

Solenoid Control Electronics



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Woodward's extensive line of solenoid protection products feature either external or internal electronics. Coil Commanders™ and pull coil timer modules (PCTMs) are externally attached to the solenoid to prevent overheating of the pull coil. ICE (Integrated Coil Electronics) and AICE (Advanced ICE) solenoids have built-in electronics that prevent overheating of the pull coil.

External Electronic Solenoid Controls



Coil Commanders™ and PCTM Protection Systems

Dual coil solenoids are constructed of two wound coils. The pull coil operates at high currents in order to provide maximum pull or push force. The hold coil retains the plunger in place after it has completed its stroke. After energizing, the pull coil must be turned off as soon as possible to prevent burnout. The protection modules energize the solenoid pull coil for approximately 1.0 second.

Woodward makes two types of externally controlled solenoid protection systems: Coil Commander™ modules and pull coil timer modules (PCTM).

Timer Module Basics

Coil Commander™ Modules

Coil Commanders time out a solenoid's high amperage pull coil within approximately 1.5 seconds. The in-line cylindrical tube design comes in 5-, 6-, and 7-wire SSR configurations:

5-Wire Module	When used with a 3-wire externally switched solenoid, the combined unit functions similarly to an internally switched solenoid without modification to existing wiring harness.
6-Wire Module	Provides a quick, easy fix to prevent burnout for externally switched installations that are connected to the "S" terminal on the starter.
7-Wire SSR Module	When used with a 4-wire externally switched solenoid, the combined unit functions similarly to an internally switched solenoid and eliminates the need for a separate solenoid relay.

Stand-alone units are lightweight and need no mounting brackets. Modules are also available with solenoid attached.

Maximum ON/OFF Duty Cycles for Coil Commander™ Modules

At de-rated conditions: 125% of rated voltage and 250 °F (121 °C)

	Continuous	Intermittent
12 Vdc	2 cycles/minute	4 cycles/minute for 5 minutes
24 Vdc	1 cycle/minute	3 cycles/minute for 5 minutes

PCTM Modules

These timers protect externally switched solenoids by limiting the pull coil ON time to 0.5 second. Use of a PCTM enhances solenoid performance by providing functionality of an internally switched solenoid but with greater durability and reliability.

Note: Coil Commanders and PCTM's will reduce the available pull coil voltage by approximately 0.5 to 1 volt.

5-Wire Coil Commander™

Provides the functionality of an internally switched solenoid when used with a 3-wire externally switched solenoid.



Features:

- Prevents solenoid burnout due to engine over cranking or misadjustment of linkage by limiting the pull coil ON time
- Potted and sealed solid-state electronics
- Separate mounting bracket not required
- Stand alone plug-in or factory assembled to solenoid
- Patented

Order Information:

Stand Alone Modules

ORDER NO.	Rated Voltage	Max. Current at 68°F (20°C)	Terminations To System Harness	Terminations To Solenoid
SA-4624-12	12 Vdc	70 A	Leads	Packard Weather Pack Housing No. 12020829
SA-4624-24	24 Vdc	40 A	Leads	Packard Weather Pack Housing No. 12020829
SA-4626-12	12 Vdc	70 A	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020829
SA-4626-24	24 Vdc	40 A	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020829
SA-4630-12	12 Vdc	70 A	Packard Weather Pack Housing No. 12010973	Yazaki Housing No. 7123-2137
SA-4634-12	12 Vdc	90 A	Packard Weather Pack Housing No. 12010973	Packard Weather Pack Housing No. 12020829
SA-4634-24	24 Vdc	60 A	Packard Weather Pack Housing No. 12010973	Packard Weather Pack Housing No. 12020829
SA-4686-12	12 Vdc	70 A	Leads	Leads
SA-4686-24	24 Vdc	40 A	Leads	Leads
SA-4687-12	12 Vdc	90 A	Leads	Leads
SA-4687-24	24 Vdc	60 A	Leads	Leads
SA-4822-12	12 Vdc	90 A	Metri-Pack 280 Series Housing No. 15300002	Packard Weather Pack Housing No. 12020829

Built-in Modules

Contact Woodward for factory assembled units

Minimum quantities required for non-standard configurations. Contact factory for details.

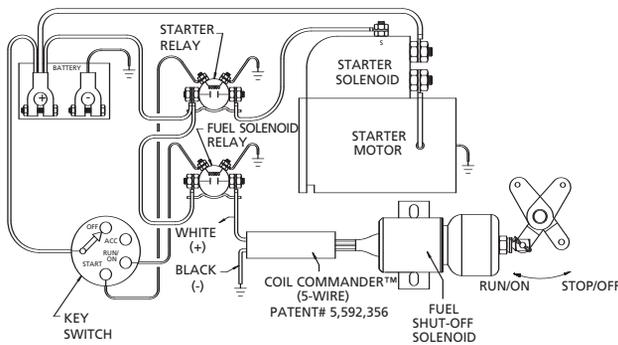
5-Wire Coil Commander™

TERMINATION CONNECTIONS



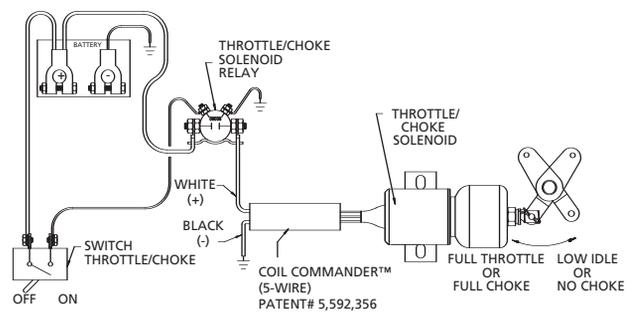
ELECTRIC SHUTOFF

Electric shutoff with dedicated relay for fuel solenoid

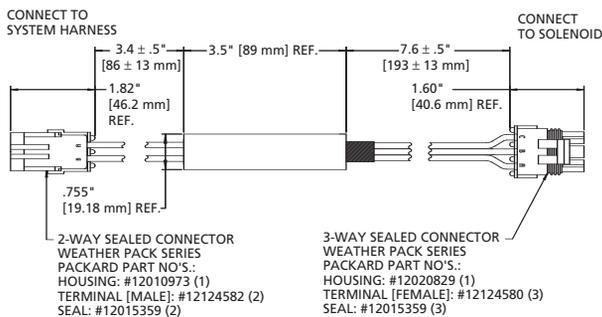


THROTTLE/CHOKE SOLENOID

Throttle/choke solenoid with dedicated relay for fuel solenoid



DIMENSIONS



Note: Coil Commanders will reduce the available pull coil voltage by approximately 0.5 to 1 volt.

Specifications:

Temperature	-40° F to +250° F (-40° C to +121° C)		
Vibration	15 G's @ 15-2000 Hz		
Rated Voltage	12 Volt	24 Volt	
	Minimum Input Voltage @ 68° F (20° C)	9 Vdc	18 Vdc
	Rated Jump Start Voltage (<5 min)	24 Vdc	48 Vdc
Reverse Polarity Protection	None		
Weight	Approx. 4 oz. (113 g)		

Specifications are for reference only.

E.E.C. Directive Compliance: All parts supplied by Woodward are classified as components, and therefore are not "CE" marked. Please contact factory direct for details on specific product compliance with 89/336/EEC and 89/392/EEC directives.

6-Wire Coil Commander™

Plugs into existing externally switched solenoid installations without wiring modification when used with optional connectors. Works with installations connected to "S" terminal on starter.



Features:

- Prevents solenoid burnout due to engine over crank or misadjustment of linkage by limiting the pull coil ON time
- Potted and sealed solid-state electronics
- Separate mounting bracket not required
- Stand alone plug-in or factory assembled to solenoid
- Patented

Order Information:

Stand Alone Modules

ORDER NO.	Rated Voltage	Max. Current at 68°F (20°C)	Terminations To System Harness	Terminations To Solenoid
SA-4751	9-36 Vdc	86 A	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020829
SA-4759	9-36 Vdc	86 A	Leads	Leads
SA-4945*	9-36 Vdc	86 A	Yazaki Housing-Male No. 7122-2237-00	Yazaki Housing-Female No. 7123-2137
SA-5028	9-36 Vdc	86 A	Packard Metri-Pack 280 Housing No. 1530003	Packard Metri-Pack 280 Housing No. 12040977
SA-5160	9-36 Vdc	86 A	Yazaki Housing-Male No. 7122-2237-00	Yazaki Housing-Female No. 7123-2137

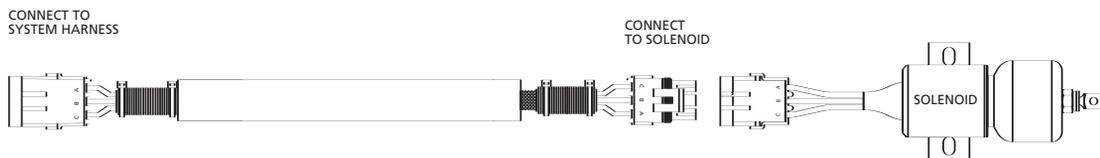
*For use with Kubota 1503ES solenoids

Built-in Modules

Contact Woodward for factory assembled units

Minimum quantities required for non-standard configurations. Contact factory for details.

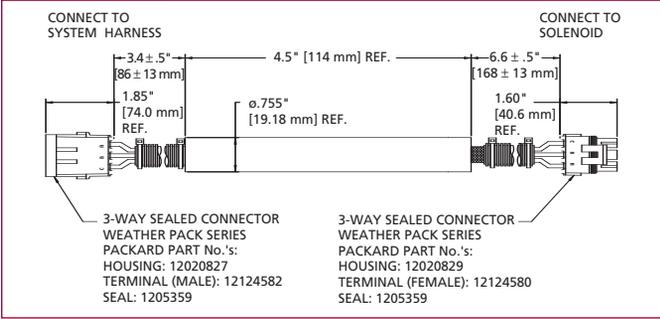
TERMINATION CONNECTIONS



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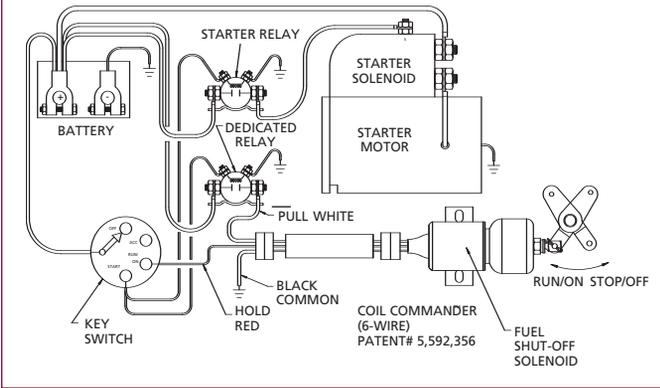
6-Wire Coil Commander™

DIMENSIONS



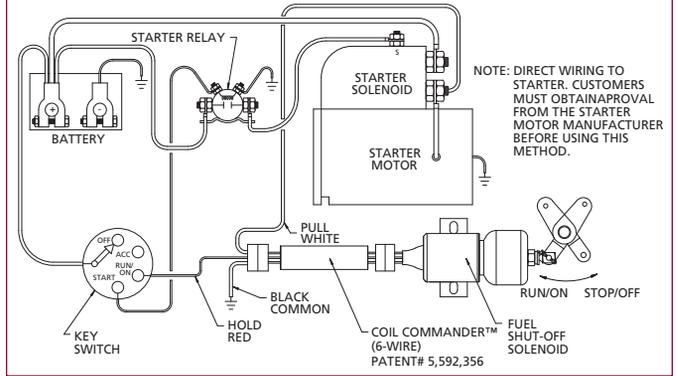
ELECTRIC SHUTOFF

Electric shutoff with dedicated relay for fuel solenoid



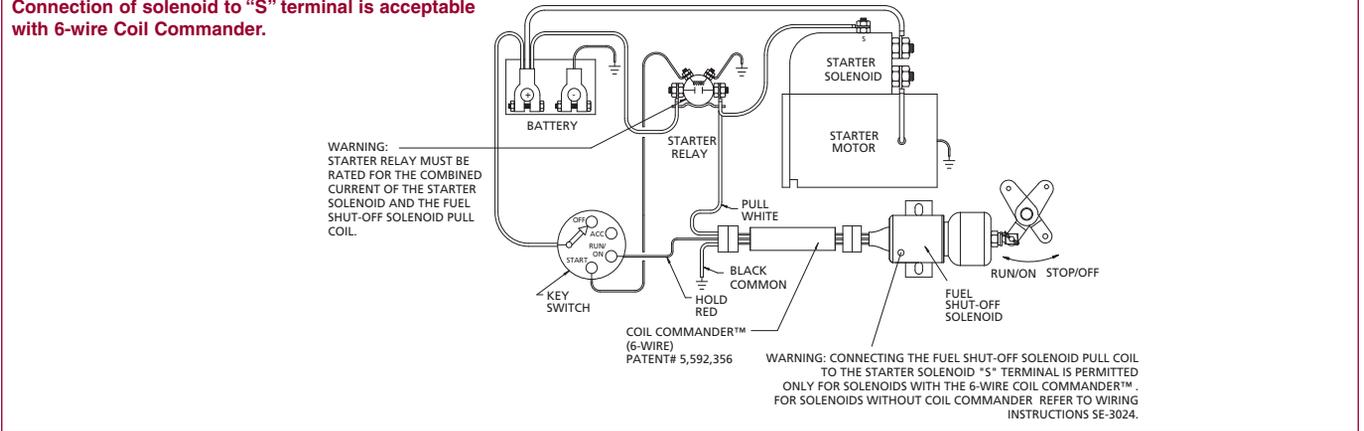
ELECTRIC SHUTOFF W/ STARTER MOTOR

Solenoid shown with Coil Commander wired to starter. *This method requires approval from the starter motor manufacturer.*



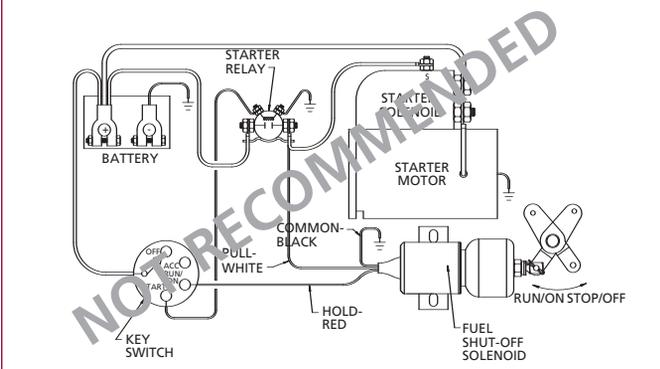
RECOMMENDED CONNECTION

Connection of solenoid to "S" terminal is acceptable with 6-wire Coil Commander.



NON-RECOMMENDED CONNECTION

Connection of solenoid to "S" terminal is not recommended.



Specifications are for reference only.

Note: Coil Commanders will reduce the available pull coil voltage by approximately 0.5 to 1 volt.

Specifications:

Temperature	-40°F to +250°F (-40°C to +121°C)	
Vibration	15 G's @ 15-2000 Hz	
Rated Voltage	12 Volt	24 Volt
	Minimum Input Voltage	9 Vdc 18 Vdc
	Rated Jump Start Voltage (1 cycle/min for 10 min)	24 Vdc 36 Vdc
Reverse Polarity Protection	None	
Weight	Approx. 4 oz. (113 g)	

7-Wire SSR Coil Commander™

Provides the functionality of an internally switched solenoid when used with a 4-wire externally switched solenoid. Eliminates the need for a separate solenoid relay.



Features:

- Prevents solenoid burnout due to engine over cranking or misadjustment of linkage by limiting the pull coil ON time
- Potted and sealed solid-state electronics
- Separate mounting bracket not required
- Stand alone plug-in or factory assembled to solenoid
- Patented

Order Information:

Stand Alone Modules

ORDER NO.	Rated Voltage	Max. Current @ 68°F (20°C)	Terminations To System Harness	Terminations To Solenoid
SA-4690-12	12 Vdc	70 A	Leads	Leads
SA-4690-24	24 Vdc	40 A	Leads	Leads
SA-4691-24	24 Vdc	60 A	Leads	Leads
SA-4727-12	12 Vdc	86 A	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020832
SA-4727-24	24 Vdc	56 A	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020832

Built-in Modules

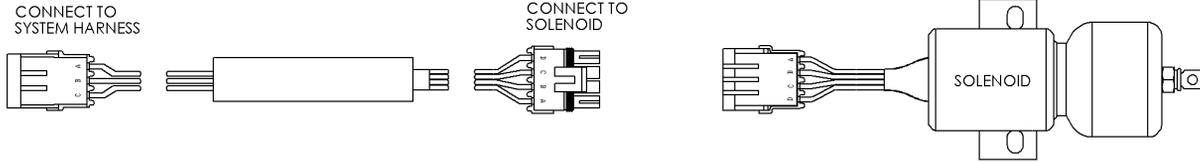
Contact Woodward for factory assembled units.

Minimum quantities required for non-standard configurations. Contact factory for details.

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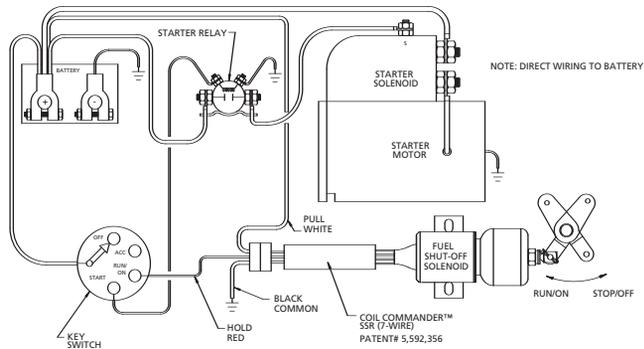
7-Wire SSR Coil Commander™

TERMINATION CONNECTIONS



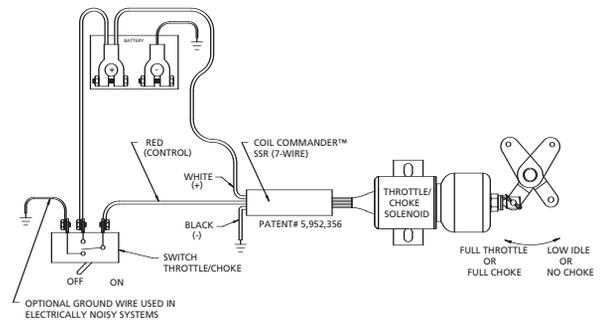
SSR ELECTRIC SHUTOFF

SSR electric shutoff for use with externally switched solenoids and to replace or eliminate a second solenoid relay

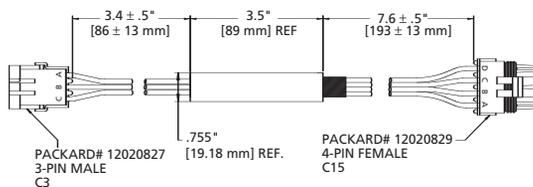


SSR THROTTLE/CHOKE SOLENOID

SSR throttle/choke solenoid eliminates need for mechanical relay



DIMENSIONS



Note: Coil Commanders will reduce the available pull coil voltage by approximately 0.5 to 1 volt.

Specifications:

Temperature	-40°F to +250°F (-40°C to +121°C)	
Vibration	15 G's @ 15-2000 Hz	
Rated Voltage	12 Volt	24 Volt
	Minimum Input Voltage	9 Vdc 18 Vdc
	Rated Jump Start Voltage (<5 min)	24 Vdc 48 Vdc
Reverse Polarity Protection	None	
Weight	Approx. 4 oz. (113 g)	

Specifications are for reference only.

e-mail: icinfo@woodward.com

PCTM Modules

Pull coil timer modules protect externally switched solenoids by limiting the pull coil ON time. Use of a PCTM enhances solenoid performance by providing functionality of an internally switched solenoid but with greater durability and reliability.



Features:

- 3- and 6-wire configurations for externally switched solenoids
- Can be mounted in any orientation or location
- Potted and sealed solid-state electronics
- Corrosion resistant

Order Information:

ORDER NO.	Wire Configuration	Rated Voltage	Terminations To System Harness	Terminations To Solenoid
SA-4092-12	3-Wire	12 Vdc	Leads	Leads
SA-4092-24	3-Wire	24 Vdc	Leads	Leads
SA-4094-12	3-Wire	12 Vdc	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020827
SA-4094-24	3-Wire	24 Vdc	Packard Weather Pack Housing No. 12020827	Packard Weather Pack Housing No. 12020827
SA-4220-12	6-Wire	12 Vdc	Leads	Leads
SA-4220-24	6-Wire	24 Vdc	Leads	Leads
SA-4222-12	6-Wire	12 Vdc	Packard Weather Pack Housing No. 12010717	Packard Weather Pack Housing No. 12015793
SA-4222-24	6-Wire	24 Vdc	Packard Weather Pack Housing No. 12010717	Packard Weather Pack Housing No. 12015793
SA-4224-12	6-Wire	12 Vdc	Leads	Packard Weather Pack Housing No. 12020827
SA-4224-24	6-Wire	24 Vdc	Leads	Packard Weather Pack Housing No. 12020827

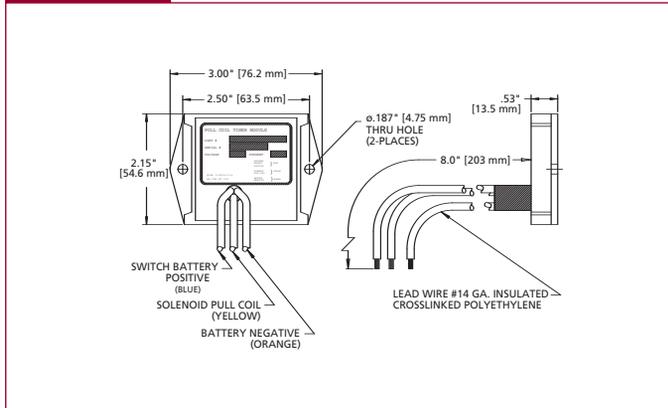
Minimum quantities required for non-standard configurations. Contact factory for details.

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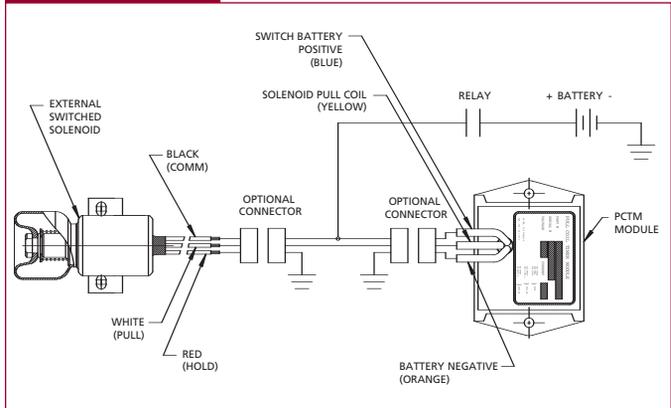
PCTM Modules

3-Wire Pull Coil Timer Module

DIMENSIONS

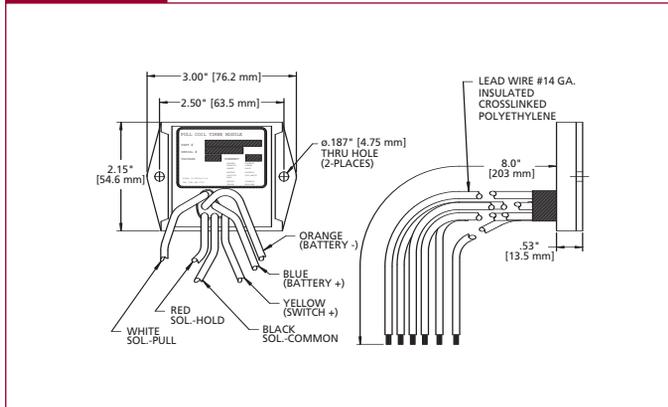


WIRING DIAGRAM

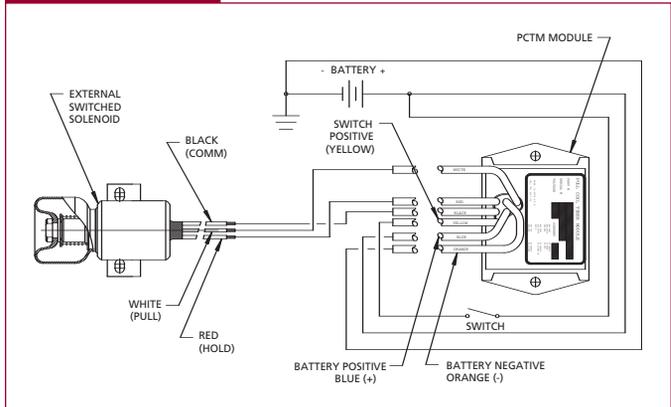


6-Wire SSR Pull Coil Timer Module

DIMENSIONS



WIRING DIAGRAM



Note: PCTM's will reduce the available pull coil voltage by approximately 0.5 to 1 volt.

Specifications:

Temperature	-40° F to +185° F (-40° C to +85° C)
Input Voltage	12 Vdc (30 Vdc jump start) 24 Vdc (57 Vdc jump start)
Pull Current	70 A @ 12 Vdc 56 A @ 24 Vdc
Vibration	15 G's @ 15-2000 Hz
Maximum Cycles	3 cycles/minute continuous
Energized Time	0.5 seconds

Specifications are for reference only.

e-mail: icinfo@woodward.com

Internal Electronic Solenoid Controls



Integrated Coil Electronic Solenoids

Ideal for custom applications, Woodward's Integrated Coil Electronics (ICE and Advanced ICE) solenoids have built-in electronics that prevent overheating of the pull coil. The electronics on both products are totally encapsulated onto the solenoid to ensure reliability in the harshest environments. And, both feature reverse polarity protection.



Integrated Coil Electronics (ICE)

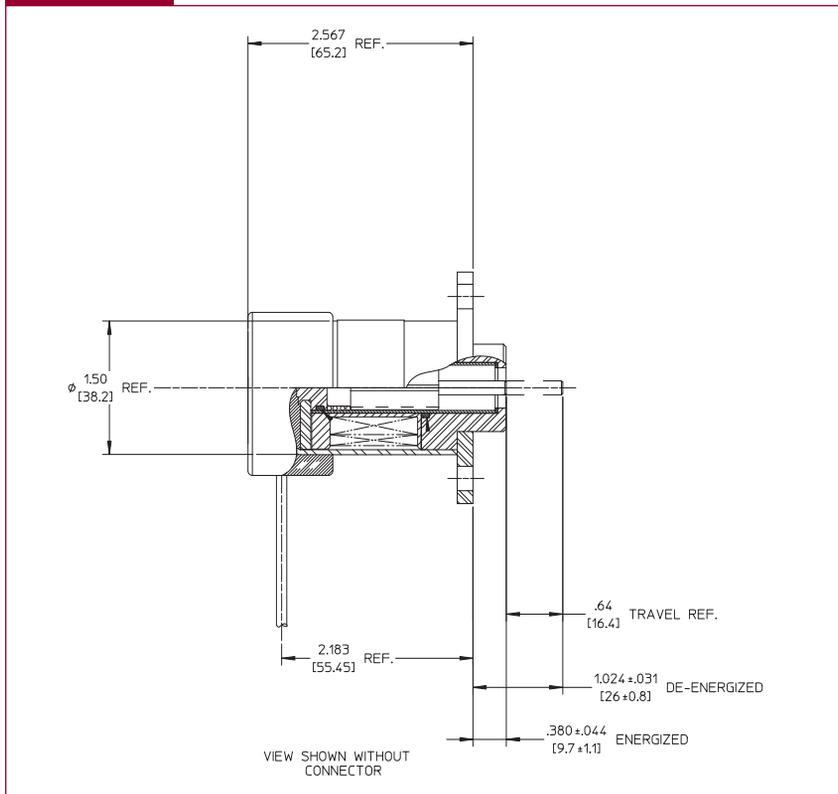
For Dual Coil Solenoids

A printed circuit board mounted onto a dual coil solenoid provides a timer circuit for the pull coil. The PCB functions as an internal timer that switches the pull coil ON and OFF so that the solenoid does not burn itself out.

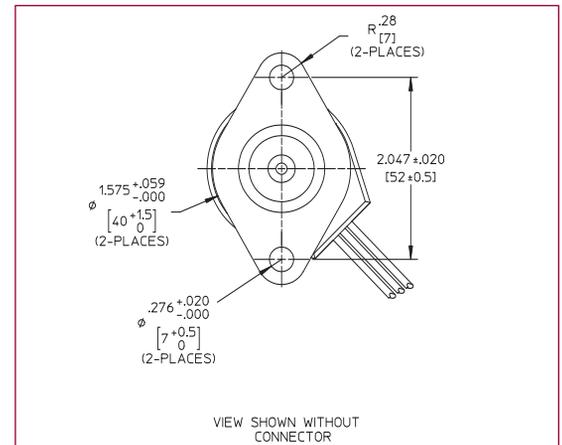
Features:

- Totally encapsulated PCB ensures reliability in the harshest environments
- Compact design for usage in tight spaces
- Reverse polarity protected

DIMENSIONS



Dimensions in brackets are millimeters.



Advanced Integrated Coil Electronics (AICE)

For Single Coil Solenoids

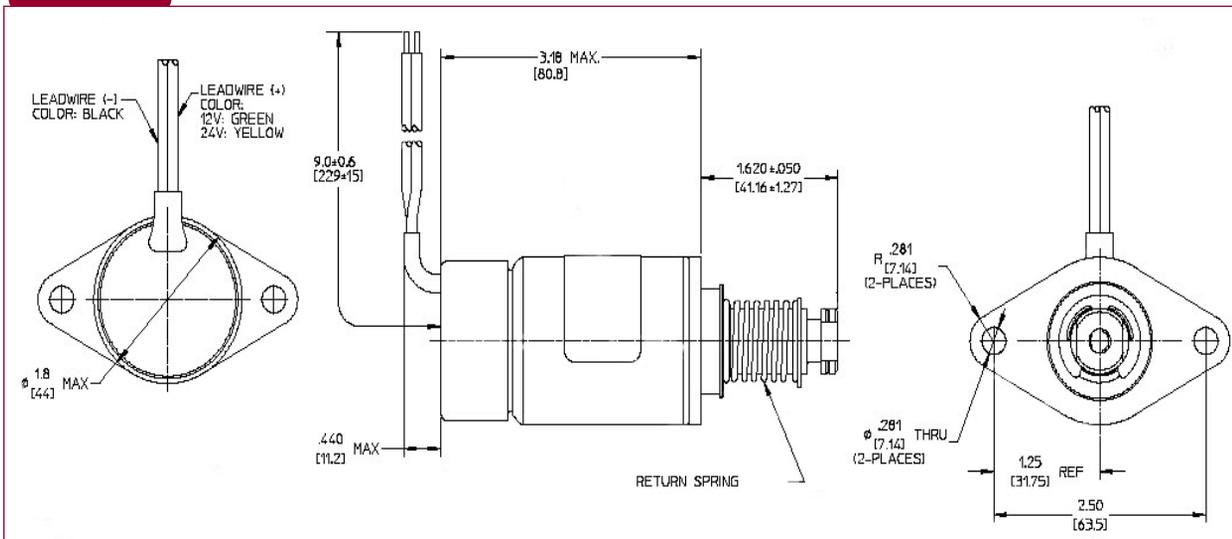


Electronics integrated into a single coil solenoid control the solenoid's current to provide high initial starting force and a constant hold force. The microprocessor encapsulated onto the solenoid calculates the pull time and then generates a pulse width modulated signal to create the hold coil function for single coil solenoids. Under this reduced current, the hold force of the plunger is held constant over input voltage and temperature ranges.

Features:

- Totally encapsulated electronics operate on PWM signals to regulate current
- Compact design for usage in tight spaces
- Reverse polarity protected

DIMENSIONS



Dimensions in brackets are millimeters.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **36585**.



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