WOODWARD

Product Manual 37521
(Revision D, 6/2015)
Original Instructions

ELV Electric Liquid Fuel Valve

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. 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.

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. 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 Out-of-date translations are marked with ⚠.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.

Contents

Illustrations and Tables

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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.

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. 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.

Chapter 1.
General Information

Introduction

The Woodward ELV (Electric Liquid Fuel Valve) controls the fuel flow to a small industrial gas turbine. This is an all-electric liquid fuel valve, which discharges fuel from the output port in proportion to the input signal to the ELV driver. The integrated valve and actuator structure addresses several issues and adds new features:

- Linkage to connect a valve and an actuator is unnecessary for the integrated valve and actuator structure.
- An oil pump driving gear box and oil piping for oil pressure governors are unnecessary for using all-electric control.
- The operator may change the valve flow curve by connecting the 4–20 mA CDP pressure input signal to the electric governor controlling the ELV driver.
- Standardization of turbine system design is possible because the ELV is a standard product.
- The valve goes to the minimum fuel position to shut down the prime mover in case of power supply failure, feedback signal failure/short, or actuator signal failure for fail-safe.
- Fuel flows to the bypass line from the relief valve when P1 (Inlet fuel pressure) exceeds a specified value.

⚠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.

⚠WARNING

NEVER CONNECT PIPES TO BYPASS THE PUMP OR THE SHUT-OFF VALVE.

Do not use the ELV's relief valve or bypass valve for any purpose except protecting the equipment.

Use the ELV's differential pressure valve only for prime mover control.

Specifications

Fuel Valve

Fuel Type	Gas turbine fuel for aircraft, JP-4, JP-5, or diesel
Specific Gravity	0.70–0.85
Viscosity	1–10 cSt
Fuel Flow	(see Figure 1-1)
	20-450 pph (9-204 kg/h)
	20–750 pph (9–340 kg/h)
	30-1250 pph (14-567 kg/h)
	40–1800 pph (18–816 kg/h)
	80–3200 pph (36–1452 kg/h)
Fuel Pressure	
Inlet Fuel	6.55 MPa/950 psig (max)
Discharge Fuel	6.21 MPa/900 psig (max)
Static Test	9.65 MPa/1400 psig
Bypass Back Pressure	0.10 MPa/14.2 psig (max) ∗See the pipe connection example.
Relief Valve Pressure	7.34 ±0.28 MPa/1065 ±40 psig (use only for valve protection) ∗See the pipe connection example.
Flow Accuracy	±5% of flow point plus additional ±0.7% of max rated flow over the operating temperature range (see Figure 1-2)
Flow Hysteresis	Better than 1.0% of flow point or 3 pph, whichever is greater
Operating Temperature	−20 to +80 °C (fuel viscosity must be from 1 cSt to 10 cSt)
Humidity	85% (max); must be non-condensation prone environment
Fuel Filter	10 µm (absolute) near the valve's inlet (see Figure 1-1)
Connectors	All connectors to connect to ELV are optional parts.
Installation Attitude	P2 hole and Pb hole must face upward. P1 hole must face downward.
Weight	About 7 kg (15 lb)

Driver

Input Power Voltage	24 Vdc nominal (18–32 Vdc)
Input Signal Current	4–20 mA or 20–160 mA
Power Consumption	100 W (max)
Operating Temperature	−20 to +60 °C
Storage Temperature	−20 to +80 °C
Humidity	85% (max); non-condensation prone
Installation Attitude	Any orientation
Weight	About 1.1 kg (2.4 lb)
Vibration	RV5 (2 hrs/axis, 1.04 Grms, 10–500 Hz)
Shock	MS2 (3 g, 11 ms half-sine pulse)
Motor Resolver Output	
Excitation	5 Vrms, 2.57 kHz
Relay Output	28 Vdc (max), 2 A

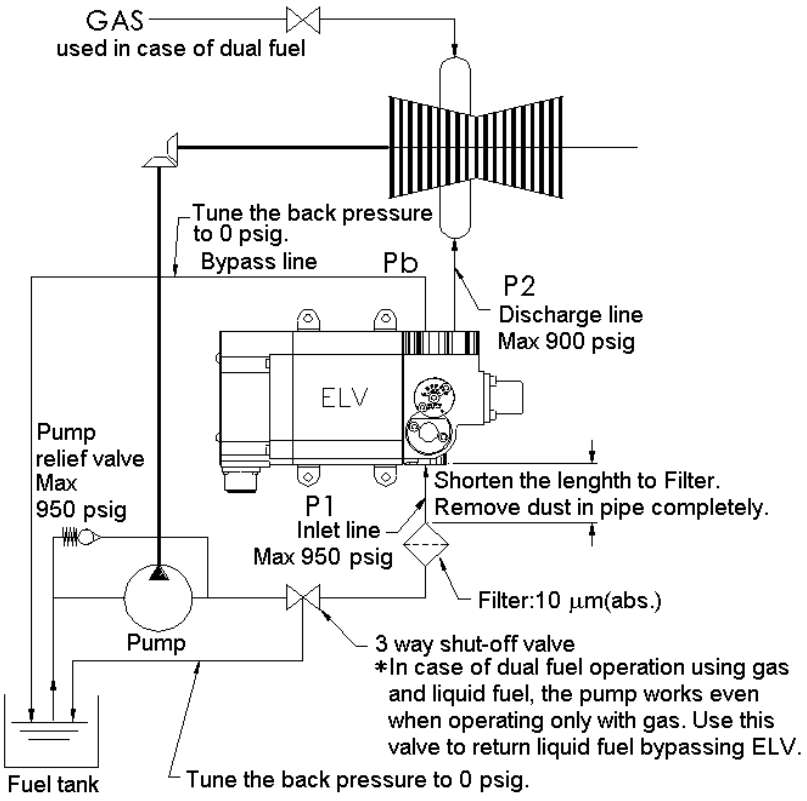
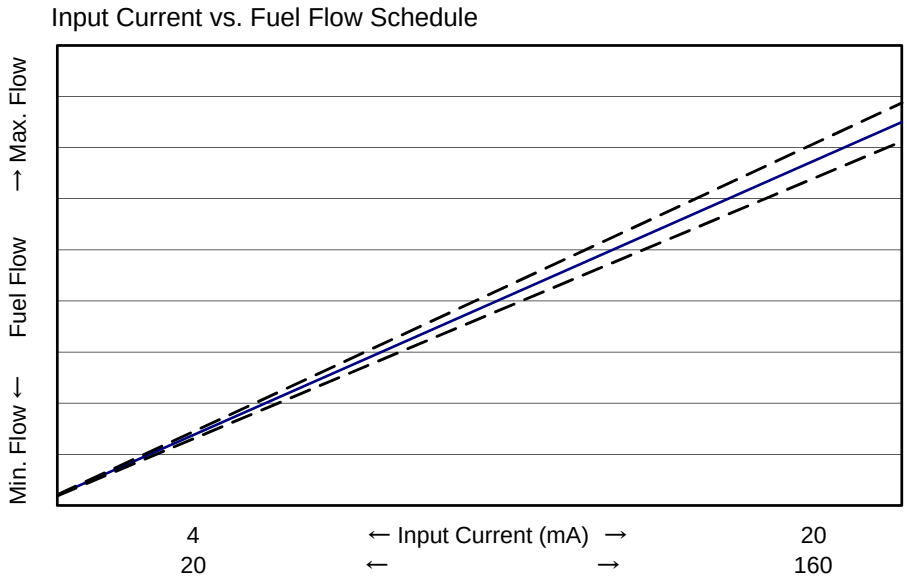


Figure 1-1. Example of Pipe Connection



Type of ELV

Fuel Flow Range	Input Current Range (mA)
9–204 kg/h (20–450 pph)	4–20
	20–160
9–340 kg/h (20–750 pph)	4–20
	20–160
14–567 kg/h (30–1250 pph)	4–20
	20–160
18–816 kg/h (40–1800 pph)	4–20
	20–160
36–1451 kg/h (80–3200 pph)	4–20
	20–160

Figure 1-2. Input Current vs Fuel Flow

IMPORTANT

Contact Woodward for the valve specification sheet, then write the necessary information on the sheet. Woodward can then determine an appropriate valve for your turbine based on this information.

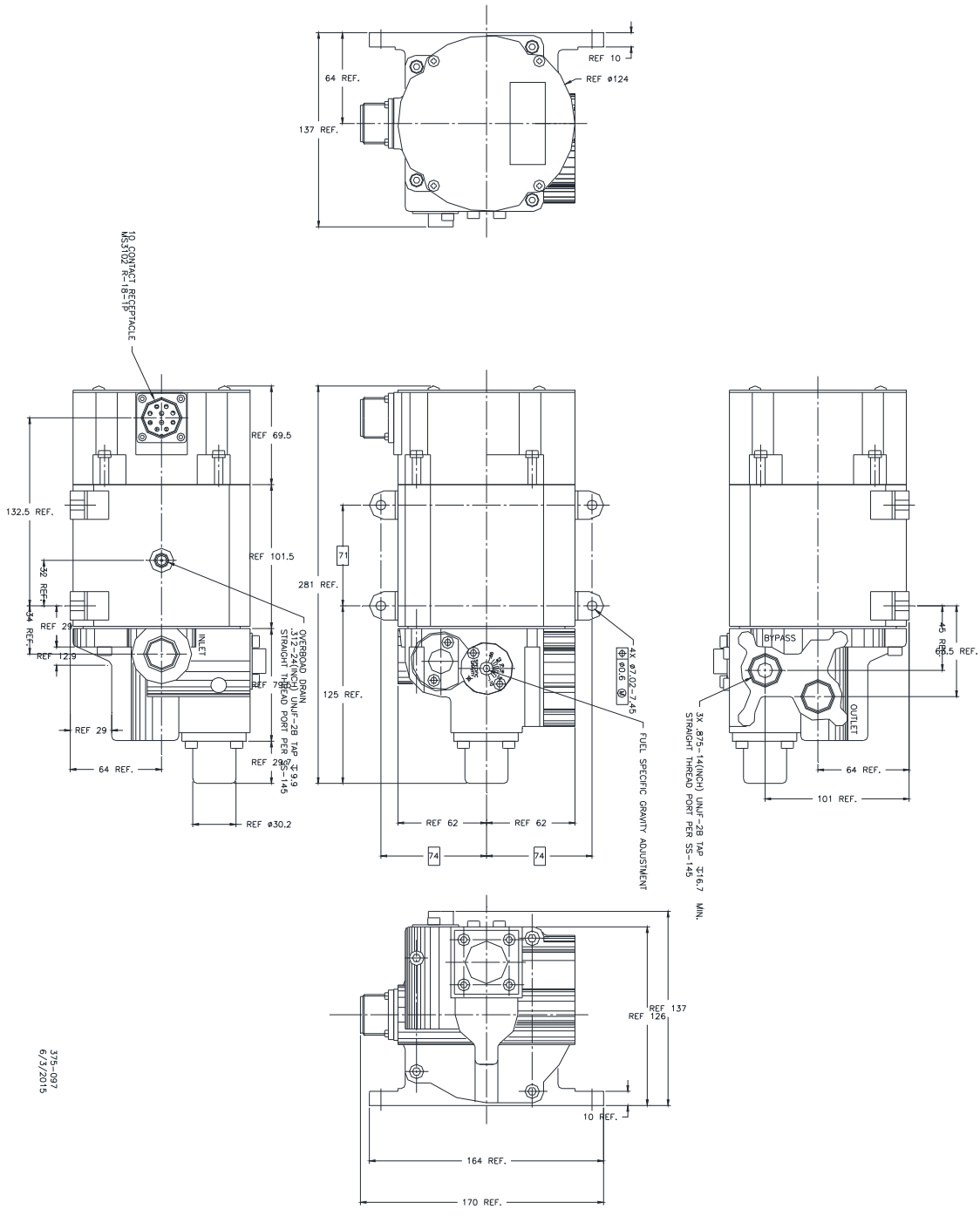


Figure 1-3. ELV Outline Drawing

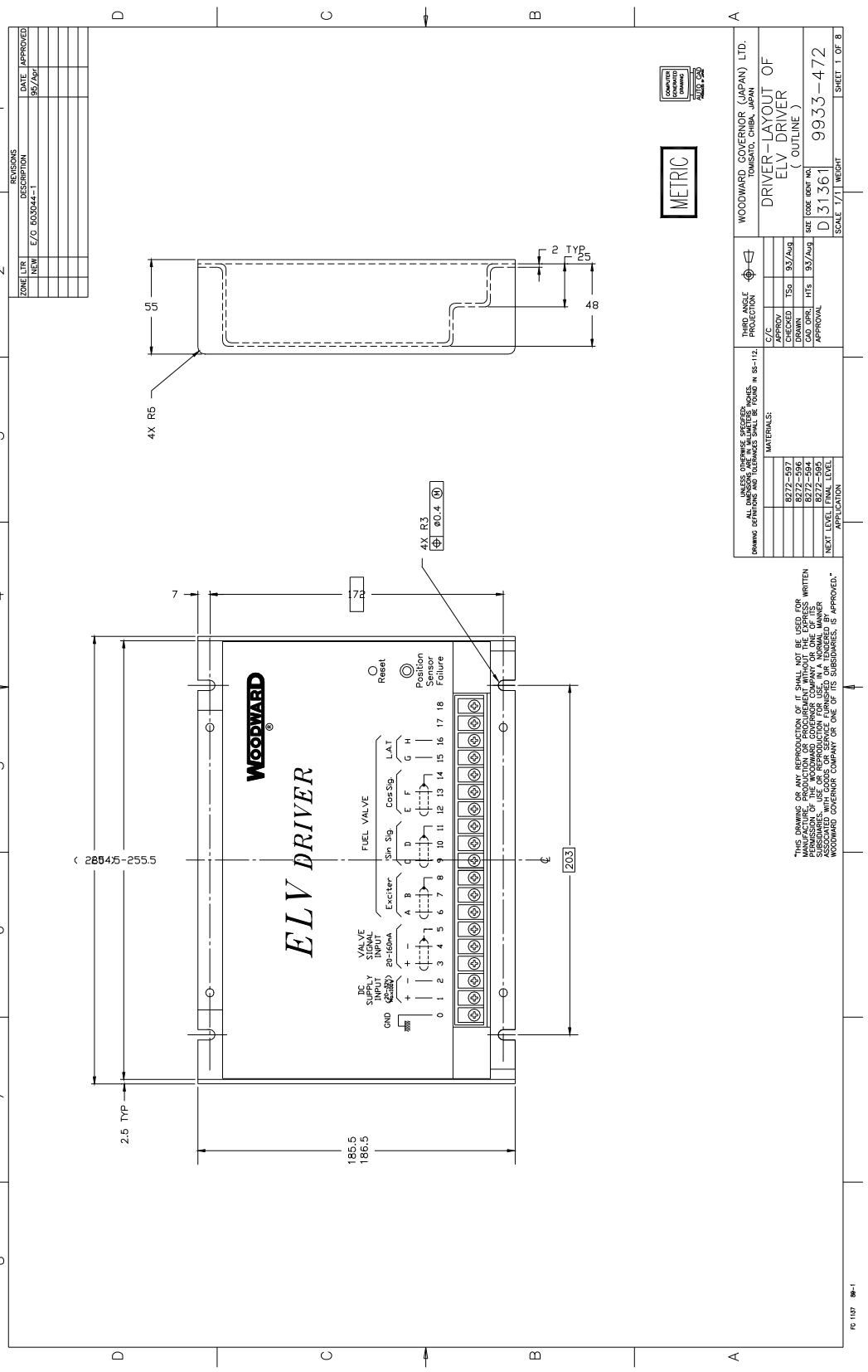


Figure 1-4. ELV Driver Outline Drawing

Chapter 2.
Installation

Introduction

This chapter describes unpacking the ELV and ELV driver (electric control), storage, and setting up the valve and driver.

⚠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.

Unpacking

The ELV and ELV driver are packed in industrial-approved materials in a packing carton and shipped to the customer after calibration in our plant. Cleaning and adjustments are unnecessary at the customer's site before installation.

Storage

The ELV and ELV driver can be stored as received. No special preparation for storage is necessary. Store these products in a low-humidity, non-corrosive environment.

⚠WARNING

The ELV valve and driver are tuned as a set in our plant. The valve will work correctly only when it is driven by the matched driver that was tuned at the factory. The matched valve and driver have the same serial number. DO NOT install a valve with a driver that have different serial numbers.

Customers MUST NOT tune the valve and driver separately.

Installation of the ELV Valve

Locate the valve where vibration is minimal, heat emission does not exist, and there is minimal dust in the atmosphere so that the equipment life will be longer.

Piping Installation to the Valve

1. See Figure 1-3 for the outline of the ELV, the attachment surface, and locations of inlet/output ports. The ELV must be fixed on a flat surface with four bolts (M6 size), washers, split washers, and nuts. See Specifications/Fuel Valve (Installation Attitude) on page 2 for proper orientation of the valve.
2. Connect fuel piping to the appropriate ports. Be careful when connecting so that dust does not enter into ports or piping.
3. Verify that no pressure loss happens at P1 (inlet pressure) and P2 (discharge pressure).
4. Verify that no back pressure is added to Pb (Bypass pressure).

Installation of the ELV Driver

Locate the driver so that the following conditions are met:

1. Adequate ventilation for cooling in order to protect electronic parts from damage by overtemperature
2. Adequate space for maintenance and repair
3. Protection from direct exposure to water or to a condensation-prone environment
4. Protection from high-voltage or high-current devices, or devices which produce electromagnetic interference
5. Operating temperature range from –20 to +60 °C
6. DO NOT mount the driver directly on the turbine. The ELV driver must be set in a cabinet in which other controllers and devices are accommodated in general (see Figure 2-1).

NOTICE

Anyone who wires the ELV driver MUST wear a wrist band connected to earth ground to protect electric parts from electrostatic discharge. All electronic parts mounted on the printed circuit board are very sensitive to electrostatic discharge, and some are easily damaged by electrostatic discharge.

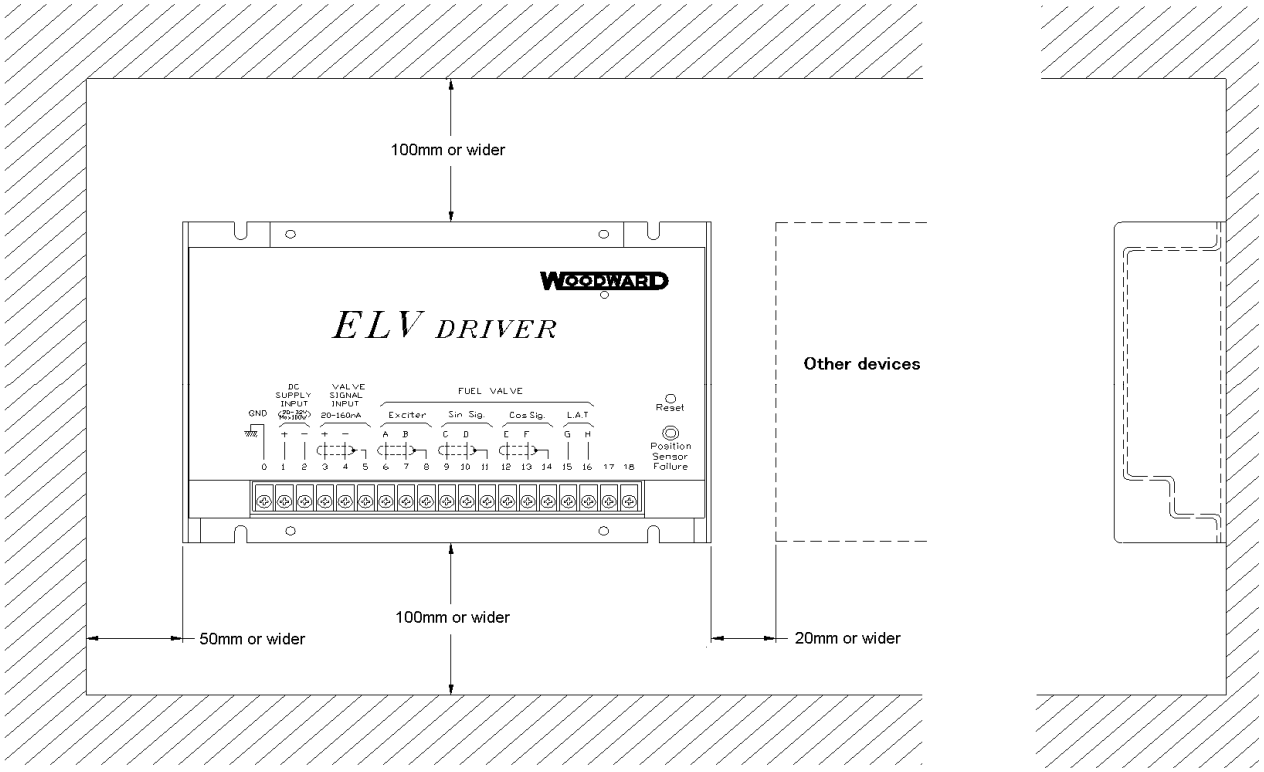
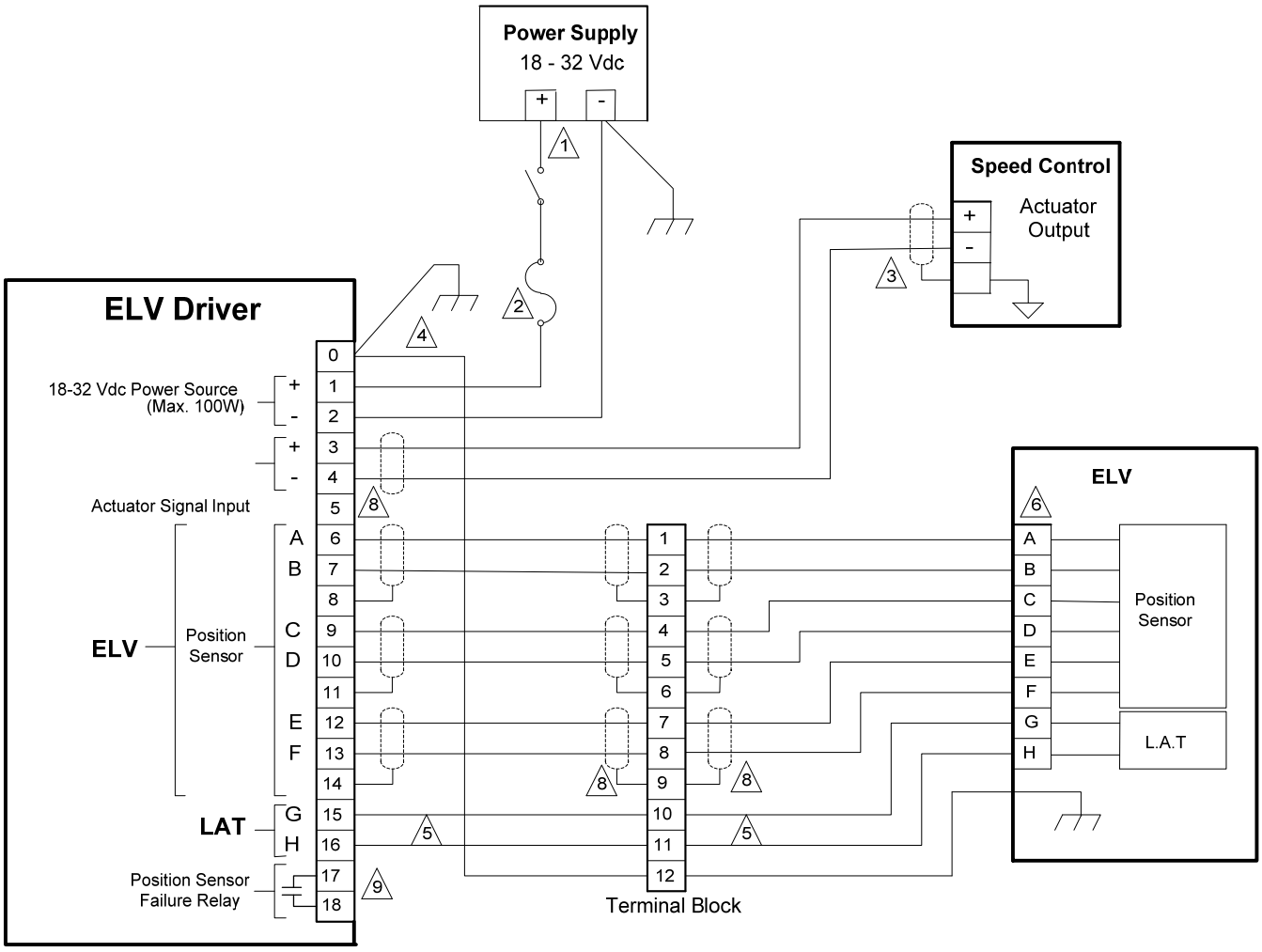


Figure 2-1. Driver Installation Location and Space Around the Driver

Electric Wiring

Refer to the appropriate Woodward governor/controller manual to wire the governor/controller connected to ELV driver. See Figure 2-2 below for wiring between the governor/controller and the ELV driver, between the driver and the ELV, and between the driver and the power supply.



1. Connect the power leads directly from a conditioned, regulated power source to the ELV driver. DO NOT power other devices with leads common to the control. Use 12 AWG (3 mm²) wire or larger for wiring, and the wiring length MUST be less than or equal to 20 m (65 ft).
2. Use only a 15 A fuse (slow-blow type).
3. Use only shielded, twisted-conductor pairs for wiring of all signal lines, and connect all shields to ground at the end of ELV driver except the cable from the governor/controller. Use 18 AWG (0.8 mm²) wire or larger for signal line.
4. Connect earth ground to terminal 0 with 12 AWG wire (1 meter max.). Additionally, connect GND (Ground) wire to valve unless ELV driver and valve are at the same GND (Ground) potential.
5. Use 12 AWG (3 mm²) wire for wiring, and the max wiring length must be 50 m (164 ft).
   In case the wiring length is near the maximum and the power supply voltage is approximately 18 V, the response of the ELV will deteriorate. The power supply voltage needs to exceed 24 V to improve the response in this case.
6. Use the 10-conductor receptacle with 1.125-18 NEF THREAD. Fitting connector is MS 3106A-18-1S or Woodward P/N 203694.
7. If there is no terminal to connect the shield to the ground at the governor/controller end, terminal 5 of the ELV driver can be used to connect the shield to the ground.
8. If an intervening terminal is used, upstream shields and downstream shields must be connected.
9. Contacts open when position sensor fails.

Figure 2-2. ELV Electric Wiring Diagram

Chapter 3.
Operation and Adjustment

Introduction

This chapter describes the initial adjustment and operation of the ELV.

Initial Operation

Check if the ELV and the ELV driver are set as specified, fuel piping is correctly connected, and all wiring is correct, before starting the prime mover.

⚠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.

⚠WARNING

NEVER CONNECT PIPES TO BYPASS THE PUMP OR THE SHUT-OFF VALVE.

Do not use the ELV's relief valve or bypass valve for any purpose except protecting the equipment.

Adjustments

Woodward has set the flow calibration per the customer's specification at the factory for each ELV and Driver (matched set). No further adjustment is necessary at customer site.

⚠WARNING

The ELV valve and driver are tuned as a set in our plant. The valve will work correctly only when it is driven by the matched driver that was tuned at the factory. The matched valve and driver have the same serial number. DO NOT install a valve with a driver that has a different serial number.

Customers MUST NOT tune the valve and driver separately.

Chapter 4.
Description of Operation

Introduction

This chapter describes the operation of the ELV. Figure 4-1 shows the schematic diagram of the ELV.

The ELV consists of the following 7 major parts:

- Limited angle torque motor (LAT) (high performance actuator)
- Resolver (high resolution position sensor)
- Rotary valve
- Relief valve mechanism
- Delta P regulator
- Specific gravity adjustment mechanism
- Electric driver

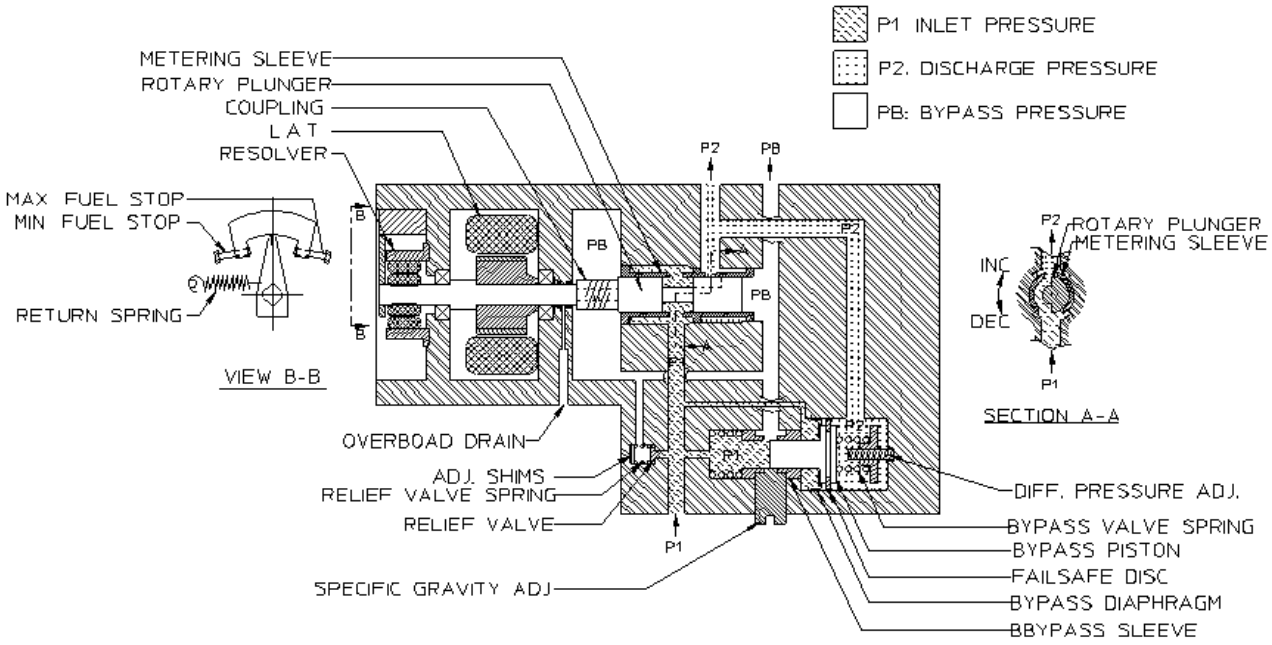


Figure 4-1. Schematic Diagram

General Description

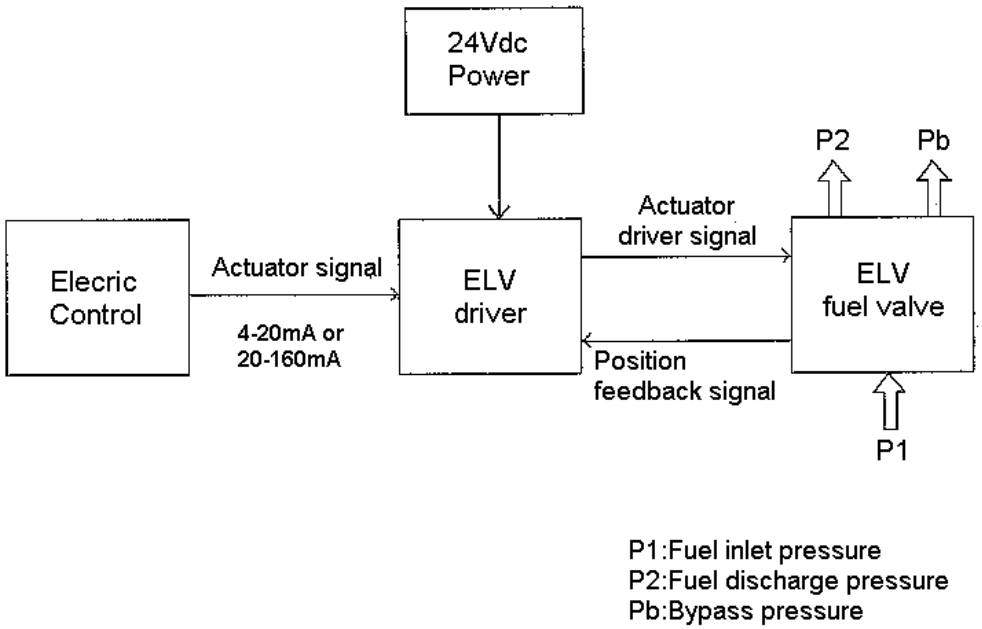
The ELV is driven by an LAT (limited angle torque motor), which provides high performance and accurate positioning. The motion of the LAT is transmitted to the fuel valve through an internal coupling. The max valve travel is limited within 40 degree by internal stops. The discharge flow from the ELV is proportional to the input signal current to the ELV driver.

Operation

See Figure 4-2 (Signal Flow Diagram). An electric governor/control outputs the actuator output signal to the ELV driver, then the ELV opens its valve according to the specification shown in Figure 1-1. The tolerance of the discharge flow against driver input current is ±5% (only if the ELV driver serial number and ELV serial number are the same).

Woodward guarantees this operation only if we have agreed to the specification in advance. The customer must send us the proposed specification for approval before ordering the product.

IMPORTANT **Customers must review the specification with Woodward engineering to confirm if it is correct and realizable before sending an order.**



IMPORTANT **Contact Woodward for the valve specification sheet, then write the necessary information on the sheet. Woodward can then determine an appropriate valve for your turbine based on this information.**

Figure 4-2. Signal Flow Diagram

Chapter 5.
Maintenance

Introduction

This chapter describes the troubleshooting of the ELV valve and driver.

⚠WARNING

The ELV valve and driver are tuned as a set in our plant. The valve will work correctly only when it is driven by the matched driver that was tuned at the factory. The matched valve and driver have the same serial number. DO NOT install a valve with a driver that has a different serial number.

The ELV valve and driver must be replaced as a matched set. Customers need to send both the valve and driver together to Woodward for troubleshooting, calibration, or repair.

Verify correct installation as described in Chapter 2.

Troubleshooting

Although problems in a turbine control system often appear as unexpected or inappropriate speed changes, this does NOT necessarily mean that the problem is caused by the ELV. Therefore, customers need to check all the parts of the turbine and the turbine control system when a problem occurs. Also read the governor/controller manual to help determine where the trouble is. Follow the procedures below to identify if the trouble is caused by the ELV.

1. Check the piping between the turbine, accessories, and the ELV to verify if it was designed and installed according to the specifications in this manual. If any deviation from the specification is found, redesign and modify the piping.

2. Shorten the pipe length to the ELV's P1 port, and remove any dust or contamination in the pipe well. The following filter must be installed in the P1 line: Filter size = 10 µm (abs.)

3. Verify that the shutoff valve is installed according to the specification on page 2.

4. Do not use low quality fuel because it will cause valve trouble.

5. Keep fuel viscosity in the range specified on page 2. Use a heater to warm fuel when it is so cold that the viscosity may be out of the specified range.

6. Take care that inlet fuel pressure and discharge fuel pressure will not exceed the specified range on page 2.

7. The ELV has a relief valve to protect itself. DO NOT use the relief valve except for ELV protection. (NEVER use as a bypass of a pump or a shutoff valve.)

8. The ELV contains a differential pressure regulating valve to control differential pressure. DO NOT use this valve except for the specified purpose. (NEVER use as a bypass of a pump or a shutoff valve.)

9. When installing, repairing, or overhauling the ELV, any dust or contamination entering the ports or piping will cause trouble. Remove dust or contamination on ELV ports and inside of piping completely before connecting a pipe to a port.

10. Ideal back pressure of the bypass line is zero. The tolerance of back pressure is 14.2 psig (98 kPa) (maximum). Contamination may enter into the Pb port if back pressure exists.

11. Inadequate shield wiring between the ELV valve and ELV driver can cause inaccurate control. Check the integrity of the wiring harness if a control malfunction is observed. Shield cables are used to protect the ELV system from electromagnetic interference. Shield wiring should be done according to Figure 2-2. Do not run high voltage cables near the electrical wiring of the ELV system. Double shielded cable and/or electrical steel ducting is preferable for control signal wiring among control devices. Electromagnetic interference is caused by various reasons, so it is difficult to find root causes and take effective countermeasures. Investigate if electromagnetic interference exists or not if system performance is not satisfactory.

12. If the ELV does not work with the control signal from the electric governor/control during turbine start-up, check the electrical wiring and power supply voltage. In case of position feedback signal failure/short between the ELV and ELV driver, the ELV fail-safe function will return the ELV to minimum fuel position and turn on the Position Sensor Failure alarm lamp.

Alarm Reset Procedure

If the Position Sensor Failure alarm lamp is on, check the feedback signals for failure/short (ELV driver terminal #6, 7, 9, 10, 12, and 13) and correct the failure/short condition if necessary. Then press the reset button through the hole of the driver panel using a non-conductive rod to reset the ELV, or cycle the power supply voltage to the driver.

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.

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 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

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (0) 21 52 14 51
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

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

Turbine 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

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

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:

Your Name	
Site Location	
Phone Number	
Fax Number	
Engine/Turbine Model Number	
Manufacturer	
Number of Cylinders (if applicable)	
Type of Fuel (gas, gaseous, steam, etc)	
Rating	
Application	
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	

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 37521D.

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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.

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