WOODWARD

Product Manual 36542
(Revision B, 05/2024)
Original Instructions

Dual Coil Solenoids Internally and Externally Switched

including Pull Coil Timer Modules & Coil Commanders™

Installation and Operation Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. The latest version of most publications is available on the Woodward website.

http://www.woodward.com

If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. The latest version of most publications is available on the Woodward website.

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Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

If your publication is not on the Woodward website, please contact your customer service representative to get the latest copy.

Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

Manual 36542

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Important Definitions

This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

WARNING

Lockout/Tagout LOTO

Ensure that personnel are fully trained on LOTO procedures prior to attempting to replace or service equipment on a "live" running engine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start or operation of a running engine. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot hydraulic fluids, exposure to hot surfaces and/or moving parts, or any moving parts that may be activated and are located in the area of control of the unit.

WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

WARNING

Automotive Applications

On- and Off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

WARNING

IOLOCK

IOLOCK: driving I/O into a known state condition. When a control fails to have all the conditions for normal operation, watchdog logic drives it into an IOLOCK condition where all output circuits and signals will default to their de-energized state as described below. *The system MUST be applied such that IOLOCK and power OFF states will result in a SAFE condition of the controlled device.*

- **Microprocessor failures will send the module into an IOLOCK state.**
- **Discrete outputs / relay drivers will be non-active and de-energized.**
- **Analog and actuator outputs will be non-active and de-energized with zero voltage or zero current.**

Network connections like CAN stay active during IOLOCK. This is up to the application to drive actuators controlled over network into a safe state.

The IOLOCK state is asserted under various conditions, including:

- **Watchdog detected failures**
- **Microprocessor failure**
- **PowerUp and PowerDown conditions**
- **System reset and hardware/software initialization**
- **PC tool initiated**

NOTE—Additional watchdog details and any exceptions to these failure states are specified in the related section of the product manual.

NOTICE

Battery Charging Device

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Touch your finger to a grounded surface to discharge any potential before touching the control, smart valve, or valve driver, or installing cabling connectors. Alternatively, ESD mitigation may be used as well: ESD smocks, ankle or wrist straps and discharging to a reference grounds surface like chassis or earth are examples of ESD mitigation.
    - ESD build up can be substantial in some environments: the unit has been designed for immunity deemed to be satisfactory for most environments. ESD levels are extremely variable and, in some situations, may exceed the level of robustness designed into the control. Follow all ESD precautions when handling the unit or any electronics.
        - I/O pins within connectors have had ESD testing to a significant level of immunity to ESD, however do not touch these pins if it can be avoided.
            - Discharge yourself after picking up the cable harness before installing it as a precaution.
        - The unit is capable of not being damaged or improper operation when installed to a level of ESD immunity for most installation as described in the EMC specifications. Mitigation is needed beyond these specification levels.

IMPORTANT

External wiring connections for reverse-acting controls are identical to those for direct-acting controls.

Chapter 1.
General Information

Introduction

This manual is a guide to the wiring procedures recommended for internally and externally switched solenoids. For detailed information on Woodward solenoids, refer to Catalog 52132. For product specifications on the Coil Commander™ and pull coil timer modules mentioned in this manual, refer to Manual 36585. Both documents may be viewed and downloaded from our website at www.woodward.com/publications.

Solenoid Basics

A solenoid is a device that converts electrical energy into mechanical work. Solenoids are constructed of a free moving steel plunger that sits within a wound coil of copper wire. When electric current is introduced, a magnetic field forms that draws the plunger in. The exposed end of the plunger can be attached to equipment and when the solenoid is activated, the plunger moves to open, turn on, or turn off that equipment.

Solenoids are used for operating engine run/stop levers, throttles, chokes, valves, and clutches and to protect expensive diesel engines from overspeed conditions, low lube pressure, and high temperature.

The dual coil solenoid offers high actuation force in a small package compared to a single coil solenoid. It uses two separate coil windings to allow the solenoid to be held energized for long periods of time without overheating. The first wound coil (pull coil) operates at a high current level to provide maximum pull or push. The second wound coil (hold coil) holds the plunger in place after it has completed its stroke.

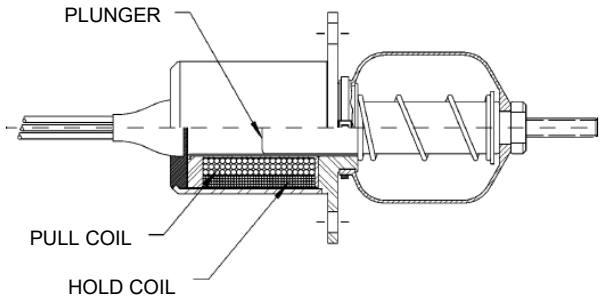


Figure 1-1. Dual Coil Solenoid

Switching Methods

The pull coil in a dual coil solenoid must be turned off as soon as possible after energizing and pulling the plunger to prevent burnout.

There are three basic methods for switching off the pull coil.

1. **Internal Switching:** Suited for stationary applications where vibration, dirt, moisture, and excessive cycling are not present.
2. **External Switching:** Suited for start/stop control of mobile equipment where moisture, dirt, and high vibration are present.
3. **External Switching with Timer:** Suited for operator/driver controlled vehicles as well as unattended equipment, throttle, and choke controls.

Chapter 2.
External Switching

The externally switched (3-wire) solenoid is used in applications where an operator/driver manually turns a key switch that temporarily energizes the pull coil to pull in the plunger. The most common application is for start-stop control of engines in trucks and mobile equipment where moisture, dirt, dust, and high vibration are present. The sealed 3-wire solenoid is well suited for these harsh conditions.

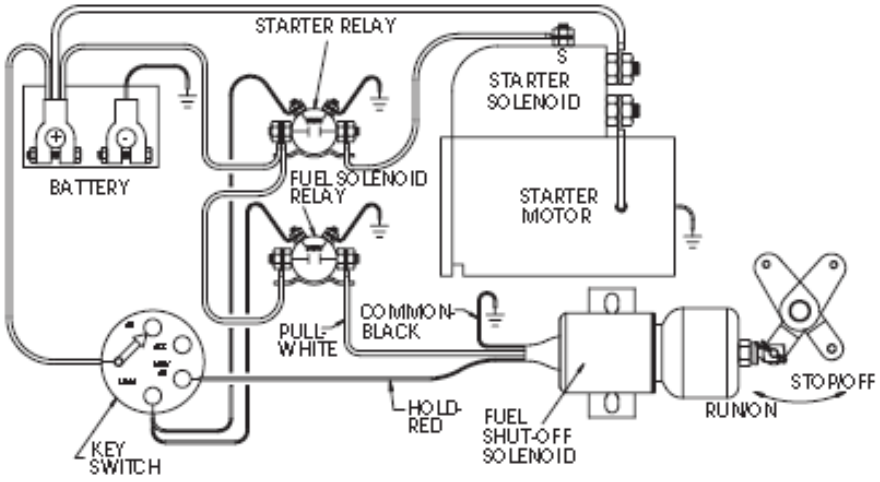


Figure 2-1. Externally Switched 3-Wire Solenoid

With the addition of a Woodward timer module, the externally switched (3-wire) solenoid can be used not only in operator/driver controlled vehicles, but also in unattended equipment, throttle, and choke controls. The timer ensures that the pull coil is turned off within approximately 1 second after energizing, which prevents overheating of the coil in situations such as abusive over cranking of an engine.

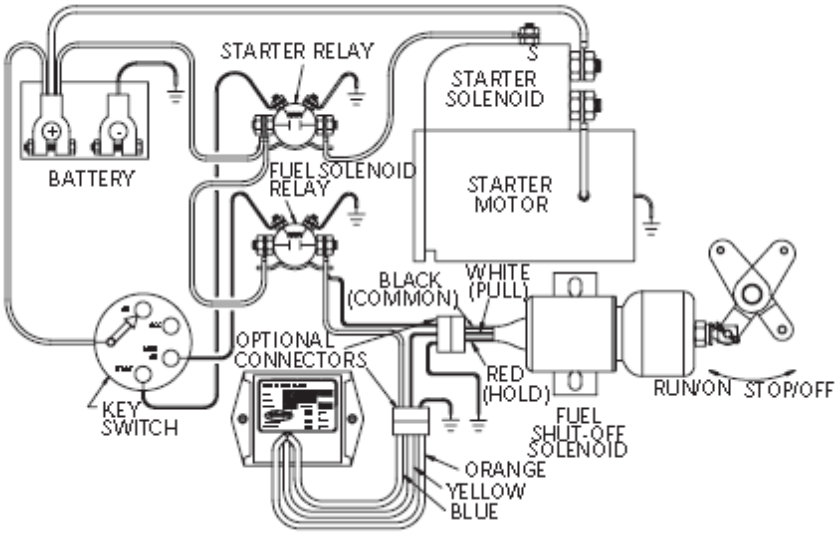


Figure 2-2. External Switching with Timer Module

The advantage of using a timer module is that the fuel solenoid pull coil is energized and de-energized by the timer module within approximately 1 second. The solenoid is isolated from the starter motor circuit and the high current pull-in coil is timed off before or within the first 1 second of cranking.

Woodward makes two types of timer modules as shown in Figure 2-3.

1. Coil Commander modules (5-wire and 7-wire)
2. Pull Coil Timer Modules (PCTM) (3-wire and 6-wire)

Coil Commander vs PCTM Modules

The basic function of the Coil Commander module and the PCTM module is the same, i.e., to prevent pull coil burnout and limit pull coil ON time due to engine overcrank and misadjustment of linkage. They are both effective solenoid protection devices.

Coil Commanders are used in high volume OEM applications for minimum cost and optimal packaging. PCTM modules are used for specialty applications. Key specifications for the two types of devices made by Woodward are listed in the chart below.

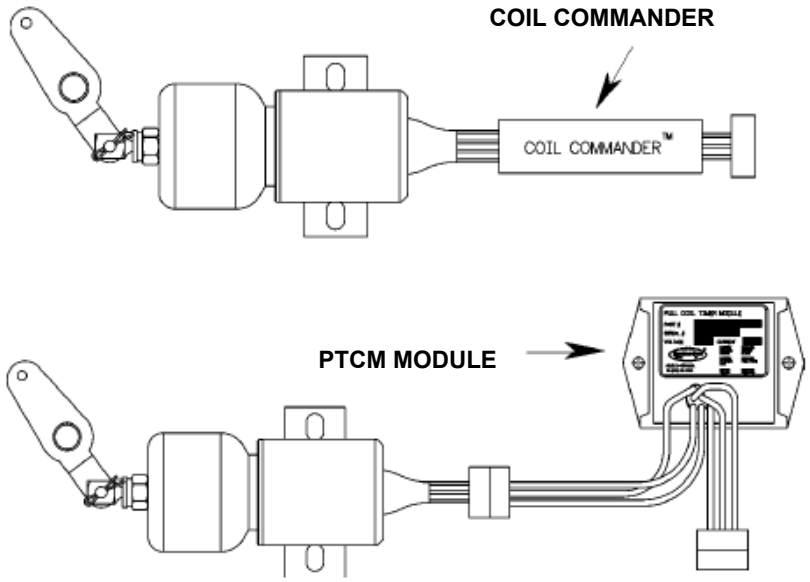


Figure 2-3. Timer Modules

Table 2-1. Coil Commander and PCTM Module Specifications

Specification	Coil Commander	PCTM Module
Installation	No separate mounting bracket required	Separate mounting bracket required
Temperature Range	-40 °F to 250 °F (-40 °C to 121 °C)	-40 °F to 185 °F (-40 °C to 85 °C)
Input Voltage	3/4 rated voltage min. @68 °F (20 °C)	12 Vdc (30 Vdc jump start) 24 Vdc (57 Vdc jump start)
Reverse Polarity Protection	None	None
Maximum Cycles/Minute	Continuous: 12 Vdc: 2 cycles/minute 24 Vdc: 1 cycle/minute Intermittent: 12 Vdc: 4 cycles/minute for 5 minutes 24 Vdc: 3 cycles/minute for 5 minutes	Continuous: 12 Vdc: 3 cycles/minute 24 Vdc: 3 cycles/minute
Pull Current @ 68 °F (20 °C)	LO – 12 Vdc: 70 amps HI – 12 Vdc: 90 amps LO – 24 Vdc: 40 amps HI – 24 Vdc: 60 amps	12 Vdc: 70 amps 24 Vdc: 56 amps
Vibration*	15Gs @ 15-2000 Hz	15Gs @ 15-2000 Hz
Energized Time	520-1200 milliseconds	500 milliseconds
Environmental	Solid state, potted and sealed	Solid state, potted and sealed

(*) Vibration specification is a short-term qualification test. It is not to be directly compared to engine vibration levels. Please contact Woodward to evaluate appropriate field application vibration levels.

Chapter 3.
Internal Switching

The internally switched solenoid utilizes a mechanical double contact switch that is mounted on the rear of the solenoid to turn off the pull coil. Internally switched solenoids are best suited for applications such as standby generator sets or other applications where vibration, dirt, moisture, and excessive cycling are not present.

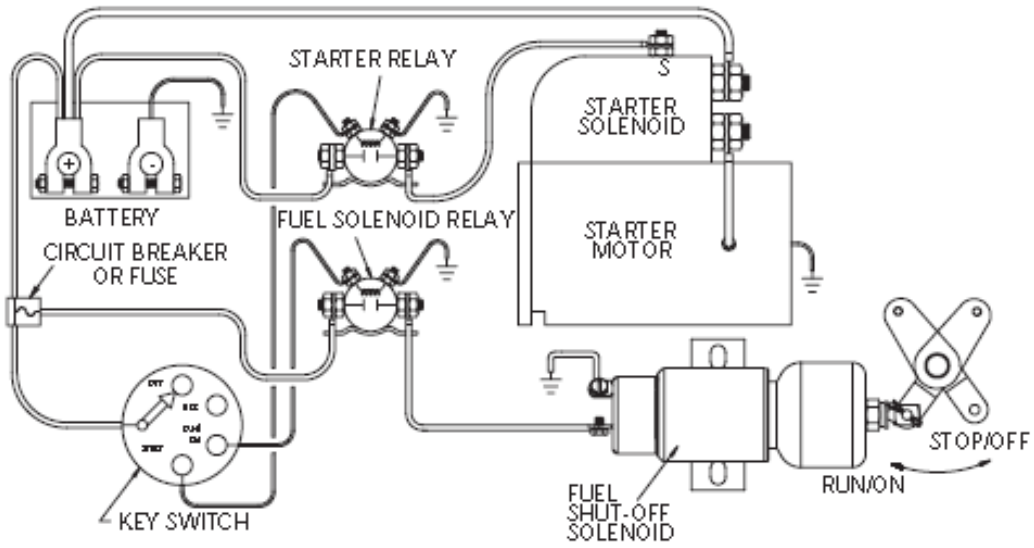


Figure 3-1. Internally Switched Solenoid

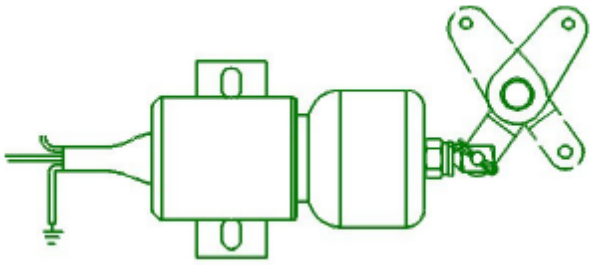
Internally Switched Solenoid Terminations

Internally switched solenoids are available with standard leads termination. They may also be equipped with switch caps and either screw or blade type terminals.

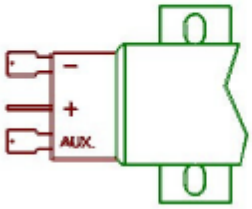
1. Pigtail (leaded) termination: designed for leads to be fitted to a connector
2. Switch cap with spade type terminals: designed for harness leads to be connected without soldering
3. Switch cap with screw type terminals: designed for harness leads to be screwed on

An Aux terminal is a feature offered on some internally switched solenoid models. A lamp or a relay coil (50 ohms minimum) could be wired across the positive and Aux terminals of the solenoid to illuminate or trip a relay when the solenoid plunger is fully seated (energized position) in the solenoid bore, indicating the solenoid pull-in coil is switched off and the hold coil is energized.

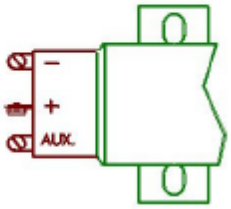
Figure 3-2 shows a variety of terminations on internally switched solenoids.



SOLENOID WITH PIGTAIL (LEADED) TERMINATION



SWITCH CAP WITH SPADE TYPE TERMINALS



SWITCH CAP WITH SCREW TYPE TERMINALS

Figure 3-2. Terminations on Internally Switched Solenoids

Chapter 4.
Electric Shut-off (ESO) Applications

Externally Switched Solenoids

There are five wiring methods for electric shut-off applications, energize to run (ETR):

1. Connection through separate relay
2. Direct connection to starter motor
3. Connection to “S” terminal of starter solenoid (Not Recommended)
4. Connection through Woodward Coil Commander modules
5. Connection through Woodward PCTM modules

Connection through Separate Relay

The preferred method is to isolate the fuel shut-off solenoid from the starter motor circuit using a separate dedicated relay. See Figure 4-1.

The relay must be rated properly to carry the current required for the fuel shut-off solenoid pull coil under all starting conditions.

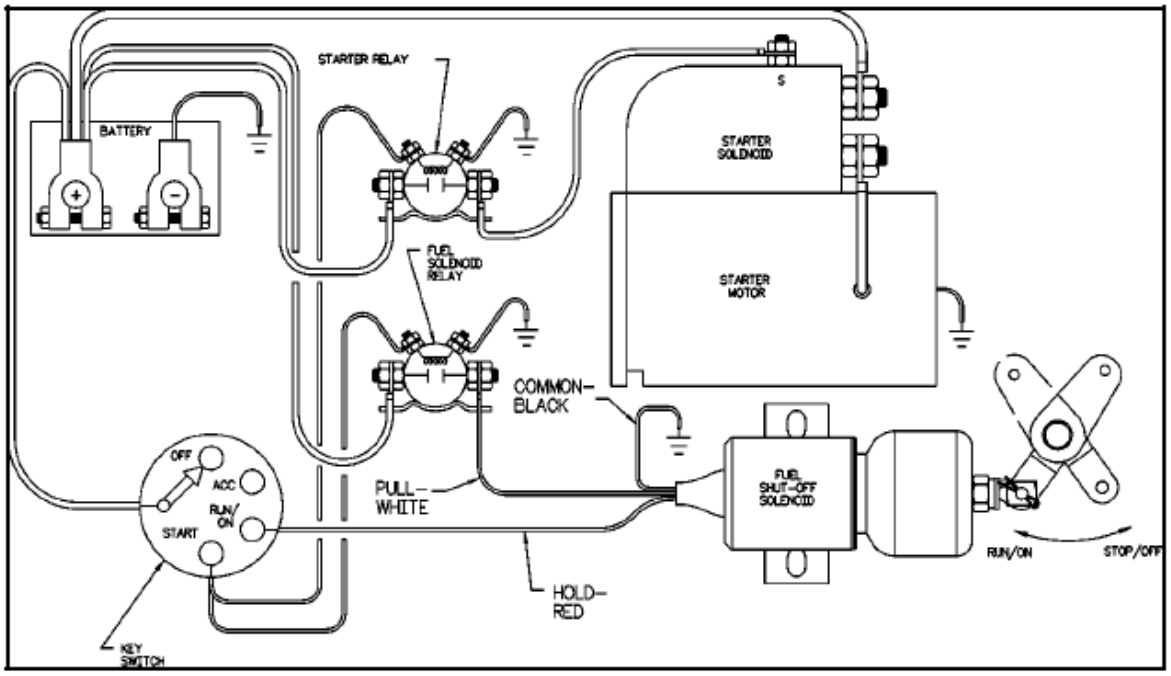


Figure 4-1. Connection through Separate Relay

Direct Connection to Starter Motor

To eliminate the cost of a separate fuel solenoid relay, the pull coil of the fuel solenoid can be wired directly to the positive side of the starter motor. With this wiring method, the starter motor solenoid contacts must be able to carry not only the current for the starter motor, but also the current for the fuel solenoid.

NOTICE

Customer must obtain approval from the starter motor manufacturer before using this method.

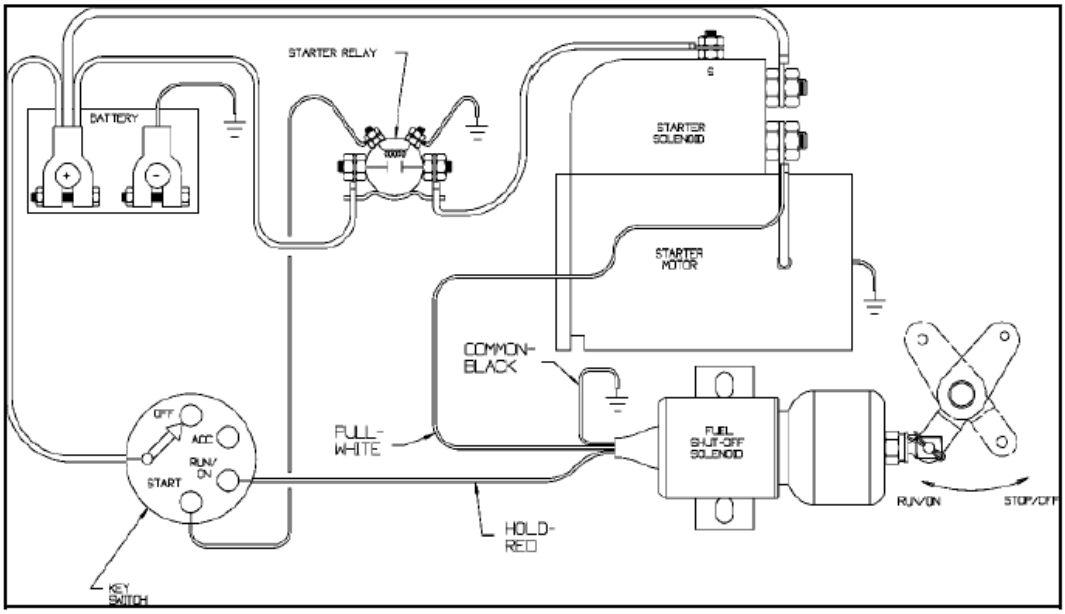


Figure 4-2. Direct Connection to Starter Motor

Connection to "S" Terminal of Starter Solenoid

WARNING

Wiring the start/stop solenoid to the "S" terminal of the starter or to the starter relay that is connected to the "S" terminal will VOID the manufacturer's warranty for the solenoid. (See Figure 4-3.

This warning is necessary because there is the possibility that this connection may affect the net magnetic force between the pull and hold coils of the **starter** solenoid.

If this condition occurs, the starter motor may continue to crank and the fuel shut-off solenoid pull coil may stay energized even when the key switch is turned from START back to RUN, or even OFF.

The starter motor may continue to crank if the internal contacts of the starter solenoid are delayed from releasing when switching from the start to the run condition due to:

1. Mechanical resistance on starter solenoid shaft, or
2. Modification of starter internal magnetic flux

Current seeks a ground through the fuel solenoid pull coil, which may cause the pull coil to overheat.

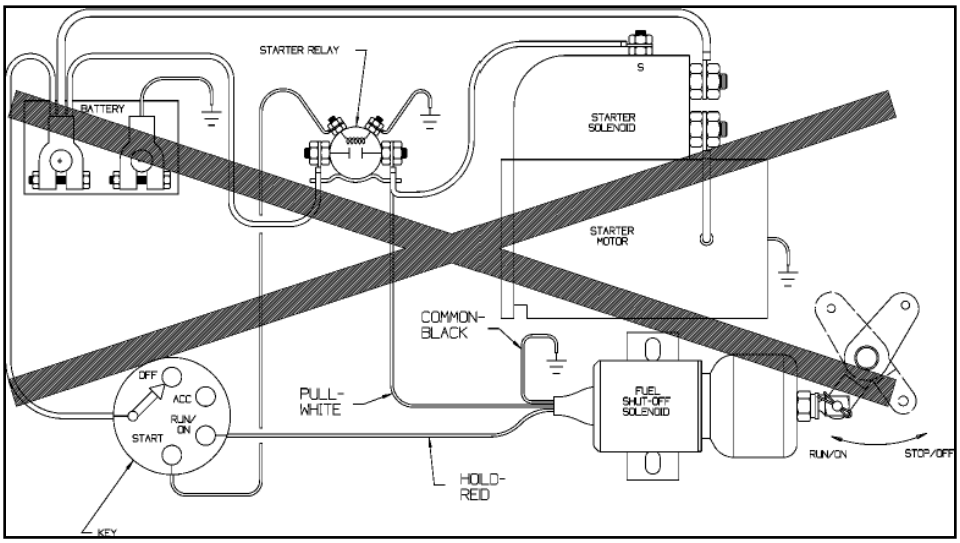


Figure 4-3. Connection to “S” Terminal Not Recommended

Connection through Coil Commander Modules

An alternative method of wiring is to use one of the Woodward solenoid protection devices, either Coil Commanders or PCTM modules. Recommended wiring is shown in Figures 4-4 – 4-8.

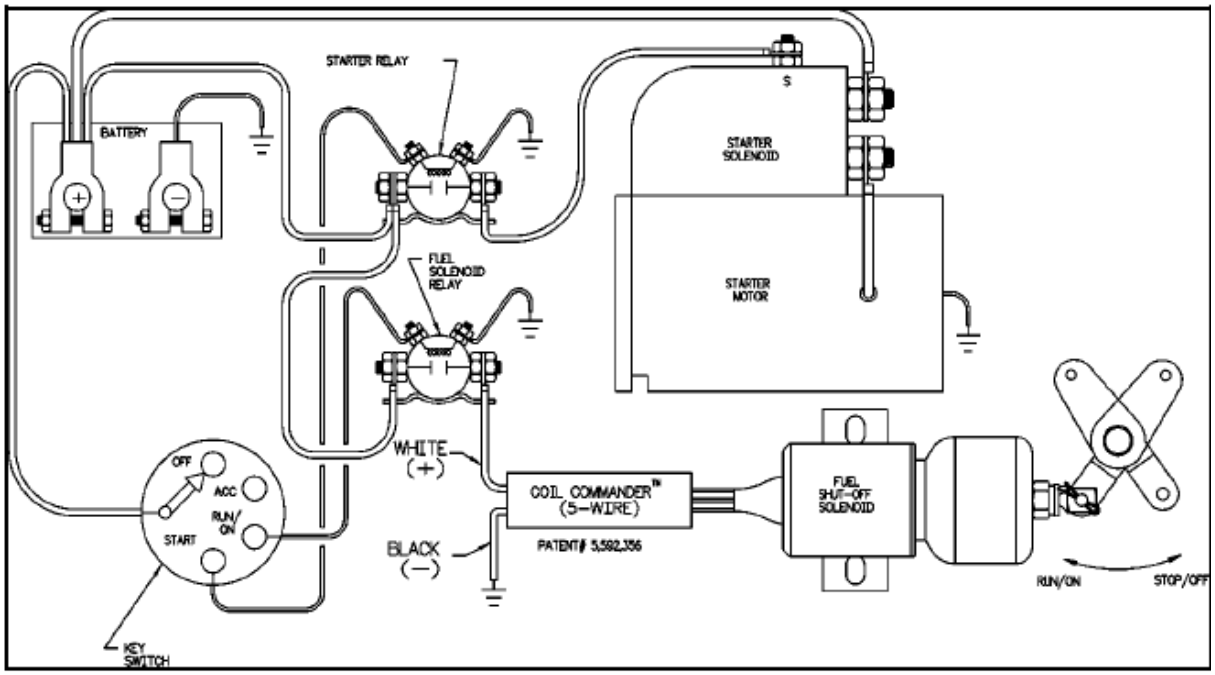


Figure 4-4. Coil Commander (5-Wire) with Dual Relay

NOTICE

For 7-wire (non-SSR) Coil Commander applications, it is required to use a start-only relay arrangement on the pull circuit connection (WHITE wire) such that it is only active during engine cranking and is not powered during engine runtime. This will aid in preventing the pull circuit electronics from overheating and causing unexpected engine shutdown. See Figures 4-5 through 4-7.

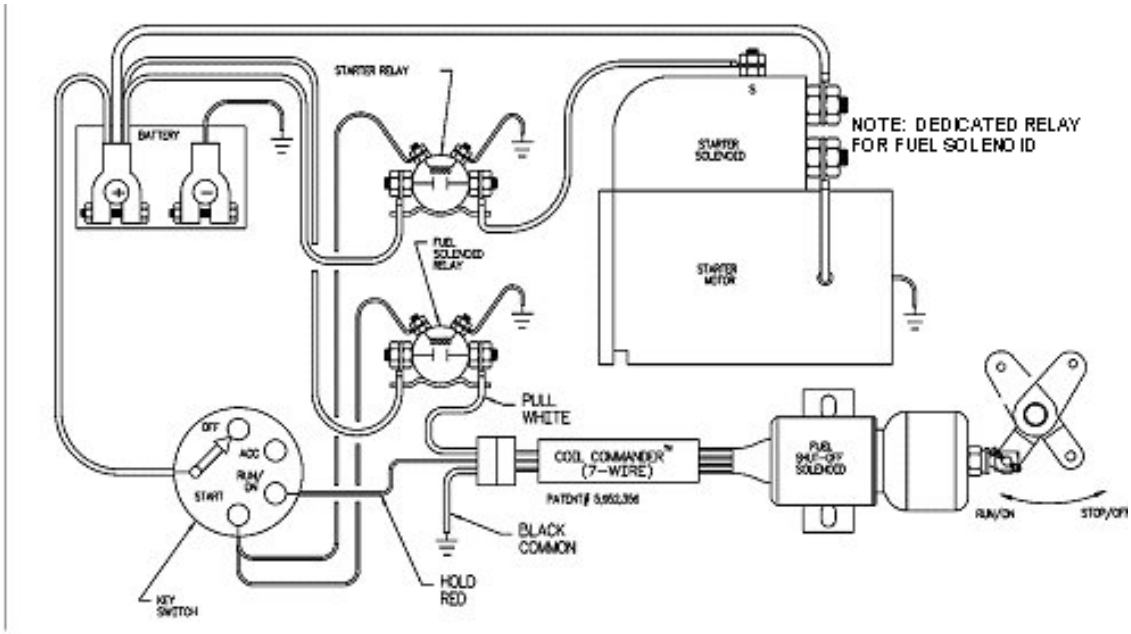


Figure 4-5. Coil Commander (7-Wire) with Dual Relay

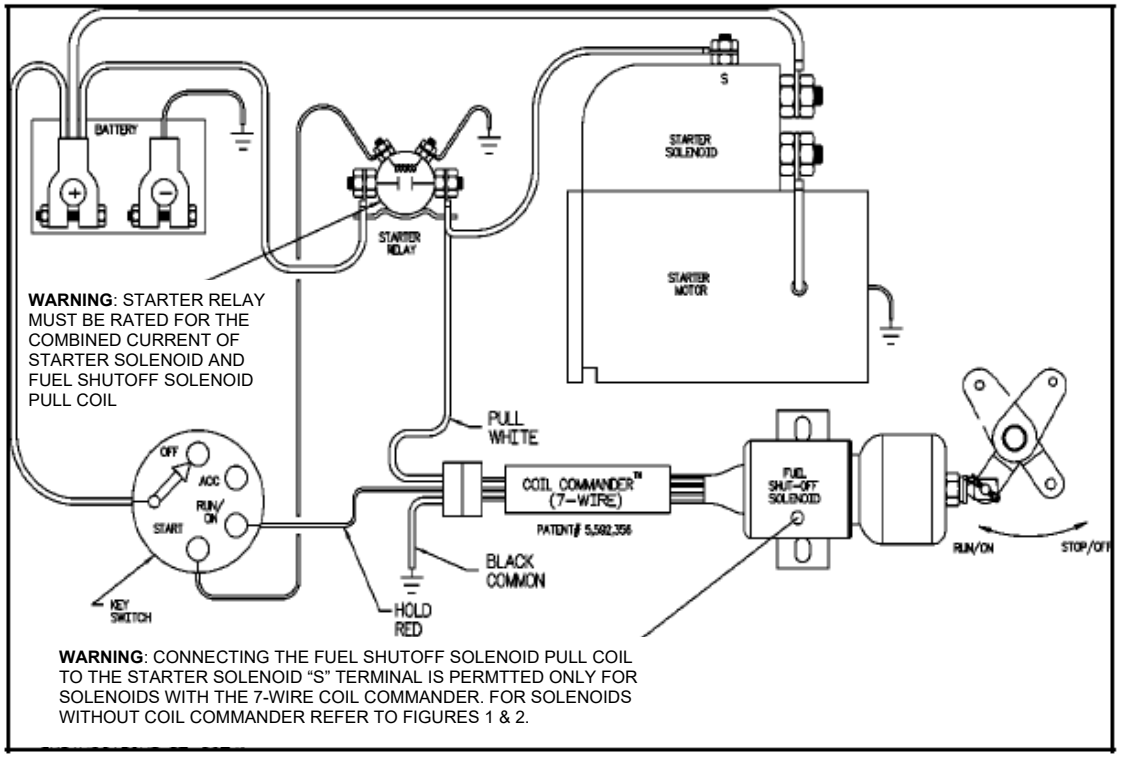


Figure 4-6. Coil Commander (7-Wire) with Single Relay

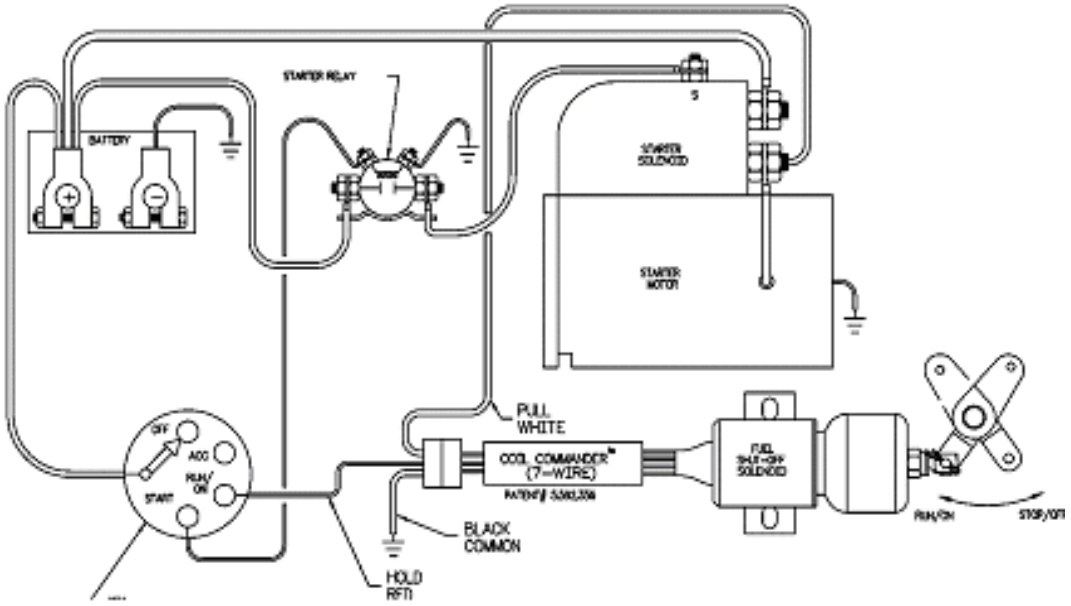


Figure 4-7. Coil Commander (7-Wire) Direct Wiring to Starter

NOTICE

Customers wishing to direct wire to the starter must obtain approval from the starter motor manufacturer before using the method shown below.

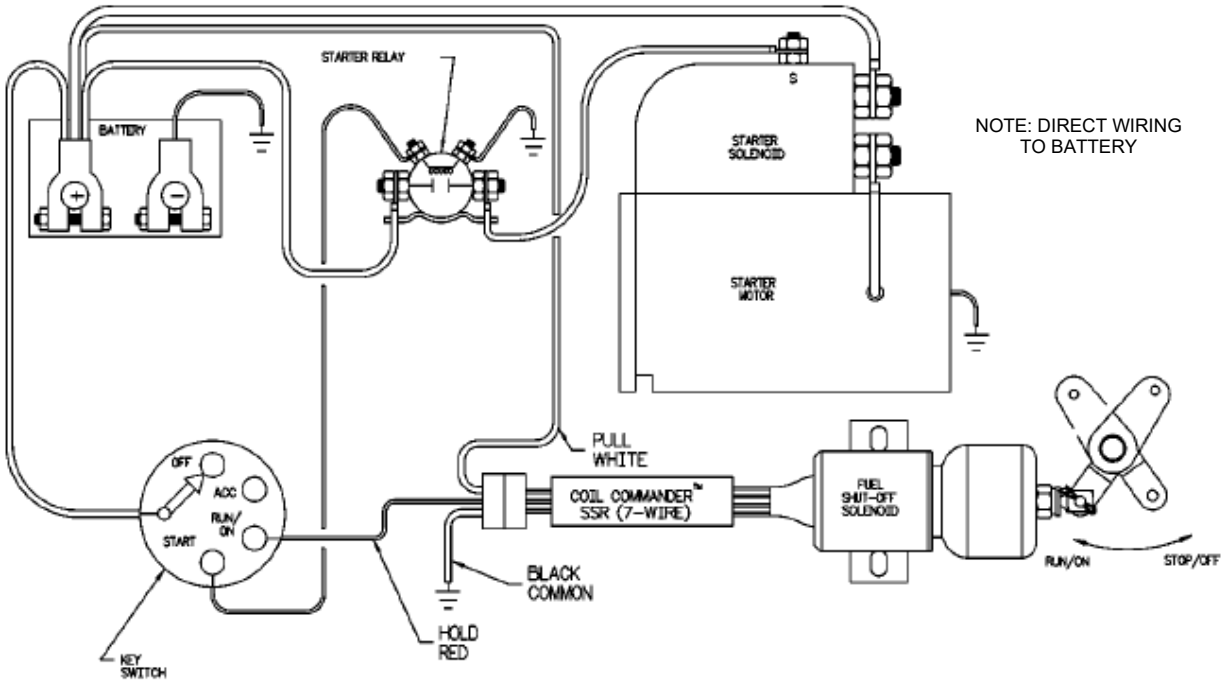


Figure 4-8. Coil Commander SSR (7-Wire) with No Relay

Connection through PCTM Modules

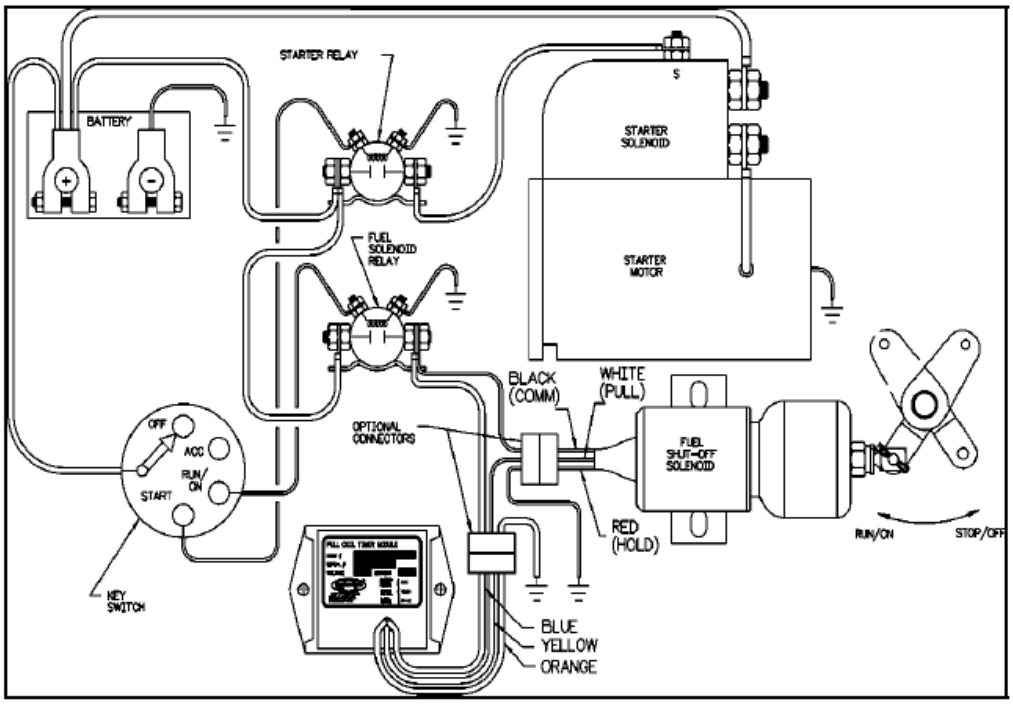


Figure 4-9. PCTM 3-Wire Module Requiring Separate Fuel Solenoid Relay

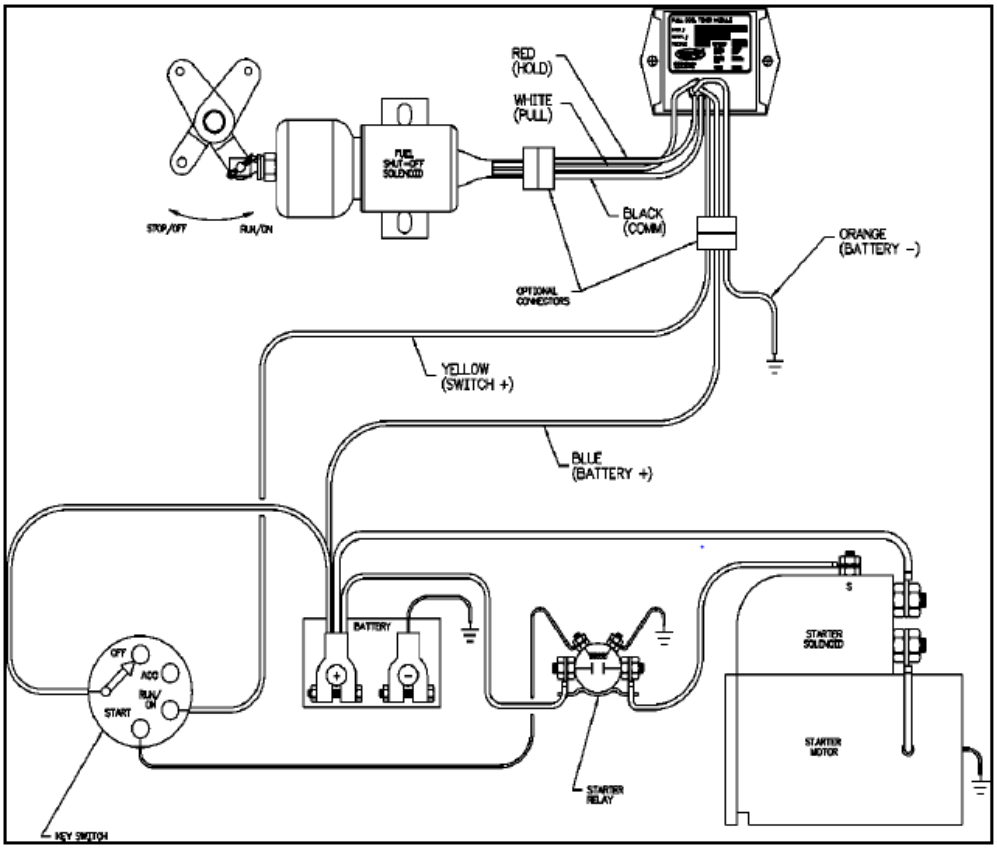


Figure 4-10. PCTM 6-Wire Module with Solid State Built-In Relay

Internally Switched Solenoids

Internally switched solenoids typically are connected through a separate relay. **Figure 16** shows this type of connection.

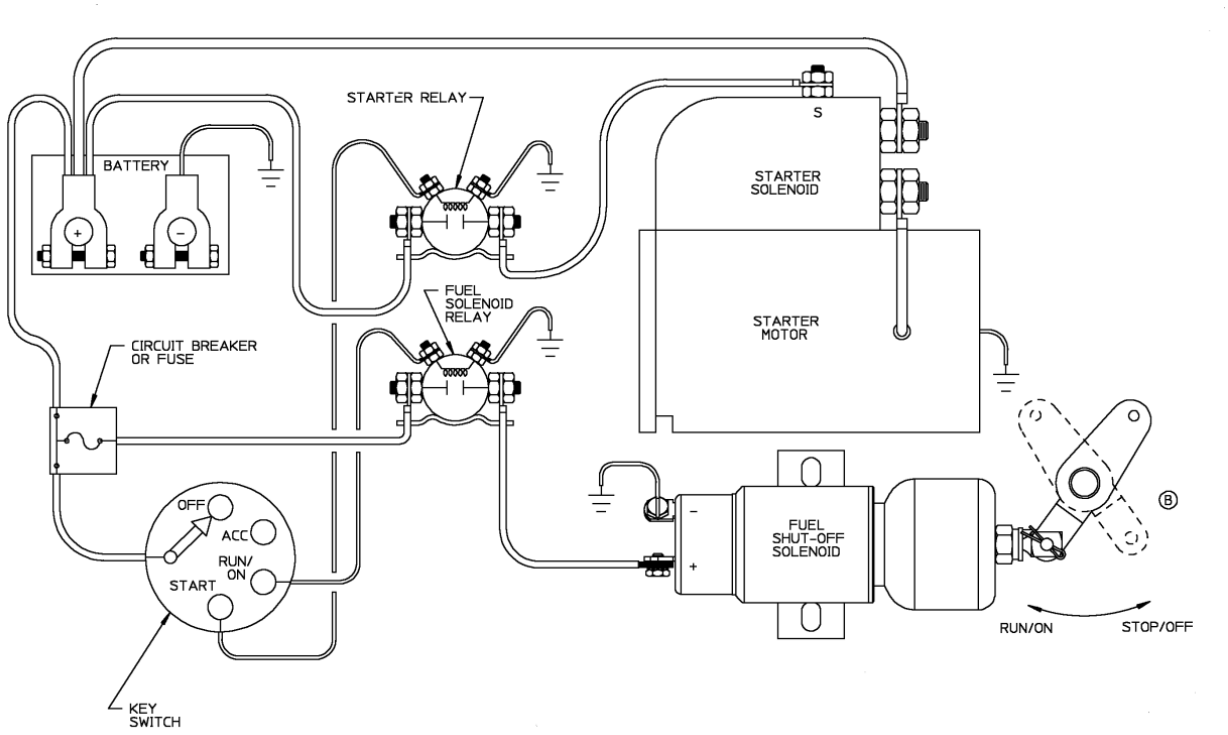


Figure 4-11. Energized to Run Internally Switched Solenoid

Chapter 5.
Throttle or Choke Applications

Externally Switched Solenoids

When using an externally switched solenoid for throttle, choke, or other non-starter key switch type applications, a Coil Commander or pull coil timer module will be required.

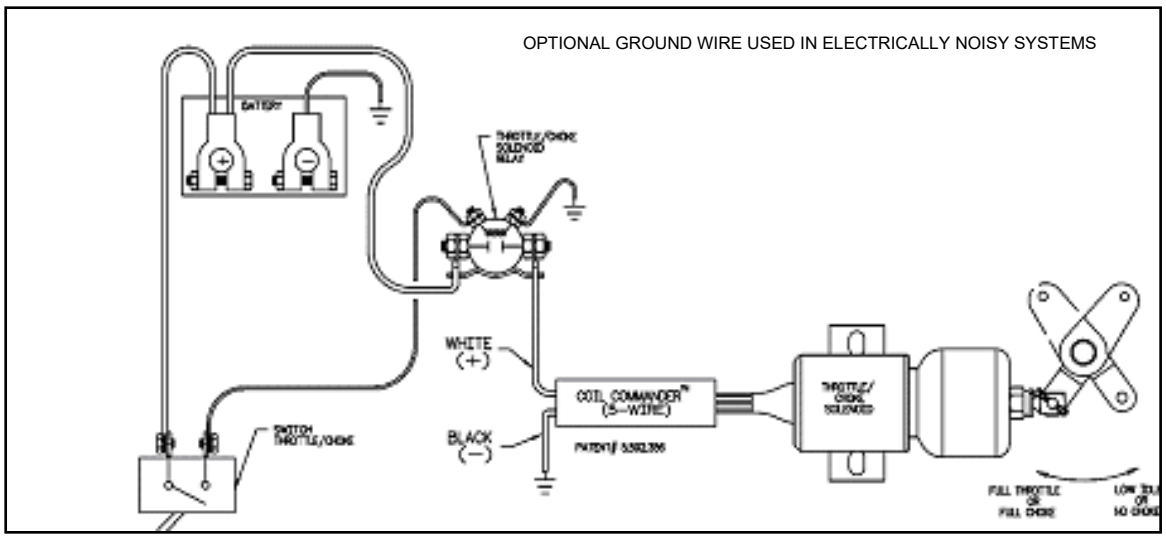


Figure 5-1. Coil Commander (5-Wire) with Dedicated Relay

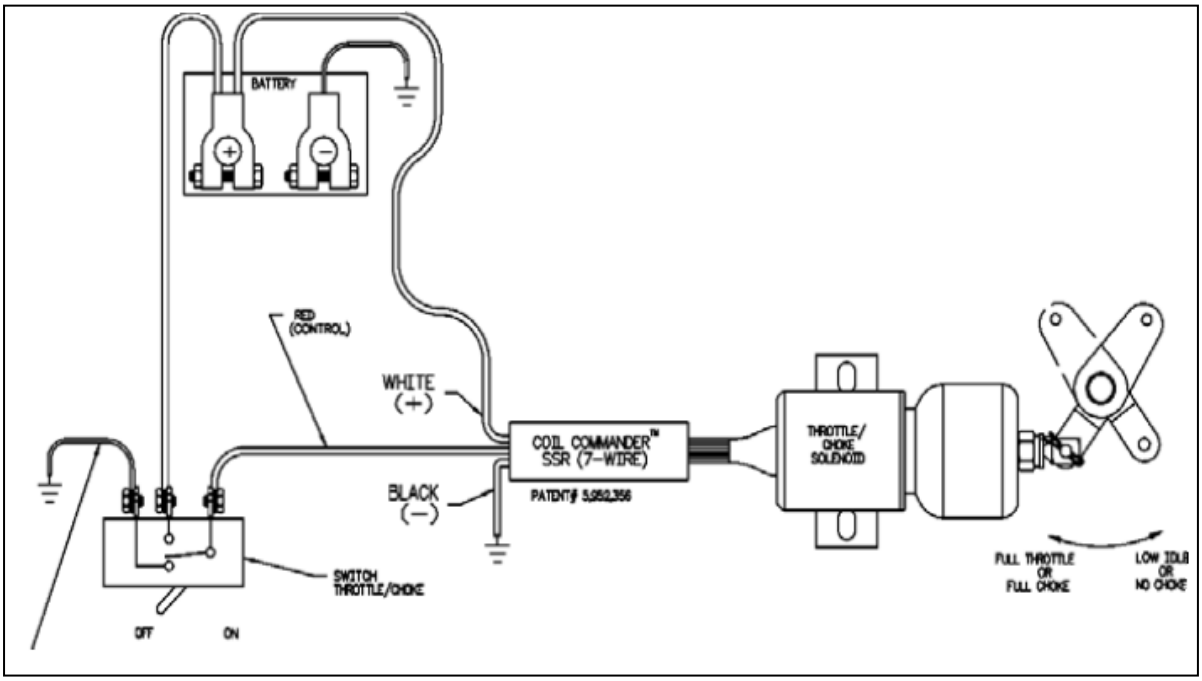


Figure 5-2. Coil Commander SSR (7-Wire) with No Relay

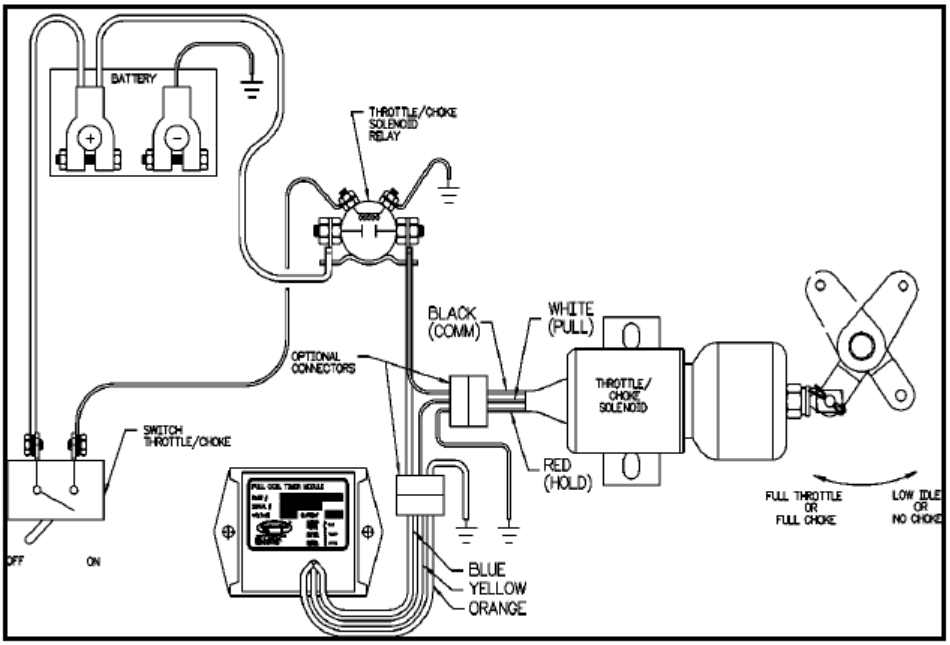


Figure 5-3. PCTM 3-Wire Module with Dedicated Relay

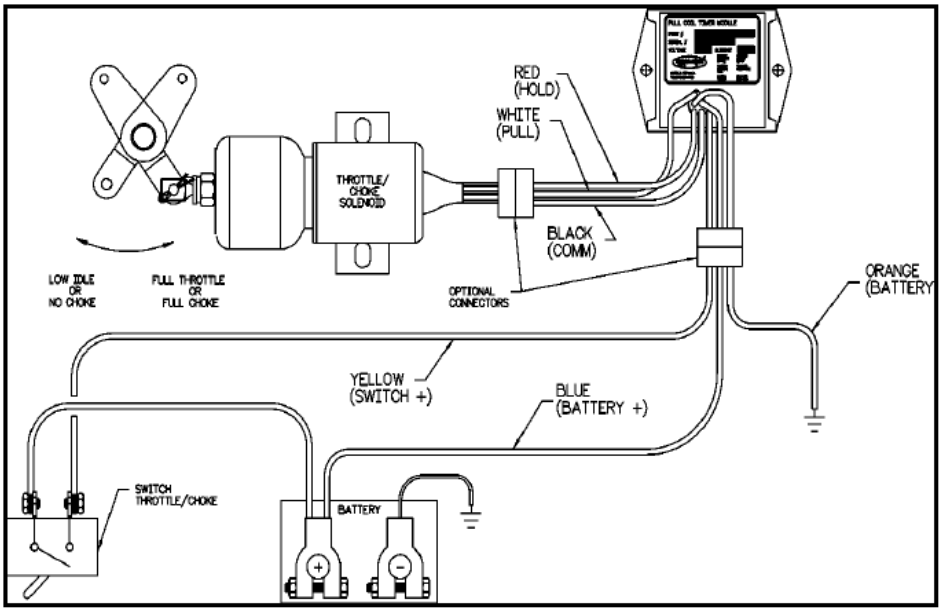


Figure 5-4. PCTM 6-Wire Module with Solid State Built-In Relay

Internally Switched Solenoids

Internally switched solenoids do not require a Coil Commander or pull coil timer module. Figure 5-5 shows how a separate relay and switch can be used to energize the solenoid.

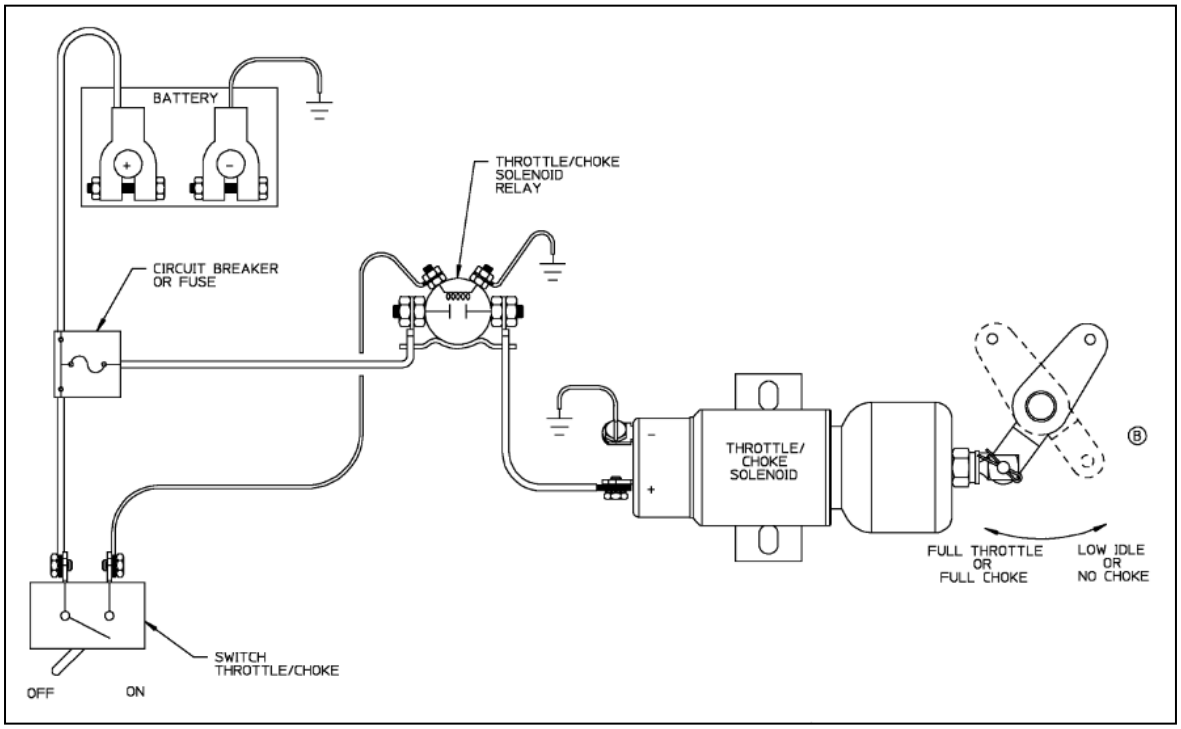


Figure 5-5. Throttle/Choke Solenoid Internally Switched

Chapter 6
Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.

A current list of Woodward Business Partners is available at: **www.woodward.com/find-a-local-partner.**

Product Service Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (Woodward North American Terms and Conditions of Sale 5-09-0690) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is a flat-rate program and includes the full standard Woodward product warranty (Woodward North American Terms and Conditions of Sale 5-09-0690).

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward North American Terms and Conditions of Sale 5-09-0690) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in “like-new” condition and carry with it the full standard Woodward product warranty (Woodward North American Terms and Conditions of Sale 5-09-0690). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- Return authorization number
- Name and location where the control is installed
- Name and phone number of contact person
- Complete Woodward part number(s) and serial number(s)
- Description of the problem
- Instructions describing the desired type of repair

Packing a Control

Use the following materials when returning a complete control:

- Protective caps on any connectors
- Antistatic protective bags on all electronic modules
- Packing materials that will not damage the surface of the unit
- At least 100 mm (4 inches) of tightly packed, industry-approved packing material
- A packing carton with double walls
- A strong tape around the outside of the carton for increased strength

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Replacement Parts

When ordering replacement parts for controls, include the following information:

- The part number(s) (XXXX-XXXX) that is on the enclosure nameplate
- The unit serial number, which is also on the nameplate

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact one of the Full-Service Distributors listed at **www.woodward.com/find-a-local-partner**.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at **https://www.woodward.com/support**, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (32) 422-5551
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

Products Used in Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used in Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
The Netherlands	+31 (23) 5661111
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

Revision History

Changes in Revision B—

- Added Lockout/Tagout and IOLOCK warnings to Warnings and Notices section
- Updated Electrostatic Discharge Awareness section
- Added footnote to Vibration specification in Table 2-1
- Added Notice for 7-wire Coil Commander applications
- Updated Chapter 6 - Product Support and Service Options

Released

We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication 36542.

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PO Box 1519, Fort Collins CO 80522-1519, USA
1041 Woodward Way, Fort Collins CO 80524, USA
Phone +1 (970) 482-5811

Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches, as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.