WOODWARD

Installation Instructions

APECS® 0250 Kit
Isuzu 4BG1-TRV Engine

Installation Instructions

Right-Hand Version

Manual 36561

WARNING

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.

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.

CAUTION

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.

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.**

IMPORTANT DEFINITIONS

WARNING—indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION—indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment.

NOTE—provides other helpful information that does not fall under the warning or caution categories.

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

Contents

Electrostatic Discharge Awareness

All electronic equipment is static-sensitive, some components more than others. To protect these components from static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the control.

1. Before doing maintenance on the electronic control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).

2. 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.

3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.

4. 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.

CAUTION

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*.

Chapter 1.
General Information

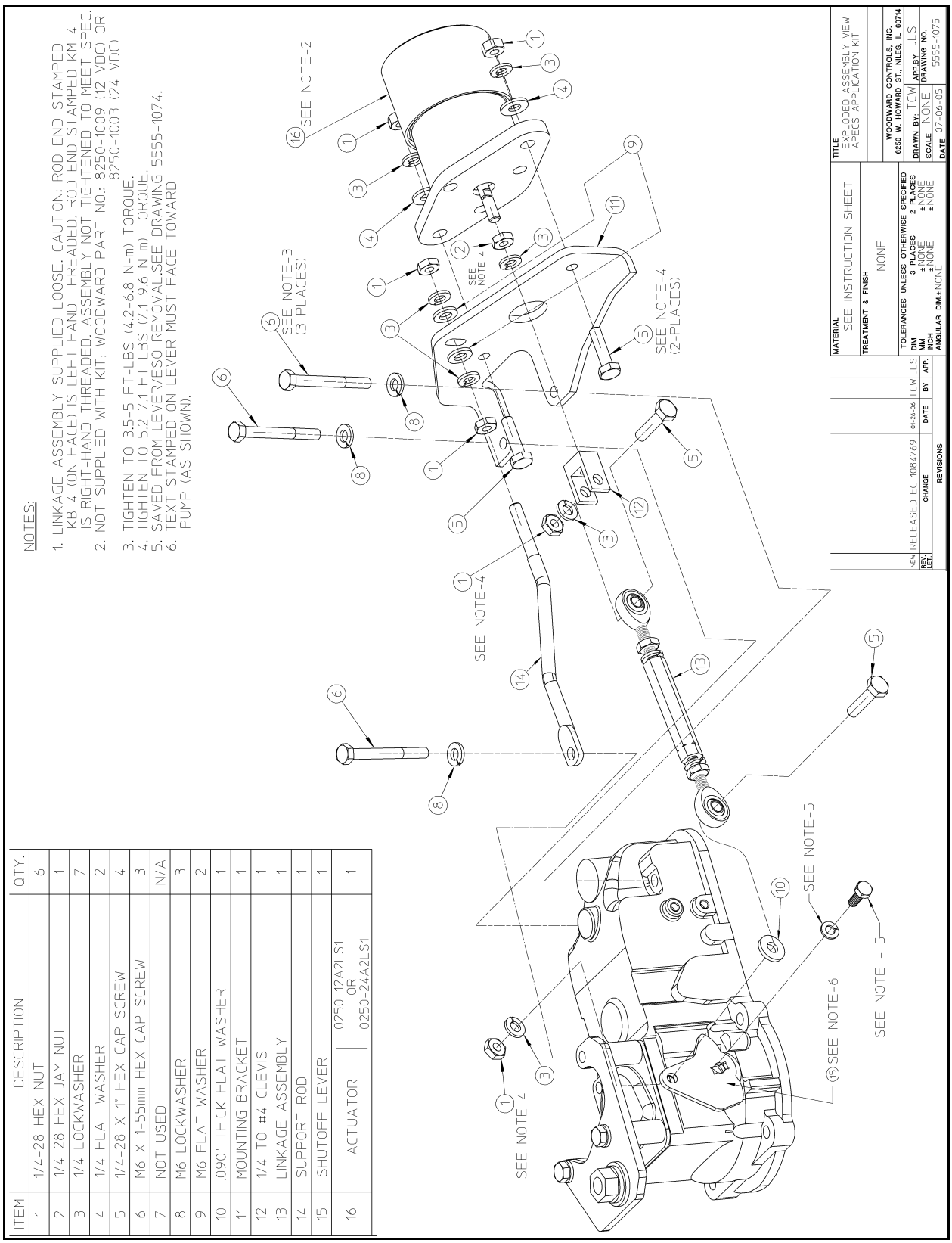
Introduction

The APECS® 0250 kit is specifically designed for Isuzu 4BG1-TRV engines (Woodward P/N 8923-1172). Kit contents are listed in the table below; refer to the exploded view in **Figure 1** for parts identification.

Woodward's linear proportional actuator (Item 16) is not supplied with the kit, but is shown for reference on the exploded view diagram.

ITEM	DESCRIPTION	QTY.
1	1/4-28 Hex Nut	6
2	1/4-28 Hex Jam Nut	1
3	1/4 Lock washer	7
4	1/4 Flat washer	2
5	1/4-28 x 1" Hex Cap Screw	4
6	M6 x 1-55 Hex Cap Screw	3
7	Not Used	–
8	M6 Lock washer	3
9	M6 Flat Washer	2
10	0.090" Thick Flat Washer	1
11	Mounting Bracket	1
12	1/4 to #4 Clevis	1
13	Linkage Assembly	1
14	Support Rod	1
15	Shutoff Lever	1
16*	0250-12A2LS1 Actuator (12 Vdc) Woodward P/N 8250-1009	1
	0250-24A2LS1 Actuator (24 Vdc) Woodward P/N 8250-1003	

(*) Not included with kit



ITEM	DESCRIPTION	QTY.
1	1/4-28 HEX NUT	6
2	1/4-28 HEX JAM NUT	1
3	1/4 LOCKWASHER	7
4	1/4 FLAT WASHER	2
5	1/4-28 X 1" HEX CAP SCREW	4
6	M6 X 1-55mm HEX CAP SCREW	3
7	NOT USED	N/A
8	M6 LOCKWASHER	3
9	M6 FLAT WASHER	2
10	.090" THICK FLAT WASHER	1
11	MOUNTING BRACKET	1
12	1/4 TO #4 CLEVIS	1
13	LINKAGE ASSEMBLY	1
14	SUPPORT ROD	1
15	SHUTOFF LEVER	1
16	ACTUATOR 0250-12A2LS1 OR 0250-24A2LS1	1

Figure 1. Exploded View

Chapter 2. Installation

Safety Guidelines

Before removing old parts or installing new ones, ensure that the engine is turned off and the battery is disconnected. Always use proper tools for the installation.

WARNING
An overspeed shutdown device, independent of the APECS system, should be provided to prevent loss of engine control that may cause personal injury or equipment damage.

Step 1: Remove Old Parts

4BG1-TRV engines may be equipped with an electric shutoff solenoid (ESO). If there is an ESO installed, it will need to be removed and discarded.

Refer to **Figure 2**. The shutoff lever (B) and shutoff lever spring (D) will need to be removed. (The shutoff lever spring may have already been removed if the engine was equipped with an ESO.)

NOTE: Do not discard the empty spring cover (C), washers (G), and the shutoff lever bolt (A). These will be reinstalled in the next procedure.

Remove pump bolts (E and F) and discard.

Step 2: Install Shutoff Lever and Spring Cover

Refer to **Figure 1**, which shows all hardware to be installed and torque specifications.

Reinstall the empty spring cover (C), washers (G), and new lever (15) with the part number [SE-5149] facing out, using the original bolt and lock washer. Tighten to torque specification.

CAUTION
Make sure the lever is square and parallel at the pivot points on the pump. If lever is binding, remove and straighten. The lever must be non-binding to ensure proper start and shut off.

Step 3: Install Actuator Bracket

Refer to **Figure 1**, which shows all hardware to be installed and torque specifications.

Attach mounting bracket (11) to pump with cap screws (6) and lock washers (8). Tighten to torque specification.

Step 4: Install Support Rod

Refer to **Figure 1**, which shows all hardware to be installed and torque specifications.

Place a hex nut (1), lock washer (3), and a flat washer (9) on the threaded end of the support rod (14). Insert the rod through the proper hole in the mounting bracket (11).

Next, attach the other end of the support rod to the proper lower hole on the pump with a hex cap screw (6) and a lock washer (8). Tighten to torque specification.

Refer to **Figure 3.** Bring hex nut on threaded end of support rod in contact with the bracket. Use another hex nut (1) lock washer (3) and flat washer (9) to secure the rod to the bracket. Tighten to torque specification shown in **Figure 3**.

Step 5: Install Acutator

Refer to **Figure 1**, which shows all hardware to be installed and torque specifications.

Install the hex jam nut (2) on the actuator shaft. Install actuator (16) by positioning the two flange holes over the proper holes in the bracket (11) and securing the actuator with hex cap screws (5), flat washers (4), lock washers (3), and hex nut (1). Tighten to torque specification.

Step 6: Install Linkage Assembly

NOTE
The linkage assembly is supplied loose (not tightened to torque specifications). Rod-end stamped KB-4 (on face) is left-hand threaded. Rod-end stamped KM-4 is right-hand threaded. The groove on the turnbuckle identifies the left-hand threaded side.

Refer to **Figure 1**, which shows all hardware to be installed and torque specifications.

Install lock washer (3) against jam nut. Thread the clevis (12) on the actuator shaft against the preinstalled hex jam nut and lock washer on the actuator. Tighten to torque specification.

Insert one rod-end (ball joint) in the clevis and slide the hex cap screw (5) through the clevis and the rod-end. Retain in place with lock washer (3) and hex nut (1). Tighten to torque specification.

Secure the other rod-end (ball joint) to the shutoff lever (15) by sliding hex cap screw (5) through the rod-end, then flat washer (10) between the lever and rod-end. Secure with a lock washer (3) and hex nut (1).

Step 7: Final Inspection

Refer to **Figure 1**, which shows all hardware to be installed and **Figure 3** for torque specifications.

1. Check tightness on all nuts and bolts in the installation, except for the actuator linkage.
2. Hand tighten actuator linkage (turnbuckle)
3. Loosen low RPM lock nut on throttle arm, and adjust low RPM screw to move the throttle arm to the full RPM stop. Tighten lock nut.

4. Verify that linkage moves up and down freely with no binding. Also, check if the linkage is too close or possibly hitting the throttle arm adjustment lock nut. If there are any concerns of binding or clearance, loosen the actuator mounting bolts (5) and reposition the actuator for better alignment and linkage clearance.

CAUTION
Any binding in linkage may prevent the engine from shutting down or returning to a lower engine speed.

5. Wire the actuator to the system according to the governor controller manual. User manuals may be found on the Publication page of the Woodward website at www.woodward.com.
6. Reconnect battery. Start and stop the engine to ensure proper operation. Adjustment of the actuator linkage (13) may be needed so that the engine will shut down and reach full rated engine RPM under all conditions. After all adjustments are made, tighten linkage to torque specifications. Refer to **Figure 3**.

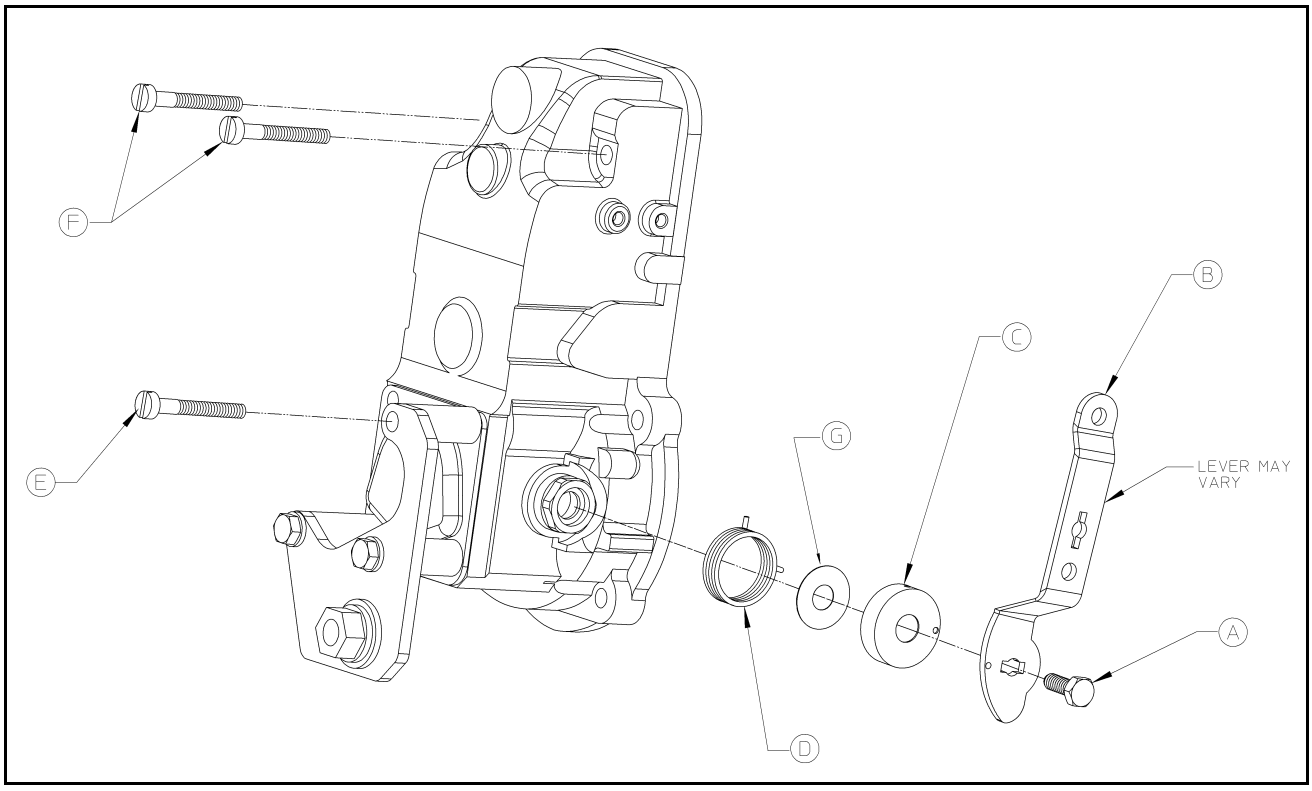


Figure 2. Fuel Pump

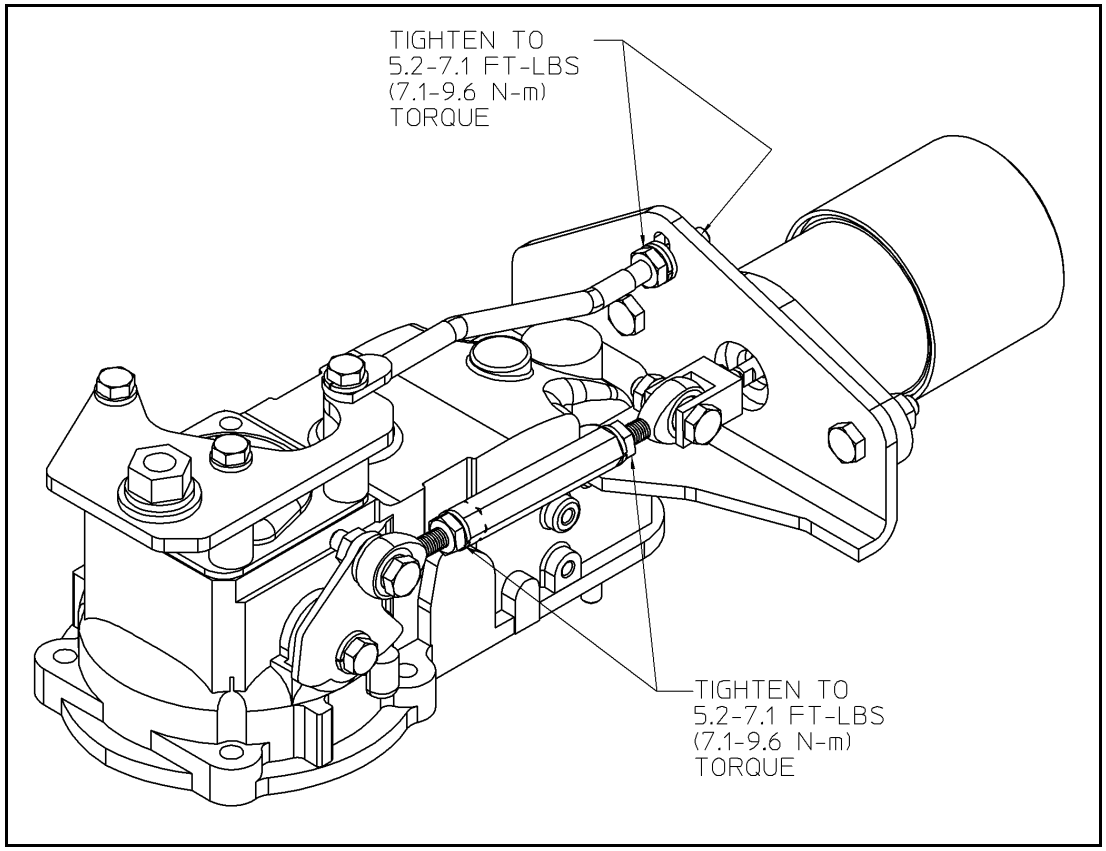


Figure 3. Final Assembly & Linkage Assembly Torque Specifications

Chapter 3.
Service Options

Product Service Options

The following factory options are available for servicing Woodward equipment, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is purchased from Woodward or the service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

If you are experiencing problems with installation or unsatisfactory performance of an installed system, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact Woodward technical assistance (see "How to Contact Woodward" later in this chapter) and discuss your problem. In most cases, your problem can be resolved over the phone. If not, you can select which course of action you wish to pursue based on the available services listed in this section.

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 is also a flat rate structured program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call 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 Woodward facility as explained below (see "Returning Equipment for Repair" later in this chapter).

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned to Woodward within 60 days, Woodward will issue a credit for the core charge. [The core charge is the average difference between the flat rate replacement/exchange charge and the current list price of a new unit.]

Return Shipment Authorization Label. To ensure prompt receipt of the core, and avoid additional charges, the package must be properly marked. A return authorization label is included with every Replacement/Exchange unit that leaves Woodward. The core should be repackaged and the return authorization label affixed to the outside of the package. Without the authorization label, receipt of the returned core could be delayed and cause additional charges to be applied.

Flat Rate Repair

Flat Rate Repair is available for the majority of standard 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. All repair work carries the standard Woodward service warranty (Woodward Product and Service Warranty
5-01-1205) on replaced parts and labor.

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 and carry with it the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205). 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 to Woodward for repair, please contact Woodward in advance to obtain a Return Authorization Number. When shipping the item(s), attach a tag with the following information:

- 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.

CAUTION

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*.

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.

Return Authorization Number

When returning equipment to Woodward, please telephone and ask for the Customer Service Department [1 (800) 523-2831 in North America or +1 (970) 482-5811]. They will help expedite the processing of your order through our distributors or local service facility. To expedite the repair process, contact Woodward in advance to obtain a Return Authorization Number, and arrange for issue of a purchase order for the item(s) to be repaired. No work can be started until a purchase order is received.

NOTE

We highly recommend that you make arrangement in advance for return shipments. Contact a Woodward customer service representative at 1 (800) 523-2831 in North America or +1 (970) 482-5811 for instructions and for a Return Authorization Number.

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.

How to Contact Woodward

In North America use the following address when shipping or corresponding:

Woodward Governor Company
PO Box 1519
1000 East Drake Rd
Fort Collins CO 80522-1519, USA

Telephone—+1 (970) 482-5811 (24 hours a day)
Toll-free Phone (in North America)—1 (800) 523-2831
Fax—+1 (970) 498-3058

For assistance outside North America, call one of the following international Woodward facilities to obtain the address and phone number of the facility nearest your location where you will be able to get information and service.

Facility	Phone Number
Brazil	+55 (19) 3708 4800
India	+91 (129) 230 7111
Japan	+81 (476) 93-4661
The Netherlands	+31 (23) 5661111

You can also contact the Woodward Customer Service Department or consult our worldwide directory on Woodward's website (**www.woodward.com**) for the name of your nearest Woodward distributor or service facility.

Engineering Services

Woodward Industrial Controls Engineering Services offers the following after-sales support for Woodward products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Contact information:

Telephone—+1 (970) 482-5811
Toll-free Phone (in North America)—1 (800) 523-2831
Email—icinfo@woodward.com
Website—**www.woodward.com**

Technical Support is available through our many worldwide locations or our authorized distributors, depending upon the product. This service can assist you with technical questions or problem solving during normal business hours. Emergency assistance is also available during non-business hours by phoning our toll-free number and stating the urgency of your problem. For technical support, please contact us via telephone, email us, or use our website and reference ***Customer Services*** and then ***Technical Support***.

Product Training is available at many of our worldwide locations (standard classes). We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability. For information concerning training, please contact us via telephone, email us, or use our website and reference ***Customer Services*** and then ***Product Training***.

Field Service engineering on-site support is available, depending on the product and location, from one of our many worldwide locations or from one of our authorized 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 field service engineering assistance, please contact us via telephone, email us, or use our website and reference ***Customer Services*** and then ***Technical Support***.

Technical Assistance

If you need to telephone for technical assistance, you will need to provide the following information. Please write it down here before phoning:

General

Your Name_____
Site Location_____
Phone Number_____
Fax Number_____

Prime Mover Information

Engine/Turbine Model Number_____
Manufacturer_____
Number of Cylinders (if applicable)_____
Type of Fuel (gas, gaseous, steam, etc)_____
Rating_____
Application_____

Control/Governor Information

Please list all Woodward governors, actuators, and electronic controls in your system:

Woodward Part Number and Revision Letter _____
Control Description or Governor Type _____
Serial Number _____

Woodward Part Number and Revision Letter _____
Control Description or Governor Type _____
Serial Number _____

Woodward Part Number and Revision Letter _____
Control Description or Governor Type _____
Serial Number _____

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 include the manual number from the front cover of this publication.

WOODWARD

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Email and Website—www.woodward.com

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

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

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