The SPRO board and backup trip relay terminal board contain electronic ID parts that are read during power initialization. This information is used by PPRO or YPRO to confirm a valid hardware arrangement prior to starting normal operation.

Configuration

There are no jumpers or hardware settings on the board.