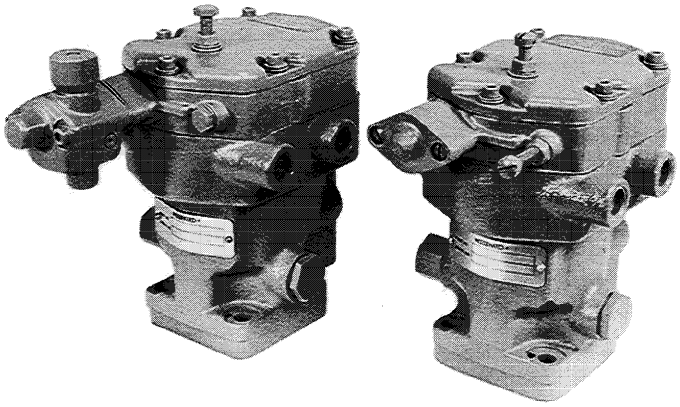
WOODWARD

Product Manual 04026
(Revision C)
Original Instructions



SG Overspeed Sensing Device

Manual Reset and Self-resetting Types

Installation and 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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Illustrations and Tables

Chapter 1.
SG Overspeed Sensing Device

General Information

The SG Overspeed Sensing Devices described in this manual are modifications of the SG governor. Overspeed sensing devices are available to provide oil flow to a shutdown servo in the engine fuel system or to stop the flow of oil to a shutdown system when speed exceeds a given point.

All overspeed sensing devices are designed to be unstable at tripping speed, so that tripping occurs within a very narrow rpm band (less than 1% of the set speed).

Overspeed sensing devices are available with either a self-resetting or a manual resetting feature. Principles of operation for both resetting types are similar.

The self-resetting unit resets itself after engine speed has decreased to a predetermined level below the tripping speed. The manual reset type is equipped with a “lock-out” latch which engages after the overspeed sensing device trips, preventing the sensing device from resetting itself. A red band is exposed under the reset knob when the manual reset knob is in a tripped position.

All SG overspeed sensing devices can be supplied with a terminal shaft extending from the outside of the case to provide a means of manually operating the overspeed sensing device or to operate an electrical switch.

⚠WARNING

The SG overspeed sensing device is only the part that initiates the shutdown signal to the engine. This signal must be acted upon by some other device on the engine to shut the engine down.

IMPORTANT

As with any engine protective system, both of the devices must be tested periodically to make certain that they are operating correctly.

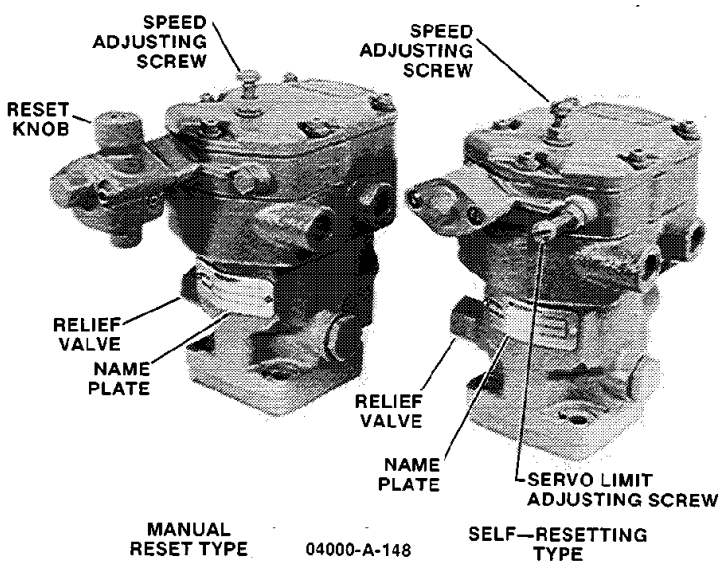

Figure 1-1. SG Overspeed Sensing Devices (Manual Reset and Self-Resetting Types)

Operation

The overspeed-sensing device uses oil from an external source. It does not have a self-contained sump. Oil enters the overspeed-sensing device at the relief-valve inlet, drops down through the inlet port and around to the pressure side of the pump.

The internal oil pump builds up pressure until the relief-valve plunger is pushed to the left (see Figures 1-2 and 1-3) against the force of the relief-valve spring. This uncovers the bypass hole in the relief-valve sleeve and recirculates the oil through the pump. Normal operating pressure of the over-speed sensing device is either 75 or 175 psi (517 or 1207 kPa) plus the inlet supply pressure.

If the overspeed-sensing device requires a volume of oil greater than that being recirculated through the oil pump, the pressure will be reduced, and the spring will move the relief valve to the right. The recirculating passage is thus blocked to maintain operating pressure, and the additional oil needed enters the pump through the inlet port.

The pilot-valve plunger controls the movement of the power piston by directing oil to or from the area beneath the piston. The power piston in turn controls the flow of oil to or from the shutdown servo in the engine fuel system.

Two opposing forces act upon the pilot-valve plunger. The speeder-spring force tends to push the plunger down; the centrifugal force developed by the rotating flyweights tends to lift the plunger.

The relative positions of the overspeed-sensing device components during normal operation with the engine running on speed are shown in Figures 1-2 and 1-3.

Pressure Rise on Trip Operation

(see Figure 1-2)

The speeder spring force holds the pilot-valve plunger down and connects the oil under the power piston to drain. The reset spring, pushing against the terminal lever, holds the power piston down. In this position, the line to the shutdown servo is connected to sump through the flyweight cavity in the case.

If the unit speed rises above the tripping speed, the centrifugal force of the flyweights overcomes the speeder-spring force and lifts the pilot-valve plunger. As the plunger rises, pressure oil flows to the underside of the power piston. The piston is forced up, rotating the terminal lever against the force of the reset spring.

The speed-droop bracket is attached to the terminal lever. As the terminal lever is rotated by the upward movement of the power piston, the pin in the speed-droop bracket raises the right end of the floating lever. This decreases the downward force of the speeder spring, and the flyweights move to their extreme “out” position. This feedback provides immediate movement from normal to overspeed position of the power piston.

The power piston moves to the top of its stroke as allowed by the terminal lever. In this position, the piston shuts off the drain line to the flyweight cavity and connects pump pressure to the shutdown servo.

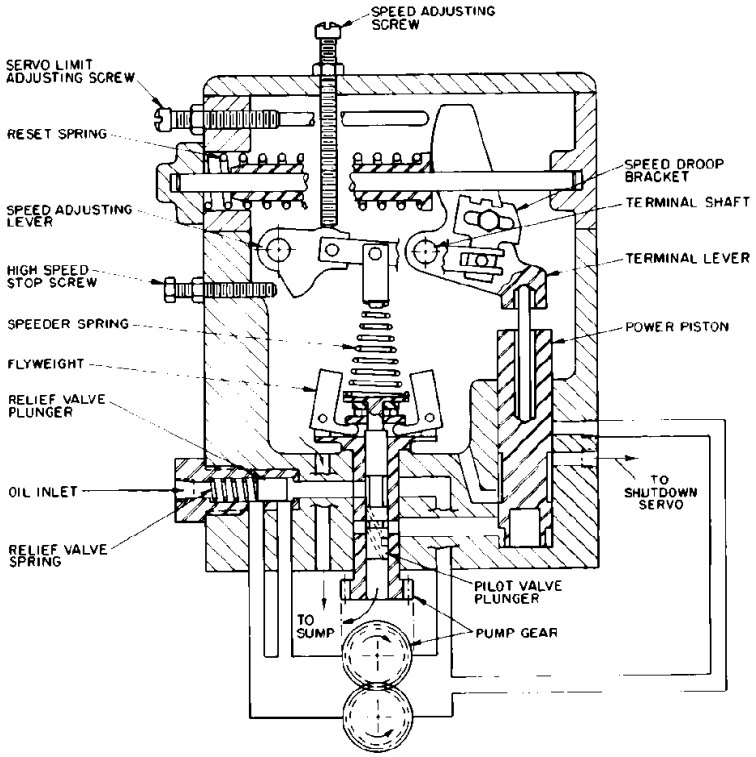

Figure 1-2. Schematic of SG Overspeed Sensing Device, Pressure Rise on Trip, Self-Resetting Type
(engine running at normal speeds)

Self-Resetting

When the engine speed drops below the reset speed, the speeder spring pushes the pilot-valve plunger down. The area under the power piston is now again connected to sump. The reset spring rotates the terminal lever and pushes the power piston down, pump pressure is cut off, and the line to the shutdown servo is again connected to the sump through the governor-case passages.

Pressure Drop on Trip

(see Figure 1-3)

Pressure drop on trip models differ from pressure rise models in the power piston area. When the pressure-drop model power piston is in the normal-speed position pressure oil flows through the pilot valve out of the governor to hold a remote shutdown cylinder in an active or “engine run” position.

When the speed exceeds the desired speed, the power piston is forced up and the oil line to the remote shutdown cylinder is connected to sump.

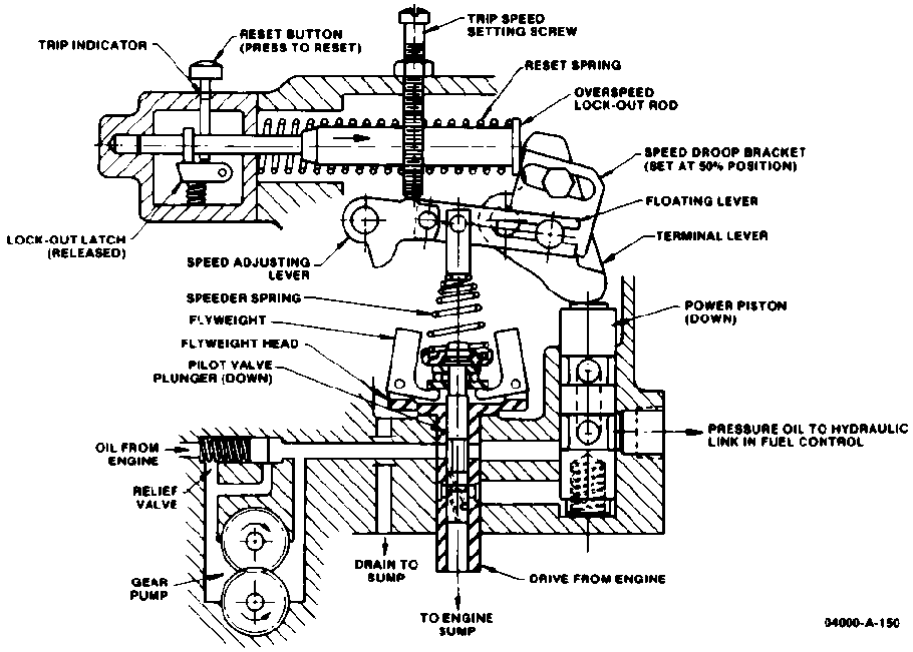

Figure 1-3. Schematic of the SG Overspeed Sensing Device, Pressure Drop on Trip, Manual Reset Type
(engine running at normal speed)

External Terminal Shaft

If an external terminal shaft is supplied, it permits the unit to be tripped manually by an external connection to the shaft. Turning the shaft counterclockwise (as seen in Figures 1-2 and 1-3) lifts the terminal lever. This permits a spring under the power piston to force the piston up. The shutdown servo is thus connected to either pump pressure (Figure 1-2) or sump (Figure 1-3).

Adjustments

Adjustments for both the self-resetting device and the manual reset device are the same. The setting of the speed-droop pin determines the range between trip and reset speeds. Moving the speed-droop bracket and pin away from the flyweight assembly increases the range; moving them towards the flyweight head assembly decreases the range. The speed at which the unit trips is determined by the position of the speed-adjusting screw. Turn the screw into the cover to raise the tripping speed, out to lower.

Proceed in this manner to adjust the overspeed sensing device: Back out the servo-limit adjusting screw (if present) so it does not limit travel of the power piston. Make tentative setting of speed-droop bracket at about one-half its travel from minimum to maximum droop. Make preliminary tripping speed adjustment using the speed-adjusting screw through top of cover. Turning the speed-adjusting screw out will lower tripping and reset speeds; turning it in will raise tripping and reset speeds.

On automatic reset models, readjust the speed-droop bracket to obtain about 10% excess range and readjust tripping speed. The speed-adjusting lever can be locked into place by tightening the high-speed stop screw against the lever. The overspeed sensing device should now reset at a speed slightly below the desired reset speed. The servo-limit adjusting screw, when present in the sub cap, affects only the reset speed. Move this screw in to raise the reset speed so the desired value.

Use a pressure gauge in the outlet line to the shutdown servo to give external indication of trip and reset, Final settings must be made with the overspeed sensing device warm. Exercise caution when making final adjustment of the servo-limit adjusting screw so that the power piston stroke is not shortened or lengthened excessively. If the power-piston stroke is too short, oil flow to or from the shutdown servo will be restricted when the unit trips. Should the travel be too great, oil can flow from the top of the servo bore into the governor case, dropping the pressure rise to the shutdown device.

If the fitting in the line to the shutdown servo is tightened too much, it may cause binding of the power piston. Operation of the overspeed-sensing device should be checked after this fitting is tightened for any reason.

Installation

The governor drive shaft (see Figures 1-4 and 1-5 for details) is splined to fit into the engine drive. The governor may be mounted either vertically or horizontally. If mounted horizontally, the power piston end of the governor must be mounted upward and a 3/8 inch (9.5 mm) OD tubing oil drain provided to connect to a 1/4 inch (6.35 mm) pipe-tapped hole in the lower end of the governor case.

The drive shaft may be rotated in either direction. The relief-valve assembly must, when the overspeed-sensing device is viewed from the power piston end, be on the left if the drive shaft is rotated clockwise when viewed from above. The relief valve assembly must be on the right for counterclockwise drive-shaft rotation The configuration of external tubing supplied with the overspeed-sensing device changes with the direction of drive shaft rotation. However, the oil-pressure outlet to the shutdown servo remains in the same location for either direction of rotation. (For reference, see top and side views on right hand side of outline drawing, Figures 1-4 and 1-5.)

When the overspeed sensing device is installed on the engine, take care to mount it squarely with the engine linkage to the terminal shaft, if used, and in line with the engine drive. Place a gasket between the base of the overspeed-sensing device and the engine mounting pad. This gasket must nor block off the two drain holes adjacent to the centering pilot of the base. The drive shaft must fit freely into the engine drive. No tightness is permitted and the overspeed-sensing device must drop of its own weight or slide onto the engine pad without any force being applied. Provide the proper drain connection from the piston end of the device for horizontally-mounted units, as indicated in Figures 1-4 and 1-5.

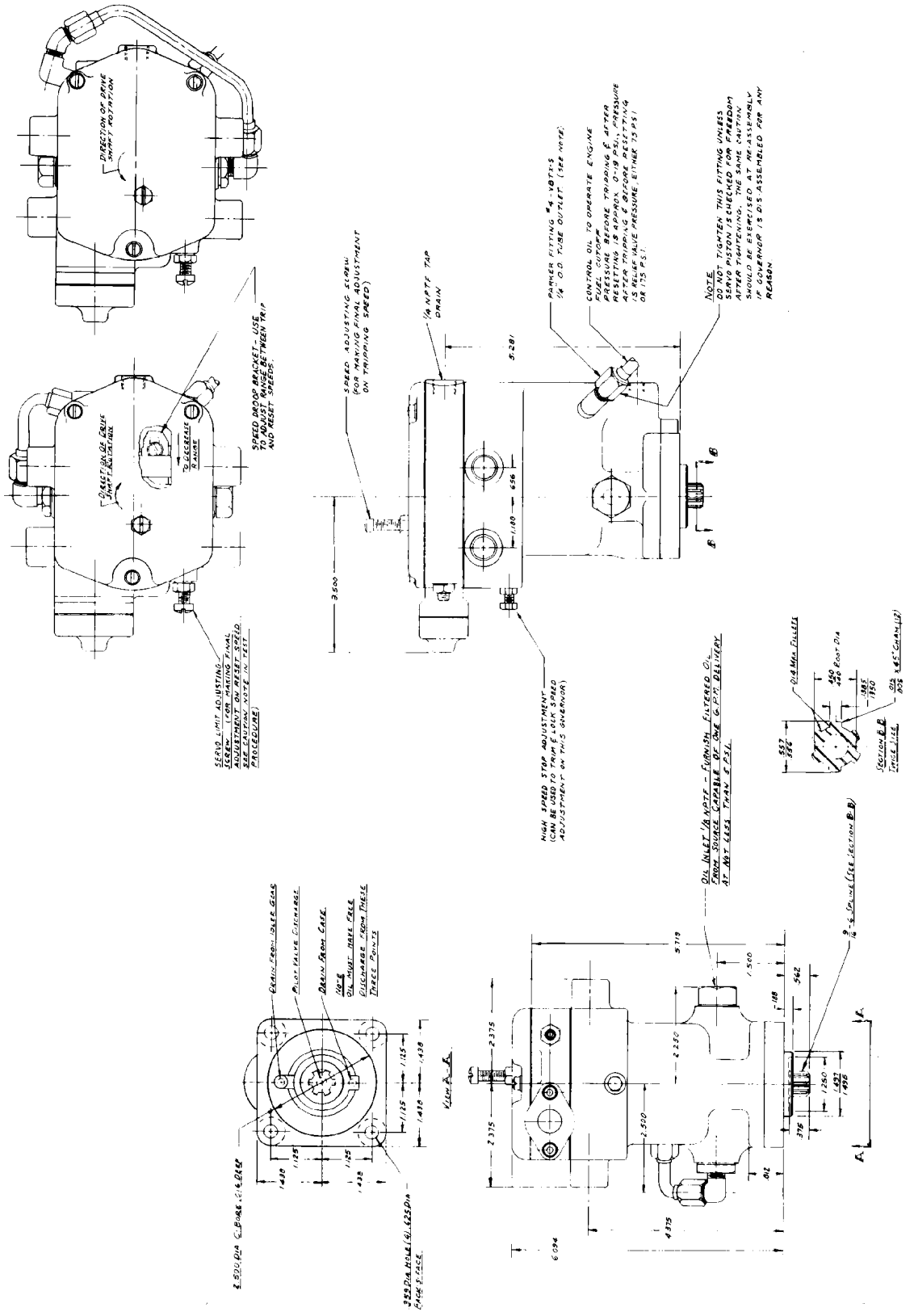

Figure 1-4. Outline Drawing of Typical SG Overspeed Sensing Device (self-resetting type, pressure rise on trip)

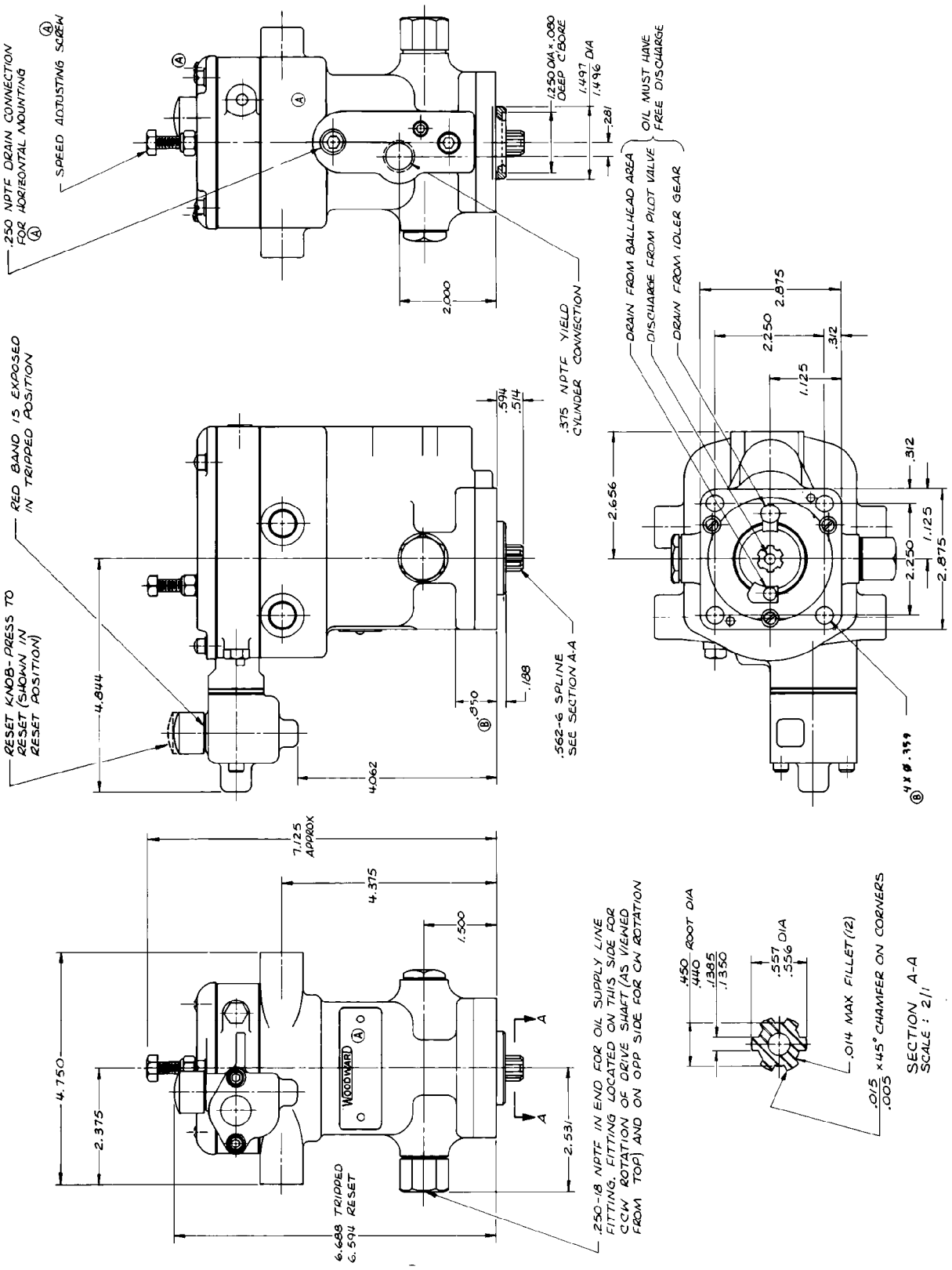

Figure 1-5. Outline Drawing of Typical SG Overspeed Sensing Device (manual reset type, pressure drop on trip)

Oil Supply

A 3/8 inch (9.5 mm) OD tubing oil line must be connected form the oil supply to the 1/8 inch (3.175 mm) pipe-tapped hole in the relief-valve sleeve of the overspeed-sensing device. Regular engine lubricating oil is usually used in the overspeed sensing device. A minimum of 5 psi (34 kPa) oil pressure is required at the inlet of the overspeed sensing device. If a separate sump is used (rather than engine lubricating oil), the lift head should not exceed 12 inches (305 mm) and a foot valve should be used.

Because dirty oil causes most operating troubles and because any dirt present in the engine oil will eventually be deposited in the overspeed sensing device, a 2 US gal/min (7.6 L/min), 40 µm filter should be installed in the oil-supply line.

Information and Parts Replacement

When requesting additional information concerning overspeed sensing device operation, or when ordering repair parts, it is essential that the following information accompany the request:

- Overspeed sensing device serial number and part number shown on nameplate.
- Manual number (this is manual 04026).
- Part reference number, name of part, or description of part.

Parts List for Figure 1-6

Ref. No.	Part Name
04026-1	No. 10-32 x 1-3/8 Sems Fil, Hd Screw
04026-2	Elbow 90°
04026-3	Cover
04026-4	Gasket
04026-5	1/4-28 Elastic Stop Nut
04026-6	1/4-28 x 2-3/8 Fit. Hd. Screw
04026-7	45” Filling
04026-8	No. 10-32 s 1 Fil. Hd. Screw
04026-9	No. 10 Splitlock Washer
04026-10	Subcap
04026-11	No. 10-32 x 1/2 Fil, Hd. Screw
04026-12	No. 10 Spring Lock Washer
04026-13	Spring Pad Cover
04026-14	Gasket
04026-15	Reset Spring
04026-16	Spring Guide Rod
04026-17	Spring Seal
04026-18	Nut - 1/4-20 Hex.
04026-19	Copper Washer
04026-20	Servo Limit Adjusting Screw
04026-21	Plug
04026-22	Droop Adjusting Screw
04026-23	1/4 Inch Shakeproof Washer
04026-24	1/4 Inch Washer
04026-25	Droop Adjusting Bracket Assembly
04026-26	Cotter Pin
04026-27	Terminal Shaft
04026-28	Pin - Terminal Lever
04026-29	Welch Plug
04026-30	Terminal Lever Assembly
04026-31	Bushing
04026-32	1/4 Inch Tube Male Connector
04026-33	Torsion Spring
04026-34	Speed Adjusting Shaft
04026-35	Speed Adjusting Lever
04026-36	Pin - Servo
04026-37	Pin - Spring Fork
04026-38	Floating Lever
04026-39	Spring Fork
04026-40	Speeder Spring
04026-41	Thrust Bearing
04026-42	Pilot Valve Plunger
04026-43	Plug
04026-44	Copper Gasket
04026-45	Relief Valve Sleeve
04026-46	Spring - Relief valve Sleeve
04026-47	Plug - Oil Outlet
04026-48	Plunger
04026-49	Spring
04026-50	Power Piston
04026-51	Plug - Shipping
04026-52	Retaining Ring
04026-53	Flyweight Head - Drive Shaft Assy.
04026-54	Flyweight
04026-55	Flyweight Pin
04026-56	Case
04026-57	No. 12-24 a 1/2 Fil. Hd. Screw
04026-58	Base
04026-59	Drive Gear
04026-60	Idler Gear
04026-61	Base Seal Ring
04026-62	Idler Stud
04026-63	No. 10-32 x 1-1/4 Hex. Hd Cap Screw
04026-64	Oilite Bushing
04026-65	Copper Washer
04026-66	Dowel Pin
04026-67	1/16 Inch Pipe Plug
04026-68	1/8 Inch Pipe Plug
04026-69	Drive Screw
04026-70	Nameplate
04026-71	Tubing Assembly
04026-72	No. 10-32 Elastic Stop Nut
04026-73	Roll Pin
04026-74 through 99—NOT USED	

Reference Numbers 1 Thru 73 Are On This Page

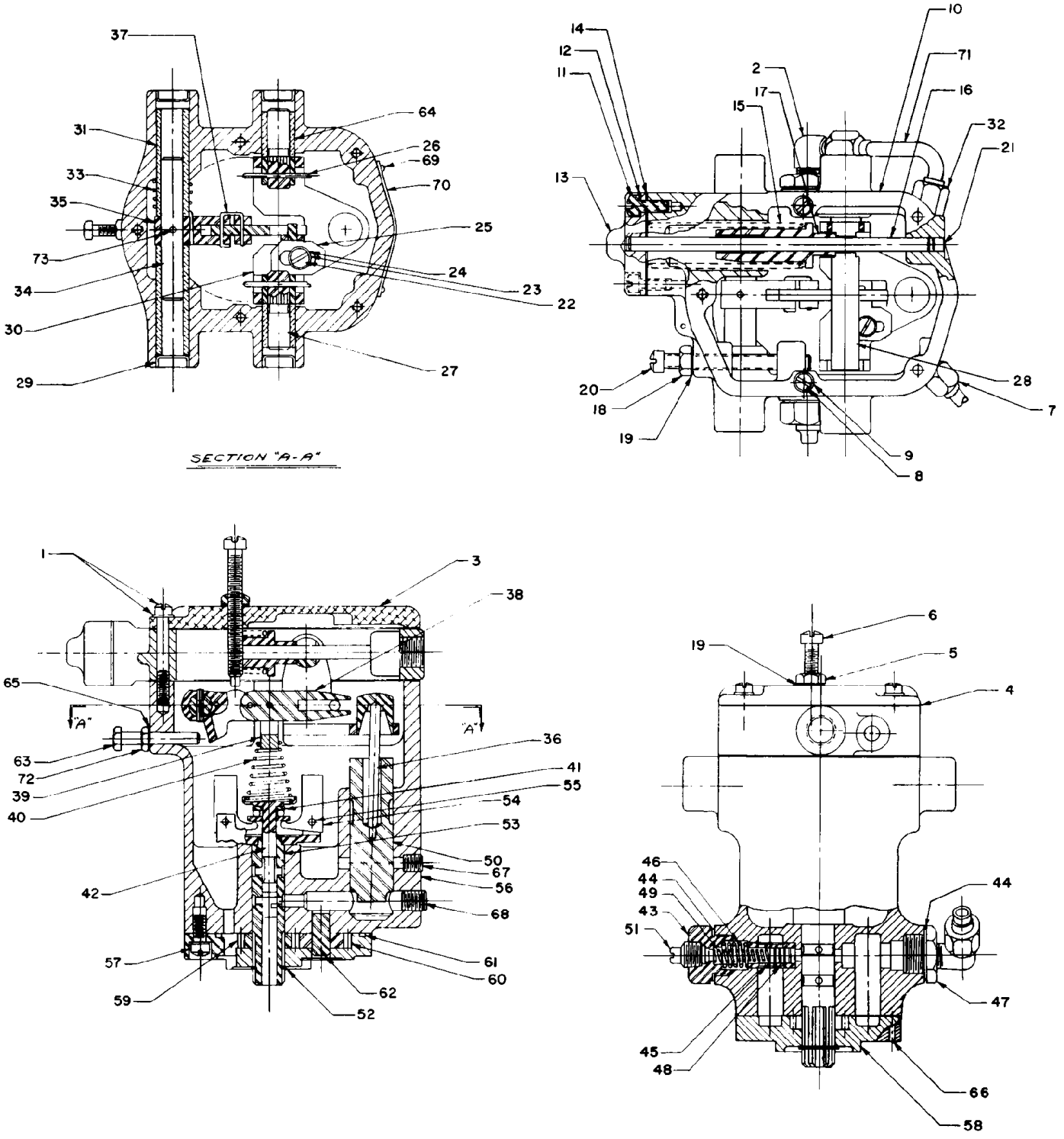

Figure 1-6. Parts Illustration for the SG Overspeed Sensing Device, Self-Resetting Type
(Pressure Rise on Trip)

Parts List for Figure 1-7

Ref. No.	Part Name	Quantity	Ref. No.	Part Name	Quantity
04026-100	Spring	1	04026-114	Fuel rod housing gasket	2
04026-101	Spring guide seat	1	04026-115	Reset latch assembly	1
04026-102	Sub cap	1	04026-116	Spacer	1
04026-103	Spring guide rod	1	04026-117	Pin	1
04026-104	Plug-.250x,156LG	1	04026-118	Plug	1
04026-105	Adhesive - Loctite TL 242	AR	04026-119	Reset button	1
04026-106	Retaining ring - .211 ID	2	04026-120	Preformed packing - .239 ID	1
04026-107	Terminal lever	1	04026-121	Tube	1
04026-108	Terminal lever pin	1	04026-122	Shaft	1
04026-109	Screw. Soc cap 10-32 x 1.00	2	04026-123	Bracket assembly reset button	1
04026-110	Seal - 1/4 nitrile thread	1	04026-124	Compression spring	1
04026-111	Washer - .265 x .500 x .032 thick SS	1	04026-125	Washer - .203 x .438 x .032 thick SS	2
04026-112	Screw - hex hd cap .250-28 x 1.750	1	04026-126	Screw-soc cap 10-32 x 2.00	2
04026-113	Shim	1	04026-127	Seal - No. 10 nitrile thread	2

Reference Numbers 100 Thru 127 Are On This Page

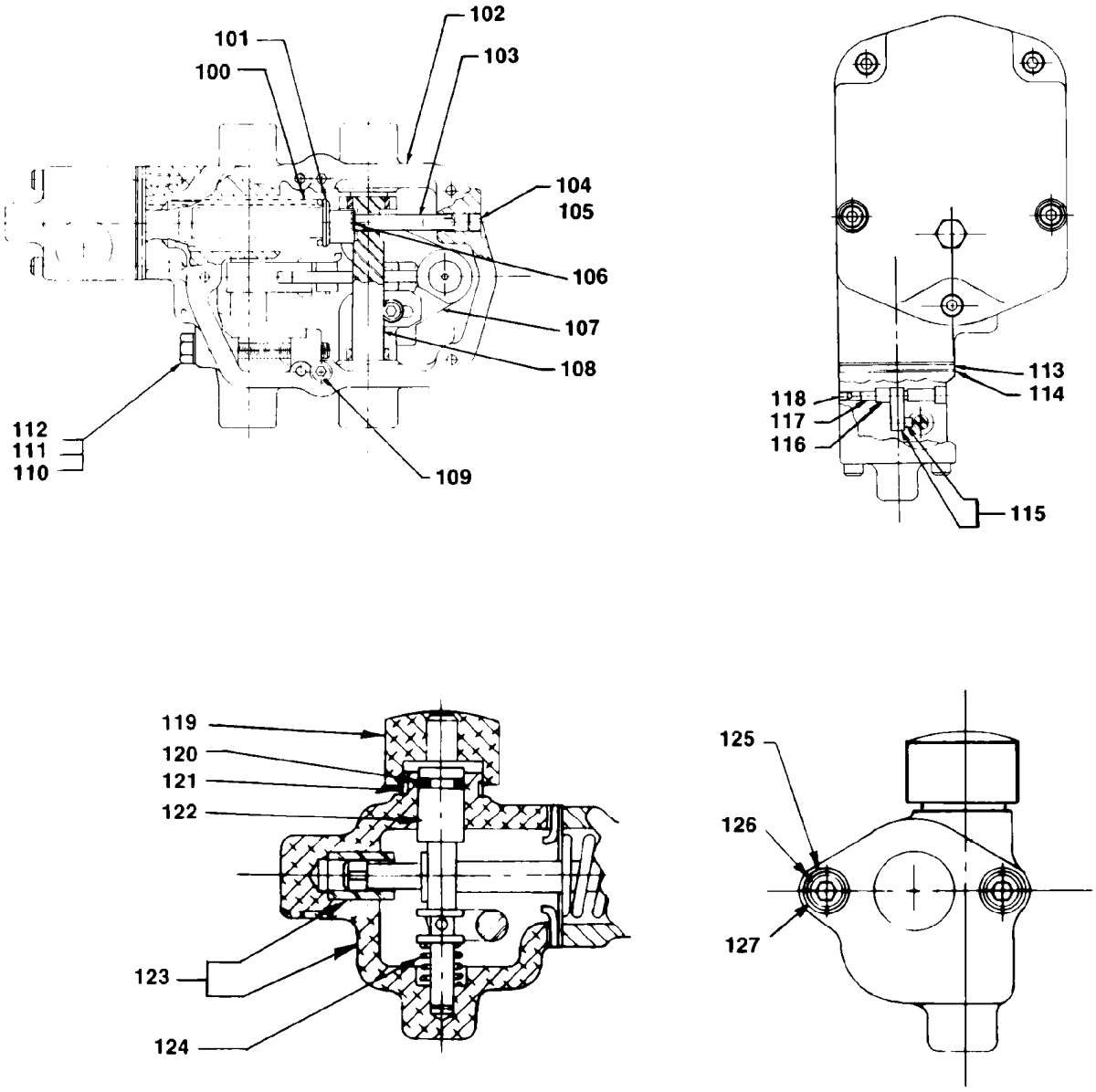

Figure 1-7. Parts Illustration for Manual Reset Device
(option available on the SG overspeed sensing device)

Chapter 2.
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 04026C.

B04026:C

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Email and Website—www.woodward.com

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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.

2012/8/Colorado