WOODWARD

Product Manual 26784
(Revision D, 07/2022)
Original Instructions

SECM70 Digital Control

Installation 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 *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

http://www.woodward.com

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 *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, 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 Out-of-date translations are marked with ⚠.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.

Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

Manual 26784

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Important Definitions

This is the safety alert symbol 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

Lockout/Tagout LOTO

Ensure that personnel are fully trained on LOTO procedures prior to attempting to replace or service equipment on a "live" running engine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start or operation of a running engine. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot hydraulic fluids, exposure to hot surfaces and/or moving parts, or any moving parts that may be activated and are located in the area of control of the unit.

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.

WARNING

IOLOCK

IOLOCK: driving I/O into a known state condition. When a control fails to have all the conditions for normal operation, watchdog logic drives it into an IOLOCK condition where all output circuits and signals will default to their de-energized state as described below. *The system MUST be applied such that IOLOCK and power OFF states will result in a SAFE condition of the controlled device.*

- **Microprocessor failures will send the module into an IOLOCK state.**
- **Discrete outputs / relay drivers will be non-active and de-energized.**
- **Analog and actuator outputs will be non-active and de-energized with zero voltage or zero current.**

Network connections like CAN stay active during IOLOCK. This is up to the application to drive actuators controlled over network into a safe state.

The IOLOCK state is asserted under various conditions, including:

- **Watchdog detected failures**
- **Microprocessor failure**
- **PowerUp and PowerDown conditions**
- **System reset and hardware/software initialization**
- **PC tool initiated**

NOTE—Additional watchdog details and any exceptions to these failure states are specified in the related section of the product manual.

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. Touch your finger to a grounded surface to discharge any potential before touching the control, smart valve, or valve driver, or installing cabling connectors. Alternatively, ESD mitigation may be used as well: ESD smocks, ankle or wrist straps and discharging to a reference grounds surface like chassis or earth are examples of ESD mitigation.
    - ESD build up can be substantial in some environments: the unit has been designed for immunity deemed to be satisfactory for most environments. ESD levels are extremely variable and, in some situations, may exceed the level of robustness designed into the control. Follow all ESD precautions when handling the unit or any electronics.
        - I/O pins within connectors have had ESD testing to a significant level of immunity to ESD, however do not touch these pins if it can be avoided.
            - Discharge yourself after picking up the cable harness before installing it as a precaution.
        - The unit is capable of not being damaged or improper operation when installed to a level of ESD immunity for most installation as described in the EMC specifications. Mitigation is needed beyond these specification levels.

IMPORTANT

External wiring connections for reverse-acting controls are identical to those for direct-acting controls.

Chapter 1. Introduction

The SECM70 is a full authority engine control module capable of withstanding the environment within the engine compartment and either on or off engine mounting. The 4 mounting feet on the controller are designed to accept specific rubber grommets and aluminum bushings to provide both vibration isolation as well as electrical isolation of the module case from chassis ground. This mounting hardware can be purchased separately or ordered pre-installed on the part numbers listed above.

The purpose of this manual is to detail the installation requirements of the 70-pin Small Engine Control Module (SECM70).

Part numbers for both production and development SECM70 units are shown in Table 1-1.

Table 1-1. SECM70 Part Numbers

Model No.	Part No.	Kit No.
MY15 PRODUCTION UNITS		
MI-1562	1751-6719	8923-2253
MI-1563	1751-6720	8923-2254
MI-1565	1751-6722	8923-2256
MI-1566	1751-6723	8923-2257
MI-1569	1751-6756	8923-2475
MY15 DEVELOPMENT UNITS		
MI-1512	1751-6713	8923-2258
MI-1513	1751-6714	8923-2259
MI-1515	1751-6716	8923-2261
MI-1516	1751-6717	8923-2262
MI-1609	1751-6755	8923-2474
MY17 PRODUCTION UNITS		
MI-1752	1751-6767	8923-2583
MI-1753	1751-6768	8923-2587
MI-1754	1751-6769	8923-2581
MI-1755	1751-6770	8923-2585
MI-1756	1751-6771	8923-2579
MI-1759	1751-6784	8923-2577
MY17 DEVELOPMENT UNITS		
MI-1702	1751-6772	8923-2584
MI-1703	1751-6773	8923-2588
MI-1704	1751-6774	8923-2582
MI-1705	1751-6776	8923-2586
MI-1706	1751-6777	8923-2580
MI-1709	1751-6785	8923-2578

Chapter 2.
Environmental Requirements

Vibration and Shock

The SECM70 is designed for engine mount operation with the vibration isolators. If the SECM70 is mounted on a bracket not provided by Woodward, the bracket needs to be evaluated in the application. It is possible for a bracket resonance to be incompatible with the SECM70 product, causing premature failure of the module.

The vibration integrity of the SECM70 for a given installation can be verified by measuring the vibration spectrum of an installed unit when the engine / vehicle is operated under worse case vibration conditions. The vibration spectrum needs to be measured with an accelerometer on the SECM70 mounting foot as shown in Figure 2-1. If the measured spectrum is within the RV3 de-rated spectrum illustrated in red in Figure 2-2, the mounting location is acceptable for vibration.

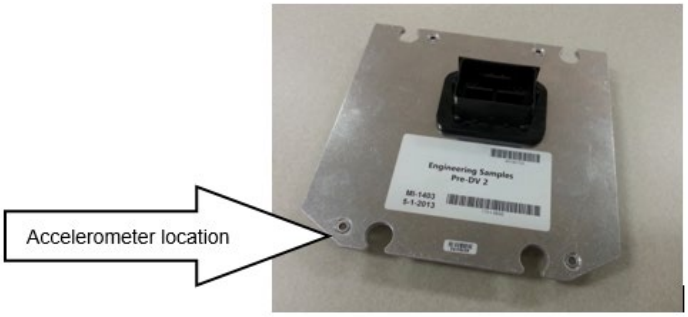

Figure 2-1. Location of Accelerometer to Measure Mounting Vibration

The harness must be firmly secured at a tie-down length not to exceed 150 mm from the center of the connectors.

Random Vibration

The SECM70 shall survive Woodward's RV3 random vibration specification (22.1 Grms / 3 hours per axis) per Woodward procedure 3-04-6231. The RV3 random vibration profile is illustrated in Figure 2-2 (blue line). A de-rated installation RV3 vibration for a 7-year life is shown in red.

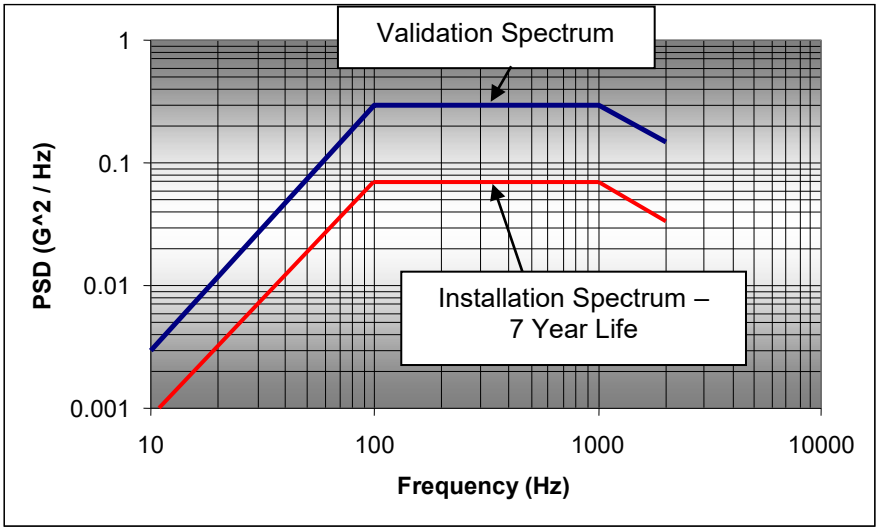

Figure 2-2. Random Vibration Spectrum

Temperature

The SECM70 is designed to be thermally isolated from the mounting surface and relies on air convection for cooling based on a minimum air flow at the worst case operation mode. The following ratings apply to the SECM70 when installed properly:

Ambient Operating Temperature:	–40 to +105 °C
Minimum Operating Airflow:	2 m/s
Heat Soak / Storage Temperature Range:	–40 to +125 °C

Customers can verify the temperature in the desired mounting location by placing a thermocouple in the air near the operating SECM70. If the external ambient conditions are not worse case, this needs to be taken into consideration when measuring the SECM70 package temperature. If the measured air temperature when operating at worse case (fastest) engine speed and worse case (hottest) ambient conditions is less than 105 °C, the mounting location thermal stress is acceptable for the SECM70.

Thermal Survey

The SECM70 thermal performance shall be evaluated with a thermal survey that measures the case temperatures of critical power components under various operating conditions. The thermal survey is used to ensure that under worse case thermal and operating conditions electrical component ratings are not exceeded.

Chapter 3.
Packaging

Isolators

The SECM70 has 4 mounting feet. Figure 3-1 illustrates the isolator components and shows the isolator pre-assembled on the module.

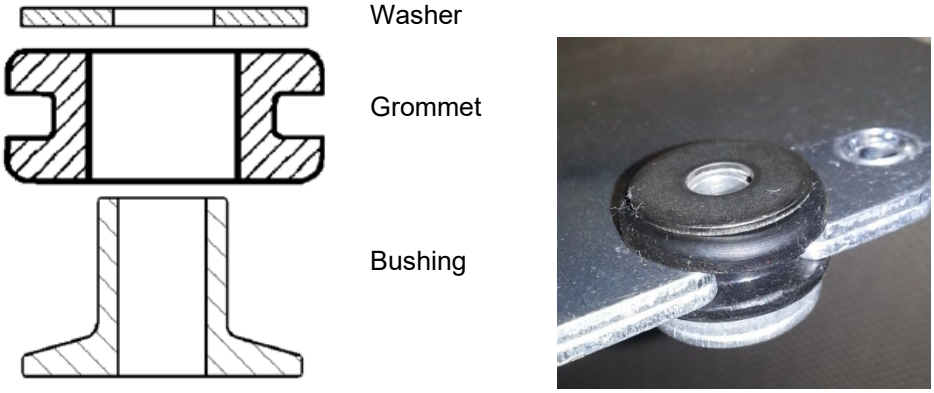

Figure 3-1: SECM70 Isolators

The isolators must be inspected for wear at least once per year. For on-engine mounting, Woodward recommends replacing the vibration isolators once a year or sooner if wear is observed. Below are the Woodward part numbers for these components.

Table 3-1. Vibration Isolator Part Numbers

Component	Woodward PN
Washer	1010-5056
Grommet	1015-1004
Bushing	1404-1031

When installing the module into customer locations, Woodward recommends using an M6, ANSI B18.2.3.1M-1979 (R1995), ANSI B18.2.3.5M-1989, or DIN 931/DIN 933 metric hex screw with a 6 mm ANSI B18.22M-1981 (R1990) narrow metric plain washer that has a maximum outer diameter of 18.80 mm. Recommended torque for M6 hex screw: 57-67 in-lbs (6.5-7.6Nm).

Outline Drawings

Figures 3-2 illustrates the package outline. Measurements shown are in millimeters.

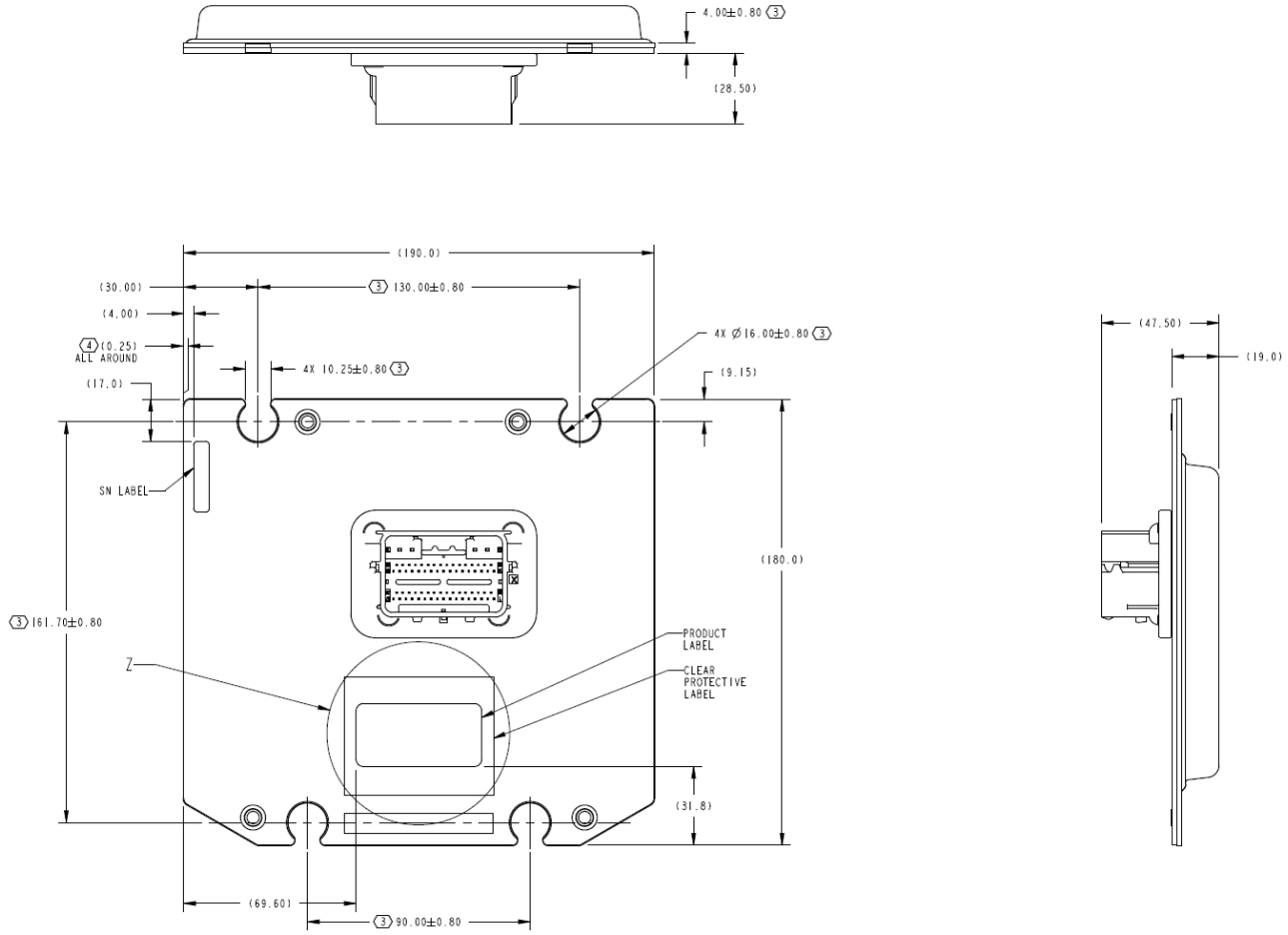

Figure 3-2: SECM70 Outline Drawing

Orientation

The SECM70 has been validated for high pressure spray and steam cleaning, however it is not recommended to mount with the connector facing up or with the harness routed upward directly from the module (Figure 3-5). This orientation can allow moisture to run down the harness to the wire seals in the connectors.

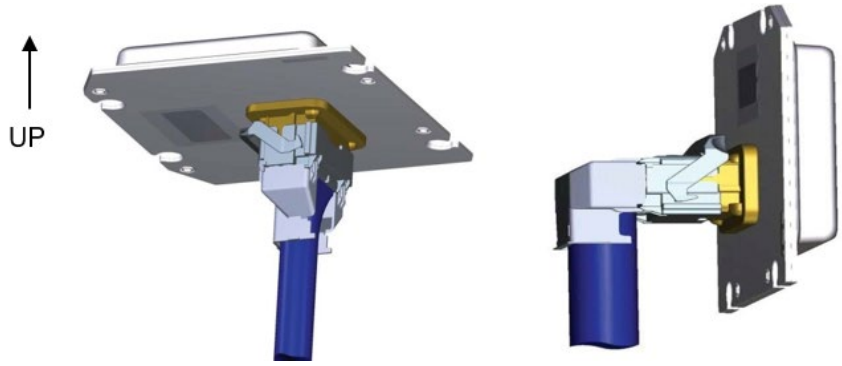

Figure 3-3. Preferred Mounting Orientation

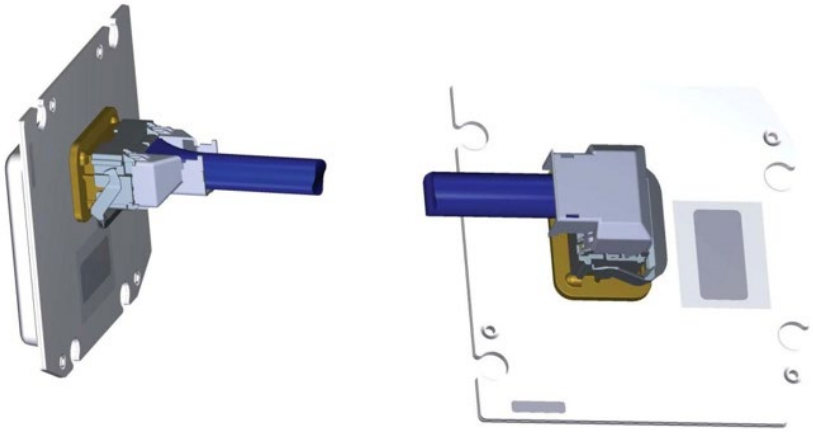

Figure 3-4. Acceptable Mounting Orientation

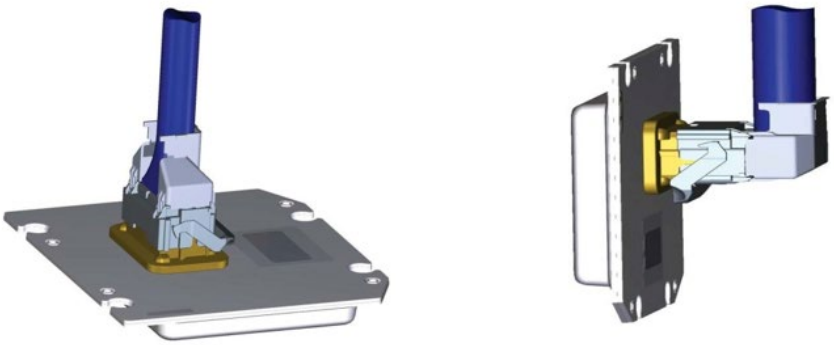

Figure 3-5. Mounting Orientation Not Recommended

Connector Information

The SECM70 mating connectors, terminals, wire caps (back shells) and wire plug part numbers are listed in Table 3-2 below. All unused pins must be plugged with the proper wire plugs to maintain environmental integrity.

Table 3-2. Connector System Part Numbers

Item	Manufacturer PN	Woodward PN
70-pin harness connector	TE 1438136-1	1635-1772
Connector kit		8923-1761
Terminals (Gold Plated)		
0.64 mm for 18-20 AWG (1.70 - 2.06 mm insulation)	TE 1393365-1	1602-1108
1.5mm (18-20 AWG) (1.70 – 2.06 mm insulation)	Molex 33001-2004	1602-1109
1.5mm (14-16 AWG) (2.18 – 2.69 mm insulation)	Molex 33001-2003	1602-1110
Wire Caps (Back Shells)		
90° (top) exit	TE 1438133-1	1633-1007
180° exit	TE 1488374-1	1633-1012
90° (side) exit	Mercury 8M0031406	1633-1013
Wire Plugs		
0.64 mm	Molex 34676-001	1607-1010
1.5 mm	Not available	-
Hand Crimper Tools		
0.64 mm (18-20 AWG)	TE 6-1393462-5	8996-2162
1.5 mm (18-20 AWG)	Molex 63811-6000	8996-2164
1.5 mm (14-16 AWG)	Molex 63811-5900	8996-2163
Applicator Crimpers		
0.64 mm (18-20 AWG)	Contact Tyco	-
1.5 mm (20 AWG)	Molex 63868-2200	-
1.5 mm (18 AWG)	Molex 63868-2100	-
1.5 mm (14-16 AWG)	Molex 63868-2000	-
Extraction Tools		
0.64 mm terminals	TE 3-1579007-6	8996-2167
1.5 mm terminals	Molex 63813-1500	-

Chapter 4
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 at **www.woodward.com/directory**, which also contains the most current product support and contact information.

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 (124) 4399500
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 (124) 4399500
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 (124) 4399500
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

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.

Revision History

Changes in Revision D—

- Added Lockout/Tagout and IOLock warnings (pages 3 and 4)
- Revised Electrostatic Discharge Awareness section (page 5)
- Corrected mounting hardware (Chapter 3):
  - Changed screw size from M8 to M6 and washer size from 8 mm to 6 mm
  - Added recommended torque for M6 hex screw: 57-67 in-lbs (6.5-7.6Nm)

Changes in Revision C—

- Updated part number chart in Chapter 1
- Updated Orientation section in Chapter 3
- Added Chapter 4 – Product Support and Service Options

Changes in Revision B—

- Replaced part number chart in Chapter 1
- Updated Table 1-1

Changes in Revision A—

- Updated Table 1-1

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 26784.

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Email and Website—www.woodward.com

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