

PGG Governor

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 **26455**, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, 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 **26455**, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, to verify whether this translation is up to date. Out-of-date translations are marked with . Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

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

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

Contents

REGULATORY COMPLIANCE	II
WARNINGS AND NOTICES	III
ELECTROSTATIC DISCHARGE AWARENESS	IV
CHAPTER 1. GENERAL INFORMATION.....	1
Description.....	1
References	1
CHAPTER 2. INSTALLATION.....	3
Introduction.....	3
Initial Operation	3
Receiving.....	3
Storage.....	4
Governor Mounting.....	4
Typical Electrical Connections	6
Auxiliary Device Connections (Optional)	7
Oil Supply	8
Installation Checkout	8
CHAPTER 3. PRINCIPLES OF OPERATION	10
Introduction.....	10
Basic Governor Section.....	10
Governor Adjustments Section.....	12
CHAPTER 4. OPERATION AND ADJUSTMENTS.....	19
Introduction.....	19
Prestart Adjustments	19
Initial Operation	20
Adjustments.....	20
CHAPTER 5. TROUBLESHOOTING	22
Introduction.....	22
Governor Oil	22
Disassembly and Repair.....	22
Troubleshooting.....	22
CHAPTER 6. REPLACEMENT PARTS FOR THE PGG GOVERNOR	27
Introduction.....	27
Parts Information	27
Parts for Figure 6-1.....	28
Parts for Figure 6-2.....	30
CHAPTER 7. PRODUCT SUPPORT AND SERVICE OPTIONS.....	32
Product Support Options	32
Product Service Options.....	32
Returning Equipment for Repair.....	33
Replacement Parts	33
Engineering Services.....	34
Contacting Woodward's Support Organization	34
Technical Assistance.....	35
REVISION HISTORY.....	36
DECLARATIONS.....	37

Illustrations and Tables

Figure 1-1. PGG Governor	2
Figure 2-1. Governor Output and Linkage Adjustment	5
Figure 2-2. Engine Torque vs. Terminal Shaft Position.....	6
Figure 2-3. PGG Wiring Schematic	7
Figure 2-4. PGG Outline Drawing (Do Not Use For Construction).....	9
Figure 3-1. Basic Governor Section Schematic	15
Figure 3-2. Speed Setting Schematic.....	16
Figure 3-3. Speed Droop Schematic	17
Figure 3-4. Load Limit Schematic.....	18
Figure 4-1. Dial Panel.....	19
Figure 6-1. Governor Adjustment Parts.....	29
Figure 6-2. Solenoid Assembly.....	30
Figure 6-3. Wiring Schematic for PGG Governor.....	31
Table 5-1. Troubleshooting Chart.....	24
Table 5-2. Troubleshooting Parallel Applications	26

Regulatory Compliance

Other European Compliance:

Compliance with the following European Directives or standards does not qualify this product for application of the CE Marking:

Machinery Directive: Compliant as partly completed machinery with Directive 2006/42/EC of the European Parliament and the Council of 17 May 2006 on machinery.

Special Conditions for Safe Use:

Field wiring must be suitable for at least 95 °C.

Compliance with the Machinery Directive 2006/42/EC noise measurement and mitigation requirements is the responsibility of the manufacturer of the machinery into which this product is incorporated.

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

Description

The PGG is a mechanical hydraulic, pressure compensated governor that combines a speed setting motor for remote speed adjustment with manual speed droop adjustment and load limit control features. These adjustments make the PGG governor useful for many prime mover applications. It is especially useful in parallel generator set applications where alternator frequencies must be matched and the governor operated in droop mode for load distribution.

Manual speed setting is also provided and pressure actuated or electric solenoid governor shutdown is available in addition to other PG auxiliary devices. Manual shutdown is provided through the manual load limit knob.

Work output of the PGG may be either rotary or linear and with work capacities of 12, 16, 29, 58 and 200 ft-lb (16, 22, 39, 79, and 271 J). The governor may also have one of several mounting base and drive shaft configurations depending on the particular installation.

The case and base parts are constructed of cast iron. The governor column and cover are cast aluminum. Internal parts including the drive shaft are mild and case hardened steels. Weight of the PGG is 85 to 120 lb (39 to 54 kg) depending on added auxiliary features, 350 lb (159 kg) for the PG-200 output option.

The PGG can be factory equipped with PG type auxiliary devices. Contact a Woodward representative for specific advice in selecting optional features or if field conversion is necessary. Manuals are available to describe the functioning of auxiliary features, not covered in this manual.

Prime mover as used herein refers to an engine, turbine, or other type of prime mover.

References

The publications below are available on the Woodward website (www.woodward.com).

Publication

25071	Oils for Hydraulic Controls
25075	Commercial Preservation Packaging for Storage of Mechanical-Hydraulic Controls
36404	Analysis and Correction of PG Governing Troubles
36602	Basic Elements PG Governor with Differential Servomotor
36641	Governor Oil Heat Exchanger
36650	Solenoid Operated Shutdown Assembly
36651	Pressure Actuated Shutdown Assembly
36652	Automatic Safety Shutdowns and Alarms
36684	Booster Servomotor
36692	PG Power Cylinder Assemblies
36693	PG Base Assemblies
36695	Manifold Air Pressure Bias Fuel Limiter (Single Barrel Model)
36618	PG-200/-300

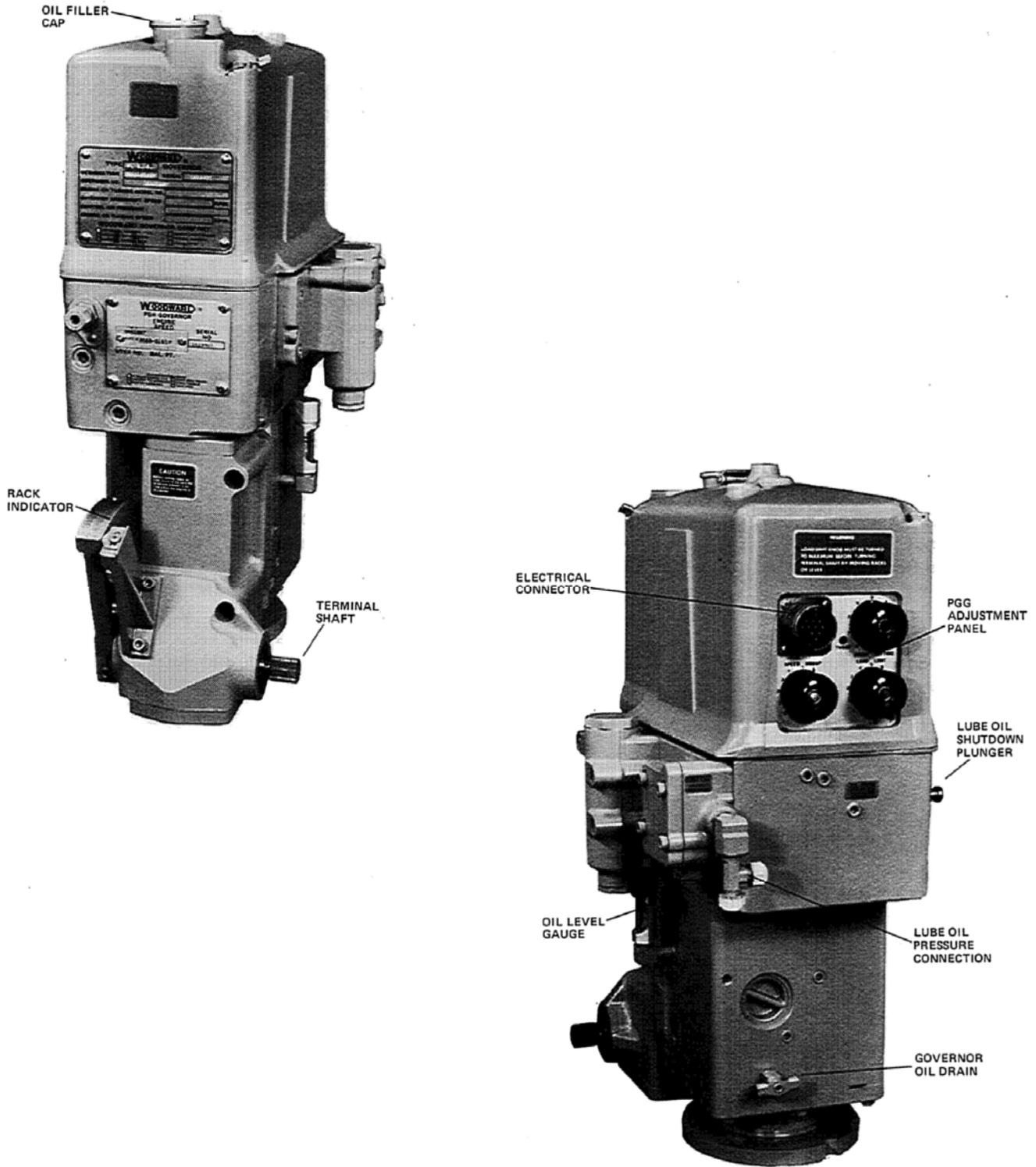


Figure 1-1. PGG Governor

Chapter 2. Installation

Introduction

This chapter describes receiving, storage, and installation requirements for the actuator.

! WARNING

Due to typical noise levels in turbine or engine environments, hearing protection should be worn when working on or around the actuator.

! WARNING

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

! WARNING

Use of a predicted minimum fuel shutdown procedure is highly recommended. Failure to comply with this recommendation can cause personal injury and/or property damage.

NOTICE

Use care while handling and installing the actuator. Be particularly careful to avoid striking the drive shaft, terminal shaft, or the electrical connector. Abuse can damage seals, internal parts, and factory adjustments. Do not set the actuator on its drive shaft.

! WARNING

External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

Initial Operation

! WARNING

Before initial operation of the engine equipped with this actuator, read all of this installation chapter. Make sure that all installation steps have been correctly accomplished and all linkages are secured and properly attached. Carefully review the direction of rotation for the actuator oil pump.

Receiving

The PGG is shipped from our factory bolted to a wooden platform in the vertical position and boxed. After factory testing and adjusting, the PGG is drained of oil, sealed, and painted. This leaves a light film of oil covering internal parts to prevent rust. External shafts are coated with a spray lubricant. No internal cleaning or flushing is necessary before installation and operation or customer retesting.

NOTICE

Use care in handling the governor. Be particularly careful to avoid striking the drive shaft. Do not drop or rest the governor on its drive shaft. Such treatment could damage the gears and bearings in the governor oil pump.

Storage

The PGG may be stored for short periods of time as received from our factory. For long term storage, storage in a hostile environment (large temperature changes, humid, or corrosive atmosphere) or if the governor is installed on the prime mover for storage, fill the governor with oil and follow preservation packaging instructions in Woodward manual 25075, *Commercial Preservation Packing for Storage of Mechanical-Hydraulic Controls*.

Governor Mounting

Typical Requirements

Refer to outline drawing, Figure 2-4, for typical: (1) overall dimensions, (2) mounting hole locations, (3) hydraulic fitting sizes, (4) drive and output shaft dimensions, and (5) adjustment locations.

Adequate clearance must be furnished for installation, removal, and servicing of the governor. The governor oil filler cup and drain should be easily accessible. The PGG must be mounted only vertically.

Governor drive rotation is preferably fixed cw or fixed ccw, but may be reversible. If governor rotation direction is fixed, make certain it matches the engine drive rotation. Incorrect rotation will prevent governor terminal shaft movement and may cause governor damage if incorrect rotation continues. The PGG requires 0.5 hp (373 W) to turn the drive shaft at maximum speed at operating temperature. Maximum speed range is 200 to 1500 rpm, however, the recommended speed range is 250 to 1000 rpm. An oil heat exchanger may be required if governor operating temperature exceeds 200 °F (93 °C).

Mounting

Make sure the governor drive shaft rotates freely before installing the governor. Use a gasket between the governor and mounting pad. Mount and fasten the governor squarely on its mounting pad using the correct length of coupling between the governor and the prime mover drive. Be sure there is no binding, excessive side loading of the drive shaft, or looseness in the coupling. There must be no force pushing the drive shaft into the governor. Improper alignment or too tight a fit between any of the parts can result in excessive wear or seizure and may also cause undesirable "jiggle" in the governor output.

The standard PG type serrated drive offers few installation problems. However, the concentricity of the shaft to the drive coupling must be maintained and the coupling should be as long as possible to permit greater flexibility and a longer life.

The optional keyed drive can be more difficult because of installation problems which include:

- Inherent side loading can be transmitted to the governor drive shaft from the bevel gear drive.
- The difficulty of shimming required to obtain proper mesh without binding or excessive backlash.
- Checking the gear mesh and re-shimming is necessary each time the governor is changed. There is danger that this check will be overlooked whenever a governor is installed.

If it is necessary to use a keyed drive, use only precision gears.

Fuel System Linkage

Properly align and attach the fuel rack linkage to the governor terminal shaft or rod ends. Use approximately 2/3 governor output between no load and full load. Allow sufficient overtravel at each end so the governor can meet shutdown and maximum fuel requirements. If there is a missing serration on the terminal shaft, make certain it is correctly aligned with the linkage during installation.

NOTICE

The load limit knob must be turned to 10, the no limit position, before moving the terminal shaft by moving the racks or lever. Damage to internal parts can result if this precaution is not followed.

NOTICE

Adjust the rotary output linkage to use no less than 5° travel between shutdown and idle or so that the "gap" does not exceed 1-1/32 inch (26.2 mm) at idle speed-no load for governors having reciprocating output. See Figure 2-1, Governor Output and Linkage Alignment.

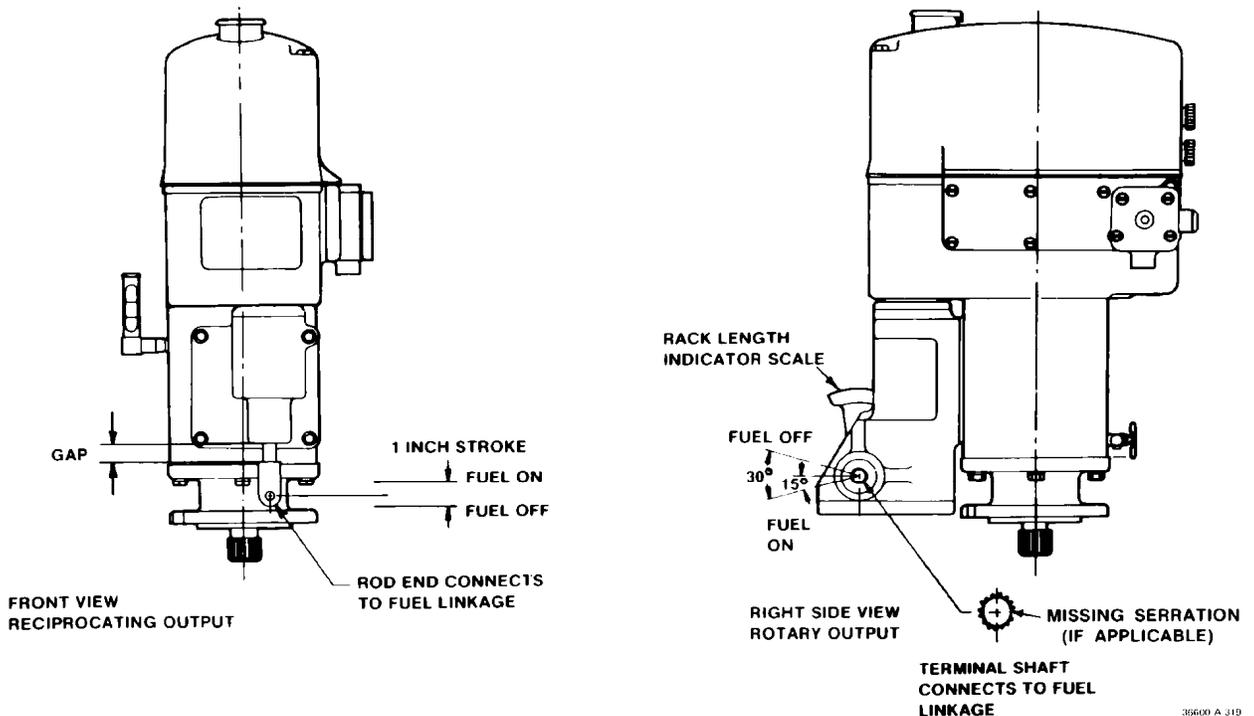


Figure 2-1. Governor Output and Linkage Adjustment
(Do not use for construction.)

There must be no lost motion or binding in this linkage. Adequate locking methods must be employed on the linkage connections.

Identical linkage adjustments on paralleled prime movers is necessary for good load sharing.

It is very important for this linkage to be correctly arranged to complement the fuel rack or valve whether "linear" or "non-linear".

The linear linkage arrangement is used in applications where the governor output positioning is directly proportional or linear in relation to the torque output of the prime mover.

The ideal linear situation is represented by the straight line "X" in Figure 2-2. As the engine moves from no load to half load, approximately half the governor output travel is used. As load continues to increase to full load, governor travel also increases directly proportionally to its maximum output position.

In other applications, such as where a governor is controlling a butterfly valve on a gas engine, a situation represented by the curve "B" results. As the engine load is increased from no load to half load, only 10% of the governor travel is used, while 90% of governor travel is used to go from half load to full load. This situation is opposite that needed for good speed control because much less governor compensation is used at light loads than at full loads.

A non-linear fuel system requires a non-linear linkage. This linkage arrangement provides greater movement of the governor per increment of valve movement at light loads than it does at heavy loads and straightens the "B" line to improve governing control.

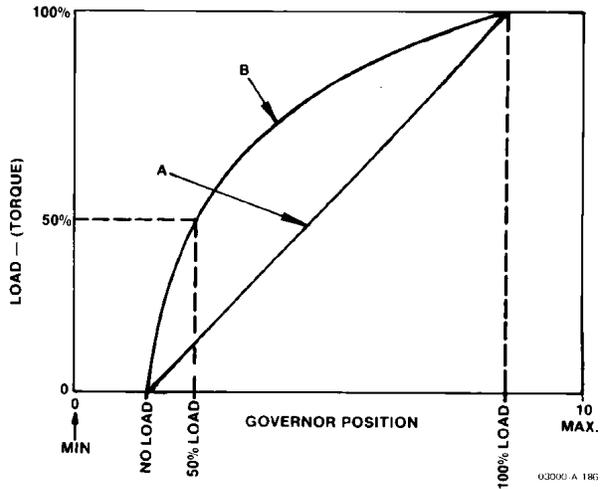
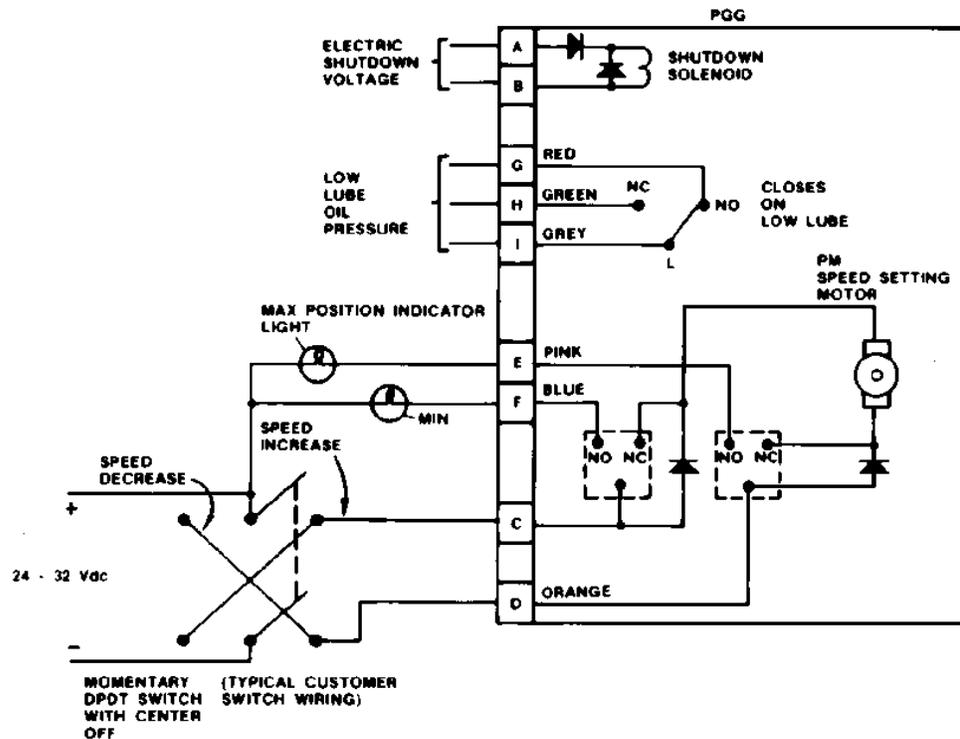


Figure 2-2. Engine Torque vs. Terminal Shaft Position

Typical Electrical Connections

See wiring schematic Figure 2-3 for typical PGG wiring connections, connector pin identification, and switch position. However, a plant wiring diagram for your specific governor part number must be used.

A size 20-14 pin mating connector is available from Woodward (p/n 5402-096-plug MS3106A20-27S).



36600 A 307

Figure 2-3. PGG Wiring Schematic
(Do Not Use For Construction)

Speed Setting Motor

The permanent magnet (pm) motor requires a 24 Vdc, ±6 volt supply. Wiring must include a DPDT switch to reverse the polarity for increasing and decreasing the speed setting.

Position Indicator Lights (optional)

Customer wiring to the speed setting motor reversing switch may include maximum and minimum indicator lights.

Auxiliary Device Connections (Optional)

Make all other electric and hydraulic connections, if any, for the particular PGG being installed. Use pertinent Woodward bulletins and plant wiring diagram.

Oil Supply

Information on oils for use in hydraulic governors is available in manual 25071, *Oils for Hydraulic Controls*. The recommended continuous operating temperature is 140 to 200 °F (60 to 93 °C). The ambient temperature limits are –20 to +210 °F (–29 to +99 °C). Contact Woodward if the temperature is beyond these limits. Hydraulic fluid pour point must be below the lowest expected starting temperature. Use SAE 20 or 30 oil for ordinary temperature conditions. If governor operating temperatures are extremely hot, use SAE 40 to 50; if extremely cold, use SAE 10. In most cases, the same oil that is used in the engine or turbine may be used in the governor.

Installation Checkout

1. The PGG is securely fastened. Drive rotation is correct.
2. Fuel control linkage is properly adjusted and secure.
3. All electrical and hydraulic connections are correct and secure.
4. The governor is filled with oil to the correct level.

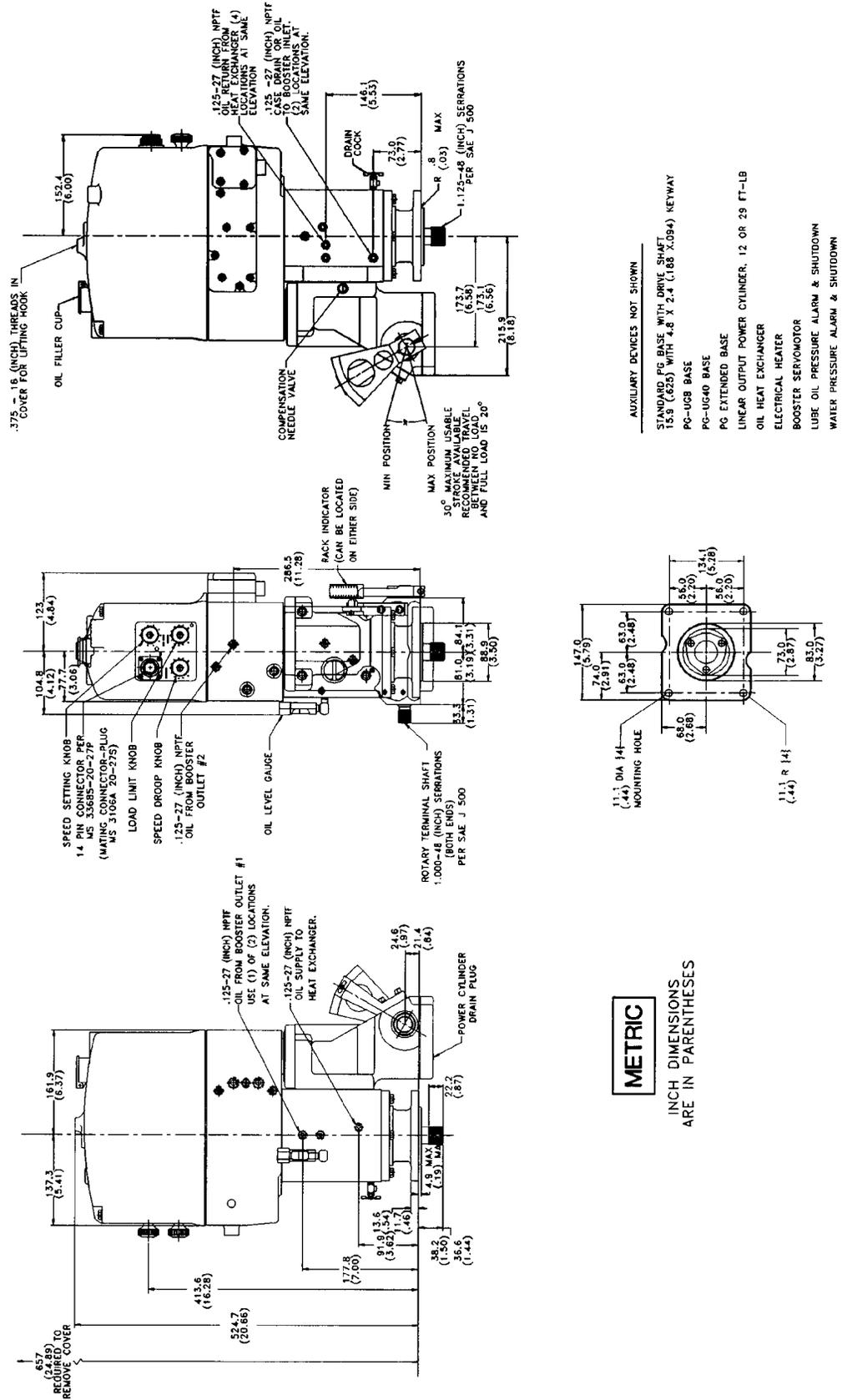


Figure 2-4. PGG Outline Drawing (Do Not Use For Construction)

Chapter 3.

Principles of Operation

Introduction

The PGG governor has two basic functional sections: Basic Governor Section and Adjustments Section.

Basic Governor Section

(See Figure 3-1)

This section consists of an oil pump, two accumulators, speeder spring, flyweight assembly, thrust bearing, pilot valve plunger, rotating bushing, buffer compensation system, and a power cylinder. The power cylinder described here is a single-acting type. For a description of the differential type power cylinder, see manual 36602, *Basic Elements PG Governor with Differential Servomotor*.

The governor drive shaft passes through the governor base and engages the rotating bushing. The oil pump drive gear is an integral part of the bushing. The pump supplies pressure oil for operation of the basic governor section, the speed setting section, and all other auxiliary features. The accumulators provide a reservoir of pressurized oil and function as a relief valve, bypassing excess oil to the governor sump. Duplicate suction and discharge check valves at the pump permit either cw or ccw rotation of the governor without modification or change to the governor. Some governors are plugged which limits rotation to only one direction.

The upper end of the rotating bushing holds the flyweight assembly, thus providing a direct drive from the prime mover to the flyweights.

Several styles of flyweight head assemblies are available. The exact style used depends upon the drive to the governor. A solid head is used where the drive is relatively free of torsional vibrations. Spring-driven and spring driven-oil damped head assemblies are used to attenuate objectionable levels of torsional vibration.

The thrust bearing allows the plunger to remain stationary with respect to the rotating bushing and flyweights. The relative motion between the bushing and plunger minimizes static friction.

The greater of two opposing forces moves the pilot valve plunger up or down: flyweight centrifugal force tends to lift the plunger and speeder spring force tends to lower the plunger. When the prime mover is on speed at any speed setting, these forces are equal and the flyweights assume a vertical position. In this position, the control land on the pilot valve plunger is centered over the regulating port in the rotating bushing. No oil, other than leakage make-up flows to or from the buffer compensation system or power cylinder. A change in either of these two forces will move the plunger from its centered position. The plunger will be lowered when:

- 1 The governor speed setting is unchanged but an additional load slows the prime mover and governor (thereby decreasing flyweight centrifugal force).
2. Prime mover speed is unchanged but speeder spring force is increased to raise the governor speed setting.

Similarly, the pilot valve plunger will be raised when:

1. The governor speed setting is unchanged but load is removed from the prime mover causing an increase in prime mover and governor speed (and hence, an increase in flyweight centrifugal force).
2. The prime mover speed is unchanged, but the speeder spring force is reduced to lower the governor speed setting.

When the plunger is lowered (an underspeed condition), pressure oil is directed into the buffer compensation system and power cylinder to raise the power piston and increase fuel or steam. When the plunger is lifted (an overspeed condition), oil is permitted to drain from these areas to sump and the power piston moves downward to decrease fuel.

The buffer compensation system comprises:

1. The buffer piston and springs
2. The compensation needle valve
3. The compensation land on the P.V. plunger
4. The hydraulic circuits between the pilot valve plunger and the power cylinder.

The buffer compensation system stabilizes governing action after a change in load or speed setting. It creates a temporary negative feedback signal (temporary droop) and applies it as a pressure differential across the compensation land of the pilot valve plunger to assist in re-centering the plunger whenever a fuel correction is made. Operation of the buffer system is described in the following paragraphs:

Load or Speed Setting Increase

Increasing the speed setting or increasing load on the prime mover at a given speed setting have identical effects. In either case, the flyweights move inward (underspeed) due to either the increase in speeder spring force or to the decrease in centrifugal force caused by the decrease in prime mover speed as load is added. The movement of the flyweights is translated into a downward movement of the pilot valve plunger. This directs pressure oil into the buffer system, causing the buffer piston to move toward the power cylinder. The oil displaced by the movement of the buffer piston forces the power piston to move upward in the increase direction. The oil pressures on either side of the buffer piston are simultaneously transmitted to opposite sides of the compensation land, the higher pressure on the lower side.

This pressure differential is proportional to buffer piston displacement, buffer spring rate, and needle valve setting. The net upward force thus produced is added to flyweight force and assists in restoring the balance of forces and re-centering the pilot valve plunger slightly before the prime mover has fully accelerated. In effect, this enables the governor to cut off the additional fuel needed for acceleration by stopping the power piston when it has reached a point corresponding to that amount of fuel required for steady state operation at the new higher speed or load.

As the prime mover continues to accelerate toward the set speed, the compensation force is gradually dissipated to offset the continuing increase in flyweight force. This is done by equalizing the pressures on each side of the compensation land through the needle valve at a rate proportional to the continued rate of acceleration. This minimizes speed overshoot and permits the governor to quickly re-establish stable operation. The needle valve setting determines the rate at which the differential pressure is dissipated and allows the governor to be "matched" to the characteristics of the prime mover and its load. The compressed buffer spring returns the buffer piston to its centered position as the pressure differential is dissipated.

Whenever large changes in speed setting or load are made, the buffer piston will move far enough to uncover a bypass port in the buffer cylinder. This restricts the pressure differential across the buffer piston to some maximum value and also permits oil to flow directly to the power cylinder. Thus, the power piston is made to respond quickly to large changes in speed setting or load.

Load or Speed Setting Decrease

Decreasing the speed setting or decreasing load on the prime mover at a given speed setting are also identical in effect and cause a reverse action to that described above. The flyweights move outward (overspeed), lifting the pilot valve plunger and allowing oil to drain from the buffer compensation system. The buffer piston moves away from the power cylinder, permitting oil to drain from the area under the power piston which then moves downward in the decrease direction. The differential pressures acting across the compensation land produce a net downward force tending to assist the speeder spring in re-centering the pilot valve plunger slightly before the prime mover has fully decelerated. This stops power piston movement when it has reached a point corresponding to that amount of fuel required for steady state operation at the new lower speed or load. Dissipation of the compensation force occurs in the same manner as previously described and, in this instance, minimizes speed undershoot.

Governor Adjustments Section

This section describes the mechanism for setting speed manually and electrically, droop adjustment, and load limiting.

Speed Setting

(See Figure 3-2)

The speed setting section provides a method of changing the compression (force) of the speeder spring which opposes flyweight centrifugal force. It does this by controlling the position of the speed setting piston in the speed setting cylinder. When control oil is admitted to the cylinder, the piston moves downward, compressing the speeder spring and increasing the speed setting. When oil is allowed to drain from the cylinder, the return spring forces the piston upward, reducing speeder spring force and decreasing the speed setting.

The flow of oil to and from the speed setting cylinder is regulated by the speed setting pilot valve plunger in the speed setting bushing. An integral gear on the governor flyweight head drives the bushing through a splined mating gear on the lower end of the bushing to minimize static friction between the speed setting pilot valve plunger and bushing.

Positioning the speed setting piston is done by raising or lowering the speed setting pilot valve plunger. The plunger position can be changed by raising or lowering the pivot point. When the pivot point is lowered, the floating speed setting lever un-centers the speed setting pilot valve plunger to direct pressure oil to the speed setting cylinder. Downward movement of the speed setting piston results not only in an increased speed setting, but also in movement to the restoring linkage on the floating speed setting lever and causes it to move downward a proportional amount. This action continues until the plunger is again re-centered, stopping the flow of oil to the speed setting cylinder. Thus, downward movement of the pivot point results in a proportional movement of the speed setting piston to a lower position corresponding to the increased speed setting.

Operation of these parts for a decrease of speed setting is similar. When the pivot point is allowed to raise, the floating speed setting lever un-centers the speed setting pilot valve plunger to drain oil from the speed setting cylinder. Upward movement of the speed setting piston results not only in a decreased speed setting, but in movement to the restoring linkage on the floating speed setting lever and causes it to move up a proportional amount. This action continues until the plunger is again re-centered, stopping the flow of oil from the speed setting cylinder. Thus, upward movement of the pivot point results in a proportional movement of the speed setting piston to a higher position corresponding to the decreased speed setting.

The pivot point is positioned by movement of the speed setting lever along the threaded shaft as it is turned either manually or by the speed setting motor. Positive high and low manual speed setting stops as well as protective limit switches limit the governor speed setting range. A revolution counter is also provided on the threaded shaft to indicate speed setting position.

Speed Droop

(See Figure 3-3)

Speed droop is an operating characteristic that adds stability to parallel units-two or more prime movers driving a common shaft and load or which are electrically interconnected on the same bus. This is the process of dividing the total load. Load division occurs as any load change or disturbance is absorbed. In a small system, especially with two units, it is usually desirable to divide load proportionally between the units. There are many system arrangements that require the governor to operate with droop for parallel operation. For rules in selecting isochronous (no droop) and droop operation, refer to Isochronous vs. Droop in Chapter 4.

Droop is simply a decrease in speed setting with power piston movement in the increase fuel direction (caused by a load increase). Droop is usually expressed as a percentage of speed decrease from rated speed no load to rated speed full load.

In the PGG governor, droop is accomplished by shifting the speed setting bushing with an adjustable feedback linkage assembly from the tailrod (governor output). When governor output moves to increase fuel (the droop function must decrease speed setting), the feedback link and rod lift the right end of the droop link. The droop link pivots about the droop fulcrum to depress the droop setting cup which sits atop the speed setting bushing. A thrust bearing allows the speed setting bushing to rotate while the droop setting cup remains stationary. When the droop setting cup and speed setting bushing are depressed, the oil ports are no longer covered by the speed setting pilot valve plunger and oil drains from the speed setting cylinder to decrease governor speed setting.

When governor output moves to decrease fuel, the feedback linkage is lowered. The droop link pivots on the droop fulcrum, lifting its left end, and allows the loading spring under the speed setting bushing to raise the bushing. Upward movement of the bushing this time directs pressure oil to the speed setting cylinder to increase speed setting.

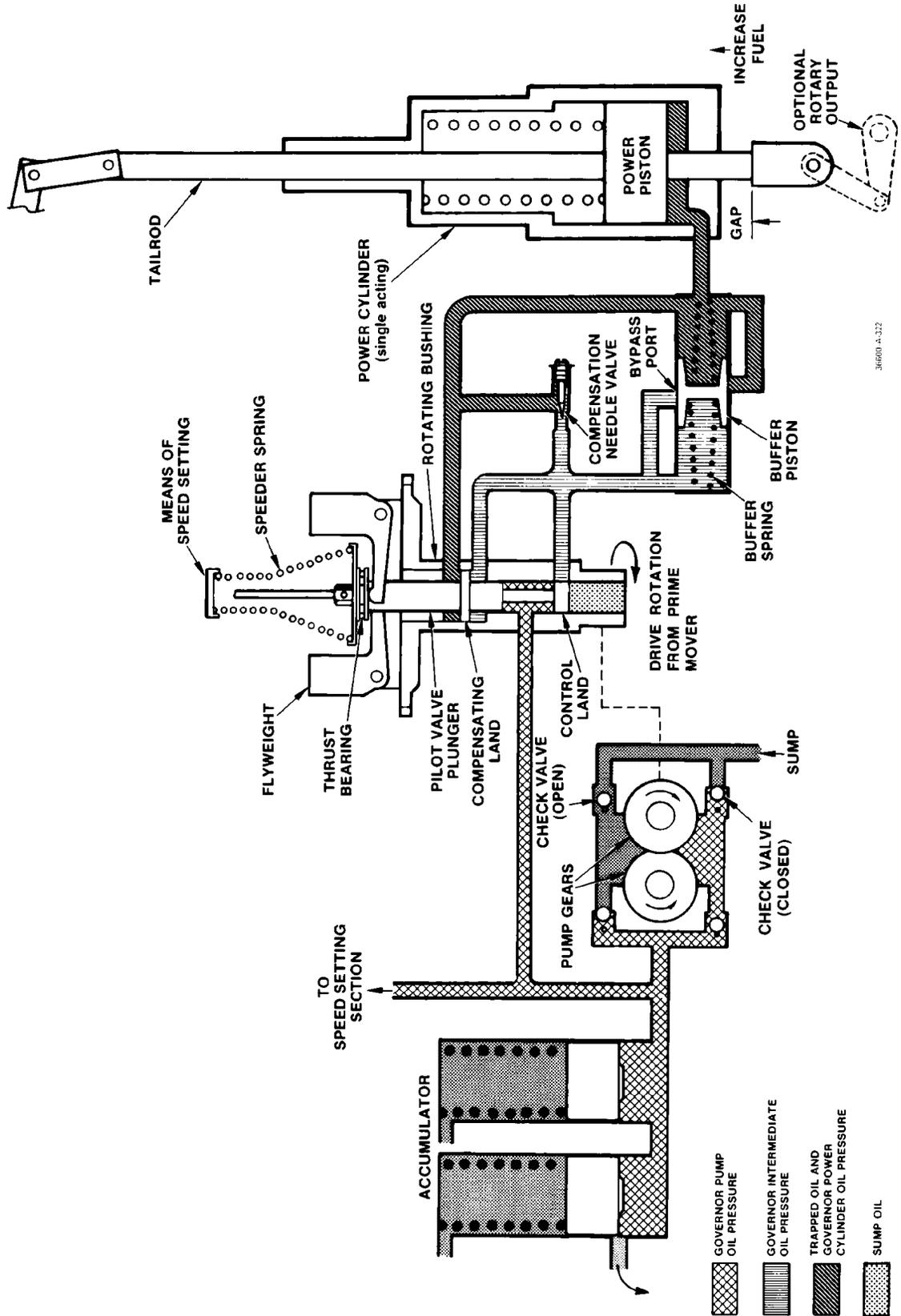
The droop fulcrum is adjustable for maximum droop (far right) to zero droop (far left) through a panel knob. At the zero droop position the droop link fulcrum is directly above the droop setting cup. When set for zero droop, movement of the feedback parts and droop link produces no movement of the speed setting bushing nor change in speed setting.

Load Limit

(See Figure 3-4)

Governor power cylinder travel to increase can be manually limited to a desired level with the load limit knob. The load limit knob is attached through a friction clutch to the load limit cam. The cam positions the load limit lever which is linked and spring loaded to the feedback lever. As the tailrod lifts the feedback lever (when governor output moves to increase) it also lifts the load limit lever. Governor output to increase fuel can continue only until the load limit lever strikes the load limit adjuster nut and lifts the shutdown rod. Lifting the shutdown rod also lifts the ballhead pilot valve plunger and prevents continued increasing movement of the power piston by closing the pilot valve bushing port to block the flow of pressure oil.

The load limit control also provides manual shutdown. During governor operation, turning the knob completely to "0" pulls down the load limit link. The load limit lever pivots on its attachment to the feedback lever, the right end lifting the shutdown rod and pilot valve plunger. The pilot valve plunger is lifted above center in this case, which allows oil from the power piston to drain. As a result, the power piston moves to the shutdown position.



36600-A-322

Figure 3-1. Basic Governor Section Schematic

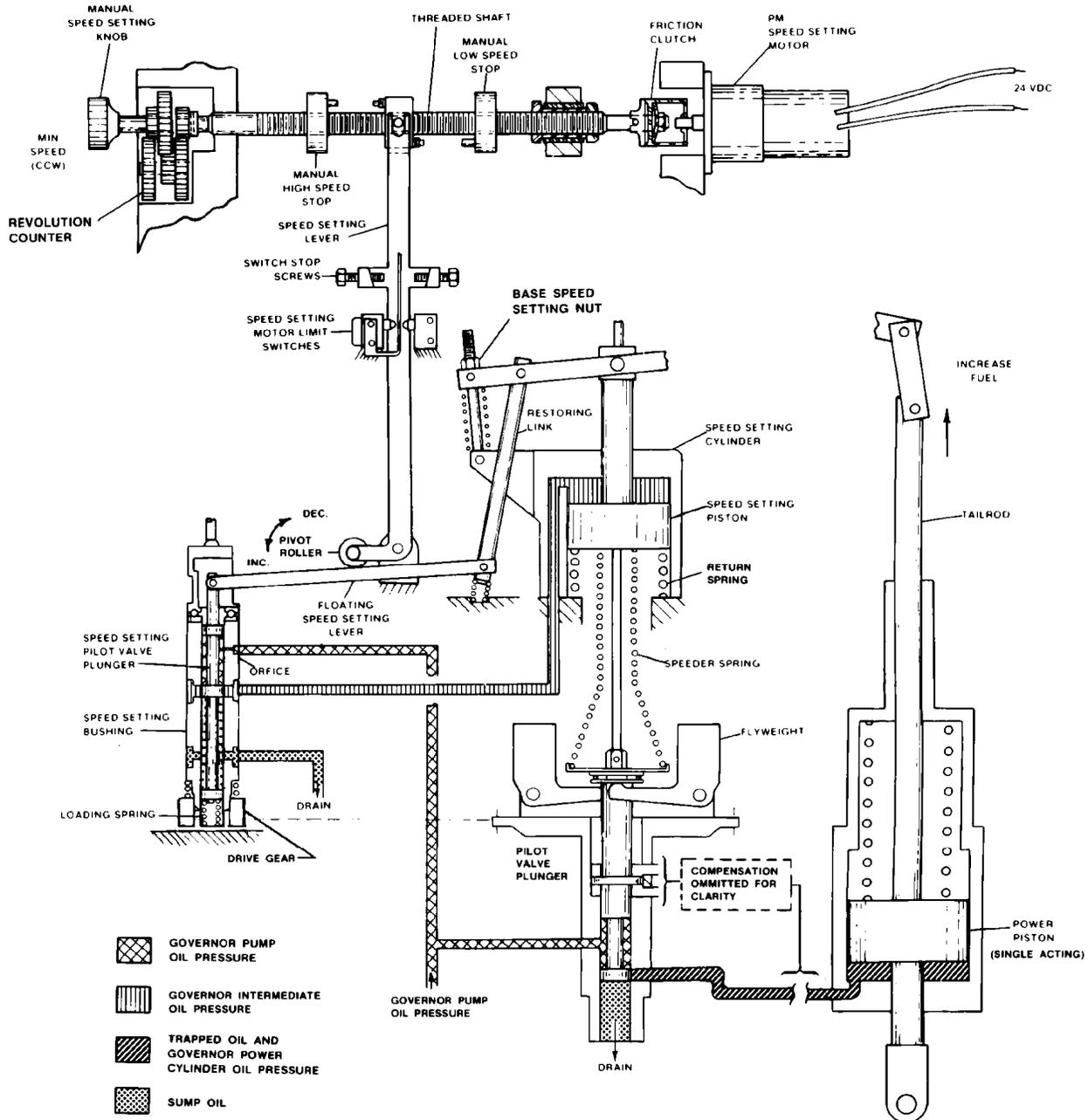


Figure 3-2. Speed Setting Schematic

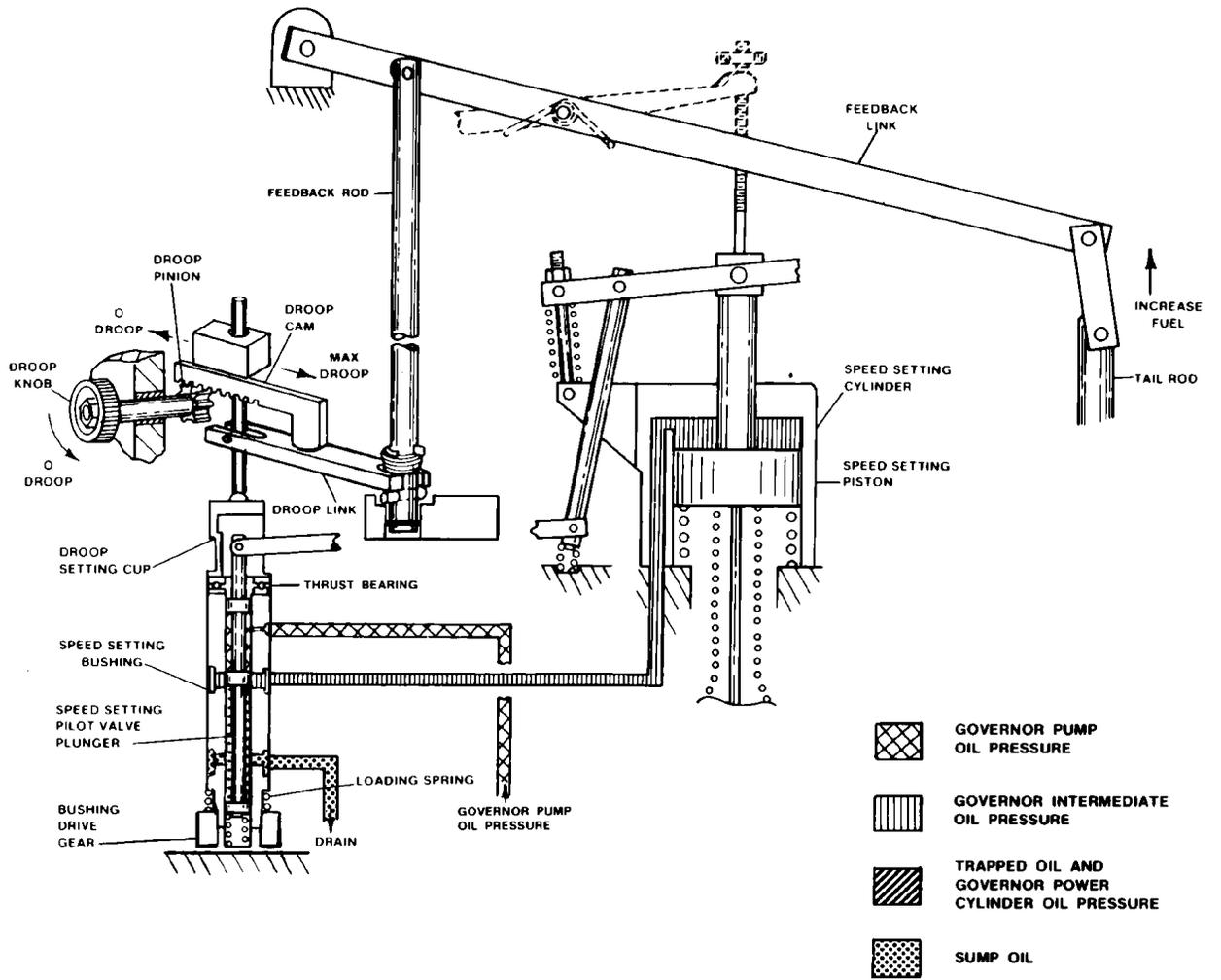
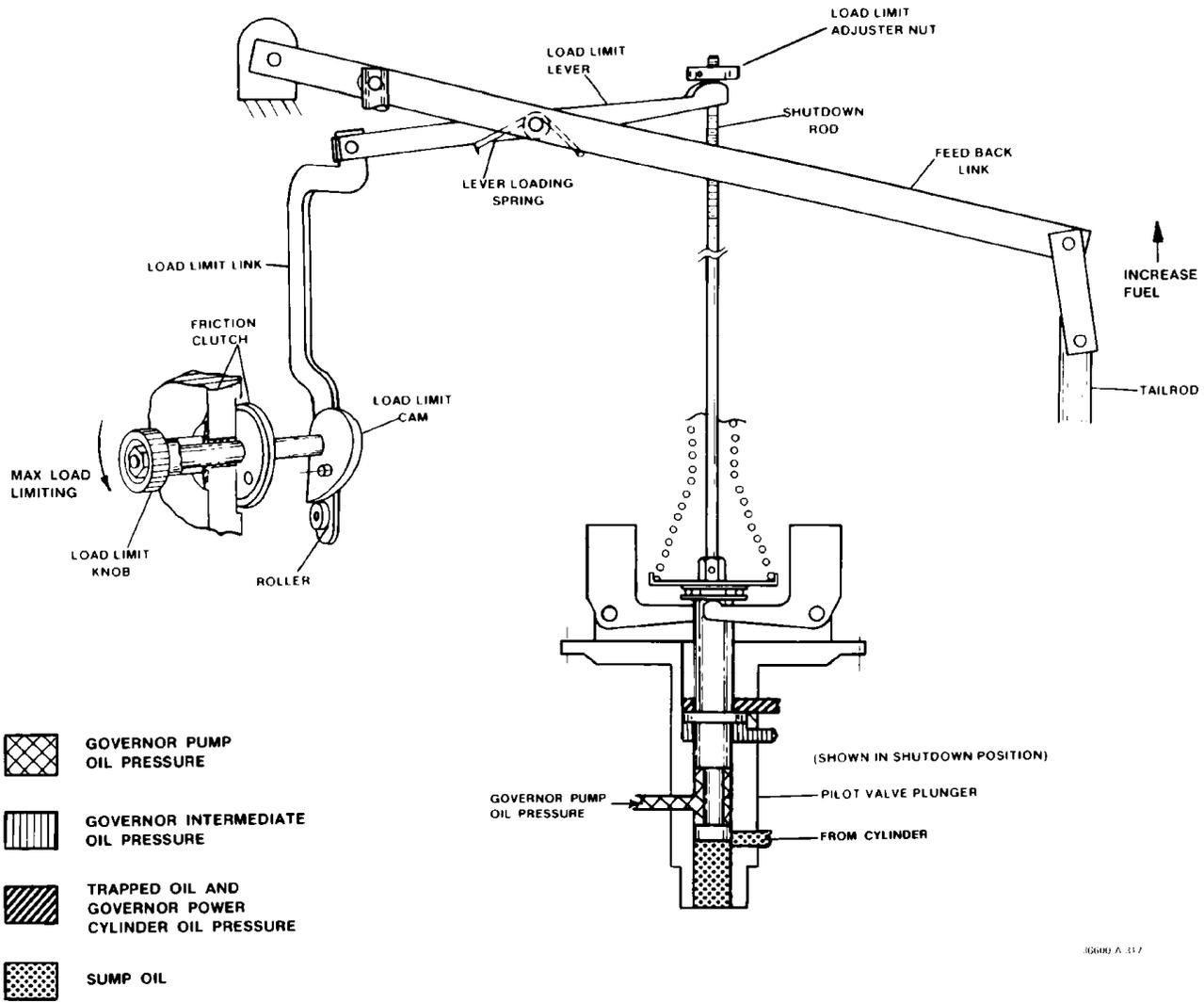


Figure 3-3. Speed Droop Schematic



36600 A 317

Figure 3-4. Load Limit Schematic

Chapter 4.

Operation and Adjustments

Introduction

This section provides instructions for the operation and adjustment of the PGG equipped prime mover. Be sure to fully understand the effects of governor adjustments and operation of governor auxiliary devices before operating the prime mover.

Prestart Adjustments

Before initial operation make the following prestart adjustments to the PGG. (Under each manual adjustment knob is an adjustment position indicator including a separate revolution counter for the manual speed adjustment. See Figure 4-1, Dial Panel.)

1. Set Load Limit to maximum, fully cw.
2. Set Speed Droop to minimum, fully ccw.
3. Set Speed Setting to idle, 0.0 on the revolution counter and indicator scales.

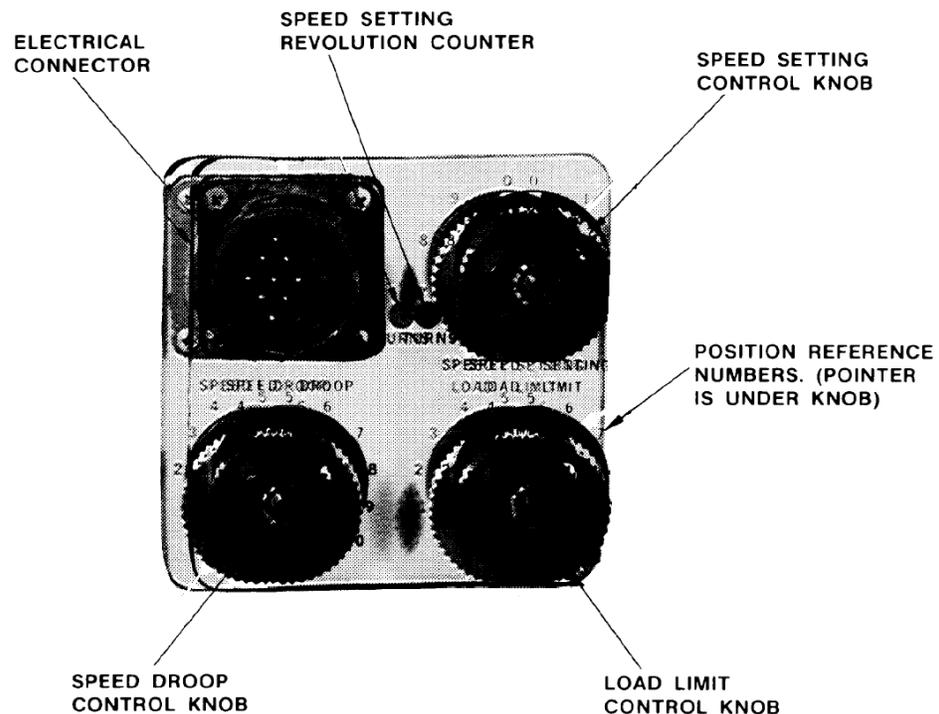


Figure 4-1. Dial Panel

Initial Operation



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.

Adjustments

Normally, the only requirements for putting a new or overhauled governor into service are filling the governor with oil and adjusting the compensation needle valve to obtain maximum stability. All other operating adjustments are made during factory testing according to engine manufacturer's specifications and should not require further adjustment. Do not attempt internal adjustment of the governor unless thoroughly familiar with the proper procedures.

Compensation Needle Valve Adjustment

The compensation needle valve is an adjustable part of the compensation system. Its setting, which directly affects governor stability, depends upon the individual characteristics of the prime mover.

1. With the prime mover operating at IDLE, open the compensation needle valve several turns to cause the engine to hunt. In some cases, opening of the needle valve alone may not cause the prime mover to hunt, but manually disturbing the governor speed setting will induce the governor to move through its full output stroke. Allow several minutes of hunting to remove trapped air in the hydraulic circuits.
2. Close the compensation needle valve gradually until hunting is just eliminated. Keep the needle valve open as far as possible to prevent sluggishness in the governor response. The needle valve setting varies from 1/16 to 2 turns open. Never close it tight, the governor cannot operate satisfactorily when this condition exists.
3. Check the governor stability by manually disturbing the governor speed setting. The compensation adjustment is satisfactory when the governor returns to speed with only a slight over-or undershoot. Once the needle valve adjustment is correct, it is not necessary to change the setting except for large, permanent changes in temperature which affects governor oil viscosity.

Speed and Droop Adjustment

Integral micro switches are factory adjusted to stop the speed setting motor at customer specified maximum and minimum speeds. Positive mechanical stops are provided for manual speed setting (see Figure 3-3).

Droop is manually adjustable to provide zero to approximately 100 rpm maximum droop speed change through the full governor stroke. A positive position stop insures zero droop at the zero droop indicator setting.

The actual procedure for setting speed and droop varies and depends on whether the PGG unit operates isochronously (without droop) or operates with droop.

The recommended speed range for the PG governor is 250 rpm to 1000 rpm with a maximum speed range of 200 rpm to 1600 rpm.

Governor Oil Heat Exchanger

A governor oil heat exchanger is required if operating temperature exceeds 200 °F (93 °C), and speed exceeds 1200 rpm on an engine application and 1100 rpm on a steam turbine. It may also be necessary to use an oil heat exchanger at lower governor drive shaft speeds if the governor is mounted close to valves or steam lines which result in high ambient temperatures.

Isochronous vs. Droop Operation

The result of controlling or maintaining the speed of an alternating current (ac) electrical generating system is frequency control (usually the frequency is 50 or 60 Hz). An independent unit that operates isochronously maintains constant frequency regardless of load. PGG governors on units operating into an infinite bus must operate with droop. A system consisting of two or more generators running parallel all with droop governors will operate stable, but result in frequency variations with changes in load. If this is not desirable, adjust all but one governor for droop. With a load increase, all droop governors will be satisfied with a decrease in speed setting except the one isochronous unit. Its power piston will move in the increase fuel direction in an effort to match its speed and speed setting. This will bring the whole system up to its original frequency with all droop units carrying the same load as before the isochronous unit carrying the increase in load.

Determine whether isochronous or droop operation is required and make the speed and droop adjustments according to the following paragraphs.

Isochronous Operating Adjustments

1. Set droop at zero.
2. From idle speed set the governor to rated speed.
3. Apply load, check stability. If response and stability are not satisfactory, set the compensation adjustments.

Droop Operating Adjustments

1. At idle speed, turn the droop adjusting knob to approximately 5 on its indicator scale.
2. Increase speed setting to synchronize.
3. Close breaker when synchronized.
4. Increase speed setting in order to pick up load to desired level.

Load Limit Adjustment

The load limit is adjustable from no limit (10), to shutdown position (0). Adjust to restrict governor terminal shaft to desired output position or leave at 10. The load limit knob must be turned to 10, the no limit position, before manually moving governor output. Damage to internal parts can result if this precaution is not followed.

Chapter 5.

Troubleshooting

Introduction

While faulty governor operation is usually revealed as speed variations of the prime mover, do not assume that such variations indicate a fault in the governor. Poor governing may be due to the governor attempting to correct for faulty operation of the prime mover or auxiliary equipment.

Governor Oil

Contamination of governor oil is a typical source of governor troubles. Foaming or the formation of sludge may occur if the oil is allowed to break down or oxidize. This results in excessive wear of moving parts and may cause parts to stick or seize.

The time interval between governor oil changes depends on many factors: type of service, operating temperature, quality and type of oil, etc. Any time the governor oil appears to be dirty or breaking down from contaminants or excessive temperatures, drain the governor while it is hot, flush with the lightest grade of the same oil, and refill with fresh oil of proper viscosity.

Disassembly and Repair

A governor should operate several years before needing an overhaul if the oil is kept clean and the drive from the prime mover is smooth and free of torsional vibration. Governors rarely fail or break down suddenly. Instead, they wear gradually and give first indication of their condition in the form of sluggish operation, then slight hunting.

Where disassembly and repair become necessary, all work should be done only by experienced personnel trained in the proper procedures.

When requesting information or service help it is essential that the following be included in your correspondence:

- Governor serial number and designation number.
- Manual number to which reference is made. This is manual 36627.

Troubleshooting

The tables on the following pages may be used to determine the probable causes of faulty operation and to correct these troubles. Table 5-2 aids in troubleshooting parallel applications.

Terms used in the tables are defined as follows:

HUNT A rhythmic variation of speed which can be eliminated by blocking governor operation manually, but which recurs when returned to governor control.

- SURGE** A rhythmic variation of speed, always of large magnitude, which can be eliminated by blocking governor action manually and which will not recur when returned to governor control, unless the speed setting or the load changes.
- JIGGLE** A high frequency vibration of the governor fuel rod end (or terminal shaft) and fuel linkage. Do not confuse this with the normal controlling action of the governor.

IMPORTANT

Isochronous operation and other characteristics of operation and control as stated in the tables are true statements only under normal load conditions. If the engine is overloaded or if the generator is motorized (driven by power from the system) the statements are untrue.

Table 5-1. Troubleshooting Chart

Symptoms	Cause/Test	Test Result/Remedy
1. Prime Mover hunts or surges.	A. Low oil level.	Add oil if necessary to correct level in oil gauge.
	B. Foamy or dirty oil.	Drain, refill as necessary. Check suitability of oil type and viscosity.
	C. Needle valve adjustment incorrect.	Adjust needle valve.
	D. Lost motion or binding in prime mover linkage, fuel pumps or valve.	Repair linkage, fuel pumps or valve.
	E. Fuel linkage incorrectly set. This might occur in new installations or if the governor has been removed and replaced.	Rework or reset the linkage to obtain a linear relationship. See Fuel System Linkage. Check that governor stroke used is not too short. It may be necessary to rework the fuel linkage to require more governor stroke.
	F. Prime mover is misfiring. (This applies principally to gas engines.)	Check pyrometer readings of each cylinder and take steps to eliminate misfiring. Installation of preloaded buffer springs may be desirable. Consult Woodward.
	G. Voltage regulator not operating properly.	Adjust or repair voltage regulator.
	H. Buffer springs too light. This may occur on a new installation, on an old installation from deterioration of prime mover or fuel linkage, or from radical change in load conditions.	Consult Woodward.
	I. Governor is worn.	Consult Woodward.
2. Fuel pump racks do not open quickly when cranking prime mover.	A. Cranking speed too low.	It may be necessary to use a booster servomotor. Consult Woodward.
	B. Booster servomotor (if used) not functioning properly.	Check action of automatic air starting valve. Use applicable bulletin.
	C. Low oil pressure in governor due to worn internal parts.	a. Check oil pressure at test port, position is shown in Figure 2-4, PGG outline drawing. b. Consult Woodward.
	D. Cold oil or oil of incorrect viscosity.	Check oil manufacturer's specifications or consider use of governor oil heater.
3. Jiggle at governor rod end or terminal shaft.	A. Rough prime mover drive.	Inspect drive mechanism: a. Check alignment of gears. b. Inspect for rough gear teeth, eccentric gears, or excessive backlash in gear train. c. Check gear keys and nuts or set screws holding drive gears to shafts. d. Tighten chain between crankshaft and camshaft if used. e. Check engine vibration dampener, if used.
<i>(continued on next page)</i>		

Table 5-1. Troubleshooting Chart-*continued*

Symptoms	Cause/Test	Test Result/Remedy
	B. Governor not bolted down evenly on prime mover mounting pad.	Loosen bolts, realign governor correctly and tighten bolts.
	C. Failure of oil damping or spring drive. Probably due to dirt collecting in the ballhead.	Consult Woodward.
	D. Drive noise on new applications with a solid drive.	Consider use of spring-driven oil-damped governor ballhead assembly.
4. Prime mover is slow to respond to a speed or a load change.	A. Needle valve adjustment incorrect.	Readjust needle valve.
	B. Prime mover may be overloaded.	Reduce the load.
	C. Fuel supply restricted.	Clean fuel filters and fuel supply lines.
	D. Turbocharger does not come to new speed quickly to supply sufficient air to burn the added fuel.	No simple field correction. Consult prime mover manufacturer and Woodward.
	E. Governor oil pressure is low.	See 2-C.
5. Prime mover will not pick up rated full load	A. Load limit control incorrectly set.	Readjust load limit if necessary.
	B. Fuel racks do not open far enough.	a. Consult prime mover manufacturer for correct adjustment of fuel pump stops. b. Check linkage between governor and fuel pumps and adjust if necessary.
	C. Fuel supply restricted.	See 4-C.
	D. Prime mover misfiring.	See 1-F.
	E. Gas pressure too low (gas engines only).	Adjust pressure regulator in gas supply line.
	F. Supercharger or turbocharger does not supply sufficient air.	Consult prime mover manufacturer.
	G. Slipping clutch (if used) between prime mover and driven load.	Check clutch.

Table 5-2. Troubleshooting Parallel Applications

Symptoms	Cause/Test	Test Result/Remedy
1. Load does not divide properly between connected units.	A. Speed setting incorrect.	Check, adjust as necessary.
	B. Droop setting incorrect on one or more units.	Adjust droop on each unit until desired division of load is obtained. a. Increasing droop results in the unit taking a smaller share of load changes. b. Decreasing droop results in the unit taking a larger share of load changes.
	C. Load limit setting is incorrect.	Check indicator for too low setting on all units. Readjust if necessary.
2. Load interchanges between connected units in parallel operation of an AC system. One unit on zero droop (to control system frequency), all other units on droop.	Incorrect setting of the speed droop adjustment on one or more of the droop units.	Increase droop on affected units until load remains steady on each droop unit. System load variations will be taken by the lead unit with zero droop.
	Load changes are beyond the capacity of the one governor with zero droop.	The droop units assist in correcting speed deviations on large disturbances, but return to their original loads after the load change has been absorbed by the zero droop unit.

Chapter 6.

Replacement Parts for the PGG Governor

Introduction

This section provides information for replacement parts for the PGG governor for the speed setting, droop, load limiting and shutdown portions of the PGG governor system. Refer to other PG manuals for parts lists of other sections of the governor.

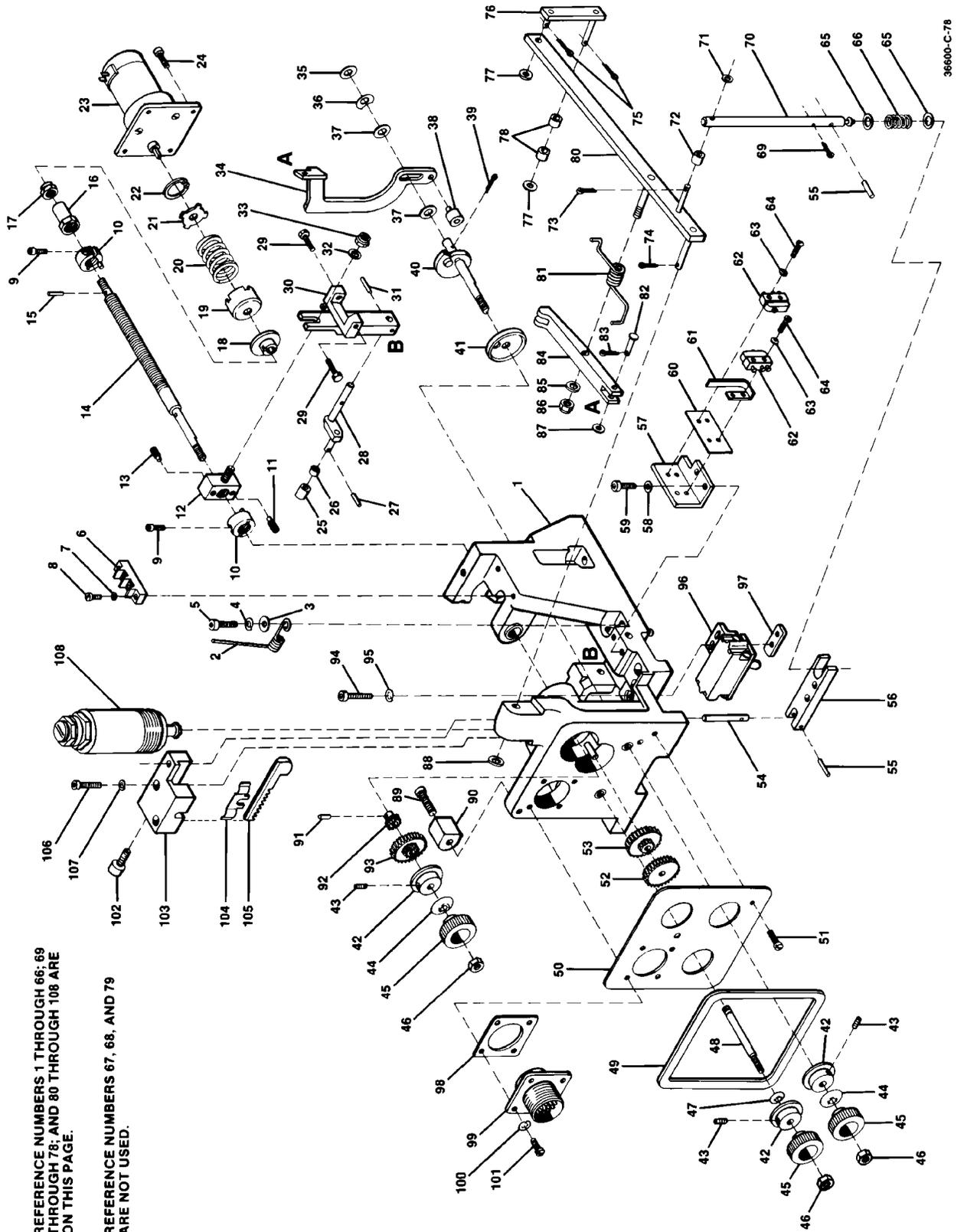
Parts Information

When ordering replacement parts, include the following information:

- Serial number and part number shown on the nameplate.
- Manual number (this is manual 36627).
- Part number from parts list, and description or part name.

Parts for Figure 6-1

Ref. No.	Part Name	Qty.	Ref. No.	Part Name	Qty
36627- 1	Bracket Assembly	1	36627-56	Link, PG G droop	1
36627- 2	Shaft Loading Spring	1	36627-57	Bracket, limit switch mounting	1
36627- 3	Washer .265 x.500 x.032	1	36627-58	Washer, spring lock number 8	2
36627- 4	Washer, helical spring lock	1	36627-59	Screw, 8-32 socket head	2
36627- 5	Screw, socket cap, .250-28 x 1	1	36627-60	Insulator, paper	1
36627- 6	Terminal Strip, 2 pin	1	36627-61	Spring, switch actuating	1
36627- 7	Washer, no. 6, shakeproof	2	36627-62	Switch, SPDT micro	2
36627- 8	Screw, 6-32 x.562, ph. pan head	2	36627-63	Washer, spring lock, number 2	4
36627- 9	Part of Assembly 10	2	36627-64	Screw, 2-56 x .438, round head	4
36627-10	Stop Assembly, speed setting	2	36627-65	Washer, .328 x .562 x .032	2
36627-11	Screw, 10-32 x .500	1	36627-66	Spring	1
36627-12	Block Assembly, speed setting	1	36627-67	Not Used	
36627-13	Screw, 10-32 x .500	1	36627-68	Not Used	
36627-14	Shaft, speed setting	1	36627-69	Cotter Pin, .062 x .500	1
36627-15	Pin, .094 x .500 roll	1	36627-70	Rod, droop feedback	1
36627-16	Nut, S. S. shaft locating	1	36627-71	Washer	1
36627-17	Nut, .375-24 elastic hex thin	1	36627-72	Spacer	1
36627-18	Plate, drive	1	36627-73	Cotter Pin, .062 x .375	1
36627-19	Case, friction drive	1	36627-74	Cotter Pin, .062 x .500	1
36627-20	Spring	1	36627-75	Cotter Pin, .062 x .375	2
36627-21	Cover, friction drive	1	36627-76	Link Assembly, tail rod	1
36627-22	Ring, internal retainer	1	36627-77	Washer, .203 x .438 x .032	2
36627-23	Speed Setting Motor Assembly	1	36627-78	Spacer	2
36627-24	Screw, 8-32, socket head	4	36627-79	Not Used	
36627-25	Bearing, needle	1	36627-80	Link Assembly, feedback	1
36627-26	Spacer	1	36627-81	Spring, load limit lever	1
36627-27	Roll Pin, .062 x .500	1	36627-82	Pin, drilled, headed	1
36627-20	Speed Setting Crank Assembly	1	36627-83	Cotter Pin, .062 x.375	1
36627-29	Screw	2	36627-84	Lever, load limit	1
36627-30	Speed Setting Lever Assembly	1	36627-85	Washer, .265 x .500 x .032	1
36627-31	Roll Pin, .094 x .500	1	36627-86	Nut, .250-28 elastic hex, thin	1
36627-32	Washer, .203 x.438 x.032	1	36627-87	Washer, .203 x.438 x.032	1
36627-33	Nut, 10-32 elastic hex thin	1	36627-88	Washer, .265 x.500 x.032	1
36627-34	Link Assembly, load limit	1	36627-89	Screw, 10-32 x 1	1
36627-35	Washer, .265 x.500 x .032	1	36627-90	Diode Assembly	1
36627-36	Washer, spring	1	36627-91	Roll Pin, .062 x .500	1
36627-37	Washer-265 x.500 x .032	2	36627-92	Gear, nylon	1
36627-38	Roller, .125 x .250	1	36627-93	Gear, nylon	1
36627-39	Pin, cotter, .063 x .500	1	36627-94'	Screw, 10-32 x 1, soc. hd. cap	2
36627-40	Cam Assembly, load limit	1	36627-95	Washer, spring lock, .190 1 D	2
36627-41	Washer, friction	1	36627-96	Switch and Mounting Bracket	1
36627-42	Pointer, PG dial	3	36627-97	Switch Bracket Clamp Plate	1
36627-43	Screw, 6-32 x .250, socket set	3	36627-98	Gasket, connector	1
36627-44	Spring, syn. friction drive	2	36627-99	Receptacle, 14 contact (pin)	1
36627-45	Knob Assembly, bakelite control	3	36627-100	Washer, spring lock, number 4	4
36627-46	Nut, .250~28 elastic hex, thin	3	36627-101	Screw, 4-40 x.438 ph. pan head	4
36627-47	Washer, spring	1	36627-102	Screw, special, 10~32	1
36627-48	Shaft, droop pinion	1	36627-103	PG G Droop Adjustment Block Assm.	1
36627-49	Gasket, bracket to cover	1	36627-104	Spring, droop rack loading	1
36627-50	Plate, PG G dial	1	36627-105	Rack, droop setting	1
36627-51	Screw. 6-32 x .375 ph. pan head	1	36627-106	Screw, 8-32 x 1 soc. head cap	2
36627-52	Indicator, S.S. shaft revolution	1	36627-107	Washer, number 8, split lock	2
36627-53	Plate, load limit friction	1	36627-108	Solenoid assembly (see Figure 6-2 for individual parts)	1
36627-54	Pin, droop plunger	1			
36627-55	Pin, .124 dia. x .625	2			



REFERENCE NUMBERS 1 THROUGH 66; 69 THROUGH 78; AND 80 THROUGH 108 ARE ON THIS PAGE.

REFERENCE NUMBERS 67, 68, AND 79 ARE NOT USED.

Figure 6-1. Governor Adjustment Parts

Parts for Figure 6-2

Ref. No.	Part Name	Qty.
36627-111	Solenoid locknut	1
36627-112	Plunger stop plug	1
36627-113	Solenoid case	1
36627-114	Solenoid plunger lock pin	1
36627-115	Load spring	1
36627-116	Insulating paper	1
36627-117	Solenoid coil	1
36627-118	Soldering shield washer	2
36627-119	Adjusting screw	1
36627-120	O-ring	2
36627-121	Solenoid plunger assembly	1
36627-122	Solenoid plunger washer	2
36627-123	Solenoid plunger rod	1
36627-124	Varnished tubing	2
36627-125	Solenoid plunger bushing	2
36627-126	Shutdown valve body	1
36627-127	Plunger guide locating pin	1
36627-128	Unloading spring	1
36627-129	Valve seat	1
36627-130	Steel ball, 1/4 inch dia.	1
36627-131	O-ring	1

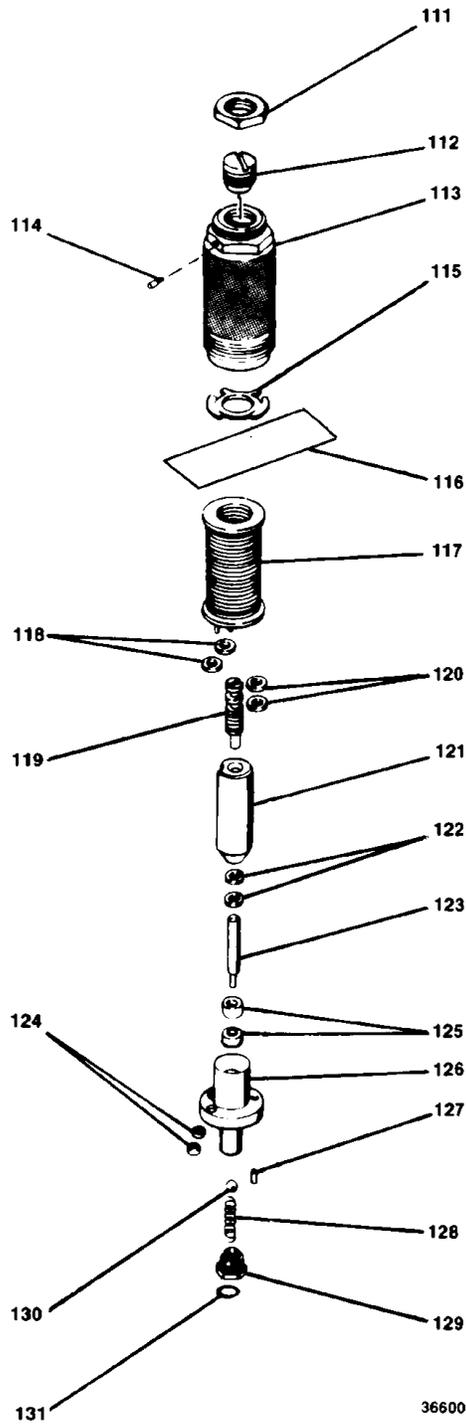
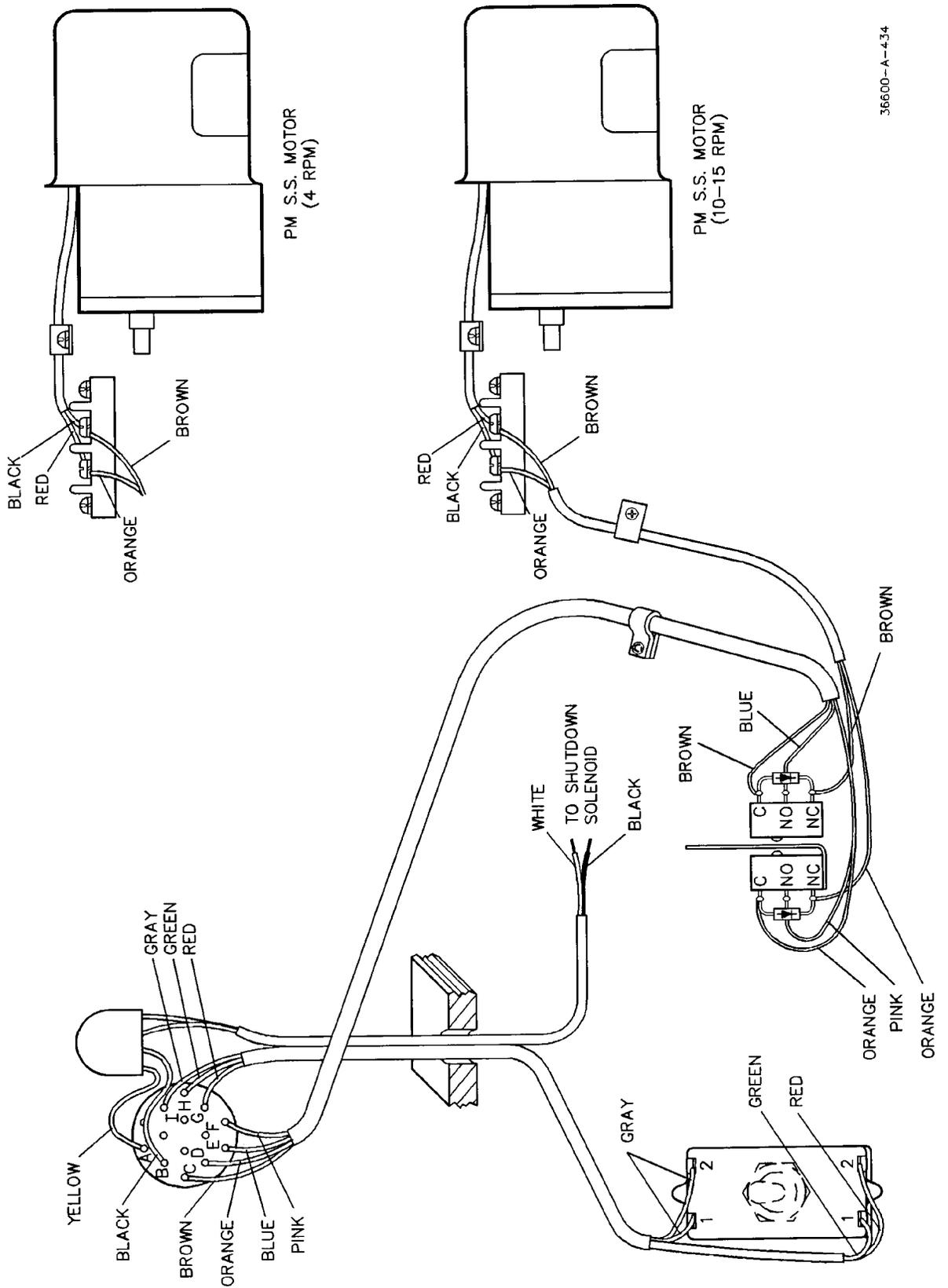


Figure 6-2. Solenoid Assembly



36600-A-434

Figure 6-3. Wiring Schematic for PGG Governor.
(Note difference in speed setting motor options.)

Chapter 7.

Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (EngineHelpDesk@Woodward.com) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full-Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.
- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.
- A **Recognized Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.

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

Product Service Options

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

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime.

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Flat Rate Repair: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option, with the exception that the unit will be returned to you in “like-new” condition. This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:

- return number;
- name and location where the control is installed;
- name and phone number of contact person;
- complete Woodward part number(s) and serial number(s);
- description of the problem;
- instructions describing the desired type of repair.

Packing a Control

Use the following materials when returning a complete control:

- protective caps on any connectors;
- antistatic protective bags on all electronic modules;
- packing materials that will not damage the surface of the unit;
- at least 100 mm (4 inches) of tightly packed, industry-approved packing material;
- a packing carton with double walls;
- a strong tape around the outside of the carton for increased strength.

NOTICE

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Replacement Parts

When ordering replacement parts for controls, include the following information:

- the part number(s) (XXXX-XXXX) that is on the enclosure nameplate;
- the unit serial number, which is also on the nameplate.

Engineering Services

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

- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact.

Product Training is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact one of the Full-Service Distributors listed at www.woodward.com/directory.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at www.woodward.com/directory, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems	Products Used in Engine Systems	Products Used in Industrial Turbomachinery Systems
<u>Facility</u> ----- <u>Phone Number</u>	<u>Facility</u> ----- <u>Phone Number</u>	<u>Facility</u> ----- <u>Phone Number</u>
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:	Germany ----- +49 (711) 78954-510	India ----- +91 (129) 4097100
Kempen---- +49 (0) 21 52 14 51	India ----- +91 (129) 4097100	Japan-----+81 (43) 213-2191
Stuttgart - +49 (711) 78954-510	Japan-----+81 (43) 213-2191	Korea-----+82 (51) 636-7080
India ----- +91 (129) 4097100	Korea-----+82 (51) 636-7080	The Netherlands--+31 (23) 5661111
Japan-----+81 (43) 213-2191	The Netherlands--+31 (23) 5661111	Poland ----- +48 12 295 13 00
Korea-----+82 (51) 636-7080	United States-----+1 (970) 482-5811	United States-----+1 (970) 482-5811
Poland ----- +48 12 295 13 00		
United States-----+1 (970) 482-5811		

Technical Assistance

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

General

Your Name _____

Site Location _____

Phone Number _____

Fax Number _____

Prime Mover Information

Manufacturer _____

Engine Model Number _____

Number of Cylinders _____

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

Power Output Rating _____

Application (power generation, marine, etc.) _____

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Control/Governor #2

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Control/Governor #3

Woodward Part Number & Rev. Letter _____

Control Description or Governor Type _____

Serial Number _____

Symptoms

Description _____

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

Revision History

Changes in Revision D—

- Updated Declaration of Incorporation

Changes in Revision C—

- Added Regulatory Compliance information
- Added installation information and warnings to Chapter 2
- Added Declarations

Declarations

**DECLARATION OF INCORPORATION
Of Partly Completed Machinery
2006/42/EC**

Manufacturer's Name: WOODWARD, INC

Manufacturer's Address: Building A ,Ditiantai Industrial Park, Huaihedao, Beichen High-Tech Industrial Park, Tianjin, China

Model Names: PG58/PG200/PG300

This product complies, where applicable, with the following Essential Requirements of Annex I: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7

The relevant technical documentation is compiled in accordance with part B of Annex VII. Woodward shall transmit relevant information if required by a reasoned request by the national authorities. The method of transmittal shall be agreed upon by the applicable parties.

The person authorized to compile the technical documentation:

Name: Dominik Kania, Managing Director at Woodward Poland Sp. z o.o
Address: Woodward Poland Sp. z o.o., ul. Skarbowa 32, 32-005 Niepolomice, Poland

This product must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive, where appropriate.

The undersigned hereby declares, on behalf of Woodward Governor Company of Loveland and Fort Collins, Colorado that the above referenced product is in conformity with Directive 2006/42/EC as partly completed machinery:

MANUFACTURER



 Signature

_____ Christopher Perkins
 Full Name

_____ Engineering Manager
 Position

_____ WGC, Fort Collins, CO, USA
 Place

_____ 07 - Aug - 2014
 Date

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **36627D**.



B36627:D



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

Email and Website—www.woodward.com

Woodward has company-owned plants, subsidiaries, and branches,
as well as authorized distributors and other authorized service and sales facilities throughout the world.

Complete address / phone / fax / email information for all locations is available on our website.