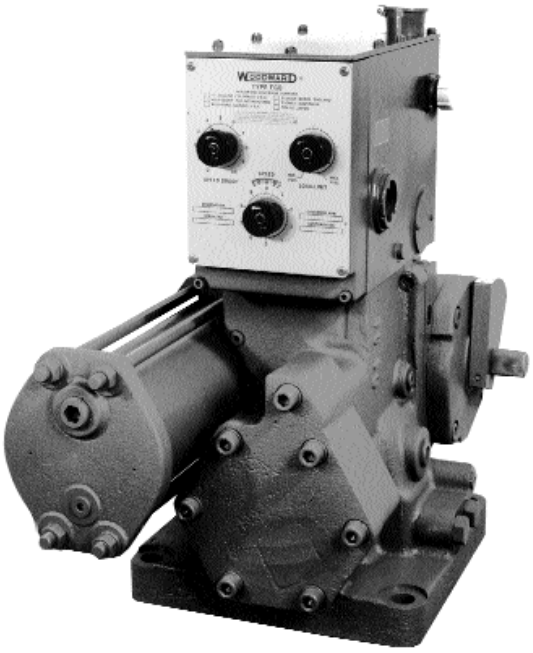
WOODWARD

Product Manual 82462
(Revision A)
Original Instructions



EGB-200P/-300P Proportional Governor/Actuator

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

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 Out-of-date translations are marked with ⚠.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

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Warnings and Notices

Important Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

⚠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

This manual describes the EGB-200P/-300P case, accumulator, and power cylinder operation, and also governor installation, adjustments and maintenance.

Description

The EGB-200P/-300P consists of an EGB-2P governor/ actuator and a 200 or 300 ft-lb (271 or 407 J) hydraulic amplifier. Refer to manual 82570E for details on operation, setup, and maintenance of the EGB-2P actuator and governor. Internal oil pressure is the only difference between the 200 and 300 ft-lb output module.

EGB Governor

The EGB is an electrically controlled actuator with proportional output and an integral backup mechanical (centrifugal) governor. It is normally used with Woodward integrating electric control units to form a complete governing system. A proportional actuator is one in which the actuator output shaft assumes a position in direct proportion to the magnitude of the input signal to the actuator. This position is determined by the fuel or steam required to maintain the desired engine or turbine speed under varying conditions of load.

The EGB-200P/-300P actuator is in effect, two governors in one: an electric actuator which provides governor function in combination with an integrating control unit, and a mechanical governor, each independently capable of positioning the output shaft. During normal operation, the electric governor controls fuel or steam to the prime mover. The mechanical governor is used as a backup governor to prevent an overspeed should the electric control fail in such a manner as to call for maximum fuel or steam. The speed of the mechanical governor is set approximately five percent higher than the electric governor. When the speed reaches the level of the mechanical governor, this section will assume and maintain control of the prime mover. Speed can be reduced, if desired, by lowering the speed setting of the mechanical governor.

Should the electric signal be interrupted or should the electric control unit fail in such a way as to produce a continuous signal calling for a decrease in fuel or steam, the prime mover will shut down. The EGB-200P/-300P can be factory equipped with a reverse-acting electrical actuator which will automatically go to maximum fuel in case of electric signal interruption. This will cause a takeover of governing functions by the mechanical section at a speed above the electrical speed setting.

⚠WARNING

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

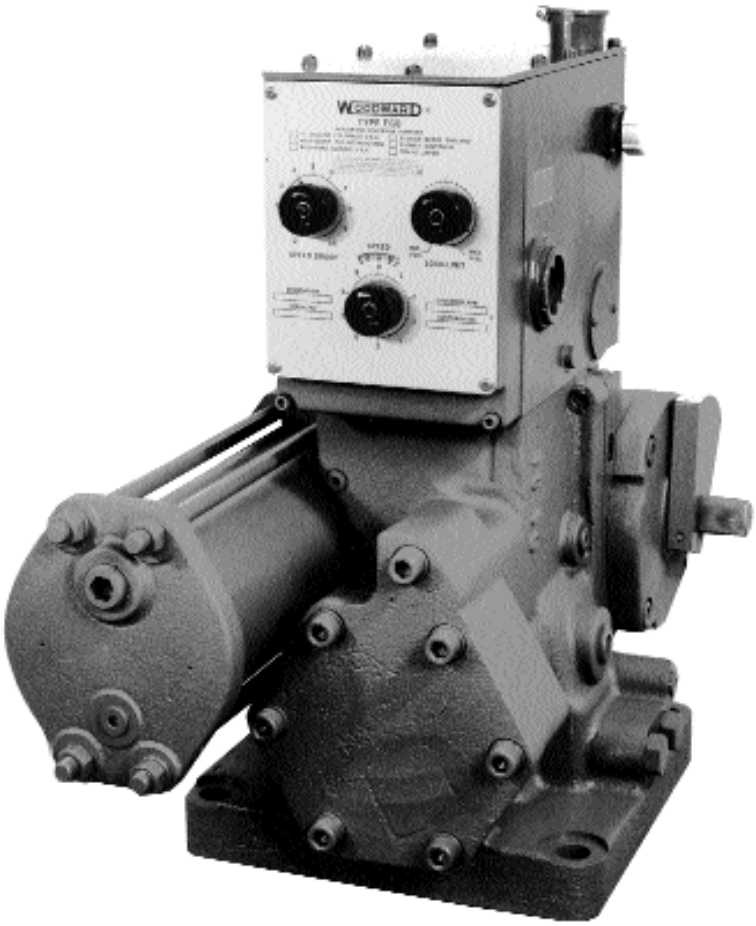


Figure 1-1. EGB-200P/-300P Governor/Actuator

Operating Units

For convenience of description, the EGB-200P/-300P can be divided into three main sections: the uppermost actuating section, the center intermediate relay section, and the lower power output section (see schematic Figure 4-1.)

Actuating Section

The electric actuator is controlled through a solenoid which drives the pilot valve plunger (upper right of Figure 4-1). The pilot valve controls pressure oil to the electric actuator power piston which controls the loading piston.

The mechanical governor side of the actuating section operates as a backup governing system to prevent overspeed under certain types of electric control failure and as a startup governor control. The mechanical governor pilot valve is driven by the flyweights and speeder spring (see upper left of Figure 4-1.) Oil flow from the mechanical governor pilot valve moves the mechanical governor power piston and likewise the loading piston.

The two actuators have independent servos, attached to the floating lever which positions the loading piston. They form a low signal selector so the actuator with the lowest output always controls.

Intermediate Relay Section

The output from the loading piston operates an intermediate relay pilot valve plunger that controls the location of the intermediate relay servo piston. Position feedback causes the intermediate relay servo piston to assume a position proportional to the actuator output.

Power Output Section

Linkage from the intermediate relay servo piston moves a large relay pilot valve which controls the flow of pressure oil to the main output servo. Position feedback from this servo to the relay pilot valve causes the servo to assume a position proportional to the intermediate relay servo piston, and consequently to the EGB sub-governor output. The engine or turbine fuel linkage attaches to the EGB-200P/-300P output shaft.

Hydraulic Oil

Pressure oil is supplied by an integral pump and accumulator for the amplifier section of the actuator. A pressure reducing valve supplies oil at a reduced pressure to the intermediate relay pilot valve and piston. The EGB sub-governor has its own pump which is supplied from the main oil sump.

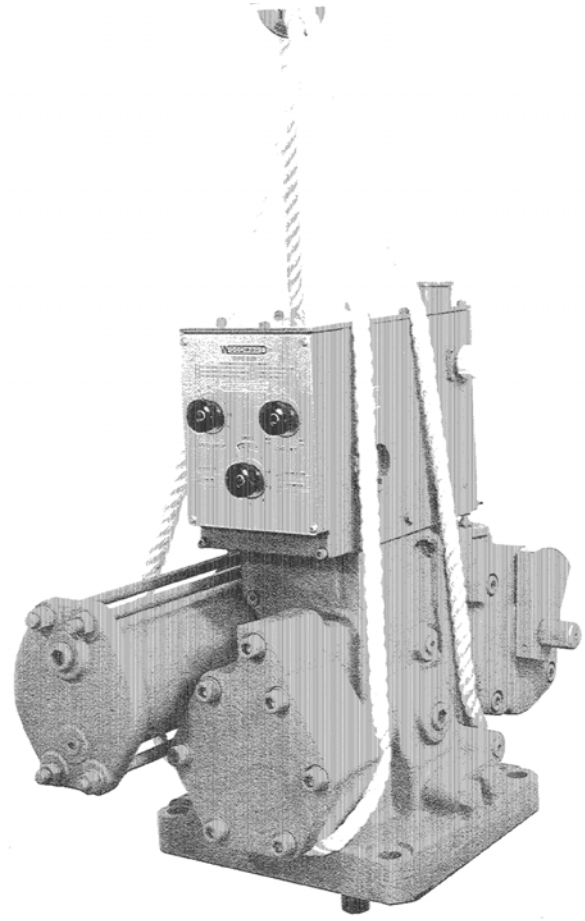


Figure 1-2. Lifting Sling for the EGB-200P Governor/Actuator
(unit pictured weighed 152 kg/334 lb)

References

The product literature listed contains additional information for parts associated with the EGB-200P/-300P governor/actuator.

Manual	Title
25071	Oils for Hydraulic Controls
25075	Commercial Preservation Packaging for Storage of Mechanical Hydraulic Controls
36641	Governor Oil Heat Exchanger
36684	Booster Servomotor
82570	EGB-1P/-2P Governor/Actuator

Accessories

The optional accessories listed here may be used on the EGB-200P/-300P.

EGB Governor Heat Exchanger (remote only)

The heat exchanger is used to lower governor oil temperature when the governor operates in high ambient temperatures. It should be used whenever the temperature of the oil goes above 90 °C (200° F) maximum operating temperature. When a governor heat exchanger is needed, it can be added without change or conversion to the EGB-200P/-300P.

IMPORTANT

Some EGB-200P/-300P governors (manufactured before 1979) have a pressurizing valve which may have been disabled. If a heat exchanger is added to one of these governors, the pressurizing valve (number 404, Figure 6-4) should be removed and checked to be sure that it has not been disabled with a cotter pin. If a cotter pin is present, it must be removed before the valve is replaced in the governor.

Booster Servomotor

The booster servomotor may be used with the governor to help the prime mover start quickly by moving the governor output toward the maximum fuel position prior to start-up. A high volume booster having a 1:1 or higher pressure ratio is necessary when used with a EGB-200P/-300P Governor/ Actuator.

Speed Setting Motor (Figure 1-3)

The speed setting motor permits changes in the speed setting of the mechanical governor section to be made from a remote location. The motor is mounted externally on top of the actuator with its output shaft connected to the manual speed adjusting screw through a friction clutch. The clutch allows speed setting changes to be made either remotely via the speed setting motor or at the actuator via the manual speed setting control knob. Two limit switches can be provided when the speed setting motor is used. The switches are actuated by the dial stops on the manual speed adjusting mechanism and may be connected in such fashion as to limit the speed setting motor travel at the desired minimum or maximum speeds or to provide a remote visual indication when the minimum or maximum speed setting has been attained. The motor is of the split field, series wound, reversible type and is available for use with all standard voltages. Refer to Woodward manual 03505 for maintenance and parts information.

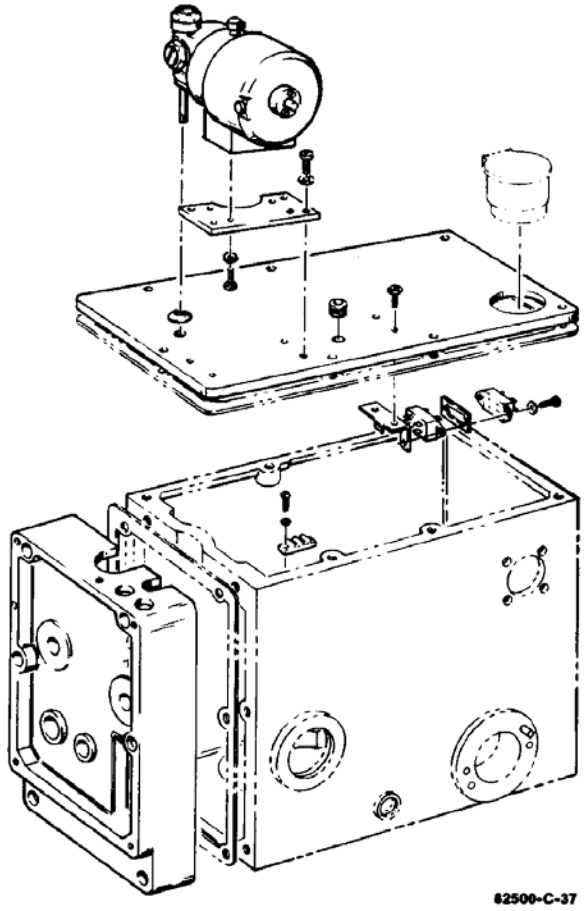


Figure 1-3. Speed Setting Motor

Shutdown Solenoid (Figure 1-4)
The shutdown solenoid is used in applications where automatic shutdown of the prime mover is desired in the event of loss of lubrication oil pressure, excessive operating temperatures, loss of vacuum, etc. The solenoid is mounted internally within the actuator column. It is connected via tubing and internal passageways to the upper side of the dashpot land on the relay-valve plunger in the hydraulic-amplifier section of the actuator. When the solenoid is open, oil pressure on the upper side of the dashpot land is dumped. This allows the oil pressure acting on the under side of the dashpot land to raise the relay-valve plunger which, in turn, dumps the trapped oil under the power piston. Oil pressure, acting on top of the power piston, then forces the piston to move to the shutdown position.

The shutdown solenoid should remain open for 5 to 10 seconds after the engine has stopped, to keep the terminal shaft from drifting open after shutdown.

⚠WARNING

This shutdown solenoid must NOT be used for OVERSPEED PROTECTION. Use only for low oil, high oil, water temperature, etc. It is good policy to use the shutdown solenoid for routine shutdown. This tests the shutdown system in a non-emergency condition.

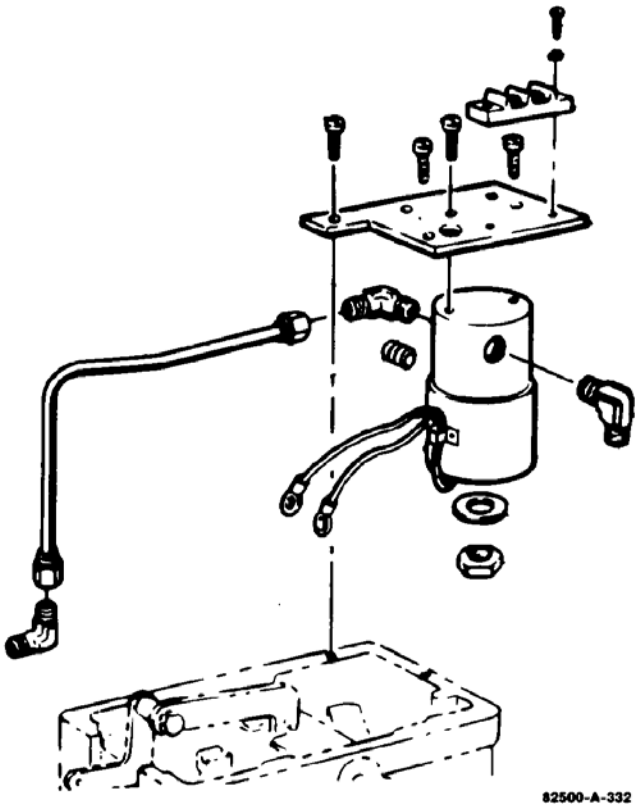


Figure 1-4. Shutdown Solenoid

Manual Starting Device

Installations which lack an electric or air pressure signal when the prime mover (which is controlled by the governor) is not running, can be fitted with a simple manual starting device. The starting device is a plunger with a spring return mounted in the governor/actuator cover directly over the actuator pilot valve plunger. When the starting plunger is pushed down on the actuator pilot valve plunger, the oil pressure generated at cranking speed will cause the terminal shaft to move in the increase direction so that the prime mover can be started under control of the mechanical governor side of the EGB. A starting device is not needed on reverse-acting units.

Mode Switch

A mode switch may be installed on the EGB-200 governor/actuator to provide a visual indication of whether electrical actuator or the mechanical governor is controlling. The installation consists of a microswitch actuated by the mechanical governor side of the control when the mechanical side is inactive. The switch assembly is mounted on top of the sub-governor case.

Pneumatic Starting Device (Figure 1-5)
The pneumatic starting device is used in applications where the electric control unit is unable to provide a signal to the actuator for starting the prime mover. This would be the case in installations where the electric control unit is dependent upon a frequency signal or upon the generator being driven for its power and thus would not provide a signal until the generator was excited. The starting device is a simple air operated plunger with spring return which is used to push the electric governor pilot valve downward. The oil pressure generated at cranking speed will then cause the actuator output shaft to move in the increase direction so the prime mover can be started. The device is mounted on the actuator cover directly over the electric actuator pilot valve and is designed for use with air pressures within a range of 690 to 1655 kPa (100 to 240 psi).

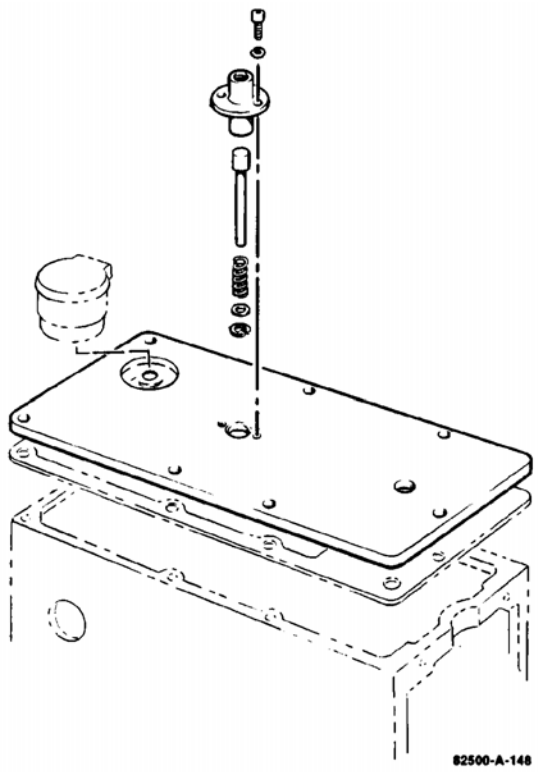


Figure 1-5. Pneumatic Starting Device

Spring Driven-Oil Damped Ballhead
A spring driven-oil damped flyweight head is available for use in EGB-200P/-300P actuators where it is necessary to dampen undesirable torsional vibrations transmitted through or from the prime mover accessory drive to the speed sensing flyweight head of the mechanical governor.

For help in selecting optional accessories for the governor, or if field conversion of the governor/actuator is necessary, contact Woodward (see Chapter 7).

⚠WARNING

t is important to regularly check the high speed stop on the speed setting knob. The operation of the electrical actuator will not be affected should this setting be changed to a higher speed. Should the speed setting knob be changed to a higher speed, and should the electric actuator or electric control fail in such a way as to call for maximum fuel, a dangerous overspeed could occur.

Chapter 2. Installation

Introduction

This chapter describes receiving, storage, and installation requirements for the EGB-200P/-300P governor/actuator. See outline drawing Figure 2-1.

WARNING

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Be careful when handling and installing the EGB-200P/-300P governor/actuator. Do not hit the drive shaft or output shaft. Rough handling can cause damage to seals, parts and adjustments.

Receiving

The EGB-200P/-300P governor/actuator is shipped from the factory in a vertical position, bolted to a wooden platform. The governor has been calibrated at the factory to exact specifications, then drained of oil. A light film of oil covers the internal parts to help prevent rust. Calibration or internal cleaning is not needed before installation and operation. The drive shaft and output shafts are covered with a light film of oil, or a soft seal preservative can be applied at the customer's request. The seal preservative is removed with a cloth and mineral spirits before installation of the unit.

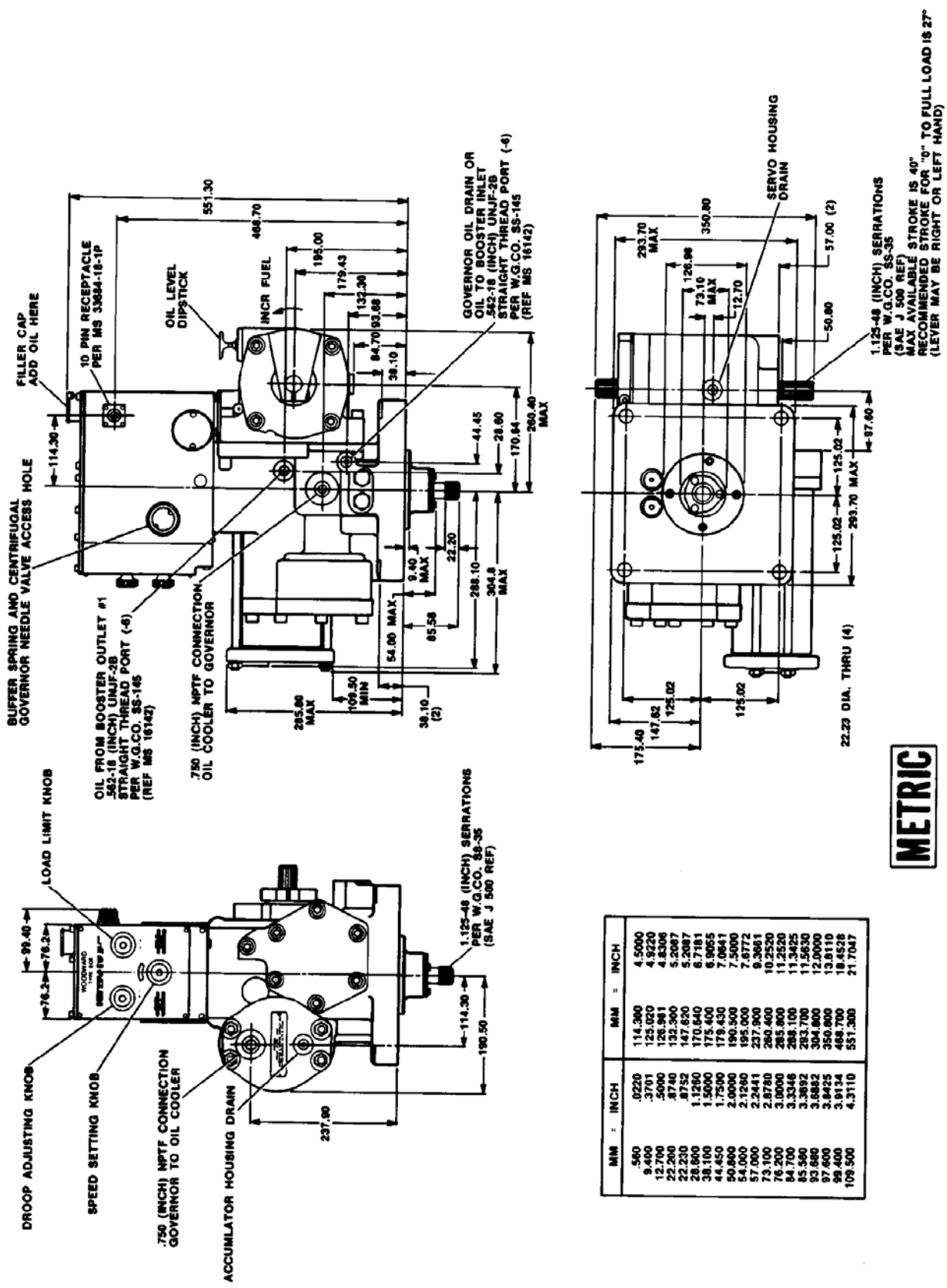
Storage

If the EGB-200P/-300P governor/actuator is to be in storage for a period of time, see Woodward manual 25075, *Commercial Preservation Packaging for Storage of Mechanical-Hydraulic Controls*.

Installation Requirements

See Figure 2-1 for (1) overall dimensions, (2) location of installation holes, (3) hydraulic fitting sizes, (4) output and drive shaft dimensions, and (5) adjustment locations.

Enough clearance must be given for installation, removal, and servicing of the governor. The governor oil drain should be easily accessible.



MM	=	INCH	MM	=	INCH
.560		.0220	114.300		4.5000
9.400		.3701	125.020		4.9220
12.700		.5000	126.941		4.9306
22.200		.8740	132.300		5.2087
22.230		.8752	147.620		5.2087
28.600		1.1260	170.640		6.7181
38.100		1.5000	175.400		6.9055
44.450		1.7500	179.430		7.0641
50.800		2.0000	190.500		7.5000
54.000		2.1260	195.000		7.6772
57.000		2.2441	237.900		9.3661
73.100		2.8780	260.400		10.2520
76.200		3.0000	285.800		11.2520
84.700		3.3346	288.100		11.3425
85.360		3.3892	293.700		11.5630
93.880		3.6882	304.800		12.0000
97.600		3.8425	350.800		13.8110
99.400		3.9134	468.700		18.4528
109.500		4.3110	551.300		21.7047

Figure 2-1. Outline Drawing of the EGB-200P Governor/Actuator

Install the EGB-200P/-300P governor/actuator on the engine governor drive pad. Use a gasket between the governor and the drive pad. The drive shaft must slip into the mating coupling without force. Be careful not to push the drive shaft into the governor. Improper alignment, or too tight a fit between any of the parts, can result in wear or seizure. Vibration or other irregularities caused by the uneven gear teeth, shaft run-out, etc., transmitted to the actuator can adversely affect actuator or ballhead governor operation and result in erratic governing.

NOTICE

Damage to the drive shaft, drive shaft seal, or other parts of the governor/actuator may occur if the governor/actuator is dropped or set on the drive shaft or drive coupling.

The linkage between the EGB-200P/-300P and the fuel or steam control should be adjusted to use a minimum of 27 degrees (approximately 2/3) of the actuator output shaft travel from the rated speed “no load position” to the rated speed “full load position”. The linkage must be adjusted to guarantee that the fuel rack is in shutdown position before the governor is at minimum position. The linkage must operate freely with a minimum of backlash. If there is a collapsible member in the linkage, it must not yield during normal governing action or under conditions of rapid output shaft movement.

Hydraulic and Electrical Connections

Make all hydraulic and electrical connections for the EGB-200P/-300P being installed. Use the correct Woodward manuals to ensure correct hookup of electrical connections.

Oil Specifications

In general, the oil used in the prime mover will be satisfactory for use in the governor.

The governor/actuator oil supply is self contained. Sump capacity is 7.0 L (7.4 qt). Whenever the governor/actuator is filled, always recheck the oil level after starting, especially when a starting booster is used.

Proper selection of the oil used in the actuator is necessary to realize best governor performance and maximum service life. The oil should have a minimum tendency to foam or retain air, form sludge, or deposit varnish. It should protect actuator parts from corrosion and not be detrimental to oil seals or paint. Refer to Woodward manual 25071, *Oils for Hydraulic Controls*, for more complete information on selection of oils for use in hydraulic controls.

The oil selected should have a high viscosity index, within the range of 50 to 300 SSU at normal operating temperatures. Only oils of the grade specified for a particular temperature range should be used.

Figure 2-2 shows the viscosity of oils at the different operating temperatures. Operating the governor with oil which does not fall in the acceptable operating range on the chart can cause erratic governor operation and possible damage to the governor.

NOTICE

Oil contamination is the major cause of actuator troubles. Use only new oil or filtered oil. Containers used for filling the actuator must be clean and should be rinsed with a light grade of the same oil before use.

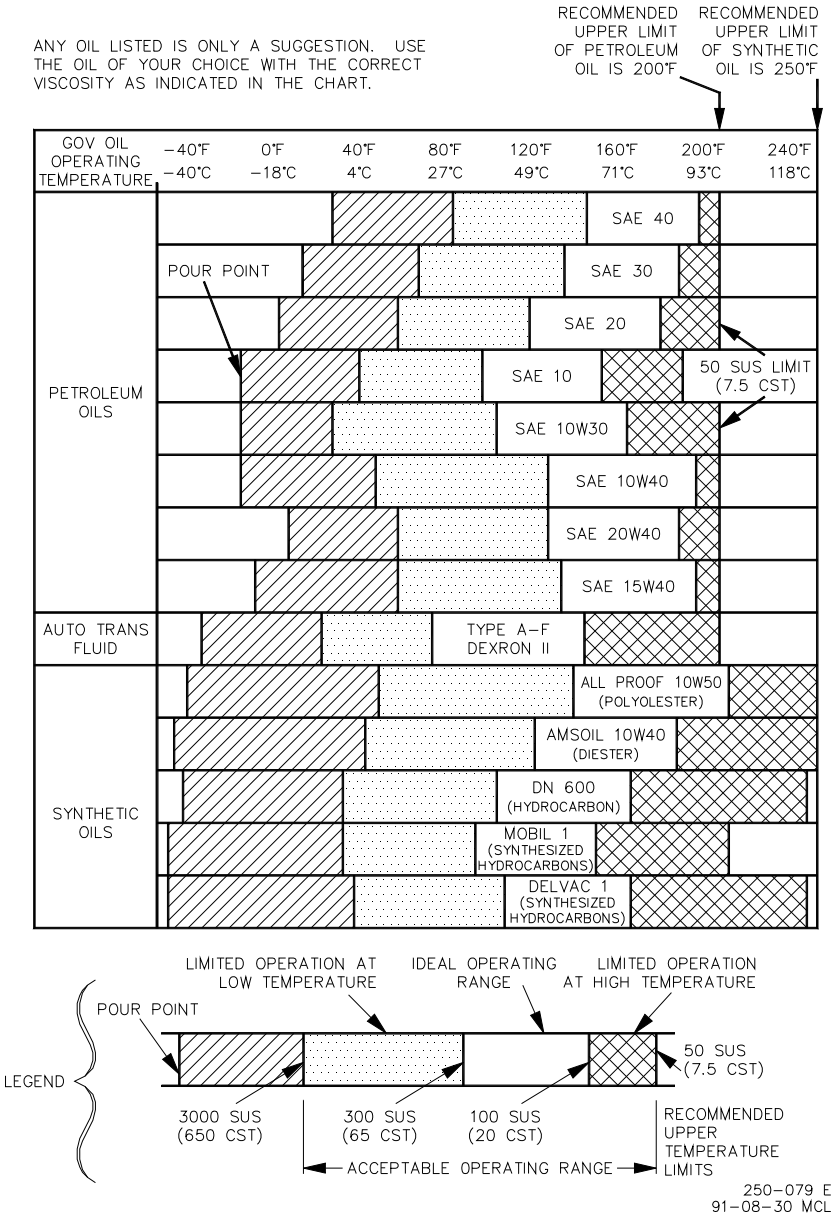


Figure 2-2. Oil Viscosity Chart

Oil Capacity

When filling a dry governor with oil, all 7.0 L (7.4 qt) can be poured in through the fill cup in the cover of the EGB column. The dipstick will read high until the unit has been run.

Filling the governor in this manner ensures that the oil level cannot drop below the intake hole for the sub-governor, which may cause a loss of control. This procedure is recommended whenever the accumulator has been drained. The oil level, under normal operating conditions, should never be allowed to drop below the bottom of the dipstick.

IMPORTANT

Failure to install and tighten down the dipstick plug before filling the unit with new oil, will allow oil to run out. When the governor/actuator has been run and the accumulator cavity and passages have been filled, the oil should be at the proper level. Check with the governor running.

Booster Servomotor

The booster servomotor (if used) is detached from the EGB-200P/-300P and is operated as a remote booster. Hydraulic lines and high pressure air lines are connected to the booster from the governor/ actuator. Make the starting air connection to the booster at the optional air supply inlet (the orificed inlet). Plug the other inlet. Refer to manual 36684, *Booster Servomotor*. The booster servomotor is actuated by a starting air pressure of 1034 to 1379 kPa (150 to 200 psi), and pressure oil from the booster moves the servo piston toward the maximum fuel position.

Because of the large volume of oil needed to move the EGB-200P/-300P servo, the booster limit screw should be adjusted to permit maximum booster servo output.

Heat Exchanger

The heat exchanger is remotely located from the governor. Make all hydraulic connections for the heat exchanger to the governor. See manual 36641, *Governor Oil Heat Exchanger*. If a heat exchanger is added to a governor manufactured before 1979, the pressurizing valve (number 404, Figure 6-4) should be removed and checked to be sure that it has not been disabled with a cotter pin. If a cotter pin is present it must be removed before the valve is replaced in the governor.

If a heat exchanger is added to a governor not having a pressurizing valve, a pressurizing valve must be installed.

Prime Mover Operation

When starting the prime mover, an electrical signal must be provided to the actuator so the pilot valve in the electric governor will move in the increase fuel or steam direction. This allows the oil pressure generated at cranking speed to rotate the output shaft and open the fuel or steam control sufficiently to start. When a battery or other independent power supply is available to provide power to the electrical control unit, the control unit will transmit a signal in the range of 8 to 9 Vdc to the actuator for starting. If a source of electrical power is not available, the actuator may be equipped with a pneumatic or manual starting device.

Where neither a source of electric or pneumatic power is available, or in the event of electrical control unit failure, a 9 V battery may be connected across pins A(+) and B(–) of the actuator receptacle to provide the necessary electrical signal for starting. This method may also be used in the event of control unit failure or loss of electrical power to force the electric governor to assume a simulated overload condition and to permit continued operation of the prime mover under control of the mechanical governor in the actuator.

⚠WARNING

Prior to starting a unit with a 9 V battery, lower the mechanical speed setting to 60 Hz or less.

Units wired for reverse-acting controls will automatically go to mechanical control upon loss of electric signal and do not need an electrical signal in order to start operation.

Chapter 3. Adjustments

Introduction

This chapter describes the first start-up and the basic adjustments of the EGB-200P/-300P governor/actuator.

Initial Operation

Before the first start-up of the EGB-200P/-300P, be sure all steps in Chapter 2 have been done and are correct.

⚠WARNING

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Mechanical Governor Needle Valve Adjustment

When starting the engine for the first time, it is necessary to eliminate any air which may be trapped in the actuator passages. First lower the mechanical speed setting to minimum, then raise the electrical actuator to maximum fuel position as described elsewhere in this manual. Then, with the mechanical governor controlling, air may be eliminated in the following manner: Open the mechanical governor needle valve (number 268, Figure 6-3) until the actuator hunts or surges. After a half minute, gradually close the needle valve until the engine speed just settles out. Closing the needle valve further than necessary will make the actuator slow to return to normal speed after load change. The needle valve should never be closed tight.

Test the action by manually disturbing the speed of the actuator. The actuator should return to its original steady-state speed with only a small overshoot or undershoot.

The electric governor section of the actuator has no external operating adjustment. For other adjustments of the EGB governor, refer to manual 82570, *EGB-1P/-2P Governor/Actuator*.

IMPORTANT

The following preliminary operating adjustments are for the mechanical governor section adjustments only and are required only after repair or overhaul. Preferably, the adjustments should be made only on a governor test stand with the mechanical governor controlling.

Operating Control Adjustments

Three operating control knobs are located on the front panel of the EGB-200P/-300P governor/actuator (see Figure 1-1):

- Speed setting control knob, used to set the speed at which the mechanical governor will control
- Speed droop control knob, used to permit load division and parallel operation of actuators controlled by the mechanical governor
- Load limit control knob, used to limit maximum prime mover load whether the actuator is controlled by the electric or mechanical governor

IMPORTANT **The following adjustments are normally factory set and need to be checked only after disassembly. These adjustments should normally be done on a test stand.**

Terminal Shaft Travel Adjustment

Turn the load limit control knob fully clockwise (CW). Turn screw (23, Figure 6-1) counterclockwise (CCW) until the control knob can be rotated 1/8 turn CCW before the load limit strap (24, Figure 6-1) begins to rise. Again turn the control knob fully CW.

Adjust screw (85, Figure 6-1) to permit full travel of the terminal shaft (that is, from minimum fuel to maximum fuel positions as shown on the fuel indicator). Turn the screw CCW to lengthen the terminal shaft travel in the maximum fuel direction.

Load Limit Adjustment

Turn the load limit control knob fully CW.

With the actuator running and the terminal shaft just at the end of its travel in the maximum fuel direction, turn screw (23, Figure 6-1) CW until the terminal shaft just starts to move in the minimum fuel direction. Then turn the screw CCW 1/4 turn.

Turn the load limit control knob CCW until the terminal shaft is at the midpoint of its travel (as shown by fuel indicator). Loosen nut (12) and position pointer disk (14) at "5". Tighten the nut to lock the pointer in position.

Speed Droop Adjustment

If the governor/actuator has been disassembled, reset the droop linkage to zero. Use steps 1 through 7 to completely recalibrate the droop linkage. Use steps 4 through 7 for a normal procedure of setting droop.

Perform steps 1 through 3 with the engine not running and the governor/actuator cover removed. For steps 4 through 7, replace the cover and operate the engine unloaded.

1. Set the speed droop knob all the way CCW to zero droop.

2. Place a dial indicator on top of speeder spring (245, Figure 6-3).

3. Manually lift up power piston (295) and check the dial indicator for movement. Zero to plus 0.003 movement indicates "0" droop. The speeder spring should not move down when the power piston is raised.

   If there is not zero droop, reposition link (62, Figure 6-1) until the pin in the link is on the same axis immediately above pivot pins (208, Figure 6-3).

   Some units are equipped with an eccentric pivot pin (62, Figure 6-1) and some just have a plain pivot pin. If pin (62) is an eccentric, turn it until it is in the center of its movement.

NOTICE **Do not release the tension on crank (68) while screw (65) is loose.**

Loosen screw (65) and manually move link (63) until its pin lines up on an axis above pivot pins (208).

Retighten screw (65). If pin (62) is an eccentric, make fine adjustments by loosening the nut and turning the eccentric until "0" droop is obtained. Remove the dial indicator.

⚠WARNING **Prior to starting the engine, make sure that the high speed stop has not slipped and that the mechanical governor is within the normal operating range.**

4. Operate the engine unloaded. Be sure the speed droop control knob is all the way CCW on zero droop.
5. Increase the electronic control speed until the mechanical governor controls the prime mover.
6. With the mechanical governor controlling, adjust the mechanical governor speed setting knob to 60 Hz.
7. Load the prime mover to maximum.
8. Check for zero droop by watching the frequency meter, which should not vary from 60 Hz. If the frequency meter does vary, shut down the prime mover, check and adjust for zero droop as in steps 1 through 3. If the frequency meter does not vary from 60 Hz. the mechanical governor is set at zero droop.
9. Once zero droop is attained, unload the prime mover.
10. Turn the droop knob to about 3 on the dial.
11. Load the prime mover to maximum and check the frequency meter. Droop should be at three percent. The frequency meter should read 58.2 Hz.
12. If droop is not correct, unload the prime mover.
13. Turn the droop knob CW to increase droop or CCW to decrease droop as required to obtain 3 percent droop.
14. Set the speed to 60 Hz and load the prime mover to maximum. Check the droop.

15. Continue the adjustments until three percent droop is attained.

16. Adjust the speed setting knob until the frequency meter reads 62.5 to 63 Hz.

17. Adjust the electronic control to 60 Hz.

The mechanical governor is now set with the correct amount of droop. The mechanical governor speed is also set just high enough that it will not interfere with the electric actuator which is now in control of the prime mover.

Speed Setting Stop Adjustment

Remove dial plate (8, Figure 6-1). Remove speed setting control knob (13) and pointer disc (14). Loosen three screws (15). Put control knob back on speed adjusting shaft (43).

⚠WARNING

It is important to regularly check the high speed stop on the speed setting knob. The operation of the electrical actuator will not be affected should this setting be changed to a higher speed. Should the speed setting knob be changed to a higher speed, and should the electric actuator or electric control fall in such a way as to call for maximum fuel, a dangerous overspeed could occur.

Turn the speed setting control knob CCW until the specified low speed is reached. Rotate dial stop (19) nearest the control knob CCW until it reaches stop pin (46). Be sure that the actuator terminal shaft is not at the end of its travel when low speed is reached.

Rotate dial stop 19 farthest from the control knob until it is about even with the low speed stop. Tighten three screws (15).

Turn the speed setting control knob CW until the specified high speed is reached. (This speed is usually about 5 percent above rated speed.)

Loosen three screws (15) and rotate dial stop (19) farthest from the knob until it is against stop.

Tighten screws (15). Recheck speed settings. Readjust stops, as necessary.

Turn the control knob to the low speed setting. Remove the knobs. Put pointer disc (14) on the shaft assembly so that the pointer is at the top or "0" position. When properly set the "0" on the speed setting dial behind the dial plate, the "0" on the dial plate and the pointer should all be aligned at low speed. Put the control knob back on and tighten nut (12).

Magnet Adjustment (Centering Pilot Valve Plunger)

The following adjustments are best made on a test stand. Actuator adjustments can be extremely difficult on the engine.

⚠WARNING

When blocking governor output or operating the hand throttle, the system is not under governor control, and extreme caution must be taken to prevent overspeed. Do not attempt if the overspeed trip device is not functioning.

Initial adjustment of the actuator consists of physically centering the magnet (240, Figure 6-3) between the coils of the solenoid when the control land on the pilot valve plunger is centered over the control port in the pilot valve bushing. This minimizes the effect of temperature drift when changes occur in the operating temperature of the actuator and provides a more balanced load division when the actuator is used in tandem (droop) applications. In applications where load division is not a factor, centering is not critical and the centering screw need only be backed out 1 to 1-1/4 turns after bottoming to provide acceptable operating characteristics.

Center the magnet (pilot valve plunger) as follows:

1. Connect the test circuit to the terminal block on the actuator as shown in Figure 5-1. Set the test switch to OFF. Remove the fuel linkage to engine or test stand.

IMPORTANT

The test circuit must be connected to the Jones plug inside the governor case, not to the terminal plug on the outside of the case. The only electrical test possible from the outside terminal plug is to check continuity of the circuit through the transducer coils. Note that circuits are jumped between the Jones plug and the receptacle. The test circuit must operate with these circuits open.

2. Install a protractor over the actuator output shaft and secure in position. Install the actuator output lever, if not already in place, for use as an indicator. Rotate the output shaft over its full range of travel. Note or mark the minimum and maximum shaft position on the protractor. The total output shaft travel should be 30 degrees if the shaft is part of the power cylinder and 45 degrees if the shaft is located in the aluminum column.

3. Insert a 7/64 inch Allen wrench through the clearance hole in the transducer lever, through the hollow center of the adjustable spring seat (226, Figure 6-3), and engage the pilot valve centering screw. Turn the centering screw in until it bottoms, then turn out 1 to 1-1/4 turns to establish an initial starting position.

4. Set the test switch to CENTER and adjust the potentiometer to 400 mA on the milliammeter. Set the test switch to OFF.

5. Insert a 1/8 inch Allen wrench through the clearance hole in the stop screw plate and engage the adjustable spring seat. Center the output shaft at the approximate midpoint of its travel. Turn the seat CW to move the shaft to increase fuel or CCW to move the shaft to decrease fuel. Note the exact position of the shaft for future reference.

6. Set the test switch to CENTER and observe the output shaft for rotation. If the output shaft remains stationary, the magnet (pilot valve plunger) is centered and no further centering adjustments are required. If the output shaft moves to another position, note the direction of movement and then set the test switch to OFF.

7. If the output shaft movement was to increase fuel, turn the pilot valve centering screw CW a small amount using the 7/64 inch Allen wrench. If the movement was to decrease fuel, turn the centering screw CCW. The output shaft will assume a new position after making an adjustment to the centering screw. Note the new position of the shaft for reference if further adjustment is required.

8. Repeat steps 6 and 7 until a point is found at which no movement of the output shaft occurs when the test switch is moved from OFF to CENTER.

9. Set the test switch to OFF and turn the potentiometer full CCW (decrease).

Adjust the travel of the actuator output shaft as follows:

1. Set the test switch to normal. Adjust the potentiometer for minimum current according to the test specification.

2. Using a 1 /8 inch Allen wrench, turn the adjustable spring seat CCW until the actuator output lever is at its minimum position, then turn the seat CW until the shaft moves 1 to 2 degrees from its minimum position.

3. Adjust the potentiometer for the maximum specification current. The output shaft should move an additional 27 (±1/2) degrees in the increase fuel direction. Shift the clamping plate so the pivot pin moves toward the output shaft to decrease shaft travel.

4. Repeat the adjustments at minimum and maximum mA alternately until no further adjustment is required at either point.

5. Disconnect the test circuit and the oil supply line if used. Remove the protractor.

IMPORTANT **Terminal shaft movement will be the opposite of that described above for reverse-acting units.**

Chapter 4.
Principles of Operation

Introduction

The EGB-200P/-300P governor/actuator (see Figure 4-1) has two distinct controls in the actuating section:(1) an electric actuator and (2) a mechanical governor section. A hydraulic amplifier in the intermediate section amplifies the product of either of the control sections, and the EGB-200P/-300P then uses this amplified product to control the fuel rack of the engine or turbine.

The control sections are interconnected through the loading piston. The loading piston position determines the actuator output shaft position.

Hydraulic Amplifier Section

The EGB-200P/-300P governor/actuator contains two separate hydraulic circuits. Each circuit utilizes the oil of a common sump. The accumulator oil pump (see Figure 4-1) provides pressure oil required by the amplifier section. The actuator drive shaft, driven at a speed proportionate to engine speed, rotates the pump drive gear and idler gear. Pressure oil forces the accumulator piston to the left, opposing the force of the accumulator spring. When the piston moves up sufficiently, it uncovers a bypass hole through which excess oil is returned to sump. The accumulator provides a reservoir of pressure oil and also a relief valve to limit maximum pressure in the hydraulic circuit.

The arrangement of the check valves on the suction and discharge sides of the oil pump permits the actuator drive shaft to be rotated in either direction without any changes being made in, or to, the governor. The direction of pump rotation does not affect the oil pressure system or actuator operation.

The intermediate relay servo piston is connected to the relay piston which controls high pressure oil to the large power cylinder. The output of the large power cylinder controls the output shaft position.

Action throughout all three sections of the EGB-200P/-300P is established by the movement of differential pistons in the various hydraulic systems. The intermediate relay pilot valve plunger in the intermediate relay pilot valve rotating bushing controls the flow of oil to and from the underside of the relay servo piston. If the plunger is "centered" in the bushing (that is, its control land exactly covers the control port in the rotating bushing), no oil flows to, or from, the piston. Pressure oil continually urges the piston down in the direction to decrease engine fuel. However, the piston cannot move down to decrease fuel unless the oil trapped between the underside of the piston and the relay valve plunger control land can escape to sump. This trapped oil can escape only if the relay valve plunger is raised. If the relay valve plunger is lowered, pressure oil is directed to the underside of the piston as well as to the upper side of the piston Because the pressure acts upon a greater area on the lower side of the piston, the resulting force is in the direction to push the piston up and increase fuel.

The relay valve plunger movement is controlled by the output nut attached to the loading piston. Assume, that with the relay valve plunger centered, the loading piston and output nut moves down. As will be seen, either the electric governor section or the mechanical governor section is capable of controlling the loading piston position.

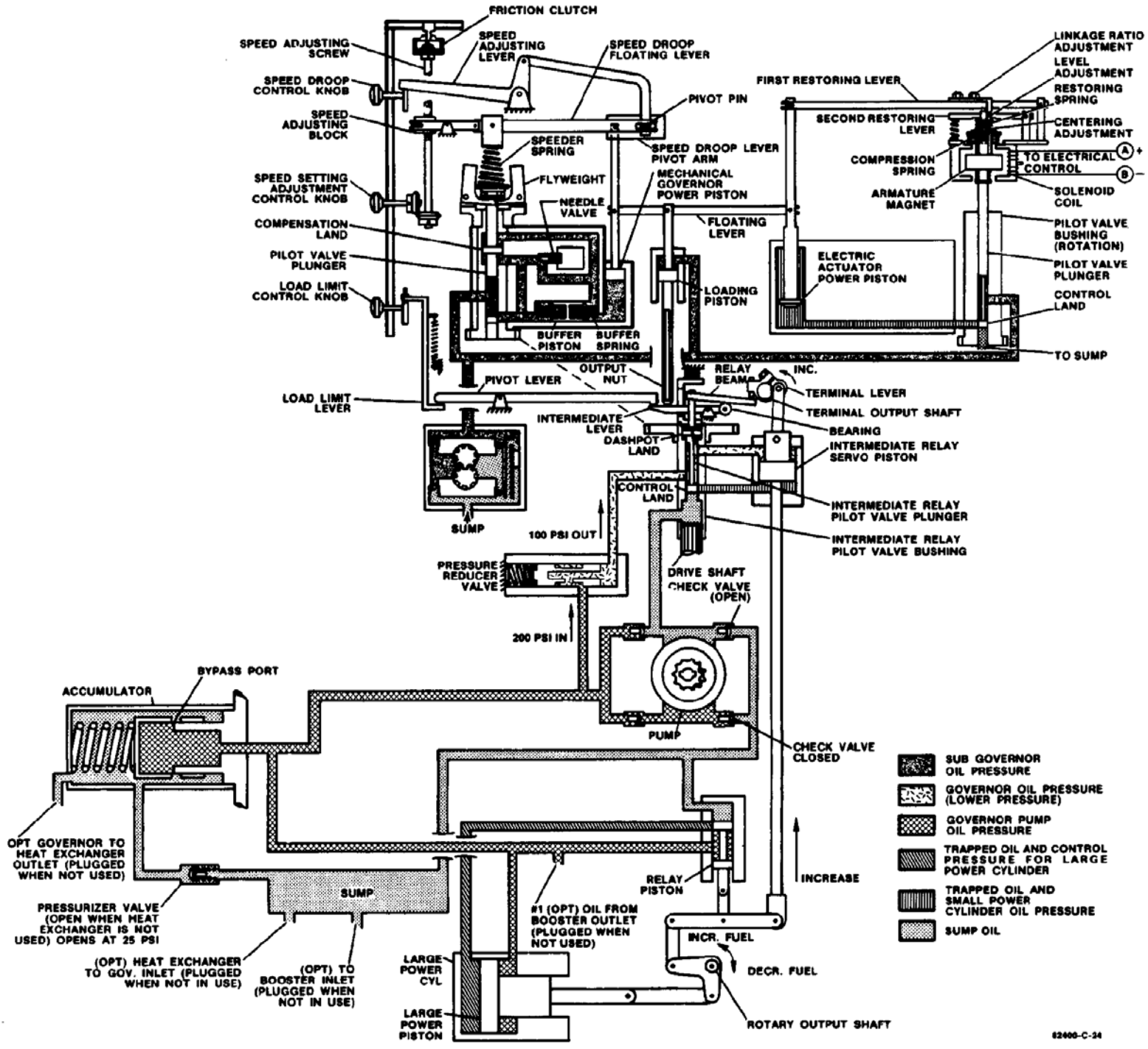


Figure 4-1. Schematic of the EGB-200 Proportional Governor/Actuator

This downward movement of the piston and nut pushes the left end of the intermediate lever down. As the right end of the intermediate lever moves up, the left end of the relay beam is raised (the beam pivots about the screw in the end of the relay terminal lever). The relay valve plunger is thus lifted above center and the servo piston rotates the terminal shaft in the decrease fuel direction.

As the relay terminal lever rotates, the screw in the left end of the lever is raised. This permits the oil pressure atop the dashpot land to push the relay plunger down, pivoting the relay beam about the bearing in the right end of the intermediate lever. (The dashpot land serves as a "differential piston" with the area on the upper side of the land greater than the area on the lower side. With pressure oil on both sides of the piston it will move in the downward direction.) As the relay valve plunger reaches its centered position, flow of oil from under the relay servo piston is stopped, thereby stopping the terminal shaft movement.

If the loading piston and output nut move up, oil pressure on the upper side of the dashpot land now pushes the relay plunger down. At the same time, the right end of the intermediate lever is pushed down thereby keeping the left end of the lever in contact with the output nut.

With the relay valve plunger below center, pressure oil flows to the lower side of the servo piston and pushes the piston up. The terminal output shaft rotates in the increase fuel direction. As the relay terminal lever rotates, the screw in the end of the lever pushes the right end of the relay beam down. The relay beam pivots about the roller bearing in the right end of the intermediate lever, thus lifting the relay valve plunger back to its centered position and stopping further movement of the terminal shaft.

All signals from the governor unit are translated into 200 foot pounds of pressure at the output shaft to move the fuel rack or steam control to the desired location for the load and speed.

Electric Actuator Section

During the normal mode of operation of the actuator, the electric actuator (see Figure 4-1) will be controlling and the mechanical governor power piston will be at the top of its stroke.

Pressure oil for the electrical and mechanical governor sections is provided by the sub-governor oil pump. The pump relief valve plunger, acting against the relief valve spring, maintains the oil pressure required in these sections. Because the oil volume required in these sections is relatively small, no accumulator is required. The sub-governor oil pump operates the same way as the accumulator oil pump.

The electric actuator pilot valve plunger controls the flow of oil to and from its servo piston. The pilot valve plunger is connected to a magnet which is spring suspended in the field of a two-coil polarized solenoid. An output signal from an electric control unit is applied to the polarized coil and produces a force, proportionate to the current in the coil, which tends to pull the magnet—and pilot valve plunger—down. A combination of the restoring spring and centering spring force tends always to raise the magnet and balance the pilot valve plunger. When the actuator is running under steady-state conditions, these opposing forces are equal and the pilot valve plunger is "centered" (that is, the control land of the plunger exactly covers the control port in the pilot valve bushing). With the pilot valve plunger centered, no oil flows to, or from, the servo piston.

If the signal from the electric control decreases (due to an increase in engine or turbine speed or a decrease in unit speed setting), an unbalanced force results. The combination of the restoring spring and centering spring force, now relatively greater, raises the pilot valve plunger. Oil under the electric actuator servo piston is thus connected to sump. The oil pressure constantly applied to the upper side of the loading piston and electric actuator power piston now forces the pistons down as the floating lever pivots about its connection to the mechanical governor servo piston. The loading piston causes the terminal shaft to rotate in the "decrease" direction.

As the electric actuator power piston moves down, it lowers the left end of the first restoring lever. The clamping plate, attached to the first restoring lever, pushes down on the second restoring lever. (The restoring levers and spring are not identified in Figure 4-1 but are shown connecting the electric actuator power piston to the electrical solenoid at the upper right of the illustration). The loading on the restoring spring is thereby increased and lowers the pilot valve plunger. The loading piston and electric actuator servo piston move down until the increase in restoring spring force is sufficient to offset the increased force resulting from the decrease in the electric signal. When the pilot valve plunger is pushed back to its centered position, movement of the power piston, loading piston, and terminal shaft stop.

It can be seen that the position of the actuator shaft is proportional to the electric input signal to the actuator. If the electric input signal increases, the pilot valve plunger will be lowered, pressure oil will flow to the underside of the servo piston and push the piston up; the loading piston will be raised, rotating the terminal shaft in the "increase" direction. At the same time, the upward movement of the servo piston, acting through the restoring levers, decreases the restoring spring force so the pilot valve plunger will re-center to stop movement of the terminal shaft.

Mechanical Governor Section

The mechanical governor (see Figure 4-1) controls the prime mover during starting and also functions as a backup governor prevent runaway should the electric control unit fail and call for maximum fuel or steam. The mechanical control must be able to increase the speed above the electrical control speed or the unit will call for maximum fuel in an attempt to increase the speed to the mechanical speed setting. The mechanical governor pilot valve plunger controls the flow of oil to its power piston. If the plunger is centered, no oil flows through the pilot valve, and the servo piston is stationary. The greater of two opposing forces moves the pilot valve plunger: The speeder spring force tends to push it down; the centrifugal force developed by the rotating flyweights is translated into an upward force which attempts to raise the plunger. With the pilot valve centered, there is only one speed at which the centrifugal force of the flyweights is equal and opposite to the speeder spring force.

With the speed setting of the mechanical governor set slightly higher than the electrical actuator, the centrifugal force of the rotating flyweights is not sufficient to lift the pilot valve plunger to its centered position. Consequently, with the electric actuator controlling, pressure oil is continually directed to the underside of the mechanical governor servo piston to hold it up against its stop. With the actuator running on-speed with the mechanical governor controlling, the pilot valve plunger is centered. If a load is added to the engine and governor speeds decrease the pilot valve plunger is lowered by the speeder spring force which will be greater than the lessened centrifugal force of the flyweights. Pressure oil flows to the buffer piston and moves it towards the servo piston.

The oil displaced by the buffer piston forces the servo piston upward, the loading piston is raised, and the terminal shaft is rotated in the direction to provide the fuel needs of the new load.

The movement of the buffer piston towards the servo piston partially relieves the compression of the left buffer spring and increases the compression of the right buffer spring. The force of the right buffer spring tending to resist this movement results in a slightly higher oil pressure on the left side of the buffer piston than on the right. The pressure on the left of the buffer piston is transmitted from the underside of the compensation land of the pilot valve plunger to the upper side of the compensation land. The difference of pressure produces a force which acts to push the pilot valve plunger back to its centered position.

When the terminal shaft has been rotated far enough to satisfy the new fuel requirement, the force of the pressure differential on the compensation land plus the centrifugal force of the rotating flyweights will have re-centered the pilot valve plunger, even though engine speed is not yet completely back to normal. The servo piston—and terminal shaft—movement is thereby stopped. The continued increase of speed to normal results in continued increase in centrifugal force developed by the rotating flyweights. This increase of speed to normal does not cause the flyweight to lift the pilot valve plunger above center because the leakage of oil through the needle valve orifice equalizes the pressure above and below the compensation land at a rate proportional to the return of the engine speed to normal.

With the pressures above and below the compensation land equalized, the buffer springs return the buffer piston to its normal, central, position.

Were the engine load to decrease, the resultant increase in governor speed would cause the flyweights to move outward and raise the pilot valve plunger. With the pilot valve plunger raised, the area to the left of the buffer piston would be connected to sump. The loading piston, continually being urged downward by oil pressure from the sub-governor pump, would move down and force the servo piston down. The movement would reduce the fuel to meet new requirement. Again, differential pressure across the compensation land would assist in re-centering the pilot valve plunger, and keep the pilot valve ports closed while speed decreases to normal.

The speed at which the mechanical governor controls the engine is determined by the loading or compression of the speeder spring which opposes the centrifugal force of the flyweights.

Speed droop is used in mechanical governors to automatically divide and balance load between engines or turbines driving the same shaft or paralleled in an electrical system. (Speed droop is defined as the decrease in governor speed as its output connection to the engine fuel linkage moves in an increase direction. How far the governor speed decreases for a given stroke, determines the amount of droop.) Speed droop is incorporated in the EGB-200P/-300P mechanical governor through linkage which varies the loading on the speeder spring as a function of the servo piston position. The change in speeder spring force for a given movement of the servo piston is determined by the servo piston and speeder spring. If the pin is on the same centerline as the speed droop lever pivot arm, there is no change in speeder spring forces as the servo piston moves and the mechanical governor responds as an isochronous (constant speed) control. The further the adjustable pin is moved away from the pivot arm centerline, the greater is the change in compression of the speeder spring for a given servo piston movement.

With the actuator operating under control of the electric actuator section, the speed droop feature is, in effect, inoperative. This is because during such operation, the mechanical governor servo piston remains in the same position for all engine or turbine loads (except possibly momentarily during transients). Thus, the speed droop linkage does not alter the speeder spring compression when the electric governor section of the actuator is controlling.

Chapter 5.
Maintenance

Hydraulic Oil Care

Use NEW OIL to fill the governor. Be sure that all containers used for governor oil storage are clean. Contaminated governor oil will cause early wear of plungers, bushings, gears, bearings, etc., and can cause rust and corrosion on springs and other internal parts.

Under normal operating conditions, oil should be changed every 18 months. Oil must be changed more often if the unit operates under unusual temperature or dirt conditions.

After the governor is put in service, the oil condition should be carefully monitored until a length of service can be established. A careful check of oil condition is suggested at least every three months until length of service is established. Any time the oil looks dirty or appears to be breaking down from contamination or high temperature, drain the governor oil while it is hot, flush with the lightest grade of the same oil, and refill the governor with new oil of the correct viscosity (see oil viscosity table, Figure 2-2 or refer to Woodward manual 25071, *Oils for Hydraulic Controls*).

Troubleshooting

When governor problems are suspected in engine or turbine operations, the first step should be to isolate the trouble area.

The following checklist is suggested as an aide in isolating the problem before initiation of corrective action.

⚠WARNING

When blocking governor output or operating the hand throttle, the system is not under governor control, and extreme caution must be taken to prevent overspeed. Do not attempt if the overspeed trip device is not functioning.

1. Check the load to be sure the problem is not beyond the capacity of the engine or turbine.

2. Remove the linkage between governor output shaft and engine or turbine. Operate the engine or turbine manually both free and under load at recommended speeds. Should this correct the problem, carefully check against linkage binding or other linkage malfunction before proceeding to step 3.

3. Using the electrical bypass method described in Chapter 3 under Prime Mover Operation, isolate the electrical actuator so the mechanical governor controls. Should this correct the problem, the electrical integrating control is causing the engine or turbine problem and should be corrected according to the supplier's specifications. If the problem remains, it can be assumed that the EGB control system is malfunctioning.

EGB Control Problems

If the problem is found to be in the EGB governor, it is probably due to the hydraulic oil supply or condition. Check the oil level, viscosity, and condition carefully. If the oil is found to be contaminated, the governor can be flushed with kerosene or fuel oil while cycling the actuator using the load limit knob. This procedure is difficult to accomplish on a governor that is mounted on an engine and is not recommended until all other procedures have been tried.

A final check of the prime mover drive to the actuator should be made before determining that the problem is in the governor itself. Excessive backlash or a tight meshing of gears driving the actuator may be the cause of erratic, but small, speed variations.

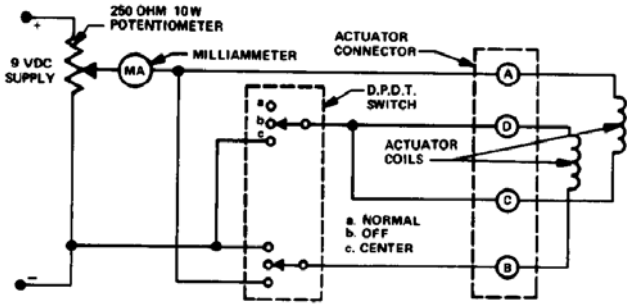


Figure 5-1. Actuator Adjustment Test Circuit

Governor Repair

In many cases, repair of the governor should not be attempted, but the unit should be sent to a qualified repair facility.

Governor Wear

Governor wear can sometimes be detected by checking oil pressure in the lower sections of the governor. Pressure in the power section of the EGB-200P/-300P may be checked with an oil pressure gauge capable of checking pressures to 3450 kPa (500 psi). The upper port in the lower section as shown in Figure 6-4 is removed and the pressure gauge installed with a SAE 6 fitting. Pressure at this point should be at 1380 ±70 kPa (200 ±10 psi) permissible.

Low pressure can be corrected only by extensive governor overhaul or replacement.

Dial Panel

Should the dial panel be removed from the front of the governor, take care when reinstalling to assure that the lugs in the speed adjusting nut accurately engage the slots in the speed adjusting levers. The speed adjusting nut must be turned toward the dial panel (the lugs turned away from the governor) when replacing the dial panel on the governor.

Repair And Disassembly

A governor can operate several years before it will need an overhaul if the oil is kept clean, and if the drive from the prime mover is smooth and does not have torsional vibration.

Should disassembly and repair become necessary, the work must be done by personnel trained in the correct repair procedures.

⚠WARNING

The accumulator spring (605, Figure 6-8) Is compressed and held in the accumulator assembly. Injury to person or damage to the equipment can result from careless disassembly of this unit. Place the accumulator assembly In an arbor press to permit a controlled rate of spring expansion.

Chapter 6.
Replacement Parts

When ordering replacement parts, include the following information:
1. Manual number (this is manual 82462).
2. Governor serial number and part number shown on the nameplate.
3. Part reference number and part name from parts list.

WARNING **Injury may result if compressed springs are released suddenly. Use the proper equipment to remove springs and spring covers.**

Parts for Figure 6-1

Ref. No.	Part Name	Quantity
82462-1	Screw, fil. hd., 1/4-28 x 5/8 (MS35266-80)	7
82462-2	Lockwasher, split, 1/4-28 ID (MS35338-44)	7
82462-3	Clutch pin	1
82462-4	Oil Cup	1
82462-5	Cover	1
82462-6	Cover Gasket	1
82462-7	Screw, binder hd., Phillips, 8-32 x 3/8	4
82462-8	Dial and name plate	1
82462-9	Screw, fil hd., 1/4-28 x 1-3/4 (MS35266-86)	6
82462-10	Lockwasher, split, 1/4 ID x 0.35 OD x 5/64 thk.	6
82462-11	Panel Gasket	1
82462-12	Locknut, thin 1/4-20	3
82462-13	Knob	3
82462-14	Pointer Disk	3
82462-15	Screw, flat hd., 10-32 x 3/8 (MS24583-53)	3
82462-16	Dial locating plate	1
82462-17	Speed setting dial	1
82462-18	Spacer	2
82462-19	Dial Stop	2
82462-20	Load limit spring	1
82462-21	Locknut,thin10-32(MS21083N3)	1
82462-22	Screw, soc. hd. cap. special 10-32 x 1	1
82462-23	Setscrew, soc. hd., oval pt., 6-32 x 5/8	1
82462-24	Load limit strap assembly	1
82462-25	Locknut, thin,3Y8-24 (MS21082N6)	2
82462-26	Spring washer	2
82462-27	Speed droop cam	1
82462-28	Load limit cam	1
82462-29	Roll pin, 3/32 x 1/2 (MS9048-069)	1
82462-30	Retaining ring, internal (MS16625-1100)	1
82462-31	Friction drive cover	1
89462-32	Locknut, thin, 1/4-28 (MS2108N4)	1
8rv462-33	Friction drive spring	1
82462-34	Friction drive case	1
82462-35	Roll pin, 3/32 x ~~/2 (MS9048-069)	1
82462-36	Friction drive plate	1
82462-37	Speed adjusting nut	1
82462-38	Friction drive shaft	1
82462-39	Speed adjusting level gear	1
82462-40	Plain washer, 21/64 ID x 5/8 OD x .050 to .052 thick	1
82462-41	Retaining ring, external (MS16624-1043)	1
82462-42	Dial stop gear	1
82462-43	Speed adjusting shaft	1
82462-44	Roll pin 1/16 x 1/2 (MS9048-007)	1
82462-45	Intermediate gear	1

82462-46	Roll pin, 5/32 x 5/8 (MS9048-133)	1
82462-47	Pinion	1
82462-48	Plug	1
82462-49	Pinion bushing	1
82462-50	Shaft bushing	1
82462-51	Screw bushing (Upper)	1
82462-52	Screw bushing (Lower)	1
82462-53	Screw, rd. hd., 6-32 x 1/2	2
82462-54	Lockwasher, split, No. 6 (MS35338-41)	2
82462-55	Locating pin	2
82462-56	Dial panel	1
82462-57	Lock nut, 5/16-24 (MS21044N5)	1
82462-58	Screw, .312-24 x 21/2	1
82462-59	Lockwasher, split, 5/16 ID (MS35338-45)	1
82462-60	Spring	1
82462-61	Lock nut, thin, 10-32 (MS21083N3)	2
82462-62	Pivot pin	1
82462-63	Speed droop link	1
82462-64	Spacer	2
82462-65	Screw, soc. hd. cap, 10-32 x 5/s	1
82462-66	Lockwasher, split, No. 10 (MS35338-43)	1
82462-67	Speed droop cam lever	1
82462-68	Speed droop crank	1
82462-69	Spring pin	1
82462-70	Gasket	1
82462-71	Screw, fil. hd., 6-32 x 7/16 (MS35265-29)	4
82462-72	Lockwasher, split, No. 6 (MS35338-41)	4
82462-73	Electrical connector receptacle (MS3102A18-1 P)	1
82462-74	Receptacle gasket	1
82462-75	Not used	
82462-76	Terminal shaft pin	1
82462-77	Screw, hex. hd. cap. 5/16-24 x 1 (MS90726-34)	5
82462-78	Lockwasher, split, 5/16 ID (MS35338-45)	5
82462-79	Not used	
82462-80	Not used	
82462-81	Oil seal	2
82462-82	Roller bearing	2
82462-83	Terminal shaft (Output)	1
82462-84	Terminal lever	1
82462-84A	Pin retainer bracket	1
82462-85	Setscrew, slotted hd., rd. point, 1 5/16-24 x 1-5/3	2
82462-86	Screw, truss hd., 6-32 x 1/4	4
82462-87	Cover	2
82462-88	Not used	
82462-89	Barrel plug	2
82462-90	Plug, sq. hd. pipe, 1/4-18 NPTF (MS2091302S)	1
82462-91	Oil level decal	2
82462-92	Not used	
82462-93	Stud, 5/16-18 x 5/16-24 x 2	1
82462-94	Column	1

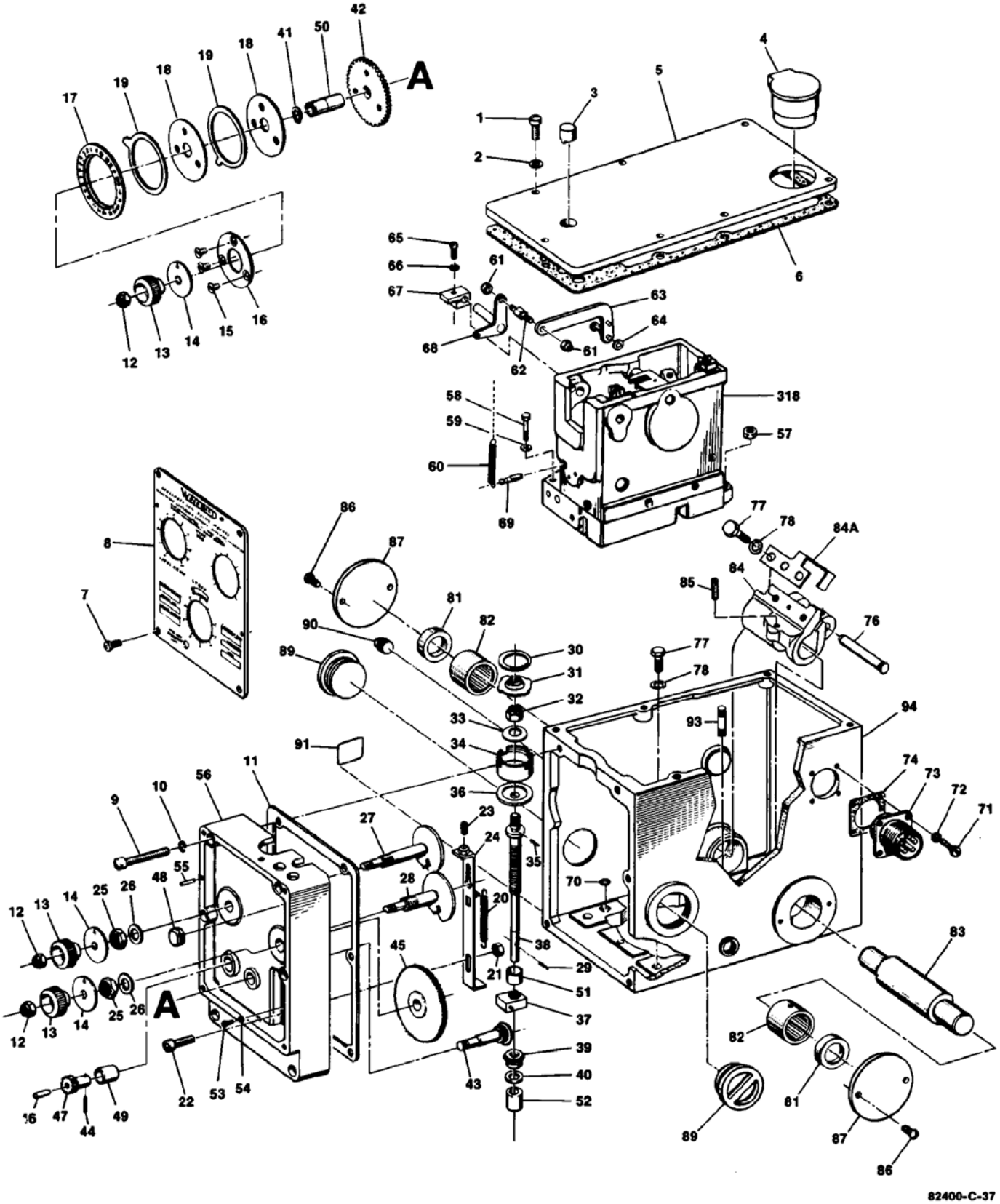


Figure 6-1. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-2

Ref. No.	Part Name	Quantity
82462-101	Roller pin	1
82462-102	Roller	1
82462-103	Intermediate lever and shaft	1
82462-104	Roll pin, 1/8 x 7/16 (MS171525)	1
82462-105	Spring	1
82462-106	Relay beam	1
82462-107	Bushing retainer	1
82462-108	Bearing	1
82462-109	Washer, soft copper, % OD x 7/16 ID 1/32 thick	2
82462-110	Bearing retainer assembly	2
82462-111	Gasket	1
82462-112	Retaining ring, internal (MS16625-1075)	1
82462-113	Intermediate Relay valve bushing	1
82462-114	Intermediate Relay valve plunger	1
82462-115	Pivot pin	1
82462-116	Pinion	1
82462-117	Intermediate Relay valve gear	1

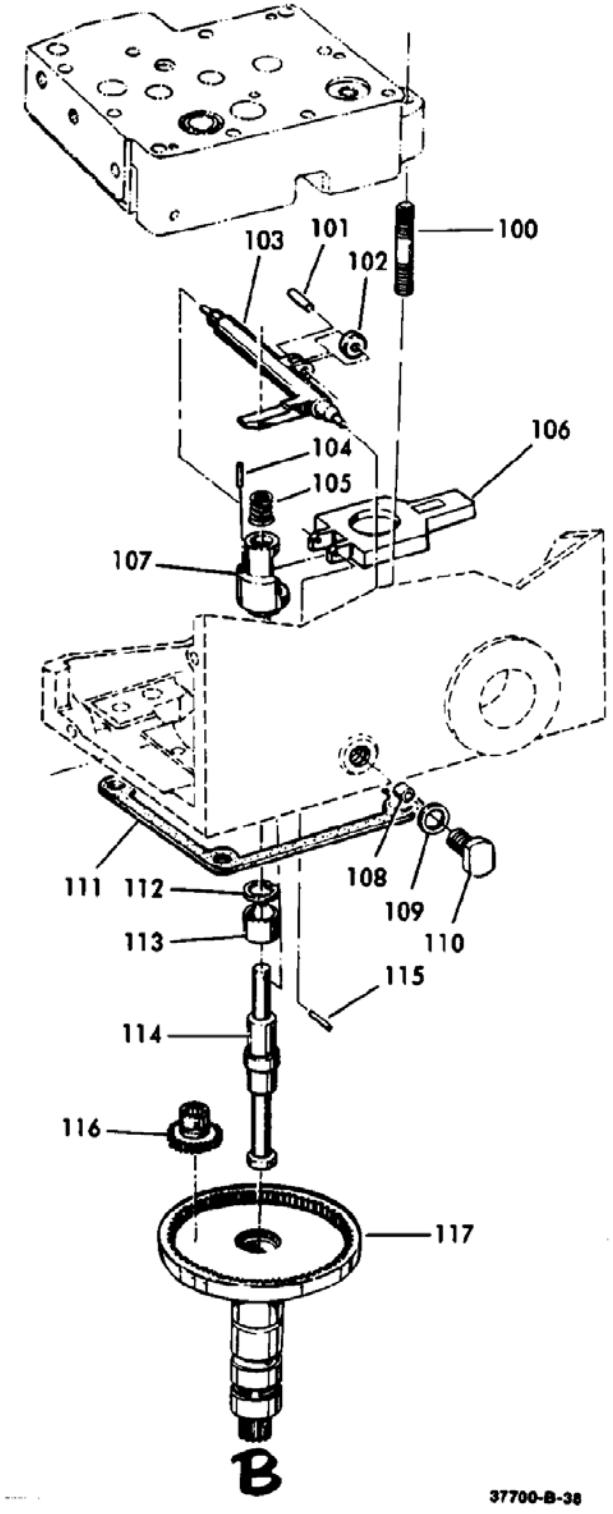


Figure 6-2. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-3

Ref. No.	Part Name	Quantity
82462-201	Screw, rd. hd., w/captive lockwasher 6-32 x 1/2	2
82462-202	Electrical connector receptacle	1
82462-203	Spacer plate	1
82462-204	Electrical connector plug	1
82462-205	Cotter pin 1/16 x 3/8 (MS24665-130)	4
82462-206	Headed pin, drilled	1
82462-207	Retaining ring, internal (MS16625-1050)	2
82462-208	Pivot pin	2
82462-209	Speed droop pivot lever	1
82462-210	Cotter pin, 1/32 x 3/8 (MS24665-3)	2
82462-211	Straight pin, drilled	1
82462-212	Locknut, thin, 1/4-28 (MS21083N4)	1
82462-213	Speed adjusting lever	2
82462-214	Spacer	1
82462-215	Lever post	1
82462-216	Floating lever	2
82462-217	Headed pin, drilled	1
82462-218	Screw, hex. hd. cap, 10/32 x 1/2 (MS9518-06)	2
82462-219	Lockwasher, No. 10 (MS35338-43)	2
82462-220	Plain washer, 13/64 ID x 3/8 OD x 3/64 thk	2
82462-221	Clamping plate	1
82462-222	Eccentric ratio adjustment pin	1
82462-223	Restoring lever	1
82462-224	Straight pin	1
82462-225	Jam nut, t/4-28	1
82462-226	Adjustable spring seat	1
82462-227	Transducer lever	1
82462-228	Load spring	1
82462-229	Screw, soc. hd. cap, self-locking, 6-32 x 3/8	1
82462-230	Restoring spring assembly	1
82462-231	Cotter pin,1/32 x 1/4 (MS9245-01)	1
82462-232	Retainer sleeve	1
82462-233	Needle bearing	1
82462-234	Bearing pin	1
82462-235	Screw, soc. hd. cap, 10-32 x 1-7/8	2
82462-236	Lockwasher, split, No. 10 (MS35338-43)	2
82462-237	Clamp bracket	1
82462-238	Roll pin, 1/16 x 1/4 (MS171432)	1
82462-239	Transducer cover	1
82462-240	Magnet	1
82462-241	Flat washer, al.,7/321 D x 7/16 OD x 1/32 thk	1
82462-242	Transducer assembly	1
82462-243	Temperature compensation ring	1
82462-244	Magnet spring	1
82462-245	Speeder spring assembly	1
82462-246	Plunger nut. 1/4-28	1
82462-247	Speeder spring seat	1
82462-248	Thrust bearing	1
82462-249	Retaining ring, external (MS16624-1062)	1
82462-250	Retaining ring, spiral	1
82462-251	Flyweight pin	2
82462-252	Flyweight assembly	2
82462-253	Flyweight head	1
82462-254	Headed pin, drilled	1
82462-255	Headed pin, drilled	1
82462-256	Servo link (Mechanical)	1
82462-257	Piston pin	1
82462-258	Retaining ring, internal, beryllium copper	1
82462-259	Buffer plug	1
82462-260	Preformed packing, 0.625 OD (NAS 1593-111)	1
82462-261	Buffer spring	2

82462-262	Buffer piston	1
82462-263	Retaining ring, internal (MS16625-1087)	1
82462-264	Plug	1
82462-265	Preformed packing, 0.816 OD (NAS 1593-017)	1
82462-266	Plug	1
82462-267	Preformed packing, 0.316 OD (NAS 1593-008)	2
82462-268	Needle valve (Compensation)	1
82462-269	Screw, soc. hd. cap, 10-32 x 1 1/8	3
82462-270	Screw, soc. hd. cap, 10-32 x 7/8 (MS24678-13)	1
82462-271	Screw, soc. hd. cap, 10-32 x 13Y8	3
82462-272	Screw, soc. hd. cap, 10-32 x 1/2 (MS24678-10)	3
82462-273	Lockwasher, split, No. 10 (MS35338-43)	10
82462-274	Relief valve spring	1
82462-275	Relief valve plunger	1
82462-276	Relief valve spacer	1
82462-277	Relief valve sleeve	1
82462-278	Preformed packing, 1.062 OD (NAS 1593-021)	1
82462-279	Pivot pin	1
82462-280	Load limit lever	1
82462-281	Check valve assembly	4
82462-282	Taper pin, No. 2	2
82462-283	Plug	1
82462-284	Guide pin	1
82462-285	Sub-governor base	1
82462-286	Idler gear	1
82462-287	Pilot valve bushing (Mechanical)	1
82462-288	Retaining ring, internal (MS16625-1043)	1
82462-289	Pilot valve plunger (Mechanical)	1
82462-290	Compensating bushing (Mechanical)	1
82462-291	Pilot valve bushing (Electrical)	1
82462-292	Retaining ring, internal (MS16625-1050)	1
82462-293	Pilot valve plunger (Electrical)	1
82462-294	Compensating bushing (Electrical)	1
82462-295	Servo piston (Mechanical)	1
82462-296	Plug	1
82462-297–300	Not used	
82462-301	Plain washer, 0.203 ID x 0.281 OD x 0.035-0.040 thick.	1
82462-302	Straight pin	1
82462-303	Servo link (Electrical)	1
82462-304	Pivot pin	1
82462-305A	Servo piston (Electrical)	1
82462-305B	Stop	1
82462-205C	Retaining ring	1
82462-306	Link pin, grooved	1
82462-307	Floating lever	1
82462-308	Retaining ring	1
82462-309	Output nut	1
82462-310	Nut, hex., 1/4-28 (MS35650-3252)	1
82462-311	Pivot	1
82462-312	Pivot link	1
82462-313	Loading piston	1
82462-314	Lever post bushing	1
82462-315	Plug, soc. hd. pipe, 1/8 NPTF (AN932-2)	AR
82462-316	Plug, soc. hd. pipe,1/16-27 NPTF (AN932S-1)	AR
82462-317	Idler gear stud	1
82462-318	Sub-governor case	1

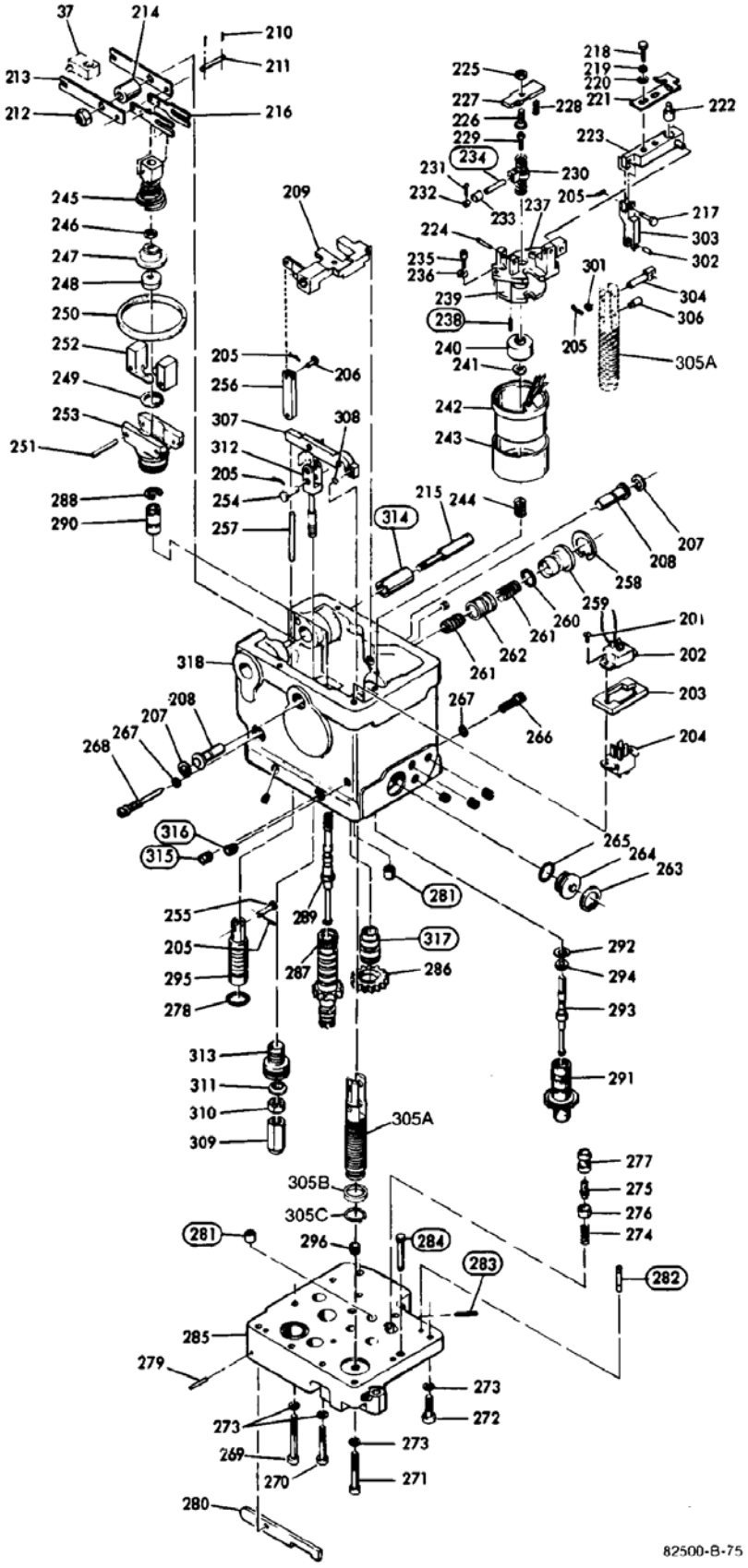


Figure 6-3. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-4

Ref. No.	Part Name	Quantity
82462-401	Relief valve plunger	1
82462-402	Relief valve spring	1
82462-403	O-ring .801 x .070	1
82462-404	Relief valve plug	1
82462-405	Retaining ring 1.111 dia.	1
82462-406	Washer .500 I D	4
82462-407	Screw .500-13 x 2.500	4
82462-408	Oil level gauge	1
82462-409	O-ring .351 ID x .072	4
82462-410	Plug .438-20 UNF-2A	4
82462-411	Screw .500-13 x 20	2
82462-412	Washer .500 I D	2
82462-413	Washer .515 x .875 x .064	2
82462-414	O-ring .468 x .078	1
82462-415	Plug .562-18 UNF-2A	1
82462-416	Pin .3742 Dia. x .625	2
82462-417	Connecting rod	1
82462-418	Gasket	1
82462-419	Case	1
82462-420	O-ring .468 ID x .070	1
82462-421	Plug .562-18 UNF-2A	1
82462-422	Pipe plug .750	1
82462-423	Plug .875-14 UNF-2A	2
82462-424	O-ring .755 ID x .097	2
82462-425	Pin 3.188 x .875	1
82462-426	Washer .500 I D	7
82462-427	Screw .500-13 x 20	7
82462-428	Servo cover	1
82462-429	Gasket	1
82462-430	Servo piston	1
82462-431	Plug .250	1
82462-432	Pin .250 x 1.125	1
82462-433	Pin	1
82462-434	Cover	1
82462-435	Screw .312-24 x .500	4
82462-436	Terminal shaft housing	1

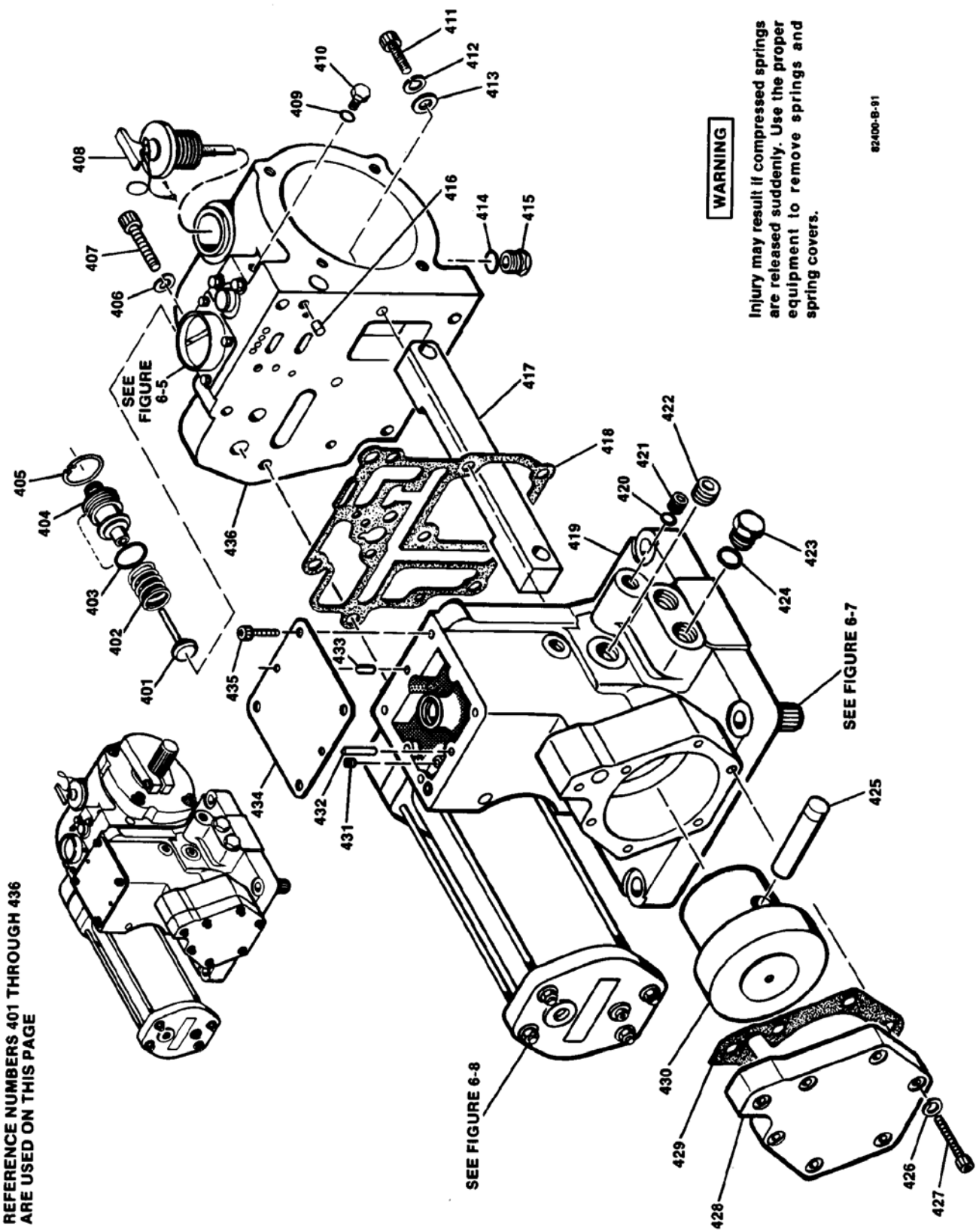


Figure 6-4. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-5

Ref. No.	Part Name	Quantity
82462-472	Cotter pin	2
82462-473	Drilled pin	1
82462-474	Lever	1
82462-475	Pin .1871 dia. x .531	2
82462-476	Piston	1
82462-477	O-ring 1.864 ID x .070	1
82462-478	Piston stop	1
82462-479	O-ring 1.989 ID x .750	3
82462-480	Plate	1
82462-481	Washer .250	4
82462-482	Screw .250-28 x .750	4
82462-483	Screw .250-28 x .500	2
82462-484	Washer .250	2
82462-485	Washer .750	2
82462-486	Spring cover	1
82462-487	O-ring 1.239 x .070	1
82462-488	Loading spring	1
82462-489	Spring seat	1
82462-490	Pilot valve sleeve	1
82462-491	Plunger adjuster	1
82462-492	Spring seat	1
82462-493	Pilot valve plunger	1
82462-494	Pilot valve spring	1

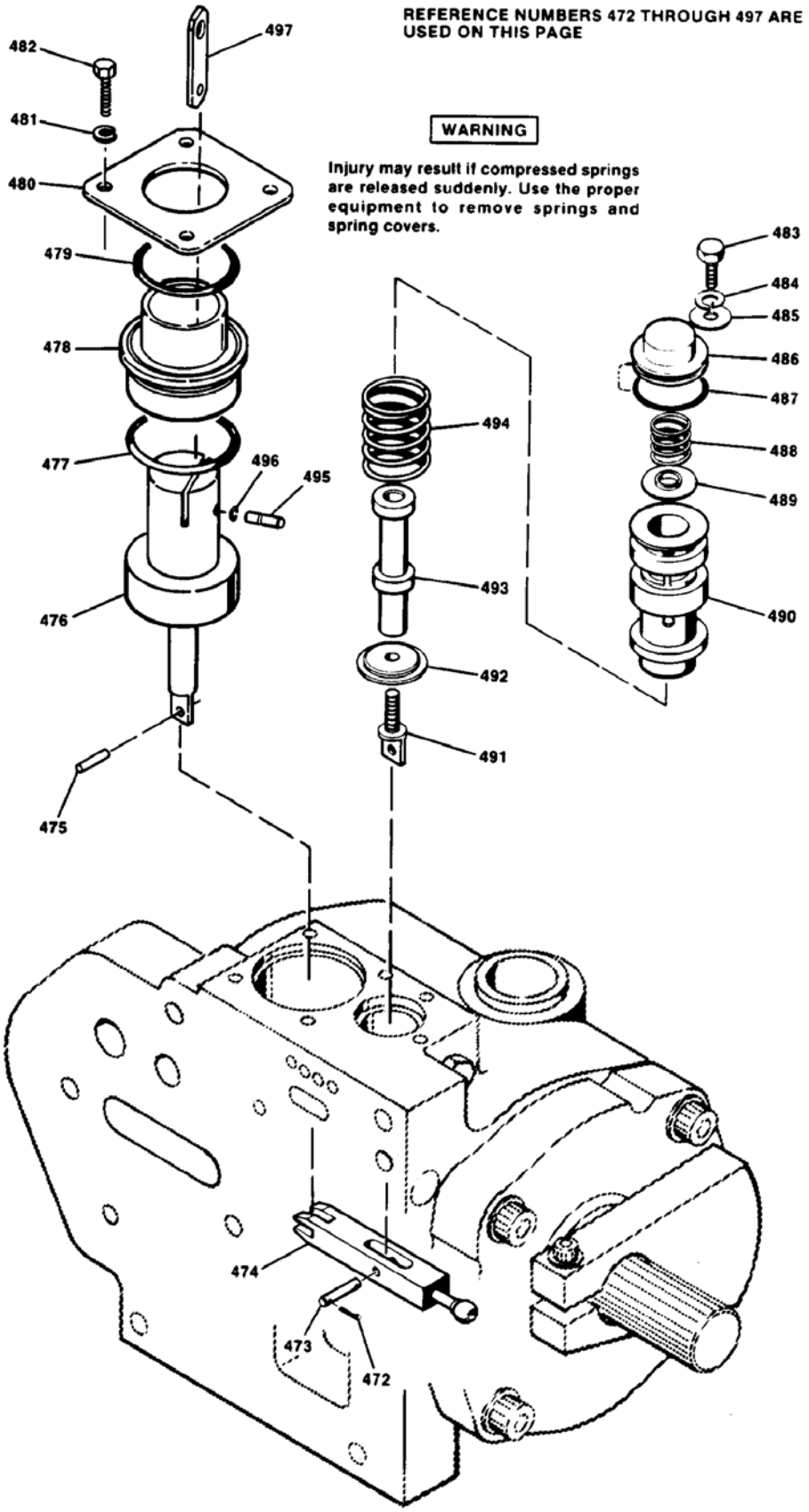


Figure 6-5. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-6

Ref. No.	Part Name	Quantity
82462-500	Oil seal 1.125 x 1.562	2
82462-501	Needle bearing	2
82462-502	Gasket	1
82462-503	Screw .500-13 x 2.500	2
82462-504	Washer .500 ID	2
82462-505	Terminal lever	1
82462-506	Output shaft	1
82462-507	Cover	1
82462-508	Screw .312-18 x 1.500	1
82462-509	Washer.312 ID	1
82462-510	Drive screw	2
82462-511	Scale	2
82462-512	Indicator	1
82462-513	Screw .500-13 x 1.250	4
82462-514	Washer.500 ID	4
82462-515	Lock Ring, Internal	1
82462-516	Pin 3.750 x .874	1
82462-517	Retaining ring .971 dia.	1
82462-518	Plug	1
82462-519	O-ring .614 ID x .070	1
82462-520	Retaining ring .620 dia.	1
82462-521	Spring seat	1
82462-522	Spring	1
82462-523	Retaining ring .207 ID	1
82462-524	Plunger	1
82462-525	Valve sleeve	1

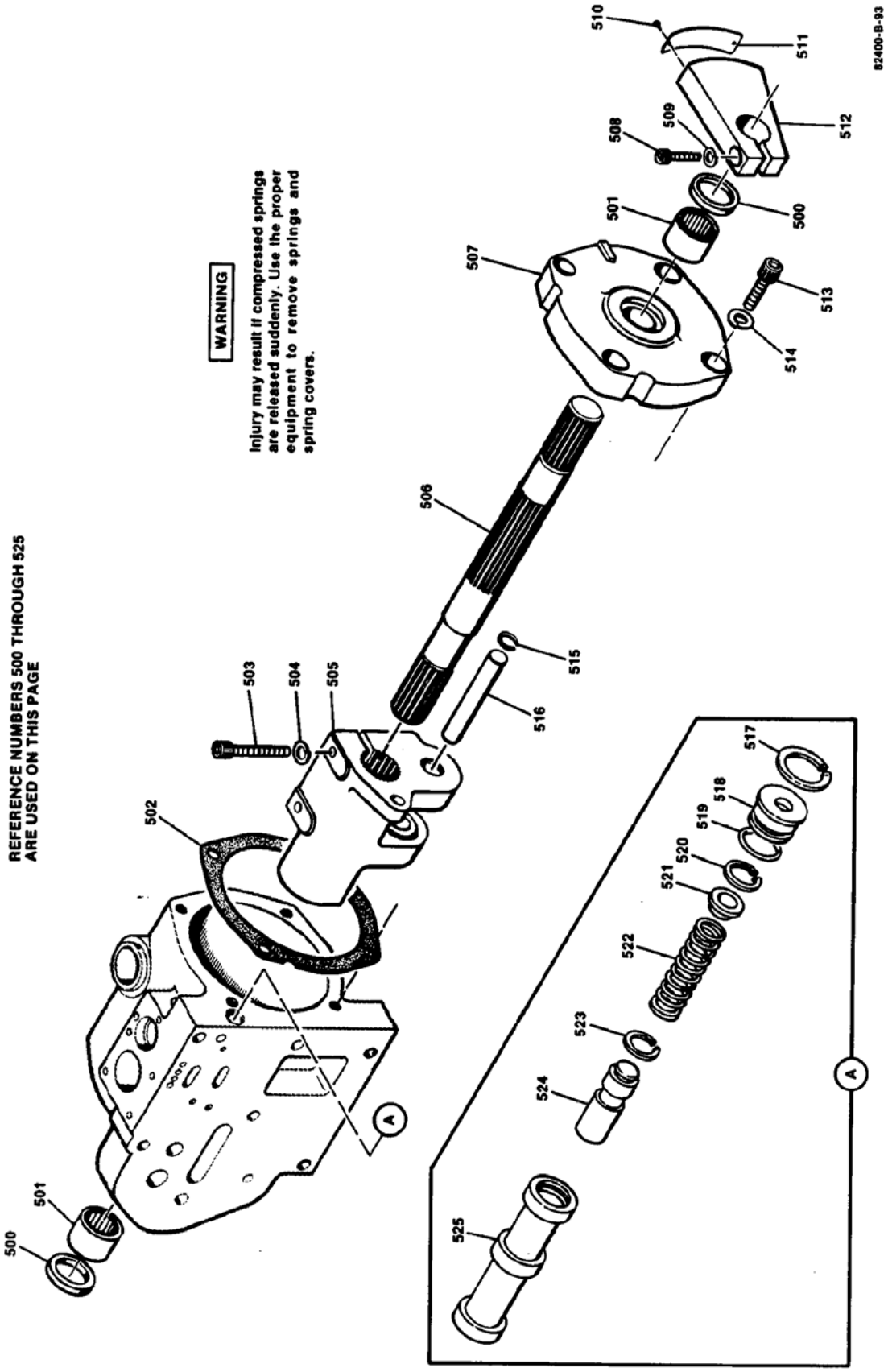


Figure 6-6. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-7

Ref. No.	Part Name	Quantity
82462-540	O-ring 1.114 ID x .070	4
82462-541	Check valve	4
82462-542	Retaining ring	4
82462-543	Magnetic plug	1
82462-544	Needle bearing 1.00 ID	1
82462-545	O-ring 3.489 ID x .070	1
82462-546	Base pilot	1
82462-547	Oil seal	1
82462-548	Gasket	1
82462-549	Oil seal retainer	1
82462-550	Retaining ring .621 dia.	1
82462-551	Bearing	1
82462-552	Drive shaft	1
82462-553	Bearing Retainer	1
82462-554	Screw .250-28 x .625	3
82462-555	Screw 5/16-24 x 1.0	4
82462-556	Washer .312	4
82462-557	Retaining ring	2
82462-558	Pump element	1
82462-559	Key .1875	1
82462-560	Solid drive shaft	1

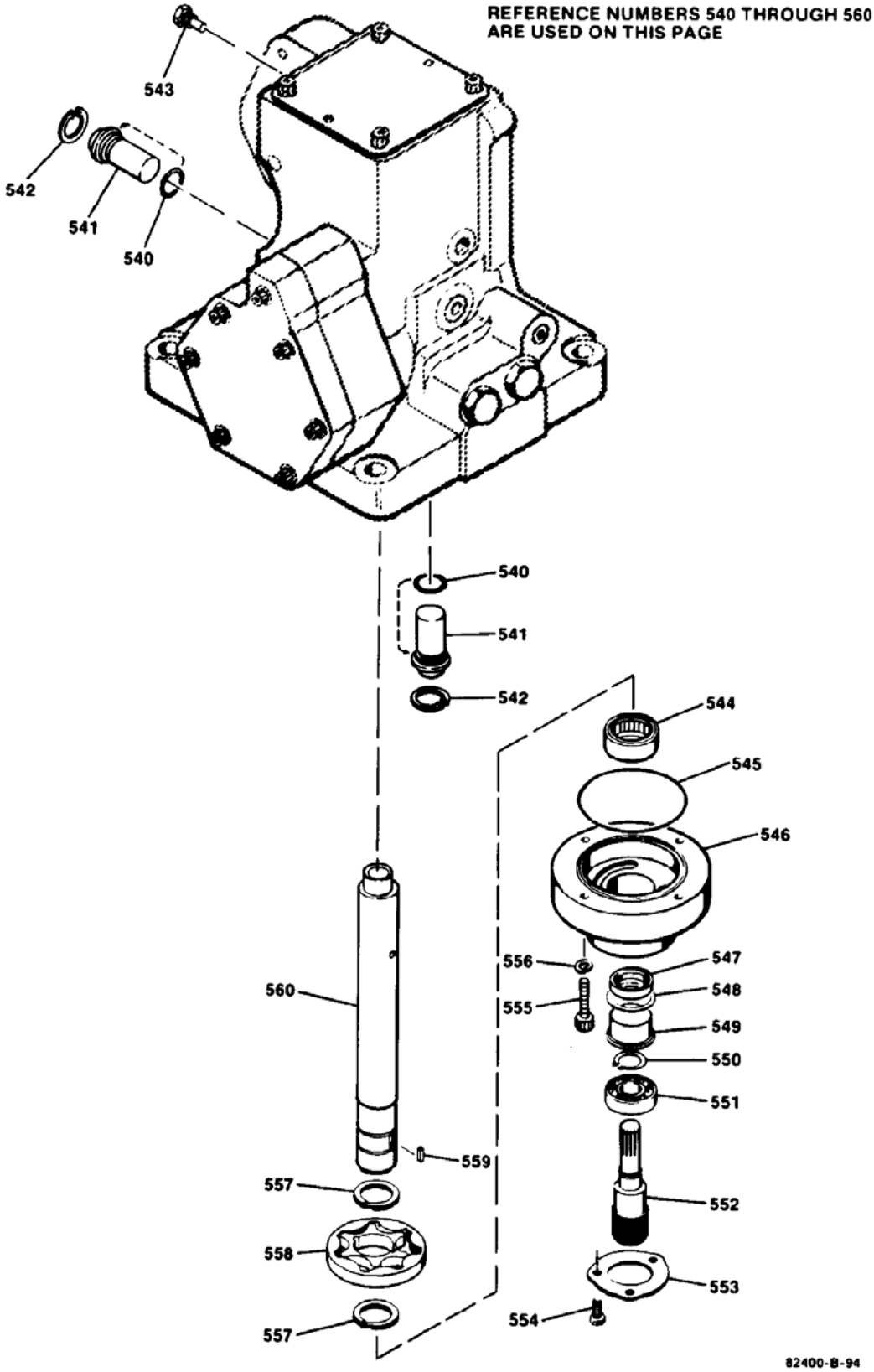


Figure 6-7. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-8

Ref. No.	Part Name	Quantity
82462-601	O-ring 1.114 ID x .070	2
82462-602	Accumulator plate	1
82462-603	Stud 13.00 x .500 dia.	2
82462-604	Accumulator	1
82462-605	Accumulator spring	1
82462-606	Accumulator tube	1
82462-607	O-ring	2
82462-608	Accumulator end	1
82462-609	Washer .500 ID	2
82462-610	Nut	4
82462-611	Plug .562-18 UNF-2A	2
82462-612	Warning plate	1
82462-613	Drive screw	2
82462-614	Plug .750	1
82462-615	O-ring .468 ID x .078	2
82462-616	Stud 14.00 x .500 dia.	2

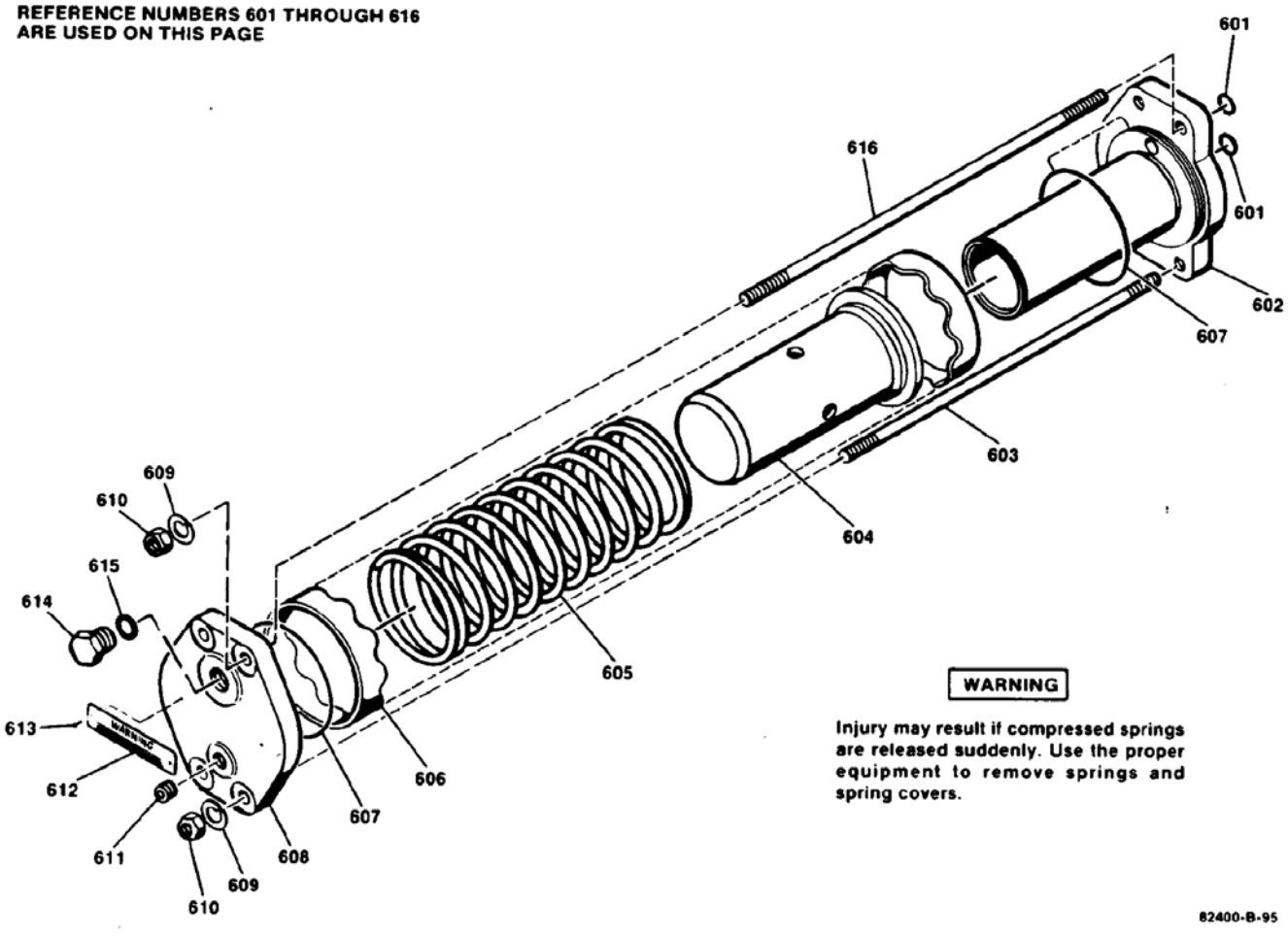


Figure 6-8. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-9

Ref. No.	Part Name	Quantity
82462-401	Screw, rd. hd., 6-32 X 5/8	2
82462-402	Lockwasher, split, No. 6	2
82462-403	Electrical connector socket (Jones)	1
82462-404	Spacer plate	1
82462-405	Electrical connector plug (Jones)	1
82462-406	Screw, rd. kid. w/captive lockwasher, 6-32 X 1/2	2
82462-407	Mounting bracket	1
82462-408	Grommet	1
82462-409	Screw, fil. hd., 10-32 X 1/2	4
82462-410	Lockwasher, split, No.10	4
82462-411	Screw, flat csk. hd., 820 10-32 X 3/8	4
82462-412	Not used	
82462-413	Motor mounting bracket	1
82462-414	Seal spring	1
82462-415	Speed setting motor (see manual 03505)	1
82462-416	Cover	1
82462-417	Screw, soc. hd., cap, 6-32 X 1/2	2
82462-418	Lockwasher, split, No. 6	2
83563-419	Screw, fil. hd., 8-32 x 1/4	1
82462-420	Lockwasher, external tooth, No. 8	1
82462-421	Clamp, cable	1
82462-422	Screw, rd. hd., 2-56 X 3/8	4
82462-423	Lockwasher, split, No. 2	4
82462-424	Microswitch, SPDT	2
82462-425	Insulator	2
82462-426	Cotter pin, 1/32 X 1/4	1
82462-427	Washer, No. 4	1
82462-428	Actuator arm	1
82462-429	Screw hex. kid. cap, full thd., 8-32X7/8	2
82462-430	Nut, hex., 8-32	2
82462-431	Pin	1
82462-432	Mounting plate	1
82462-433	Terminal lug, crimp type	4
82462-434	Grommet	1
82462-435	Dial panel	1
82462-436	Screw, fil. hd., 6-32 X 1/2	2
82462-437	Lockwasher, internal tooth, No. 6	2
82462-438	Terminal block, 3 term	1
	Terminal block, 4 term	1

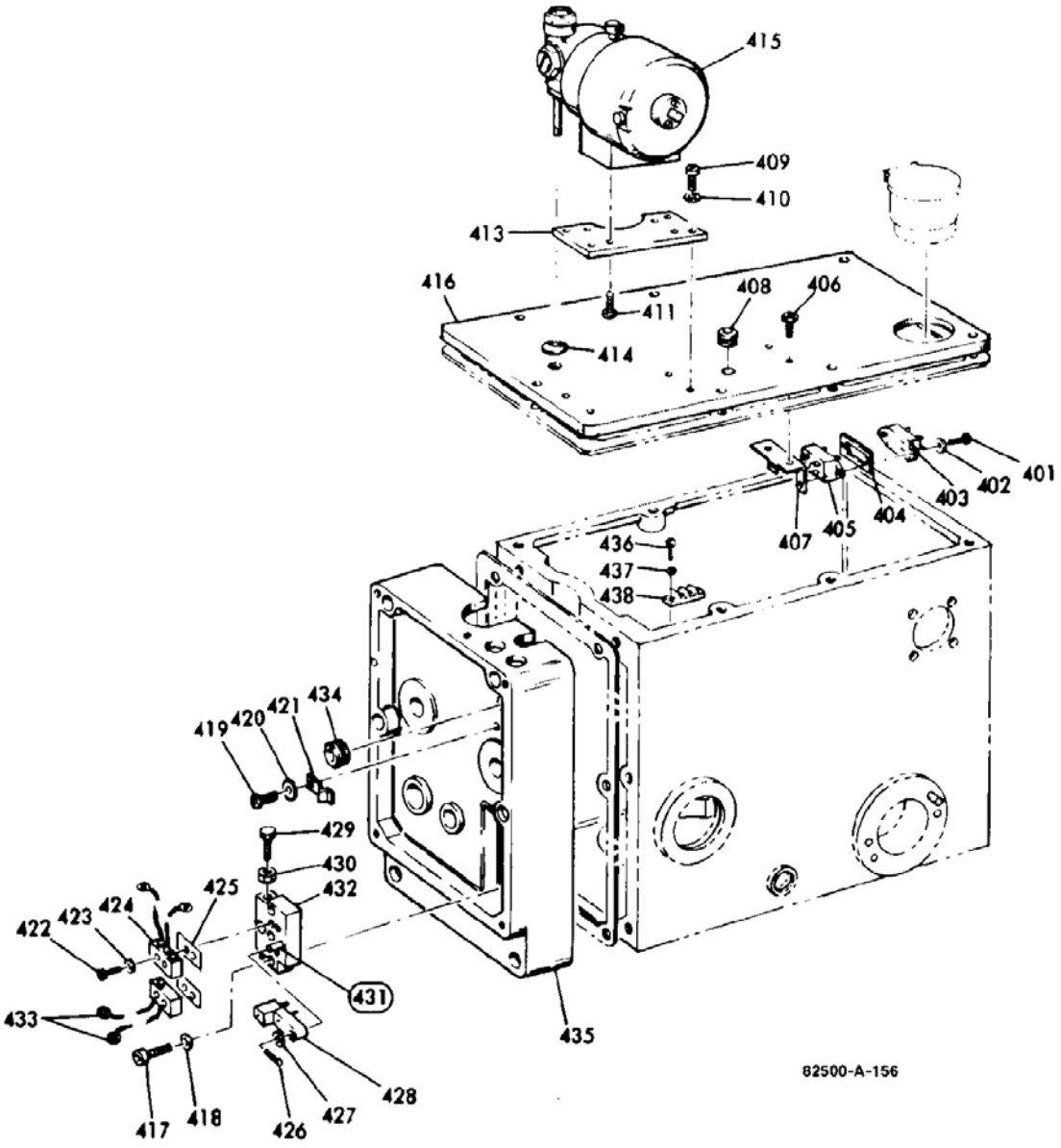


Figure 6-9. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-10

Ref. No.	Part Name	Quantity
82462-501	Bleeder Bolt	I
82462-502	Flat washer, copper, 21/64 ID x 17/32 OD x 1/32 thk	2
82462-503	Screw, fir., hd., drilled, 10-32 x 1/2	4
82462-504	Copper tube, 1/4 OD	1
82462-505	Elbow, 90°,1/4 tube X 1/8 NPT (with nut and sleeve)	3
82462-505A	Pipe plug	1
82462-506	Banjo fitting	1
82462-507	Solenoid valve	1
82462-508	Not used	
82462-509	Terminal lug, insulated	2
82462-510	Screw, fil. hd., 6-32 x 1/2	2
82462-511	Lockwasher, internal tooth, No. 6	2
82462-512	Terminal block, 2 terminal	1
82462-513	Solenoid mounting bracket	1
82462-514	Preformed packing, 0.531 OD	1
82462-514a	Seal, .364 OD	1
82462-514b	Gasket, .438 OD	1
82462-515	Column	1
82462-516	Power case	1
82462-517	Nut, 1/2-20	1

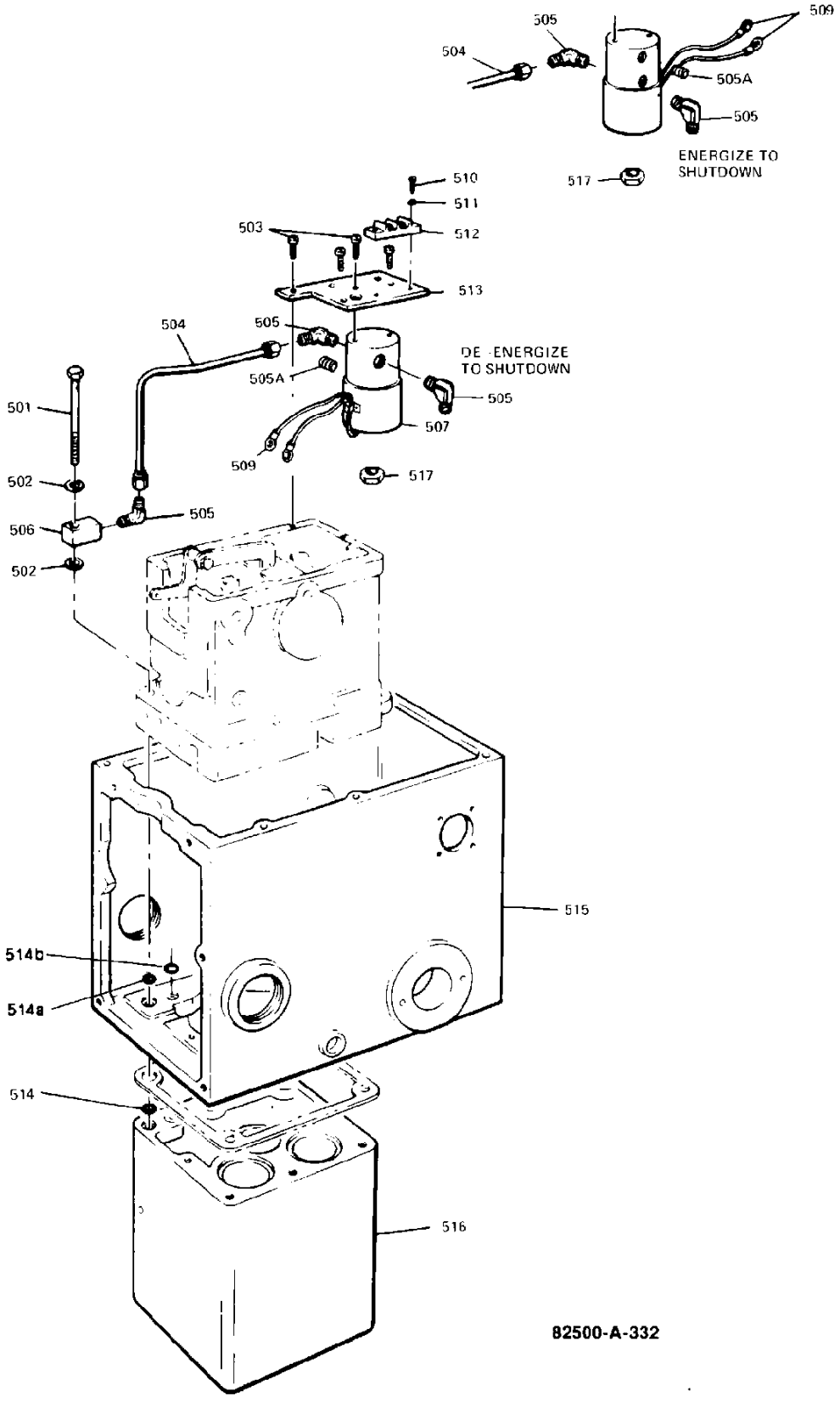


Figure 6-10. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-11

Ref. No.	Part Name	Quantity
Pneumatic Starting Device Parts		
82462-601	Screw, soc. hd. cap. 10-32 x 1/2	2
82462-602	Lockwasher, split, No. 10	2
82462-603	Retaining ring, internal	1
82462-604	Plain washer, 17/64 ID x 13/3200 x 1/32 thk	1
82462-605	Plunger spring	1
82462-606	Plunger	1
82462-607	Air cylinder	1
82462-608	Cover	1
82462-609	Not used	
82462-610	Not used	
Manual Starting Device Parts		
82462-611	Knob assembly	1
82462-612	Pin, .096 x 1.000, roll	1
82462-613	Spring, manual override loading	1
82462-614	O-ring, .176 ID x .070	1
82462-615	Pin, .094 dia x .625, s.s	1
82462-616	Shaft, manual override	1
82462-617	Sleeve, manual override	1
82462-618	Nut, 3/4-32 jam	1
82462-619	Cover, manual override	1

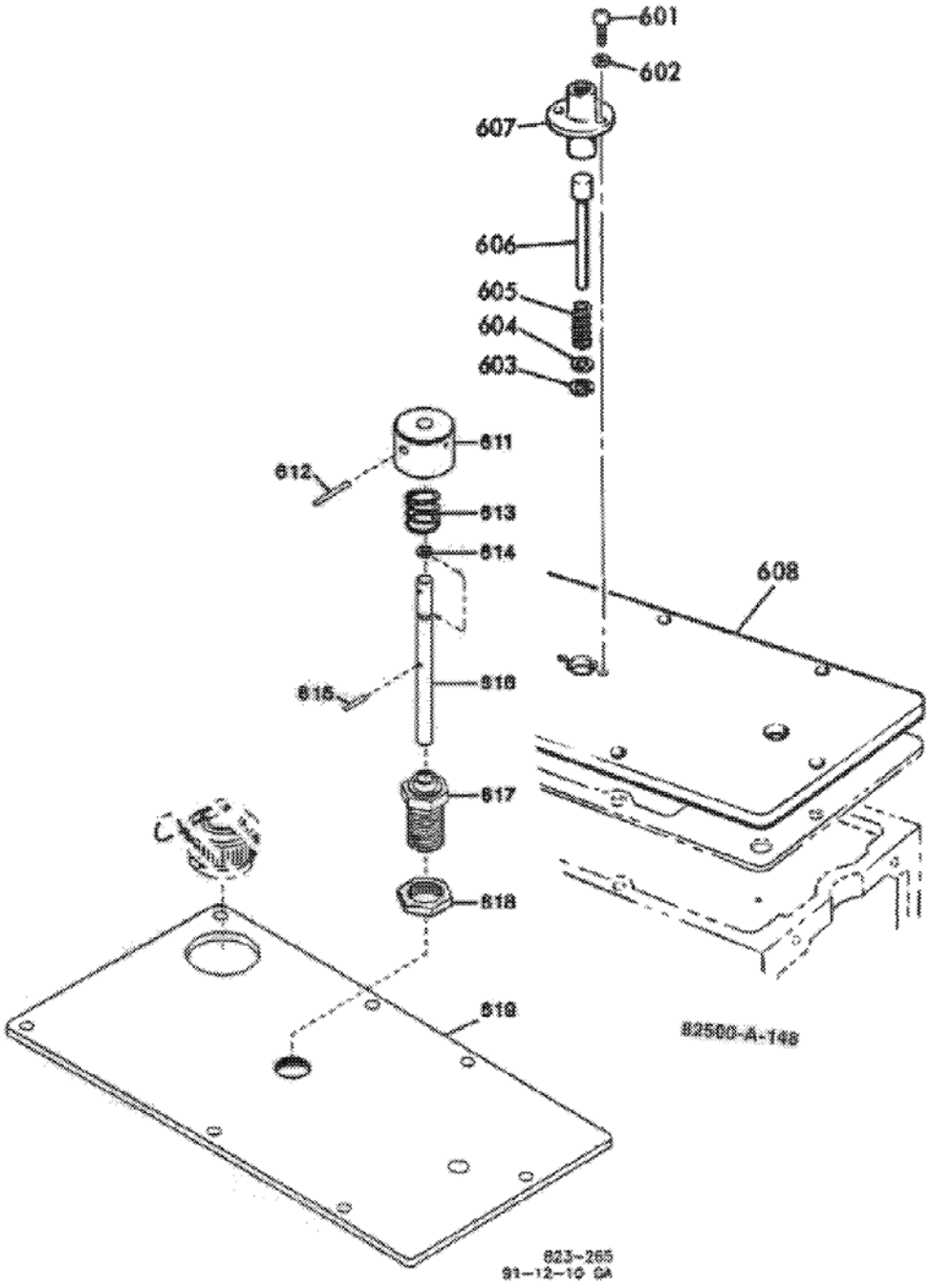


Figure 6-11. Parts for the EGB-200P Governor/Actuator

Parts for Figure 6-12

Ref. No.	Part Name	Quantity
82462-701	Ballarm pin	2
82462-702	Ballarm assembly	2
82462-703	Ballhead	1
82462-704	Torsion spring	1
82462-705	Ball bearing	1
82462-706	Ballhead drive cup	1
82462-707	Ballhead cover	1

*—These parts are furnished only as a complete assembly.

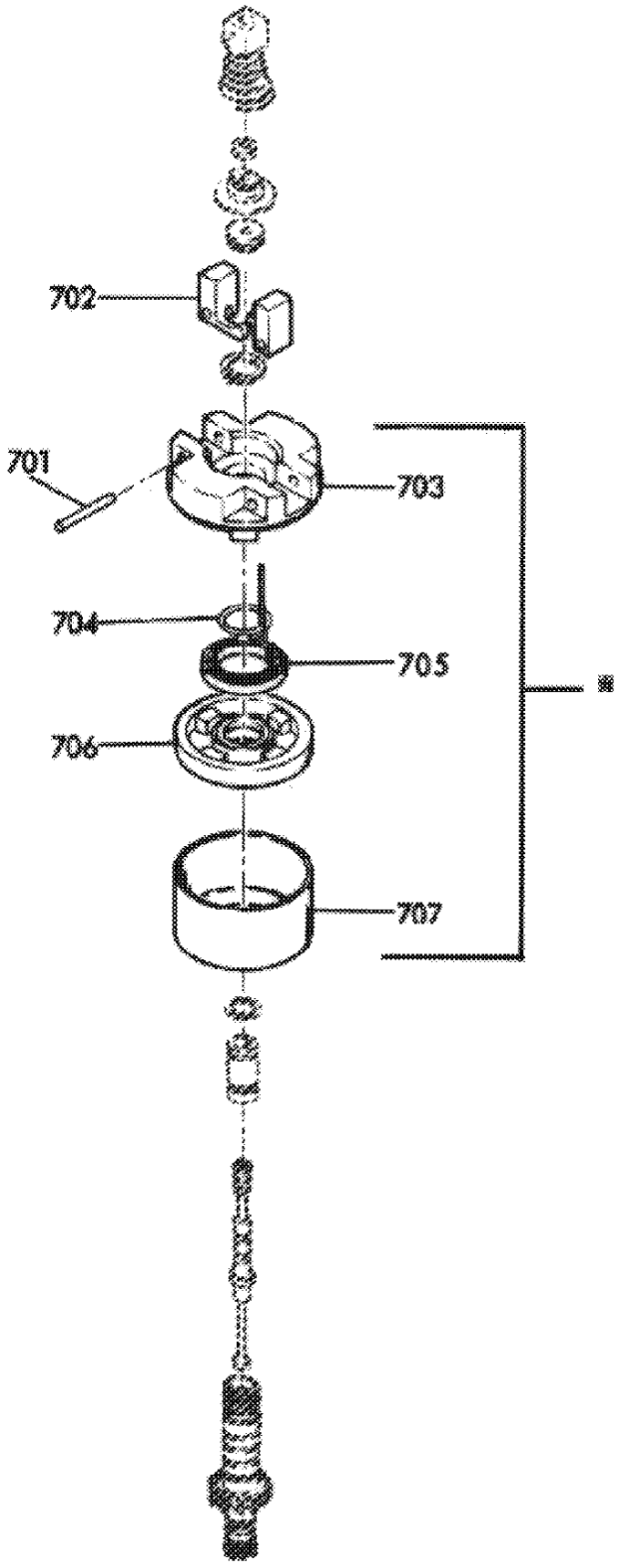


Figure 6-12. Parts for the EGB-200P Governor/Actuator

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 published at **www.woodward.com/directory**.

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

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany:	
Kempen	+49 (0) 21 52 14 51
Stuttgart	+49 (711) 78954-510
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

Products Used In 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

Products Used In Industrial Turbomachinery 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

For the most current product support and contact information, please visit our website directory at **www.woodward.com/directory**.

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.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 82462A.

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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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