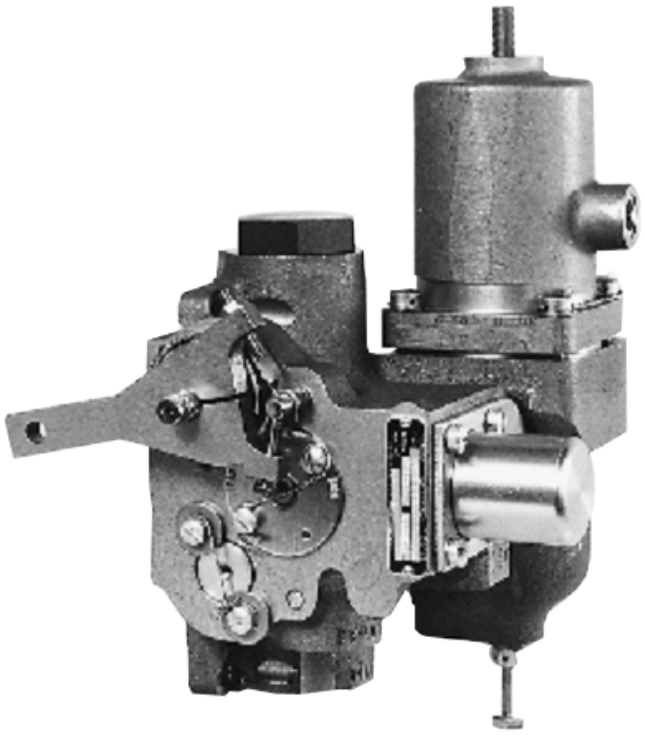
WOODWARD

Product Manual 40053
(Revision B)
Original Instructions



1907 Liquid Fuel Valve/Limiter

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:

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 Out-of-date translations are marked with ⚠.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

Contents

Illustrations and Tables

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.

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 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, thereby preventing excessive heating of the gas turbine.

Description

The fuel valve/limiter consists essentially 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. The end of the plunger is held in contact with either the input lever or the fuel limiter lever by a spring. 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 rolling diaphragm mechanically linked to the fuel limiter lever. Adjustment of the fuel limiter lever is provided to change the fuel flow to CDP ratio.

Specifications

Refer to Figure 2-1 for fuel valve/limiter outline and mounting data.

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)

IMPORTANT

The 1907 small liquid fuel valve may be configured without a CDP acceleration fuel limiter. Without the CDP acceleration limiter option, the input to meter fuel flow during all operating conditions is through the input shaft from the governor/actuator system.

Chapter 2.
Installation

Introduction

Mount the fuel valve/limiter square with the governor actuator linkage to prevent binding. This unit is calibrated before shipment, and a minimum use of adjustments is recommended. If adjustments are necessary, refer to Figure 2-1 for adjustment locations and proceed as follows.

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 where adequate test facilities are available.**

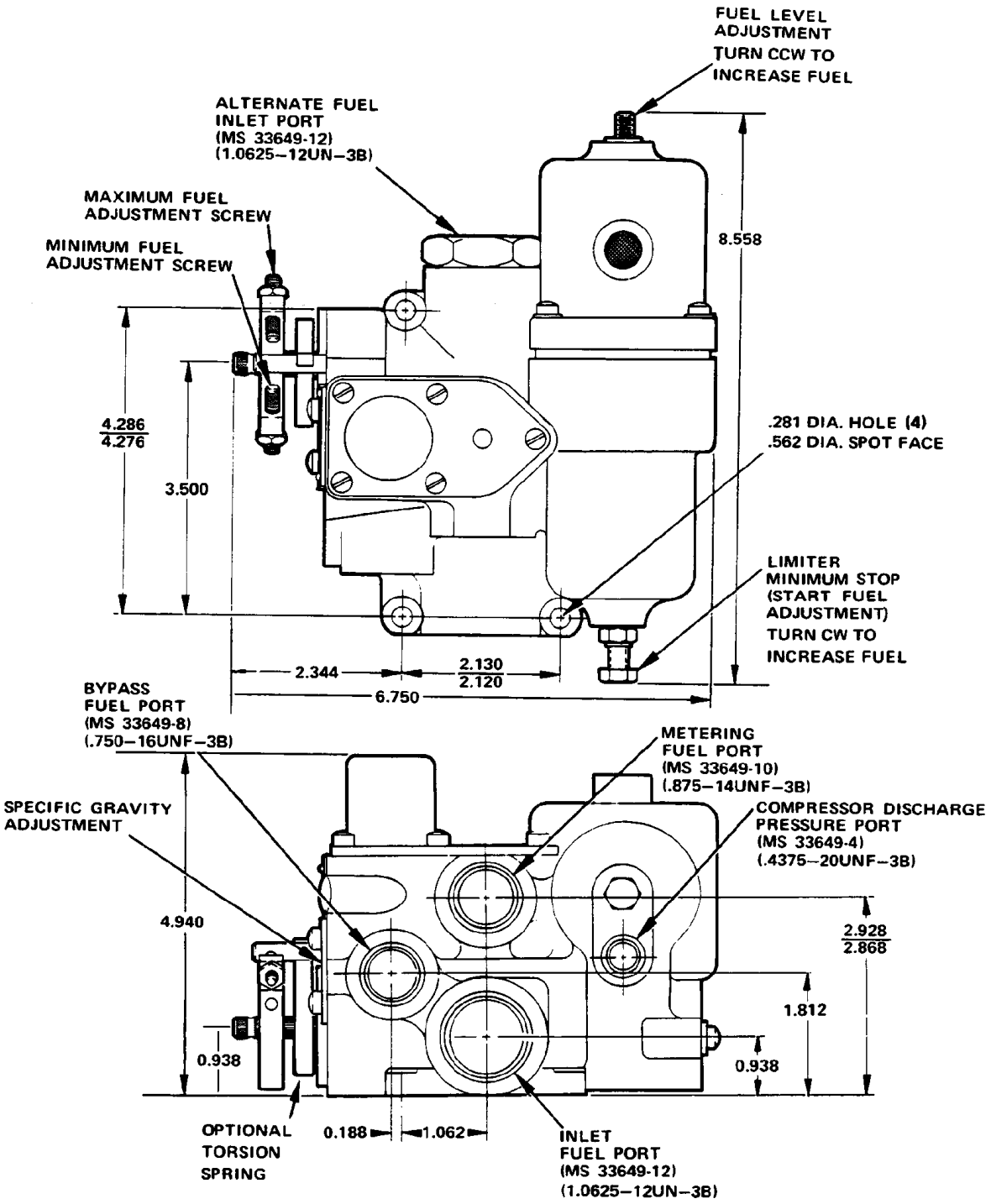

Figure 2-1. Outline Diagram and Adjustment Locations
(Do not use for construction.)

Chapter 3.
Principles of Operation

Introduction

Figures 3-1 and 3-2 show the relationship of various parts of the fuel valve/limiter. The connecting fuel passages between parts are simplified for ease in visualizing the system.

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 limiter 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 pore 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 attains 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 diaphragm 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 set 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. To provide the minimum fuel flow necessary to sustain combustion and prevent flameout, the minimum fuel adjustment screw limits the movement of the throttle shaft in the decrease-fuel direction.

Bypass Feature

To meter fuel flow accurately as a function of port opening, a constant pressure drop must be maintained across the metering port. Inlet pressure P_1 is applied to one side of the bypass diaphragm, and outlet pressure to the opposite side. The bypass piston is positioned by the force exerted by P_2 plus the spring force acting on the bottom side of the diaphragm and by the force exerted on the top side. With these forces in balance, the spring force against the diaphragm determines the pressure drop (P_1 minus P_2) across the fuel metering port, The diaphragm positions the bypass valve plunger with respect to the bypass port and thereby controls the amount of fuel returned to the pump inlet P_0. Thus. a constant differential pressure is maintained 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 stopped.

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 stopped.

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 as long as the diaphragm is in good condition.

Auxiliary Start Feature (optional)

During start-up, the auxiliary stare 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 increasing, the CDP increases, allowing the metering piston to rise. The auxiliary start pore closes while the main metering pore 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 as long as 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 the pump inlet (P_0).

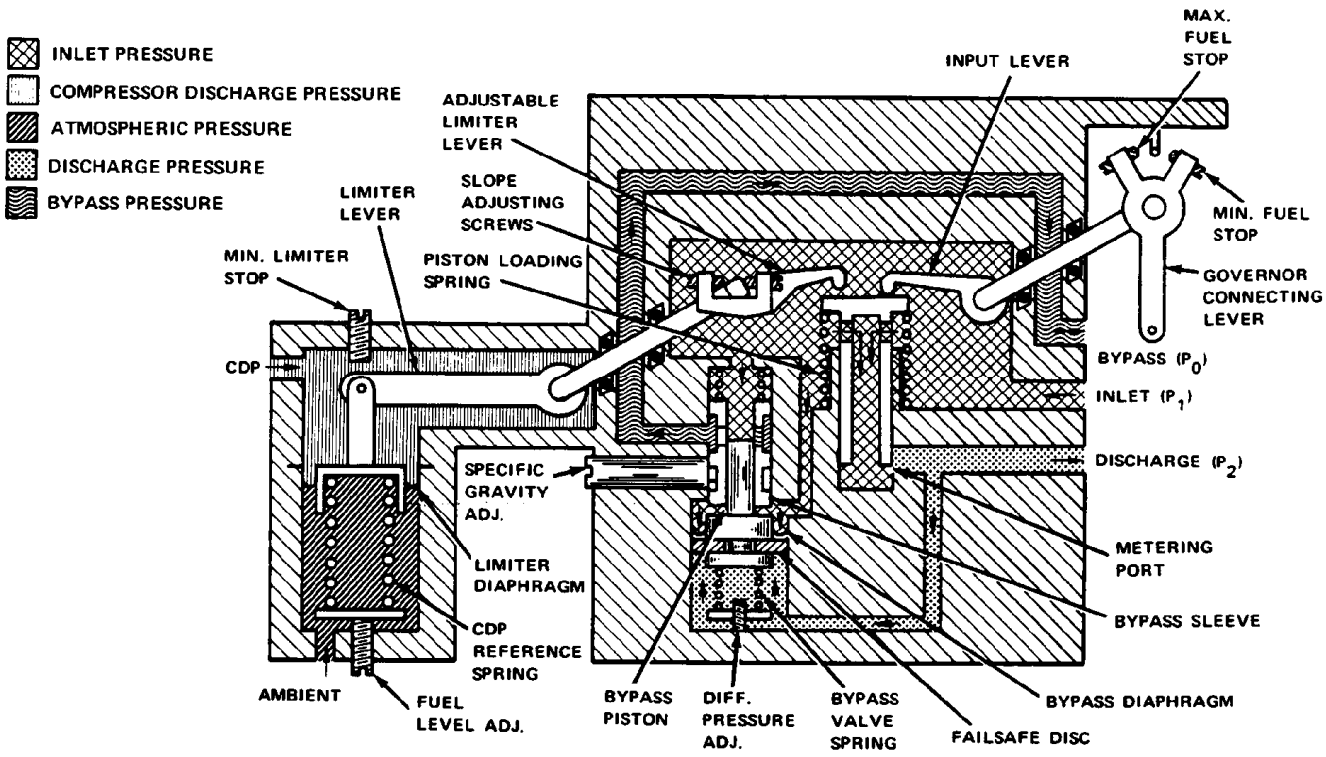

Figure 3-1. Schematic Diagram. 1907 Liquid Fuel Valve/Limiter

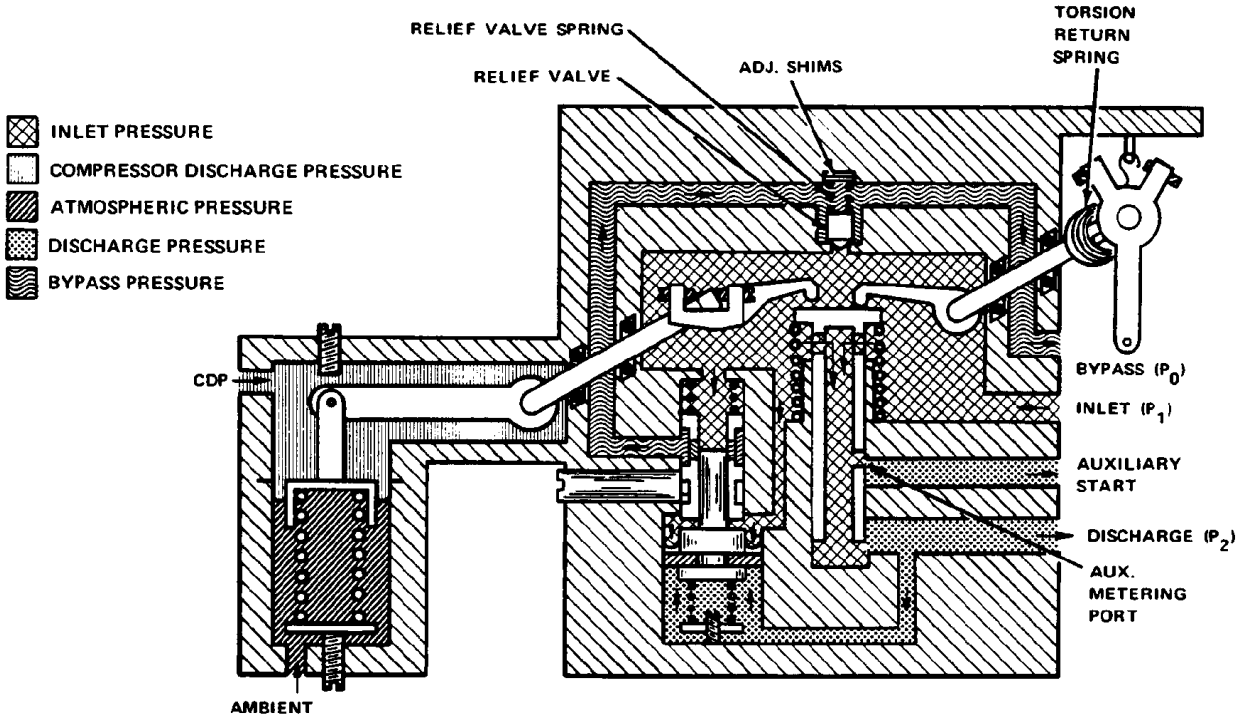

Figure 3-2. Schematic Diagram, 1907 Liquid Fuel Valve/Limiter with Auxiliary Features

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. Therefore, when improper speed variations appear, check all components, including the turbine, 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.

IMPORTANT **Refer to Figure 2-1 for location of adjustment screws identified in the following steps.**

1. 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 reaching 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 necessary, 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 the screw clockwise.

4. If starting occurs, but acceleration is very slow, the fuel limit level may be too low. To increase, turn the 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. Max 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 unit.

Disassembly

Disassemble the fuel valve/limiter following the sequence of index numbers assigned in Figure 5-1, giving special attention to the following. Circled index numbers indicate items which do not require further disassembly and are normally replaced as an assembly.

1. Clean the exterior surfaces of valve/limiter.

2. Discard all gaskets, O-rings, seals, retaining rings, cotter pins, clips, locknuts, etc., removed in the process of disassembly.

3. Do not remove press-fit components unless replacement is necessary. Removal of these components only for cleaning and inspection may necessitate replacement.

4. Do not turn screw (15) in spring seat (14). If the screw must be removed, make necessary measurements to assure that it can be replaced in its original position.

5. Record the position of eccentric (31) before removing it.

6. 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 “X” dimension (Figure 4-1) to assure that these parts can be replaced in their original positions.

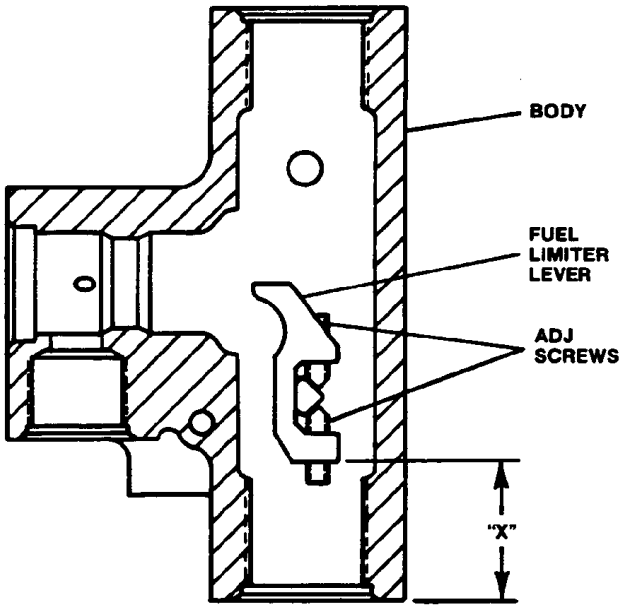

Figure 4-1. Measurement of Fuel Limit Lever Position

8. Mark throttle shaft (56) at a point parallel to the slot in throttle shaft stop (2).

9. To remove bypass valve sleeve (33), insert your finger (or 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 (58) out of the body, removing input lever (55) and bearing (57) in the process.

11. Remove plugs (61) and (91) from the body using 12-34 screws as pullers.

12. Insert a wooden dowel in the access port from which plug (81) was removed and push 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 scriber 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 parts after cleaning with a jet of 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 in parts if possible to free by other means.

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 the index numbers assigned in Figure 5-1, following the special instructions given below. A dust free area is recommended for assembly to obtain satisfactory results.

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

1. Lubricate packings and channel seals with petrolatum or light lubricating oil prior to installation. Lubricate rolling diaphragms (21 and 76) with molykote lubricant prior to installation. Lubricate metal parts lightly with lubricating oil prior to assembly.

2. Press bearing (105) into body (109) with a 3/8 inch inside diameter tube (with an OD slightly less than 1/2”) through the access bore from which plug (61) was removed. Press the bearing in until seated against the shoulder.

3. Assemble packings (102) on channel seal (101). Insert one seal set into the shaft bore and seat against the shoulder. Insert grooved seal spacer (104) into the shaft bore and seat against the previously inserted seal set. Install packing (103) in the groove in the shaft bore.

4. Insert CDP shaft (93) partially into the body, engaging CDP lever (95) and taking care not to dislodge spacer (98) or channel seals (101). Align the key in the shaft with the keyway in the lever and complete insertion of the shaft.

5. Start set screws (87) into fuel limit lever (88), if previously removed. Assemble the lever on the inner end of the CDP shaft and seat against spacer (94). Adjust the set screws to obtain dimension “X” recorded during disassembly.

6. To assemble rolling diaphragm (76), insert a 3/16-inch diameter wooden dowel through the hole for screw (83). Raise and hold link (82) in a workable position. Carefully install a new seal (78) over the threads on the upper end of link (82) and seat it against the shoulder. Install clamp (77) on the link with the flat surface against seal (78). Collapse the top hat section of diaphragm (76) in itself using piston (75) and install it on the link. Secure with nut (74) tightened just enough to ensure sealing. Position the outer flange of the diaphragm concentric with and flat against the face of housing (109). Install retainer (73), making sure the diaphragm does not shift. Place spring (71) on the piston. Carefully assemble the remaining parts in sequence.

7. Assemble one packing (34) in the groove at the outer end of bypass valve sleeve (33). Do not install second packing (34) at this time. Insert the sleeve in the body from the side opposite cover (25) until the outer land of the packing groove is flush with the bottom of the diaphragm counter bore in the body. Assemble packing (32) on eccentric (31) and insert it into the body, turning as required so that the eccentric pin projects into the relieved center section of the sleeve. Install adjustment plate (30). Install second packing (34) on the shouldered end of sleeve (33) from the cover end of the bore. Carefully assemble the remaining parts in sequence.

8. Insert sleeve (35) into the body with the metering part 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 the outer flange of the diaphragm and push the piston into the diaphragm, rolling the diaphragm back over the piston for approximately 1/3 the length of the piston. Insert the piston end of the assembly into sleeve (16) from the large end, working the rolled section of the diaphragm into the relieved port of the sleeve ID between the sleeve and piston. Hold the sleeve and piston so that failsafe disc (19) is approximately 1/8-inch from the outer end of the sleeve and seat the diaphragm bead in the groove in the large end of the sleeve. Carefully insert the assembled parts into the body, making sure the diaphragm bead is not dislodged. Hold the sleeve and test the action of the plunger and diaphragm.

Testing and Calibration

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

Chapter 5.
Replacement Parts

When ordering replacement pares 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 40053)
- Part reference number in parts list and description of part or part name

Figures 5-1 and 5-2 illustrate and list all replacement pares of the basic 1907 fuel valve/limiter. Index numbers are assigned in disassembly sequence.

Parts List for Figure 5-1

Ref. No.	Part Name	Quantity	Ref. No.	Part Name	Quantity
40053-1	Screw	1	40053-27	Spring. bypass valve	1
40053-2	Governor connecting lever	1	40053-28	Seat, loading spring	1
40053-3	Nut, hex	2	40053-29	Screw	2
40053-4	Set screw	2	40053-30	Plate, bypass valve adjustment	1
40053-5	Spring torsion (optional)	1	40053-31	Eccentric, spring gravity	1
40053-6	Spring seat collar (optional)	1	40053-32	Packing, preformed	1
40053-7	Screw	5	40053-33	Sleeve, bypass valve	1
40053-8	Screw (aux. start-optional)	5	40053-34	Packing, preformed	2
40053-9	Plate	1	40053-35	Sleeve, fuel metering valve	1
40053-10	Plate (aux. start-optional)	1	40053-36	Packing, preformed	1
40053-11	Cover, bypass valve	1	40053-37	Packing, preformed	1
40053-12	Packing preformed	1	40053-38	Spring, fuel metering valve	1
40053-13	Spring, bypass valve	1	40053-39	Plunger, metering valve	1
40053-14	Seat. assy., bypass valve spring	1	40053-40	Nozzle, fuel (aux. start-optional)	1
40053-15	Set screw	1	40053-41	Packing, preformed (aux. start-opt.)	2
40053-16	Sleeve, diaphragm clamping	1	40053-42	Packing, preformed (aux. start-opt.)	1
40053-17	Nut, hex, self-locking	1	40053-42A	Needle valve	1
40053-18	Seat, bypass valve spring	1	40053-43	Stop, fuel vlv sleeve (aux. start-opt.)	1
40053-19	Disc, failsafe	1	40053-44	Packing, preformed (aux. start-opt.)	1
40053-20	Piston, diaphragm	1	40053-45	Packing, preformed (aux. start-opt.)	1
40053-21	Diaphragm, bypass rolling	1	40053-46	Sleeve, fuel valve (aux. start-opt.)	1
40053-22	Clamp, diaphragm	1	40053-47	Packing, preformed (aux. start-opt.)	1
40053-23	Plunger, bypass valve	1	40053-48	Spring, fuel valve (aux. start-opt.)	1
40053-24	Screw	3	40053-49	Valve, metering (aux. start-opt.)	1
40053-25	Cover, bypass valve	1	40053-50	Plug and bleeder	1
40053-26	Packing, preformed	1			

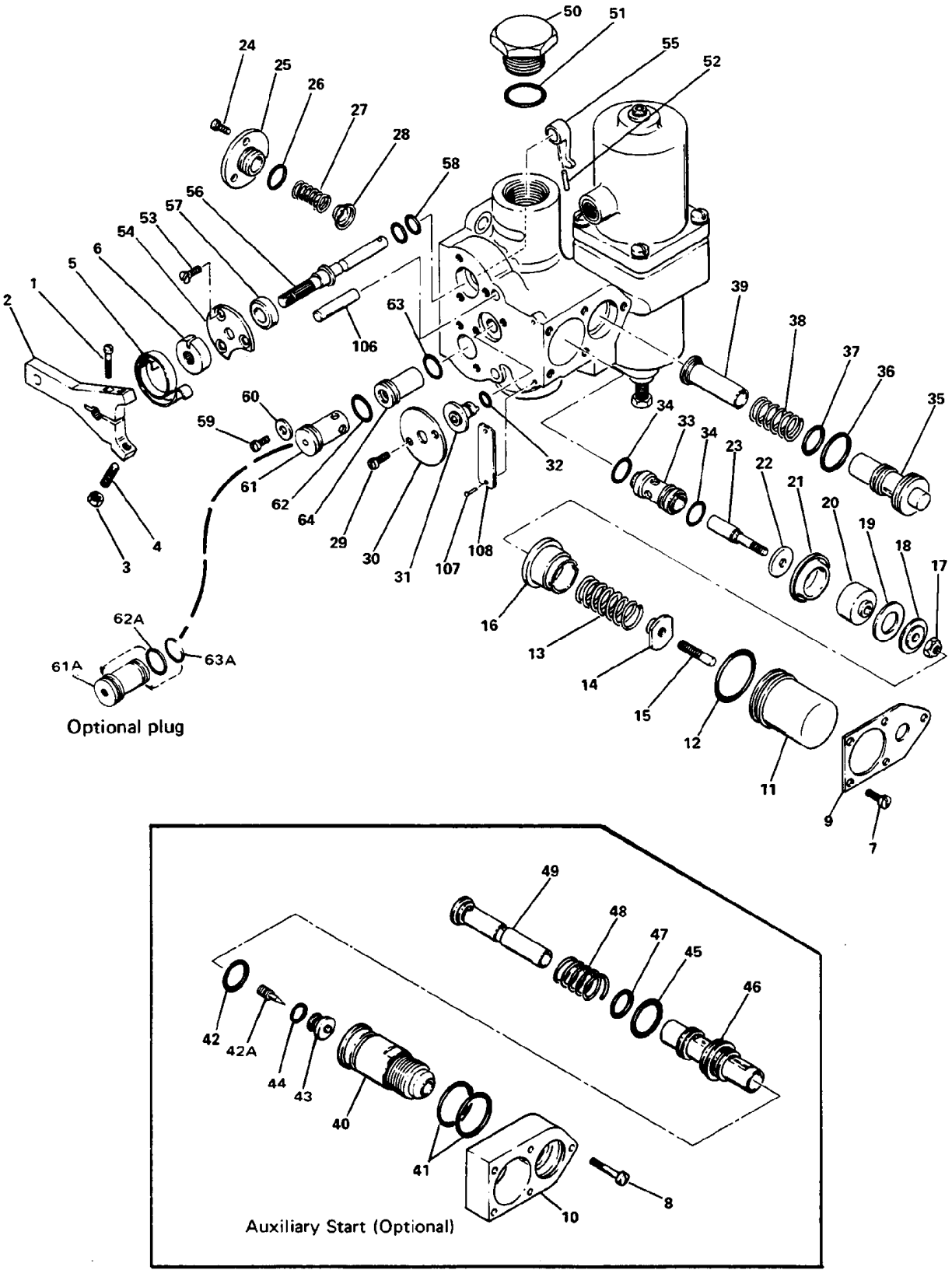

Figure 5-1. Exploded View

Parts List for Figure 5-2

Ref. No.	Part Name	Quantity
40053-51	Packing, preformed	1
40053-52	Pin, spring	1
40053-53	Screw	3
40053-54	Plate, retainer	1
40053-55	Lever, input	1
40053-56	Shaft, throttle	1
40053-57	Bearing, ball	1
40053-58	Packing, preformed	2
40053-59	Screw	2
40053-60	Washer, flat, CRES, 13/64 ID x 5/8 OD x 1/16THK	2
40053-61	Plug, relief valve	1
40053-61A	“Optional” plug	1
40053-62	Packing, preformed	1
40053-62A	Preformed packing	1
40053-63	Packing, preformed	1
40053-63A	Preformed packing	1
40053-64	Valve, relief (optional)	1
40053-65	Screw	4
40053-66	Washer, flat, CRES, 0.250 ID x 0.428 OD (max.) x 0.030 thk	4
40053-67	Cover assembly, CDP spring	1
40053-68	Collar	1
40053-69	Bearing, thrust	1
40053-70	Seat, CDP spring (UPR)	1
40053-71	Spring. CDP limiter	1
40053-72	Set screw	1
40053-73	Retainer, diaphragm	1
40053-74	Nut, hex, self-locking	1
40053-75	Piston, diaphragm	1
40053-76	Diaphragm, CDP rolling	1
40053-77	Clamp, CDP diaphragm	1
40053-78	Seal	1
40053-79	Pin, cotter	1
40053-80	Washer, flat, CRES, 0.200/0.210 ID x 0.360 OD (max.) x 0.030 thk	1
40053-81	Fin	1
40053-82	Link	1
40053-83	Screw, hex hd, dc pl stl 1/4-28 UNF2A x 1-3/4 thd full lg	1
40053-84	Nut, hex, dr, dc pl stl 1/4-28 UNF2B	1
40053-85	Washer	1
40053-86	Seal, thread	1
40053-87	Set screw	2
40053-88	Lever, fuel limit	1
40053-89	Screw	2
40053-90	Washer, flat, CRES, 13/64 ID x 5/8 ID x 1/16 thk	2
40053-91	Plug, packing	1
40053-92	Packing, preformed	1
40053-93	Shaft, CDP	1
40053-94	Spacer, bearing (small)	1
40053-95	Lever, CDP	1
40053-96	Key, Woodruff	1
40053-97	Bearing, ball	1
40053-98	Spacer (large)	1
40053-99	Ring, retaining	1
40053-100	Spacer, packing	1
40053-101	Seal, channel	2
40053-102	Packing, preformed	2
40053-103	Packing, preformed	1
40053-104	Spacer, seal	1
40053-105	Bearing. ball	1
40053-106	Pin, straight, CRES, 0.251/0.252 dia. x 1.250 l	1
40053-107	Screw, drive	2
40053-108	Nameplate	1
40053-109	Body assembly, fuel valve	1

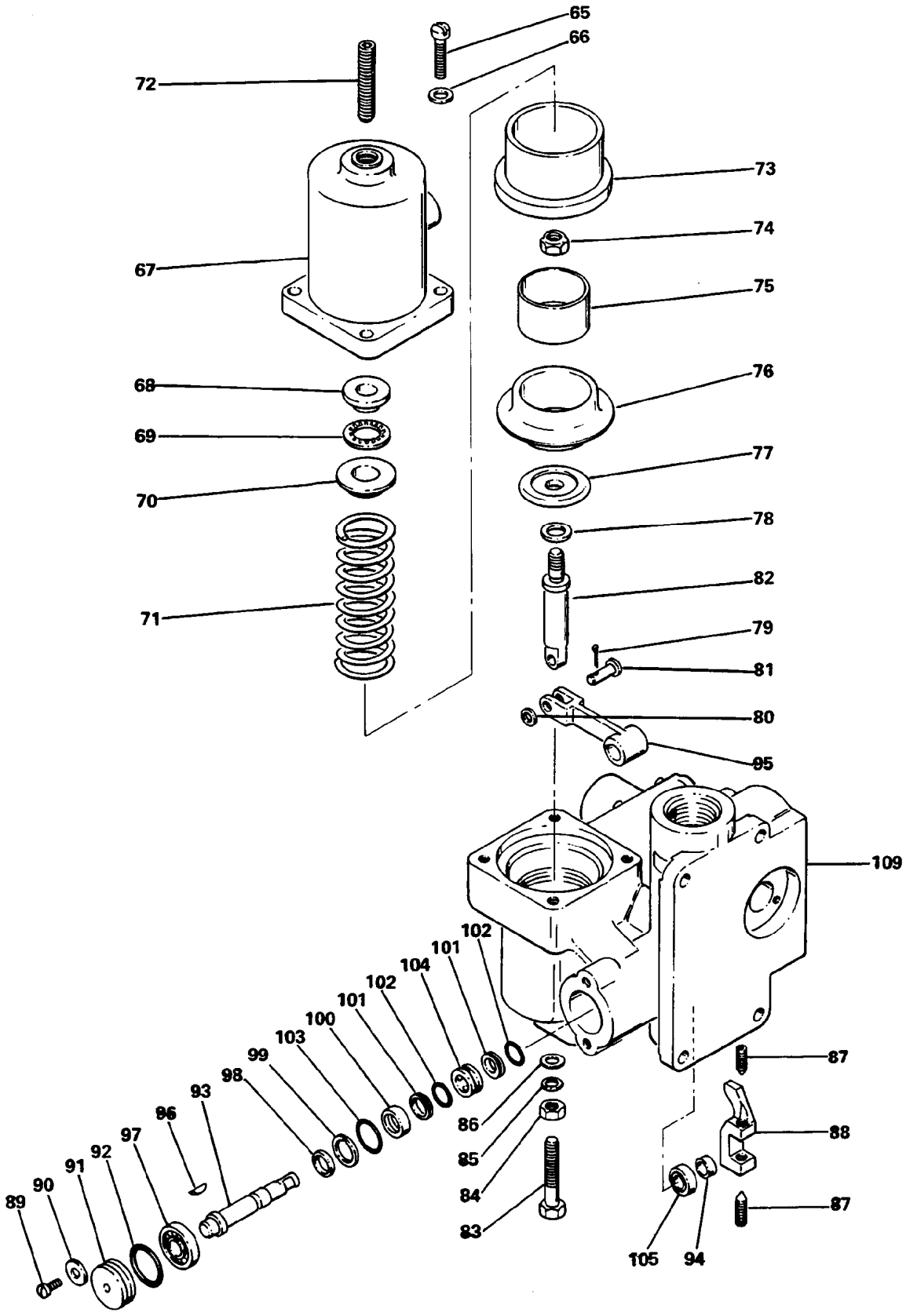

Figure 5-2. Exploded View

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 40053B.

B40053:B

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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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