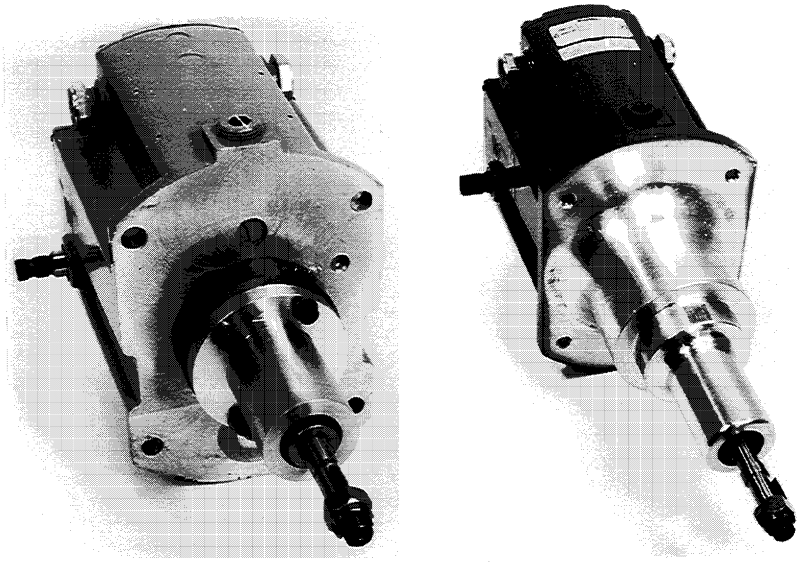
WOODWARD

Product Manual 54103
(Revision A)
Original Instructions



TG-13 Governor for Ajax Engines

Installation and Operation Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, on the *publications page* of the Woodward website:

www.woodward.com/publications

The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual *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 Out-of-date translations are marked with ⚠.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.

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

Copyright © Woodward 1987
All Rights Reserved

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.

TG-13 Governor for Ajax Engines

Introduction

The instructions contained in this manual are provided to aid in the installation of a Woodward TG-13 governor on Ajax single cylinder and multi-cylinder 2-cycle gas engines. The TG-13 governor replaces the mechanical governor to provide more reliable, responsive, and stable engine-speed control on Ajax engines.

Receiving

The governor and drive adapter are assembled at the factory. The governor is calibrated at the factory, and the only calibration necessary at the time of installation is the final speed setting. The governor should be left in its protective box until ready for installation. Protect the governor from high humidity or other corrosive atmospheres during prolonged storage.

Handling

Take care while handling the governor not to damage the drive shaft, output shaft, or seals and bearings associated with these shafts. Do not stand the governor on the drive shaft or lay it on the output shaft while handling the assembly before installation on the Ajax governor drive. Do not attempt to force the drive gear or output lever on the shafts.

Mechanical Governor Removal

1. For convenience and to protect the governor drive area which will be opened to possible contamination, thoroughly clean the exterior of the existing governor, the fuel setting linkage, and the exterior of the governor drive, If possible work on a cool engine

2. Thoroughly inspect the linkage between the governor and the fuel valve for wear or misalignment. Repair as necessary.

3. Remove the lever from the existing mechanical governor. Do not disturb the length of the operating rod which goes to the Ajax linkage.

4. On multi-cylinder engines remove the four bolts which hold the mechanical governor to the drive mechanism. On one-cylinder engines loosen the set screw which holds the mechanical governor to the governor drive.

5. Remove the mechanical governor from the drive, extracting the long drive shaft and attached helical gear.

6. Remove the cotter key that locks the castle nut on the drive shaft and remove the castle nut. Remove the helical gear from the mechanical-governor drive shaft.

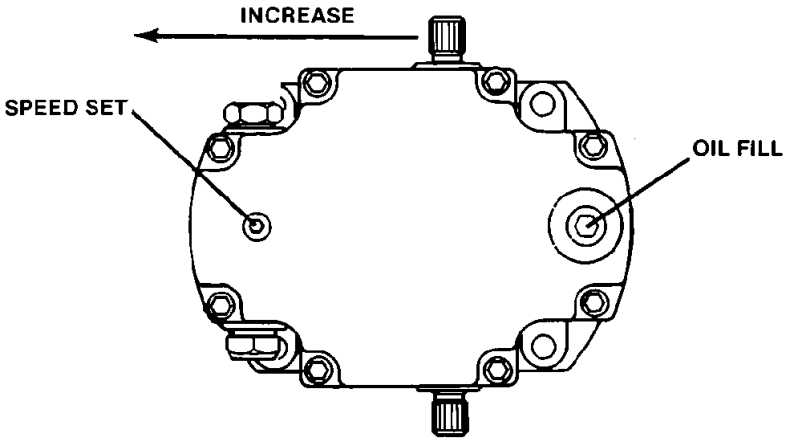


Figure 1. TG Governor Installation

Installation of the TG-13 Governor

1. Install the drive gear from the mechanical governor on the TG-13 drive shaft, A spacer is shipped on the drive shaft and this must be left on the shaft between the gear and the governor. Use the new drive key which accompanies the TG-13.

NOTICE **Do not pound the drive gear onto the TG drive shaft, or force the TG into position. You could damage the drive shaft oil seals and/or drive bearings.**

Should the gear not slip onto the shaft, check carefully for burrs or dings in the inside diameter of the gear or in the keyway. Remove damaged areas with a stone or lightly hone the inside diameter of the gear, if necessary. The new drive key must slip freely in the drive keyway and in the TG-13 drive shaft keyway.

2. With the spacer and gear in place with the new drive key on the TG-13 drive shaft, tighten the castle nut. The nut should be snug, but need not be torqued. Use the new cotter key to secure the castle nut.

3. Carefully install the new governor-drive assembly where the mechanical governor was removed. No gasket is required on the multi-cylinder mounting surface, although a thin gasket may be used to overcome imperfections in the mounting surface and to assure a good fit. The TG-13 installs with the clockwise output shaft toward the engine. Arrows on the side of the governor identify output-shaft rotation.

   Meshing the drive gear with the governor drive on the engine must be done carefully. Pressure must not be exerted while installing the governor. If the gear does not mesh, remove the governor and rotate the drive slightly, then try again. The installation must not require any more pressure than that exerted by the weight of the governor.

4. Tighten the set screw on the one cylinder engine. Evenly torque the four mounting bolts on the multi-cylinder unit.

Linkage

1. Remove the rod end from the old governor output lever and carefully inspect the linkage for wear. Replace any rod ends which show excessive wear.

2. With the new governor at minimum fuel and the engine linkage moved to a minimum-fuel position, install the new terminal lever on the governor terminal shaft. Torque the hex head cap screw to 5.6 to 9.0 N·m (50 to 80 lb-in). (Install vertically, pointing up.) (If the old terminal lever is to be used, provide a new hole in the lever which will be even with or below the top of the governor when installed on the output shaft.)

3. Install the rod end and linkage on the new terminal shaft lever in a hole even with the cover. The installation of the linkage should use about one-half of the 40-degree governor stroke, with the fuel valve providing the maximum and minimum stops. To increase the amount of stroke being used move the rod end closer to the output shaft of the governor. Use as much actuator stroke as practical to provide more stable engine control.

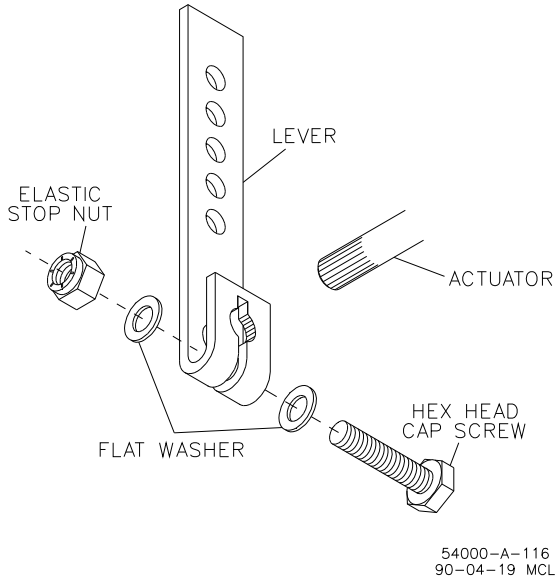


Figure 2. Actuator Lever Assembly.

Operation

Fill the governor with new, clean oil, If possible, use the same weight and grade of oil used in the engine oiler system. The engine oiler oil will work in almost all installations. The only exceptions may be in installations which wilt want to start an extremely cold governor. It is possible in these installations that a lighter (10 weight or 5 weight oil) may have to be used during the cold season.

The governor will require about 1.750 quarts of oil. Remove the oil breather screw from the cover and fill through this hole. Add Oil until the oil level is visible in the sight gauge on the side of the governor. Always check the oil level before starting the engine. Add oil if it is not visible in the sight gauge

⚠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.

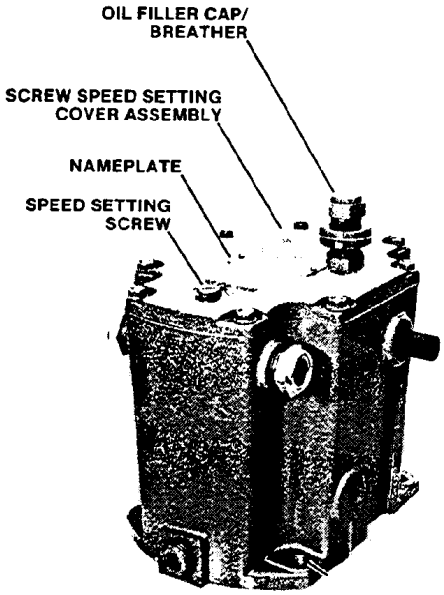


Figure 3. TG-13 Governor

Setting Speed

1. Set the desired engine speed with the speed-setting screw. A full turn of the screw should change engine speed about 15 rpm. The governor should produce a constant engine speed under all types of constant load. The engine speed should be from 10 to 20 rpm slower at full load than at no load.

   The terminal lever on the governor will respond to engine misfires with a rapid move to increase fuel. This should not change the speed of the engine as the governor will recover on the next firing of the cylinder, before fuel to the engine has been changed enough to affect engine speed.

2. If the terminal shaft “jiggles”, it must be corrected, usually by moving the rod end on the output lever closer to the Output shaft. Do not mistake corrections caused by rough engine operation for jiggle.

NOTICE

Jiggle will cause damage to the governor linkage and fuel valve. Do not operate the engine with a governor which is “jiggling” the linkage, even though engine operation appears adequate. Jiggle is more likely to damage the linkage from the governor to the fuel valve than it is to damage the governor itself.

3. The engine will not hunt with a properly installed governor. Hunting is a low frequency oscillation of the governor output, with no stable steady-state location. Should the installation hunt it can usually be corrected by moving the linkage connection on the governor output lever closer to the output shaft (shortening the effective length of the output lever). Also check the position of the lever on the shaft. Adjust the linkage so the output lever is vertical at minimum fuel. In cases where it may be impossible to further shorten the output lever it may be necessary to increase the droop setting in the governor.

   Under normal operation the governor output will be active, making definite movements toward additional and reduced fuel, but coming to a complete, quiet stop between movement. Engine speed will be constant if the governor is operating correctly.

   Constant engine speed changes, under a constant load, indicate possible improper governor control and should be corrected, probably by moving the terminal-lever rod end closer to the TG-13 terminal shaft.

Governor Maintenance

The governor should need only minimal maintenance to provide years of service on an Ajax engine. The oil in the governor should be changed in the spring and fall, when the viscosity of the engine oiler oil is changed. Always use new, clean oil and prevent contamination of the governor by using clean vessels when transferring the oil.

Change oil while the governor is hot but the engine is shut down. Remove the plug from the front of the governor and allow the oil to completely drain from the governor. After the oil has drained from the governor, replace the plug. Remove the oil breather screw from the top of the governor and add new oil (about 1.7 L/1.75 qt) until the oil level again shows in the sight gauge.

Most apparent governor problems are related to the viscosity of the oil being used or to wear in the linkage between the governor and the engine fuel valve. When governor problems are suspected always carefully review the condition of the linkage and of the governor oil before making any adjustments.

Linkage maintenance is essential for safe and adequate governor control. Routinely inspect the linkage for wear and for loose connections. The TG governor will change the control movements of the linkage and could cause unexpected problems.

Governor Wear

A worn TG-13 will normally continue to give good engine-speed control but will slow down in its reaction to load changes. On an Ajax engine, this may show up as difficult starting and slow response to load changes, particularly at low speed or with minimum load.

Woodward has a replacement-exchange program which permits the user to receive a factory rebuilt governor before removing the worn governor. The worn governor is then sent to Woodward, where it is rebuilt and returned to stock. The user pays only for the parts and labor required to rebuild the worn governor to new equipment standards. Contact Woodward Customer Service for additional details.

Troubleshooting

Most suspected governor problems are caused by incorrect or worn linkage or the condition of the oil in the governor. DO NOT make any adjustments to the governor until the linkage has been thoroughly inspected for damage, wear, or other problems and the condition of the governor oil has been determined.

If governor jiggle cannot be cured by attaching the rod end closer to the terminal shaft on the governor a rough governor drive should be suspected. On one-cylinder engines, a rough drive can sometimes be cured by slightly turning the governor clockwise or counterclockwise. On multi-cylinder engines, loosen the four installation bolts and turn the governor slightly in an attempt to improve governor operation. Damage to the governor drive or to the drive gear can also cause governor jiggle, and this area should be inspected before making any governor adjustments.

Should the TG-13 suddenly fail, a broken drive should be suspected. Inspect for a broken drive shaft, a sheared key in the drive gear on the drive shaft, or other drive-related failure. A low oil level or breakdown in the governor oil can also cause sudden governor failure.

The TG governor oil pump works in only one direction of rotation. Should the governor not produce any output and the drive appear positive, incorrect installation of the oil pump on the governor should be suspected. Oil pump rotation is determined by the direction in which the pump is installed on the TG-13 case.

Woodward Manual 04042, *TG-13 and TG-17 Governors*, has complete information on governor troubleshooting, repair, and maintenance.

Droop Adjustment

Adjustment of droop may be required during TG governor installation if the governor shows instability or is slow in responding to load change.

Instability in the form of hunting or surging indicates possible insufficient droop or insufficient terminal-shaft movement. If the terminal shaft is moving at least 20 degrees between minimum and maximum fuel, it may be necessary to increase droop. Delay in accepting load after a toad change indicates excessive droop.

To change the droop setting: shut down the engine; remove the governor cover, and move the adjusting lever as indicated. Do not move the droop-adjusting lever in the decrease direction too close to the center line of the terminal shaft.

Move the lever about 0.8 mm (1/32 of an inch) at a time when adjusting droop. After each move replace the cover and try the operation at the new setting.

NOTICE

Do not move the droop-adjusting lever in the decrease-droop direction to the point of zero droop (the center line of the terminal shaft), as this results in unstable operation. TG governors are not stable at “0” droop.

⚠WARNING

Do not operate the TG-13 without the cover assembly securely in place, as this can cause a change in the speed setting and possible overspeed.

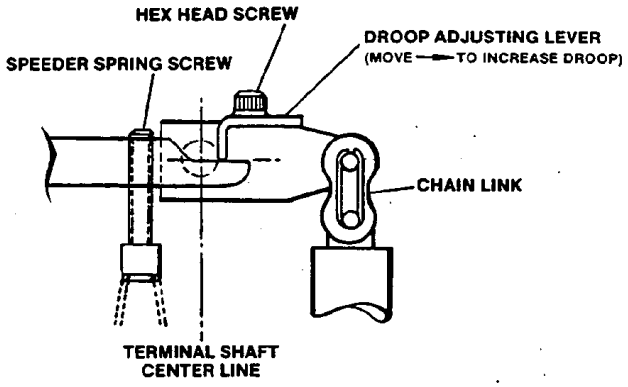


Figure 4. Droop-Adjusting Lever Movement

Replacement Parts

When ordering replacement parts, include the following information:

1. Governor aerial number and part number shown on the nameplate.
2. Manual number (this is manual 54103).
3. Parts reference number and part name from the parts list.

Parts List for Single Cylinder Assembly

Ref. No.	Part Name	Quantity
54103-1	Extended TG Drive	1
54103-2	Woodruff Key	1
54103-3	Oil Seal	1
54103-4	TG Pump HSG	1
54103-5	Not used	
54103-6	Ball Bearing	1
54103-7	Ext. Retaining 0.461 Free Dia. Ring	1
54103-8	Int. Bowed Retaining Ring	1
54103-9	TG Drive Spacer	1
54103-10	0.500-20 Castle Nut	1
54103-11	0.125 inch Cotter Pin	1

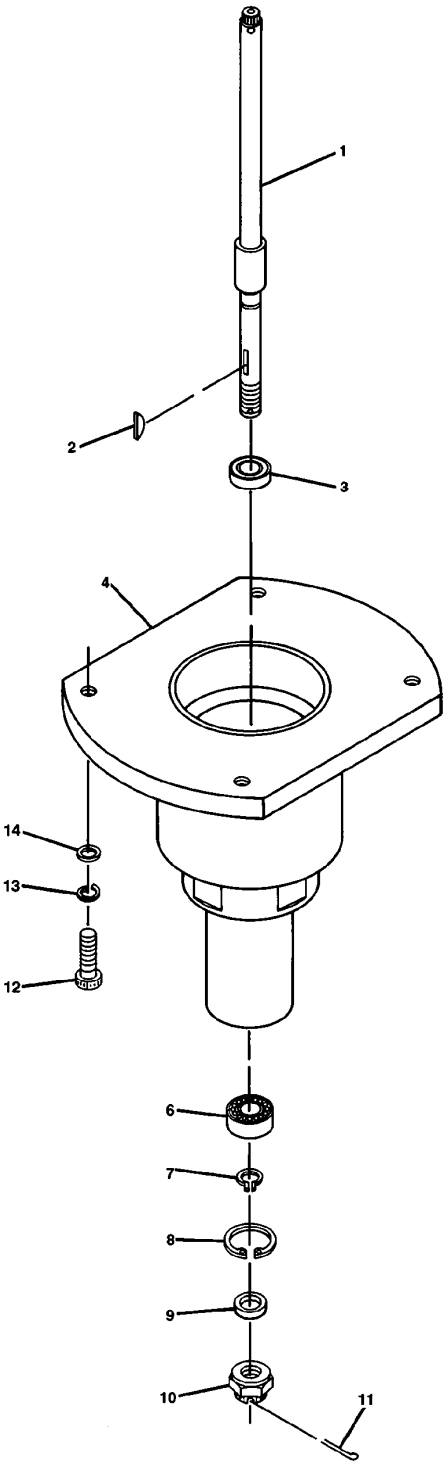


Figure 5. Parts List for Single Cylinder Assembly

Parts List for Multi-cylinder Assembly

Ref. No.	Part Name ..... Quantity
54103-101	Extended TG Drive 1
54103-102	Woodruff Key 1
54103-103	Pump 0.312 Housing 1
54103-104	Oil Seal 1
54103-105	TG Pump HSG Extension 1
54103-106	0.250-20 x 1.750 Hex HD Cap Screw ...1
54103-107	Int. Ret.1.249 Free Dia. Ring 1
54103-108	Not used
54103-109	Ball Bearing.....1
54103-110	Ext. Retain .461 Free Die. Ring 1
54103-111	Int. Bowed Retaining Ring.....1
54103-112	TG Drive Spacer 1
54103-113	0.500-20 Castle Nut 1

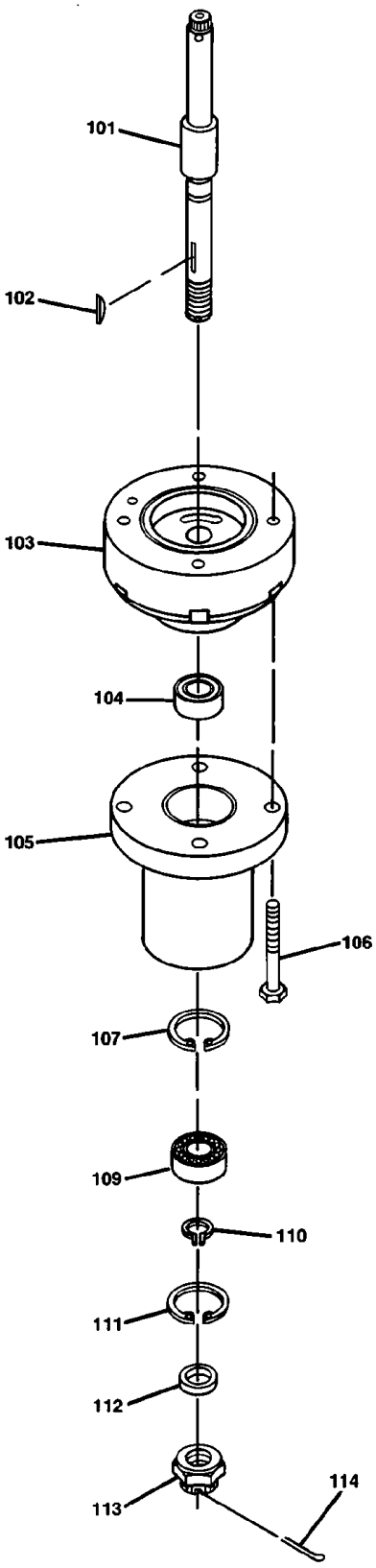


Figure 6. Parts List for Two Cylinder Assembly

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 54103A.

WOODWARD

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

Email and Website—www.woodward.com

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

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

2013/1/Colorado