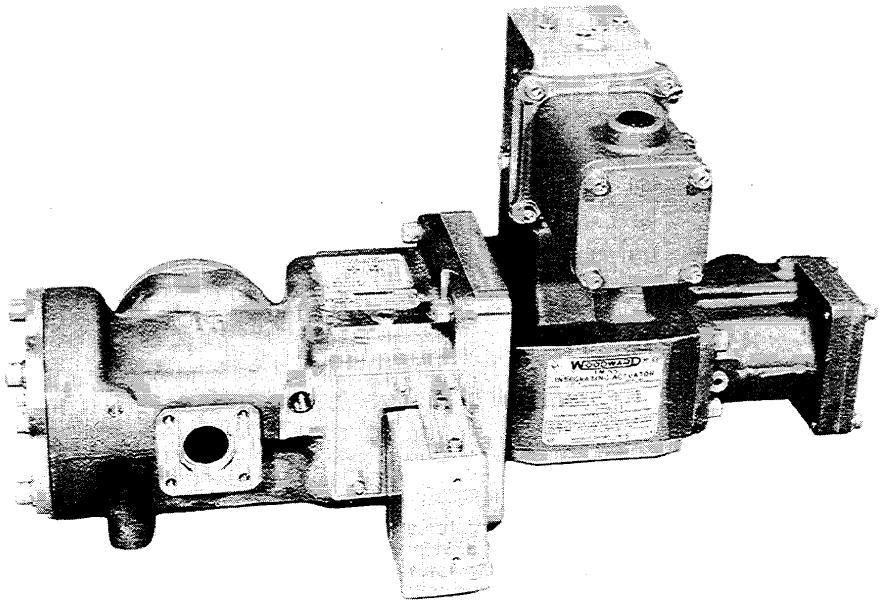
WOODWARD

Product Manual 40115
(Revision NEW)
Original Instructions



3171 Gas Valve with TM-55 Integrating Actuator

Installation and Operation Manual

General Precautions

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

Practice all plant and safety instructions and precautions.

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

Revisions

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

www.woodward.com/publications

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

Proper Use

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

Translated Publications

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

The original source of this publication may have been updated since this translation was made. Be sure to check manual *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.

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Warnings and Notices

Important Definitions

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER**—Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- **WARNING**—Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION**—Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE**—Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT**—Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

⚠WARNING

Automotive Applications

On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

NOTICE

Battery Charging Device

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Chapter 1.
General Information

Description

This manual describes a complete 3171 Gas Valve/TM-55 Integrating Actuator assembly.

The 3171 gas valve is installed in combination with a Woodward TM-55 integrated actuator. The actuator receives position commands from an electric control and changes them into mechanical energy to position the gas valve.

The 3171 gas valve is a stainless steel valve capable of metering 0 to 5000 lb/h (0 to 2268 kg/h) of almost any gaseous fuel. The valve is a rotary sleeve and shoe type throttling valve. Metering port area is determined by input shaft positioning from the actuator. The valve is spring loaded in the minimum fuel direction.

Valve design incorporates an inlet guide tube directing gas contaminants through the metering port to minimize accumulation of contaminants in the valve housing. Metering sleeve support bearings are positively sealed from the gas. Internal parts are through-hardened stainless steel.

TM-55 Actuator

The TM-55 actuator is an electrohydraulic integrating actuator for industrial gas turbine control applications. It is designed for use with Woodward 43027 electronic controls or for other electronic controls. The TM-55 has an aluminum case with through-hardened stainless steel internal parts. It weights 14.5 lb (6.6 kg).

In the actuator, a torque motor servovalve is energized by the electronic control to generate a pressure differential applied to the ends of. and to operate, the second stage spool valve. Supply pressure is regulated by the spool valve to move a double acting servo piston and provide terminal shaft output. An electrical position feedback transducer provides the 43027 electronic control with exact feedback information on movement of the gas valve.

The actuator is factory adjusted for bias in the minimum fuel direction in the event of a loss of input current.

Hydraulic fluid is sealed from the torque motor by a preformed packing ring between the armature and the servovalve housing, eliminating the accumulation of magnetic contaminants. The hydraulic inlet fitting incorporates a 40 µm filter screen for additional protection from contaminants in the event of an upstream filter failure.

UL Approved

The TM-55 actuator is UL approved and is designed for safe operation In hazardous environments.

Fuel Acceptance

The stainless steel metering sleeve and shoe are tungsten carbide coated to assure long life and extreme resistance to damage from particulates or other contaminants. Fuel gases and mixtures containing the following components are all acceptable to the 3171 fuel valve: methane, ethane, propane, butanes, pentanes, hexanes, hydrogen, carbon monoxide, carbon dioxide, nitrogen, water vapor, and hydrogen sulfide.

References

Product Spec. 82767, *TM-55 Integrating Actuator*
Manual 82768, *TM-55 Integrating Actuator*

For sales, service, and additional product information for the 3171 Gas Valve/TM-55 Integrating Actuator, visit the Woodward website (**www.woodward.com**).

Chapter 2. Installation

Introduction

Refer to the outline drawing, Figure 2-1.

WARNING

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Use care while handling and installing the valve/actuator. Abuse can damage seals, installation surfaces, and factory adjustments. Hydraulic and gas connections must be protected by plastic shipping caps or covers whenever the valve/actuator is not connected to the normal service connections. The hydraulic oil inlet fitting in the TM-55 actuator contains a 40 µm (nominal) protective screen, and this should not be removed during operation.

Receiving

The 3171 Gas Valve/TM-55 Actuator is assembled, calibrated, and drained of calibration fluid and gas at the factory. The assembly is then bolted to a transportation skid and packed in a protective box for delivery to the customer. Additional cleaning or calibration is not necessary prior to installation or operation of the unit.

Storage

The valve/actuator may be stored as received from the factory for a period of time before installation.

Installation

See the outline drawing, Figure 2-1, for:

- overall dimensions
- Installation hole locations
- hydraulic fitting sizes
- adjustment locations
- electrical connections

Installation attitude does not affect actuator performance, but a vertical position is recommended for ease in making electrical, fuel line, and hydraulic connections.

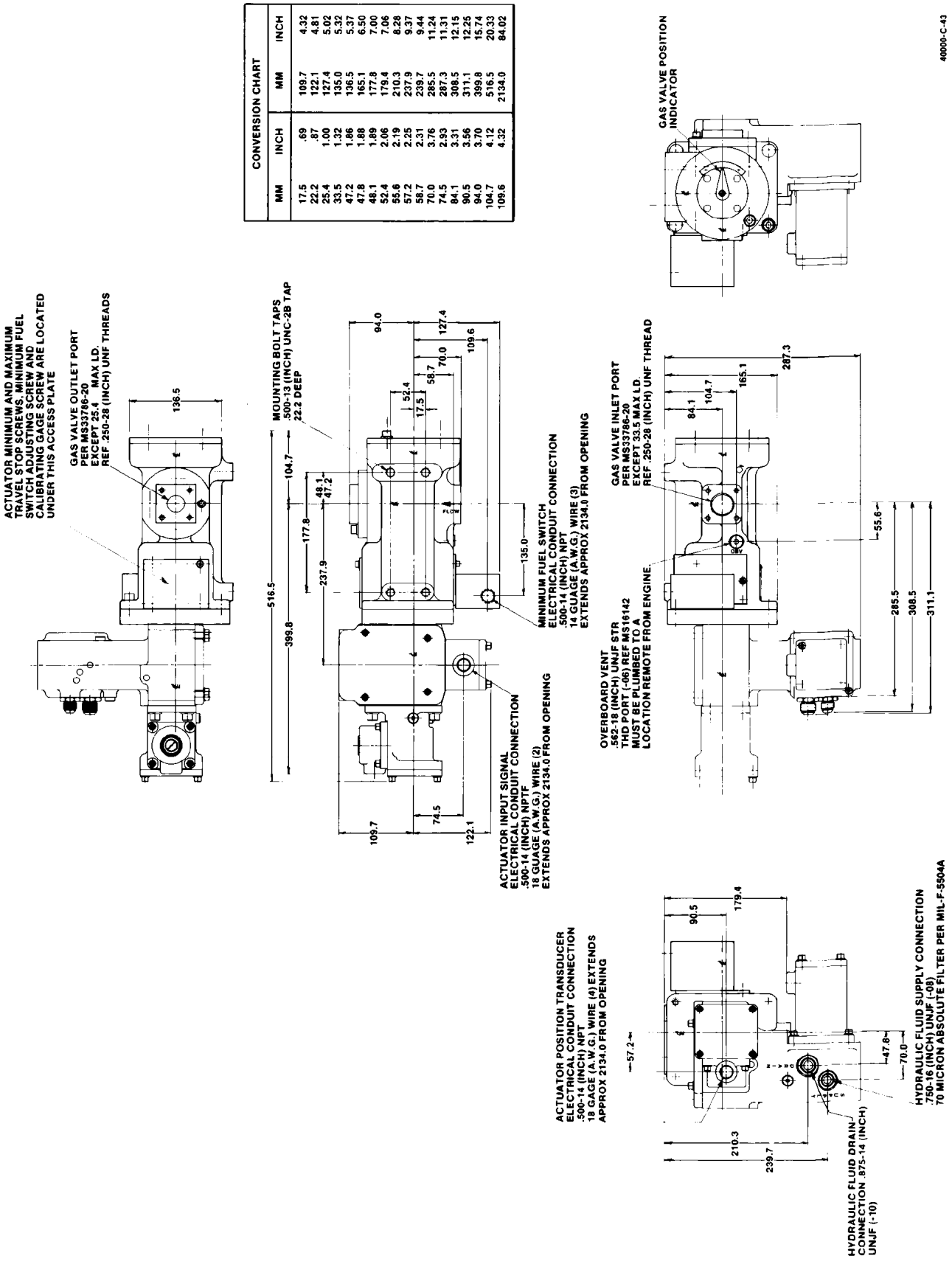

Figure 2-1. Outline Drawing of 3171 Gas Valve/TM-55 Integrating Actuator

Hydraulic Fluid

Make provisions for proper filtration of the hydraulic fluid that will supply the TM-55 actuator. A 10 µm (nominal) metal element filter must be installed in the supply line to the actuator. The absolute rating of the filter should not exceed 30 µm. Care must be taken to keep the immediate area clean and free of dirt and other contaminants.

Make all hydraulic connections that are needed. Supply pressure for the TM-55 actuator can be from either positive displacement or centrifugal type pumps. Woodward recommends the use of a pressure switch to ensure that correct supply pressure is established prior to start-up and continually thereafter.

Make all electrical connections that are required using applicable Woodward electronic control manuals. A plant wiring diagram will be supplied upon request. In applications where the TM-55 actuator is not used with a Woodward electronic control, electrical input requirements will also be supplied upon request.

3171 Metered Gas Supply

Table 2-1. 3171 Gas Supply Characteristics

Metered Fuel Types:	Natural gas, methane, ethane, propane, butanes, pentanes, hexanes, hydrogen, carbon monoxide, carbon dioxide, nitrogen, water vapor, hydrogen sulfide
Specific Gravity:	0.5 to 1.5
Temperature:	–40 to +200 °F (–40 to +93 °C)
Contaminants:	Solid particles (rust and sand)—less than 10 µm diameter, 30 ppm by volume max. Greater than 10 µm diameter, 0.3 ppm by volume max. or 0.7 grams/1000 ft³ of which 99% shall be smaller than 10 µm in diameter Maximum particle size shall not exceed 70 µm diameter

Table 2-2. 3171 Gas Flow Requirements

Inlet Pressure	500 psig (3448 kPa) maximum
Pressure Differential:	20 to 500 psig (138 to 3448 kPa)
Gas Flow Range:	50 to 5000 lb/h (23 to 2268 kg/h) (0.6 SG, 70 °F/21 °C max.)

TM-55 Hydraulic Fluid Requirements

Table 2-3. TM-55 Supply Characteristics

Fluid Types:	Mineral or synthetic based oil, diesel fuels, kerosenses, gasolines, or light distillate fuels
Specific Gravity:	0.6 to 1.0
Recommended Viscosity:	0.6 to 400 centistokes
External Filter:	10 µm (nominal)
Supply Pressure:	±20% of any nominal level between 400 and 1000 psig (2758 and 6895 kPa)
Steady Flow:	0.3 to 0.5 US gal/min (1.1 to 1.9 L/min)
Transient Flow:	2.5 to 2.7 US gal/min (9.5 to 10.2 L/min)

Chapter 3.
Operation and Adjustments

Initial Operation

Before initial operation of the valve/actuator, check that all previous installation and hookup steps are successfully accomplished, that all electrical connections and hydraulic and gas fittings are secure and properly attached.

Make certain that correct hydraulic supply pressure to the actuator is established before start-up. Use applicable Woodward manuals for the particular Woodward electronic control to begin prime mover operation.

NOTICE

Trapped air within the hydraulic system may cause erratic behavior of the actuator during the first few minutes of initial operation.

⚠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.

Adjustments

Normally all operating adjustments are made to the 3171 Gas Valve/TM-55 integrating actuator during factory calibration according to specifications provided by the customer. The unit should not require further adjustment.

IMPORTANT

Do not attempt adjustments to the actuator unless thoroughly familiar with the proper procedures. The gas valve cannot be adjusted in the field. Should additional or new calibration be required, the unit must be returned to a Woodward facility.

Chapter 4.
Principles of Operation

A schematic drawing, Figure 4-1, illustrates working relationships of the various parts.

TM-55 Integrating Actuator

The TM-55 integrating actuator consists of three basic sections:

- A torque motor servovalve
- A spring-centered, four-land, spool valve
- A double-sided, equal-area, servo piston linked to the rotary output shaft

The basic element of the TM-55 is the torque motor servovalve which uses a double nozzle and flapper to generate a differential pressure to operate the second stage spool valve. The torque motor receives dc current signals from the electric control and applies torque to the single piece armature and flapper which is supported on a torsion flexure. The servovalve flapper acts as a variable flow restrictor that throttles the flow of hydraulic fluid from a nozzle on each side of the flapper. The two nozzles are supplied hydraulic fluid from the actuator supply pressure inlet via separate, fixed orifices. During steady state operation, the flapper is centered between the nozzles and the two pressures, Pc1 and Pc2, are approximately equal.

Current to the torque motor causes the flapper to move from its normal centered position, restricting hydraulic flow from one nozzle and opening flow from the other nozzle. The resulting differential pressure is applied to the end of the spool valve, moving it from the spring-centered, null position.

Moved from its centered position, the spool valve directs supply pressure to one side of the servo piston and simultaneously vents the other side, causing a corresponding movement of the output shaft.

The electrical position transducer provides a voltage signal proportional to the position of the terminal shaft. This signal is fed back to the electronic final driver circuit to obtain a constant relation between the input signal and the fuel valve position. In operation, the system provides accurate scheduling of gas flow and also provides shutdown should the actuator position loop exceed a predetermined limit.

3171 Gas Valve

Actuator output shaft movement positions the gas valve metering sleeve.

Gas flow is metered at the valve through a ported rotary sleeve. Gas enters the inlet port where it is directed through the inlet guide tube to the rotary sleeve metering port. A spring-loaded, sharp-edged shoe seals against the metering sleeve. Metered fuel is discharged at the outlet.

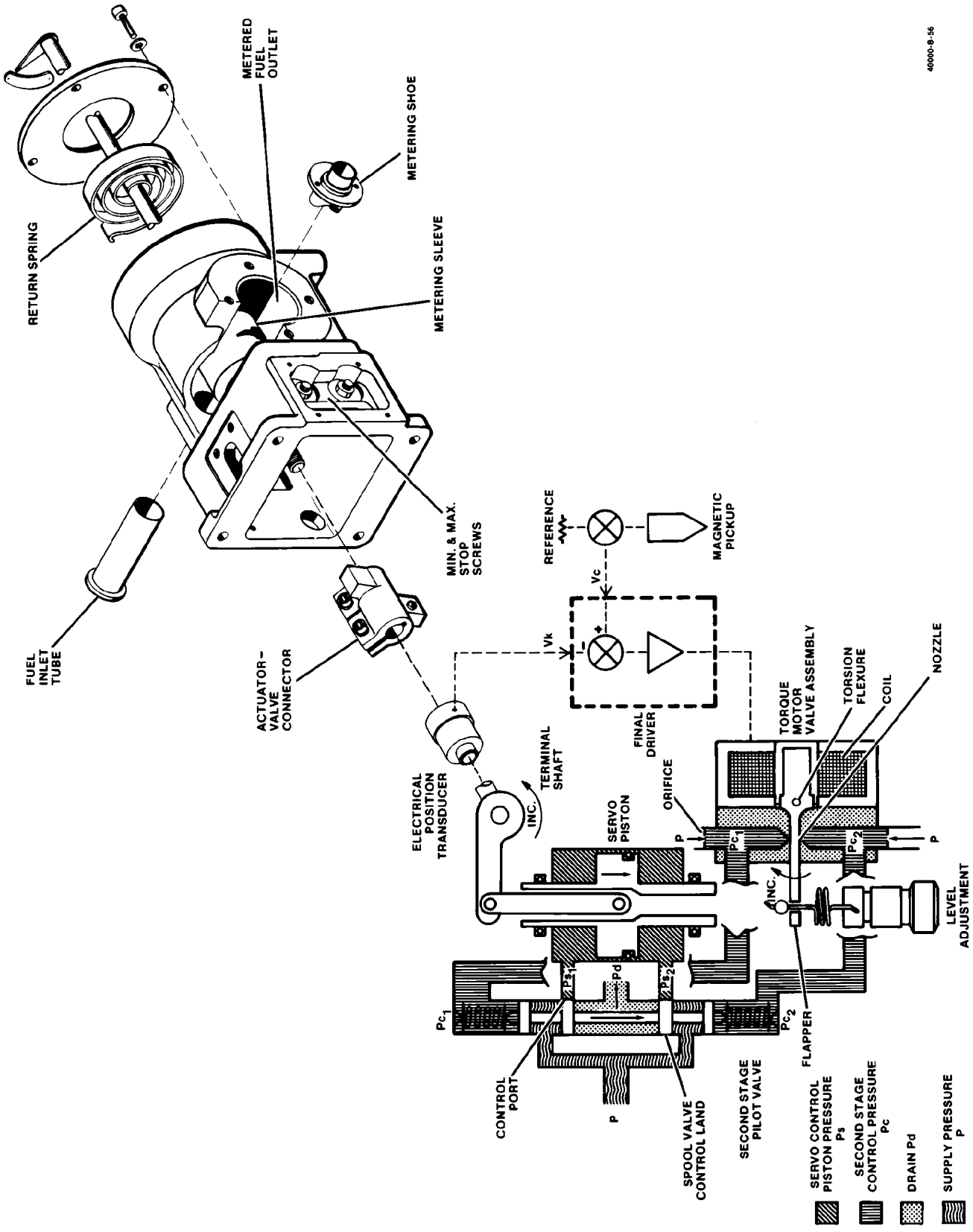

Figure 4-1. Schematic Diagram of 3171 Gas Valve/TM-55 Integrating Actuator

Chapter 5. Maintenance

Introduction

Contaminant resistance of the 3171 gas valve/actuator is excellent due to design features and high working forces. The service life of the actuator and gas valve (designed for 30 000 hours between overhauls with an ultimate design life of 160 000 hours) is increased with the use of the clean supply flow.

Filter Cleaning

The TM-55 integrating actuator is equipped with a 40 µm low capacity fitter fitting at the supply inlet. See the outline drawing, Figure 2-1, for the supply inlet location. The filter is provided to protect against failure of the 10 µm nominal external filter. Should the filter become clogged as evidenced by sluggish response, the filter may be cleaned ultrasonically and back-flushed with a light solvent. Be prepared to replace the O-ring (part no. 24, Figure 6-1) after cleaning the filter (part no. 25, Figure 6-1). The actuator should not have to be removed from the gas valve—should this become necessary, it should only be attempted by trained service personnel familiar with the proper procedures.

NOTICE

Do not run the actuator with the inlet filter fitting or the in-line filter removed or bypassed, as extensive repairs can be made necessary by only momentary exposure of the interior of the torque motor to contaminants.

Troubleshooting

Faults In the governing system are usually revealed as speed variations of the prime mover, but it does not necessarily follow that such speed variations indicate governing system faults. When improper speed variations appear, check all components, including the turbine, for proper operation and the fuel supply for proper pressure. Refer to applicable Woodward electronic control manuals for assistance in isolating the trouble. If the actuator does not respond to electronic control input during the starting sequence, check the actuator pressure supply and supply filters.

Disassembly of the TM-55 actuator or 3171 gas valve in the field is not recommended. Under unusual circumstances where disassembly becomes necessary, all work and adjustments should be made only by personnel thoroughly trained in the proper procedures.

When requesting information or service help from Woodward, it is important to include the part number and serial number of the gas valve/actuator in your communication.

Chapter 6.
Replacement Parts

When ordering replacement parts. it is essential to include the following information:

- Serial number and part number shown on the nameplate of the actuator
- Manual number (this is manual 40115)
- Part reference number in parts list and name and description of part

Figure 6-1 illustrates the replacement parts for the TM-55 integrated actuator. The numbers assigned are used as reference number and are not specific Woodward part numbers.

Since the 3171 gas valve should not be disassembled in the field, no parts are shown for this element of the control. Should repairs be necessary, contact your Woodward representative.

Ref. No.	Part Name	Quantity
40115-1	Screw, 0.375-24 x 1.500	4
40115-2	Washer, 0.375	4
40115-3	Mounting plate assembly	1
40115-4	Prefrmd pckng, 1.174 ID x 0.103	2
40115-5	Step seal, 0.812	1
40115-6	Prefrmd pckng, 0.914 ID x 0.103	1
40115-7	Shaft seal plug	1
40115-8	Bearing assembly	1
40115-9	Output shaft	1
40115-10	Preformed packing included with torque motor assembly	1
40115-11	Preformed packing included with torque motor assembly	2
40115-12	Plug, 0.438-20	1
40115-13	Prefrmd pckng, 0.351 ID x 0.072	2
40115-14	Extension spring level adjustment	1
40115-15	Plug	1
40115-16	Plunger bushing	1
40115-17	Prefrmd pckng, 0.551 ID x 0.070	6
40115-18	Expansion plug	1
40115-19	Spring support assembly	2
40115-20	Prefrmd pckng, 0.737 ID x 0.103	2
40115-21	Plunger spring assembly	2
40115-22	Retainer assembly	1
40115-23	Pilot valve plunger	1
40115-24	Preformed packing	1
40115-25	Filter fitting	1
40115-26	Preformed packing	1
40115-27	Connector assembly	1
40115-28	Washer	13
40115-29	Screw, 0.250-18 x 1.00	11
40115-30	Plug	1
40115-31	Preformed packing	3
40115-32	Step seal	3
40115-33	Shim	2
40115-34	Shim	2
40115-35	Bearing assembly	1
40115-36	Cover	1
40115-37	Prefrmd pckng, 4.489 ID x 0.70	1
40115-38	Retaining ring	1

Ref. No.	Part Name	Quantity
40115-39	Washer	1
40115-40	Inner race	2
40115-41	Headed pin	1
40115-42	Cover	1
40115-43	Preformed packing	1
40115-44	Bowed retaining ring	1
40115-45	Piston rod guide tube	1
40115-46	Link assembly	1
40115-47	Preformed packing	1
40115-48	Pin, 0.375 OD x 1.062	1
40115-49	Servo piston	1
40115-50	Preformed packing	1
40115-51	Seal, 1.250	1
40115-52	Servo sleeve	1
40115-53	Preformed packing	1
40115-54	Ring seal	1
40115-55	Nameplate	1
40115-56	Drive screw	4
40115-57	Body assembly	1
40115-58	Torque motor	1
40115-59	Housing assembly	1
40115-60	Cover	1
40115-61	Screw, 6-32 x 0.250	1
40115-62	Washer	1
40115-63	Clamp	1
40115-64	Cover	1
40115-65	Prefrmd pckng, 2.114 ID x 0.070	1
40115-66	Transducer	1
40115-67	Screw, 4-40 cleat	3
40115-68	Bellows coupling	1
40115-69	Preformed packing	1
40115-70	Seal, 0.312	1
40115-71	Washer	1
40115-72	Kearfott housing assembly	1
40115-73	Clamp	1
40115-74	Washer	1
40115-75	Screw, 6-32 x 0.250	1
40115-76	Plug	1
40115-77	Cover	1
40115-78	Lever assembly	1

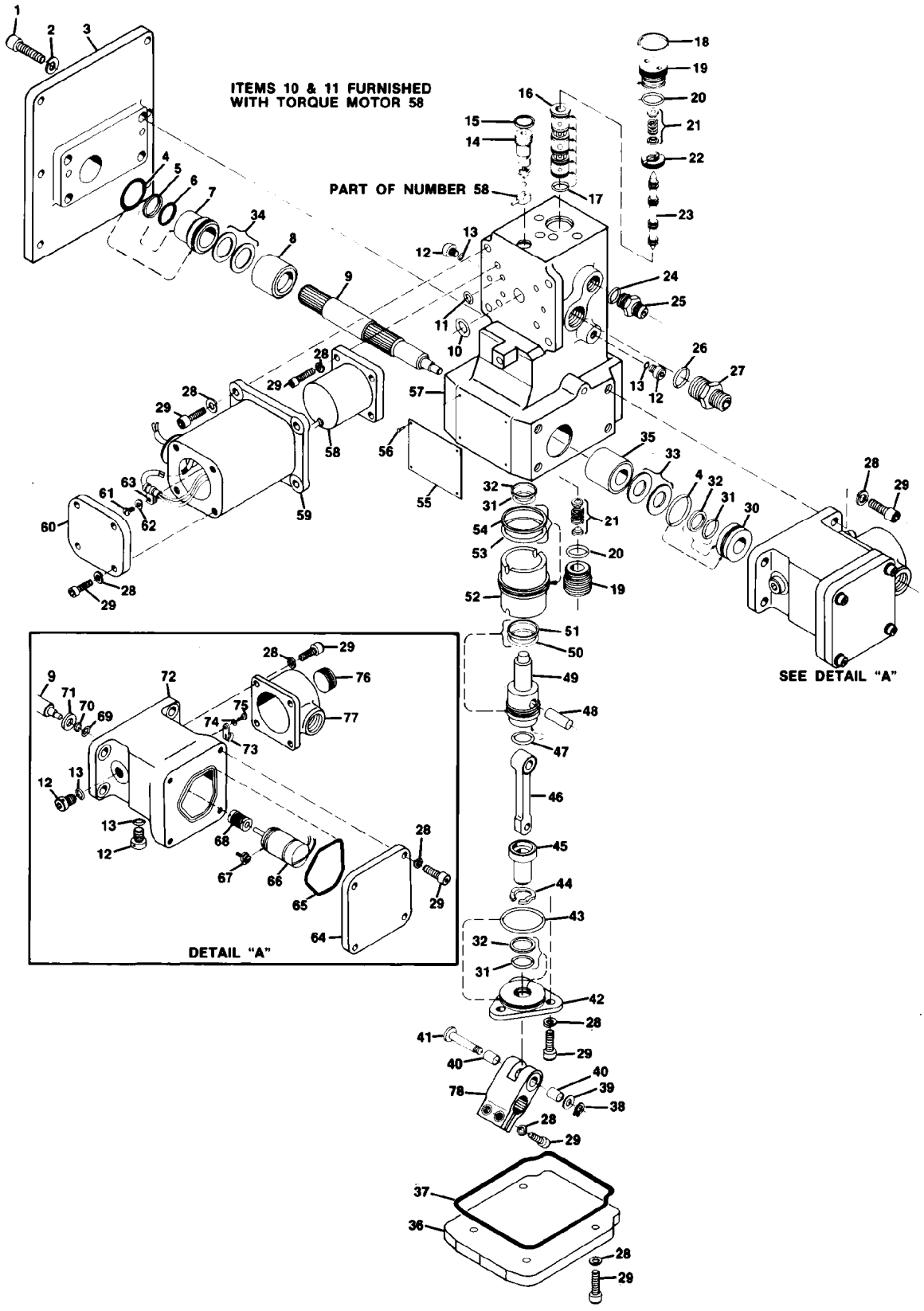

Figure 6-1. Exploded Drawing, TM-55 Integrating Actuator

Chapter 7.
Service Options

Product Service Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see "How to Contact Woodward" later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM and 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 **Recognized Turbine Retrofitter (RTR)** is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

You can locate your nearest Woodward distributor, AISF, RER, or RTR on our website at:

www.woodward.com/directory

Woodward Factory Servicing Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

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

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.

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 within 60 days, a credit for the core charge will be issued.

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 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 authorization 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 offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- 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. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. 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.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or 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 us via telephone, email us, or use our website: **www.woodward.com**.

How to Contact Woodward

For assistance, call one of the following 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.

Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
Germany	+49 (0) 21 52 14 51
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

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

Turbine 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

You can also locate your nearest Woodward distributor or service facility on our website at:

www.woodward.com/directory

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:

Your Name	
Site Location	
Phone Number	
Fax Number	
Engine/Turbine Model Number	
Manufacturer	
Number of Cylinders (if applicable)	
Type of Fuel (gas, gaseous, steam, etc)	
Rating	
Application	
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	

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 40115.

B40115:NEW

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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.

2013/1/Colorado