



***PosiGROUND***<sup>TM</sup>  
**Grounding Controller**

**MODEL 672 SHOP MANUAL**

 **GARNET** *INSTRUMENTS LTD.*

**PosiGROUND**<sup>™</sup> **Grounding Controller**

**MODEL 672 SHOP MANUAL**

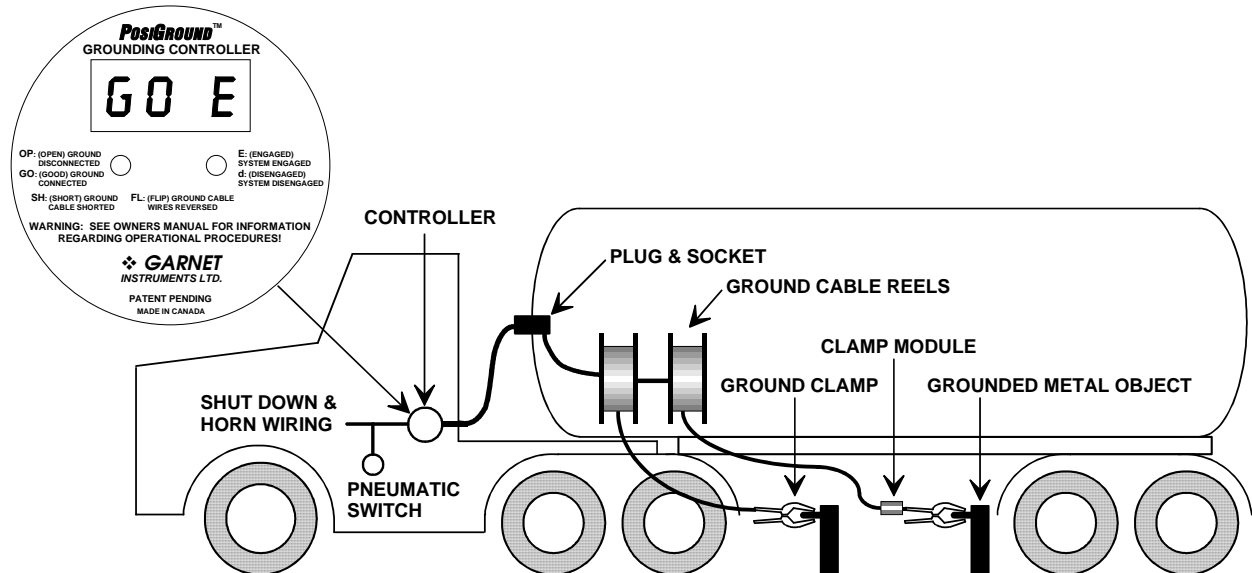
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## A) 672 POSIGROUND GROUNDING CONTROLLER FEATURES & OPERATION

Congratulations on purchasing the Garnet Instruments Model 672 PosiGround Truck Grounding Control System. The 672 represents the state of the art in truck mounted grounding control systems, and will enhance safety in the handling of flammable products by providing a positive indication of proper grounding.

The PosiGround system consists of four main components: the controller mounted either inside or outside the cab of the truck, the pneumatic switch sensing loading/unloading engagement, the clamp module which connects between one of the ground cables and its clamp, and the dealer supplied pair of ground reels, cables, and clamps.



The controller is the “brains” of the system. It determines the operational status of the system and whether the ground clamps are properly connected, and controls the warning horn and the shutdown of the loading. The front panel of the controller has an LCD diagnostic display which allows the operator to determine whether the trailer is grounded, and also to assist in troubleshooting in the event of a system malfunction. The LCD has a light behind it to aid in night time viewing, this light operates from the 12 volt power on the truck. There are five wires coming from the controller: ground, ground sense, shutdown, warning horn, and optional 12 volt power for display illumination. The controller operates from a 3 volt Lithium coin cell which should give approximately 10 years of lifetime.

The controller continuously scans the ground and ground sense lines (the two ground cables with their clamps and the clamp module) to determine the ground status of the truck. There are six conditions that the controller scans for:

- 1) **Loading Disengaged:** If the PosiGround senses a short circuit between the **shutdown** and **ground** lines, (which would be caused by the pneumatic switch sensing no pressure) it displays **d** on the right side of the display, indicating that loading is disengaged. The warning horn will be off, and the closed circuit of the pneumatic switch will permit loading when it is engaged. The left side of the display will show the grounding connection, as described below.
- 2) **Loading Engaged:** If the PosiGround does not sense a short circuit between the **shutdown** and **ground** lines, it displays **E** on the right side of the display, indicating that loading

is engaged. It controls the horn and shutdown outputs in accordance with the grounding connection, as described below.

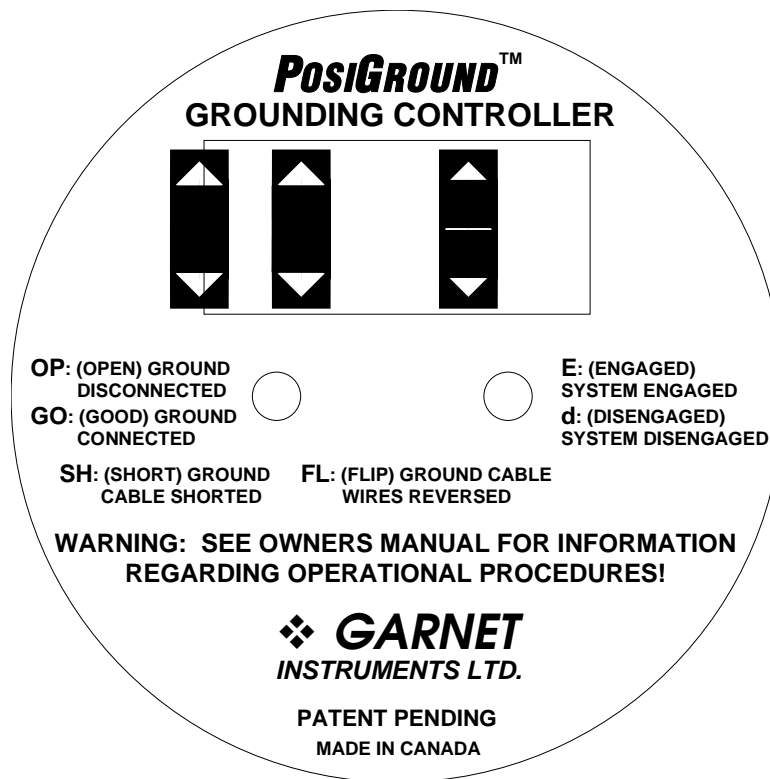
3) **Open Circuit:** If the controller determines that there is no electrical connection between the ground sense line and ground, indicating that the truck is not grounded, it displays **OP** (OPen) on the left side of the display. If loading is engaged, the horn will sound for a set time, and then loading will be shut down.

4) **Short Circuit:** If the controller determines that there is an electrical connection between the ground sense line and ground that does not go through the clamp module, indicating a short circuit between the grounding cables, it displays **SH** (SHort) on the left side of the display. If loading is engaged, the horn will sound for a set time, and then loading will be shut down.

5) **Reversed Clamp Module:** If the controller determines that there is an electrical connection between the ground sense line and ground, but that it is backwards, indicating that the clamp module is reversed or in the ground line, it displays **FL** (FLipped) on the left side of the display. If loading is engaged, the horn will sound for a set time, and then loading will be shut down.

6) **Proper Ground Connection:** If the controller determines that there is an electrical connection between the ground sense line and ground, and that it is in the proper direction, indicating that the truck is properly grounded, it displays **GO** (GOod) on the left side of the display. The horn will be off, and loading will be allowed.

The following drawing shows the front panel of the controller:



The pneumatic switch closes when it senses low pressure. It is electrically connected between **the shut down** line and **ground**. If the truck is PTO loaded, then the pneumatic port of the

switch is plumbed into the PTO engagement air line, so that high pressure indicates PTO engagement. If the truck is vacuum loaded, then the switch is plumbed into the isolation valve pneumatic control line so that high pressure indicates that the isolation valve is open. If the truck is loaded with a hydraulically driven pump driven by a separate engine, then the switch is plumbed into the air line controlling pump engagement, so that high pressure indicates that the pump is running. If the loading pump is driven directly off a separate engine, then the switch is not used. An electrical switch which turns off the engine is used, and has extra contacts that close when the engine is off.

The clamp module is used to determine that the only electrical connection between the ground sense line and ground is through the sense line clamp. This ensures that a short circuit in the cabling prior to the clamps does not fool the system into thinking that the truck is grounded when in fact it may not be.

The dealer supplied cables, reels, and clamps are used to make the actual connections to ground. The proper procedure is to connect one clamp to a metal object which looks like it should be grounded, and to connect the other clamp to another metal object at least 20 feet away which also looks like it should be grounded. If they are both grounded, then there will be an electrical connection between them which the PosiGround will detect. If one or both of the objects is not grounded, then there should not be any connection between them, so the PosiGround will indicate that the truck is ungrounded. This ungrounded condition may result from connecting to pipes which have cathodic protection insulators at the flanges, or from paint or gaskets insulating the metal pieces from each other.

## **B) 672 POSIGROUND OPERATIONAL PROCEDURES**

- 1) When the operator is ready to begin handling, loading, or unloading flammable material, the truck must be grounded.
- 2) Connect one clamp to a metal object which looks like it should be grounded, and connect the other clamp to another metal object at least 20 feet away which also looks like it should be grounded. Ideally, both objects should have a buried portion.
- 3) Check the display, it should show **GO d**, indicating that the ground is good but that loading or unloading has not been started.
- 4) Loading or unloading can now be started. If loading is attempted before the ground connection is made, the horn will sound for a set time, and then loading will be shut down unless the ground connection is made within the set time period.
- 5) If the ground connection is lost during loading, the horn will sound for a set time, and then loading will be shut down unless the ground connection is remade within the set time period.
- 6) When loading is complete, shut down the loading system and then disconnect the grounds.
- 7) If the ground has been lost and the horn is sounding, shutting down the loading system will silence the horn.
- 8) If the PosiGround shows **SH** or **FL** when the cables are connected, then there is a defect in the wiring of the ground cables which must be corrected before the PosiGround can be used.
- 9) Each time a proper grounding connection is established, or the loading system is shut down, the timer is reset.
- 10) The PosiGround system must be tested periodically to make sure that the horn sounds and that loading shuts down. The system must also be tested by any new operator to ensure that he is familiar with PosiGround operation for that particular vehicle.

**WARNING: The PosiGround is intended as an emergency backup system only, and is not intended as a substitute for operator diligence during the loading or unloading process.**

**WARNING: It is the operators responsibility to properly connect the ground cables to ensure correct PosiGround operation. Simply hooking the ground clamps together and laying them on the ground does NOT constitute a proper ground connection.**

**WARNING: Do NOT travel with the ground clamps hooked together, or with the ground sense clamp connected to the truck frame. This may result in the operator forgetting to properly connect the ground**

clamps since no warning will be given when loading or unloading is started.

**WARNING:** It is the installers responsibility to properly connect and test the horn and shut down features of the PosiGround. If these systems are not all connected, the truck operator **MUST** be made aware of exactly what the PosiGround does control, if anything.

### **IMPORTANT**

In the unlikely event that the PosiGround system should fail and the truck is disabled due to engine shut down, the dash mounted PosiGround switch can be selected to **OVERRIDE** from the **NORMAL** position. This switch position completely disables the engine shutdown feature of the PosiGround system. All other features, such as the horn, may still be functional.

**WARNING:** When the PosiGround switch is in the **OVERRIDE** position, engine shutdown is disabled and grounding protection is eliminated.

## C) 672 INSTALLATION GUIDE

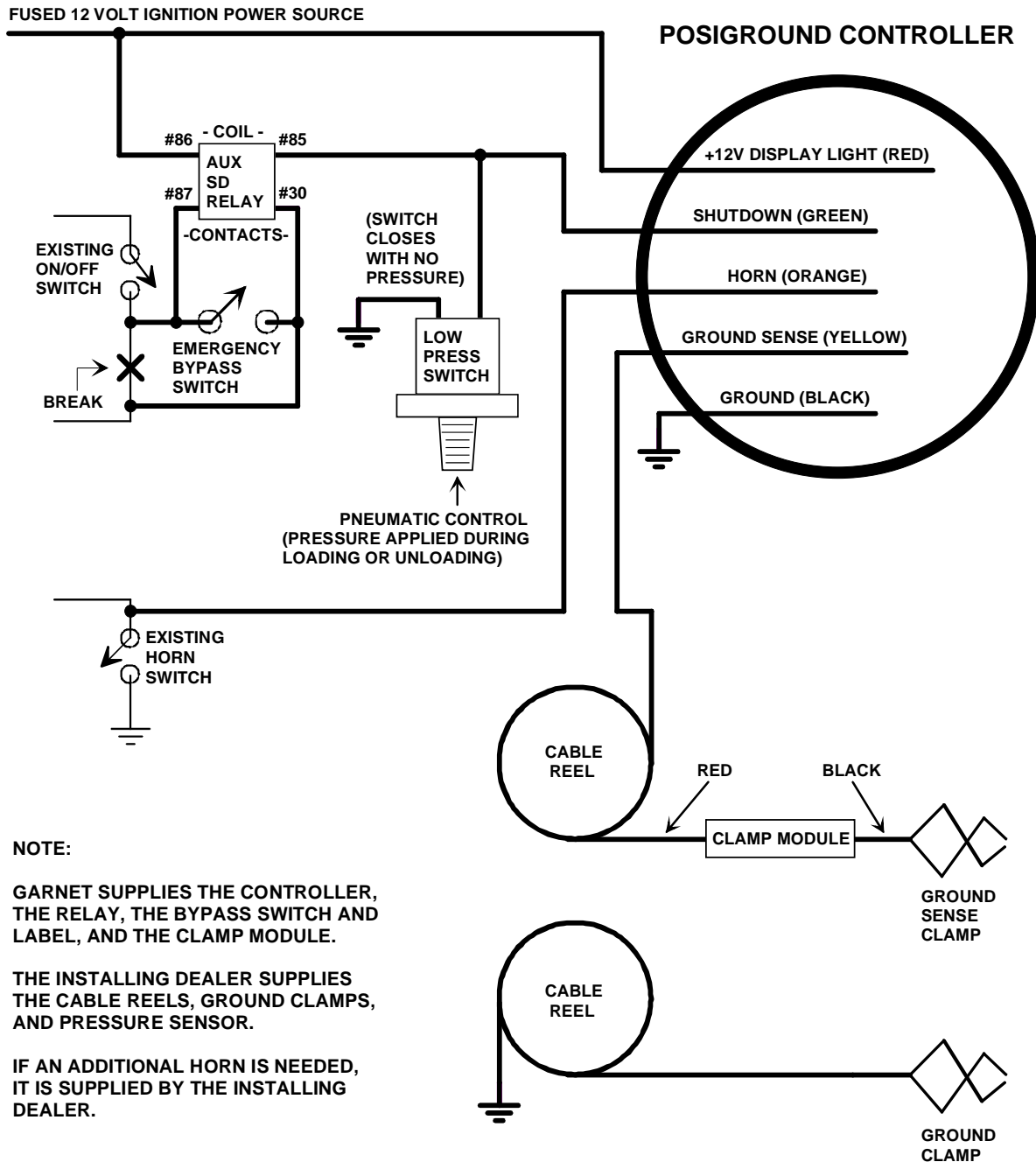
Refer to the wiring diagram in section D during installation of the PosiGround system.

1. Pick a spot for the PosiGround controller box to be mounted. Do not mount the controller where it can be kicked, or where it will likely be struck by tools or equipment, or where it will be exposed to road wind and spray. It should be mounted where its face can be easily seen by the operator. The controller must not be mounted on a separate vehicle from the loading system that it is controlling, for example, if the PosiGround is shutting down a truck engine which drives a PTO pump, the controller must be mounted on the truck and not the trailer.
2. Drill holes in the box for wire entries. Observe the “smile” line around the outside of the box, this is the permissible drill line. The center of the drill bit must be on this line when starting to drill. **BE CAREFUL** when drilling to avoid damaging the wiring when the drill bit breaks through the box wall. NOTE: If the controller you are installing is CSA certified for Class I Div 2 then it will be mounted inside a square Hoffman enclosure and this is the box you will be drilling.
3. Install the wiring fittings into the enclosure.
4. Mount the display enclosure using the mounting flange holes, being certain to shim the enclosure away from the mounting surface with the spacers provided to allow water drainage. **Broken display enclosures caused by water freezing behind the enclosure are NOT covered by warranty.**
5. If applicable to your installation, connect the pressure port of the pneumatic switch to the appropriate sensing point for loading control. The pneumatic switch closes when it senses low pressure, which indicates that the loading system is DISENGAGED. Conversely, the switch opens when it senses high pressure, which indicates that the loading system is ENGAGED.
  - A) If the truck is PTO loaded, then the pneumatic port of the switch should be plumbed into the PTO engagement air line, so that high pressure indicates PTO engagement.
  - B) If the truck is vacuum loaded, then the switch should be plumbed into the isolation valve pneumatic control line so that high pressure indicates that the isolation valve is open.
  - C) If the truck is loaded with a hydraulically driven pump driven by a separate engine, then the switch should be plumbed into the air line controlling pump engagement, so that high pressure indicates that the pump is running.
  - D) If the loading pump is driven directly off a separate engine, then the pneumatic switch is not used. Connect an electrical switch with contacts that close when the engine is turned off. Contact Garnet Instruments if you are unclear as to how to do this.
6. If the truck does not have an existing ground cable, clamp, and reel, install one now. Mount a second cable reel and cable for the ground sense line. This cable must be insulated.

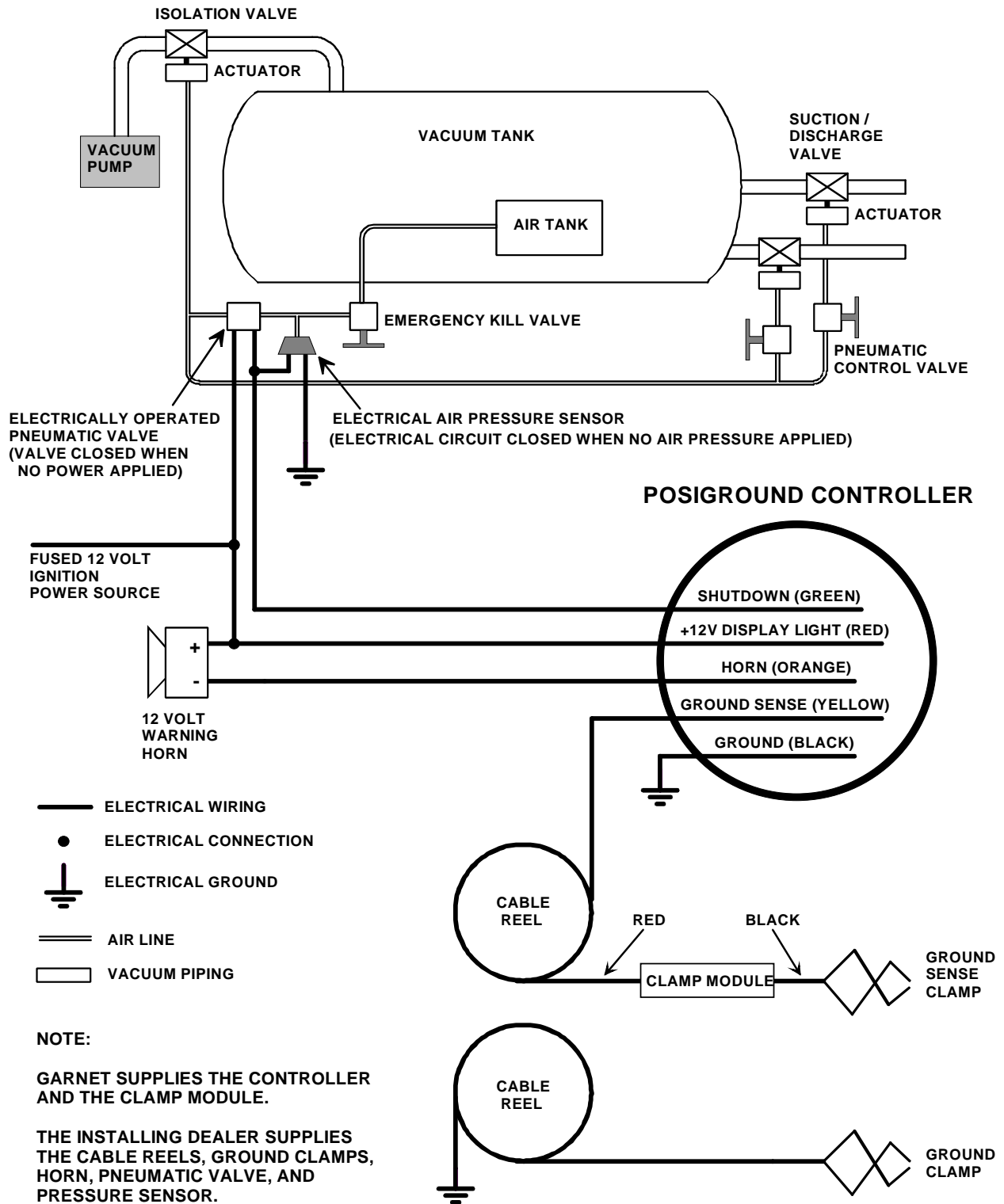
7. Connect the clamp module between the end of the ground sense cable and the ground sense clamp. The RED wire from the module goes to the cable, and the BLACK wire from the module goes to the clamp.
8. The system can now be wired. Refer to the wiring diagram in Section D. Connect the controller black GROUND wire to ground, and the controller yellow GROUND SENSE wire to the ground sense cable.
9. Connect the controller red 12V DISPLAY LIGHT wire to a 12 volt source. This 12 volt source should be an ignition source so the truck battery is not drained when the truck is off.
10. If applicable to your installation, connect the controller orange HORN wire to an electrical warning horn. The controller completes a circuit to ground when the horn is to sound, so one side of the horn needs 12 volts provided to it, and the other side goes to the HORN wire.
11. Locate an electrical shutoff switch for the loading system. Break the connection to the switch and connect the two wire ends to the contact terminals (#30 and #87) of the auxiliary shut down (SD) relay (supplied). Connect one of the auxiliary SD relay coil terminals (#86) to a 12 volt ignition source, and the other coil terminal (#85) to the green SHUTDOWN wire from the PosiGround controller. It is a good idea to mount the auxiliary ESD relay close to the existing shutoff wiring to minimize any extra wire length in the shutoff circuit.
12. Connect one of the pneumatic switch terminals to ground, and the other terminal to either the green SHUTDOWN wire from the PosiGround controller, or to the #85 coil terminal of the auxiliary SD relay.
13. Determine the length of warning time desired. The choices are 2, 20 and 40 seconds. Inside the controller you will find a single GREY wire on the left and BLUE, GREY and PURPLE wires in a bunch on the right. For a 2 second warning connect the BLUE wire to the single GREY, for 20 seconds connect the two GREYS together and for 40 seconds connect the PURPLE to the single GREY.
14. If the PosiGround is set up to shut down the truck engine, connect the emergency bypass switch across the auxiliary SD relay terminals to allow emergency engine starting in the event of a failure of the PosiGround system. This switch should be located in a spot where it cannot be accidentally flipped. Be sure to install a label showing the switch position (this label is available from Garnet if needed).
15. Test the system for proper operation (see section B for operational procedures). If the loading system is shut down and the clamps are not connected, the PosiGround should show **OP d**. Engaging the loading system at this point should show **OP E** and the horn should start sounding. After the set amount of warning time the horn should stop and the loading system should be shut down. Connecting the ground clamps together at this point should show **GO E** and the loading system should be allowed to start. If the controller show **FL E** or **SH E** then the clamp module is not properly wired. **MAKE SURE** that the horn warning and shutdown systems work properly.
16. If either the shutdown or horn features are not connected, **MAKE SURE** that this is indicated in the owners manual and that the operator is aware of what the system does.

## D) WIRING DIAGRAMS

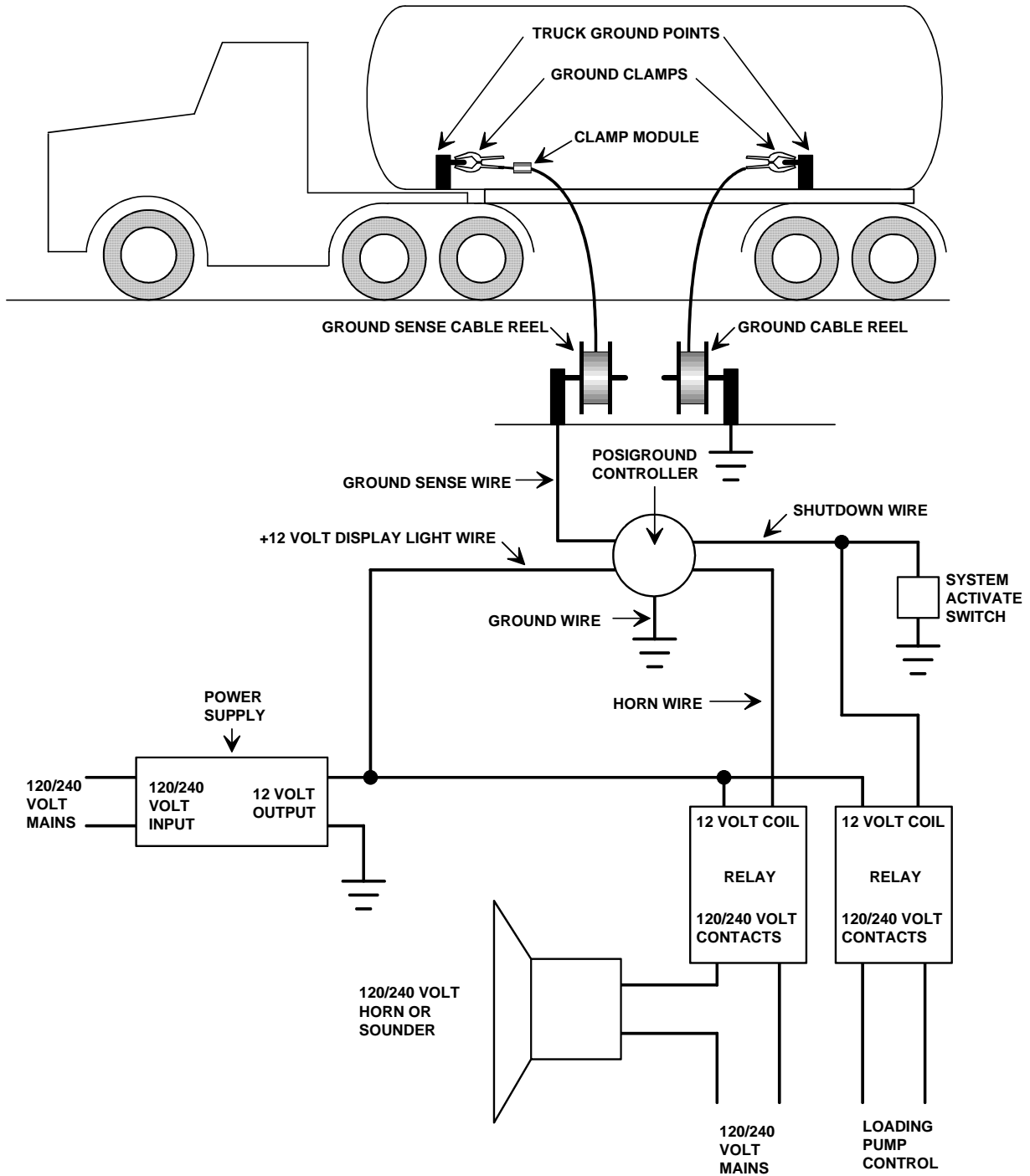
### 672 POSIGROUND WIRING DIAGRAM BODY TRUCK WITH ENGINE SHUTDOWN



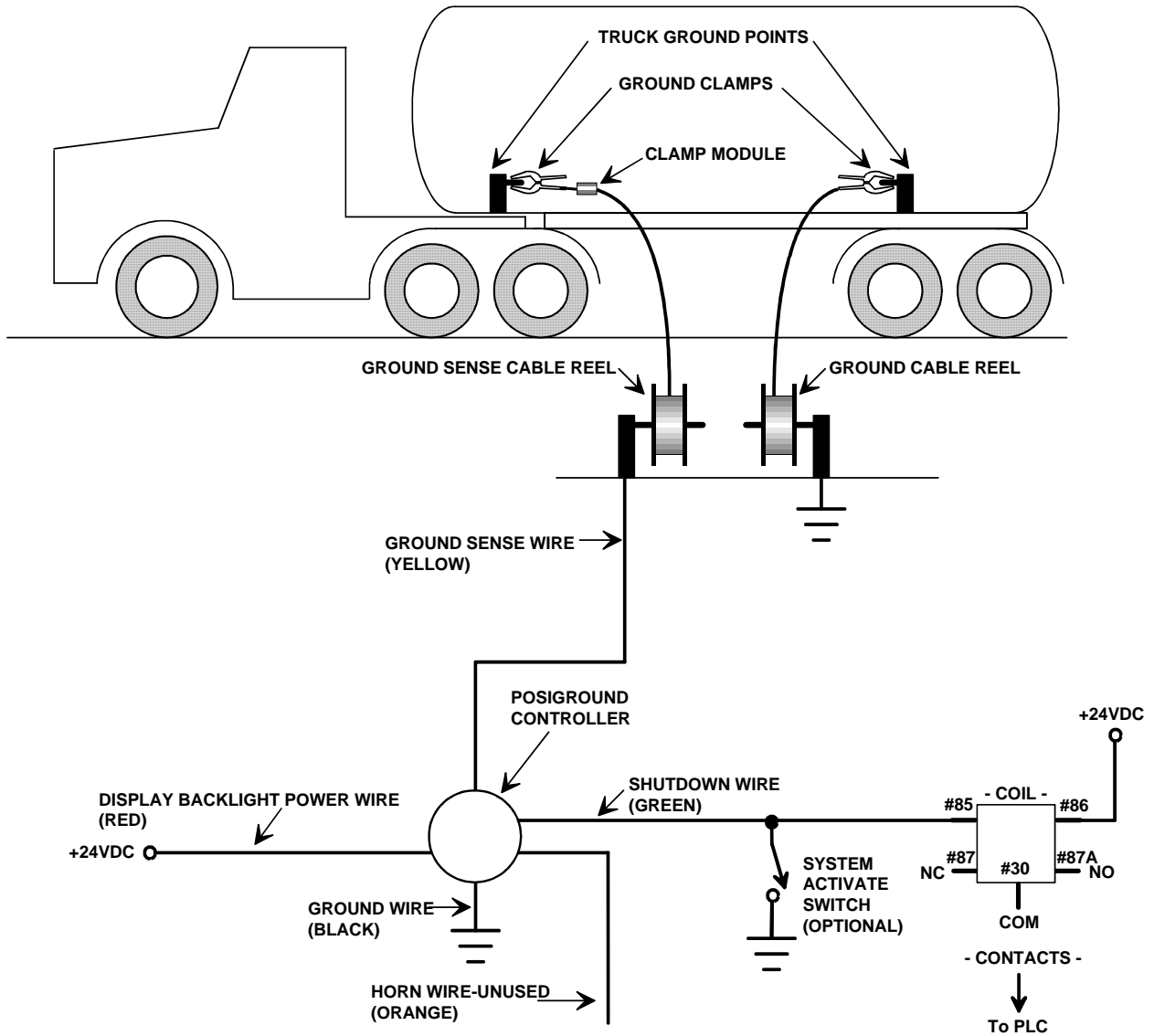
# 672 POSIGROUND WIRING DIAGRAM TRAILER WITH AIR SHUTDOWN



# 672 POSIGROUND WIRING DIAGRAM REELS AND CONTROLLER FIXED MOUNTING 120/240 VOLT HORN AND PUMP CONTROL



# 672 POSIGROUND WIRING DIAGRAM REELS AND CONTROLLER FIXED MOUNTING



## E) TROUBLESHOOTING GUIDE

There are only 3 serviceable components in the PosiGround system: the controller, the clamp module, and the pneumatic switch. Each part can be tested independently.

To test the pneumatic switch, disconnect the terminals and connect a continuity tester across the terminals. When there is no pressure to the switch, there should be continuity. Applying more than about 4 PSI of air pressure should cause the switch to open.

To test the clamp module, connect the red wire to the yellow ground sense wire of a PosiGround controller (one that you know is good), and the black wire to the black ground wire of the controller. The controller should show **GO**, if not then the module is defective.

To test the controller, connect test lights between +12 volts and the horn and shutdown wires. Connect a known good clamp module (CM red to controller yellow, CM black to controller black). The display should read **GO E** and the shutdown light should be on and the horn light should be off. Note that it may take 1 to 2 seconds for the display to respond. Shorting the ground sense and ground wires together should show **SH E** and the shutdown light should stay on and the horn light should flash for a set time, and then both lights should go out. Shorting the shutdown and ground wires together should turn on the shutdown light, and the display should show **SH d**. Removing this short should start the horn light flashing and the shutdown light should stay on for a set time. Remove the short between the ground sense and ground wires, the display should read **GO E** again. Removing the clamp module should show **OP E** and the shutdown light should stay on and the horn light should flash for a set time, and then both lights should go out.

If all components check out but problems are still encountered, check the wiring for faults by starting at the controller and working out from there.

## **F) SERVICE AND WARRANTY INFORMATION**

The warranty will apply only if the warranty card shipped with the equipment has been returned to Garnet Instruments Ltd.

Garnet Instruments Ltd. warrants equipment manufactured by Garnet to be free from defects in material and workmanship under normal use and service for a period of one year from the date of sale from Garnet or an Authorized Dealer. The warranty period will start from the date of purchase or installation as indicated on the warranty card. Under these warranties, Garnet shall be responsible only for actual loss or damage suffered and then only to the extent of Garnet's invoiced price of the product. Garnet shall not be liable in any case for labor charges for indirect, special, or consequential damages. Garnet shall not be liable in any case for the removal and/or reinstallation of defective Garnet equipment. These warranties shall not apply to any defects or other damages to any Garnet equipment that has been altered or tampered with by anyone other than Garnet factory representatives. In all cases, Garnet will warrant only Garnet products which are being used for applications acceptable to Garnet and within the technical specifications of the particular product. In addition, Garnet will warrant only those products which have been installed and maintained according to Garnet factory specifications.

### **LIMITATION ON WARRANTIES**

These warranties are the only warranties, expressed or implied, upon which products are sold by Garnet and Garnet makes no warranty of merchantability or fitness for any particular purpose in respect to the products sold. Garnet products or parts thereof assumed to be defective by the purchaser within the stipulated warranty period should be returned to the seller, local distributor, or directly to Garnet for evaluation and service. Whenever direct factory evaluation, service or replacement is necessary, the customer must first, by either letter or phone, obtain a Returned Material Authorization (RMA) from Garnet Instruments directly. No material may be returned to Garnet without an RMA number assigned to it or without proper factory authorization. Any returns must be returned freight prepaid to: Garnet Instruments Ltd., 284 Kaska Road, Sherwood Park, Alberta, T8A 4G7. Returned warranted items will be repaired or replaced at the discretion of Garnet Instruments. Any Garnet items under the Garnet Warranty Policy that are deemed irreparable by Garnet Instruments will be replaced at no charge or a credit will be issued for that item subject to the customer's request.

If you do have a warranty claim or if the equipment needs to be serviced, contact the installation dealer. If you do need to contact Garnet, we can be reached as follows:

Garnet Instruments Ltd.  
284 Kaska Road  
Sherwood Park, Alberta  
Canada T8A 4G7  
E-mail: [tstalker@garnetinstruments.com](mailto:tstalker@garnetinstruments.com)