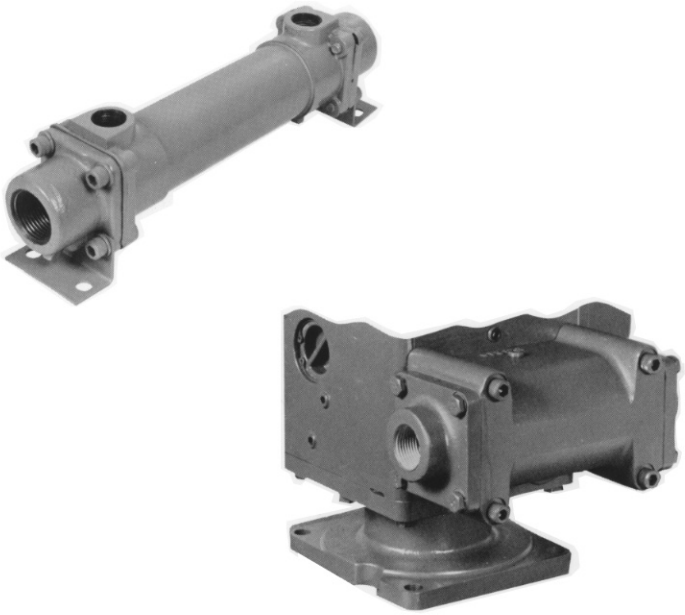
WOODWARD

Product Manual 36641
(Revision H)
Original Instructions



Governor Oil Heat Exchanger for PG & EG Governors

Remote and Integral Types

Installation and Operation Manual

IMPORTANT

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

DEFINITIONS

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

WARNING

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

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

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

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

NOTICE

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

NOTICE

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

Governor Oil Heat Exchanger for PG & EG Governors

The PG and EG governor heat exchanger is an accessory unit for lowering or, in some applications, raising the temperature of governor oil. Two basic models of heat exchangers are offered; one mounts on the governor case, and the other may be mounted at a distance from the governor. A heat exchanger should be used whenever governor oil will exceed maximum operating temperature—usually 93 °C (200 °F). It is usually undesirable to cool governor oil below 32 °C (90 °F). This manual describes both the bolt-on and remote heat exchanger models suitable for actuators. PG-35, PG-50, and PG-PH governors use only integral mounted heat exchangers.

Remote Mounted Heat Exchanger

NOTICE

Purge air from the heat exchanger by disconnecting one of the governor oil lines at the exchanger. Allow the cooler and the supply lines to fill with oil. Reconnect the line, check the oil level in the governor, and add oil if necessary. Continue to monitor oil level as the unit is initially run, and add oil as needed.

Specifications: The PG and EG remote heat exchanger has an exchange surface of 0.14 m² (1.5 ft²). To maintain an 82 °C (180 °F) governor oil temperature using water as a coolant, a supply at 517 kPa (75 psi) pressure (1034 kPa/150 psi max.), 5.7 L/min (1.5 US gal/min) flow, and 60 °C (140 °F) or lower temperature should be provided. In order to keep the temperature within a 32 to 82 °C (90 to 180 °F) range, a flow control may be needed in the coolant supply line. Turbine oil or engine coolant may be circulated in the exchanger to better regulate governor heat. Other coolants, such as oil or glycol, may be circulated, with allowances made for heat transfer differences of the coolant. In addition to the standard model, stainless steel and sea water models and other connector arrangements are available. Contact a Woodward application engineer for special applications. Maximum oil pressure on the governor side of the heat exchanger is 1724 kPa (250 psi).

Operation (see Figure 1): Bypass oil from the governor's accumulator is passed through the outer concentric passage of the heat exchanger and back to sump. In the heat exchanger, some of the oil heat is conducted through the walls of the tubes in the center, and into the coolant. The circulation of coolant through the central tube cluster carries this excess heat away from the exchanger.

Installation: Figure 2 shows typical dimensions and connections of the heat exchanger. Figure 3 shows installation points for various governor styles. The heat exchanger should be mounted as near as conveniently possible to the governor and below the governor's oil level so that no air will be trapped in the system. If the heat exchanger is mounted more than a few centimeters/inches from the governor or is not rigidly supported, use 1/2 inch (~13 mm) pipe for the connecting lines and reduce to 1/8 inch (~3.2 mm) at the connectors.

IMPORTANT

Do not connect the heat exchanger oil return directly opposite the oil level sight gauge. This will make the gauge reading inaccurate.

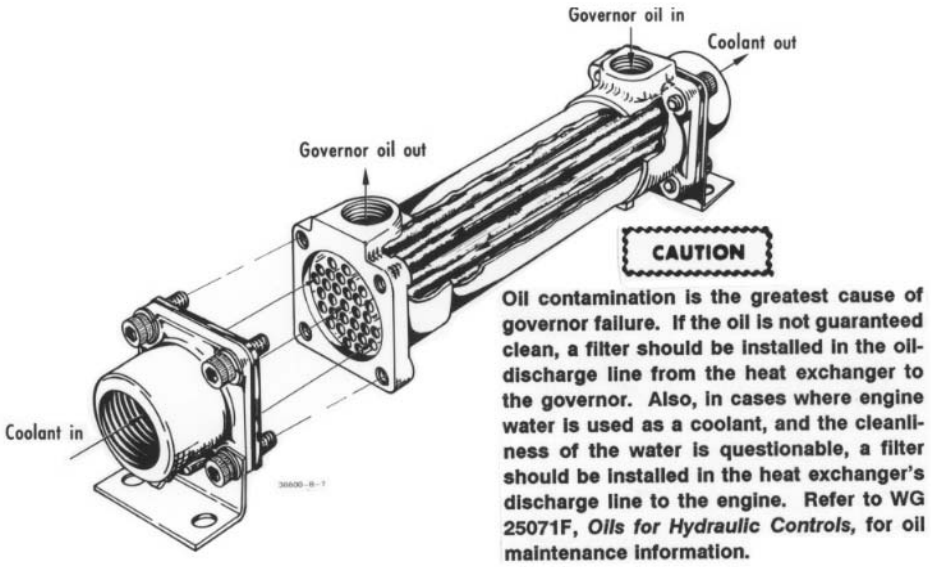

Figure 1. External Heat Exchanger Schematic

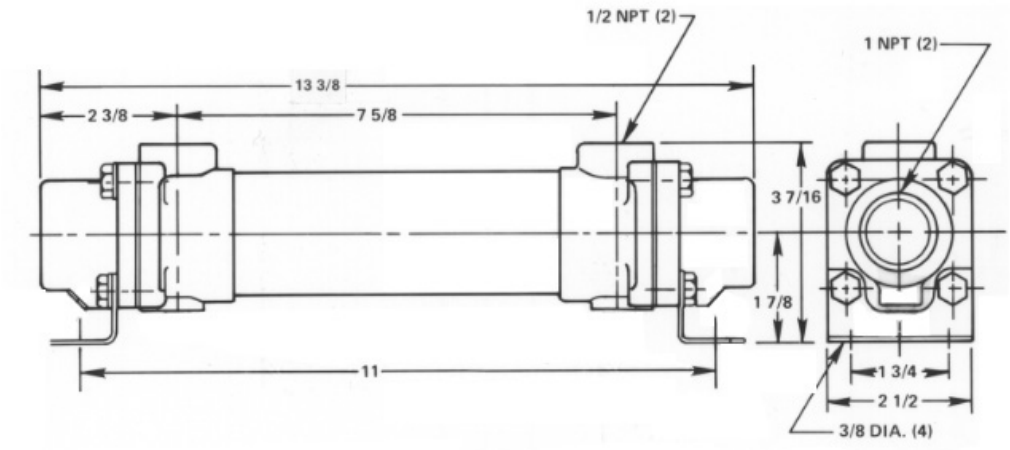

Figure 2. Typical Outline Drawing of External Heat Exchanger
(Do not use for construction.)

Troubleshooting: Two O-rings, one at each end, are the seals. If the unit leaks, replace the O-rings. Lubricate the O-rings with oil or petrolatum before reassembling.

Replacement coolers must be ordered complete.

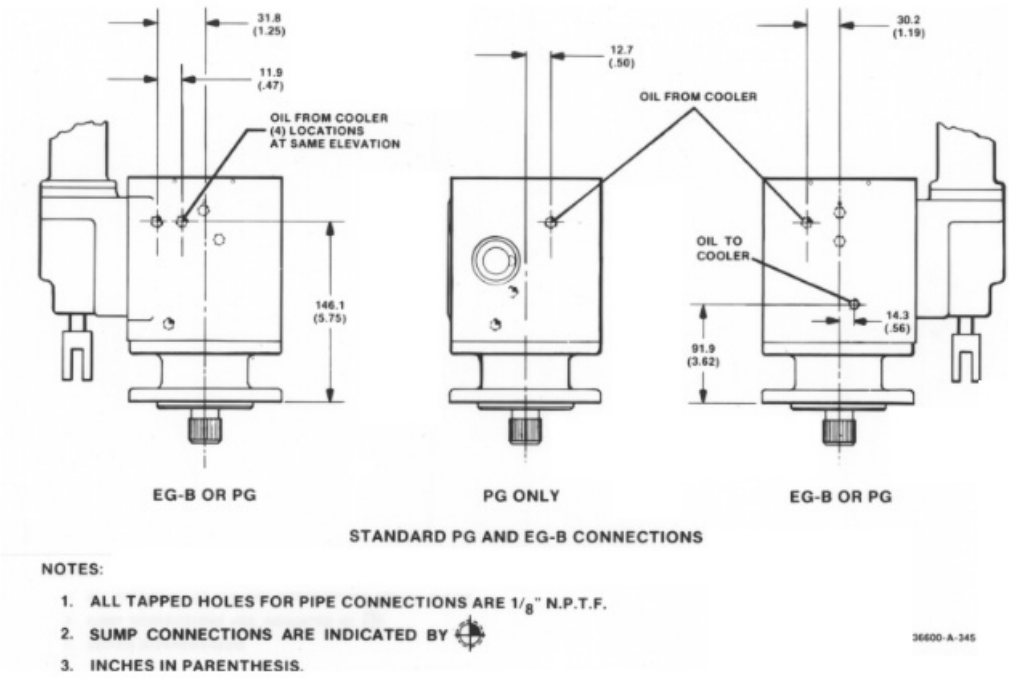

Figure 3. Connections from Various Governor Models to External Heat Exchanger

Integral or Bolt-on Heat Exchanger

The integral heat exchanger is designed to be mounted on the power case of a governor predrilled to accept it, and is shipped already mounted on its governor. Figures 4 and 5 show typical mounting details for this exchanger. Adapters to permit alternate or remote mounting are available.

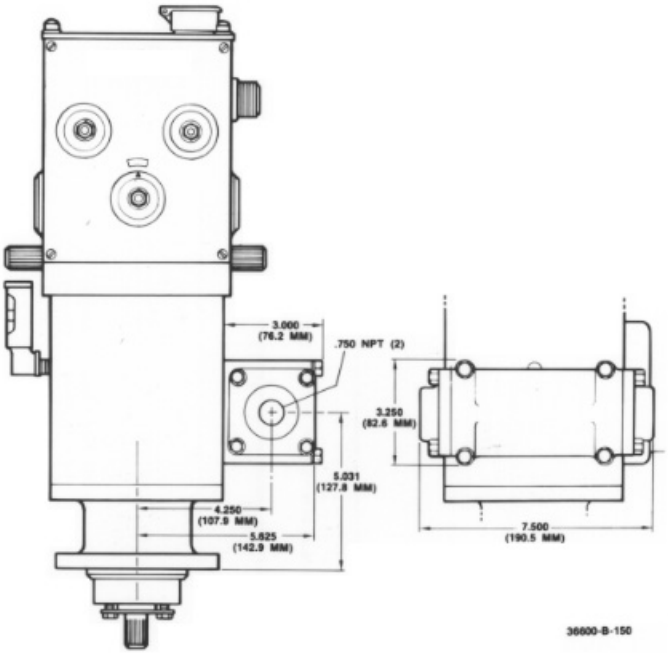

Figure 4. Integral Cooler Mounting Detail and Dimensions

Specifications: Several coolants or heating mediums, such as glycol, water, oil, or sea water may be used with these units. Governor oil should not be cooled below 38 °C (100 °F). If governor operation is sluggish due to excessive cooling, either restrict coolant flow or use turbine oil or engine coolant. Fluid pressure of the coolant should not exceed 3448 kPa (500 psi). See the remote heat exchanger specifications for suggestions for coolants. Flow should be between 0.8 and 7.6 L/min (0.2 and 2.0 US gal/min).

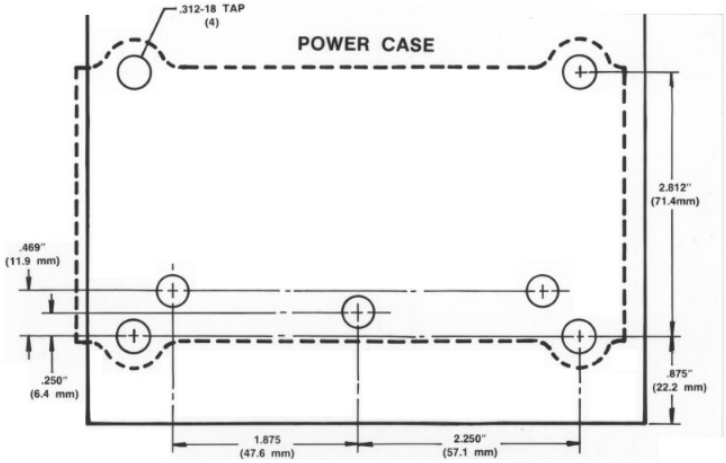

Figure 5. Integral Cooler Mounting (do not use for construction)

Operation (see Figure 6): Oil enters the outside concentric spiral at the center and flows towards the ends. The oil comes from the gear pump inside the governor. After the heat is exchanged, the oil exits to the accumulator section of the governor. The coolant is run through the inner spiral passage of the exchanger.

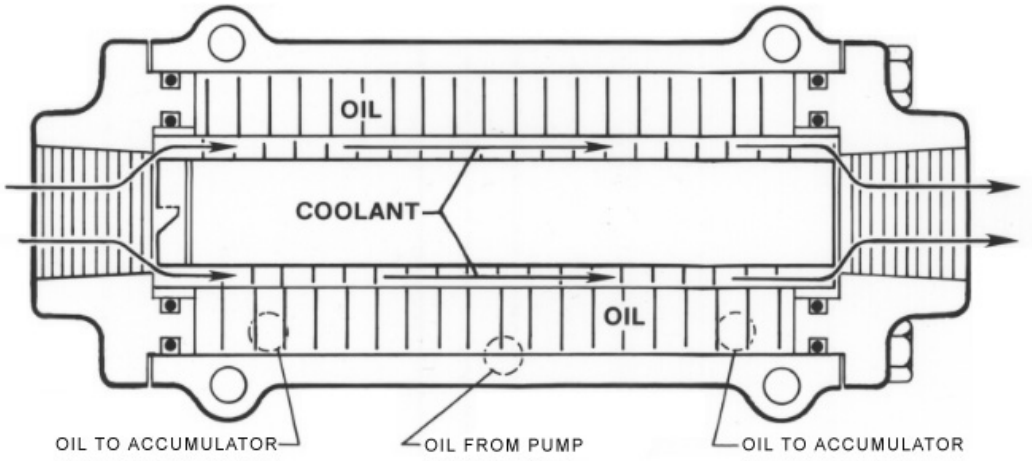

Figure 6. Integral Cooler Assembly

Troubleshooting: Four O-rings, two at each end of the spiral tubes, prevent leakage and keep the governor oil and coolant separated. If any leakage or interaction is noted, replace the O-rings. Lubricate the O-rings with petrolatum or oil before reassembling.

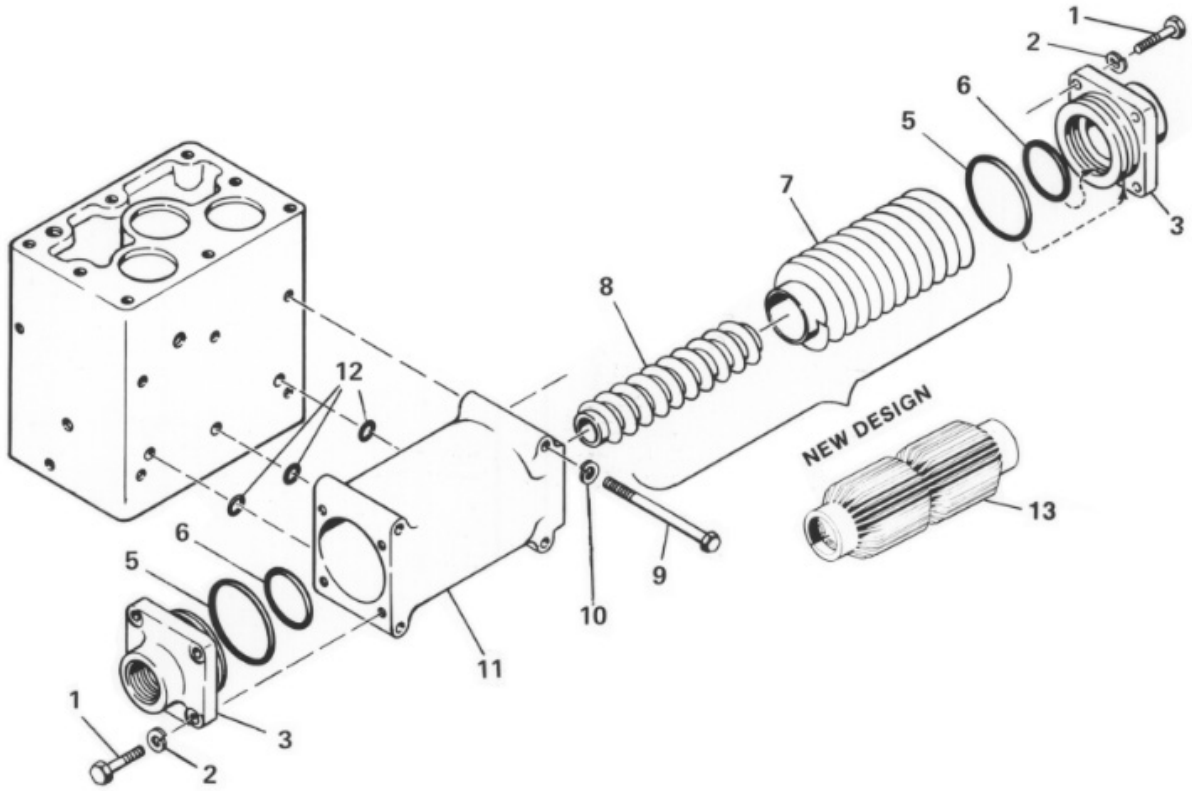

Figure 7. Integral Cooler Exploded View

Parts List

Ref. No.	Part Name ..... Quantity
36641-1	Hex cap screw, 1/4-20 x 3/4.....8
36641-2	Shakeproof washer 1/4 8
36641-3	End cap.....2
36641-4	Deleted
36641-5	O ring 2
36641-6	O ring 2
36641-7	Heat exchanger outer tubing.....1
36641-8	Heat exchanger inner tubing 1
36641-9	Hex cap screw, 5/16-18 x 3 1/4.....4
36641-10	Lockwasher, 5/16 4
36641-11	Body.....1
36641-12	O ring 3
36641-13	Heat exch. tube (new design).....1

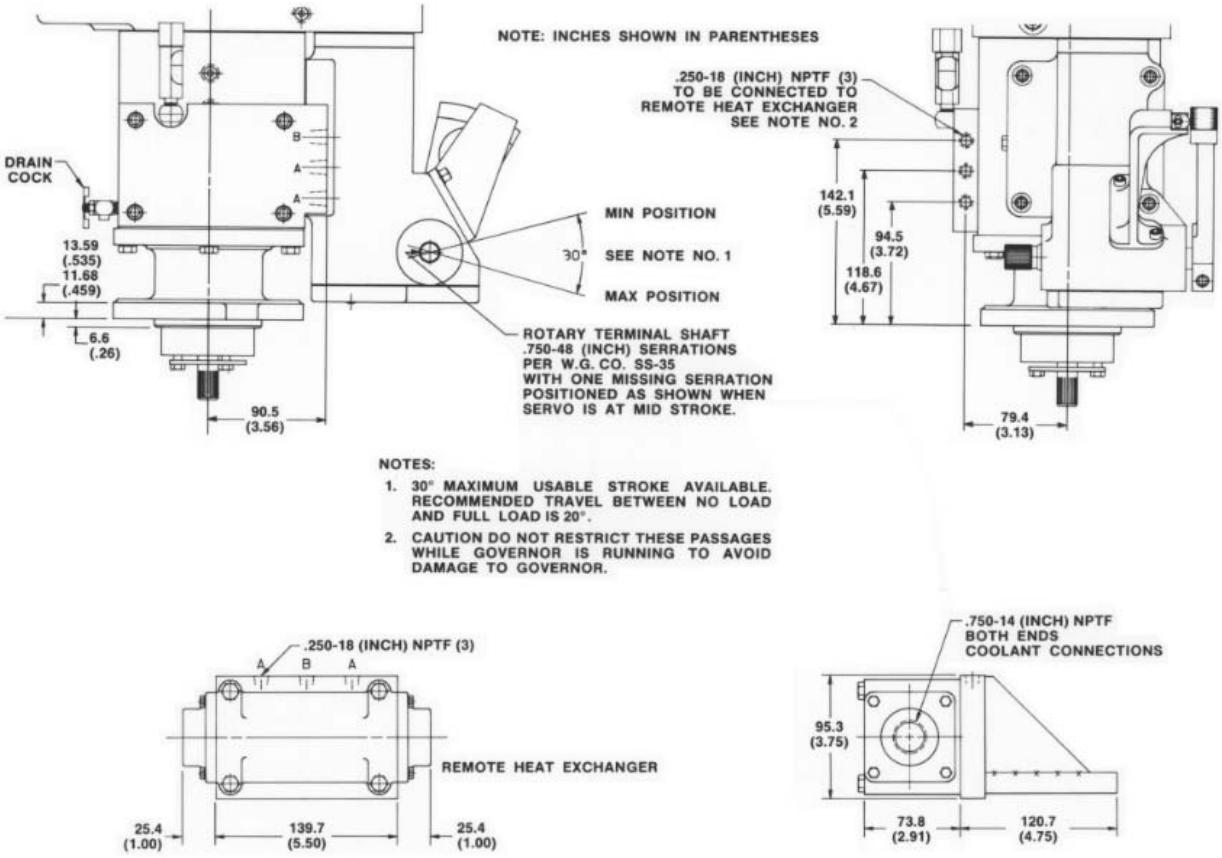

Figure 8. Remote Cooler PG Governor Mounting Plate Detail and Dimensions

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