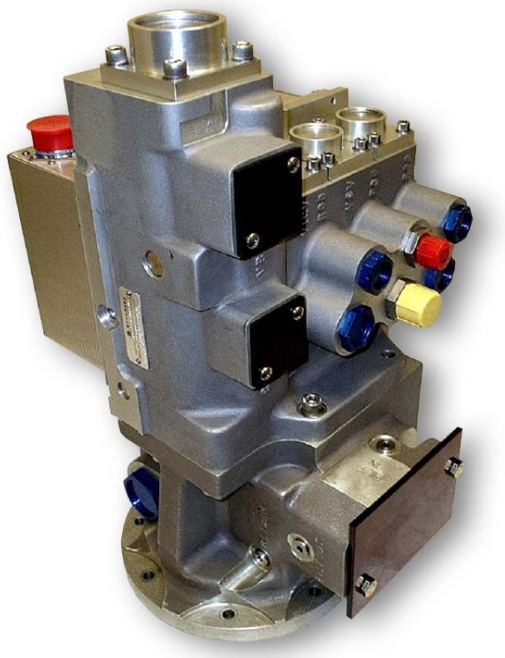
WOODWARD

Product Manual 26285
(Revision B, 11/2014)
Original Instructions



Hydraulic Control Unit (HCU) for the GE LM6000 Gas Turbine

Woodward Part Numbers
9902-364, 9902-701

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 Out-of-date translations are marked with ⚠.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

Manual 26285

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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

Introduction

This manual describes the operation and installation of the Woodward Hydraulic Control Unit (HCU), Woodward part numbers 9902-364 and 9902-701.

Description/Operation

The HCU is used in conjunction with the Woodward NetCon 5000 Digital Control System to control the variable-geometry actuator positions in the compressor stage of the General Electric LM6000 industrial gas turbine.

The HCU is mounted on a hydraulic pump, which is in turn mounted on the drive pad on the forward right-hand side of the engine accessory gearbox. The pump provides a flow of hydraulic oil to the HCU that is proportional to gearbox speed and has an output of approximately 167 L/min (44 US gal/min) at 100 % engine speed (about 6000 rpm pump speed).

The HCU is composed of the following major subassemblies:
- Pressure Regulator Manifold
- Servovalve Assembly

Pressure Regulator Manifold

The pressure regulator manifold includes a two-stage pressure regulator that sets the oil pressure in the system to a nominal level of 8274 kPa (1200 psi) above return pressure. Return pressure normally is about 414 kPa (60 psig). The pressure regulator manifold provides a mounting location for the hydraulic filter and also provides regulated oil pressure to the servovalve assembly. The oil not used by the servovalve(s) from each system is bypassed by the pressure regulator to the low-pressure return.

Servovalve Assembly

The servovalve assembly consists of two separate two-stage servovalves, Variable Bleed Valves (VBV) and Variable Stator Vanes (VSV). Each servovalve independently controls the flow of oil to one variable-geometry system of the turbine as a function of the input current signal from the NetCon digital-electronic control.

The linear actuators for each variable-geometry system are mounted on the turbine compressor. Linear variable-differential transformers (LVDTs) on the actuators provide position-feedback information to the NetCon control.

Each servovalve is composed of a double-nozzle/flapper type torque-motor servovalve (TMSV) and a spring-centered pilot valve. The torque-motor servovalve provides a differential-pressure signal (that is proportional to input current from the electronic control) to the ends of the pilot valve. The pilot valve then moves a distance approximately proportional to the differential-pressure signal; this opens the control ports and directs oil to and from the rod and head cavities of the turbine-mounted actuators.

VSV/VIGV Systems

The pilot valves for the VSV and VIGV systems are four-way four-landed spool valves. The electrical input to both servovalves is (–80 to +120) mA with a steady-state (null) value of +20 mA. Changes in current from the 20 mA value will cause the pilot valve to move, directing supply oil to one side of the actuators, and directing oil from the other side of the actuators to return. For both the VSV and the VIGV systems, an increase in current from the null value causes oil to flow from the “head port” of the servovalve, resulting in an extension of the actuator rod. Similarly, a decrease in current from the null value causes oil to flow from the “rod port” of the servovalve which results in retraction of the actuator rod.

Pilot-valve porting for the VSV and VIGV servovalves is designed to provide a dual-gain characteristic. The low-gain region applies to input-current levels near null (+20 mA ±25 mA). The remaining range of current from –80 mA to +120 mA has higher gain by a factor of approximately 8 with no load.

IMPORTANT **High and low gain values will be significantly influenced during operation by the magnitude and direction of external loads on the linear actuators.**

VBV

Similar to the VSV and VIGV systems, the VBV system operates with an electrical current range of (–80 to +120) mA, has a null value of +20 mA, and operates as a simple four way spool valve.

For the VBV system, an increase in current from null causes oil to flow from the rod port of the servovalve, which results in retraction of the actuator rod. Similarly, a decrease in current from null causes oil to flow from the head port of the servovalve, which results in extension of the actuator rod.

Pilot-valve porting for the VBV servovalve is designed to provide a dual-gain characteristic. The low-gain region applies to input-current levels near null (+20 mA ±30 mA). The range of current from +50 mA to +120 mA has higher gain by a factor of approximately 5 with no load. The range of current from –10 mA to –80 mA has higher gain by a factor of approximately 16 with no load.

IMPORTANT **High and low gain values will be significantly influenced during operation by the magnitude and direction of external loads on the linear actuators.**

General

A 400 µm strainer is installed in each rod and head port of each servovalve to protect the servovalves from contamination. Also, 70 µm screens are provided at the supply and control ports of each of the torque-motor servovalves. A 1000 µm strainer is installed in the pump inlet port upstream from the pressure regulator.

The HCU servovalve housing has been machined so that a fourth servovalve can be added at any time with minimal effort. The provision for the fourth servovalve will accommodate parts similar to those used in the VSV and VIGV servovalves.

Pressure taps are provided in the housing of the HCU to monitor pressures before and after the hydraulic filter as well as return pressure.

The pressure regulator manifold and the servovalve assembly are bolted together at the Woodward factory with O-rings sealing the oil passages between the two units. The HCU is shipped to GE in this assembled state with shipping covers over the HCU's mounting flange and the oil-filter mounting flange. Shipping plugs or caps also protect all hydraulic and electrical interface points.

Each of the three variable-geometry servovalves in the HCU uses a torque-motor servovalve assembly to provide a differential-pressure signal to the pilot valve. As shown on the wiring diagrams (Figures 2-1 through 2-4), each torque-motor servovalve has three separate and independent coils. Any one of the three coils can be used to operate the unit with current to the remaining coils at zero.

Two connectors are provided for each torque-motor servovalve coil. See Figures 2-1 through 2-4 for wiring diagram.

HCU Specifications

Hydraulic Fluid	US MIL-L-23699 or MIL-L-7808
Maximum Pump Hydraulic Supply Flowrate	167 L/min (44 US gal/min)
Dry Weight:	27 kg (60 lb)

	Normal Operation	**Extreme Operation***
Ambient Operating Temperature Range	(–7 to +66) °C / (+20 to +150) °F	(–40 to +121) °C / (–40 to +250) °F
Hydraulic Fluid Temperature Range US MIL-L-7808	(–29 to +104) °C / (–20 to +220) °F	(–40 to +135) °C / (–40 to +275) °F
Hydraulic Fluid Temperature Range US MIL-L-23699	(–7 to +104) °C / (+20 to +220) °F	(–40 to + 135) °C / (–40 to +275) °F
Maximum Hydraulic Supply Pressure (above return)	8619 kPa / 1250 psig	8964 kPa / 1300 psig
Maximum Hydraulic Return Pressure	690 kPa 100 psig	2068 kPa 300 psig

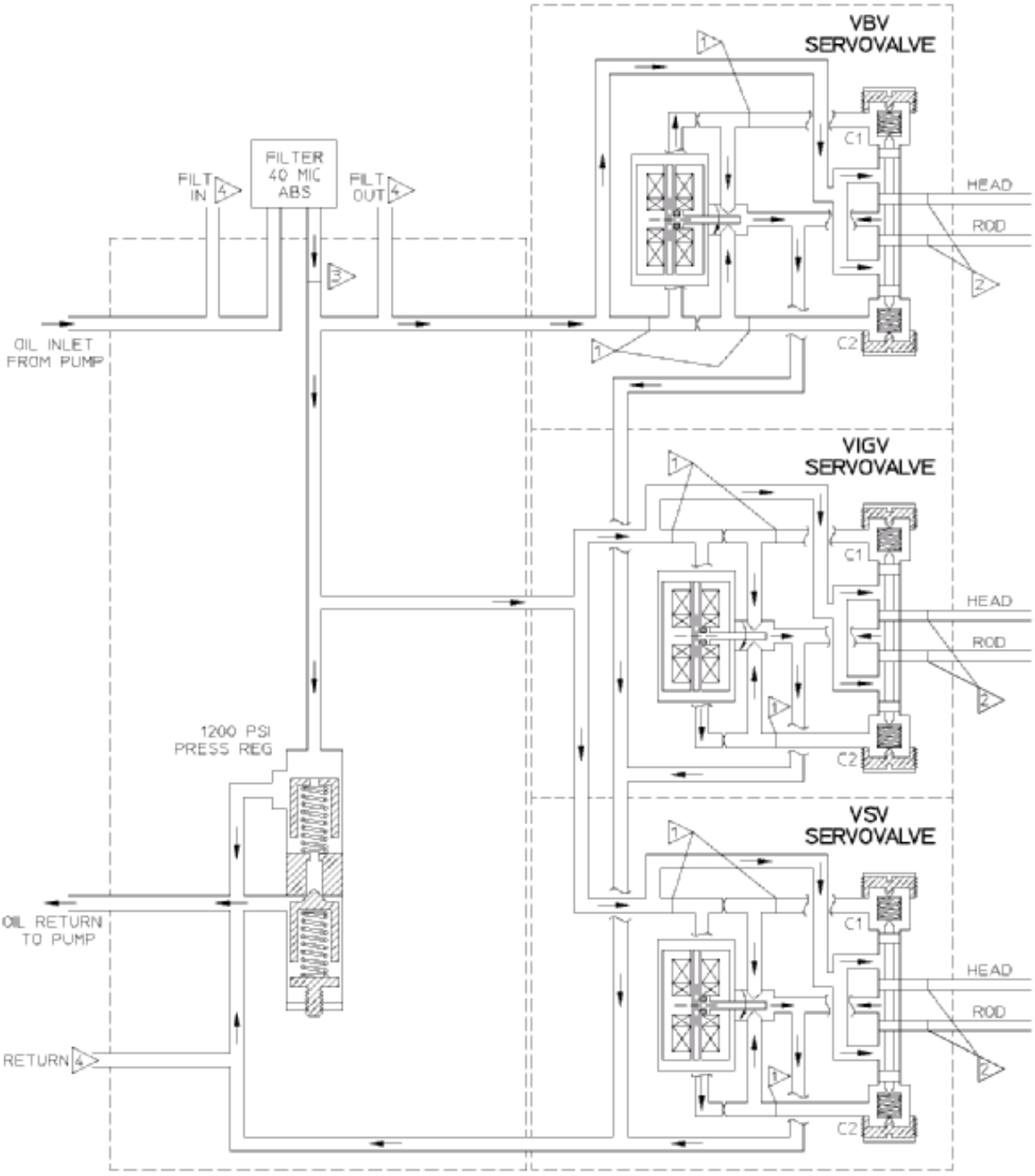
*—The unit will not operate in the extreme range for more than 2 % of its total service life.

References

Outline drawings are provided in this manual. The outline drawings include information on electrical wiring and installation dimensions.

Woodward manual 25075, *Commercial Preservation Packaging for Storage of Mechanical-Hydraulic Controls*, provides additional information about storage of Woodward controls (available on **www.woodward.com/publications**).

This manual does not attempt to provide information about the electronic control which determines the outputs of the HCU. This information must be obtained from the appropriate NetCon Hardware manual and the application program.



NOTES
1—70 µm screen
2—400 µm strainer
3—1000 µm strainer
4—pressure tap

Figure 1-1. HCU Schematic

Chapter 2. Installation

Receiving

Use care while handling and installing the HCU. Be careful to avoid striking the hydraulic ports and the electrical connectors. Abuse can damage seals, installation surfaces, and factory adjustments. Protect hydraulic connections with plastic shipping caps whenever the HCU is not connected to the normal piping.

After factory testing and calibration, the HCU is drained of oil. This leaves a light film of oil on internal parts to prevent rust. They are then placed in cardboard containers filled with urethane foam for delivery to the customer. The little oil left in the HCU is clean hydraulic fluid which will not contaminate a hydraulic system. Additional cleaning or calibration is not necessary before installation or operation.

Storage

Short Term Storage (Less than 1 year)
Flush the unit with a corrosion-resistant oil (US MIL-C-6529, type 3, or equivalent).

Record the date the unit was prepared and identify the oil used on two identification tags. Attach one tag to the unit and one tag to the exterior of the storage container.

Place protective closures in open ports, wrap and seal the unit in barrier material (US MIL-B-121, Type 1, Grade A, Class 1, or equivalent). Cushion the unit and place in the container.

Long Term Storage (More than 1 year)
Perform all steps outlined in the short-term storage instructions. In addition, place a proper amount of desiccant (US MIL-D-3464, Class 1, or equivalent) with the unit before wrapping it in the barrier material.

IMPORTANT **Once the unit has been properly prepared for storage, it does not require periodic flushing.**

Installation

Attitude

The HCU can only be installed in one position. Looking at the turbine, with the turbine intake on your left, the HCU is installed with its mounting flange on your left and with the oil-filter holes facing you. Holding the unit and gasket in place, install the eight bolts through the mounting flange hand tight. Then, tighten them according to GE instructions.

⚠CAUTION **Do not attempt to hold the HCU in position and install it by yourself. It is heavy and could injure you if it falls. Either use a hoist or get a helper.**

Filters and Screens

70 µm strainers are provided within the supply and control ports of the HCU. 400 µm screens are provided in the head and rod outputs from the servovalve. A 1000 µm strainer is provided at the pump oil inlet. These are all in place and do not require any action prior to installation.

A 40 µm nominal filter is required to be installed on the HCU to filter the pressure oil immediately after it enters the HCU from the gear pump. Remove the temporary cover from the oil-filter mounting pad (per Figures 2-1 through 2-4) and install the oil filter, following GE instructions.

Oil Connections

Make the hydraulic connections to the head and rod ports for VBV, VIGV, and VSV, following GE instructions. All port locations are shown in the outline drawings (Figures 2-1 through 2-4). Pressure tap ports may be used as required.

Electrical Connections

Electrical connections to the HCU are made using the two US MIL-C-83723 / 82G18148 14-pin receptacles. Figures 2-1 through 2-4 shows the receptacle locations and plant wiring diagram.

Connect the proper cable-end connectors to the two receptacles on the HCU, following GE instructions.

Special Limitations for Safe Use

Proper grounding shall be applied as part of the final installation in accordance with EN 60079-15, Clause 6.2.5 and EN 50021, Clause 7.2.5.

The final Ingress Protection of the product shall be ensured by the use of a proper mating electrical connector and is the responsibility of the user in accordance with EN 60079-15, Clause 5.1.3 and EN 50021, Clause 6.1.4

The mating electrical connector provided at the installation must withstand a separating force of at least 15 N (1.5 kgf) or be prevented from loosening or separating in accordance with EN 60079-15, Clause 14.2 and EN50021, Clause 15.2. Do not separate the electrical connection when the product is energized.

⚠CAUTION

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the HCU.

⚠CAUTION

The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

⚠WARNING

External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

⚠WARNING

Due to the hazardous location listings associated with this product, proper wire type and wiring practices are critical to operation.

NOTICE

Do not connect any cable grounds to “instrument ground”, “control ground”, or any non-earth ground system. Make all required electrical connections based on the wiring diagrams (Figures 2-1 through 2-4).

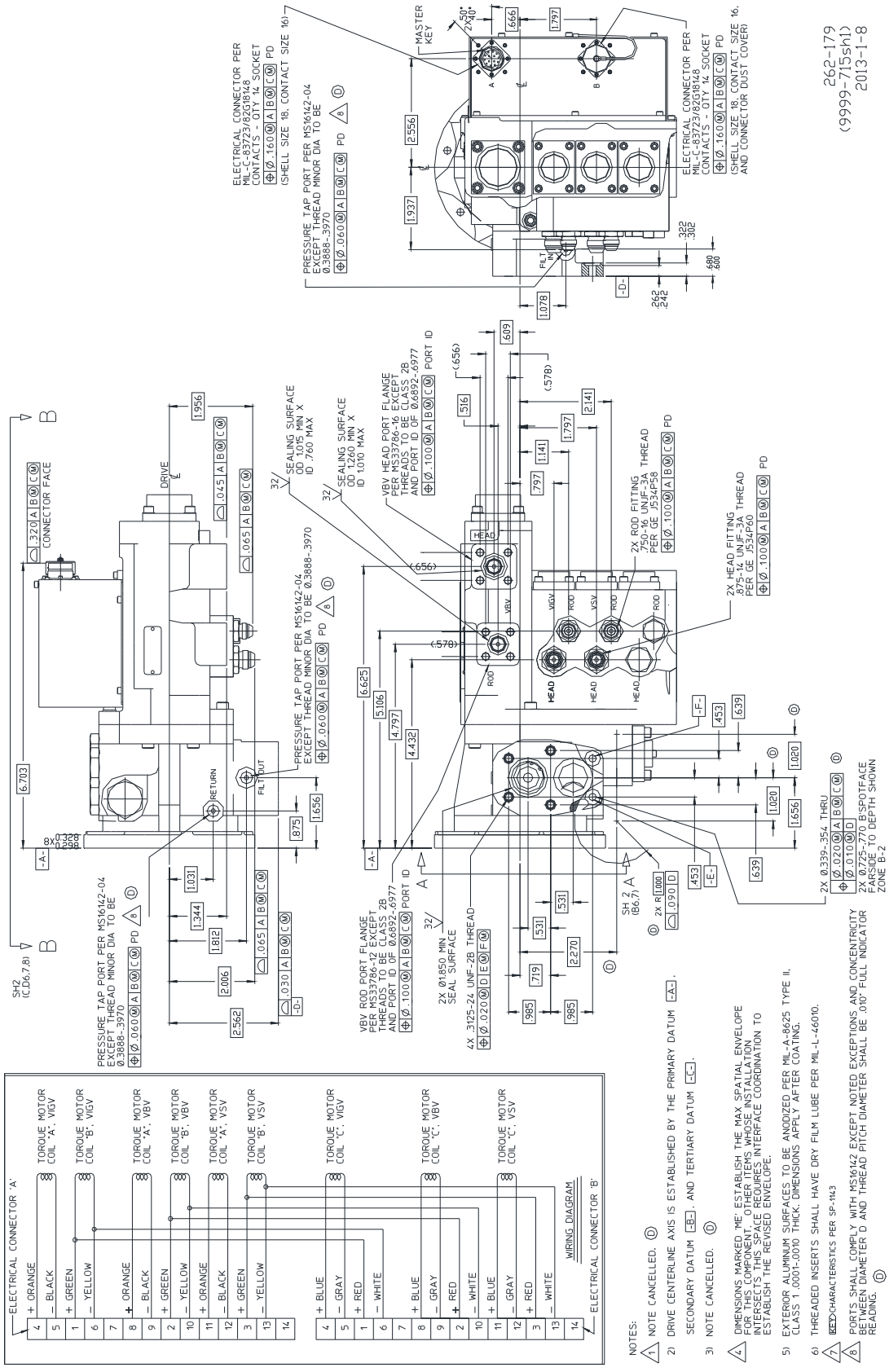


Figure 2-1a. Outline Drawing of 9902-364 HCU (2 channel)

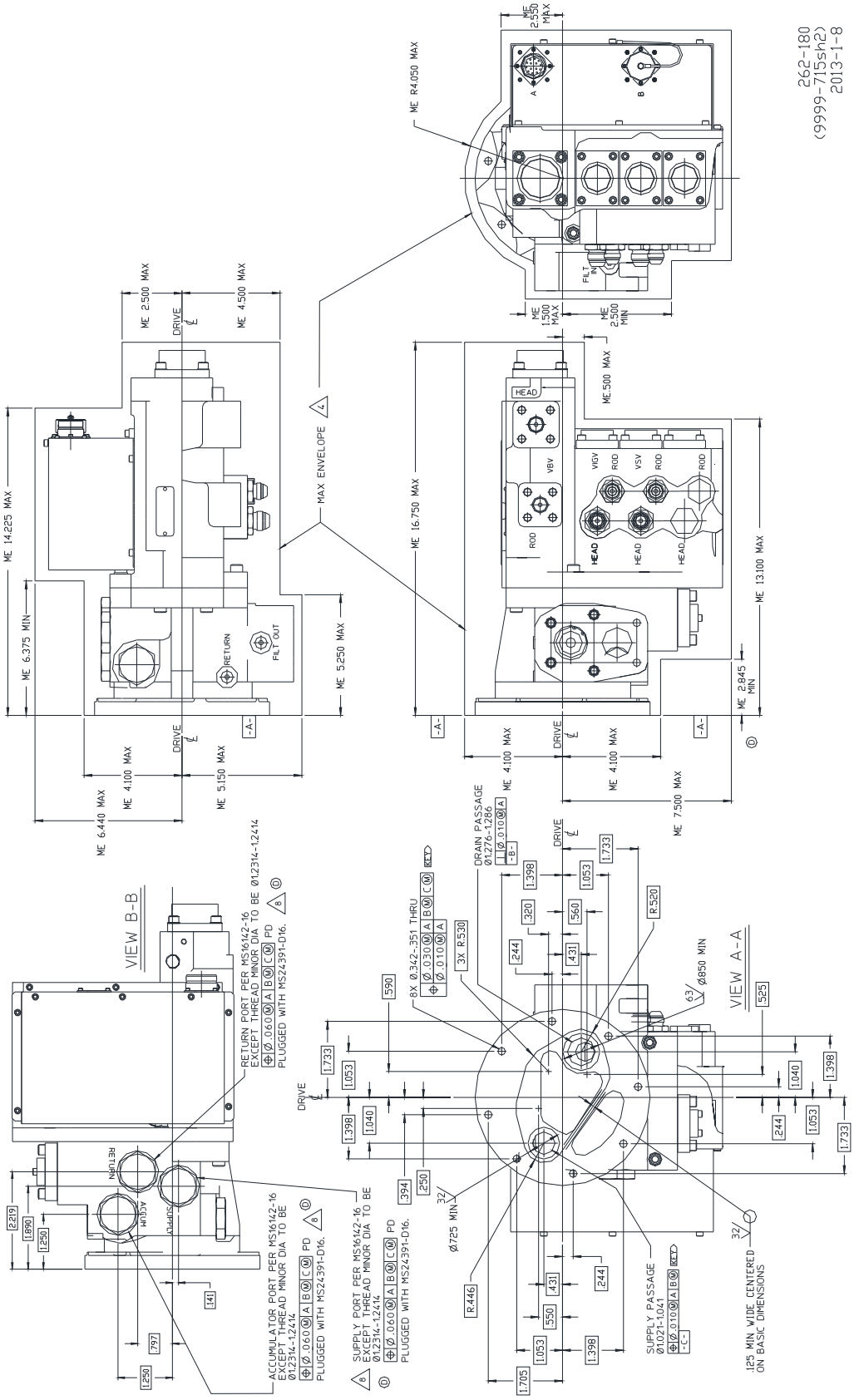


Figure 2-1b. Outline Drawing of 9902-364 HCU (2 channel)

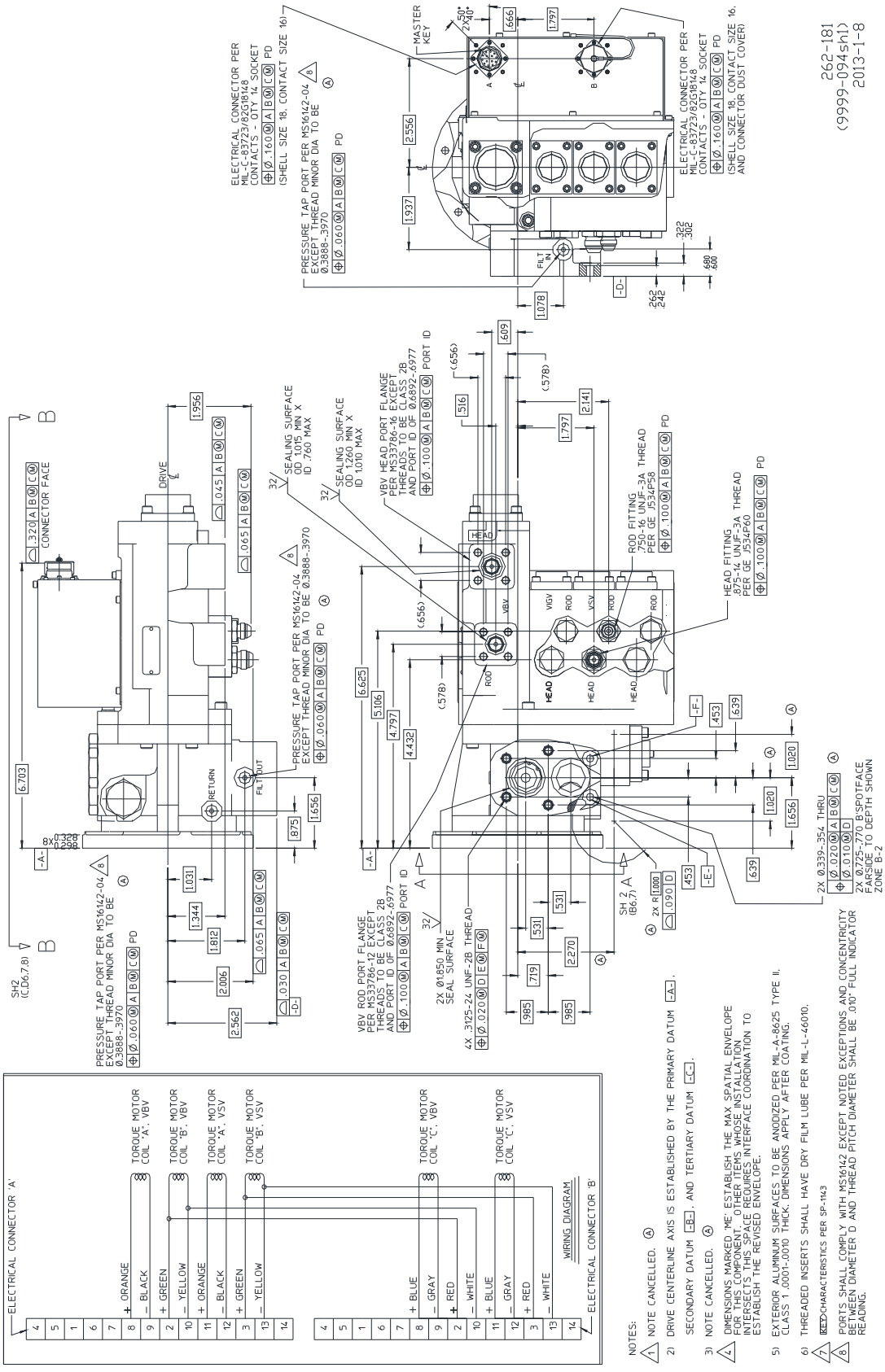


Figure 2-4a. Outline Drawing of 9902-701 HCU (2 channel)

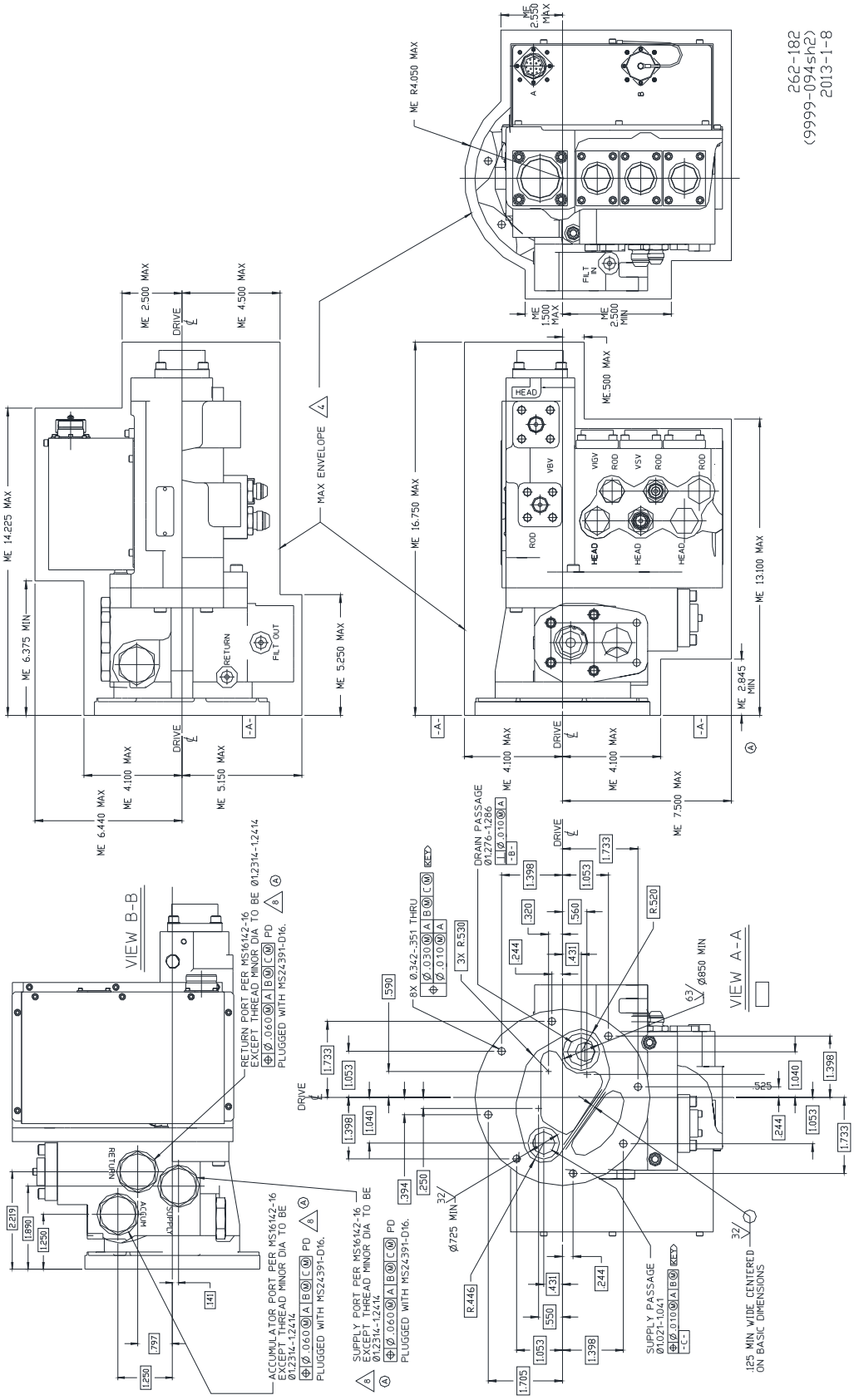


Figure 2-4b. Outline Drawing of 9902-701 HCU (2 channel)

Chapter 3.
Initial Operation and Adjustment

Before initial operation of the system, make sure that all previous installation and hookup steps are accomplished and that all linkages, electrical connections, and hydraulic fittings are secure and properly attached.

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

The turbine must be operated according to GE instructions, therefore, there are no operating instructions included in this manual. Use the GE instructions.

⚠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.

Adjustments

The HCU is not field adjustable. The flow rate is set by design. The regulating valve pressure is factory calibrated and should not be changed.

The servovalve has been factory adjusted for a 20 mA nominal null current. All adjustments in the actuator have been sealed at the factory and cannot be changed in the field.

⚠WARNING

External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

⚠CAUTION

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the HCU.

⚠CAUTION

The surface of this product can become hot enough or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

Chapter 4.
Maintenance and Repair

Introduction

The only maintenance procedures for the HCU are cleaning the screen behind the oil filter and the rod- and head-port screens. This should be done as often as GE instructions require. Figures 2-1 through 2-4 shows the locations of the oil filter and rod and head ports.

⚠WARNING **To prevent possible serious personal injury, or damage to the equipment, be sure all electric power and hydraulic pressure have been removed from the HCU before beginning any maintenance.**

Oil Filter Screen

1. Remove the 40 µm oil filter by removing the six bolts that secure it. Be prepared to catch the oil which will drain from the filter and HCU.
2. Remove the snap ring from the oil return port (top hole) and remove **the 1000 µm** screen.
3. Flush the screen with solvent and dry it.
4. Re-install the screen and the snap ring.
5. Re-install the filter, following GE instructions.

Rod and Head Port Screens

The rod and head ports, shown in Figures 2-1 through 2-4, contain 400 µm screens. Periodically, as required by GE, clean these screens as follows:

1. Remove the hydraulic fitting from the port.
2. Using Woodward tool number T272908, remove the screen from the port.
3. Clean the screen with solvent and dry it.
4. Replace the screen in the port, using tool number T272908.
5. Replace the hydraulic fitting and secure it following the GE instructions.

No maintenance is required for the 70 µm screens provided within the supply and control ports.

Repair

Because assembly and calibration of the HCU requires special tools, it cannot be repaired in the field. If you suspect the unit, return it to Woodward for repair or replacement. Contact information is on the Woodward website (**www.woodward.com/directory**) and is also stated in the following chapter. Be sure to call for a return authorization number before shipping an HCU. When shipping, include:

- Your name
- The name of your company, department or mail drop, and address
- The address where you want the unit returned (if different from above)
- The Woodward part number from the nameplate of the HCU (9902-364 or 9902-701)
- The serial number from the nameplate of the HCU
- A description of the reason the unit is being returned

Chapter 5.
Product Support and Service Options

Product Support Options

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

- 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 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 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.

A current list of Woodward Business Partners is available at **www.woodward.com/directory**.

Product Service 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**.

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 (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

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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 _____

Turbine Model Number _____

Type of Fuel (gas, steam, 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 B—

- Removed references to inactive part numbers 9902-415 & 9902-416
- Removed Regulatory Compliance information (does not apply to part numbers 9902-364 & 9902-701)

Changes in Revision A—

- Add outline drawings for new part numbers

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 26285B.

B26285:B

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