WOODWARD

Product Manual 55008
(Revision NEW)
Original Instructions

Actuator Centering Box

Tool Number 94911

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.

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the *publications page* on the Woodward website:

www.woodward.com/publications

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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*.

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Actuator Centering Box
Tool Number 94911

Introduction

The Woodward centering box is used to center the magnet in the actuator transducer relative to the control land of the pilot valve plunger. When the magnet is centered with respect to the transducer coils, the control land of the pilot valve plunger is also centered with the control port in the pilot valve bushing. This centering box is used to center the proportional type of electric-hydraulic actuator on a test stand. If the proper relationship of the magnet to the pilot valve plunger control land is not correct, the speed of the prime mover may drift and be slow to recover from load changes.

Equipment Provided by Woodward

- Centering Box
- Connector Cable

General Description

The centering box contains all of the parts required for the setting of the pilot valve plunger to the center of the actuator control port. These parts are:

- Digital Current Meter
- Current Supply
- Power Supply for the Centering Box
- Control Switches

The discussion of each part follows with each part shown in Figure 2 or 3.

Digital Current Meter

The digital current meter is connected for reading the current being supplied to the actuator. This meter is auto-ranging and can read a current greater than the maximum current of the current supply. On the low range of the meter, the current is read out to one tenth of a ma and on the high range to one ma.

Current Supply

The current supply on the centering box is a constant current source set up to be controlled by the two adjustments on the front panel and a fixed reference. The current supply is designed to deliver current into the 35 ohm coil resistance of the actuator transducer. The supply consists of the current adjust circuit, current control amplifier and the current driver shown in Figure 2. The supply uses the 115 Vac input and the voltages from the power supply to generate the currents required for setting up an actuator. The fixed reference causes the current supply to deliver 400 mA to the actuator coils when the current select and center normal switches are in the center position.

Power Supply for the Centering Box

The power supply in the centering box receives the 115 Vac input and generates the voltages required by the centering box for operation. These voltages are used by all parts of the centering box for power including the current supply. The centering box is protected from damage by a fuse in the input line rated at 3/4 amp. The fuse is located on the back panel of the centering box.

Control Switches

There are four switches on the front panel of the centering box that control the output current of the centering box. The four switches are the current select, the center normal, the center-open (centering disconnect), and the power ON/OFF. The current select switch determines the adjustment that controls the output current level. When the current select switch is in the LO position, the LO adjustment controls the output current level and when it is in the HI position, the HI adjustment controls the output current level. The center position on the current select switch uses the fixed reference to place the current output level at 400 mA with no external adjustment. The center-normal switch is used to change the wiring connections of the two coils in the actuator. This switch is designed to connect the coils in parallel for centering, and in series for normal operation to the current supply. The center-open or centering current disconnect switch is used to disconnect the current for centering the magnet. This switch is spring loaded to return the center-open switch to the center position.

IMPORTANT

When trying to center an actuator magnet, the center normal switch must be in the center position. The wiring of the switches is designed to prevent centering current from flowing through the actuator coils when they are connected in series.

Output and Input Tolerances

Input Supply Voltage	110 ±15 Vac
HI Current	0 to 410 mA
LO Current	0 to 120 mA
Centering Current	400 mA ±1%
Current Meter	1999 mA maximum
Accuracy	±0.5% ±1 digit

NOTICE

Do not leave the output, set at maximum, connected to a short circuit. Damage from overheating can occur if this condition is prolonged.

Test Procedure

The following test procedure refers to the calibration of an EG proportional type actuator. Other types of actuators, like the EGB proportional types are very similar. In most cases the proper specifications, wiring diagrams, and bulletins if required are obtainable from Woodward Governor Company. A protractor and a terminal shaft movement indicator lever are required for setting up an actuator correctly.

Initial Connections

Connect the cable assembly shown in Figure 5 between the actuator and the centering box panel connector as shown in Figure 4. Connect the centering box to the 115 Vac supply and turn the power switch on.

Initial Set-up

The setup of the switch and adjustments is as follows:

Normal/Center Switch	NORMAL
Current Selector Switch	OFF
HI and LO Current Adjustments	counterclockwise

Centering

Install the actuator on the test stand in the same position as it will be on the prime mover. Insert a 7/64 inch Allen wrench through the clearance hole in the cover, through the hollow center of the adjustable spring seat and engage the centering screw. See Figure 1. Gently bottom the centering screw by adjusting it clockwise and then back it out 1 to 1-1/4 turns for a starting adjustment.

A. Install and secure a protractor and the actuator lever for use as an indicator of terminal shaft rotation. See Figure 4.

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

For an oil pump unit, mount it on the test stand, turn on the oil supply, allow a few minutes for the actuator to warm up to operating temperature, and drive it at 3000 rpm or the operating speed of the actuator.

For an oil motor unit, mount it on the test stand, turn on the oil supply and allow a few minutes for the actuator to warm up. Make certain the oil motor is operating by observing if the splined end of the pilot valve bushing is rotating.

B. Place the Normal/Center switch to the Center position. When the Current Selector switch is in the Center position, the current reading on the meter should be 400 mA.

C. Insert a 1/8 inch Allen wrench through the clearance hole in the cover and engage the adjustable spring seat. Adjust the spring seat to approximately the mid-point of the terminal shaft travel. (Turn the spring seat clockwise to move the terminal shaft in the increase fuel direction.) Note the exact position of the terminal shaft for future reference.

D. Open and close the Center/Open (centering current disconnect) switch and observe the terminal shaft for rotation.

If the terminal shaft remains stationary, when shifting from 0 to 400 mA, the pilot valve plunger is centered and no further centering adjustments are required. If the terminal shaft moves to another position, note the direction of movement and turn the current select switch to the off position.

E. If the terminal shaft moves in the increase fuel direction, turn the centering screw clockwise a small amount. If the terminal shaft movement was in the decrease fuel direction, turn the centering screw counterclockwise. Note the new position of the terminal shaft for reference, if further adjustment is required.

F. Set the current select switch to the center position. Repeat steps D and E until no movement of the terminal shaft occurs when the Center/Open switch is opened and closed.

G. Set the Current Selector switch to the Off position and the Normal/Center switch to the Normal position.

Terminal Shaft Travel

NOTICE

Do not go above the specified maximum actuator current when the Current Selector switch is in the LO or HI positions. This can affect the magnet strength and the operation of the actuator.

A. Set the Normal/Center switch to the Normal position and the Current Selector switch to the LO current position.

B. Set the LO current adjustment for the milliamp current required at minimum fuel per the specifications.

C. Adjust the spring seat adjustment counterclockwise until the actuator terminal shaft is at the minimum fuel position, then turn the spring seat clockwise until the shaft moves the required amount from its minimum fuel position towards the maximum fuel position.

D. Set the Current Selector switch to the HI current position.

E. Set the HI current adjustment for the milliamp current required for the range, per the specifications.

F. The terminal shaft should move to increase fuel. Observe the terminal shaft movement and that it is the required amount. If the shaft has moved the correct amount, turn off and disconnect the centering box and oil supply line, and remove the protractor.

G. If the terminal shaft does not move the correct amount, remove the cover for access to the feedback bracket and pivot pin.

H. Adjust the feedback bracket pivot pin until the right amount of terminal shaft movement is obtained.

IMPORTANT

To increase the terminal shaft travel, move the feedback bracket pivot pin towards the terminal shaft.

I. Repeat the adjustments at the current minimum and maximum levels, until no further adjustment is required at either point.

J. Replace the cover.

K. Recheck the adjustments and, if adjustment is required, repeat the adjustment procedure.

L. Turn off and disconnect the centering box and oil supply line, and remove the protractor.

Drawings

Figure 1 shows the pilot valve bushing and plunger assembly of an actuator.
Figure 2 shows the block schematic diagram of the centering box.
Figure 3 shows the front panel layout of the centering box.
Figure 4 shows the test hookup of the actuator and centering box.
Figure 5 shows the cable for connecting the centering box to the actuator.

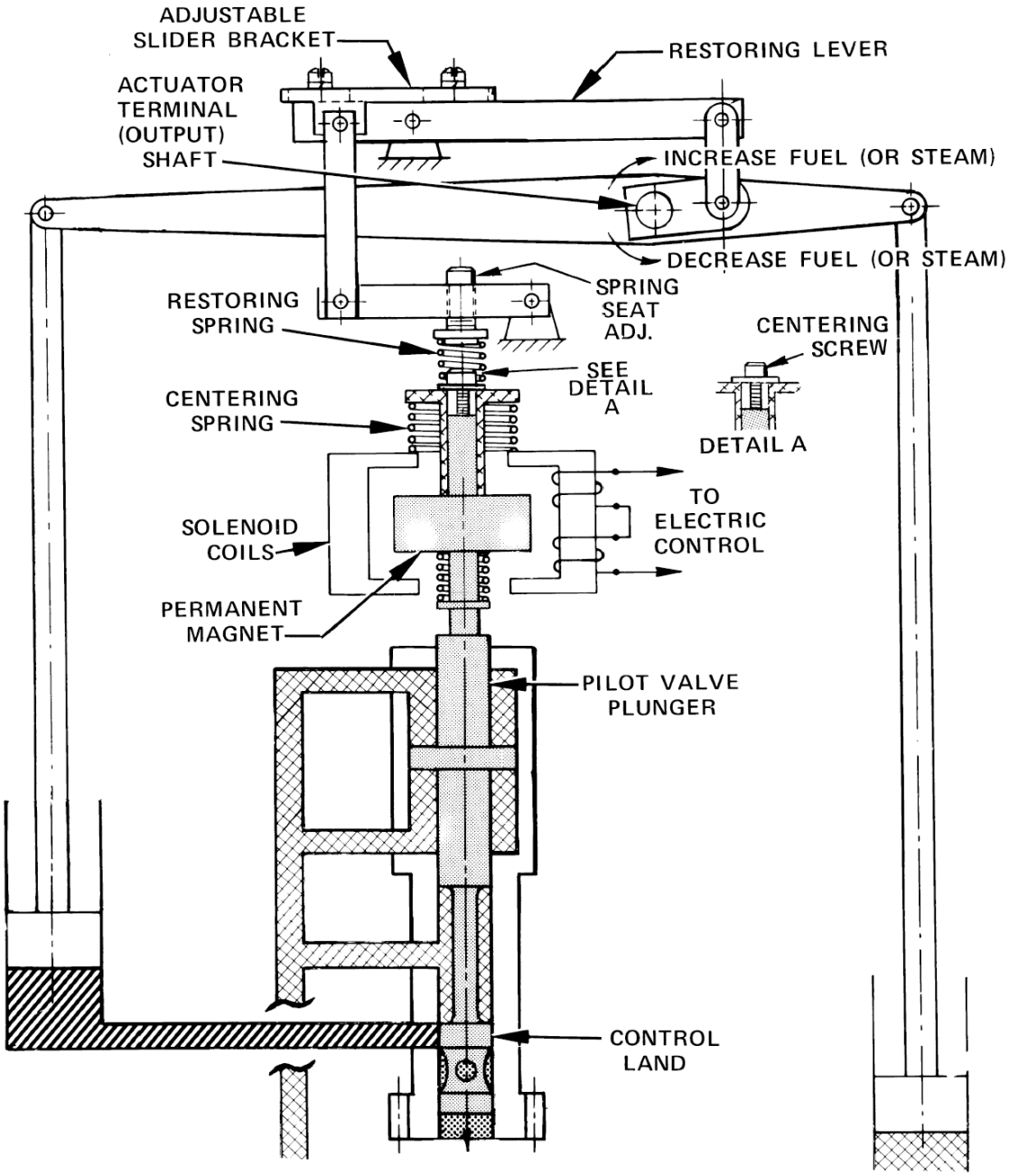

Figure 1. Pilot Valve Bushing and Plunger Assembly

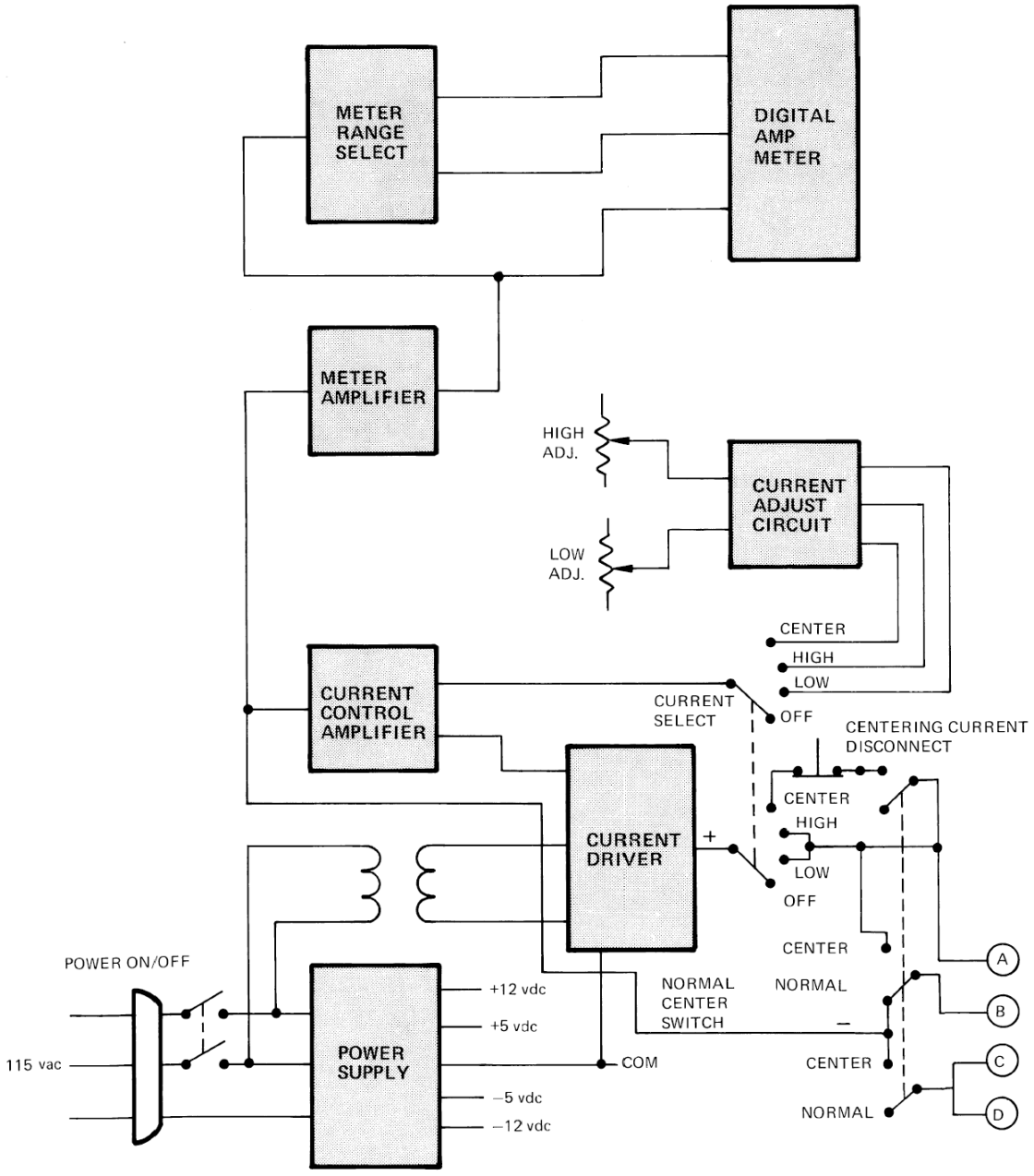

Figure 2. Block Schematic, Centering Box

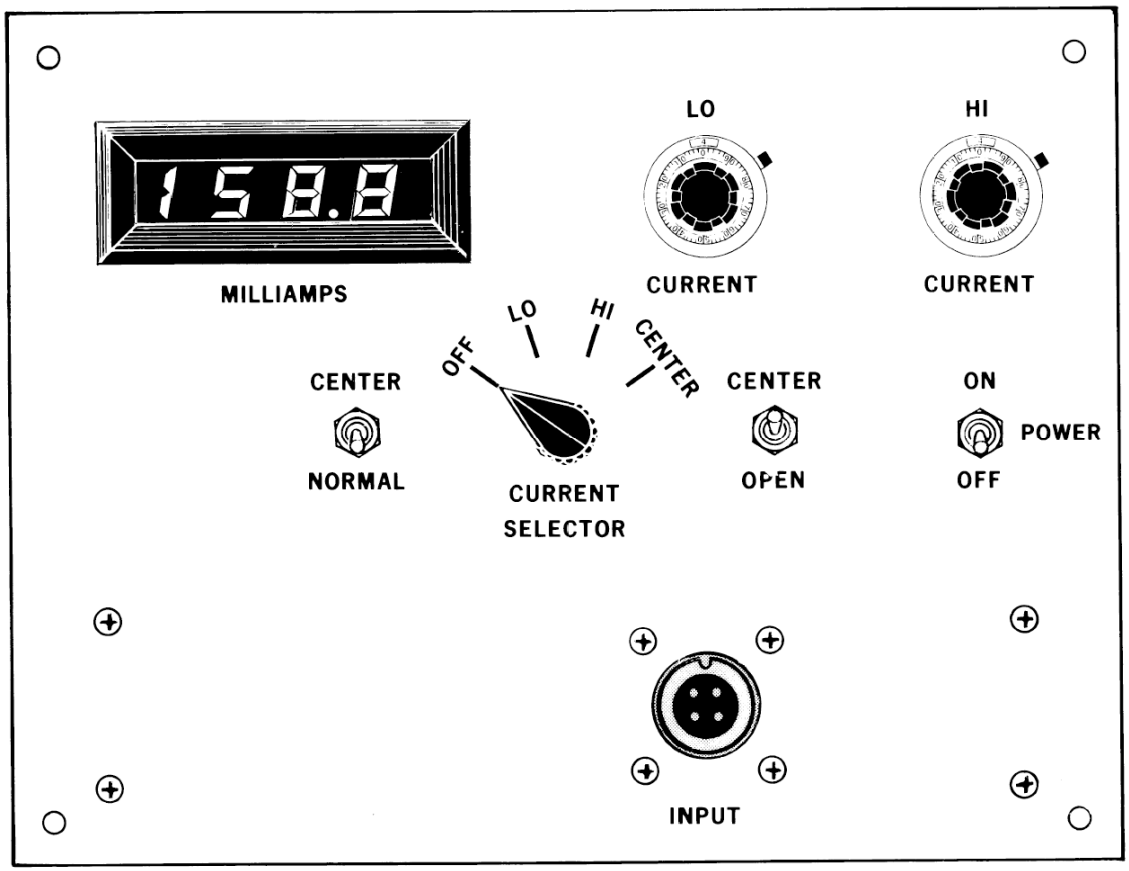

Figure 3. Front Panel Layout, Centering Box

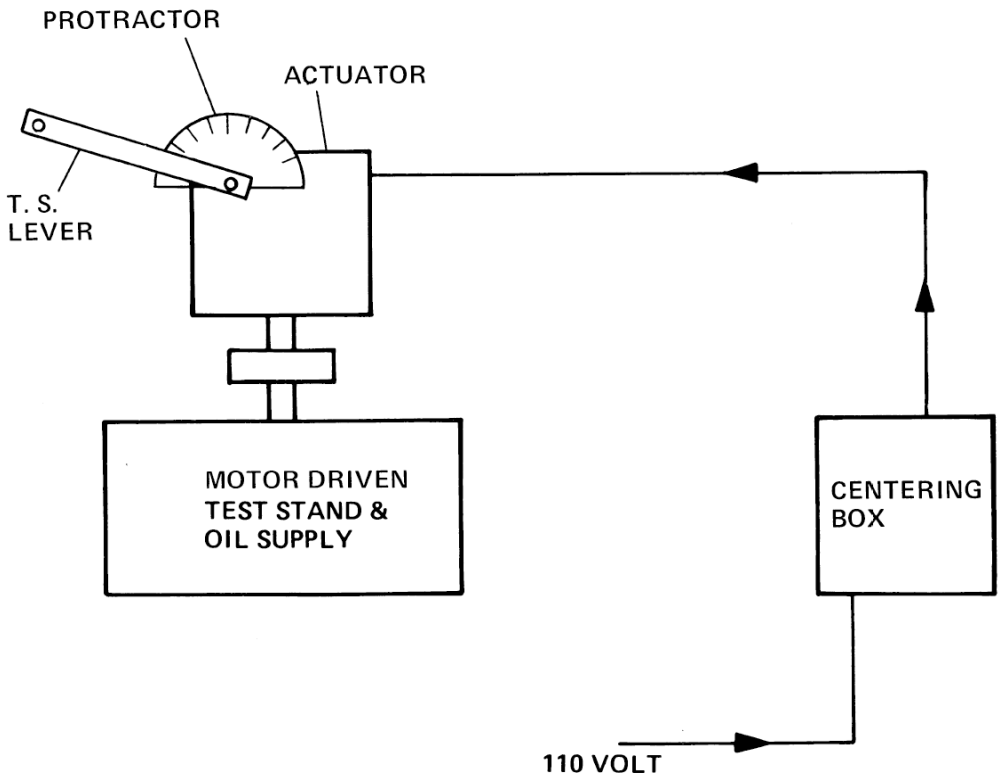

Figure 4. Test Hookup

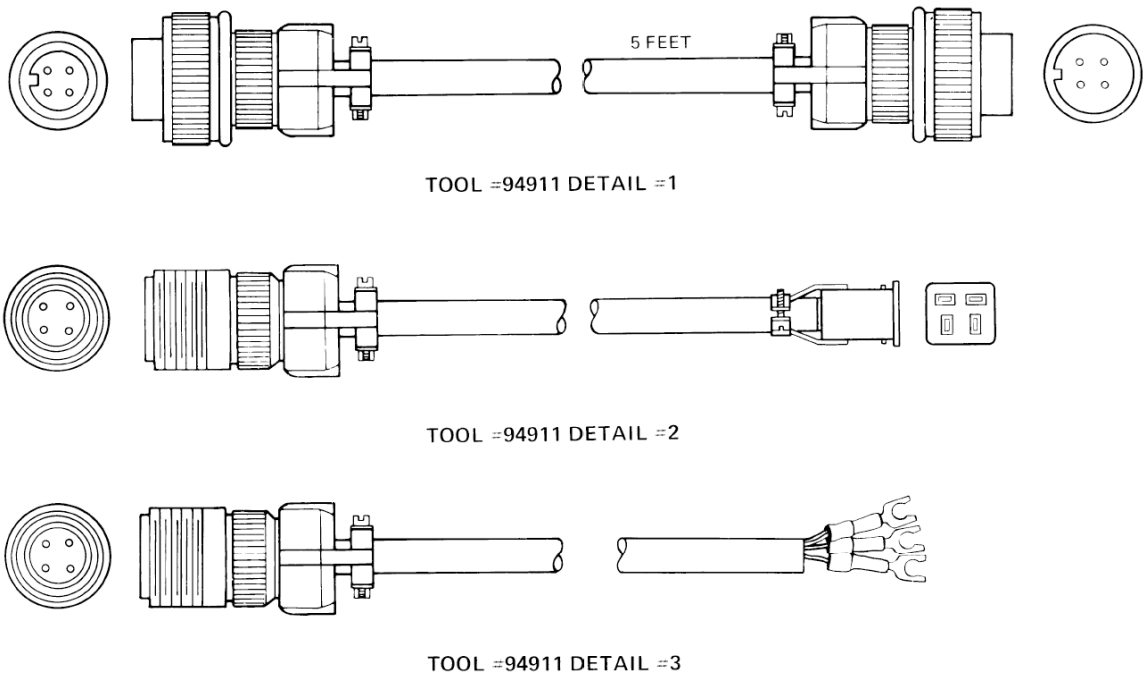

Figure 5. Cable for Connecting the Centering Box to the Actuator

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Send comments to: icinfo@woodward.com

Please reference publication 55008.

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