

3161 Governor

**Speed Adjusting Motor
with Manual Speed Adjustment**

Operation Manual

IMPORTANT



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.

DEFINITIONS

- **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

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.



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.



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www.woodward.com/publications

The current revision and distribution restriction of all publications are shown in manual **26311**.

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.



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.

NOTICE

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

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*.

■ Revisions—Text changes are indicated by a black line alongside the text.

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Chapter 1.

General Information

Introduction

This manual describes the operation, repair, and calibration of the Speed Adjusting Motor available for the 3161 Governor. This device is installed and calibrated at the factory.

Description

The permanent magnet speed adjusting motor, run by dc voltage, is installed on the governor cover. The motor rotates a speed adjusting screw to adjust the position of the governor speed setting lever.



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.

References

03101	3161 Governor manual
03102	3161 Governor product specification
03103	3161 Governor, Manual Shutdown Device
03104	3161 Governor, Pressure Shutdown Device
03105	3161 Governor, Electric Shutdown Device
03106	3161 Governor, Pneumatic Speed Setting Device
03108	3161 Governor, Air Pressure Fuel Limiter
03109	3161 Governor, Load Limit Control
25075	Commercial Preserv Pkg for Storage of Mech-Hydr Controls

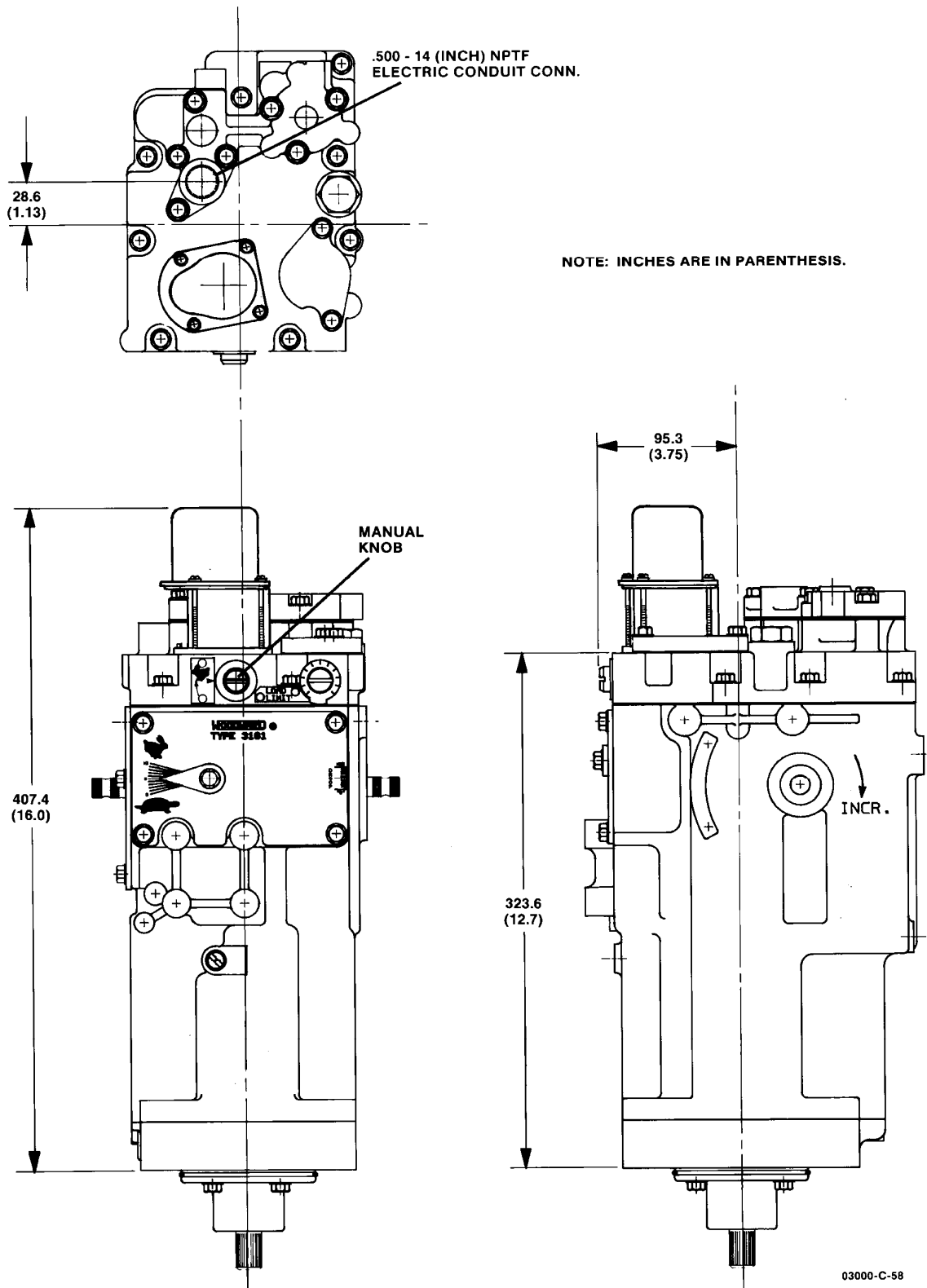


Figure 1-1. Outline Drawing of 3161 Governor with Motor Speed Setting

Chapter 2.

Principles of Operation

Introduction

This chapter describes the operation of the speed adjusting motor with manual speed adjustment used on the 3161 governor (see Figure 2-1).

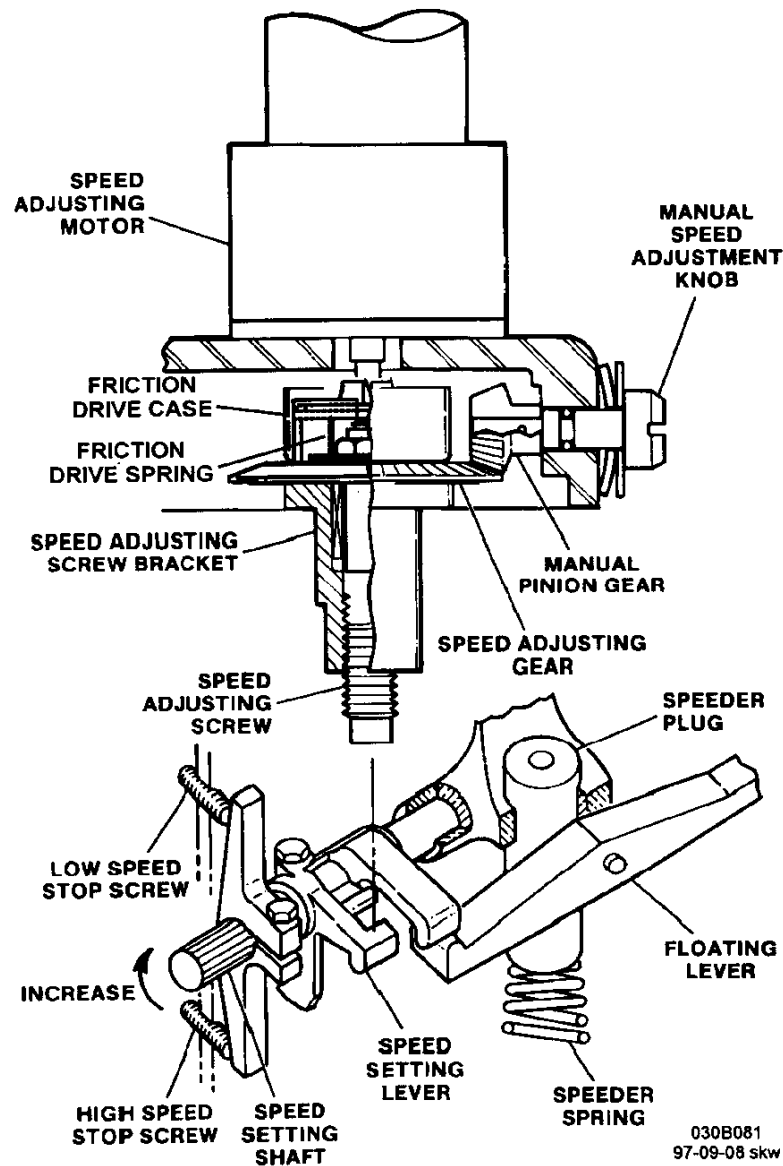


Figure 2-1. Schematic of Speed Adjusting Motor with Manual Speed Adjustment

Operation

To increase governor speed, a specified voltage is applied to the motor; (+ to red wire, – to black wire). The motor shaft rotates clockwise, and the speed adjusting screw turns to lower the governor speed adjusting lever. The motor will turn the speed adjusting screw until it is de-energized or until the speed adjusting lever contacts the high speed stop. If the motor is not de-energized at this time, the friction clutch will slip to prevent damage to the motor.

NOTICE

The motor should not be left running with clutch slipping, or premature clutch wear will occur.

To decrease governor speed, the motor shaft turns counterclockwise and the speed adjusting screw backs out, allowing the speed adjusting lever to move toward the decrease speed setting direction. This is accomplished by reversing the polarity to the motor.

if the motor shaft is permitted to rotate counterclockwise after the speed adjusting lever has reached the low speed stop screw, the speed adjusting screw will back away from the speed setting lever and no further reduction of speed setting will occur.

IMPORTANT

If the speed adjusting motor has been allowed to run after low speed stop has been reached, it may take a period of time for the speed adjusting screw to turn in and make contact with the speed adjusting lever, when an increase in speed is required.

IMPORTANT

3161 speed setting motor life is limited to 250 000 raise/lower commands.

Manual Speed Adjustment

Speed can be increased or decreased by the manual speed adjustment knob located on the front of the governor cover. Turn the knob clockwise to increase speed setting, and counterclockwise to decrease speed setting. The high and low speed stops will limit speed adjustments.

Chapter 3.

Troubleshooting, Repair, and Calibration

Introduction

Chapter 3 provides instruction for troubleshooting, repair, and calibration of the Speed Adjusting Motor with Manual Speed Adjustment.

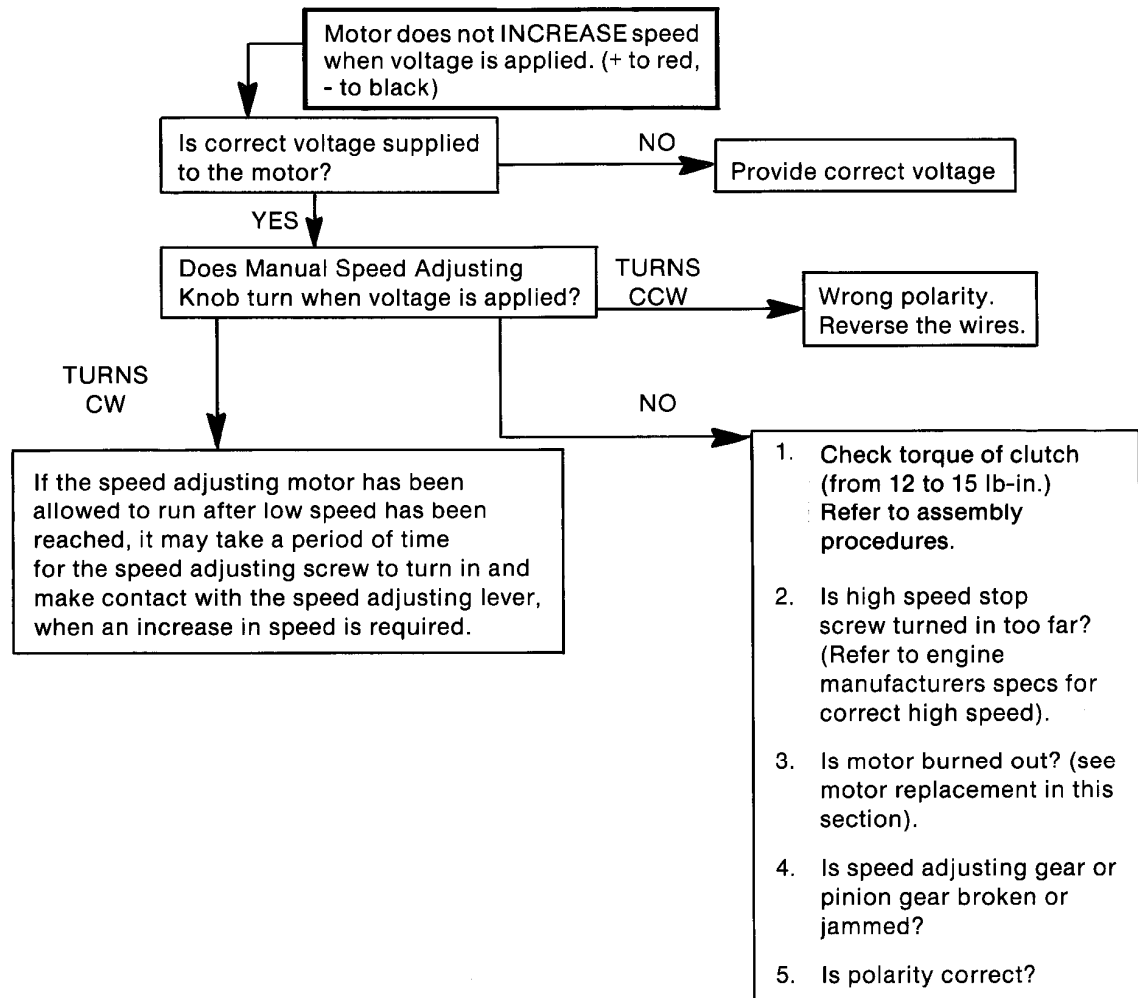
Troubleshooting

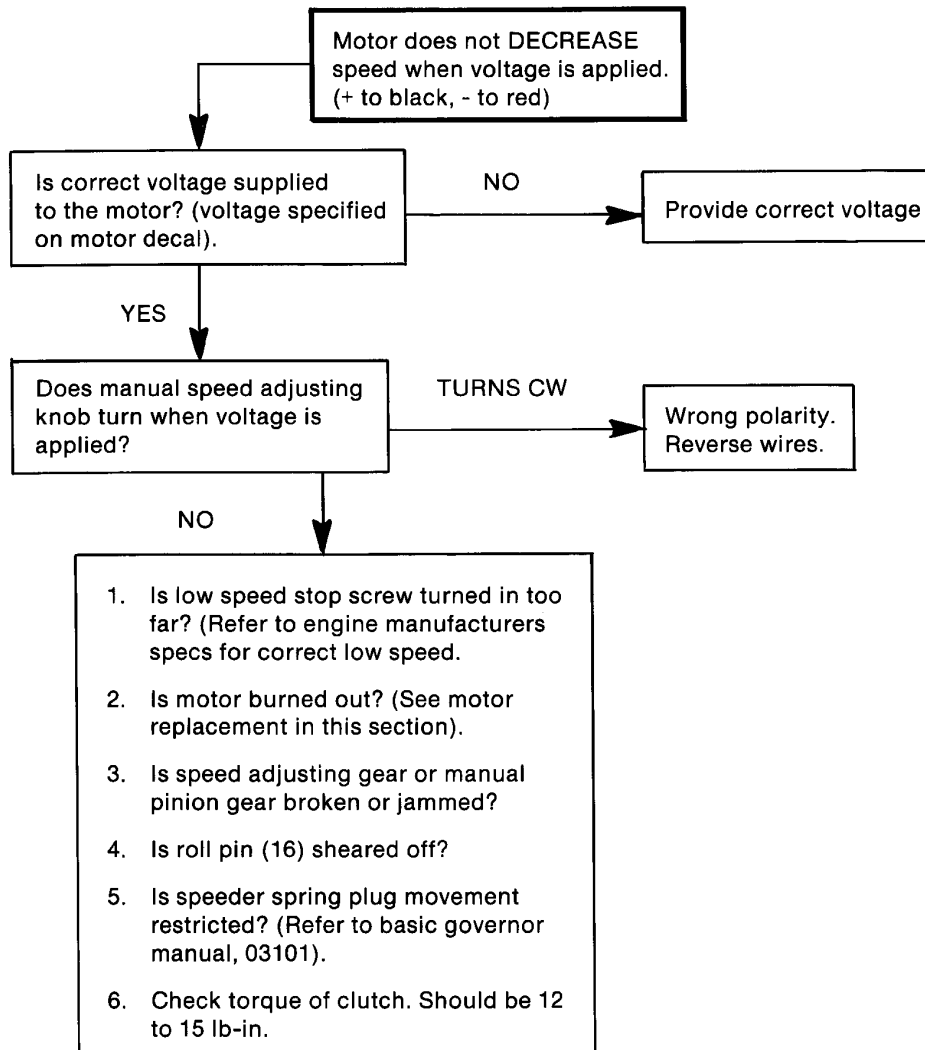
(Refer to Figure 4-1.)



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.



**NOTICE**

DO NOT turn the manual speed adjusting knob after the speed setting stop lever has touched the speed stops, as it is possible to shear roll pin (16) and/or damage pinion gear (17) and speed adjusting gear (12).

Motor Replacement

(Refer to Figure 4-1.)

If it is determined through troubleshooting procedures that replacement of motor (4) is all that is needed to return the governor to service, do the following:

1. Disconnect the electric leads from the power supply to motor.
2. Remove dirt, grease, and other foreign material from around the motor to prevent contaminants from entering the governor.
3. Remove screws (2) and washers (1). Lift motor (4) from the cover.
4. Stick new gasket (5) on the motor. Install the new motor on the cover with screws (2) and washers (1).

5. Connect the electric leads from the power supply to the motor. Observe correct polarity.

**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.

Disassembly

If complete disassembly of the speed adjusting device is necessary:

1. Disconnect the electric leads from power supply to the motor.
2. Remove the governor from the prime mover.

NOTICE

The governor is a precision device and should be treated as such. Set the governor upright on wooden blocks to protect the drive shaft. Do not drop or set the governor on the drive shaft as this may cause damage to the drive shaft, bearings, seals, and other parts inside the governor.

All disassembly and repair should be done by personnel experienced in repair and calibration of precision controls. In all repair work, it is essential that tools, the work area and parts be kept clean.

**CAUTION**

Wear approved eye protection to prevent possible eye injury during disassembly, cleaning, and assembly of parts.

Disassemble the device according to the following instructions. Reference numbers in parentheses are assigned to each part in the exploded view, Figure 4-1.

1. Remove dirt, grease and other foreign material from around the motor to prevent contaminants from entering the governor.
2. Remove the cover screws and cover from the governor. Cover the governor with a clean shop towel to prevent contaminants from entering the governor.
3. Remove screws (2) and washers (1). Lift motor (4) and gasket from the cover.
4. Invert the cover on a clean dry work surface. Remove speed adjusting screw (15) from bracket (13).
5. Remove two screws (14), bracket (13), gear (12), and the friction clutch.
6. Remove retaining ring (6) from case (11).

NOTICE

Cover ring (6) to prevent possible personal injury, or loss of the ring if it should slip off of the snap ring pliers during removal.

7. Remove cover (7) and spring (8).

8. Refer to Figure 3-1 for the method of removing friction adjusting screw (9). Secure bar stock in vise. Place gear (12) on the piece of bar. Use a 7/16 inch wrench to remove screw (9).
9. Remove case (11) and three springs (10).
10. Use a small pin punch and mallet of appropriate size to gently tap roll pin (16) from gear (17) and knob (19).
11. Remove knob (19) from the cover. Be careful not to drop gear (17) as the shaft is removed.

Cleaning

Clean parts with solvent and a stiff brush to remove foreign particles.



Observe manufacturer's instructions or restrictions regarding the use of solvents. If no instructions are available, handle with care. Use the cleaning solvent in a well ventilated area away from fires or sparks.

Dry parts with clean, lint-free wipes, or blow dry with clean dry air.

Handle parts carefully to prevent damage caused by contact with other parts or objects.

Part Inspection

(Refer to Figure 4-1.)

Spring (8)

Inspect spring for rust and corrosion and replace if any damage is found.

Friction Drive Spring (10)

Inspect springs for rust, corrosion and shape distortion. Replace if any damage is found.

Gear (12)

Inspect gear teeth for wear and damage in area of contact with pinion gear (17).

Gear (17)

Inspect gear teeth for wear and damage in area of contact with gear (12).

Motor (4)

Does the motor run when the specified voltage is applied? Does it reverse direction when polarity is reversed?

Assembly

To prepare to assemble the governor, lay the parts in an orderly fashion on a clean dry work surface.

Use only new O-rings, seals, and gaskets. Careful, precise assembly methods will save time and help to ensure correct calibration of the device.

Lubricate O-rings with white petroleum jelly to facilitate assembly.

Torque all 1/4-20 screws to 90 lb-in (10 N·m).

Assembly Procedures

(Refer to Figures 3-1 and 4-1.)

1. Put O-ring (20) on the shaft of knob (19) and insert the shaft through dial plate (21) and wave washer (22). Place this assembly in the cover.
2. Place gear (17) on shaft (19) from inside the cover. Align the hole in the shaft and gear, and start roll pin (16).
3. Use a 1/8 inch pin punch and gently tap roll pin (16) into the gear and shaft. Be sure the shaft turns freely.
4. Turn speed adjusting screw (15) into bracket (13).
5. Lubricate the top of gear (12) with a few drops of oil and place case (11) and friction drive springs (10) on gear (12). Turn screw (9) into gear (12), but don't tighten at this time.
6. Refer to Figure 3-1. Use 3/16 inch square stock in a vise to hold the gear and clutch. Tighten screw (9) to provide from 12 to 15 lb-in (1.4 to 1.7 N·m) torque between friction drive case (11) and gear (12). Check the clutch torque with a torque wrench and adapter (part number 8995-030).

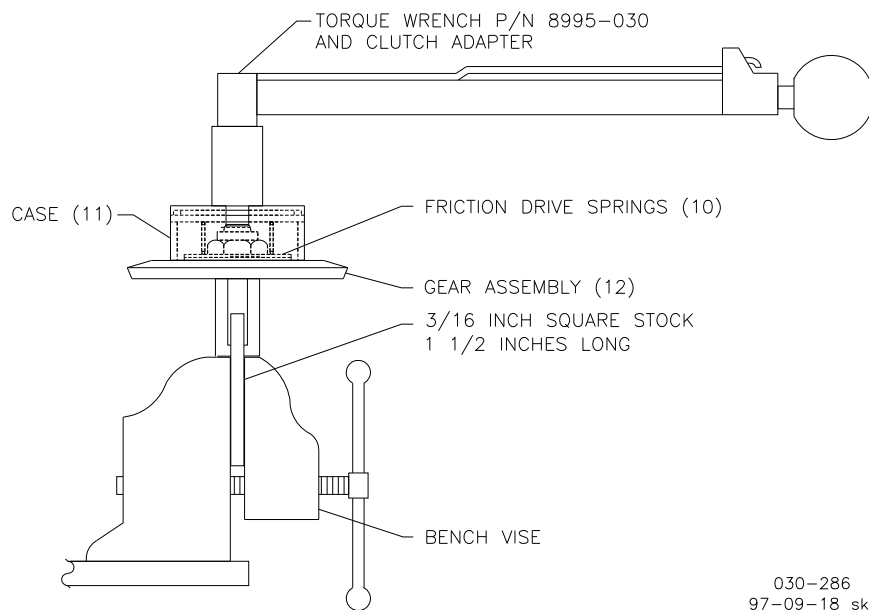


Figure 3-1. Method of Holding Gear While Removing Screw (9) and also for Setting Torque

7. Place spring (8) and cover (7) in case (11). Secure the plate with retaining ring (6).

NOTICE

Cover ring (6) to prevent possible personal injury, or loss of the ring if it should slip off of the snap ring pliers during assembly.

8. Place gear (12) and the friction clutch assembly on bracket (13). Secure bracket (13) to the cover with screws (14).

NOTICE

Be sure gear teeth on gears (12 and 17) mesh together and gears turn freely.

9. Stick gasket (5) on the motor. Install motor (4) and bracket (3). Secure the bracket in place using four screws (2) and lock washers (1). Torque screws to 9 to 11 lb-in (1.0 to 1.2 N·m).
10. Install the cover on the governor.
11. Install the governor on the prime mover.

IMPORTANT

Refer to manual 03101, *3161 Governor*, for information on attaching the output shaft linkage to the prime mover.

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.

Calibration Procedures

Calibration of the motor speed setting device is not required. If the HIGH and LOW speeds as specified for your governor cannot be reached, refer back to the Troubleshooting information at the beginning of Chapter 3.

Chapter 4. Replacement Parts

Speed Setting Motor with Manual Speed Adjustment

When ordering replacement parts, include the following information:

- Manual number (this is manual 03107).
- Governor serial number and part number shown on the nameplate.
- Part reference number and parts list.

Ref. No.	Part Name.....	Quantity
03107-1	Lock washer	4
03107-2	Screw	4
03107-3	Clamp plate	1
03107-4	Motor	1
03107-5	Gasket	1
03107-6	Retaining Ring	1
03107-7	Cover	1
03107-8	Spring	1
03107-9	Nut (old style has screw)	1
03107-10	Friction drive spring	3
03107-11	Case	1
03107-12	Manual speed adjusting gear	1
03107-13	Bracket	1
03107-14	Screw .250-20 x 1.0	2
03107-15	Speed adjusting screw	1
03107-16	Roll pin .062 dia x .375	1
03107-17	Pinion gear	1
03107-18	Roll pin .062 x .188	1
03107-19	Manual speed adjusting knob	1
03107-20	O-ring .176 ID x .070	1
03107-21	Dial	1
03107-22	Wave washer	1
03107-23	Drive screw	2
03107-24	Dial plate	1
03107-25	Washers	(as required)

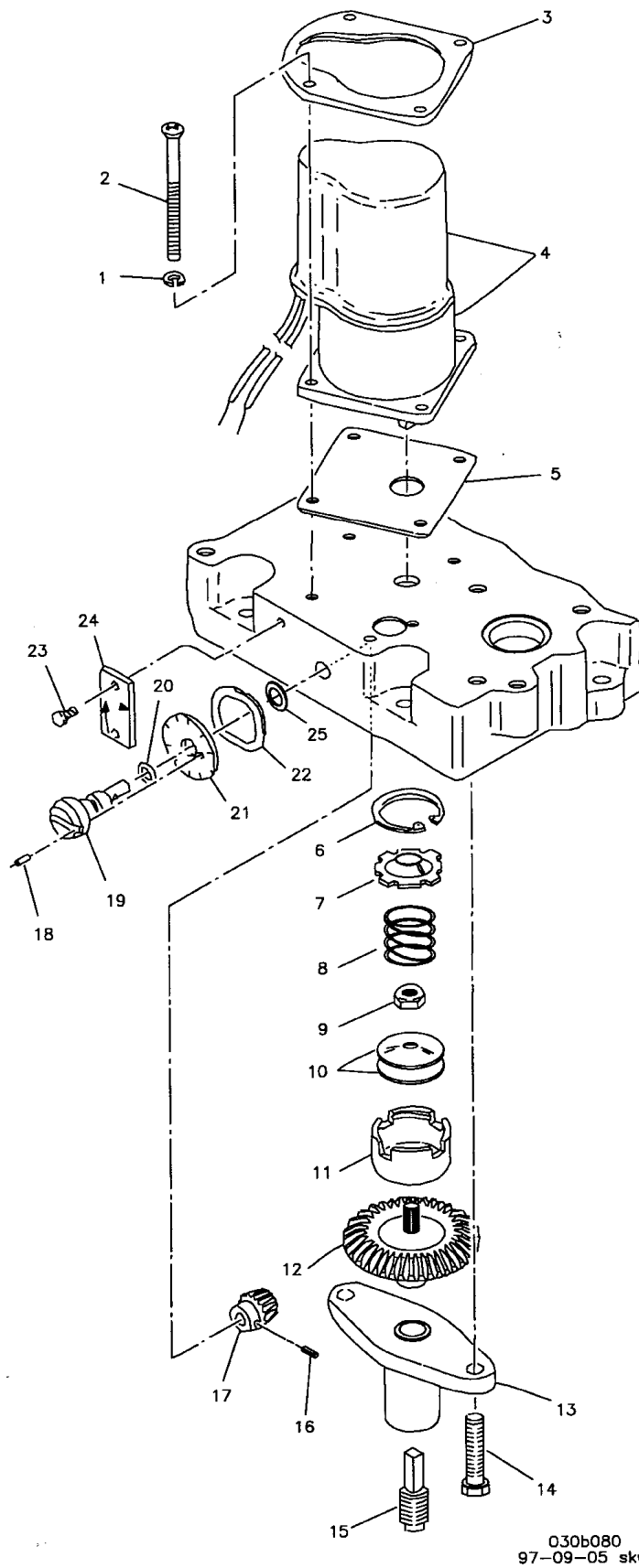


Figure 4-1. Parts for Speed Adjusting Motor with Manual Speed Adjustment

Chapter 5.

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		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
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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 03107B.



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