

Product Manual 45011 (Revision NEW) Original Instructions

1907 Liquid Fuel Valve with Solid Piston Limiter

Installation and Operation Manual



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

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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:

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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.

WARNINGOverspeed /
Overtemperature /
OverpressureOverspeed /
overspeed /
overspeed shutdown device must be totally independent of the
prime mover control system. An overtemperature or overpressure
overspeed 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
	 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 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

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.

Battery Charging Device

Electrostatic Discharge Awareness

NOTICE	Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:
Electrostatic Precautions	 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 1907 Liquid Fuel Valve/Limiter meters fuel to gas turbines under all operating conditions. The fuel valve is mechanically linked to and operated by a governor actuator, which determines the amount of fuel flow required for any gas turbine mode of operation. The limiter function overrides the actuator input during starting and rapid acceleration, preventing excessive heating of the gas turbine.

Description

The fuel valve/limiter consists of three sections: a fuel-metering valve, a bypass valve, and an acceleration limiter.

The fuel-metering valve section consists of a hollow plunger, housed within a ported sleeve. A spring holds the end of the plunger in contact with either the input lever or the fuel-limiter. The size and shape of the metering port is determined by the turbine fuel-flow requirements.

The bypass-valve section consists of a spring-loaded rolling diaphragm, which senses both fuel inlet and outlet pressure, to control the position of a bypass-valve plunger in a ported sleeve. An adjustment is provided for positioning the bypass-valve sleeve.

The acceleration-limiter section consists of a spring-loaded piston, mechanically linked to the fuel-limiter lever. Adjustment of the fuel-limiter lever is provided to change the fuel flow to the compressor discharge pressure (CDP) ratio.

Specifications

Outside dimensions and installation data are provided in Figure 2-1. Fuel types and flow specifications are:

Fuel Types	aviation gasoline, JP-4, JP-5, or diesel fuel
Specific Gravity	0.70 to 0.85
Fuel Flow	100 to 3120 lb/h (45 to 1415 kg/h)
Fuel Pressures:	
Inlet	950 psig max. (6550 kPa max.)
Outlet	900 psig max. (6206 kPa max.)
CDP	155 psig max. (1069 kPa max.)
Static Test	1400 psig (9653 kPa)

Chapter 2. Installation

Introduction

Install the fuel valve/limiter square with the governor/actuator linkage to prevent binding. The actuator should use about two-thirds of the available output between minimum and maximum. The remainder of the actuator travel should be split between the maximum and minimum ends to assure positive position for shutdown and for maximum fuel. The final minimum and maximum fuel flows will be set on the fuel valve. The linkage should be designed to provide linear connection between the actuator and the fuel valve. (A given movement of the actuator output will cause an equal movement of the fuel valve.)

This unit is calibrated before shipment and a minimum use of adjustments is recommended. If adjustments are needed, refer to Figure 2-1 for adjustment location and then follow the procedures listed below.

Adjustments

- 1. The fuel-level adjustment screw increases the fuel-flow limit for any given CDP value when turned counterclockwise.
- 2. The minimum-limiter stop screw increases the minimum-fuel limit when turned clockwise.
- 3. The minimum-fuel stop screw increases the minimum-speed setting when turned clockwise.
- 4. The maximum-fuel stop screw increases the maximum-speed setting when turned counterclockwise.
- 5. The specific-gravity adjustment changes the pressure drop across the metering port. It is set by loosening the two screws holding the plate and turning the socket-head screw, aligning its scribe mark with the desired specific-gravity mark on the plate.
- 6. The adjustable limiter lever (internal adjustment) changes the ratio of fuel flow to CDP.

IMPORTANT

This adjustment should be made only if adequate test facilities are available.



Figure 2-1. Outline Drawing and Adjustment Locations (Do not use for construction.)

Chapter 3. Principles of Operation

General

The fuel valve/limiter is used in conjunction with a governor/actuator. Fuel is metered to the turbine for starting, acceleration, steady-state operation, and deceleration. The limiter section meters fuel flow during acceleration as a function of turbine CDP. During steady-state operation, fuel flow is controlled by the mechanical linkage from the governor/actuator.

Starting

The fuel limiter will be in the minimum-acceleration fuel position, with the limiter lever against the minimum-limit stop screw. The adjustable limit lever controls the position of the metering piston. Under these conditions, the metering discharge port is opened sufficiently to allow the required starting-fuel flow. Fuel from the fuel pump enters the inlet port (P_1) where it is directed through the metering port to the discharge port (P_2) and then to the engine. Excess fuel is returned to the pump inlet through the bypass valve.

Acceleration

As the gas turbine reaches ignition speed, the governor/actuator rotates the governor connecting lever to the maximum-fuel position and moves the input lever clockwise, away from the metering piston. However, the metering piston is held in the starting position by the adjustable limiter lever. Following ignition, the gas turbine accelerates toward the governor speed setting. CDP increases with turbine speed, causing the limiter piston to move away from the minimum limiter stop and rotate the adjustable limiter lever counterclockwise. The piston-loading spring now moves the metering piston upward, allowing more fuel to flow. This action continues until the turbine reaches the preset governor speed.

Steady State

When the turbine has accelerated to the governor preset speed, the governor rotates the governor connecting lever counterclockwise to decrease fuel. In this condition, fuel flow is regulated by the governor which increases or decreases fuel as a function of speed.

Deceleration

During large reductions in load or speed setting, the governing system will reduce fuel flow to the turbine by moving the fuel valve. The minimum-fuel adjustment limits the movement of the throttle shaft to provide the minimum fuel flow necessary to sustain combustion and prevent flameout.

Bypass Feature

A constant pressure drop is maintained across the metering port to allow the port opening to accurately meter fuel flow. Inlet pressure (P₁) is applied to one side of the bypass diaphragm and outlet pressure (P₂) to the opposite side. The bypass piston is positioned by the force exerted by (P₂) plus the spring force acting on the bottom side of the diaphragm and by the force (P₁) exerted on the top side. With these forces in balance, the spring force against the diaphragm determines the pressure drop (P₁ minus P₂) across the fuel metering port. The diaphragm positions the bypass-valve plunger with respect to the bypass port, thereby controlling the amount of fuel returned to the pump inlet (P₀). The bypass control provides a constant differential pressure across the metering valve, regardless of variations in flow or pressure level.

An increase in outlet flow increases P_2 , unbalancing the forces acting across the diaphragm. The diaphragm then moves up to reduce bypass flow, causing pressure P_1 to increase until the forces acting across the diaphragm are again balanced and movement stops.

A decrease in outlet flow decreases P_2 , unbalancing the forces acting across the diaphragm. The diaphragm then moves down to increase bypass flow, causing pressure P_1 to decrease until the forces acting across the diaphragm are again balanced and movement stops.

Failsafe Feature

The bypass valve includes a failsafe disc to prevent excessive fuel flow to the turbine, should the bypass-valve diaphragm rupture. The area of the disc is greater than the effective area of the diaphragm. This reduces the differential pressure across the metering port to compensate for the leakage past the diaphragm and disc in the event of a rupture. The failsafe feature has no function if the diaphragm is in good condition.

Auxiliary Start Feature (optional)

During start-up, the optional auxiliary-start feature provides a separate fuel supply to the turbine. The schematic (Figure 3-2) shows two openings; one for the main metering port to discharge pressure (P_2), and one for auxiliary start. The main metering port is at a minimum-fuel position during shutdown. When the governor calls for fuel at start up, the auxiliary-start metering port supplies fuel through a separate line. As the metering piston rises, the main metering port (P_2) releases fuel in addition to the auxiliary-start metering port. As the turbine speed continues to increase the CDP limiter increases, allowing the metering piston to rise. The auxiliary-start port closes while the main metering port takes over, supplying fuel to the turbine.

Input Shaft Torsion Spring (optional)

The input-shaft torsion spring, shown in Figure 3-2, forces the governor connecting link to the minimum fuel-stop position, if a connecting link should break or become disconnected. This spring has no function when the linkage or governor has not failed.

Relief Valve (optional)

A spring-loaded, poppet-type relief valve can be included to protect the system from excessive pressure. Shims are used to adjust the pressure at which the valve will dump fuel to bypass (P_0).



Figure 3-1. Schematic Diagram of 1907 Liquid Fuel Valve/Limiter



Figure 3-2. Schematic of 1907 Liquid Fuel Valve/Limiter with Auxiliary Features.

Chapter 4. Maintenance

Troubleshooting

Faults in the governing system are usually revealed in speed variations of the turbine, but it does not necessarily follow that such speed variations indicate governing system faults.

When improper speed variations appear, check all components, including the turbine and fuel supply, for proper operation. Refer to the governor system manuals for assistance in isolating the trouble.

The following steps describe troubles relating to the fuel valve/limiter:



- Check the linkage between the governor and the fuel valve/limiter to make certain there is no binding or lost motion. Disconnect the actuator linkage and check that the valve input shaft can be rotated between stops without exceeding a torque of 15 lb-in (1.7 N·m).
- 2. During cranking (before ignition speed), the governor/actuator should rotate the valve input shaft to the maximum-fuel stop. If this does not occur, the governor oil supply and the linkage should be checked again. If possible, substitute a spare governor to determine if the initial governor was faulty.
- 3. If the governor moves the fuel-valve input shaft to the maximum-fuel stop during cranking, but ignition does not occur, the minimum-limiter stop may be set too low. To increase, turn screw clockwise.
- 4. If starting occurs, but acceleration is very slow, the fuel-limit level may be too low. To increase, turn fuel-level adjustment screw counterclockwise.
- 5. If acceleration to rated speed does not occur with the governor speed setting properly adjusted, it may be due to:
 - a. Fuel-limit lever being set too short
 - b. A CDP signal leak
 - c. Maximum-fuel stop set too low
- 6. If overtemperature occurs during acceleration, the adjustment-limit lever may be set too long or the fuel-level adjustment set too high.
- 7. If the load carried by the turbine is limited by the maximum-fuel adjustment, increase this adjustment, being careful not to exceed any of the operating conditions recommended by the turbine manufacturer.
- 8. If any valve/limiter malfunction is indicated, refer to disassembly, cleaning, inspection, and assembly procedures for repairing the unit.

Disassembly

When disassembling the fuel valve/limiter, follow the sequence of index numbers assigned to Figures 5-1 and 5-2.

- 1. Clean the exterior surface of the valve/limiter.
- 2. Discard all gaskets, O-rings, seals, retaining rings, cotter pins, clips, and lock nuts removed in the process of disassembly.
- 3. Do not remove press-fit components unless replacement is necessary. Removal of these components may necessitate replacement.
- 4. Do not turn screw (15) in spring seat (14). If the screw must be removed, make necessary measurements so it can be replaced in its original position.
- 5. Record the position of eccentric 31 before removing it.
- Loosen one adjusting screw only to remove fuel-limiter lever (see Figure 4-1). The other screw maintains the correct position for reassembly.
- 7. If both adjustment screws are removed, measure the "X" dimension (Figure 4-1) so these parts can be replaced in the original position.



Figure 4-1. Measurement of Fuel-Limit-Lever Position

- 8. Mark shaft (56) at a point parallel to the slot in the throttle stop (2).
- 9. To remove the bypass-valve sleeve (33), insert your finger (or a wooden dowel) in the cover end of the bypass-valve bore and push the sleeve out of the body through the diaphragm end of the bore. Do not remove the sleeve through the cover end of the bypass-valve bore.
- 10. Pull throttle shaft (56) out of the body, removing input lever (55) and bearing (57) in the process.

- 11. Remove plugs (61 and 91) from the body using a 12-24 screw for a puller.
- 12. Insert a wooden dowel in the access port from which plug (61) was removed and push the CDP shaft (93) out of the body. Remove spacer (94), CDP lever (95), key (96), bearing (97), and spacer (98) in the process.
- 13. Use a hook-shaped scribe to pull out spacer (100), together with packing (102) and channel seal (101). Remove packing (103), then remove seal spacer (104) and remaining channel seal (101) together with packing (102).

Cleaning

Immerse all metal parts in cleaning solvent and wash ultrasonically or by agitation. Use a non-metallic brush or jet of compressed air to clean slots, holes, or apertures.

Dry all cleaned parts with clean, dry compressed air.

Inspection

- 1. Visually inspect all parts for wear or damage.
- 2. Inspect bearings in accordance with standard shop practice. Replace bearings when there is any detectable roughness.
- 3. All pistons, valves, plungers, and rods should move freely, without excessive play. Do not lap parts if possible to free by other means. Carefully inspect any bores which contained damaged pistons or plungers.
- 4. Polish slightly corroded, scored, or nicked parts with crocus cloth and oil. Discard parts with excessive wear or pitting.

Assembly

Assemble the fuel valve/limiter in reverse order of index numbers assigned to Figures 5-1 and 5-2, following the special instructions below. A dust-free area is recommended for assembly.

Obtain new gaskets, O-rings, seals, retaining rings, cotter pins, etc., to replace those discarded during disassembly.

- 1. Lubricate O-rings and channel seals with petroleum jelly or light lubricating oil before installation. Lubricate rolling diaphragm (21) with Molykote before installation. Lubricate metal parts lightly with oil before assembly.
- Press bearing (105) into body (109) with a 3/8 inch inside diameter tube (O.D. slightly less than 1/2 inch) through access bore from which plug (61) was removed. Press bearing in until seated against shoulder.
- 3. Assemble O-ring (102) on channel seal (101). Insert one seal set into shaft bore and seat against shoulder. Insert grooved seal spacer (104) into shaft bore and seat against previously inserted seal set. Install o-ring (103) in groove in shaft bore.

- 4. Insert CDP shaft (93) partially into body, engaging CDP lever (95) and taking care not to dislodge spacer (98) or channel seals (101). Align key in shaft with keyway in lever and complete insertion of shaft.
- Start set screw (87) into fuel-limit lever (88), if previously removed. Assemble lever on inner end of CDP shaft and seat against spacer (94). Adjust set screws to obtain dimension "X" recorded during disassembly.
- 6. To assemble the limiter piston install new o-rings (77 and 73) to sleeve (78). Attach link (82) to piston (74) with press pin (74A). (Pin slips through one side of piston, slips through lever and presses into other side of piston.) Attach piston-link assembly to lever (95) with pin (81), washer (80), and cotter pin (79). Coat the o-rings on sleeve (78) with lubricant and install in the valve body. Attach spring (71), spring seat (70), race (69), and set-screw seat (68). Add limiter body (67) and carefully assemble remaining parts.
- 7. Assemble one O-ring (34) in groove at outer end of bypass-valve sleeve (33). Do not install second O-ring (34) at this time. Insert sleeve in body from side opposite cover (25) until outer land of o-ring grove is flush with bottom of diaphragm counter bore in body. Assemble O-ring (32) on eccentric (31) and insert it into body, turning as required so the eccentric pin projects into the relieved center section of the sleeve. Install adjustment plate (30). Install second o-ring (34) on shouldered end of sleeve (33) from cover end of bore. Carefully assemble remaining parts in sequence.
- 8. Insert sleeve (35) into body with metering port facing toward the outlet port.
- 9. Assemble rolling diaphragm (21) on bypass-valve plunger (23). The bead on the outer flange of the diaphragm must face outward. Support outer flange of the diaphragm and push piston into diaphragm, rolling diaphragm back over piston for about 1/3 of the length of the piston. Insert piston end of assembly into sleeve (16) from large end, working rolled section of diaphragm into the relieved port of the sleeve ID between sleeve and piston. Hold sleeve and piston so failsafe disc (19) is about 1/8 inch from outer end of sleeve and seat diaphragm bead in the groove in the large end of the sleeve. Carefully insert assembled parts into body, making sure diaphragm bead is not dislodged. Test the action of the plunger and diaphragm.

Testing And Calibration

Test and calibration specifications are available from Woodward upon request. Be sure to specify the part number and serial number of the fuel valve/limiter.

Chapter 5. Replacement Parts

When ordering replacement parts it is essential that the following information be given:

- Fuel valve/limiter serial number and part number (as shown on nameplate)
- Manual number (this is manual 45011)
- Part reference number in parts list and description of part or part name

Figures 5-1 and 5-2 show and list all replacement parts of the basic 1907 Fuel Valve/Limiter. Index numbers are assigned in disassembly sequence.

IMPORTANT

Index numbers are used, not Woodward part numbers. When replacement parts are ordered, the specific parts list that matches the serial number of the individual fuel valve is compared with the index number to supply the correct part. The serial number must be supplied along with the parts order.

Ref. No.	Part NameQuantity	Ref. No.	Part NameQuantity
40011-1	Screw1	40011-41	Packing, preformed (O-ring)
40011-2	Governor connecting lever1		(aux. start, optional)2
40011-3	Nut, hex2	40011-42	Packing, preformed (O-ring)
40011-4	Set screw2		(aux. start, optional)1
40011-5	Spring, torsion (optional)1	40011-42A	Needle valve1
40011-6	Spring, seat collar (optional)1	40011-43	Stop, fuel-valve sleeve
40011-7	Screw5		(aux. start, optional)1
40011-8	Screw (aux. start, optional)5	40011-44	Packing, preformed (O-ring)
40011-9	Plate1		(aux. start, optional)1
40011-10	Plate (aux. start, optional)1	40011-45	Packing, preformed (O-ring)
40011-11	Cover, bypass valve1		(aux. start, optional)1
40011-12	Packing, preformed (O-ring)1	40011-46	Sleeve, fuel valve
40011-13	Spring, bypass valve1		(aux. start, optional)1
40011-14	Seat, assy., bypass valve spring1	40011-47	Packing, preformed (O-ring)
40011-15	Set screw1		(aux. start, optional)1
40011-16	Sleeve, diaphragm clamping1	40011-48	Spring, fuel valve
40011-17	Nut, hex, self locking1		(aux. start, optional)1
40011-18	Seat, bypass valve spring1	40011-49	Valve, metering (aux. start, optional) 1
40011-19	Disc, failsafe1	40011-50	Plug and bleeder1
40011-20	Piston, diaphragm1	40011-51	Packing, preformed (O-ring)1
40011-21	Diaphragm, bypass rolling1	40011-52	Pin, spring1
40011-22	Clamp, diaphragm1	40011-53	Screw
40011-23	Plunger, bypass valve1	40011-54	Plate, retainer1
40011-24	Screw	40011-55	Lever, input1
40011-25	Cover, bypass valve1	40011-56	Shaft, throttle1
40011-26	Packing, preformed (O-ring)1	40011-57	Bearing, ball1
40011-27	Spring, bypass valve1	40011-58	Packing, preformed (O-ring)2
40011-28	Seat, loading spring1	40011-59	Screw2
40011-29	Screw2	40011-60	Washer, flat, CRES, 13/64 ID
40011-30	Plate, bypass valve adjustment1		x 5/8 OD x 1/162
40011-31	Eccentric, spring gravity1	40011-61	Plug, relief valve1
40011-32	Packing, preformed (O-ring)1	40011-61A	Plug (optional)1
40011-33	Sleeve, bypass valve1	40011-62	Packing, preformed (O-ring)1
40011-34	Packing, preformed (O-ring)2	40011-62A	Packing, preformed (O-ring)1
40011-35	Sleeve, fuel metering valve1	40011-63	Packing, preformed (O-ring)1
40011-36	Packing, preformed (O-ring)1	40011-653A	Packing, preformed (O-ring)1
40011-37	Packing, preformed (O-ring)1	40011-64	Valve, relief (optional)1
40011-38	Spring, fuel metering valve1	40011-65	Nut4
40011-39	Plunger, metering valve1	40011-66	Washer, flat, CRES, 1/4 ID x 7/16
40011-40	Nozzle, fuel (aux. start, optional)1		OD x 1/324

Ref. No.	Part NameQuantity	Ref. No.	Part Name Quantity
40011-67	Cover assembly, CDP spring1	40011-88	Lever, fuel limit1
40011-68	Collar 1	40011-89	Screw2
40011-69	Bearing, thrust1	40011-90	Washer, flat, CRES, 13/64 ID
40011-70	Seat, CDP spring (upper) 1		x 5/8 OD x 1/162
40011-71	Spring, CDP limiter 1	40011-91	Plug, packing1
40011-72	Set screw1	40011-92	Packing, preformed, (O-ring)1
40011-73	Packing, preformed (O-ring)1	40011-93	Shaft, CDP1
40011-74	Piston Limiter1	40011-94	Spacer, bearing (small)1
40011-74A	Pin, press1	40011-95	Lever, CDP1
40011-75	Not used	40011-96	Key, Woodruff1
40011-76	Washer, seal1	40011-97	Bearing, ball1
40011-77	Packing, preformed (O-ring)1	40011-98	Spacer (large)1
40011-78	Sleeve 1	40011-99	Ring, retaining1
40011-79	Pin, cotter1	40011-100	Spacer, packing1
40011-80	Washer, flat, CRES, 0.205 ID	40011-101	Seal, channel2
	x .360 OD x 0.0301	40011-102	Packing, preformed (O-ring)2
40011-81	Pin 1	40011-103	Packing, preformed (O-ring)1
40011-82	Link 1	40011-104	Spacer, seal1
40011-83	Screw, 1/4-28 x 1-3/4 1	40011-105	Bearing, ball1
40011-84	Nut, 1/4-281	40011-106	Pin, straight, 0.251 x 1.2501
40011-85	Washer 1	40011-107	Screw, drive2
40011-86	Seal, thread2	40011-108	Nameplate1
40011-87	Screw, set2	40011-109	Body assembly, fuel valve1



Figure 5-1. Exploded View of Fuel Valve





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.

NOTICE

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: <u>www.woodward.com</u>.

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	Engine Systems	Turbine Systems
FacilityPhone Number	FacilityPhone Number	FacilityPhone Number
Brazil+55 (19) 3708 4800	Brazil+55 (19) 3708 4800	Brazil+55 (19) 3708 4800
China +86 (512) 6762 6727	China +86 (512) 6762 6727	China +86 (512) 6762 6727
Germany+49 (0) 21 52 14 51	Germany +49 (711) 78954-510	India+91 (129) 4097100
India+91 (129) 4097100	India+91 (129) 4097100	Japan +81 (43) 213-2191
Japan +81 (43) 213-2191	Japan +81 (43) 213-2191	Korea +82 (51) 636-7080
Korea +82 (51) 636-7080	Korea +82 (51) 636-7080	The Netherlands- +31 (23) 5661111
Poland+48 12 295 13 00	The Netherlands- +31 (23) 5661111	Poland+48 12 295 13 00
United States +1 (970) 482-5811	United States +1 (970) 482-5811	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	
Woodward Part Number & Rev. Letter Control Description or Governor Type	
Woodward Part Number & Rev. Letter Control Description or Governor Type Serial Number	
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 #2 Woodward Part Number & Rev. Letter	
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	
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	
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 Control/Governor #2 Woodward Part Number & Rev. Letter Control Description or Governor Type Serial Number Control/Governor #3 Woodward Part Number & Rev. Letter	
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	

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 45011.



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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.