Released

WOODWARD

Product Manual 55021
(Revision G, 6/2023)
Original Instructions

EG Actuator Tester
Models 8909-041 and 8909-059

Installation and Operation Manual

Released

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. The latest version of most publications is available on the Woodward website.

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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. The latest version of most publications is available on the Woodward website.

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Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

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

Manual 55021

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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.
EG Actuator Tester Operation

The EG Actuator Tester is used to test EG proportional actuators and EG compensated actuators. It is used in conjunction with a magnetic pickup and electronic digital counter on the test stand. See Figure 1-2 for interconnections. In addition, the tester is used to center the pilot-valve plunger to pilot-valve port. Figure 1-1 shows interconnections between the EG Actuator Tester, governor magnetic pickup, and the counter.

The current meter Is connected for reading current supplied to the actuator coil.

Power supply in the EG Actuator Tester is as follows:

- 28 VDC Power Supply (relays)
- ±15 VDC Power Supply (electronics)

EGB Speed Setting

When working with an EGB P or C governor/actuator, the section (mechanical or electrical) with the lowest speed setting will control speed. Set the mechanical governor speed about 5% higher than the electric actuator so the actuator can control speed. This results in the mechanical governor power piston moving to maximum position. EGB systems with droop can exhibit a fuel limiting effect if the mechanical speed is set too close to the electrical speed setting. Should this be suspected, increase the mechanical speed setting to be sure there is not interference.

Specifications

Table 1-1. EG Actuator Tester Specifications

Line Input	115 VAC 50 or 60 Hz
Tachometer Input	3V peak-to-peak minimum sine or square wave
External Voltmeter	Any digital or analog dc voltmeter with minimum impedance of 10 000 Ω/V.
Proportional Actuator Current	0 to 300 mAdc or more
Compensated Actuator Voltage	–10 VDC to +10 VDC
Transducer Centering Current	380 mA total into 35 Ω
Digital Display	190 mA per coil into 17.5 Ω 1% accuracy in either proportional or compensated

IMPORTANT

Transducer centering current will vary with line voltage. (100V centering current will drop to 320 mA.)

NOTICE

Do not leave the transducer output connected to a short circuit. Overheating can damage the actuator.

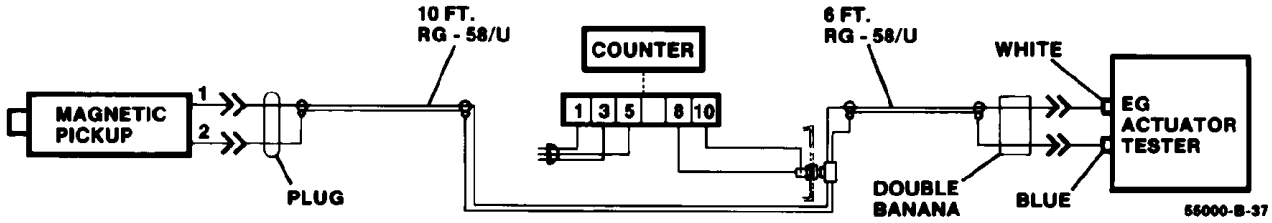


Figure 1-1. Magnetic Pickup Connection for Diesel Governor Test Stands

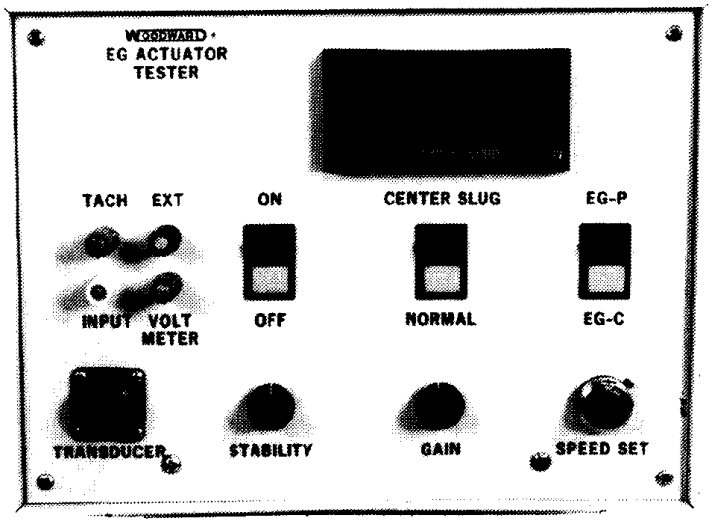


Figure 1-2. EG Actuator Tester Panel

Integrating–Compensating

Many electric controls require an actuator, which operates at a null voltage for steady state conditions. These actuators will increase fuel in response to a positive control signal and decrease fuel in response to a negative control signal. Reverse acting actuators will maximize its fuel in response to a negative control signal. All of these actuators require adjustable compensation to provide stability of operation. Because the Woodward designation of most integrating actuators is shown with a “C,” the term “compensated” is used interchangeably with “integrated” in the discussion of test equipment for actuators. Compensation has been provided in some recent models of proportional actuators, but in every case the P is also included in the designation, as in EG-10PC.

Proportional Mode

Introduction

Proportional actuators respond to control signals which are in direct proportion to the total fuel setting position needed by the actuator. The signals generally range from 20 to 200 mA. Direct acting proportional actuators are at minimum fuel at the 20 mA signal. Reverse acting proportional actuators are at maximum fuel at 20 mA and at minimum fuel at 200 mA control signal.

Setup

The initial setup of switches and adjustments for an EG Proportional Actuator is shown in Table 1-2.

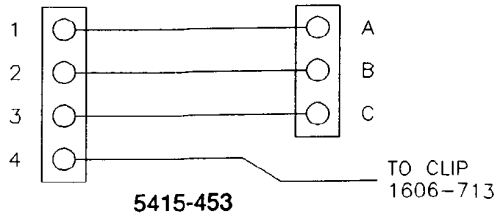
Table 1-2. EG Proportional Actuator Setup of Switches and Adjustments

EG Actuator Tester Switch or Dial	Initial Switch and Dial Settings
Power ON/OFF switch	OFF position
Center/slug normal switch	Normal position
EG-P/EG-C switch	EG-P position
Stability potentiometer	Full clockwise position (315° movement)
Gain potentiometer	Mid position (315° movement)
Speed setting potentiometer for direct acting actuator	At 10-turn position (full counterclockwise position)
Speed setting potentiometer for reverse acting actuator	At 10-turn position (full clockwise position)

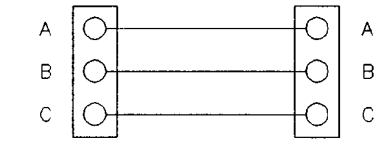
Connection

Select the correct cable assembly from Figure 1-3. Connect the actuator to the actuator tester with the correct cable assembly. Connect the actuator tester to 115 VAC supply and turn power ON.

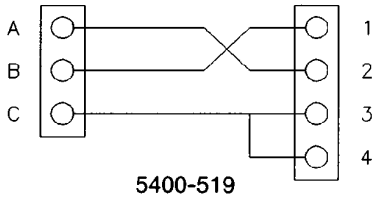
	Cable 5400-523 (10-pin)	Cable 5400-562 (4-pin)	Cable 5400-521 (2-pin)	Cable 5400-560	Cable 5400-519	Cable 5400-515	Cable 5400-531	Cable 5400-518
TO OUTSIDE PLUG ON ACTUATOR								
EGB-2P direct acting			X		X	X		
EGB-2P reverse acting			X		X	X		
EGB-10P direct acting	X				X	X		
EGB-10P reverse acting	X				X	X		
EGB-29 and 58P direct acting	X				X	X		
EGB-29 and 58P reverse acting	X				X	X		
EGB-200P direct acting	X				X	X		
EGB-200P reverse acting	X				X	X		
EGB-2C (two-pin plug)			X	X		X		X
EGB-2C (three-pin plug)							X	X
EGB-10C	X			X		X		X
EGB-29-58C	X			X		X		X
EG-R							X	X
EG compensated							X	X
EG-P		X		X		X		
EG-P compensated		X		X		X		
3199 and most UA (Special Cable 5415-453 is available)				X		X		
3161 EGB				X		X		
PG EG		X		X		X		
TG-13E		X		X		X		
TO INSIDE JONES PLUG								
EGB-2P direct acting				X		X		
EGB-2P reverse acting					X	X		
EGB-10P direct acting				X		X		
EGB-10P reverse acting					X	X		
EGB-29 and 58P direct acting				X		X		
EGB-29 and 58P reverse acting					X	X		
EGB-200P direct acting				X		X		
EGB-200P reverse acting					X	X		
EGB-2C (two pin plug)				X		X		X
EGB-2C (three pin plug)				X		X		X
EGB-10C				X		X		X
EGB-29-58C				X		X		X



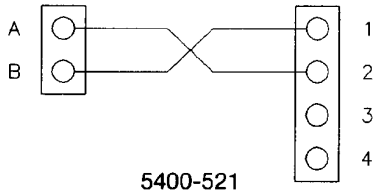
5415-453



5400-515



5400-519



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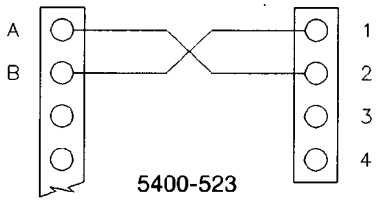

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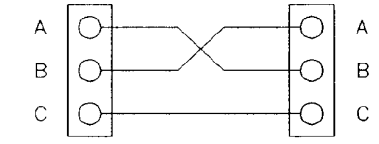
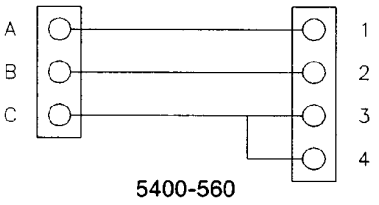
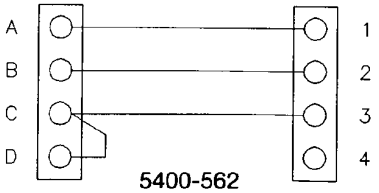


5400-531



5400-560



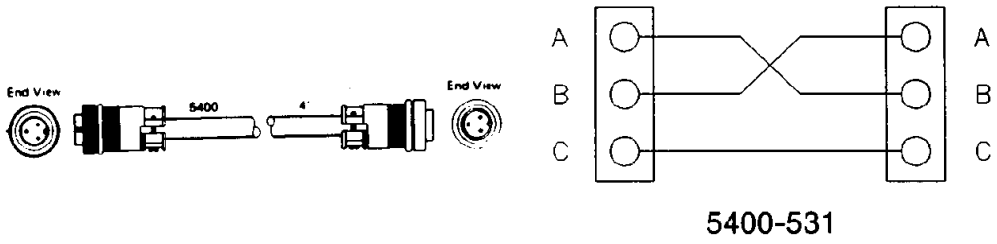
5400-562

Figure 1-3. Cable Assemblies for Connecting EG Actuator Tester to Actuator

Cables

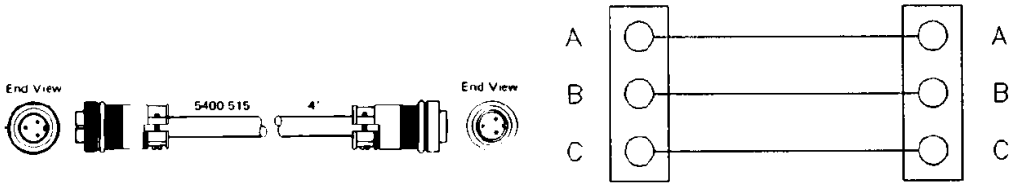
Two 4-foot (1.2 m) cables are used to extend the connection on the test box to the table of the test stand.

5400-531 reverses the 3-pin wiring from the test box to the table but provides the same type of plug as is on the test box.



5400-531

5400-515 provides a direct copy of the plug on the test box at the end of a 4-foot (1.2 m) extension cord.

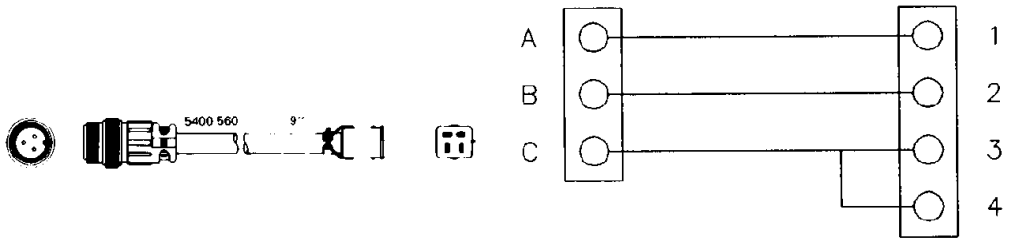


5400-515

Notice that 5400-531 and 5400-515 are identical except for the reversed wiring available from 5400-531.

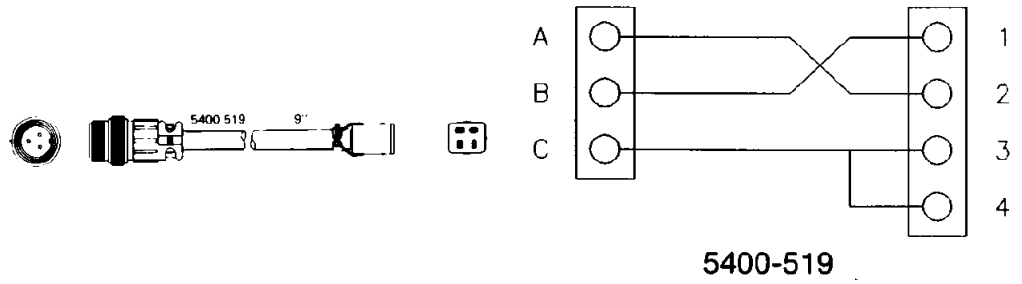
Two interconnected cables, each 9 inches (229 mm) long, connect to the 3-pin plugs on the end of the selected 4-foot (1.2 m) extension cords. The interconnected cables terminate with a Jones plug, which connects to the final actuator cable or to certain actuators after the cover is removed.

5400-560 converts from the 3-pin plug to a Jones plug directly.



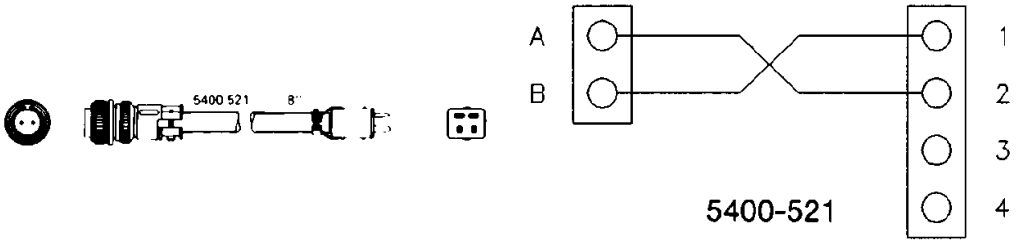
5400-560

5400-519 converts the output of the 3-pin plug on the end of the 4-foot (1.2 m) extension cord to a Jones plug but reverses the location of the positive and negative pins.

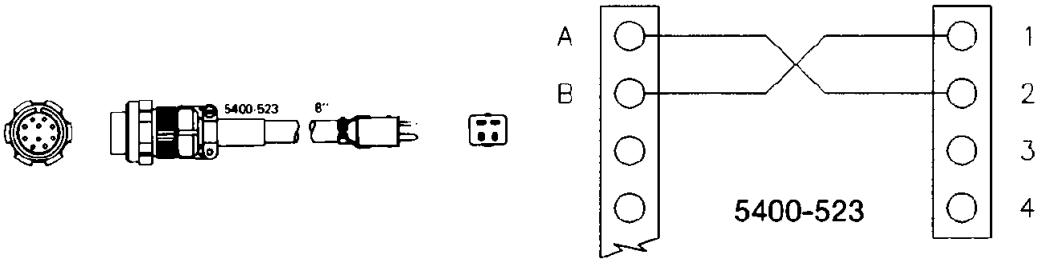


Three 8-inch (203 mm) conversion cords are provided to allow connection between the Jones plug to the various plugs used on actuators. Some of these cords reverse wiring between the Jones plug on one end and the actuator plug on the other end, requiring the proper assembly of the 4-foot (1.2 m) and 9-inch (229 mm) cables to complete the connection.

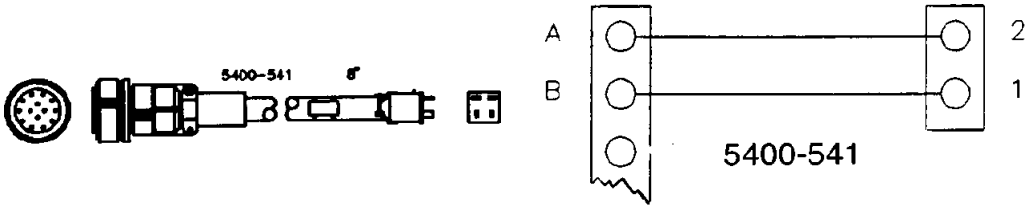
5400-521 Jones plug to 2-pin connection on actuator. Reverses polarity.



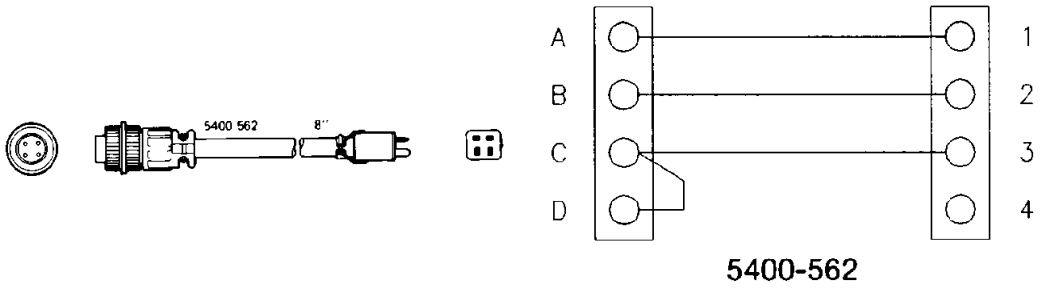
5400-523 Jones plug to 10-pin connector at actuator. Reverses polarity.



5400-541 Jones plug to 14-pin connector at actuator. Direct polarity.

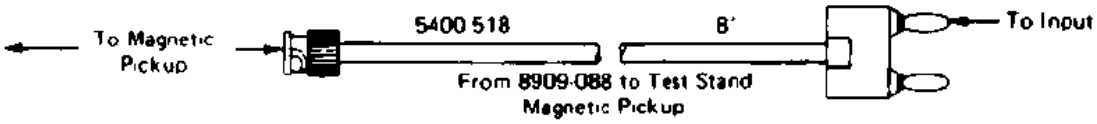


5400-562 Jones plug to 4-pin connector at actuator. Does not reverse polarity.



A special cable is provided to make testing of integrating actuators possible.

5400-518 connects from the test box to the BNC connection on a Woodward electric drive test stand to permit use of the test stand speed feedback with the test box and actuator.



A special cable is available for use with the 3199 actuator.

5415-519 is used between the Jones plug and the actuator plug. A pigtail is provided connecting to the center sap on the actuator coil. This connection is used to center the slug in the coil. Other cables may be constructed to connect to Sure Seal and 10-pin plugs used on some 3199 actuators.

The newer version of the EG Tester, 8909-059, has a new set of cables that allows connection directly from the tester to the actuator/governor without using two or three interconnecting cables. This will help avoid confusion. The operation of the EG Tester itself is identical to the previous version, 8909-041. The cables include attachments to 2-, 3-, 4-, and 10-pin MS connectors, as well as to the Sure Seal connector used on newer Caterpillar applications. There are two cables to connect to the internal Jones plug on the inside of EGB governors. Cables are available for 14-pin connectors, but they are not included in the tester for cost reasons, as they are not standard.

Cables for 8909-059 EG Actuator Tester

Table 1-3. EG Actuator Tester 8909-059 Cables

Actuator Model	Cable Part Number
Cables to Outside Plug on Actuator	
EGB2P direct & reverse acting	5400-543
EGB10P, 29P, 58P, 200P: 10-pin direct & reverse acting	5400-545
EGB10P, 29P, 58P, 200P: 14-pin direct & reverse acting	5400-547*
EGB2C 2-pin plug	5400-557
EGB2C 3-pin plug	5400-531
EGB10C, 29C, 58C 10-pin	5400-559
EGB10C, 29C, 58C 14-pin	5400-561*
EG3P, 10P, 3PC, 10PC	5400-551
EG-P with Sure Seal connector	5400-549
EGR	5400-531
EG3C, 10C	5400-531
UA, UG Actuator, UG40 Actuator	5400-515
PGEG	5400-551
TG-13E	5400-551
Cables to Inside Jones Plug	
EGB2P direct acting	5400-553
EGB2P reverse acting	5400-555
EGB10P, 29P, 58P, 200P direct acting	5400-553
EGB10P, 29P, 58P, 200P reverse acting	5400-555
EGB2C	5400-553
EGB10C, 29C. 58C	5400-553

(*) Available, but not included with tester

Centering and Terminal Shaft Travel

1. Attach protractor to terminal shaft.
2. Insert a 7/64-inch Allen wrench through clearance hole In cover, through hollow center of spring seat adjustment, and engage centering screw (see Figure 1-5).
3. Turn centering screw clockwise until it bottoms GENTLY.
4. Back centering screw out 1 and 1/4 turns for a starting adjustment.
5. Turn power ON/OFF switch ON. Be sure the Speed Adjustment is at 0.
6. Turn spring seat adjustment screw (1/8-inch hex) until actuator terminal shaft is near mid-stroke.
7. Operate Center Slug/Normal switch to “Center Slug” position and observe terminal shaft. Terminal shaft should not move. If it does move, adjust centering screw (7/64-inch hex) until terminal shaft does not move when switching from “Center Slug” to “Normal”.
8. Do not exceed 200 mA after this point.
9. Set Center Slug/Normal switch to “Normal” position and EG-P/EG-C switch to EG-P position.
10. Adjust speed setting potentiometer to milliamp current required at minimum fuel per specifications (typically 20 mA).

11. Turn spring seat adjustment counterclockwise until actuator terminal shaft is at minimum fuel position, then turn the seat clockwise until the shaft moves 2 to 3 degrees from its minimum fuel position towards maximum fuel position.
12. See specifications and adjust potentiometer to milliamp setting for maximum terminal shaft position.
13. Terminal shaft should move to maximum-fuel position.
    - If it does, disconnect actuator tester and oil supply line.
    - If it does not, continue with step 14.
14. Remove cover and move feedback bracket toward the terminal shaft to increase terminal shaft travel and away from the terminal shaft to decrease terminal shaft travel.
15. Repeat the adjustments at minimum and maximum current alternately, until no further adjustment is required at either point and correct degrees of rotation are attained.
16. Replace cover and recheck range.
17. If adjustment is required, adjust spring seat through vent hole in cover. Use a 1/8-inch Allen wrench to make adjustment.
18. Disconnect test circuit and oil supply line. Remove protractor.

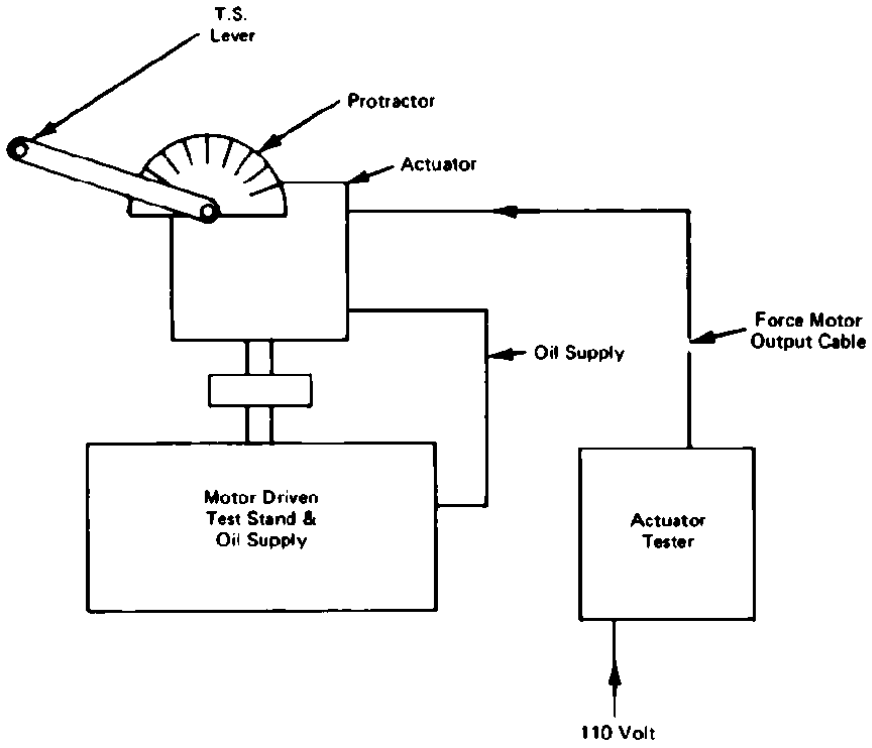


Figure 1-4. Test Hookup for Proportional Actuators

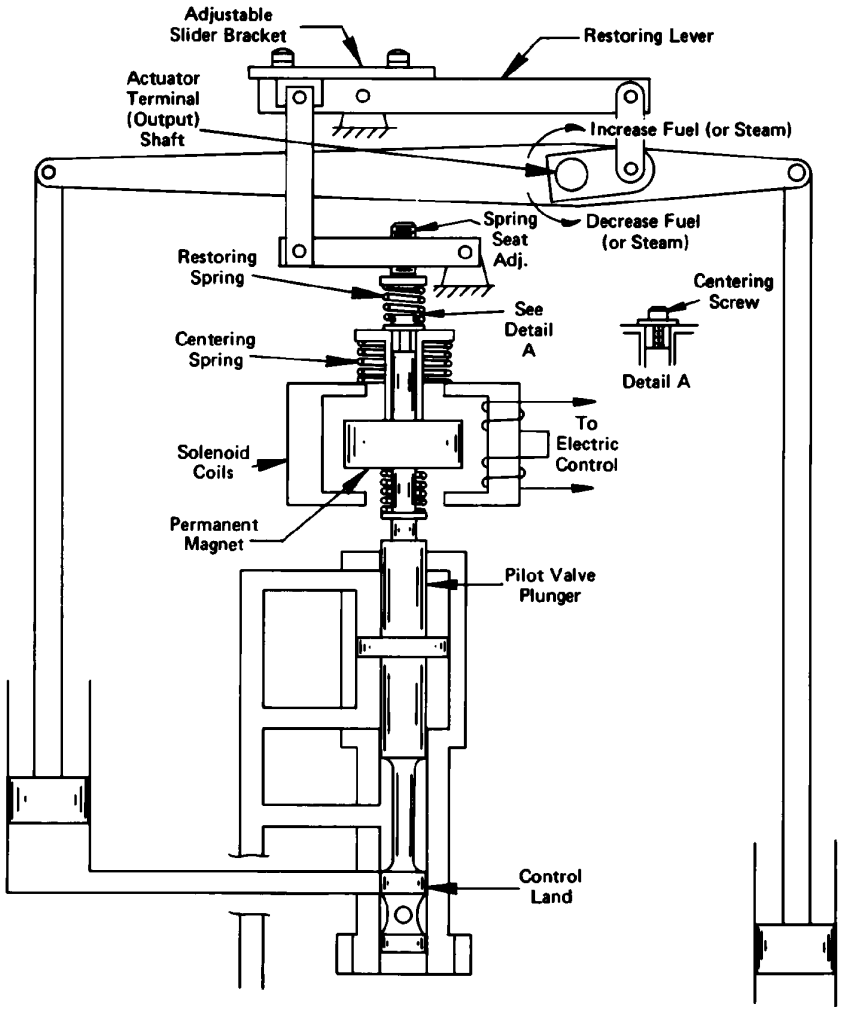


Figure 1-5. Schematic of a Proportional Actuator

Current Supply

- 360 mA non-adjustable when in center slug position.
- 0 to 350 mA in proportional mode. Adjustable with speed adjustment control.

Compensated Mode

General Information

Testing a compensated (integrated) electric actuator or governor/actuator requires a magnetic pickup kit assembly. Testing an EGR actuator requires a remote servomotor mounted on the test stand. Figure 1-6 shows the test hookup for a compensated actuator.

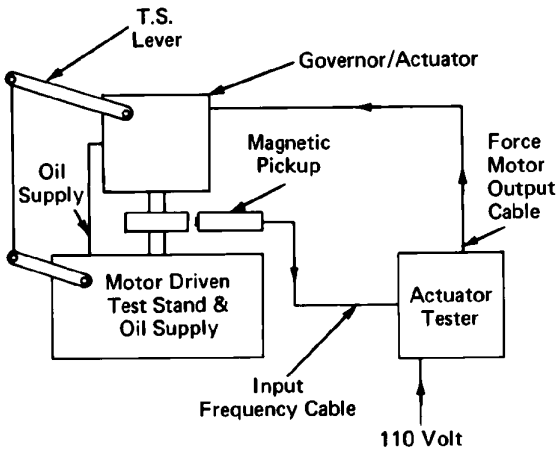


Figure 1-6. Test Hookup for Compensated Actuator

Use the actuator tester to center the pilot-valve plunger control land with the pilot-valve bushing control port (see Figure 1-7). If the centering is not correct, null voltage shifts will occur, resulting in a change of prime mover speed. For a theoretical system, null voltage would be zero volts when the speed signal derived from the prime mover is equal to the speed reference signal. If an electrical failure occurs, the pilot valve will remain centered, and the prime mover will run uncontrolled.

Therefore, Woodward actuators are spring biased at the pilot valve to go to maximum or minimum fuel on loss of control signal, depending on customer requirements, The 1/8-inch Allen screw above the magnet adjusts tension on the biasing (centering) spring. This spring bias results when a small voltage is present, and the system is on speed. The voltage electrically balances the spring bias. A reading of about 1V is normal.

Specifications of a particular actuator can be obtained from Woodward. Be sure you have manuals for the governors being tested.

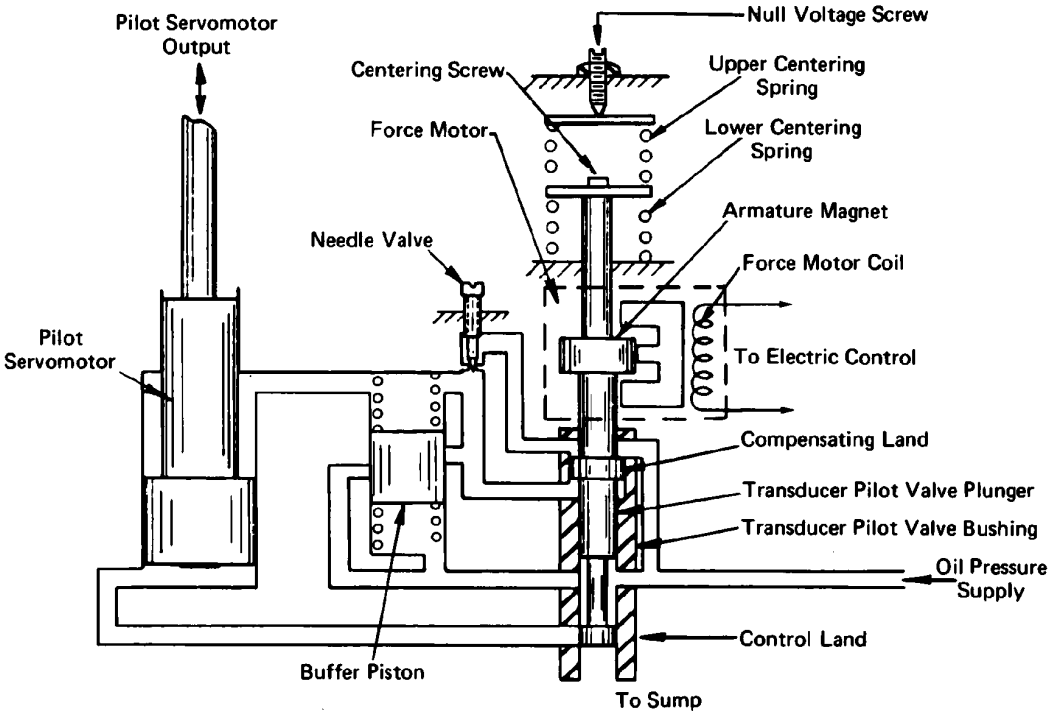


Figure 1-7. Schematic of a Compensated Actuator

Initial Connections

Select the correct cable assembly from Figure 1-3. Connect the actuator to the actuator tester with the correct cable assembly. Connect the actuator tester to 115 VAC supply and turn power ON.

Setup

The initial setup of switches and adjustments for an EG Compensated Actuator is shown in Table 1-4.

Table 1-4. EG Compensated Actuator Setup of Switches and Adjustments

EG Actuator Tester Switch or Dial	Initial Switch and Dial Settings
Power ON/OFF switch	OFF position
Center/slug normal switch	Normal position
EG-P/EG-C switch	EG-C position
Stability potentiometer	Full clockwise position (315° movement)
Gain potentiometer	Mid position (315° movement)
Speed setting potentiometer	At 0-turn position (full counterclockwise position; 10-turn movement)

Centering

1. Install actuator on test stand in same position as it is on prime mover (see Figure 1-6).
2. Insert a 7/64-inch Allen wrench through clearance hole in cover, through hollow center of adjustable spring seat and engage centering screw (see Figure 1-7).
3. GENTLY bottom centering screw, then back out 1 and 1/4 turns for a starting adjustment.
4. Turn power switch to ‘ON” position.
5. Increase speed-setting potentiometer until governor controls test-stand speed.
6. Adjust spring seat (1/8 Inch Allen wrench) until voltage reads approximately zero volts.
7. Tune gain and stability for optimum performance. Turn gain control clockwise as necessary to maintain stable but fast control.
8. Move center slug switch between normal and center-slug position. Note speed at each position.

IMPORTANT

The object is to have the same speed in both switch positions and no change in null voltage. Acceptable limits are 5 rpm difference and 0.2V change in null voltage.

9. Adjust centering screw to eliminate any speed difference between the two switch positions of Center Slug/Normal.
10. If speed increases when switching from Normal to Center Slug, turn centering screw clockwise (counterclockwise for reverse-acting actuators) about 1/8 turn.
11. Adjust null voltage screw clockwise (counterclockwise for reverse-acting actuators) about 1/8 turn to maintain null voltage close to zero volts.
12. Adjust null voltage screw to provide a null voltage of either a positive or negative value of one volt, or per test specification.
    a. For the actuator to go to maximum-fuel position on loss of electrical signal, adjust null-voltage screw to positive one volt.
    b. For the actuator to go to minimum-fuel position on loss of electrical signal, adjust null-voltage screw to negative one volt.

13. Check operation by turning power switch to OFF position on actuator tester and observe direction of terminal-shaft travel.
14. If instability occurs between stand control and actuator tester, reverse jacks of cable assembly 5400-518. This ensures correct grounding to eliminate noise interference.
15. If EGB-10C governor/actuator is equipped with an internal shutdown solenoid or with a two-solenoid speed setting, modify 5400-523 cable assembly at EGB-10C connector end so correct voltages can be applied to these solenoids.
16. Refer to the correct actuator wiring schematic for connections, and to Woodward manual 37729 for adjustment and operation of a two-solenoid speed setting assembly.

Oil Pump and Oil Motor Units

IMPORTANT

Some actuators are driven by the engine and have their own oil pumps. Other actuators use an oil motor or electric motor drive. These types do not require a test stand drive.

Oil Pump Unit

1. Turn on oil supply after mounting unit on test stand.
2. Allow a few minutes for actuator to warm up.
3. Drive actuator at 2000 rpm or at operating speed.

Oil Motor Unit

1. Mount unit on the test stand, turn on oil supply and allow a few minutes for actuator to warm up.
2. Make sure oil motor is operating by observing if splined end of pilot-valve bushing is rotating.

Maintenance, Functional Checks, and Calibration

External Voltmeter

Two jacks, marked EXT-VOLTMETER, are provided for an external analog voltmeter, if analog reading is desired. The reading is the actual dc voltage going to the coil.

Digital Readout

In the EG-C mode, the digital meter shows dc volts to two decimal places.

In the EG-P mode, the digital shows dc current in mA to three digits.

Fuse Replacement

⚠WARNING

HIGH VOLTAGE—Disconnect the power cord from the power source to avoid possibly dangerous electrical shock.

If the lights fail and the box does not function, check the fuse.

Check the fuse by removing the four screws on the back panel and the top cover. The fuse is located on the circuit board and is a 0.5 A fast blow. Littlefuse number 3AG 1/2 A.

Lamp Replacement

To replace a lamp:

1. Grasp sides of lens lightly with pliers and pry left or right. Lens should come off.
2. Remove lamp by pulling straight out on metal tab above or below lamp.
3. Replace with Chicago Miniature lamp, Type 85, 28V.
4. Snap lens back into position.

Setup

1. Connect a power cord to 115 VAC.
2. Connect a function generator between the blue and white jack on the front panel.
3. Set the output of the function generator for a 3 Vrms sine wave at 1kHz ±5Hz.

MODE Check

1. Press ON switch to ON position.
    a. ON switch should light green.
    b. NORMAL switch should light yellow.
2. Press NORMAL switch in the CENTER SLUG position.
    a. Switch should light green.
    b. Release switch to Normal.
3. Press EG-P/EG-C switch in the EG-P position.
    a. Switch should light green.
    b. Digital meter should display 3 digits to represent current mode.
4. Press EG-P/EG-C switch in the EG-C mode.
    a. Switch should light yellow.
    b. Digital meter should display a 3- or 4-digit figure with 2 decimal places to represent voltage mode.

Functional Check

1. Set the GAIN pot to full CCW
2. Set the STABILITY pot to full CW
3. Ensure the EG Actuator Tester is in EG-C mode.
    - Adjust the speed-setting pot from full counterclockwise to full clockwise. The meter reading should vary from 2.75V ±2.00V (CCW) to –12.81V ±2.00V (CW).
4. Connect an external voltmeter to the external voltmeter jacks and set the SPEED pot to full CCW. Reading on external voltmeter should be within 1 percent of digital display (in EG-C mode). Remove external meter.
5. EG-P mode of operation
    - Disconnect the function generator
    - Verify the GAIN pot to full CCW
    - Verify the STABILITY pot to full CW
    - Connect a 35 Ω resistor (30 Ω to 60 Ω will work) to A and B of the transducer connector (see Figure 1-8). Adjustment of speed setting pot should vary the current reading on the digital display from 000 to -300 mA or more (into 35 Ω).
6. Move resistor to C and B of transducer connector. Turn speed setting pot counterclockwise to 0. Press NORMAL switch to center slug. Meter should display 300 mA ±25 mA (at 35 Ω).

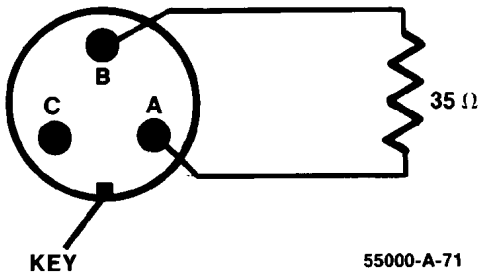


Figure 1-8. Connection of Resistor to Transducer Connector

Calibration

1. Connect a resistive load (35 Ω recommended) and a calibrated dc current meter capable of 350 mA to pins A and B of transducer connector (see Figure 1-9).

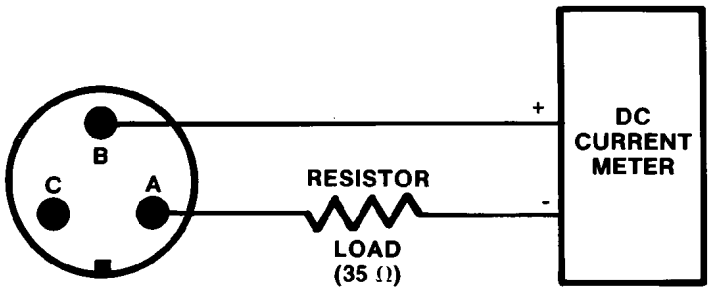


Figure 1-9. Transducer Connected to DC Meter

2. Select EG-P mode of operation. Adjust speed setting pot for -300 mA on a calibrated current meter. Digital display should read -297 mA to -303 mA.
3. If adjustment is necessary, remove four screws on back panel and cover. Adjust P2 until digital display matches the calibrated dc current meter.
4. Remove resistor and dc current meter. Select EG-C mode of operation. Connect a calibrated dc voltmeter to external voltmeter jacks on front panel. Adjust speed setting for –5V on calibrated voltmeter. Digital display should read between –4.95 and –5.05. There is no adjustment for this step.

This completes the calibration of the test-box meter.

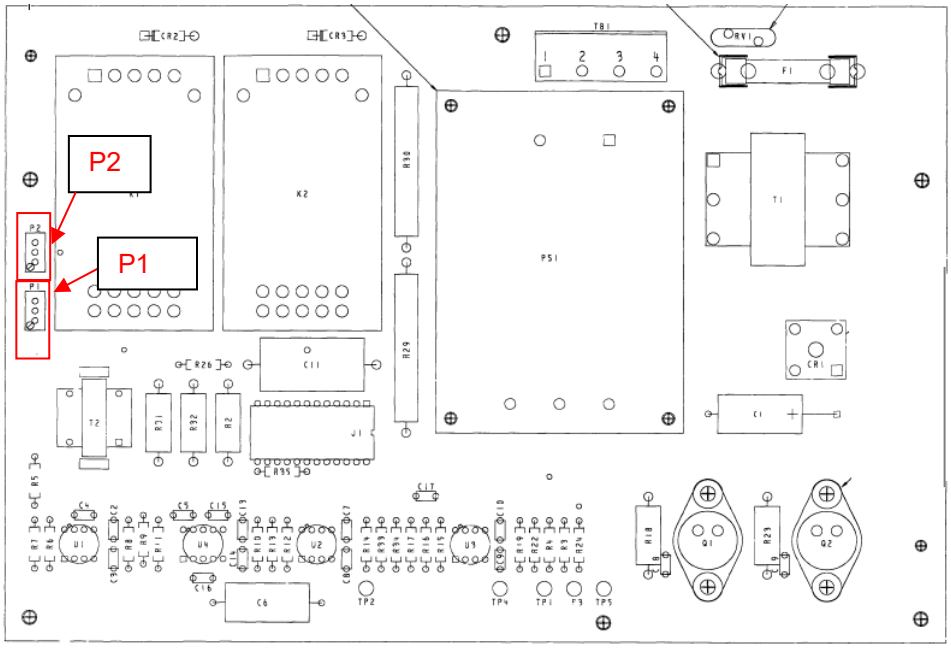


Figure 1-10 Location of P1 and P2

Troubleshooting Guide

1. Make sure EG-P/EG-C switch is in proper position.
2. Check external wiring from transducer connector to governor transducer.
3. Check that speed signal from tachometer is at least 3V peak-to-peak and is a sine or square wave.
4. Remove cover from box by removing four screws in back.
5. Check 1/2 A fuse on board.
6. Check power supply coming into box at terminal strip. It should be 115 VAC ±10 VAC.
7.
   a) Connect a function generator to the Tachometer Input jacks on front panel. Set function generator for 1000 Hz sine wave and 3 Vrms amplitude.
   b) Connect a dc voltmeter from common (black test point) and frequency voltage converter output (brown test point).
   c) Measure 0.437 VDC.
   d) If at 1000 Hz, the brown test point is not 0.437V, adjust P1. Refer to Figure 1-10.
   e) Vary function generator above and below 1000 Hz.
   f) DC voltage should increase and decrease with frequency. If voltage does not vary with frequency, return the unit for repair.
8.
   a) Put test box in EG-C mode. Move positive lead of dc voltmeter to blue test point. Observe a positive or negative dc voltage.
   b) Vary frequency generator. Voltage should increase or decrease. If voltage does not vary with frequency, return the unit for repair.
   c) Vary SPEED SET adjustment. Voltage should increase or decrease. If voltage does not vary, return the unit for repair
   d) Vary GAIN potentiometer. Voltage should increase or decrease. If GAIN has no effect, return the unit for repair.
9. Relay check:
   a) With equipment connected as in step 10, select EG-P mode.
   b) Adjust SPEED SET pot for 5V on blue test point.
   c) Vary frequency at tachometer input. It should have no effect.
   d) If frequency affects voltage in EG-P mode, return the unit to Woodward
   e) If frequency does not affect voltage in EG-C mode, return the unit to Woodward

Chapter 2.
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/local-partner.

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/local-partner

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/support, where you may also find 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) 8818 5515
Germany:	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (32) 422-5551
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) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
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) 8818 5515
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
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 G—

- Under Functional Checks, added two additional steps and revised language in step 5.
- Added negative signs before all numerical values in Calibration section.

Changes in Revision F—

- Added part number 8909-059 to cover page.
- Updated Maintenance, Functional Checks and Calibration to include attachment and setup of function generator.
- Revised Figure 1-10 to show locations of P1 and P2,

Changes in Revision E—

- Updated Performance Check and Troubleshooting Guide to match current test specification (pages 13 & 14).

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Released

We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication **55021**.

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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.