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, check manual 26311, Revision Status & Distribution Restrictions of Woodward Technical Publications, on the publications page of the Woodward website:

www.woodward.com/publications

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.

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. Be sure to check manual 26311, Revision Status & Distribution Restrictions of Woodward Technical Publications, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.

Woodward reserves the right to update any portion of this publication at any time. Information provided by Woodward is believed to be correct and reliable. However, no responsibility is assumed by Woodward unless otherwise expressly undertaken.

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## Contents

**WARNINGS AND NOTICES** .................................................................................. II
**ELECTROSTATIC DISCHARGE AWARENESS** .......................................................... III
**REGULATORY COMPLIANCE** ........................................................................ IV

**CHAPTER 1. GENERAL INFORMATION** .............................................................. 1
   Introduction ............................................................................................................. 1
   Woodward Part Numbers ....................................................................................... 1
   Description .............................................................................................................. 1

**CHAPTER 2. INSTALLATION** ............................................................................ 5
   Mechanical ............................................................................................................. 5
   Installation .............................................................................................................. 5

**CHAPTER 3. INITIAL OPERATION** ................................................................ 7
   General ................................................................................................................... 7
   Adjustments .......................................................................................................... 7

**CHAPTER 4. PRINCIPLES OF OPERATION** .................................................... 8

**CHAPTER 5. MAINTENANCE AND TROUBLESHOOTING** ............................... 13
   Maintenance ......................................................................................................... 13
   Hardware Replacement ......................................................................................... 14
   Troubleshooting Guide ......................................................................................... 14

**CHAPTER 6. SERVICE OPTIONS** ................................................................. 16
   Product Service Options ....................................................................................... 16
   Woodward Factory Servicing Options ................................................................ 17
   Returning Equipment for Repair ........................................................................ 17
   Replacement Parts ............................................................................................... 18
   Engineering Services ........................................................................................... 18
   How to Contact Woodward .................................................................................. 19
   Technical Assistance ........................................................................................... 19

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### Illustrations and Tables

Figure 1-1. Outline Drawing of Electrohydraulic Power Servo (Single Coil) ........ 2
Figure 1-2. Outline Drawing of Electrohydraulic Power Servo (Dual Coil) ......... 3
Figure 1-3. Wiring Diagram (Single Coil EHPS) .................................................... 4
Figure 1-4. Wiring Diagram (Dual Coil EHPS) ...................................................... 4
Figure 4-1. Schematic Drawing of Electrohydraulic Power Servo ....................... 9
Figure 4-2. EHPS Manifold Porting Orientation ................................................. 10
Figure 4-3. Schematic Drawing of Extend or Retract on Increasing Current ....... 11
Figure 4-4. Typical EHPS Application—Double Acting Actuator ..................... 12
Figure 4-5. Typical EHPS Application—Single Acting Actuator ....................... 12
Warnings and Notices

Important Definitions

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.

- **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**

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.
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**

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. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.
Regulatory Compliance

North American Compliance:
These listings are limited only to those units bearing the UL identification.

UL: UL Listed for Class I, Division 2, Groups A, B, C, & D, T4 at 40 °C Ambient. For use in Canada and the United States.
UL File E158654.

Wiring must be in accordance with North American Class I, Division 2 wiring methods as applicable, and in accordance with the authority having jurisdiction.

WARNING EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT RISQUE D'EXPLOSION—Ne pas enlever les couvercles, ni raccorder / débrancher les prises électriques, sans vous en assurer auparavant que le système a bien été mis hors tension, ou que vous vous situez bien dans une zone non explosive.

La substitution de composants peut rendre ce matériel incompatible pour les emplacements de Classe I, Division 2.
Chapter 1.
General Information

Introduction

This manual provides information on the installation, operation and adjustments, principles of operation, and maintenance of the Electrohydraulic Power Servo (EHPS).

The EHPS is available in four combinations. There is either a single coil or dual coil servo valve along with either “integral” or “separate” hydraulic supply for the 1st and 2nd stages. The integral or separate oil supply is crucial during the design of the installation. The 1st and 2nd stages of the EHPS require 10 µm nominal/ 25 µm absolute hydraulic filtration at 19 L/min (5 US gal/min). The 3rd stage of the EHPS requires up to 757 L/min (200 US gal/min), but is not as susceptible to hydraulic contamination. If this filtration level is not maintained, then the functionality of the EHPS will be compromised. Should the installation provide hydraulic oil at up to 757 L/min (200 US gal/min) with the required level of filtration, then the “integral” supply option is recommended. However, if hydraulic filtration is difficult at the required flow rates, the “separate” supply option is recommended.

Woodward Part Numbers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9907-551</td>
<td>Single Coil Servo Valve with Separate Hydraulic Supply</td>
</tr>
<tr>
<td>9907-555</td>
<td>Dual Coil Servo Valve with Separate Hydraulic Supply</td>
</tr>
<tr>
<td>9907-556</td>
<td>Dual Coil Servo Valve with Integral Hydraulic Supply</td>
</tr>
<tr>
<td>9907-557</td>
<td>Single Coil Servo Valve with Integral Hydraulic Supply</td>
</tr>
</tbody>
</table>

Description

The Electrohydraulic Power Servo (Figures 1-1 & 1-2) is a three-stage servo valve used in conjunction with a customer-supplied power cylinder with integral position feedback. The EHPS is a modular staged design that can provide several output stages, all within the same envelope size. The stages are as follows:

- Stage 1—a torque-motor servo valve
- Stage 2—a 19.05 mm (0.750 inch) diameter spool stage with feedback to the first stage
- Stage 3—a spool stage driven by the second-stage flow valve with feedback to the second-stage spool bushing
- Stage 4—a commercial hydraulic servo with an integral electrical position transducer installed to provide a position feedback signal to the electronic control to allow closed loop control (customer supplied)
Figure 1-1. Outline Drawing of Electrohydraulic Power Servo (Single Coil)
Figure 1-2. Outline Drawing of Electrohydraulic Power Servo (Dual Coil)
Figure 1-3. Wiring Diagram (Single Coil EHPS)

Figure 1-4. Wiring Diagram (Dual Coil EHPS)
Chapter 2.
Installation

Mechanical

Weight
The EHPS weighs approximately 68 kg (150 pounds) when sent from the factory. Installation hardware must be adequate to hold this weight and still provide stable support for the EHPS. Do not lift the unit by the torque motor housing or damage may occur.

Receiving
The EHPS is calibrated and then drained of calibrating fluid at the factory. It is then placed in a custom-fabricated wooden packing crate for delivery to the customer. Additional cleaning or calibration is not necessary before installation or operation.

Storage
The EHPS may be stored as received from the factory before installation. If storage time will exceed nine months, please contact Woodward.

Installation

See Outline Drawing, Figure 1-1 or 1-2 for:
- Overall dimensions
- Installation hole locations
- Hydraulic fitting sizes

See Wiring Diagram, Figure 1-3 or 1-4 for:
- Wiring connections

Proper filtration of the hydraulic fluid that is to be supplied to the unit is extremely important. A 10 µm nominal, 25 µm absolute filter must be installed in the supply to the EHPS within 1 m of the supply port. It is necessary to keep the immediate area and equipment clean and free of dirt and contaminants while connecting the hydraulic lines. Failure to maintain clean hydraulic fluid can result in damage to the EHPS. The hydraulic supply must be connected to the supply connection on the servo valve.

The attitude in which the EHPS is installed does not affect the performance of the unit. However, it is recommended that the EHPS be mounted vertically due to its weight. Adequate support must be provided if the unit is not mounted vertically.

Connect the supply and return hydraulic lines to the EHPS. Supply pressure can be from positive displacement or centrifugal-type pumps. Use a pressure switch in the supply line to be sure that correct supply pressure is established before start-up and maintained thereafter.
The manifold of the EHPS has two ports labeled A and B. These ports are 2-inch NPT threaded ports for connection to the customer-supplied hydraulic cylinder. Depending on the action of the cylinder the ports will need to be connected differently. The port labeled "A" will increase in pressure when an increasing command signal is given to the control system. Port "B" will increase in pressure when a decreasing command signal is given by the control system. When zero command signal is given, Port "B" will be pressurized, suggesting that this port should be connected to the failsafe side of the output cylinder.

**Hydraulic Supply Requirements**

**Hydraulic Source:** Prime mover lubricating system or external independent supply  
**Fluid Types:** Mineral or synthetic based oils may be used. Contact Woodward for specific oil recommendations.  
**Recommended Viscosity:** 0.6 to 400 centistokes  
**Specific Gravity:** 0.6 to 1.0  
**Required Filtration:** 10 µm nominal, 25 µm absolute  
**Supply Pressure:** 552 kPa minimum to 1724 kPa maximum limit (80 psi minimum to 250 psi maximum limit)  
**Return Pressure:** Maximum 10% of Supply Pressure

<table>
<thead>
<tr>
<th>Supply Pressure</th>
<th>Steady State Flow</th>
<th>Maximum Transient Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>552 kPa (80 psig)</td>
<td>7.6 L/min (2.0 US gal/min)</td>
<td>378 L/min (100 US gal/min)</td>
</tr>
<tr>
<td>1724 kPa (250 psig)</td>
<td>11.4 L/min (3.0 US gal/min)</td>
<td>662 L/min (175 US gal/min)</td>
</tr>
</tbody>
</table>

The hydraulic system should be capable of supplying the maximum transient flow on a constant basis to avoid sluggish servo valve response.

It is very important that the linkage between the power servo output and the fuel system be of correct relationship to ensure proper operation. Use as much of the power servo output travel as possible between minimum and maximum flow points.

**Electrical Supply Requirements**

The EHPS is an integrating actuator without feedback. The installation of the EHPS requires an external feedback device along with a suitable control system. The Woodward Servo Position Controller (SPC) is ideal for controlling the device when an external feedback device is installed. See Woodward Manual 26236 for details of wiring the EHPS with a Woodward Servo Position Controller (SPC).

The EHPS requires a 0–200 mA current input to the servo valve of the 1st stage with a 100 mA null current. Therefore any current below 100 mA, will result in pressure increasing from Port "B". Any current above 100 mA, will result in pressure increasing from Port "A".

For field wiring, use copper wire rated 60 °C only. Torque clamping screw terminal connectors for field wiring to 1.4 N·m (12 lb-in).

The wiring connections are detailed in Figures 1-3 and 1-4.

---

**NOTICE**  
Due to the hazardous location listings associated with this product, proper wire type and wiring practices are critical to operation.
Chapter 3.
Initial Operation

General

Before the initial operation of the EHPS, be sure that all previous installation and hook up procedures are accomplished and all linkages (if any), electrical connections, and hydraulic fittings are secure and properly connected.

WARNING

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.

NOTICE

Be sure the correct hydraulic supply pressure to the EHPS is established before start-up. Trapped air within the hydraulic system may cause momentary erratic behavior of the EHPS during initial operation. Trapped air in the unit itself may have to be bled to ensure proper operation (contact Woodward personnel for information on this procedure). Use the correct Woodward manual for the Woodward electronic control to begin prime-mover operation.

Adjustments

Normally all operating adjustments are made to the EHPS during factory calibration according to specifications provided by the customer and should not require any further adjustment. Do not attempt adjustments to the EHPS unless thoroughly familiar with proper procedures.

Adjustments are available at the factory to set the level position of the output, the distance of output for a given control voltage change, and total movement of the power servo output.
Chapter 4.
Principles of Operation

The EHPS consists of four basic stages:
- Stage 1—A torque motor servo valve, receiving an output signal from the control
- Stage 2—A 19.05 mm (0.750 inch) diameter spool valve, with mechanical feedback to first stage
- Stage 3—A 50.80 mm (2.000 inch) diameter spool valve, with mechanical feedback to second stage
- Stage 4—A hydraulic Servo with electrical position feedback to the control (customer supplied)

See schematic drawing, Figure 4-1, for an illustration of the working relationship of the various parts.

Operation begins with a 0 to 200 mA (the operating null current is 100 mA) signal from the control system. When this current is changed to a value other than 100 mA (within its 0–200 mA range), it causes the torque-motor armature to move to a position that will be proportional to the input current. The torque-motor armature controls the flapper/nozzle section of the first-stage servo valve. The output of this servo valve is a differential pressure signal (C1-C2).

This signal is proportional to the armature position and is applied to the ends of the second-stage spool valve, causing the spool valve to move. Movement of the spool valve causes a force to be applied to the cantilevered spring on the torque-motor armature. This force re-centers the torque-motor armature and brings the pressure signal to zero pressure differential, which stops the spool from moving. The position of the spool is, therefore, proportional to the input current, and since the spool valve is a flow control, flow is proportional to input current.

This flow in the A1-B1 port system is directed to the third-stage spool valves. The direction of flow determines which valve (A1 or B1) will move to open the P1 supply flow to the “A” (manifold) port connection to the servo. Movement of the third-stage valve system is fed back to the second-stage bushing. This movement re-centers the bushing on the spool valve and stops the flow to the third-stage valve system. With this action, the third-stage position and flow are now proportional to input current.

The output flow from the third stage is directed to the servo to provide the necessary force (servo diameter) and position (servo stroke) to operate the steam turbine throttling valves. With flow from the third stage, the servo will integrate in the direction dictated by the flow path direction (manifold “A” or “B”).

When the servo is in the position requested by the control system, the feedback signal from the position transducer in the servo will cause the control to re-null the first-stage torque motor (i.e., bring the input current to the operating null of 100 mA). This action will bring the second stage to its null position and cause the third stage to re-null, stopping flow to the fourth stage and establishing a position of the servo that meets the needs of the control system. Control system commands will then cause the servo to change its position to increase or decrease steam flow to the turbine stages.
The EHPS servo can be used in numerous applications; however, there are two primary installation methods: single acting and double acting. The double acting installation (see Figure 4-4) uses both output connections of the EHPS, whereas the single acting installation (Figure 4-5) utilizes only one of the output connections. In the single acting installation, either supply port may be used depending on whether the application calls for direct acting or in-direct acting.
Manifold Porting

The output connections on the manifold are labeled “A” and “B” (see Figure 4-2), and each will increase in pressure/flow depending on the input current to the EHPS. Port “A” increases in pressure/flow and port “B” decreases in pressure/flow when an increasing command signal is given to the servo. Conversely, when a decreasing command signal is given, port “B” increases in pressure/flow while port “A” decreases in pressure/flow. See Figure 4-3 for two examples of how to pipe the EHPS in a “double-acting” configuration. If the installation requires only one connection to the EHPS, make sure that the other connection is plugged, as it will see full hydraulic pressure during normal operation.

![Figure 4-2. EHPS Manifold Porting Orientation](image)
Figure 4-3. Schematic Drawing of Extend or Retract on Increasing Current
Figure 4-4. Typical EHPS Application—Double Acting Actuator

Figure 4-5. Typical EHPS Application—Single Acting Actuator
Chapter 5.
Maintenance and Troubleshooting

Maintenance

The EHPS requires no maintenance or adjustment for operation. All operating adjustments are made to the EHPS during factory calibration according to specifications provided by the customer and should not require any further adjustment. Do not attempt adjustments to the EHPS unless thoroughly familiar with proper procedures. Adjustments are available at the factory to set the level position of the output, the distance of output for a given control signal change and total movement of the power cylinder output. Optionally output shaft offset and distance, can be set by the system's electronic driver (servo position controller).

To verify optimum performance, it is recommended that the EHPS and its included servo system be periodically stroked and its operation and minimum and maximum limits verified.

Repair and Overhaul

Based on product line service history, it is recommended that the EHPS's performance be verified every 6 years of service. If tests verify that unit performance is not optimum, optionally an authorized Woodward field engineer can determine if the actuator's Stage-1-2 or Stage-3 requires repair or overhaul. For product and service warranty purposes, it is required that only authorized Woodward field engineers perform field repair or overhaul services.

Optionally a user can return the complete EHPS to Woodward or an authorized Woodward service facility, however, due to the size of this actuator, Woodward also offers partial repair and overhaul services on this product line. For product and service warranty purposes, it is required that only authorized Woodward field engineers perform field repair or overhaul services.

Please refer to the Chapter 6 in this manual for product in-warranty and after-warranty service options.

The following partial repair and overhaul options are available with this product line:

- Stage-1&2 Assembly (SV12)—Return to Woodward or for repair or overhaul.
- Stage-3 Assembly (SV32)—Return to Woodward for repair or overhaul.

Hydraulic Filtration

The service life of the actuator is increased with the use of clean hydraulic supply oil. Proper filtration of the hydraulic oil that is to be supplied to the unit is extremely important. A 10 µm nominal, 25 µm absolute filter must be installed in the supply to the EHPS within 1 m of the supply port. Failure to maintain clean hydraulic fluid can result in damage to the EHPS and a reduced product life span. Periodic cleaning or replacement of the supply line filter is recommended. If the filter becomes clogged, the EHPS may show evidence of sluggish response.
The EHPS is available with a separate supply port for the primary and second stage (SV-12) in cases where large, high flow filters are not reasonable. This separate port requires much lower flow rates, 38 L/min (10 US gal/min), at the 10 µm nominal, 25 µm absolute rating, while leaving the main hydraulic supply to have less filtration, 100 µm nominal.

Hardware Replacement

**WARNING**
EXPLOSION HAZARD—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2 or Zone 2 applications.

**WARNING**
To prevent possible serious personal injury, or damage to equipment, be sure all electric power, hydraulic pressure, and gas pressure have been removed from the actuator before beginning any maintenance or repairs.

**CAUTION**
The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

**NOTICE**
Do not lift or handle the actuator by any conduit. Lift or handle the actuator only by using the eyebolts.

To facilitate field replacement of items, it is recommended that spare parts be kept on-site. The following spare or replacement assemblies are available with this product line:
- Stage-1&2 assembly (SV12)—Contact your Woodward Customer Service Representative to establish the exact SV12 part number for your EHPS, and availability.
- Stage-3 assembly (SV32)—Contact your Woodward Customer Service Representative to establish the exact SV32 part number for your EHPS and availability.

**Troubleshooting Guide**
Malfunctions of the governing system are usually revealed as speed variations of the prime mover, but this does not necessarily mean that such speed variations indicate governing system problems. When improper speed variations appear, inspect all components, including the turbine, for proper operation. See the correct Woodward control manual for assistance in isolating the trouble.
The following steps describe troubleshooting the EHPS:

- If during the starting sequence, the EHPS exhibits a sluggish or slow response to electrical control input:
  1. Verify that the EHPS is receiving the correct supply oil pressure during transient movement.
  2. Verify that the EHPS supply oil filter is clean and not flow limited.
  3. Verify that the EHPS driver module (Servo Position Control) is dynamically adjusted for optimum performance. This can be performed, with the unit shutdown and turbine steam shut off, by using the control's valve demand signal to stroke the EHPS, to verify smooth, accurate, quick, stable, and repeatable operation.
  4. If supply oil pressure is verified to be within specification, but via stroking the EHPS it is proven not to operate correctly, it is recommend that the EHPS be repaired or overhauled.
  5. For product and service warranty purposes, it is required that only authorized Woodward field engineers perform field disassembly, repair, or calibration services.
  6. When requesting information or service help from Woodward, it is important to include in your communication the part number and serial number of the EHPS.

- If during the operation, the EHPS exhibits an unstable operation:
  1. Verify that the EHPS is receiving the correct supply oil pressure during transient movements.
  2. Verify that the EHPS supply oil filter is clean and not flow limited.
  3. With the unit shutdown and turbine steam off, via the control's valve demand signal, stroke the EHPS and verify smooth, accurate, and repeatable operation. (If proper EHPS operation is proven at this point troubleshoot other parts of the system for the stability problem.)
  4. If supply oil pressure is verified to be within specification, but via stroking the EHPS it is proven not to operate correctly, verify that the EHPS driver module (Servo Position Control) is dynamically adjusted for optimum performance. This can be performed, with the unit shutdown and turbine steam shut off, by using the control’s valve demand signal to stroke the EHPS, to verify smooth, accurate, quick, stable, and repeatable operation.
  5. If supply oil pressure is verified to be within specification, but via stroking the EHPS it is proven not to operate correctly, it is recommend that the EHPS be repaired or overhauled.
  6. For product and service warranty purposes, it is required that only authorized Woodward field engineers perform field disassembly, repair, or calibration services.
  7. When requesting information or service help from Woodward, it is important to include in your communication the part number and serial number of the EHPS.
Chapter 6.
Service Options

Product Service 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 and 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 Recognized Turbine Retrofitter (RTR) is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

You can locate your nearest Woodward distributor, AISF, RER, or RTR on our website at:

www.woodward.com/directory
Woodward Factory Servicing 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 (5-01-1205) 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 Product and Service Warranty 5-01-1205).

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 Product and Service Warranty 5-01-1205) 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 Product and Service Warranty 5-01-1205). 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.

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 us via telephone, email us, or use our website: www.woodward.com.
How to Contact Woodward

For assistance, call one of the following Woodward facilities to obtain the address and phone number of the facility nearest your location where you will be able to get information and service.

### Electrical Power Systems

<table>
<thead>
<tr>
<th>Facility</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>+55 (19) 3708 4800</td>
</tr>
<tr>
<td>China</td>
<td>+86 (512) 6762 6727</td>
</tr>
<tr>
<td>Germany</td>
<td>+49 (0) 21 52 14 51</td>
</tr>
<tr>
<td>India</td>
<td>+91 (129) 4097100</td>
</tr>
<tr>
<td>Japan</td>
<td>+81 (43) 213-2191</td>
</tr>
<tr>
<td>Korea</td>
<td>+48 12 295 13 00</td>
</tr>
<tr>
<td>United States</td>
<td>+1 (970) 482-5811</td>
</tr>
</tbody>
</table>

### Engine Systems

<table>
<thead>
<tr>
<th>Facility</th>
<th>Phone Number</th>
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</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>+55 (19) 3708 4800</td>
</tr>
<tr>
<td>China</td>
<td>+86 (512) 6762 6727</td>
</tr>
<tr>
<td>Germany</td>
<td>+49 (711) 78954-510</td>
</tr>
<tr>
<td>India</td>
<td>+91 (129) 4097100</td>
</tr>
<tr>
<td>Japan</td>
<td>+81 (43) 213-2191</td>
</tr>
<tr>
<td>Korea</td>
<td>+82 (51) 636-7080</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>+31 (23) 5661111</td>
</tr>
<tr>
<td>United States</td>
<td>+1 (970) 482-5811</td>
</tr>
</tbody>
</table>

### Turbine Systems

<table>
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<th>Facility</th>
<th>Phone Number</th>
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<tbody>
<tr>
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<tr>
<td>The Netherlands</td>
<td>+31 (23) 5661111</td>
</tr>
<tr>
<td>Poland</td>
<td>+48 12 295 13 00</td>
</tr>
<tr>
<td>United States</td>
<td>+1 (970) 482-5811</td>
</tr>
</tbody>
</table>

You can also locate your nearest Woodward distributor or service facility on our website at:

[www.woodward.com/directory](http://www.woodward.com/directory)

### Technical Assistance

If you need to telephone for technical assistance, you will need to provide the following information. Please write it down here before phoning:

<table>
<thead>
<tr>
<th>Your Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Location</td>
<td></td>
</tr>
<tr>
<td>Phone Number</td>
<td></td>
</tr>
<tr>
<td>Fax Number</td>
<td></td>
</tr>
<tr>
<td>Engine/Turbine Model Number</td>
<td></td>
</tr>
<tr>
<td>Manufacturer</td>
<td></td>
</tr>
<tr>
<td>Number of Cylinders (if applicable)</td>
<td></td>
</tr>
<tr>
<td>Type of Fuel (gas, gaseous, steam, etc)</td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td></td>
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<tr>
<td>Application</td>
<td></td>
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</table>

**Control/Governor #1**

<table>
<thead>
<tr>
<th>Woodward Part Number &amp; Rev. Letter</th>
<th>Control Description or Governor Type</th>
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<td>Serial Number</td>
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</tbody>
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**Control/Governor #2**

<table>
<thead>
<tr>
<th>Woodward Part Number &amp; Rev. Letter</th>
<th>Control Description or Governor Type</th>
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<tbody>
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</tbody>
</table>

**Control/Governor #3**

<table>
<thead>
<tr>
<th>Woodward Part Number &amp; Rev. Letter</th>
<th>Control Description or Governor Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td></td>
</tr>
</tbody>
</table>

*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.*