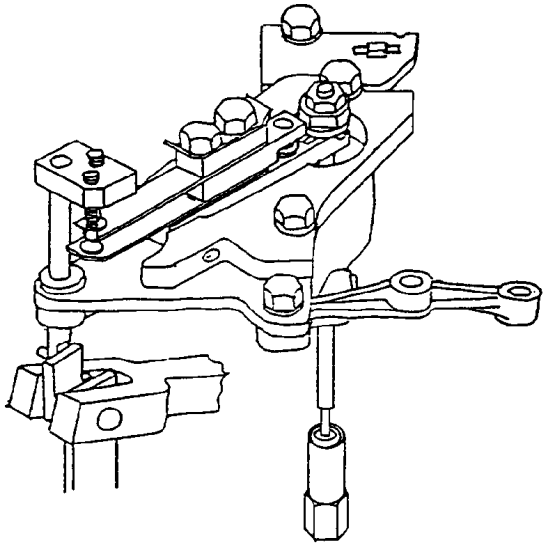
WOODWARD

Product Manual 03111
(Revision B)
Original Instructions



3161 Governor

Torque Rise, Low Idle Offset, and Idle Detent

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.

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the *publications page* on the Woodward website:

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*.

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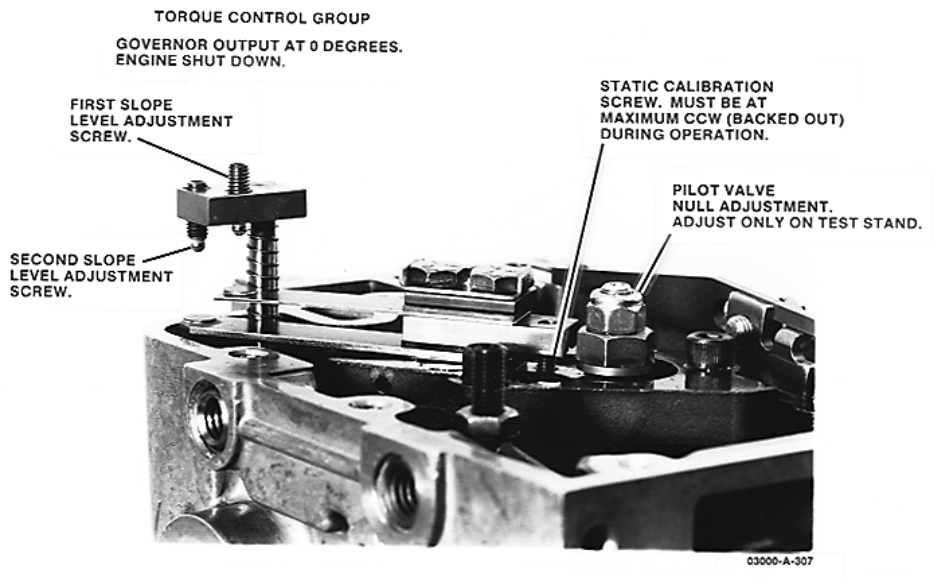


Figure 1-1. Torque Rise at Minimum Fuel

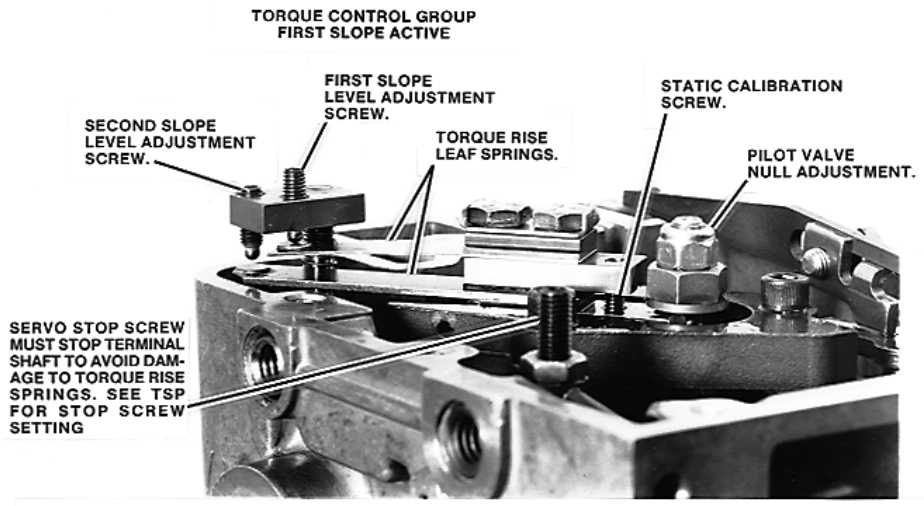


Figure 1-2. Torque Rise During Light Lug

Figure 1-3. Torque Rise During Deep Lug

Chapter 1.
General Information

Introduction

This manual contains information on the 3161 Torque Rise, Low Idle Offset, and Idle Detent features. General information on the 3161 governor system should be obtained from manual 03101.

Torque Rise is included on 3161 governors used on Caterpillar 3508, 3512, and 3516 engines used in Caterpillar vehicular application (trucks, wheel loaders, track-type tractors). This option is not used on marine industrial or stationary applications. Low Idle Offset is be used on applications where idle stability may be a problem. Idle Detent is used on some special tractor applications.

Torque Rise

The leaf-spring-type torque rise was developed to replace the former cam-operated torque rise feature. The cam-operated torque rise feature suffered from rapid wear which caused the torque rise schedule to shift out of tolerance. When a properly adjusted leaf-spring-type torque-rise governor replaces an old cam-type torque rise governor, it may make the engine seem less powerful than it was if the old cam design had worn to allow excess power. The leaf-spring-type torque rise is designed to provide the correct torque rise schedule throughout the overhaul life of the engine.

The torque rise feature provides a schedule of fuel position as a function of engine speed. This schedule is specified with the governor held to its maximum speed setting (full throttle on the vehicle).

Low Idle Offset similarly provides fuel position as a function of rpm. However, Low Idle Offset is specified at minimum governor speed setting or in the low idle condition. Both of these schedules can be thought of as multi-slope droop. This feature is used on Caterpillar vehicular, marine, and industrial engines.

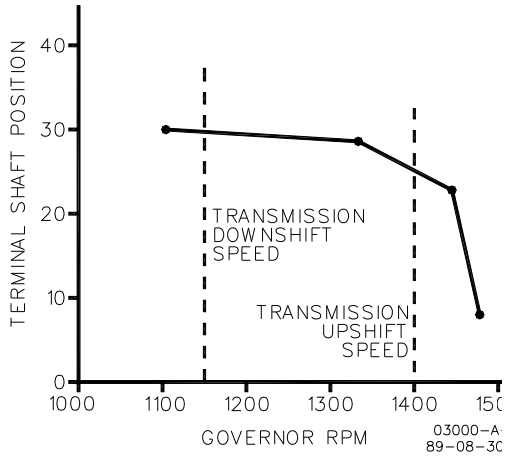
The Torque Rise mechanism can be configured to accept either one or two leaf springs. This translates directly into either one or two slopes of control provided by the mechanism. It should be noted that the total torque-rise schedule for Caterpillar vehicular engines (see Figure 1-4) is provided by two different mechanisms within the governor. The first slope (overrun), which occurs at the highest rpm, is a result of the droop linkage. The next two slopes are provided by the torque rise mechanism. Governors designed for truck applications have two leaf springs, which yield a three-slope torque rise schedule (see Figure 1-4). Tractor governors have one leaf spring, which yields a two-slope torque rise schedule.

The reason this feature is called torque rise can be explained by looking at the relationship between engine torque and rpm.

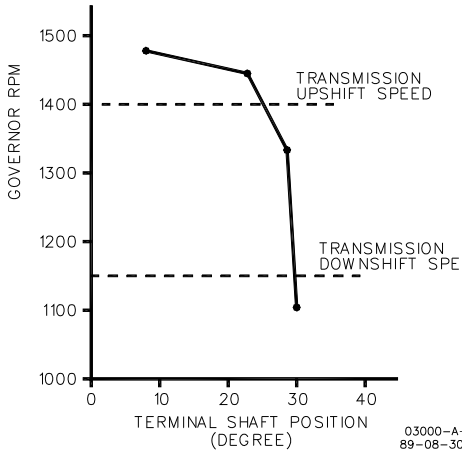
As a vehicle begins to load, the engine slows slightly and the governor acts to provide additional fuel to maintain speed. Additional load increases cause a greater loss in speed. The governor increases fuel position rapidly during the droop portion (overrun) of its schedule, until rated power is reached. Continued load increases cause more speed loss and greater fuel position at speeds less than rated. The engine now operates in a lug condition. Engine torque is related to fuel position. More fuel position allows greater torque output as the engine lugs harder. Therefore the lug “torque rise” helps the engine provide a specific amount of torque rise during lug.

The torque-rise feature is factory installed on the governor and cannot be added to governors in the field.

Calibration of the torque rise feature may be accomplished on a governor test stand or by static calibration. In order to set break points on the torque rise schedules, the pilot valve must have been previously set on a governor test stand.



1-4a. Terminal Shaft Position vs Governor RPM [droop is at bottom right]



1-4b. Governor RPM vs Terminal Shaft Position [droop is at top left]

Figure 1-4. Torque Rise Slopes for Truck Governors (two ways of representing the same information)

Low-Idle Offset

Low-Idle Offset provides two functions. First, it minimizes speed undershoot when the governor speed setting is suddenly changed from high to low (the vehicle throttle goes from maximum to minimum). Second, it provides a large amount of droop in the idle condition which greatly enhances stability. Note that the additional droop at idle makes the speed setting more sensitive to load.

The load change will cause a somewhat slower cold low-idle speed than when an engine is hot. Clutching in a transmission at low idle will cause a drop in speed as the load on the engine increases.

Idle Detent

With the Idle Detent feature, the governor cannot be set to a lower speed than low idle without applying additional force to the speed setting shaft and causing shutdown of the governor.

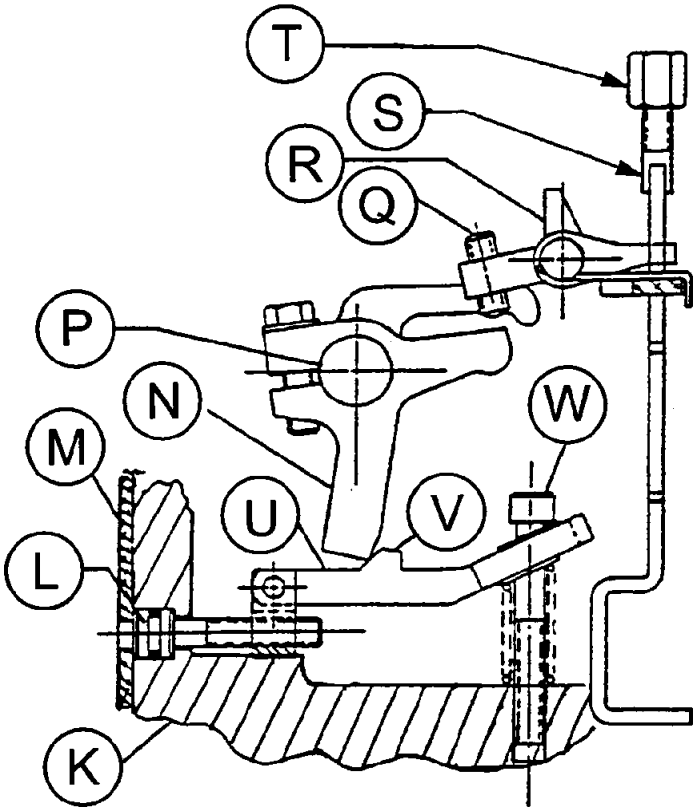


Figure 1-5. Idle Detent

Chapter 2.
Principles of Operation

Introduction

Torque rise on the 3161 governor consists of one or two flat springs which bias the speeder-spring flyweight net force as a function of terminal-shaft position.

As engine speed slows due to load, the governor senses the underspeed condition and moves the power cylinder and terminal shaft to an increase-fuel position (see Figure 2-1). This pulls the torque rise rod-adjustment block assembly downward. The governor speed setting will drop off slightly, due to droop. As the load on the vehicle continues to increase, the first set screw in the adjustment block assembly will contact the upper leaf spring. The force resulting from this spring deflection will act through the torque rise lever and lift up on the torque rise rod. This force transfer subtracts from the speeder-spring force or adds to the flyweight force, resulting in a modified droop slope. The first break point on Figure 1-4b occurs when the set screw contacts the upper leaf spring. If load on the vehicle continues to increase, the speed will continue to slow until the second set screw contacts the lower leaf spring, resulting in the third slope in Figure 1-4b.

The terminal shaft angles at which the break points occur are adjustable. The two set screws can be turned clockwise to move the break points toward a lower terminal-shaft position, and counterclockwise to move the break points in the increase direction. The slopes of these curves are adjustable only by replacing the leaf springs with ones of different thickness. See Chapter 3 for additional information on adjustments.

The torque-rise schedule is affected by the setting of the high idle stop. If the high idle is changed, the torque rise break points will occur at different speeds.

Tractor Operation

Tractor applications of the 3161 governor with Torque Rise employ a single torque rise slope. The slope starts after the engine has slowed to rated fuel position.

Low-Idle Offset

Low-idle offset minimizes speed undershoot and improves idle stability. These functions are accomplished with a set screw in the terminal lever operating on the floating lever (see Figure 2-2).

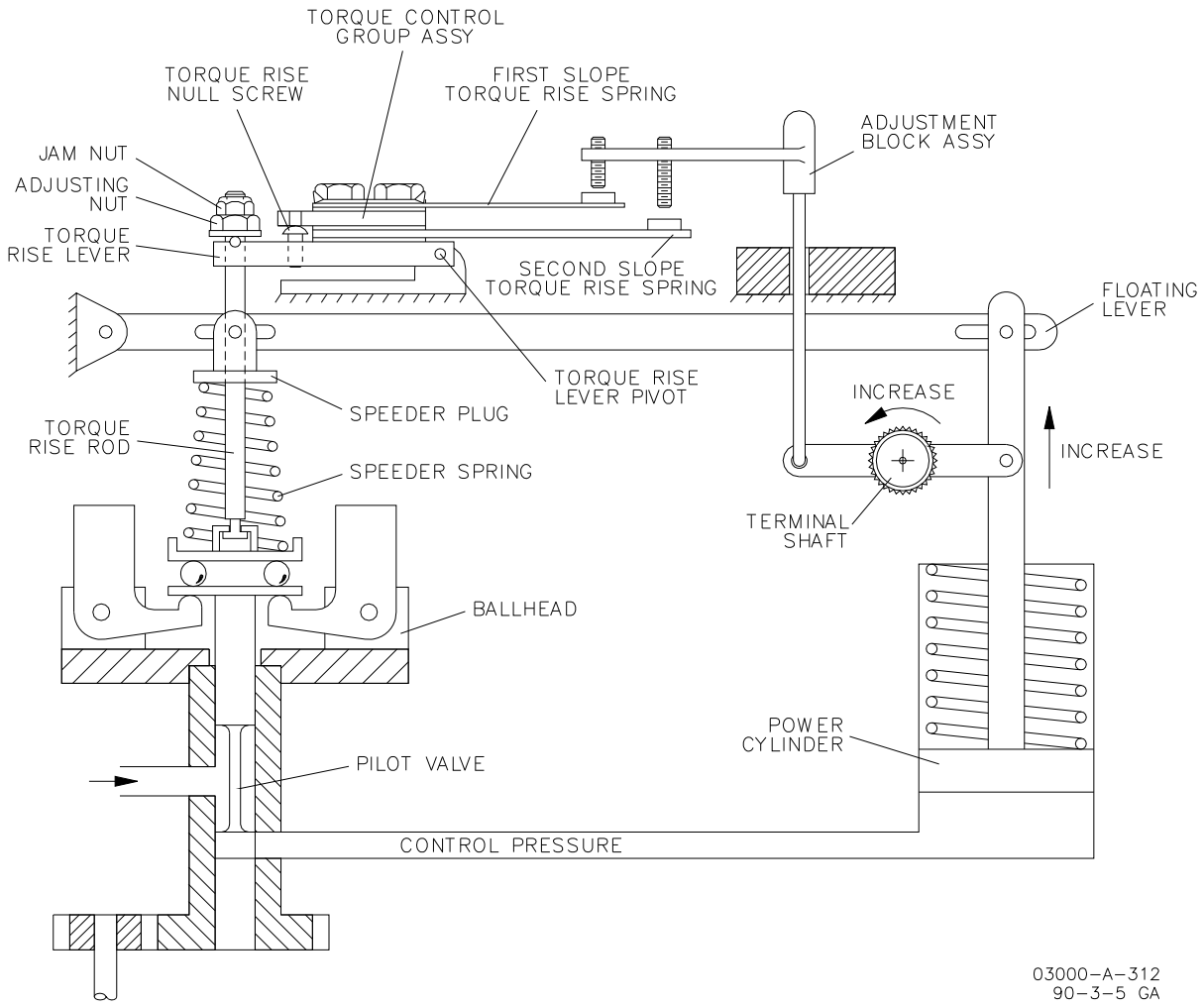


Figure 2-1. Schematic of Truck and Wheeled Tractor Torque Rise Control

Speed undershoot is minimized by temporarily increasing the low-idle speed setting under minimum fuel/minimum speed setting conditions. As the throttle is suddenly dropped from maximum to minimum, the governor immediately senses an overspeed condition, and the servo moves to minimum. Under these conditions, the low-idle offset screw engages the floating lever, moving it downward (see Figure 2-2) and thus displacing the speeder plug. This sets the governor speed setting above what is actually required. Therefore, as the actual engine speed drops, the governor will start to respond before reaching the final desired speed. The result is that speed undershoot is minimized.

Idle stability is improved by simply increasing the droop at the idle condition. The amount of droop provided by the low-idle offset is about 22.5 rpm/degree. This is built into the hardware and is not adjustable. The only adjustment to this feature is the terminal-shaft position where the increased droop begins. Note that the low-idle stop must be set before the low-idle offset is adjusted, and that the adjustment is limited to 14 degrees or less (see Chapter 3 for adjustment procedures).

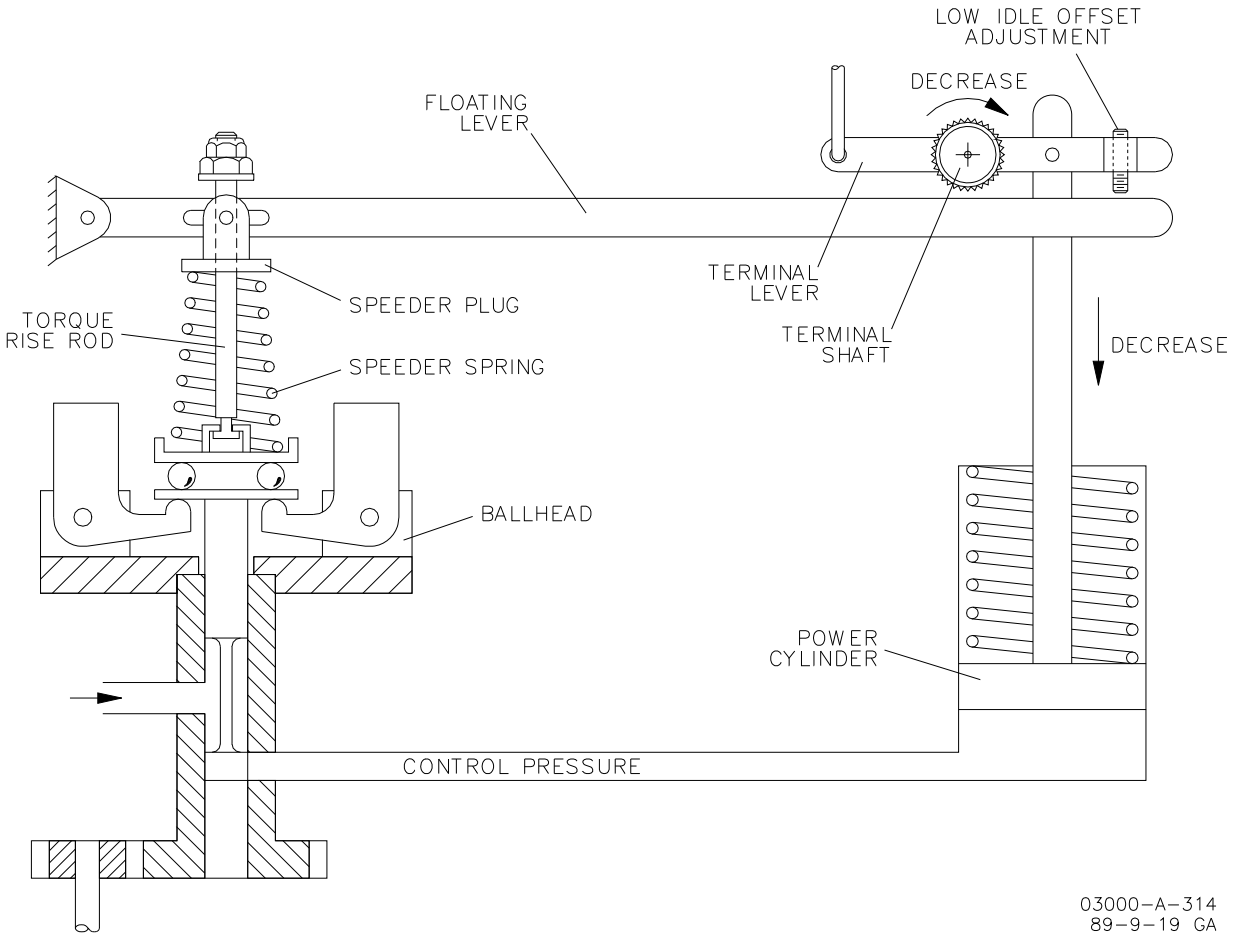


Figure 2-2. Schematic of Low-Idle Offset Governor Feature

Idle Detent

At low idle, the speed setting lever will contact a detent lever. Force of 4.5 to 10.2 N·m (40 to 90 lb-in) must be applied to the speed-setting shaft in the counterclockwise direction to move past the detent position. Movement beyond detent causes the speed-setting lever to contact the shutdown lever setting screw, resulting in governor shutdown.

The setting of the detent lever and shutdown screw should not be done while the governor is installed on the engine. Adjustment is factory-set and should be changed only by a Woodward-authorized and trained service technician.

Chapter 3. Troubleshooting

Two-Slope Truck or Wheeled Tractor Static Calibration Procedure

The slope of the torque rise schedule provided by the two torque rise springs can be changed only by installing different thickness springs. However, the terminal-shaft position at which the governor begins each slope is adjustable.

Some engine problems can be masked by adjusting the governor. This can lead to improper operation of engine and transmission components, and therefore care should be taken to properly troubleshoot and identify the problem before the governor is adjusted.

Caterpillar publishes a procedure for setting governors on the engine, using millimeter readings of fuel-position output.

The following procedure can be used to statically set fuel position in degrees of terminal-shaft rotation.

1. Shut down the engine.

2. Install an approved electronic digital readout device on the governor output shaft (Woodward tool 8909-513). Woodward specifications provide break point identification in degrees of terminal shaft rotation. (Caterpillar provides instructions for use of an indicator seated against the fuel-position lever. The Caterpillar instructions provide break point locations in millimeters of travel by the fuel-position lever.)

3. Engage the rig pin.

4. Attach levers to the speed-setting shaft and to the terminal shaft. Apply 3.4 N·m (30 lb-in) of torque to the speed-setting shaft toward maximum. Torque the terminal shaft toward maximum fuel to 10.2 N·m (90 lb-in). (The Caterpillar instructions provide weights and specific levers to provide the correct torque.)

5. Remove the cover, being careful not to introduce foreign material into the governor.

IMPORTANT

DO NOT turn the nut on the end of the pilot valve plunger extension (torque rise rod). This is factory set, and movement of this adjustment will require calibration of the governor on a test stand. The only adjustments possible on torque rise are the start points of the two slopes. The slopes themselves are not field adjustable.

6. Set the readout equipment to 17.9 degrees when the terminal shaft is loaded against the rig pin. Disengage the rig pin. The pin will sometimes stick until pressure or weights are removed.

7. Turn the null screw on the torque rise lever assembly clockwise as far as it will go.

8. Clean torque control adjusting screw tips and spring contacts to remove oil film. Attach a continuity light clip to the case cover bolt hole and touch the probe to the top leaf spring at the side edge of the shim pack.

9. Adjust the set screw so the light just goes on at the specified fuel position for break point one. Turn the set screw an additional one-eighth of a turn clockwise. Loosen the servo stop nut and adjust the servo stop screw until the specified fuel position for break point one is achieved.

10. Touch the continuity light probe to the bottom spring on the side edge of the shim pack.

11. Adjust the servo stop screw to set the output shaft until the specified fuel position for break point two is achieved. Set the screw to just complete the circuit. Turn the set screw an additional one-eighth of a turn clockwise.

12. Return the servo stop screw to its specified position and torque the lock nut.

13. Turn the null screw counterclockwise as far as it will go. Remove tooling and instrumentation. Replace the cover.

14. Set the high idle screw to achieve the specified nominal high idle speed after governor oil temperature is at 50 to 60 °C.

15. Check the pneumatic speed setting to be sure the setting of the high idle did not change the set speed. Repeat steps 14 and 15 until no further adjustment is necessary.

Troubleshooting

The torque-rise feature on a 3161 governor largely prevents making any field repairs to the torque rise portion of a governor. Removal of the torque rise feature requires removal of the pilot valve null-adjustment nut, and a test stand is required to adequately readjust the pilot valve.

The torque rise control of output position will normally make the governor extremely stable under load without a decrease in responsiveness. Torque rise problems will normally be seen as low power output from the engine, transmission hunting, or failure to upshift on schedule. A number of other factors could cause the same power train problems. Since the most practical governor troubleshooting method involves replacing the governor with a known good governor, the other factors should be carefully inspected before determining that the engine problem is indeed the governor.

Always check the oil level in the governor. Low oil level or a level that is so high that the case is pressurized can cause governor problems. The troubleshooting section of manual 03101 should be consulted to help identify other governor problems.

IMPORTANT

The null screw in the torque-rise lever must be backed out as far as it can go for the governor to operate correctly. Always check the position of this screw when starting to troubleshoot a suspected torque rise problem on a new or repaired governor. The null-adjustment screw has vibration-resistant threads and should not move during normal governor operation. Except in the case of new or newly rebuilt governors, it is unlikely the null-adjustment screw will cause problems.

Speed Setting Changes

If the governor speed setting is incorrect, the drive train may react as though the torque rise system is malfunctioning. The slopes of the two levels will remain the same, but the speeds in which the slopes operate will be incorrect, making the transmission shifting seem incorrect.

Check the high-idle setting and the pneumatic speed setting on truck and wheeled tractor applications, or the throttle linkage on tractor applications. Pneumatic pressure control problems can cause a change in speed setting as can leaks in the pneumatic lines.

Fuel Limiter

Many governors are equipped with fuel limiters, and this could cause problems which would appear like a malfunction of the torque rise. Failure to achieve lug-fuel position may be caused by a failed fuel limiter diaphragm. Leak decay test the fuel limiter to rule out this malfunction. Inspect for correct level setting. Malfunctioning limiters and shutdowns can give deceptive symptoms which resemble governor-control problems.

Droop

Torque rise fuel schedules are designed to start at the end of a specified droop schedule. If the droop setting is not at the specified position, the torque rise schedule will not match the transmission shift points, and vehicle operation will be unacceptable. The droop slope is determined by a combination of load and speed. It is extremely difficult to set accurately with the governor on a vehicle. Droop should be carefully calibrated before the torque rise schedule is added to the governor.

Droop in the 3161 governor is not generally changed by wear.

Limit/Shutdown Rod

The 3161 governor limit/shutdown rod and connected limit/shutdown pilot-valve plunger control most of the special features on the governor. The speed-setting pilot valve is controlled only by the speed setting, droop, low-idle offset, and torque rise. Operation of the limit/shutdown pilot valve system must be considered when troubleshooting suspected problems in the torque-rise function.

3161 governor limiters are discussed in manuals 03110 and 03108.

Idle Detent and Low-Idle Screw

Do not adjust the low-idle screw to a higher speed than the idle detent point. If this happens, the speed setting shaft will be stopped before the detent position can be reached. Under this condition, the detent/shutdown feature will not operate.

Chapter 4.
Replacement Parts

When ordering replacement parts, include the following information:
1. Manual number (this is manual 03110).
2. Governor serial number and part number shown on the nameplate.
3. Part reference number and part name from parts list.

Ref. No.	Part Name	Quantity
03111-1	Jam Nut, pilot valve adjustment	1
03111-2	Pilot Valve Adjusting Nut Assembly	1
03111-3	Socket Head Cap Screw, .250-20 x .875	2
03111-4	Torque Rise Lever Bracket	1
03111-5	Speed Setting Shaft	1
03111-6	Speeder Plug Bracket	1
03111-7	Terminal Lever	1
03111-8	Cotter Pin	1
03111-9	Drilled Pin	1
03111-10	Terminal Shaft Loading Link Assembly	1
03111-11	Torque Rise Link Assembly	1
03111-12	Screw	1
03111-13	Lock Washer	1
03111-14	Droop Slider	1
03111-15	Droop Slider Pin	1
03111-16	Low Idle Offset Screw	1
03111-17	Torque Rise Rod Assembly	1
03111-18	Pivot Pin	1
03111-19	Retainer	1
03111-20	Screw, Hex Head, .250-28 x .875	2
03111-21	Spacer	1
03111-22	Insulator	1
03111-23	Torque Rise Spring Assembly	1
03111-24	Spacer	1
03111-25	Insulator	1
03111-26	Torque Rise Spring Assembly	1
03111-27	Insulator	1
03111-28	Torque Rise Lever Assembly	1
03111-29	Static Set Null Screw	1
03111-30	Torque Rise Loading Spring	1
03111-31	Torque Rise Rod Assembly	1
03111-32	Adjusting Screw Assembly	2

The two 0.250-20 screws should be torqued from 11.3 to 13.5 N·m (100 to 120 lb-in) during assembly.

Single-Slope Torque Limit Assembly

The single-slope "tractor" torque rise assembly is identical to the two-slope assembly, except that is does not use part 23.

Part 26 is NOT interchangeable between the two slope and single-slope torque rise features.

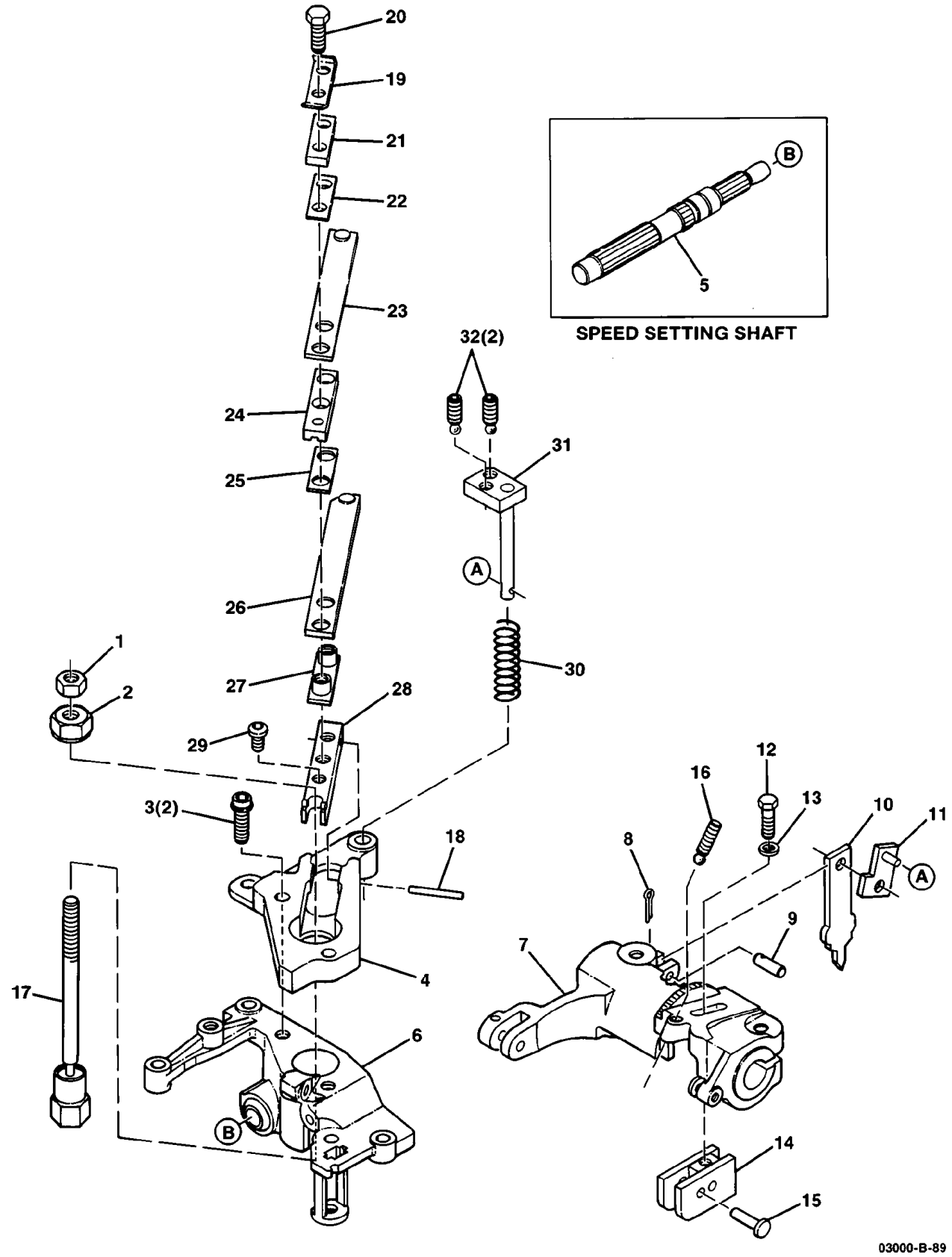


Figure 4-1. Exploded View of 3161 Torque Rise Feature

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

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 03111B.

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2012/9/Colorado