WOODWARD

**Product Manual 26098**
**(Revision NEW)**
**Original Instructions**

# LCS Series
# Integrated Speed Control

## Retrofit of LCS Control/Pump Cover Assembly to Stanadyne ‘D’ Series Pumps

## Installation Manual

**IMPORTANT**

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

## DEFINITIONS

- **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**

**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.**

**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.**

**This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the *publications page* on the Woodward website:**

**www.woodward.com/publications**

**The current revision and distribution restriction of all publications are shown in manual *26311*.**

**The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.**

**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.**

**NOTICE**

**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.**

**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*.**

# Chapter 1.
# Installation

## Removing Existing Governor Control Cover

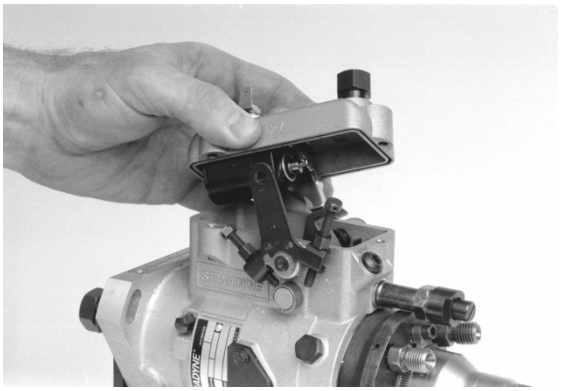
1. Remove the fuel return line from the pump return line connector assembly. Use two wrenches to loosen.

**IMPORTANT**

**Clean the outside of the pump with solvent and dry with compressed air before removing the Stanadyne governor control cover. A suitable container should be placed under the fuel injection pump to catch any fuel that may spill when removing the cover.**

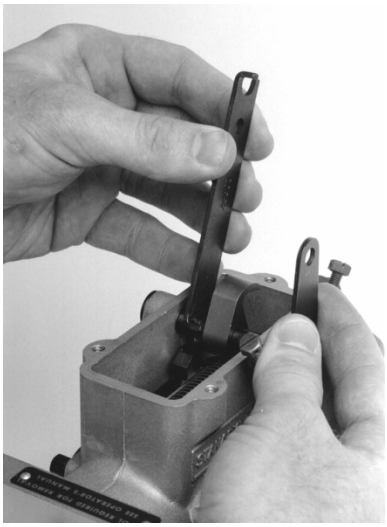
2. Disconnect the electric shutoff (ESO) solenoid wire from the governor control cover.

3. Loosen the three cover screws and remove the existing pump cover. At a later step the emergency shutoff (ESO) solenoid, its hardware, and the housing pressure regulator fitting, will be removed from the original pump cover and re-used during the Installation of the LCS Control/Cover assembly steps (step 16).

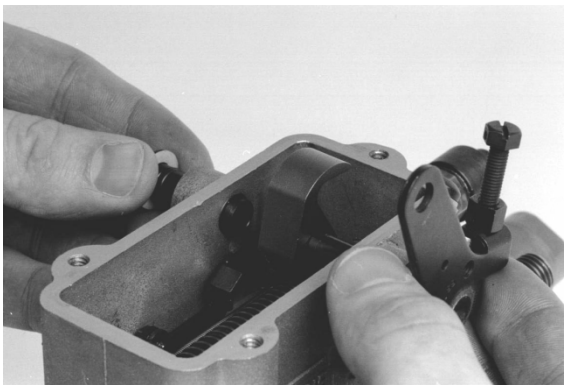


# Preparing Stanadyne Fuel Pump

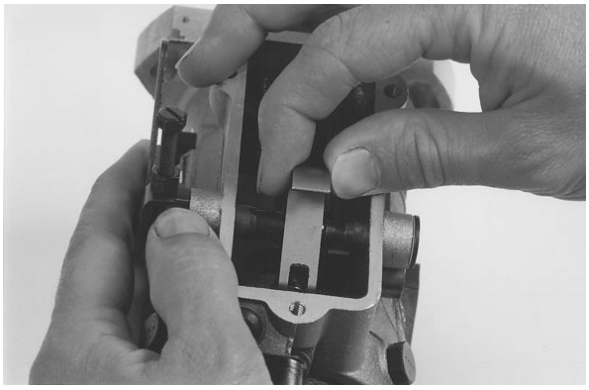
4. Remove and discard the throttle shaft linkage snap clip (or shut-off cam, if external lever). Use Stanadyne tool #20992 or needle nose pliers.



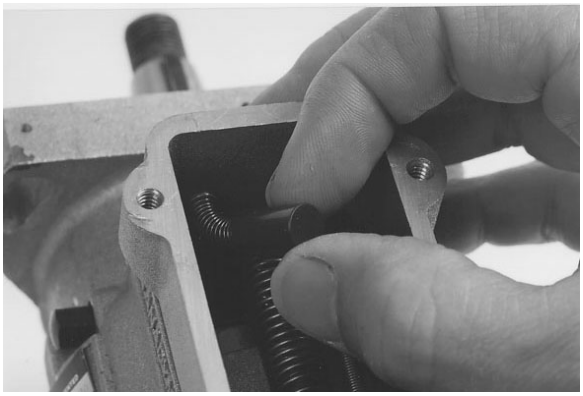
5. Remove the shutoff shaft assembly. Remove the O-ring seal and spacer washer from the shaft and discard.



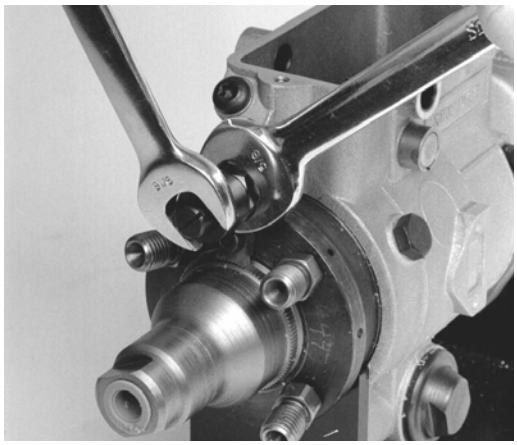
6. Remove the throttle lever and shaft assembly and the throttle lever fork and spacer.



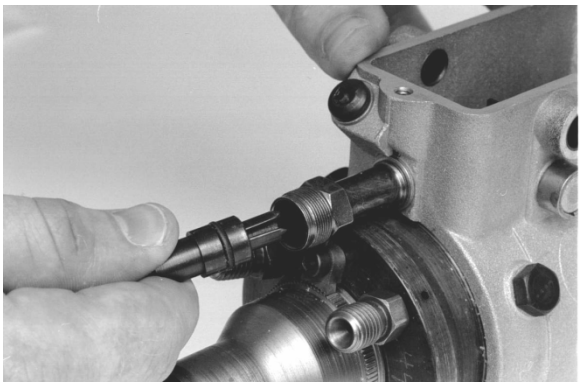
7. If the pump is equipped with a damper assembly, slide the damper barrel off the damper piston.



8. While holding the control rod guide with a 5/8 inch (16 mm) wrench, use a 9/16 inch (15 mm) wrench to loosen and remove the droop control locking cap.

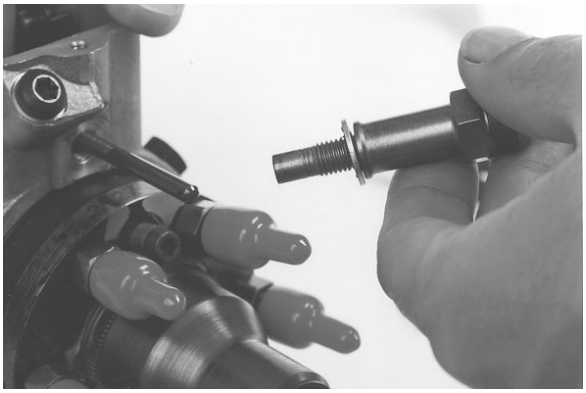


9. Twist and pull to remove the slotted adjusting cap assembly.

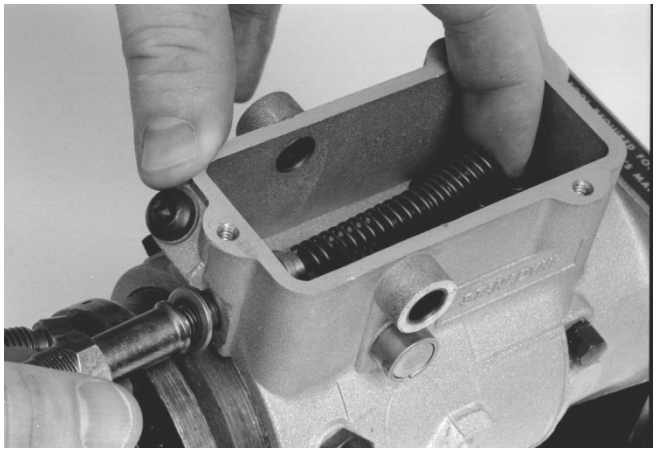


10. Use diagonal cutting pliers to remove the control spring pin from the control rod.

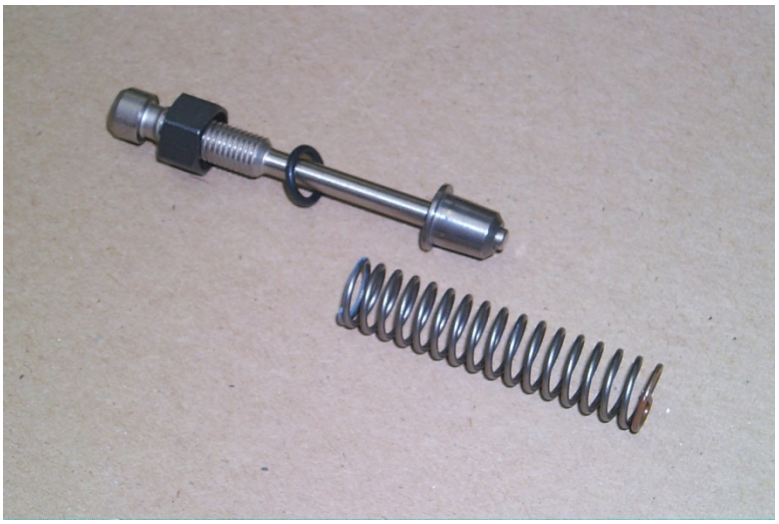
11. Loosen and remove the control rod guide.



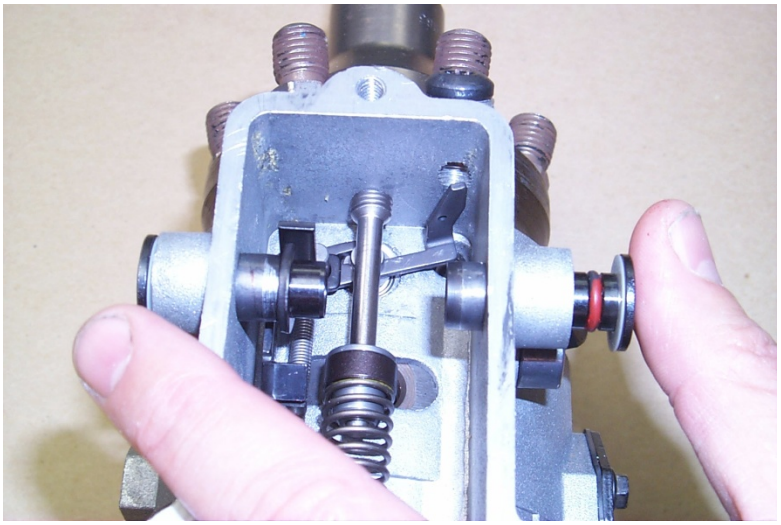
12. Disengage the governor spring from the governor arm. Depress the metering valve and remove the control rod and spring assembly.



13. Install the new spring (p/n 02-0004-142) over the tabs on governor arm, ensuring that the cross loop on the end of the spring is between the tabs. Install the spring retainer (p/n 02-0004-143), install the guide stud nut (p/n 02-0004-146) with the chamfer side positioned toward the housing so that it acts as a seat for the black O-ring (p/n 02-0004-145). Install the guide stud (p/n 02-0004-144). Turn the guide stud into the housing two or three turns beyond the point where all the slop is taken out of the assembly (this sets the target speed of the mechanical governor).

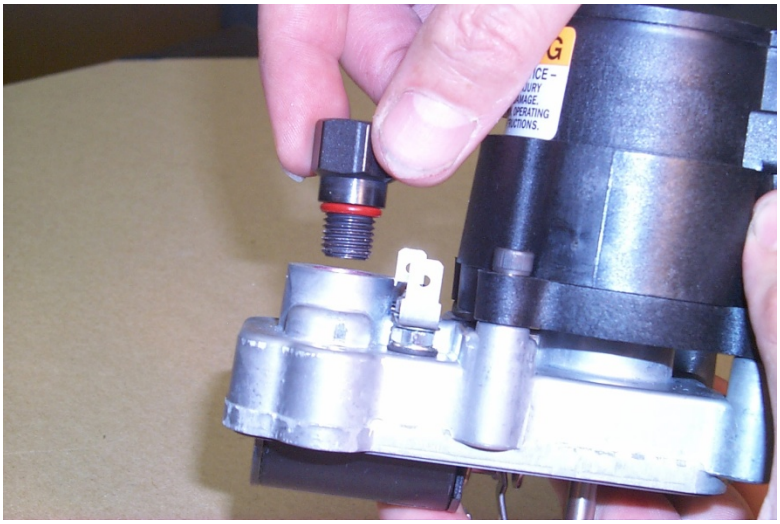


14. Slide the plastic spacers (p/n 02-0004-137) on the bore plugs (p/n 02-0004-135). Lubricate the red O-rings (p/n 02-0004-136) with silicon or petroleum-based lubricant before installing them on the bore plugs. Insert the bore plugs into the housing and secure with the clips (p/n 02-0004-138). (If using pliers or another tool to press the clip into place, be sure the top surface of the pump housing is not damaged where the O-ring will seal.) Manually spin the bore plugs to be sure the clips do not interfere with the linkage hook.



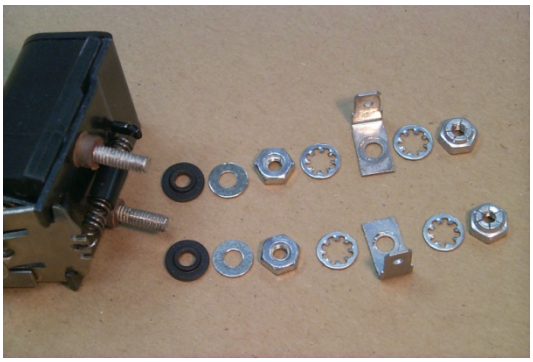
# Installation of LCS Control / Cover Assembly

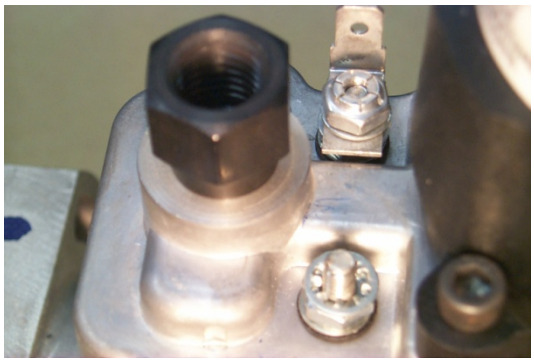
15. Remove housing pressure regulator fitting from original pump cover. Although, the adapter kit includes a housing pressure regulator fitting (p/n 02-0004-139) and red O-ring (p/n 02-0004-140), it is preferable to re-use the housing pressure regulator that is currently installed on the original pump cover to ensure the threads match with the existing fuel return lines. Lubricate the O-ring before installing it on the fitting and tighten it into the cover with 10.2–12.4 N·m (90–110 lb-in) of torque.



16. Remove electric shut-off (ESO) solenoid from original pump cover and install it on the LCS control/cover assembly. Ensure that components are installed in the correct sequence as follows. Working from inside the cover out, the ESO solenoid loads into the bottom of the pump cover, and the solenoid terminal studs protrude through to the top side of the cover. Each terminal stud needs the following:
    - seal-pump cover (p/n 02-0004-148; if not already on the solenoid studs)
    - fiber seal (p/n 02-0004-149)
    - flat washer (p/n 02-0004-150)
    - nut (p/n 02-0004-151)
    - star lock washer (p/n 02-0004-152)
    - ESO terminal (p/n 02-0004-153)
    - star lock washer (p/n 02-0004-152)
    - locknut (p/n 02-0004-155)

    Tighten locknuts to 1.1–1.7 N·m (10–15 lb-in) of torque.

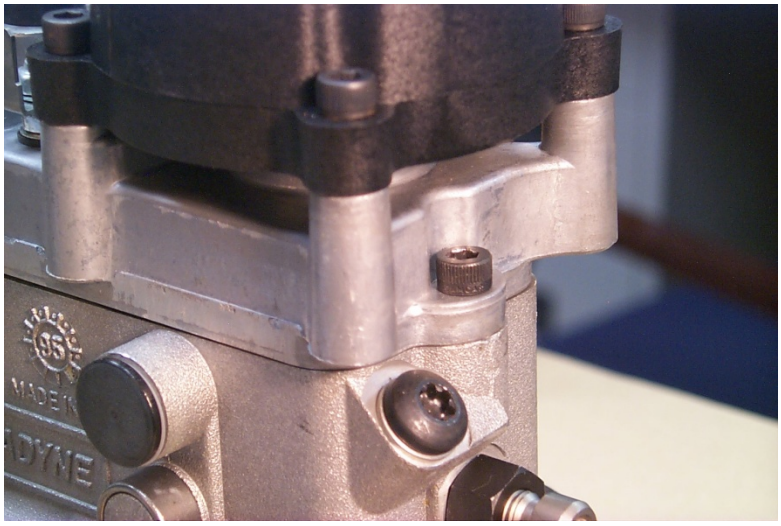




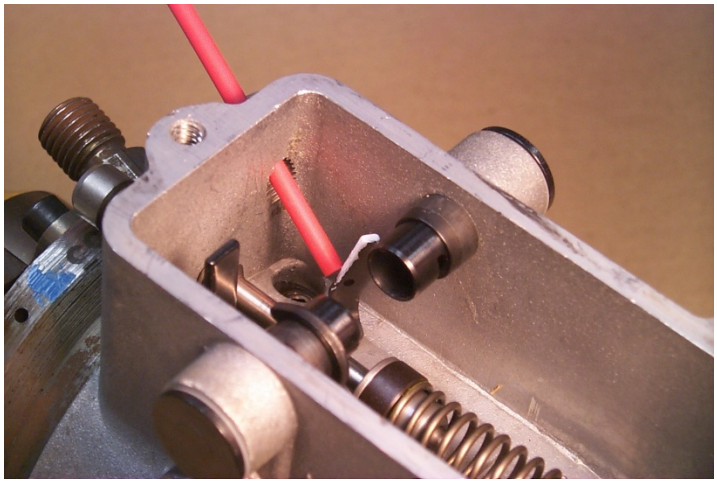
17. Install the cover gasket (p/n 02-0004-134) onto the LCS Control/cover assembly (02-0042-000). (Note in the photo that the small terminal lever on the end of the control's terminal shaft is shown in its properly-assembled orientation while the shaft is at its fully clockwise position when looking at the end of the shaft.)

18. The photographs show the linkage being driven (to minimum fuel position) through the torque control screw hole. For clarity it is shown without the pump cover blocking the view of the linkage. In this step the linkage must be moved with a small screwdriver before the cover is lowered, to engage the pump housing (at this point the cover would block the view of the linkage).

    a) Remove the torque control screw from the end of the fuel pump housing and

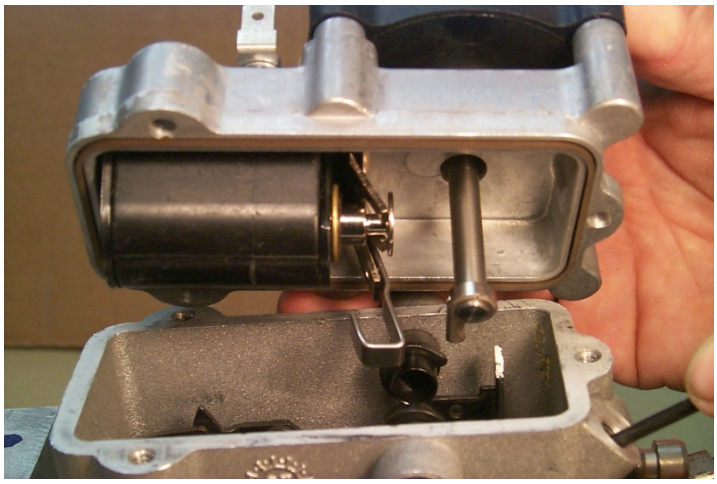


b) drive the internal linkage toward minimum fuel in order to position the linkage hook in a manner that will allow the ESO solenoid to properly engage the linkage hook once the new cover assembly is installed.

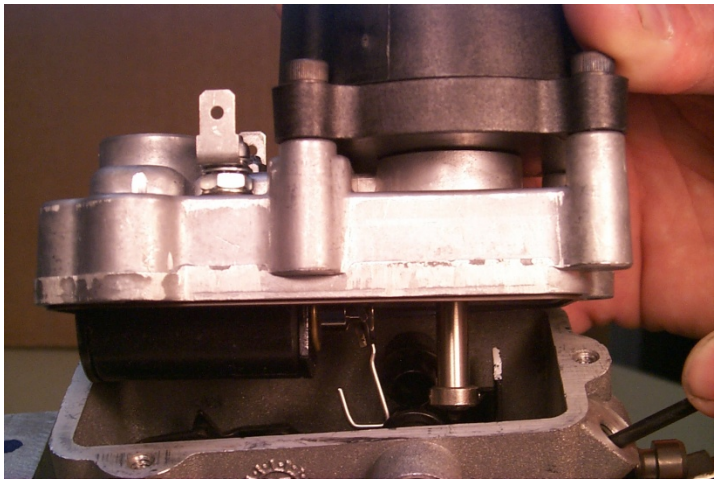


c) With the LCS control's shaft in its fully clockwise position and with the internal linkage driven to minimum fuel,

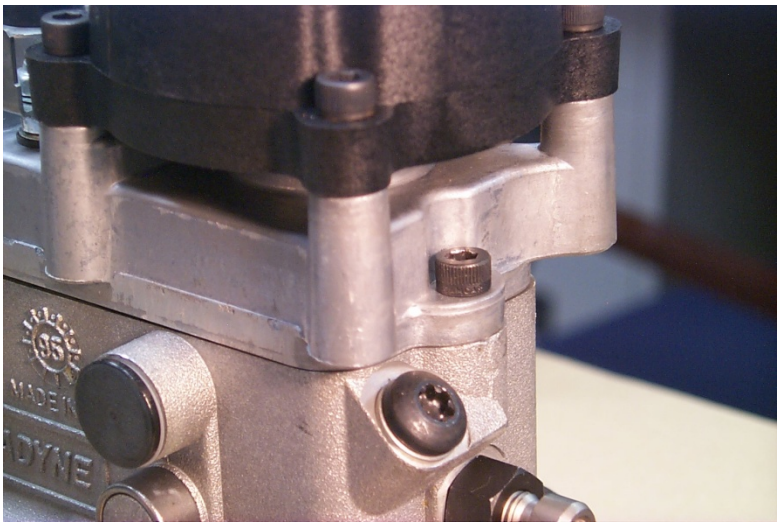
d) position the LCS control / Cover on its side, aligned with pump housing and internal linkage as shown in photograph.



Lower cover unto pump housing.

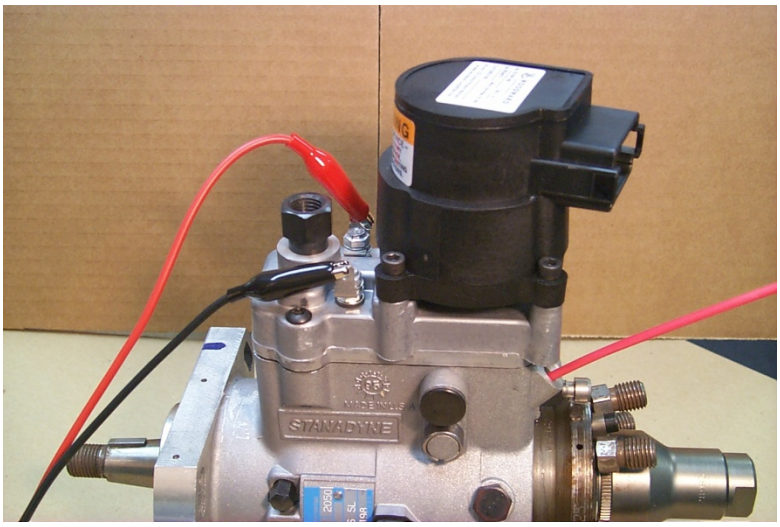


19. Re-use two of the cover mounting screws on the end of the cover closest to the pump drive but do not tighten until all three screws are lightly "snugged" down. Use the 5/8" (about 16 mm) long socket head cap screw (included in the kit) as the third mounting screw. Wiggle the pump cover while turning the screw by hand until a 5/32" (about 4 mm) ball-end hex wrench can be inserted in the cap screw. Torque all three screws to 4.0–5.1 N·m (35–45 lb-in).



20. Because the fuel return line fitting is on the opposite end of the cover, the fuel return line must either be replaced or modified. A suggested modification is to cut several inches out of the existing line with a tubing cutter, then use a wire brush to remove the paint off the cut ends. Install a segment of hydraulic hose to reconnect the fuel line, and use a hose clamp to hold in place. Be sure all fuel return line fittings are tight.

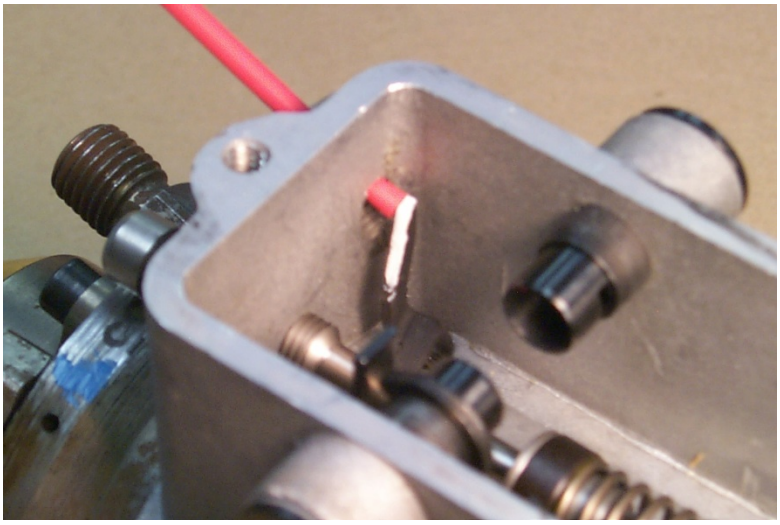
21. Ensure that the ESO solenoid is properly engaged with the pump's internal linkage hook and that the LCS control's terminal lever is not binding the linkage by applying 12 Vdc to the ESO solenoid terminals. If the assembly has been made properly, a screwdriver inserted into the torque control screw hole (reference step 18) will detect a change in linkage position as voltage is applied and removed.



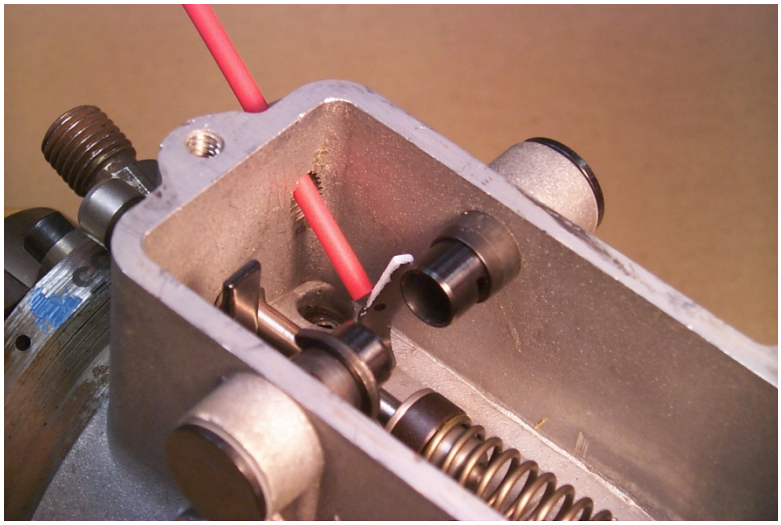

**IMPORTANT**

**This is a very important step because the engine's overspeed protection is activated by changing the power supplied to the ESO solenoid, therefore the linkage must move freely.**

Because this is a "blind assembly", the following two pictures are included to demonstrate how the position of the internal linkage changes when the power is cycled to the ESO solenoid and how the screwdriver interacts with the internal linkage.



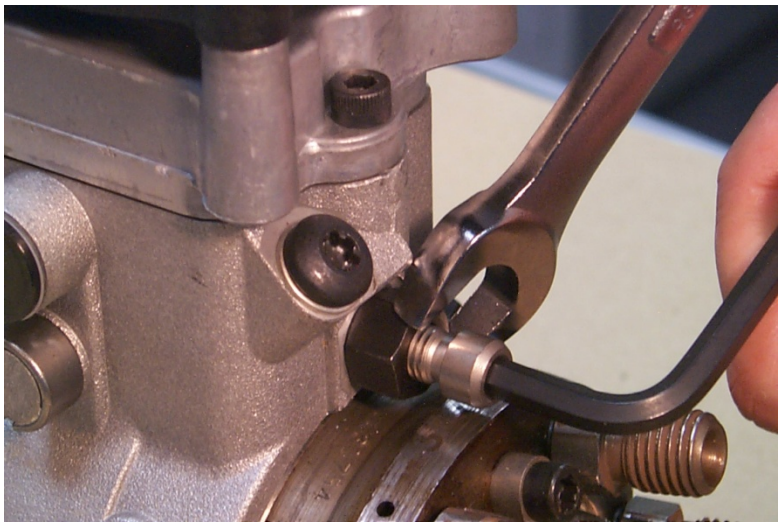
**ESO solenoid energized and linkage at maximum fuel**



**ESO solenoid de-energized and linkage at minimum fuel**

22. Reinstall the torque control screw and re-connect the engine wire harness to the ESO solenoid. Tighten screw to 8.5–11.3 N·m (75–100 lb-in).

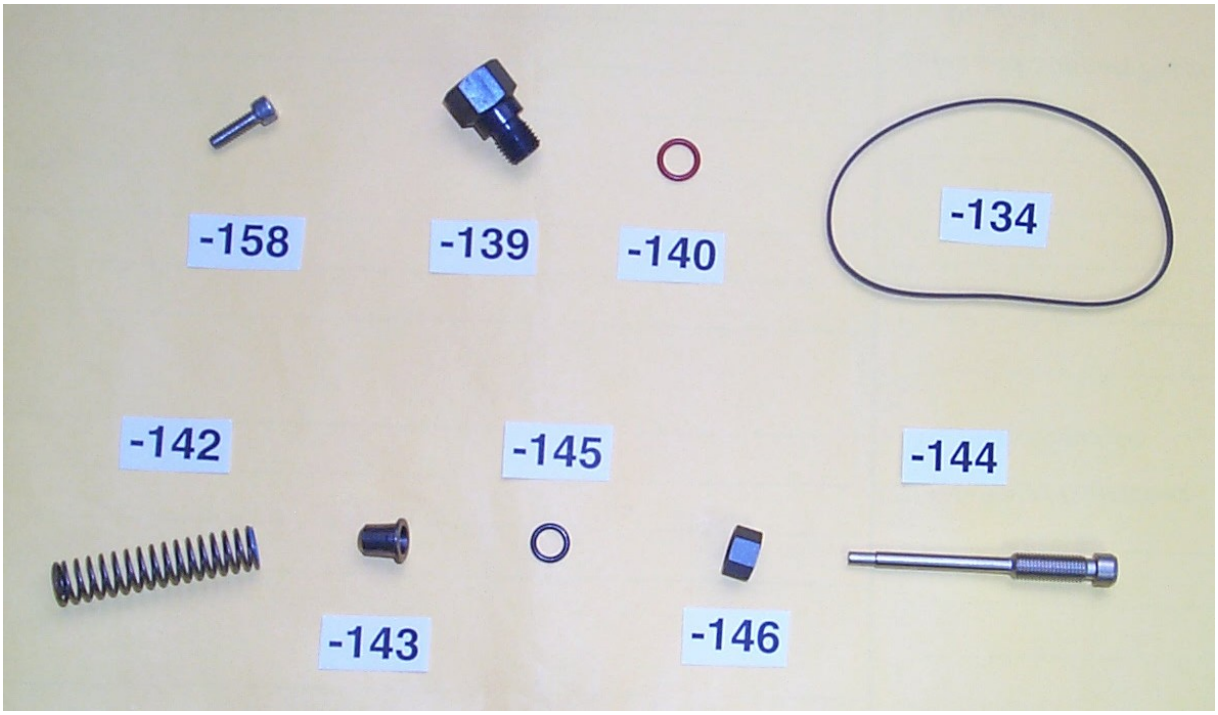
23. Install the mating Deutsch electrical connector on the wiring harness but do not connect it to the LCS control. Start the engine on the mechanical governor and adjust the guide stud (p/n 02-0004-144) until the mechanical governor's target speed is 3% higher than the LCS control's target speed will be. (If there is droop in the mechanical governor, it must be removed, or the no-load speed set point should be adjusted high enough so that the mechanical governor's full-load speed is still 3% higher than the LCS control's speed set point.) Tighten the guide stud nut (p/n 02-0004-146) to 6.8–7.9 N·m (60–70 lb-in) and shut down the engine.

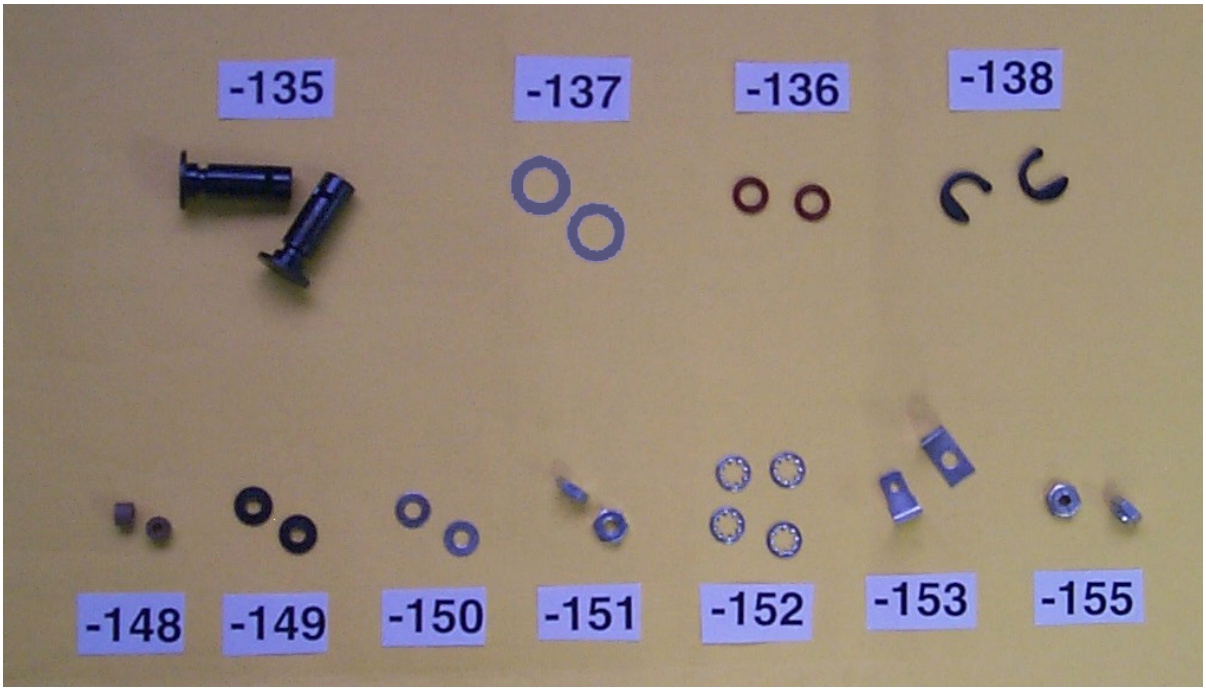


24. Connect the wiring harness to the LCS control and start the engine. Cycle the power to the ESO solenoid to test that it is capable of shutting down the engine.

# Reference

For parts identification, the following photos show components and their part numbers.



# Chapter 2.
# 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:

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (**EngineHelpDesk@Woodward.com**) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further 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 **Recognized Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.

A current list of Woodward Business Partners is available at **www.woodward.com/directory**.

## Product Service Options

Depending on the type of product, the following options for servicing Woodward products may be available through your local Full-Service Distributor or the OEM or Packager of the equipment system.

- 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 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.

**Flat Rate Repair**: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic 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.

**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. 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 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's Full-Service Distributors offer various Engineering Services for our products. For these services, you can contact the Distributor by telephone or by email.

- 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.

**Product Training** is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor 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 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/directory**.

# Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory published at **www.woodward.com/directory**.

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) 6762 6727 |
| Germany: | |
| Kempen | +49 (0) 21 52 14 51 |
| Stuttgart | +49 (711) 78954-510 |
| India | +91 (129) 4097100 |
| Japan | +81 (43) 213-2191 |
| Korea | +82 (51) 636-7080 |
| 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) 6762 6727 |
| Germany | +49 (711) 78954-510 |
| India | +91 (129) 4097100 |
| Japan | +81 (43) 213-2191 |
| Korea | +82 (51) 636-7080 |
| 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) 6762 6727 |
| India | +91 (129) 4097100 |
| Japan | +81 (43) 213-2191 |
| Korea | +82 (51) 636-7080 |
| The Netherlands | +31 (23) 5661111 |
| Poland | +48 12 295 13 00 |
| United States | +1 (970) 482-5811 |

For the most current product support and contact information, please visit our website directory at **www.woodward.com/directory**.

# Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

## General

Your Name _____

Site Location _____

Phone Number _____

Fax Number

## Prime Mover Information

Manufacturer _____

Engine Model Number _____

Number of Cylinders _____

Type of Fuel (gas, gaseous, diesel, dual-fuel, etc.) _____

Power Output Rating _____

Application (power generation, marine, etc.)

## Control/Governor Information

**Control/Governor #1**

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

**Control/Governor #2**

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

**Control/Governor #3**

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number

## Symptoms

Description _____

_____

*If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.*

**We appreciate your comments about the content of our publications.**

**Send comments to: icinfo@woodward.com**

**Please reference publication 26098.**

WOODWARD

PO Box 1519, Fort Collins CO 80522-1519, USA
1000 East Drake Road, Fort Collins CO 80525, USA
Phone +1 (970) 482-5811 • Fax +1 (970) 498-3058

**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.**

2012/9/Colorado