



Engine Kill for Onboard High Level Shutdown

Application Note

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This warranty does not cover those damages incurred due to corrosion of the wetted parts. Probe failure from corrosion is not covered by this warranty. The TD80™FINCH 5332 Display, FINCH II Display and all electronics supplied by Titan Logix Corp. are only warranted if protected from road hazards. The warranty is valid only if the TD80™ is installed in accordance with the instruction manual provided.

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1 Introduction

1.1 About this Application Note

This application note addresses the need for a reliable and cost effective onboard overfill prevention system using the TD80 and Finch II Display. The method presented is for Emergency Shutdown (ESD) of the truck engine providing power to the onboard loading pump through a PTO. It is applicable to a wide range of tankers from single compartment body tank trucks to multi-compartment B-Train units.

The engine kill circuit provides overfill protection only when a TD80 transmitter and Finch II display are installed and programmed correctly according to the specific application.

This circuit is intended to be easily installed by trained and qualified installers for new and retrofit systems. A single automotive relay, socket with attached pigtail wiring, crimp or solder butt splices are the required parts. Most installers will be familiar with the J560 sockets and cable. Engine control information must be provided by the engine manufacturer or body builder. Engine kill may be done by controlling the fuel pump, engine kill signal into the ECM or a separate engine kill module.

Refer to TD80 Installation and Operation Manual TPM 001 and Finch II Installation and Operation Manual TPM 010 for installation, programming and test details.

1.2 Disclaimer

The information in this document is subject to change without notice. Titan Logix Corp. makes no representation or warranties with respect to the content hereof.

1.3 System Description

Overfill prevention devices are designed as an emergency system to stop loading when the product level is at the maximum allowable capacity of a tank. The operator must constantly and attentively monitor the loading progress. He is required to stop loading before a dangerously overfilled compartment creates a hazardous condition.

Many devices exist to automatically stop loading if the operator is unable to perform that task. The method discussed in this application note is engine shutdown for onboard loading pumps. An engine driven power takeoff (PTO) drives an onboard loading pump. Kill the engine and loading stops. The specific engine kill method is to turn off the fuel pump. The engine starves of fuel and the loading pump halts.

A redundant overfill prevention method may be included to provide a greater level of fault tolerance. Hydraulically powered onboard loading pump control along with the engine kill method provides a backup if one system fails to automatically halt loading to prevent an overfill or spill. This method also applies to bottom loading valve control.

Engine restart is enabled by acknowledging the high level alarm and then placing the Finch display in Sleep Mode where all alarm responses are disabled.

The circuit is designed to maintain engine power in the event of a Finch II display or electrical connection failure. The engine kill is armed under only one set of strict conditions; Finch II is turned on and is monitoring alarm states while the PTO is engaged and the parking brake is set.

WARNING: ENGINE KILL IS AN EMERGENCY SHUTDOWN (ESD) ONLY AND SECONDARY TO OPERATOR CONTROL OF THE LOADING PROCESS. REPEATED ESD MAY CAUSE PREMATURE ENGINE FAILURE.

2 Overview

2.1 The Solution

TD80 and Finch display generated alarms are annunciated by relay contacts to external devices. Some of the external devices are safety related and control an overfill prevention system. The onboard overfill prevention system may stop loading by closing a bottom loading valve, stopping the loading pump or disconnecting the drive to the pump. Engine shutdown disconnects power to the loading pump by killing the engine.

A switch signals a loading event to the overfill prevention system. This may be a pressure switch or cam activated micro switch connected to the PTO hydraulics, pneumatics, engagement lever, vents or hose interlock. This is generically called the PTO switch.

An optional parking brake interlock switch provides a confirmed loading event along with the PTO switch.

The engine is shutdown under the following conditions while loading:

1. Finch II is turned on and monitoring alarms, AND
2. PTO is engaged, AND
3. Parking brake is set, AND
4. Active safety alarm
 - a. Fail alarm, OR
 - b. Spill alarm, OR
 - c. High-High alarm

The shutdown signal is generated at the truck or trailer mounted Finch display. Engine power can be controlled by the following three methods:

1. Fuel pump power can be controlled. A relay is installed to control power to the fuel pump by cutting a wire at the key switch. This method is explained in detail.
2. The ECM, engine kill input can be controlled by a set of relay contacts. Refer to the ECM manufacturer for details.
3. An engine kill module can be controlled by a set of relay contacts. Refer to the engine kill module manufacturer for details.

Engine shutdown is an emergency shutdown (ESD) and secondary to operator control of the loading process. Heavy-Duty diesel truck engines must always be started and stopped according to the manufacturer's guidelines. Recommended guidelines may include idling the engine for a period of time to cool down before shutdown. Sudden loss of engine power while under load stops engine coolant circulation and oil pressure. The turbocharger may still be spinning and the engine is hot from providing hydraulic power to the pump. Repeated ESD may cause premature engine failure.

3 Installation

3.1 Parts and Material Required, Not Supplied by Titan

1. Qty 1, Plug-in SPDT automotive relay, Truck-Lite part number 1924 or equivalent
2. Qty 1, automotive relay socket with wires attached, Truck-Lite part number 9185 or equivalent
3. For trailer installation, qty 2, molded J560 sockets, Varisystems part number 7TRx or equivalent, where x is the cable length 1', 4' or 10'.
4. For trailer installation, qty 2, brackets for the J560 sockets.
5. For trailer installations, qty 1, molded J560 cable, Varisystems part number 7CCx or equivalent, where x is the length 10', 12', 15' or 20'.
6. A weatherproof mechanical switch or pressure operated switch to signal a loading event. This is usually engaged by operating the PTO or onboard loading system. It is required to provide the loading event signal.
7. A weatherproof brake air pressure switch. This is an optional feature to provide a confirmed loading event signal.
8. Crimp or solder butt splices for relay wiring.
9. Suitable electrical wire and cable.
10. Self-bonding electrical tape, Scotch 2242 or equivalent
11. Nylon cable ties

3.2 Electrical Installation Notes

1. Vehicle manufacturers usually have specific locations for electrical power access. These locations are fuse protected to limit short-circuit current. Refer to the vehicle documentation or contact the manufacturer for the recommended locations prior to the electrical installation.
2. Locate the key switch wire for fuel pump control. Refer to the truck manufacturer or body builder documentation for wiring location and details.
3. Refer to the manufacturer's information for an optional ECM or engine kill module installation.
4. When making connections to the vehicle electrical ground, ensure that the wiring is terminated at a battery ground terminal. Some metal components are electrically insulated from the battery ground or bolted with painted surfaces causing a poor connection.
5. Follow all federal, state/provincial and local safety standards and industry recommended practices for the vehicle. For example, the Federal Motor Vehicle Safety Standards (FMVSS) and the American Trucking Association

(ATA) Technology and Maintenance Council (TMC) Recommended Practices (RP).

3.3 Installation Instructions

Locate the engine kill relay inside the cab and as close as possible to where the key switch wiring will be cut. Secure the relay and wiring with nylon cable ties to prevent vibration and unintentional pulling on the relay and wire assembly after final testing.

Refer to TD80 Installation and Operation Manual, TPM 001 and Finch II Installation and Operation Manual, TPM 010 for installation, programming and test details.

The optional onboard loading control is described in the Finch II Installation and Operation Manual, TPM 010. Refer to the manual for pump or bottom loading valve control. The J560 socket, pins 5 and 6 are reserved for tractor mounted loading pump control.

Refer to the brake manufacturer's recommended service and test procedures for the brake air pressure switch installation.

Refer to Figure 5-1 and Figure 5-2 for the tractor to trailer wiring details.

Refer to Figure 5-3 and Figure 5-4 for the tank truck wiring details.

Refer to Figure 5-5 for the key switch wire cut details.

For Tractor and Tank Trailer Installation

At the Trailer: See Figure 5-1

1. Install the dedicated J560 socket.
2. Label the socket "FOR TD80 HIGH LEVEL SHUTDOWN USE ONLY".
3. Connect the shutdown wiring from the dedicated J560 socket to the Finch display.
 - a. Pin-1 to Finch GND IN
 - b. Pin-7 to Finch PWR IN
 - c. Pin-2 to Finch RELAY 1 NO
 - d. Pin-3 to Finch RELAY PWR
 - e. Pin-4 to Finch DISPLY EN (if installing for a truck mounted pump only)
4. For a trailer mounted pump, connect the following:
 - a. Finch DISPLAY EN terminal to the PTO actuated switch, NO terminal.
 - b. PTO actuated switch COM terminal to GND.
5. Install the optional brake air pressure switch.
 - a. Connect the COM terminal of the switch to Finch DISPLAY EN
 - b. Connect the NC terminal of the switch to Finch RELAY 1 COM terminal

OR

 - c. If the switch is not installed; connect Finch DISPLAY EN to RELAY 1 COM

At the Tractor: See Figure 5-1

6. Install the dedicated J560 socket.
7. Label the socket "FOR TD80 HIGH LEVEL SHUTDOWN USE ONLY".
8. Connect shutdown wiring at the dedicated J560 socket.

- a. Pin-1 to GND
- b. Pin-7 to a switched and fuse protected battery power source
- c. Pin-2 to the RELAY NO wire
- d. Pin-3 to the RELAY PWR wire
- e. Pin-4, PTO Switch wire (if installing for a truck mounted pump only)
9. Route the RELAY NO, Pin-2 and RELAY PWR, Pin-3 wiring to the relay located near the key switch. Use grommets, loom or strain reliefs where required. Use nylon cable ties to securely fasten the wiring to existing cables where available.
10. Continue with instructions for all installations.

For Tank Truck Installation: See Figure 5-3

1. Connect the following PTO wiring:
 - a. Finch DISPLAY EN terminal to the PTO actuated switch, NO terminal.
 - b. PTO actuated switch COM terminal to GND.
2. Install the optional brake air pressure switch.
 - a. Connect the COM terminal of the switch to Finch DISPLAY EN
 - b. Connect the NC terminal of the switch to Finch RELAY 1 COM terminal

OR

 - c. If the switch is not installed , connect Finch DISPLAY EN to RELAY 1 COM
3. Connect Finch GND IN to power ground.
4. Connect Finch PWR IN to a switched and fuse protected battery power source.
5. Connect the following shutdown wiring:
 - a. Finch RELAY 1 NO terminal to the Relay NO wire.
 - b. Finch RELAY PWR terminal to the Relay PWR wire.
 - c. Route the two wires to the relay located near the key switch. Use grommets, loom or strain reliefs where required. Use nylon cable ties to securely fasten the wiring to existing cables where available.
6. Continue with instructions for all installations.

For All Installations: At the truck: See Figure 5-2 for tractor, Figure 5-4 for tank truck wiring.

1. Connect the shutdown wiring from the Finch or J560 socket, Relay NO and Relay PWR to the engine kill relay terminals 85 and 86 using crimp or solder butt splices as follows:
 - a. Terminal 85 to RELAY NO wire
 - b. Terminal 86 to RELAY PWR wire
2. Cut the fuel pump control wire near the key switch. Refer to truck manufacturer or body builder documentation for wiring location and details. The wire end at the switch is labeled (B), the wire end to the fuel pump is labeled (A). See Figure 5-5 for details.
3. Connect the engine kill relay terminals 30 and 87A to the cut fuel pump wire using crimp or solder butt splices as follows:
 - a. Terminal 30 to Wire end B
 - b. Terminal 87A to Wire end A

4. For a tractor mounted pump and trailer, connect the following:
 - a. Dedicated J560 socket, Pin-4 to the PTO actuated switch, NO terminal.
 - b. PTO actuated switch COM terminal to GND.
5. Insulate and moisture-proof the wiring connections using the self-sealing tape. Use nylon cable ties to securely fasten the wiring to existing cables where available.
6. Inspect the installation.
7. Confirm the TD80 and Finch programming. Reprogram the following if required. See Figure 5-6 for alarm relay mapping details.
 - a. TD80 Spill alarm level
 - b. TD80 High-High alarm volume
 - c. Finch alarm relay mapping and state for engine shutdown:
 - i. Spill/Fail Alarm=Engine
 - ii. HH Alarm=Engine
 - iii. Engine Relay Alarming State=Energized
8. For a trailer installation, connect the trailer and tractor J560 sockets with the 7-way cable.
9. Test the system.
 - a. Test the entire TD80 and shutdown system in accordance with the Finch II Installation and Operation Manual, TPM 010, section 2.6.2, TD80 System Testing and Verification.
 - b. For the optional brake air pressure switch, follow the manufacturer's recommended brake test procedure.
 - c. A quick test of the engine kill relay is performed by the following:
 - i. Start the engine
 - ii. Turn on the TD80 system
 - iii. Ensure that all alarms are inactive and the Finch II display is in Monitor Mode
 - iv. Ensure that the parking brake is engaged.
 - v. Engage the PTO for loading
 - vi. Inside the Finch II display, press and hold the Engine Relay Test push button
 - vii. Ensure that the engine shuts down
 - viii. Release the Engine Relay Test push button
 - ix. Place the Finch II display into Sleep Mode
 - x. Disengage the PTO
 - xi. Restart the engine

4 Recommendations

1. Test the high level shutdown system daily or at the beginning of each shift as follows:
 - a. Start the engine
 - b. Turn on the TD80 system
 - c. Ensure that all alarms are inactive and the Finch II display is in Monitor Mode
 - d. Ensure that the parking brake is engaged.
 - e. Engage the PTO for loading
 - f. Inside the Finch II display, press and hold the Engine Relay Test push button
 - g. Ensure that the engine shuts down
 - h. Release the Engine Relay Test push button
 - i. Place the Finch II display into Sleep Mode
 - j. Disengage the PTO
 - k. Restart the engine
2. Test the entire system annually, in accordance with the Finch II Installation and Operation Manual, TPM 010, section 2.6.2, TD80 System Testing and Verification.

5 Appendix

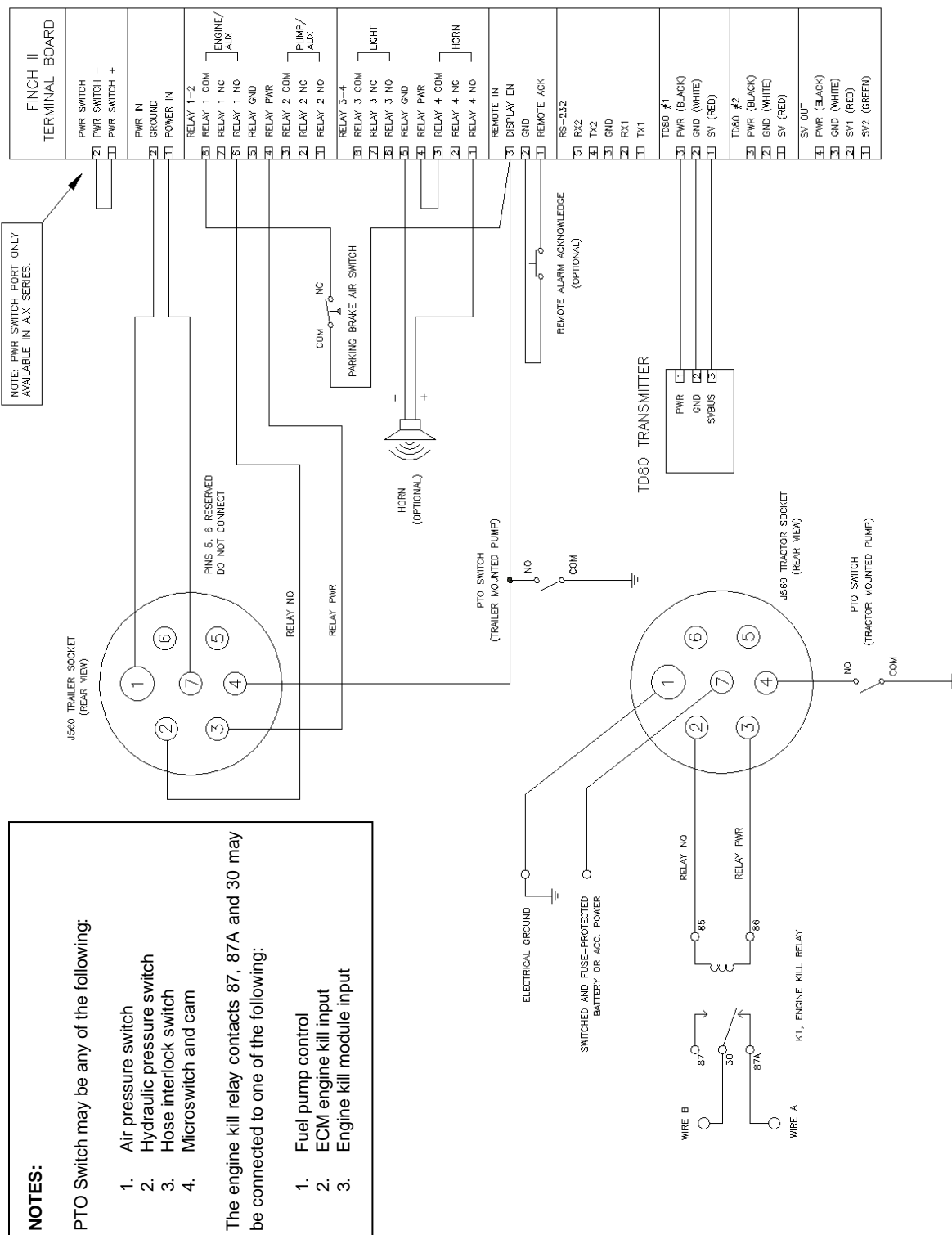


Figure 5-1: Tractor-Trailer Engine Kill Wiring Schematic

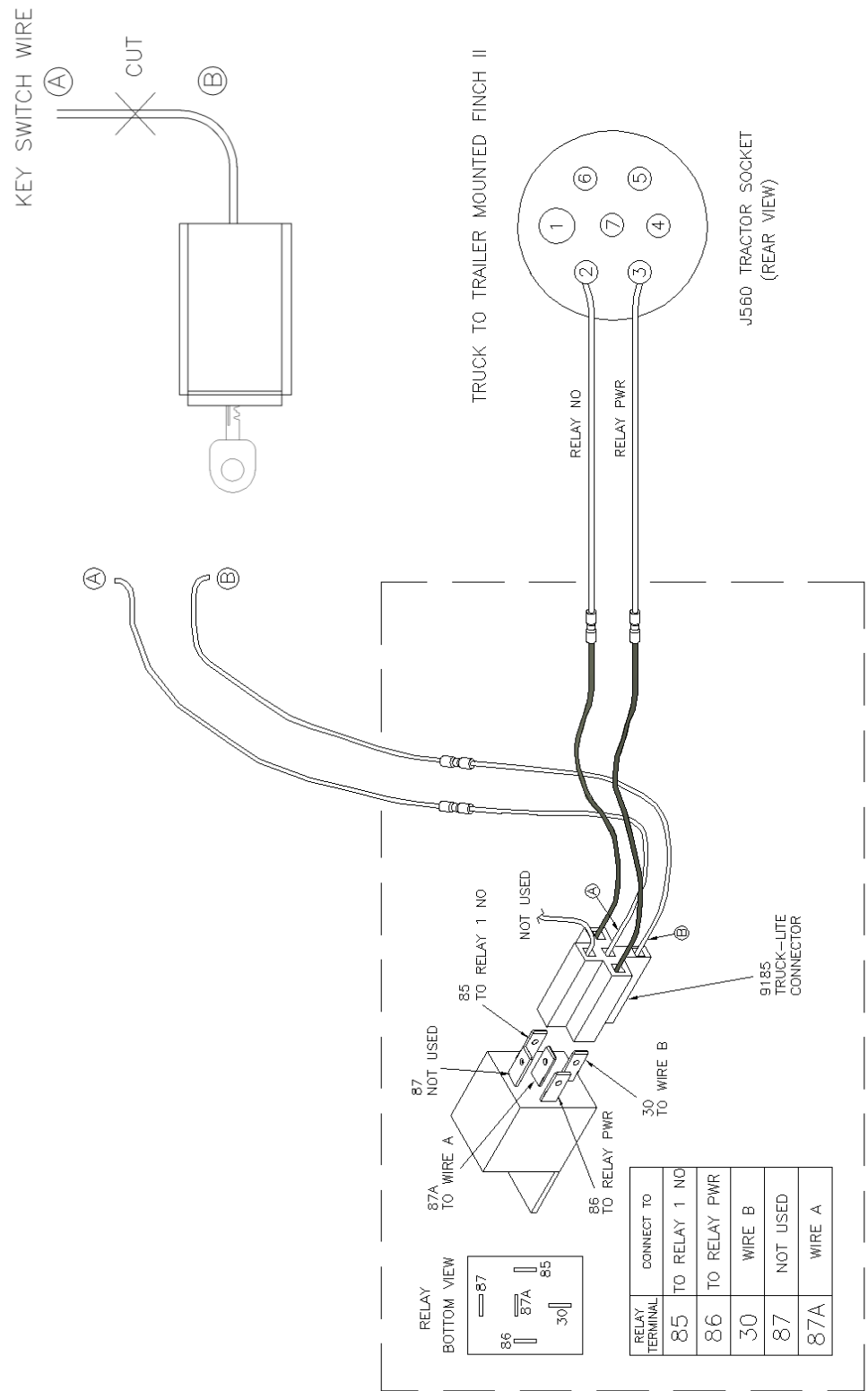


Figure 5-2: Tractor-Trailer Engine Kill Relay Wiring Detail

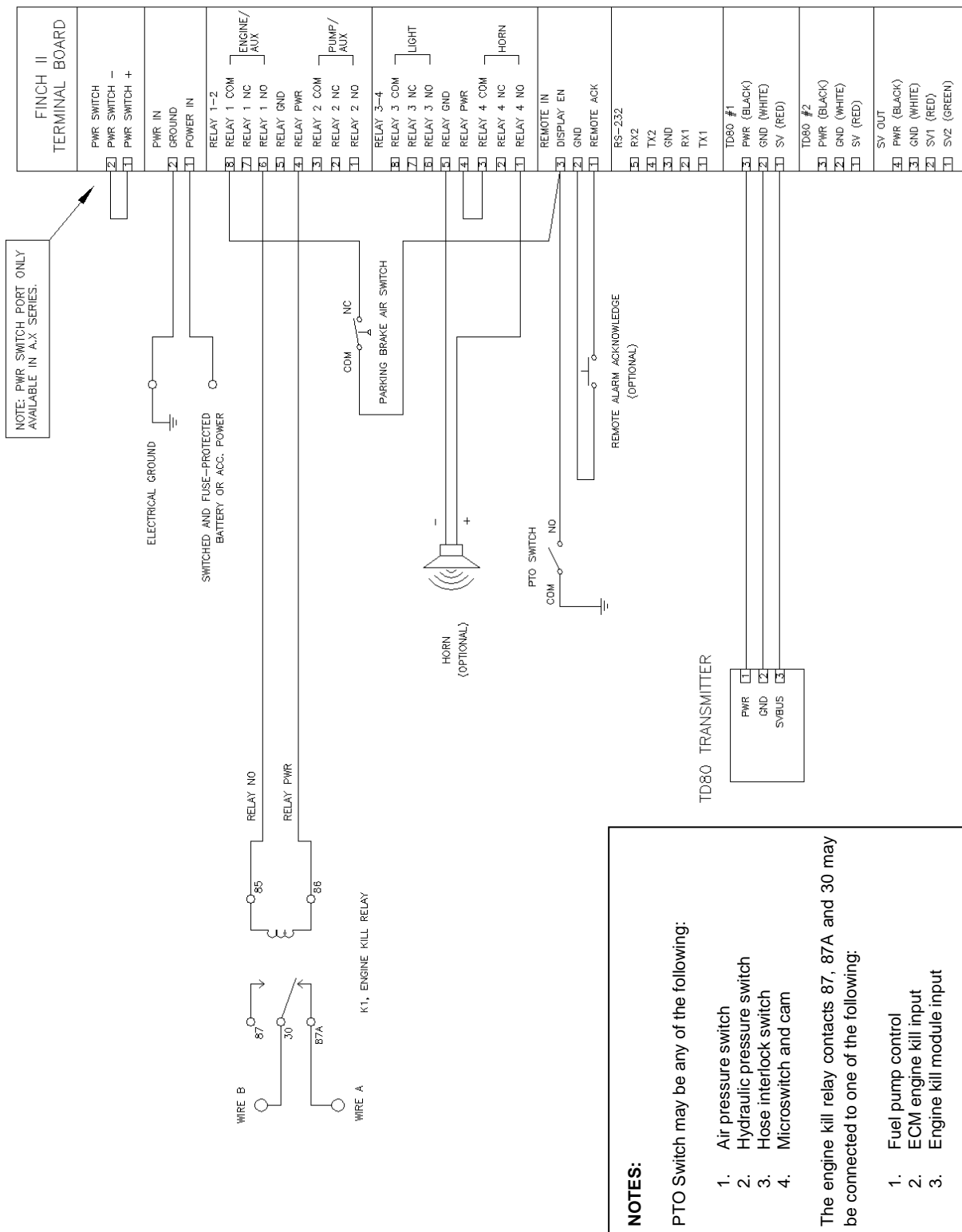


Figure 5-3: Tank Truck Engine Kill Wiring Schematic

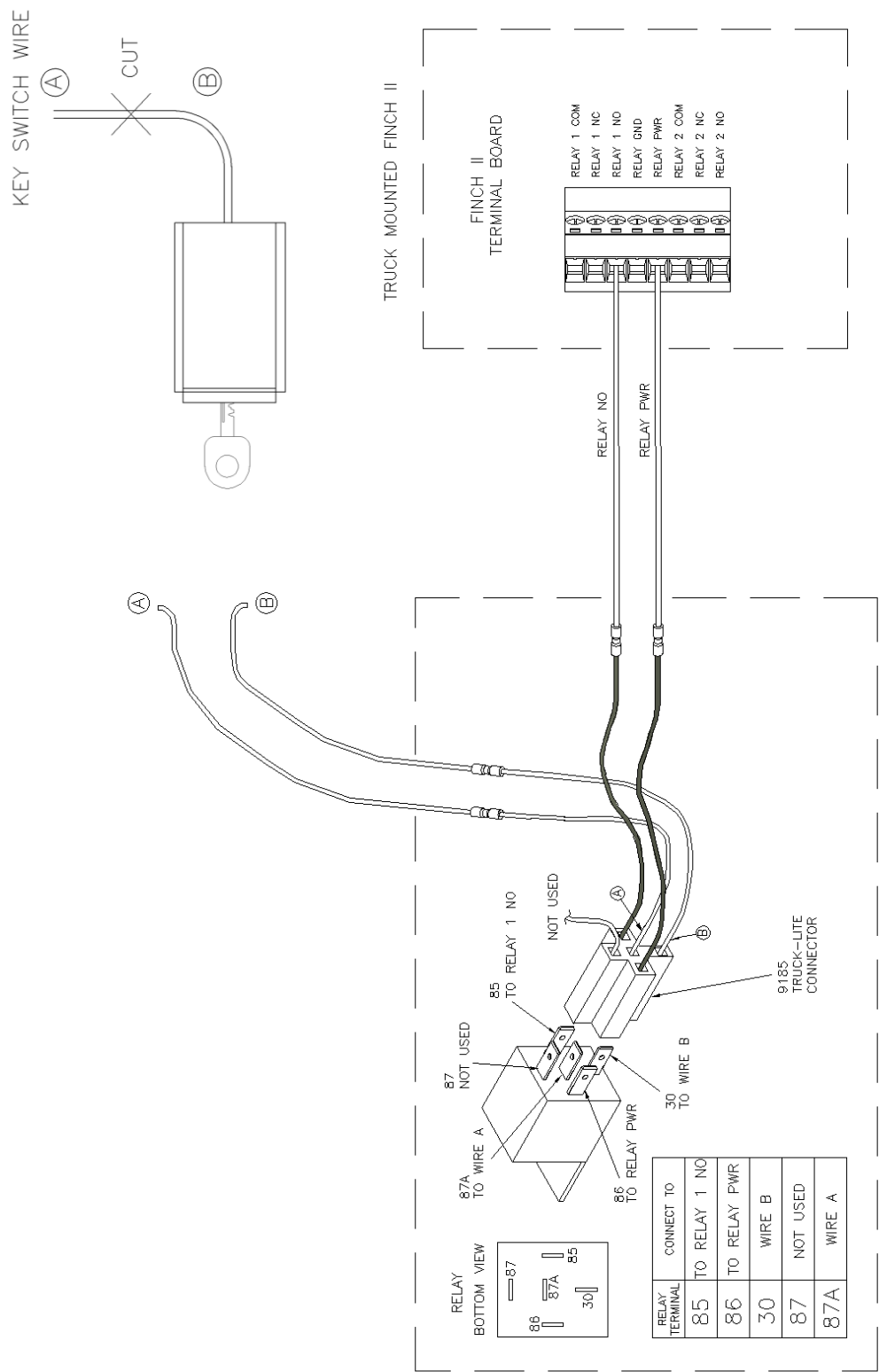


Figure 5-4: Tank Truck Engine Kill Relay Wiring Detail

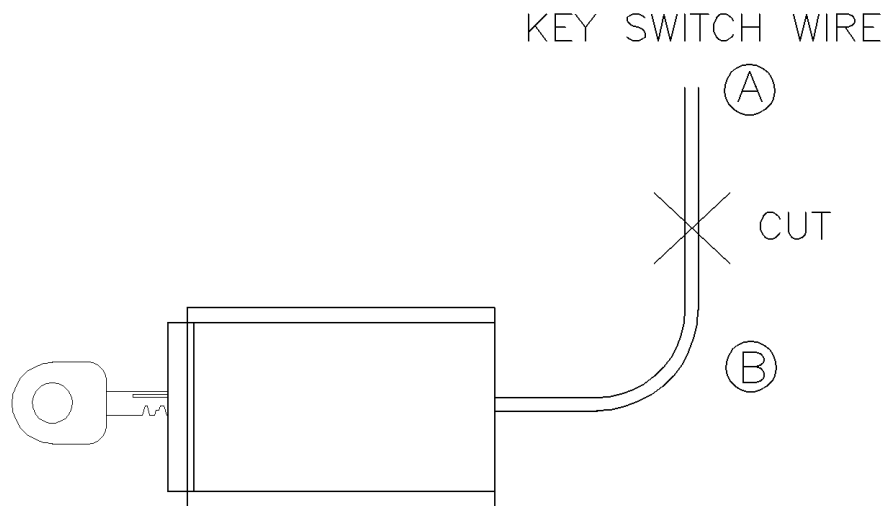


Figure 5-5: Key Switch Wire Cut Details

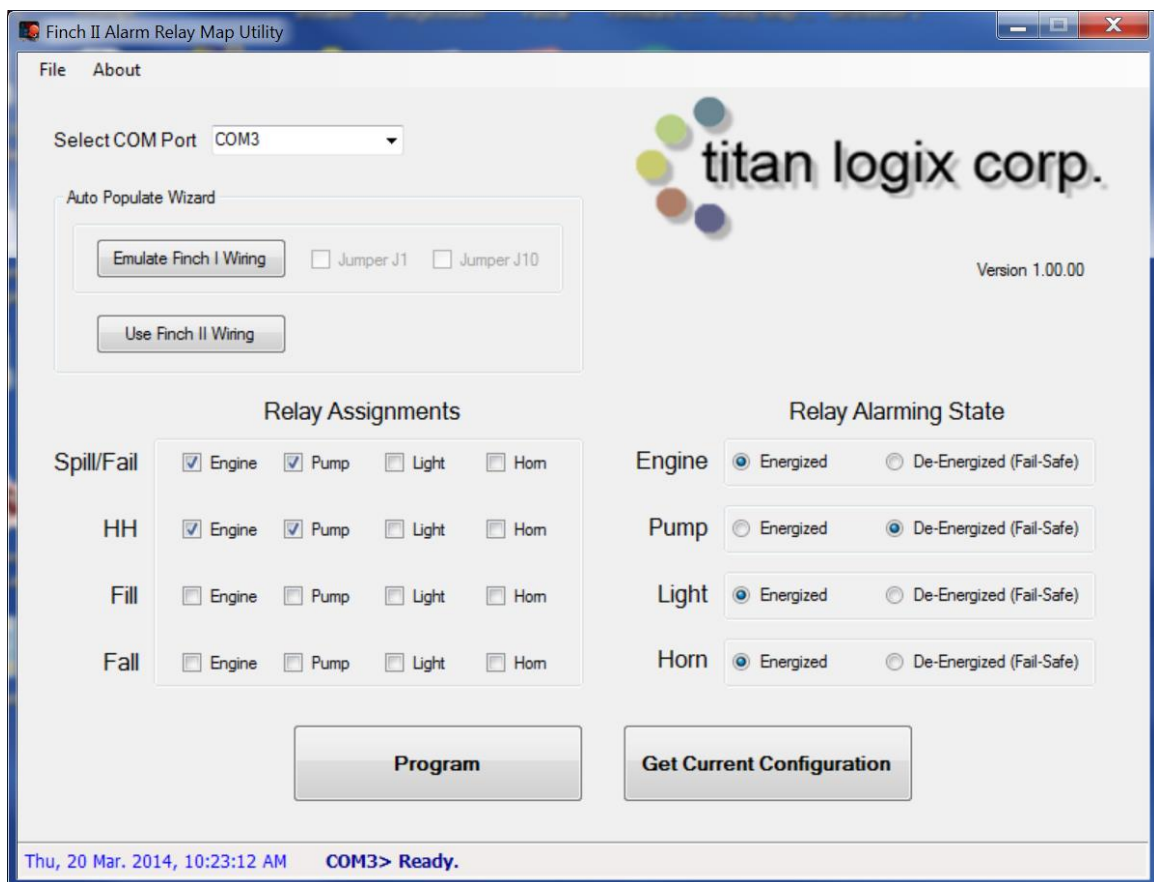


Figure 5-6: Finch II Alarm Relay Mapping