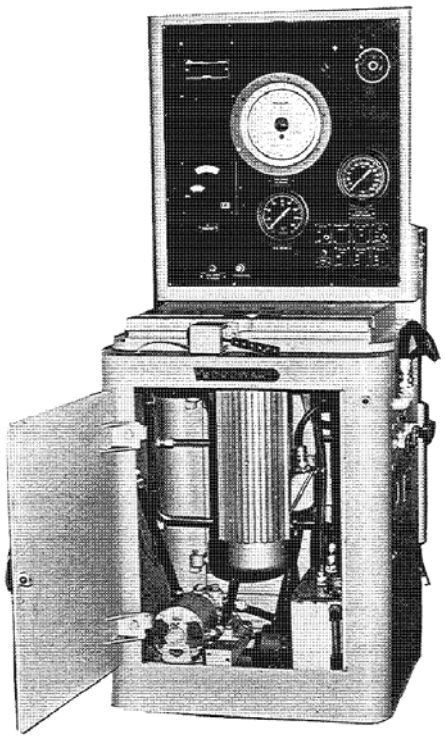
WOODWARD

Product Manual 25801
(Revision B)
Original Instructions



Test Stand Conversion Kit
Air to Electric Drive

8959-045 and 8959-061

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*.

Revisions—Text changes are indicated by a black line alongside the text.

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Illustrations and Tables

Chapter 1.
General Information

Time Required

The mechanical conversion of the air stand to an electric-drive stand should require about eight hours after the tools have been assembled. The electrical installation and the testing of the converted test stand should take about four hours. The length of time required will depend upon the skill and experience of the installer.

Tools Required

The mechanical installation will require a normal set of shop wrenches and screw drivers. A large breaker bar and attached 15/16 socket, a 1/2-inch electric drill, drills and reamers to provide a 1/2-inch hole (two inches deep into cast iron), a scissors jack or other low-profile jack capable of handling a few hundred pounds, a 3/8-diameter drill, 1/2-inch conduit-knockout punch or a 7/8 drill or hole saw, a 1/4-inch drill and a .001-test indicator with attaching hardware.

Skills Required

The installation of the drive kit will require extensive, but non-technical, mechanical skills. No machining is required and a competent, mechanically oriented person should be able to complete the installation. Familiarity with the existing air-driven stand should make the work go more smoothly.

An electrician with the ability to read the schematic enclosed with these instructions should provide the electrical connections and the wiring which will be required to make the test stand operational.

Contents of the Kit

The 8959-045 and 8959-061 kits include the parts needed to convert the test stand from air to electric. Parts of the existing test stand are utilized in the conversion. Exercise care to keep all parts removed for possible use during the conversion of the stand. (See Figures 6-1, 6-2, and 6-3 for parts included in kit.)

Preparation of the Stand

Use the stand's pump to drain the reservoir of oil. If there is an oil contamination problem and sludge in the bottom of reservoir, this should be corrected while the conversion is in process. Arrange the stand so there is adequate work area both in front and behind, If necessary empty the stand of oil, then remove the electric and air supplies and relocate the stand. Make sure the plumbing inside the stand is clean, as this can make it easier to convert the stand.

⚠WARNING

HIGH VOLTAGE—Disconnect the supply of electricity to the test stand. Remove the supply of pressure air to the test stand. Do not work on the test stand while either the electrical supply or the air supply is connected.

IMPORTANT

Stands converted with 8959-061 kits will have a different feedback and will have an additional operator control panel mounted on the side of the stand.

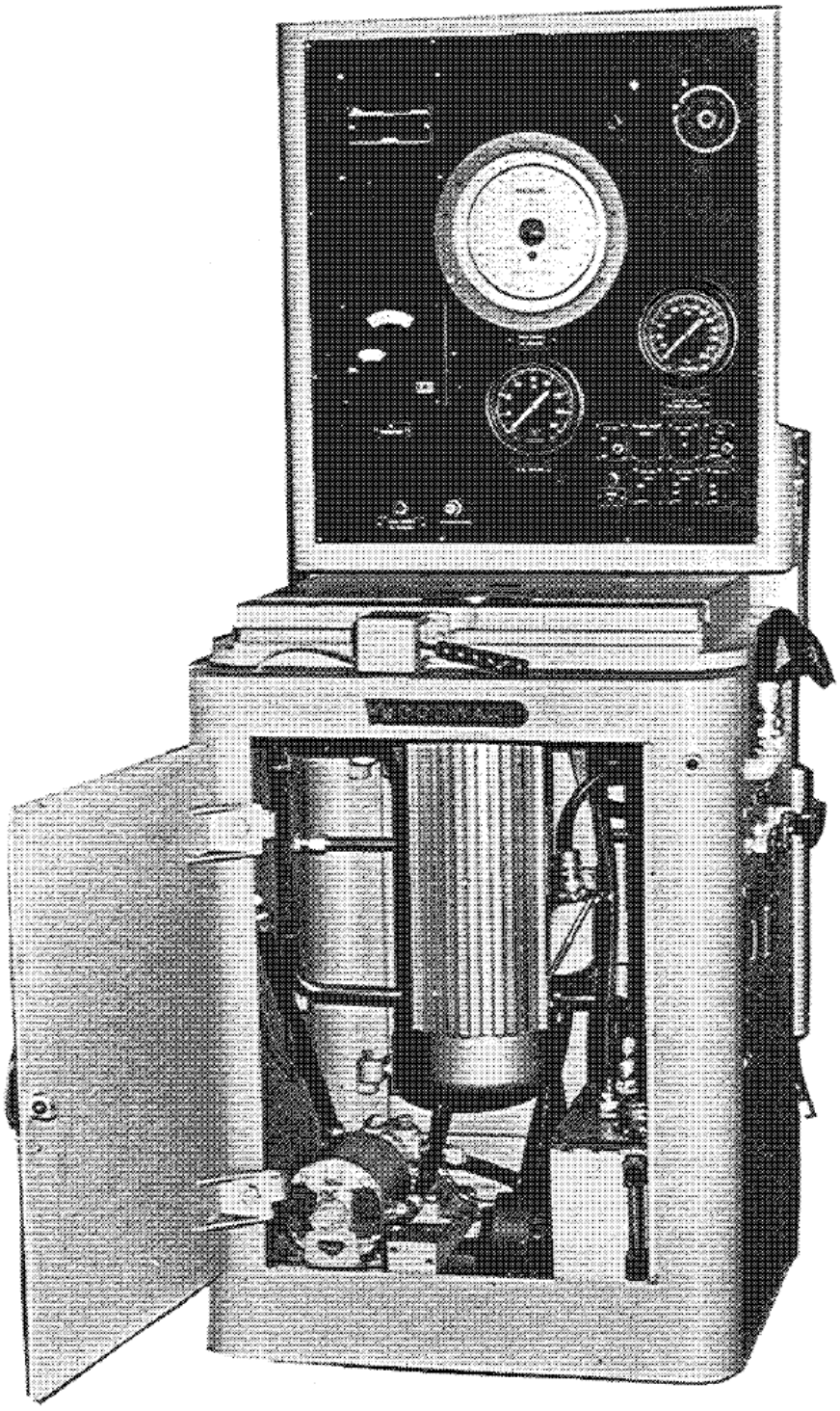

Figure 1-1. Air Stand After Conversion with 8959-045

Chapter 2.
Disassembly of the Stand

Air Supply

Remove the incoming air line and cap the “T” connector to remove pressure-air supply from the motor-drive area in the base of the test stand. Leave pressure-air supply to the gauges and auxiliary devices on the test stand.

Remove the air filter and lubricator. Remove the air valve and the control to which the feedback wire attaches. Remove the four-way valve from the right side of the test-stand base. Remove the air lines which attach to the air motor.

Oil Plumbing

Remove oil plumbing as necessary to gain easy access to the drive motor. Provide protection for the oil-temperature-sensing line which accompanies the plumbing in the base. Care must be taken not to break or restrict this line while working on the conversion. Removal of the sensing unit is not necessary. Remove the front heater from the oil reservoir. (The reservoir must be empty before the heater is removed.) (The stand can be converted without removing the heater, but the work is easier if the heater is removed.) To remove the heater remove the red cover and the wiring to the heater. The heater will thread out of the reservoir with an 1.750 open-end wrench. The heater may have been inserted with pipe sealant and considerable torque may be needed to free it from the reservoir. Remove the single screw which holds the electrical junction box on the back of the angle plate.

Remove the Air Motor

With the air motor in about the center of its vertical travel remove the bolts which attach the motor and gear box to the shaft and flywheel assembly. None of these parts will be reused.

Remove the Flywheel Assembly

Run the flywheel assembly to the bottom of its travel. Loosen the set screw in the collar of the motor-height-adjustment screw. Remove the height-adjustment screw. Remove the wires from the speed-sensing units on the flywheel assembly. (Remove the wires completely, disconnecting in the control cabinet as well as at the flywheel assembly.) Pull the cotter key that holds the brake assembly at the flywheel and remove the brake and brake rod. Pull the brake handle and attached cable from the front of the stand. The brake will not be needed with an electric drive. Remove the nuts from the two air-motor-bracket studs and remove the flywheel-assembly bracket from the angle plate.

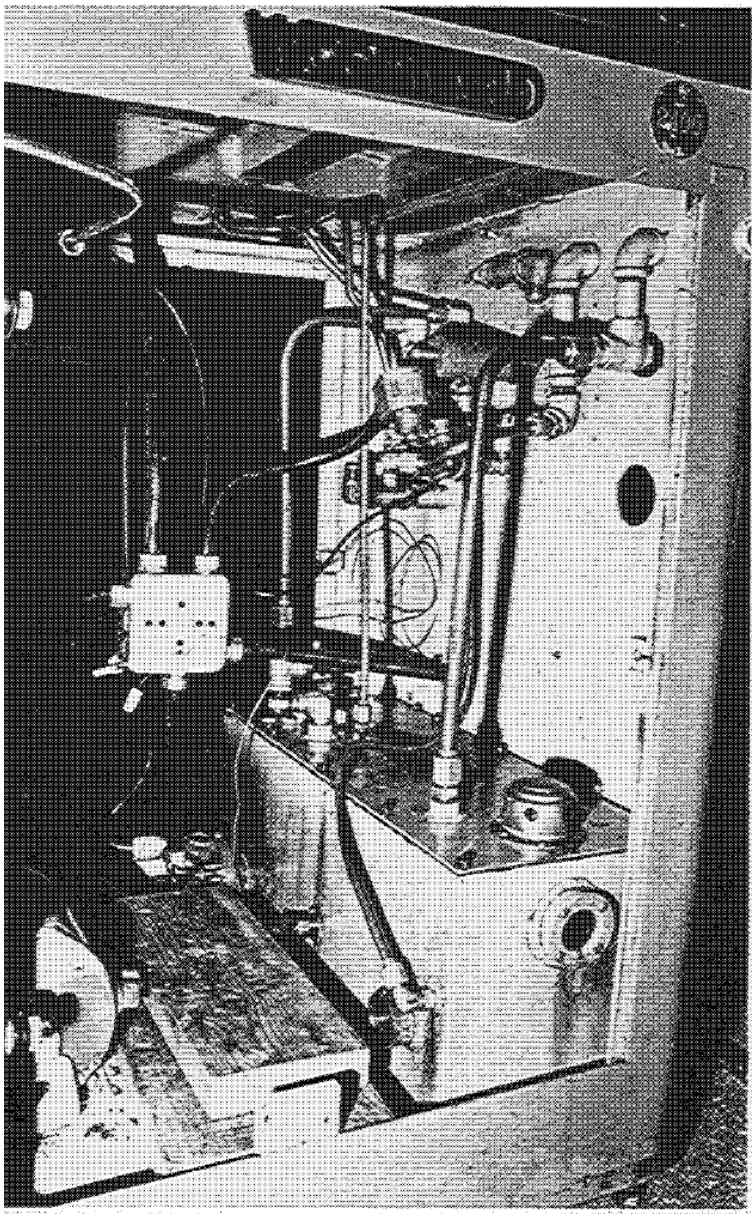

Figure 2-1. Stand with Angle Plate Removed

Remove the Angle Plate

Remove the angle plate from the bottom of the table by removing the four 5/8-11 hex head bolts. Use the 15/16 socket and breaker bar to loosen the screws. Use the scissors jack under the angle plate to prevent dropping the heavy iron and damaging other parts of the test stand. The angle plate has been pinned in place. After taking it off of the table, drive out the two locating pins. (The angle plate must be relocated to adapt to the electric drive. The only reason for removal is to drive out the two locating pins.)

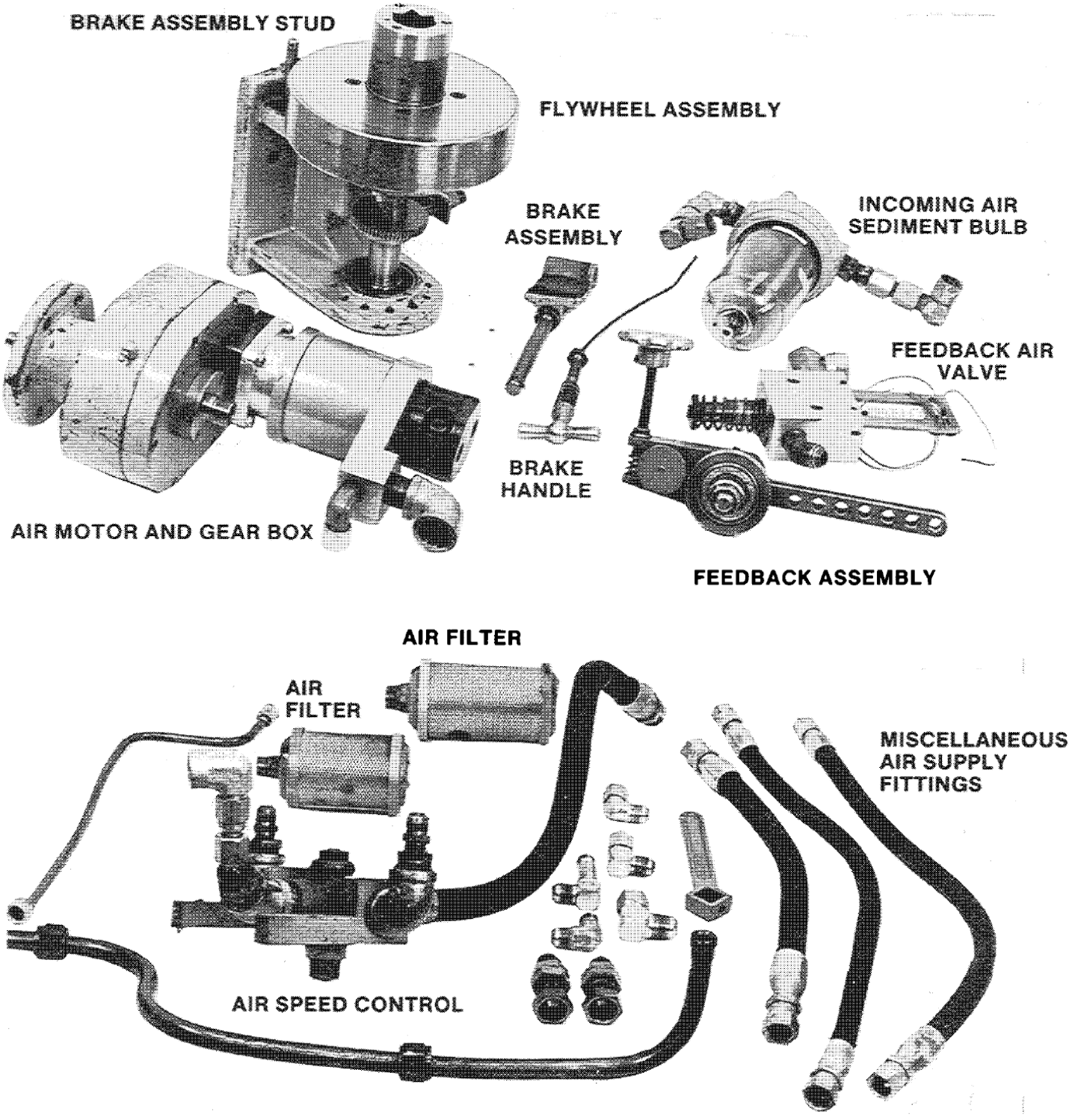

Figure 2-2. Items Removed from the Air Test Stand

Chapter 3.
Install the Electric Drive

Replace the Angle Plate

Drill two new 0.375 or 0.438 inch holes through the mounting flange of the angle plate similar to the 0.500 inch holes which held the locating pins. Stone the mounting surface of the angle plate and test-stand table to assure a smooth surface. Install the angle plate back on the bottom of the test-stand table with the four 5/8-11 hex head bolts. Attach snugly, not tightly. The vertical position of the angle plate in relation with the top surface of the table is important and must be maintained. Be sure the mounting surfaces are smooth and clean.

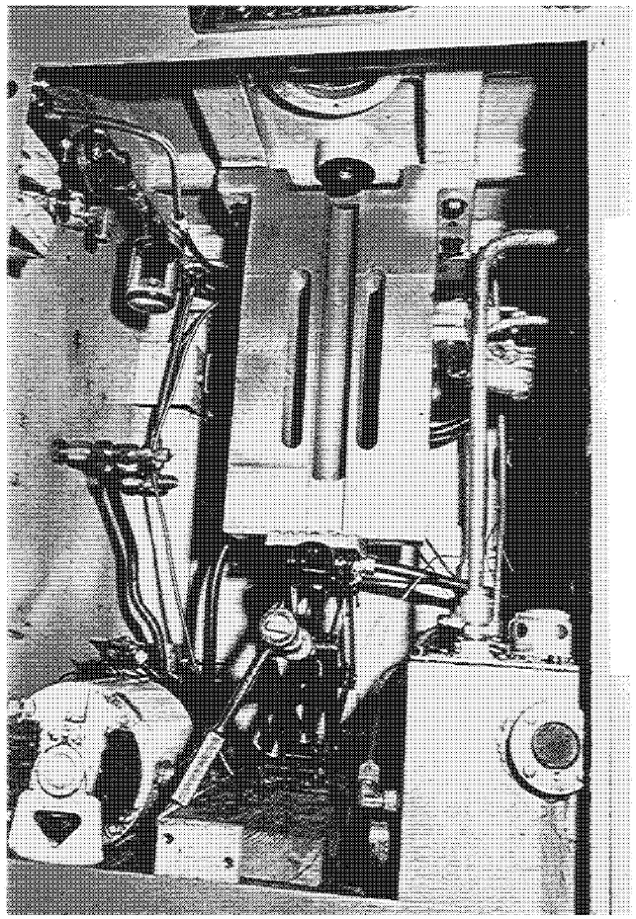

Figure 3-1. Angle Plate Replaced

Install the New Motor Support

Anchor the two 4.875 long 5/8-11 studs in the Motor Support Mount with 271 Loctite or equivalent. Attach the new motor-support mount to the angle plate using the nuts taken from the old motor support. Replace the height-adjusting screw, tighten the set screw in the collar. Run the new motor support up and down to check for freedom of travel. Leave at the top of the travel.

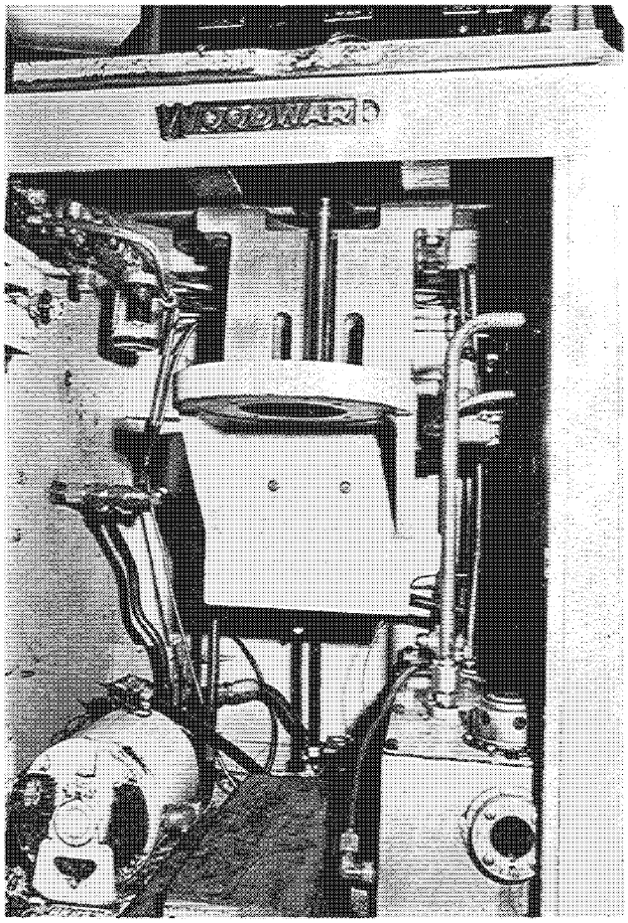

Figure 3-2. Motor Support Mount

Install the New Drive Motor

Locate the new electric drive motor under the bracket with the gray gasket placed between the motor and the bracket. Do not use gasket cement, the fit will be sufficient to prevent oil leakage. Attach with the four 3/8-16 x 1 1/2 bolts supplied with the kit. Use the jack to aid in locating the motor under the bracket. Use the height-adjusting screw to lower the bracket down onto the motor. Torque the four bolts carefully to have the motor hang from the bracket as straight as possible.

Install the Magnetic Pickup

Attach the adapter drive to the motor-drive shaft with the key in place. (The adapter-drive gear goes down, toward the motor.) Tighten the set screw in the adapter drive down on the key. Attach the magnetic-pickup bracket to the motor bracket with the right-rear bolt as seen from the front of the test stand. Align the bracket so the magnetic pickup will be perpendicular to the gear face when the pickup is installed in the 5/8-16 threaded hole in the bracket. (This perpendicular location is necessary to have the tachometer read accurately in both directions.) Re-torque the bolt holding the magnetic pickup bracket. Attach the magnetic pickup to the bracket and locate 0.005 inch from the highpoint of the gear in rotation. Tighten the jam nut on the magnetic pickup assembly.

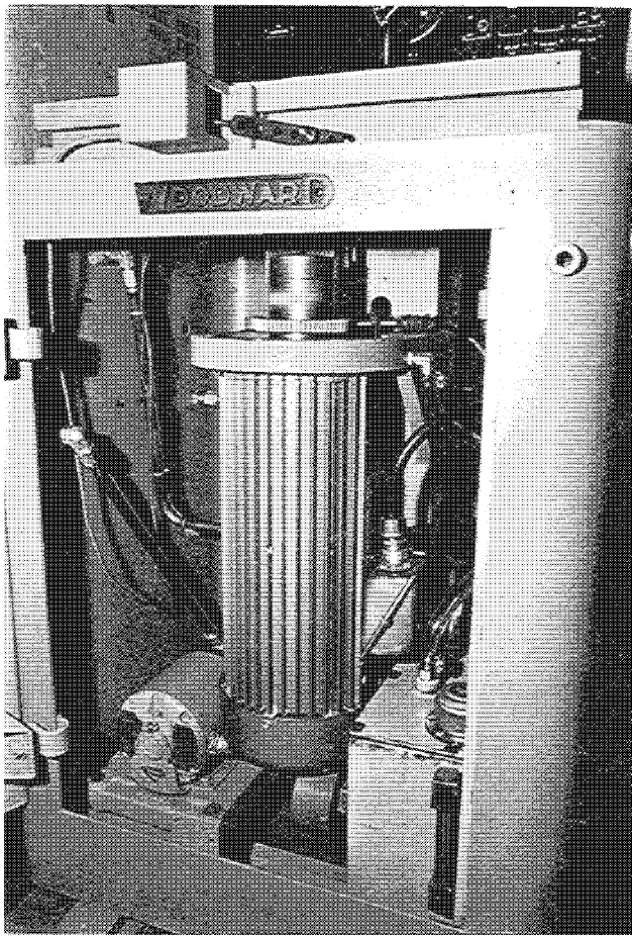

Figure 3-3. Drive Motor Installed

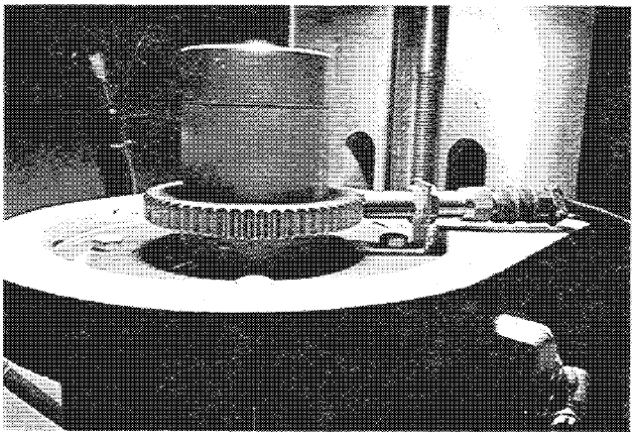

Figure 3-4. Magnetic Pickup Installed

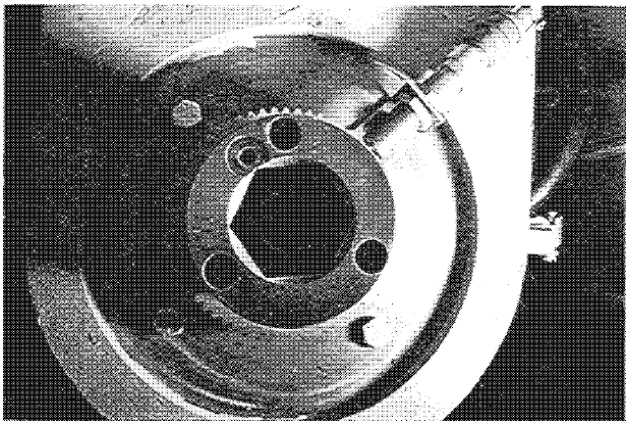

Figure 3-5. Magnetic Pickup Viewed from Above

Check the Angle Plate Installation

The vertical axis location of the motor should remain stable while the motor is raised and lowered through its travel. The accuracy should be within 0.010 inch over several inches of motor travel. Travel should be as accurate as it was with the air-motor drive. If correction is needed it is probably because the angle-plate mounting surface was nicked or distorted by dirt while removed to take out the dowels. This surface should be carefully inspected before resorting to shims to correct distortions.

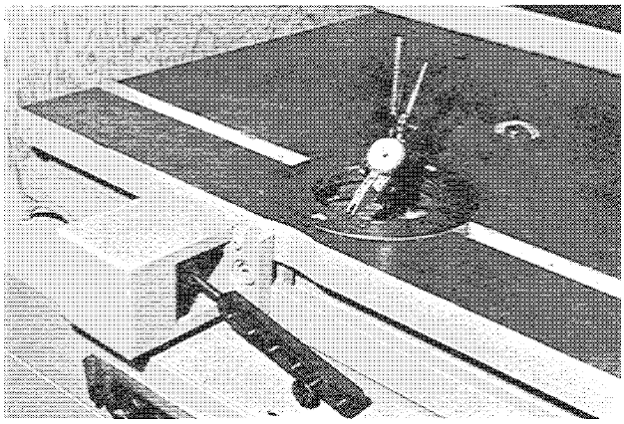

Figure 3-6. Indicator Checking Concentricity
(Kits use a different feedback than shown)

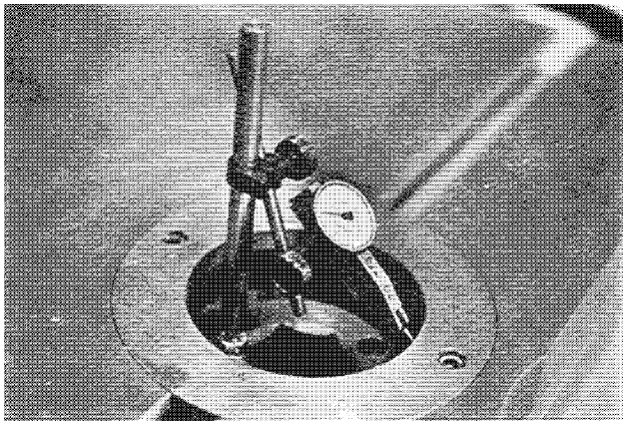

Figure 3-7. Indicator Attached to Drive Adapter

Center the Drive Motor

Run the motor to the top of its travel and then back off about 1/2 turn. Tighten the two bolts which attach the motor bracket to the angle plate.

Attach the indicator to the adapter drive. Tap the angle plate to center the adapter drive with the inside diameter of the governor-mounting ring in the table within 0.005 total indicator reading. Torque the four bolts which attach the angle plate to 150 lb-ft or more. Make sure the concentricity of the drive adapter to the governor-mounting ring is still true.

Pin Angle Plate in Place
(Recommended)

When the concentricity is satisfactory install half-inch steel dowel pins through the angle plate into the base to assure that the angle plate does not move during use of the test stand. (Recommended.)

Suggested Method to Pin Angle Plate to the Table—While the angle plate was off the table, new 0.375 or 0.438 inch holes were drilled through the portion of the angle plate which bolts onto the table. After the plate has been relocated and the drive indicated in, torque in place to prevent movement while pinning. Then, using the predrilled holes as pilots and using the same size drill, make two holes in the bottom side of the table 0.750 to 1.000 inch deep. Follow with drills and reamers until the hole is about 0.485 inch diameter. Check concentricity to make sure the angle plate has not been moved. Ream the holes with a 0.499–0.4995 inch reamer and check concentricity. Drive lubricated dowel pins (supplied) into place. Loctite can be used to hold pins in place, if desired.

Check the concentricity of the drive again to be sure it is within the 0.005 tolerance. Check the elevation screw operation to be sure it does not bind. Run the motor down two to three inches and check concentricity again. If the angle plate is properly mounted the concentricity should be nearly as good when the motor is lowered as it was when the motor is at the top of its travel.

IMPORTANT

The pinning of the angle plate is to ensure that the plate does not move, not to permit removal and replacement in the future, since it should never be necessary to remove the angle plate again.

Complete the Base

Replace the oil plumbing and wiring to the heaters. Remove all of the feedback mechanism from the table of the test stand. Remove the tachometer and the related wiring from the control panel. Leave the power wires to the bottom of the tachometer in place, but removed from the tachometer. Add the new drain line from the top of the electric motor bracket. The drain will go to a newly installed tee in an existing drain line. The new drain hose and the tee are supplied with the conversion kit. Replace the electrical junction box on the angle plate. Replace the oil heater if it was removed.

Chapter 4.
Electrical Installations

Install Feedback
(8959-045 only)

Install the new feedback potentiometer on the front of the test-stand table. Drill a 3/8 diameter hole through the sheet metal of the stand on the left-front horizontal surface of the test-stand cabinet. Install the rubber grommet in the hole and run the feedback wire into the base and up into the control panel.

Leave enough extra wire to allow locating the magnetic feedback pot with the 5439-611 kit anywhere needed on the test-stand table.

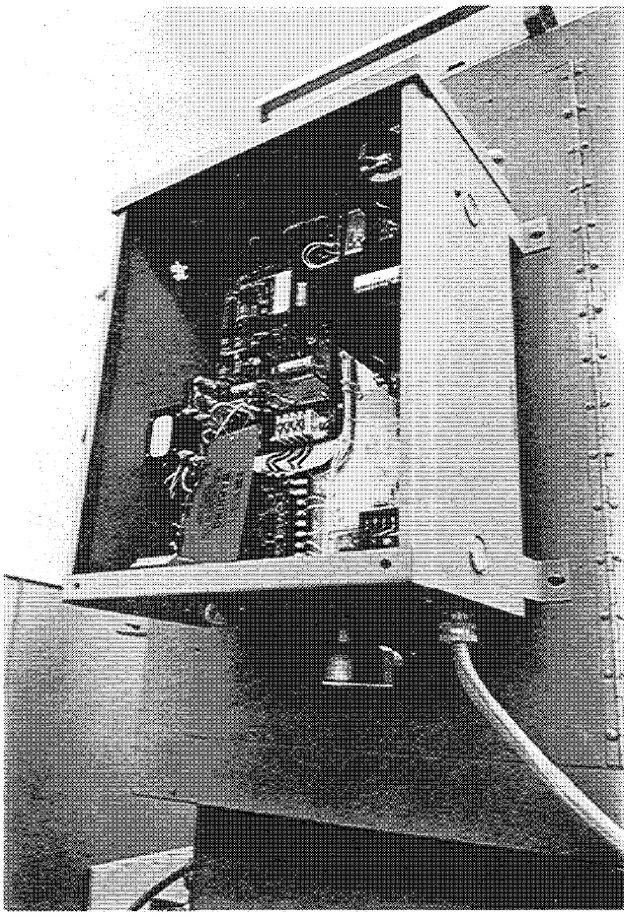

Figure 4-1. Control Box Installed on Panel Door

Attach New Control Box
(Both 8959-045 and 8959-061)

Drill four 1/4-inch holes in the door to the back of the existing test stand and a 7/8 hole in the center of the door to accommodate the electrical control box and attached conduit elbow. Attach the box to the door and wire the drive system to the existing interior wiring as shown on the schematic for the conversion kit being used.

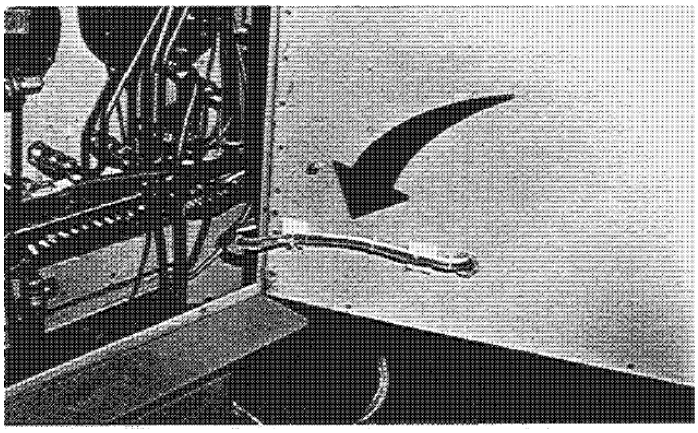

Figure 4-2. Wires from Control Box to Interior of Panel

The conduit elbow is not attached to the control box in kit 8959-045. A 7/8” hole, needed for the elbow, must be placed in the bottom of the electrical box. The installer must be careful, while making the hole, that the wiring or drive boards inside the box are not damaged and that chips are not introduced into the electrical box.

Mount the New Switch Panel

The new switch panel must be mounted conveniently at the test stand. The usual method is to install on the side of the lower stand on a sheet metal or angle-iron bracket. The bracket is not included in the kit.

Tachometer Installation

The new tachometer comes mounted on a plate with the wire to the magnetic pickup attached. Mount the plate in the hole left by the removal of the old tachometer. Install from the front, running the wire through the back to the magnetic pickup installed earlier on the new drive motor. Attach the two wires removed from the old tachometer to the two open posts on the new tachometer. Should these wires not be available run 18-gauge wire from terminals 3 and 4 on the 8-pole terminal block to the new tachometer. Polarity is not important.

Complete Wiring

Attach the supply current to the 8-pole terminal strip as shown on the schematic. The two power leads attach to posts 1 and 2. The stand requires the same 220 Vac current that was used in the air stand.

The wires from the feedback will attach to the new control box installed on the panel door: red (cw) to terminal 14, black (ccw) to terminal 13, white (wiper) to terminal 12 and the shield to terminal 15. The shield may have about 3 inches of insulated 22 AWG wire soldered on the end, if it makes connection to post 15 more convenient. The shield must be attached only to terminal 15. Do not attempt to attach an end of the shield to the feedback potentiometer.

Attach two dc wires from the 8-pole terminal strip to the new drive motor. Pole 5 on the terminal block to pole Al on the motor. Pole 6 on the terminal block to pole A2 on the motor.

⚠WARNING **HIGH VOLTAGE—Ground the test stand prior to operation to protect against possible life threatening electric shock.**

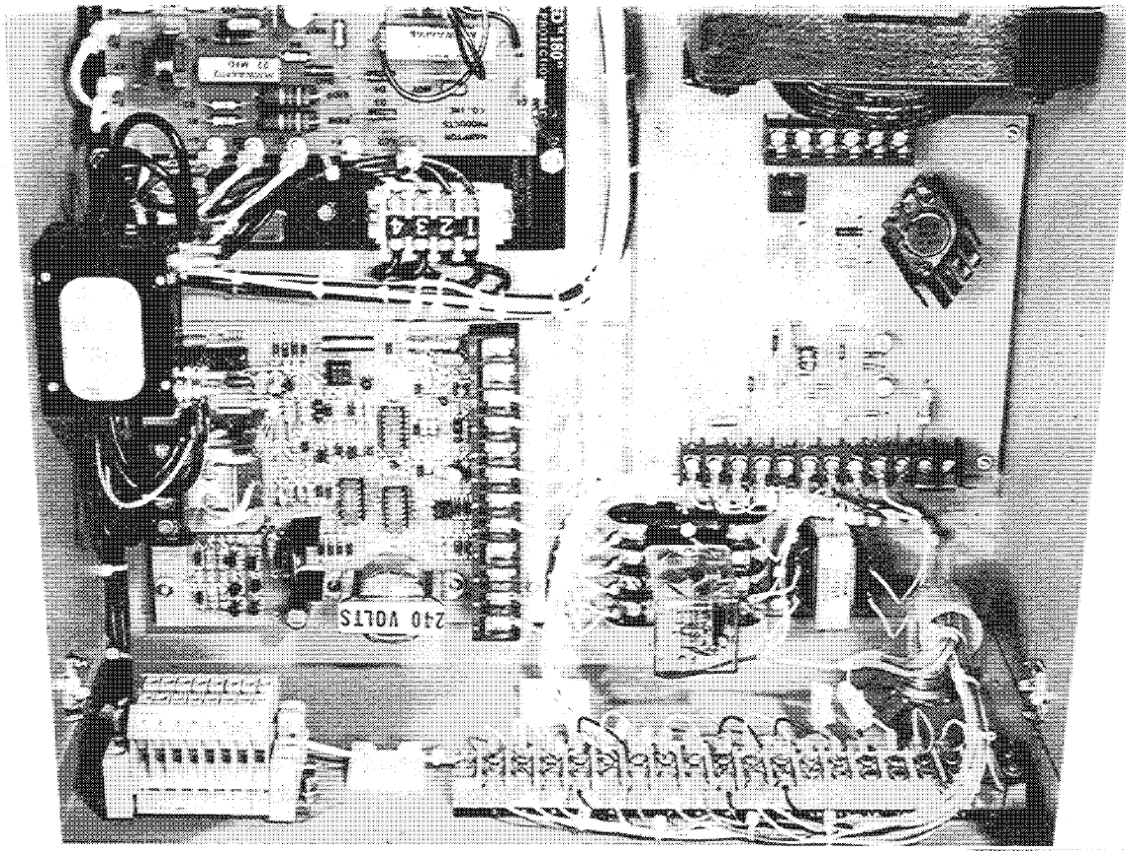

Figure 4-3. Interior of Control Box of 8959-045

Chapter 5.
Operation of the Converted Stand

Governor Feedback

IMPORTANT

To start motor rotation, first set the speed setting potentiometer to 0 (maximum counterclockwise.) Re-engage the start circuit with the black pushbutton momentary switch, then reset the speed with the speed-setting potentiometer. The potentiometer must be set to 0 before the black button will engage the circuit. Setting the potentiometer to 0 does not shut off the motor-drive circuit, but it does cause the motor to stop rotating.

Feedback Potentiometer (used with 8959-061)

A portable potentiometer, driven by a combination of a return spring and monofilament line, provides the feedback needed to calibrate and check a governor. The test stand's universal output lever is attached to the output shaft of the actuator or governor under test. The monofilament line is then attached to the universal lever with the take up spool either 20 degrees before the maximum stop or 20 degrees in front of the minimum stop.

Figures 5-1, 5-2, and 5-3 show methods of connecting the feedback system to various governor outputs.

NOTICE

When attaching linkage to the 8959-045 kit feedback potentiometer, be sure that the feedback arm is in the middle of its travel. Linkage which will attempt to move the feedback beyond the mechanical stops can break the feedback arm.

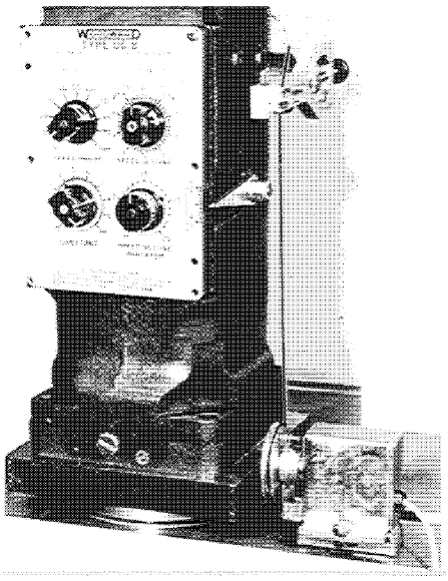

Figure 5-1. Typical Rotary Output Connected to Feedback

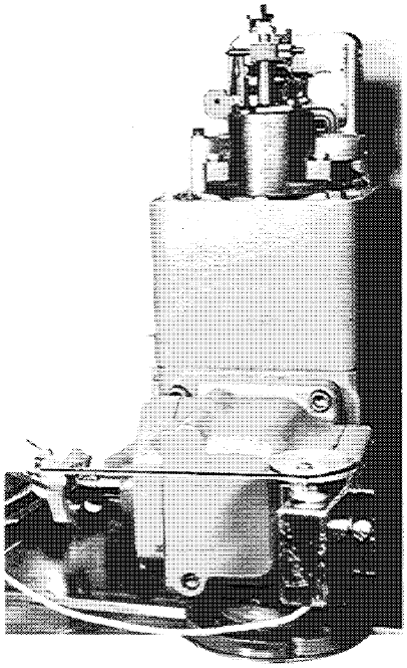

Figure 5-2. Linear Output Connected to Feedback

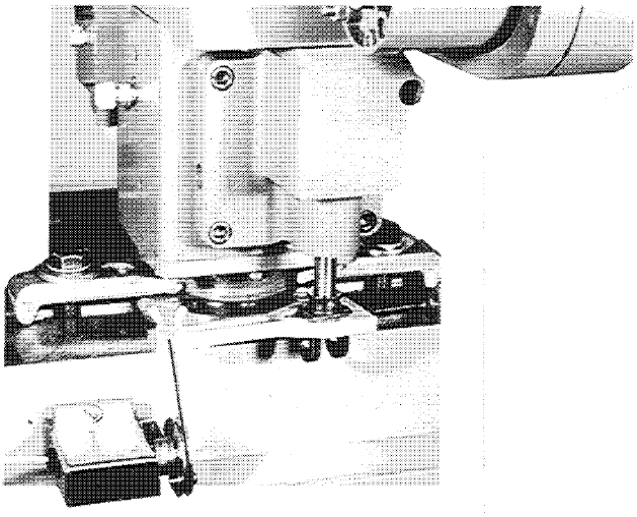

Figure 5-3. Downstroke Output Connected to Feedback

Use Manual 25405 with the 8959-045 Kit

(does not apply to the 8959-061 kit)

The converted stand is similar in operation to the 8909-094 Basic Electric Drive Test Stand. Wood ward manual 25405 provides the operating information needed to operate the converted air-drive test stand.

Mounting governors on the table and attaching governor output to the feedback mechanism will remain the same as it was in the original air-drive stand, not as it is described for the newer electric-drive test stands.

Operator Control Panel

The Operator Control Panel on the left side of the test stand provides the switches and controls which will be needed to test most governors.

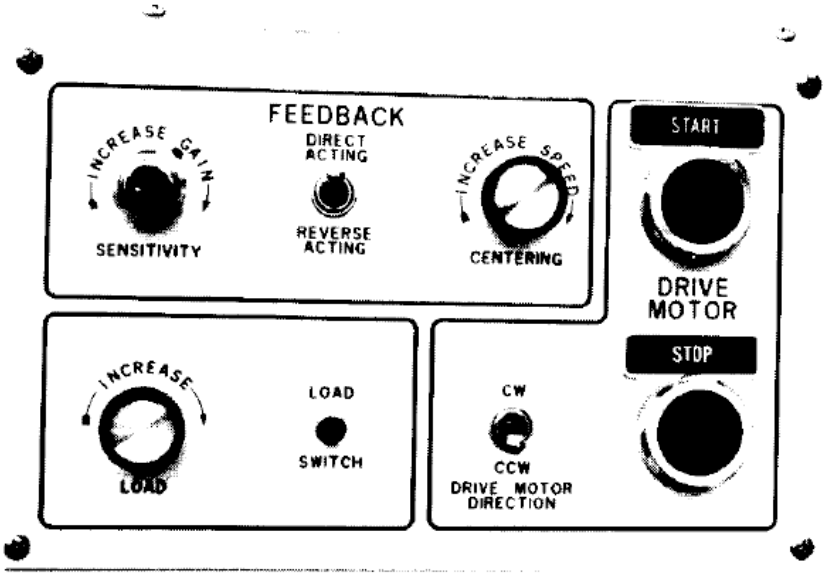

Figure 5-4. Operator Control Panel

Direct Acting/Reverse Acting Switch

This switch is up (at Direct Acting) when the output shaft of the governor being calibrated pulls the monofilament line from the feedback spool on increase fuel.

This switch is down (at Reverse Acting) when the output shaft of the governor being calibrated pulls the monofilament line from the feedback spool on decrease fuel.

The pulley on the feedback potentiometer must turn counterclockwise to increase when the switch is up and clockwise to increase when the switch is down. When the lever switch is down the pulley will take up line on increased fuel.

Increase Speed-Centering

This adjustment sets the drive speed of the test stand, clockwise for increased speed and counterclockwise for reduced speed. Test-stand-drive speed is adjusted to center the output of the governor at a given governor-speed setting. The electric-motor circuits are protected from unintentional overloads by requiring that this potentiometer always be at the minimum (counterclockwise) setting before the START button will activate the drive circuit.

Increase Gain-Sensitivity

This potentiometer, turned counterclockwise, retards the rate of response of the test-stand-drive motor to a speed change. On initial operation this potentiometer should be set totally counterclockwise. After test-stand drive is set at the desired speed the increase Gain-Sensitivity Potentiometer should be turned clockwise until the governor being tested loses stability. Response time can then be set in the counterclockwise direction until governor stability is reached under control of the feedback potentiometer connected to the governor output. The response time set by the increase Gain-Sensitivity potentiometer is not related to the ability of the governor to respond to speed changes, but rather to the ability of the governor to operate with acceptable stability. The sensitivity pot may be locked in a desired position. To lock the setting turn the button on the back of the adjustment clockwise. To unlock, turn the button counterclockwise.

Drive Motor Buttons

(Black button is the START button, red button is the STOP button.) The electrical circuits in the test stand automatically open the run circuits when the stop switch is pushed in or when an overload occurs. The run circuit is always opened when the forward-reverse switch is moved. When the run circuit is opened it cannot be reinstated by the START button until the Speed Adjusting potentiometer is turned counterclockwise to “0.” The START button likewise does not start the drive motor as this must be done by advancing the increase Speed-Centering potentiometer after the circuit is energized by the START button. When the motor is stopped by use of the potentiometer, the run circuit does not open, and restarting is possible by adjusting the potentiometer. Reversing the drive direction always opens the drive circuit and the START button must be used, even if the speed-adjusting potentiometer is at “0”

Drive Motor Direction (cw/ccw)

When this two-position switch is “Up” (cw) the drive shaft will turn clockwise. When this switch is “Down” (ccw) the drive shaft will turn counterclockwise. if this switch is changed it will cause the motor circuit to open. The Centering (speed adjustment) potentiometer will then have to be moved to zero-speed setting and the Start button pushed before the motor can be restarted.

Load

The test stand is equipped with a control circuit which simulates load to an engine. When the Load switch is held down the drive speed increases or decreases by an amount determined by the setting of the Load Potentiometer on the operator control panel. With the speed change the governor under test should call for a change in fuel setting with the test-stand drive responding to the output of the portable feedback potentiometer. The load switch tests a governor’s ability to return to normal after a load transient. The feature is also used to test droop settings.

Starting the Test

Set the Sensitivity and Centering potentiometers on the control panel full counterclockwise. Push the black START button momentarily, then slowly turn up the Centering potentiometer until either the drive motor just starts to move or until the tachometer shows the desired number of rotations at minimum fuel according to the governor's test specification (TSP) available from Woodward. The drive motor will not start when the START button is pushed. The Centering setting starts the drive motor as the setting is moved from the full counterclockwise position.

When the test stand drive is rotating the governor at the desired minimum-fuel speed, turn the Sensitivity potentiometer clockwise until the governor becomes unstable. Then turn the adjustment counterclockwise until stability is just reached. The setting of the Sensitivity control will not hinder the ability to test the governor if stability can be attained. You may have to adjust the Centering pot as you turn up the Stability pot.

Make such tests and adjustments required by the appropriate TSP. Use the red button or the Centering potentiometer to shut down the test-stand motor while leaving the oil heater and pump operating.

Load Switch

The Load control contains a potentiometer which can be set to momentarily raise or lower the test-stand speed from the speed setting of the Centering potentiometer. A momentary (push button) switch includes this setting in the test-stand-drive circuit while the button is pushed, causing a reaction that is the same as that which occurs when load is added or removed from an engine or turbine.

When the momentary switch is pushed it allows testing of a governor in relation to load changes. When the Load control is in about the middle of its travel it will show little effect on drive speed. Turning the control clockwise will allow the simulation of a reduction in load. Turning the control counterclockwise will simulate an increase in load while the momentary switch is closed.

IMPORTANT

- **The governor being calibrated should be allowed to run on the test stand for at least 30 minutes before making final adjustments.**
- **To start motor after STOP button is pushed, the Centering potentiometer must be turned to full counterclockwise, the START button pushed, and the Centering potentiometer turned slowly clockwise.**
- **If motor direction is changed, the drive will stop, and the Speed Adjustment potentiometer must be returned to full counterclockwise and the motor circuit re-engaged with the START button.**

Test Stand Jiggle

Oscillation of governor output while under test can be caused by either the governor or the test stand.

To determine the source of output-shaft instability (jiggle), disconnect the feedback pot.

This “opens the loop” between the test-stand drive and the governor. If the jiggle continues, replace the governor with a known good governor. If the jiggle still occurs in open-loop operation, it is caused by the test stand or by the mechanical connection between the motor and the governor.

if the jiggle stops when the loop is opened, it can be assumed the test-stand drive is stable and the problem is caused by the governor or actuator under test, or by the feedback potentiometer. Refer to the schematic in this manual to check the operation of the feedback potentiometer.

Test-stand jiggle that continues can be caused by either the electrical drive of the stand, by the electrical supply to the stand, or by the connection between the drive shaft and the governor under test.

Troubleshooting Jiggle

To troubleshoot jiggle which continues when the test-stand loop is open, follow this procedure as closely as possible:

1. Check the drive connection between the test stand and the governor. The connection must be correctly installed with the right fittings between the test-stand motor and the drive shaft of the governor. The drive shaft must fit into the connecting linkage without binding. If the drive shaft is splined or serrated make certain the shaft slips into the connecting fittings freely enough to drop into place of its own weight.

   If a keyed drive shaft is used there must be neither excessive backlash or binding in the connection, Irregularities in the connection or run out in the shaft will often cause jiggle.

⚠WARNING **HIGH VOLTAGE—Remove the test stand from electrical supply before checking or working on any of the drive components. Life-threatening voltages are present throughout the drive circuits.**

2. Mount a different governor on the stand to compare output before determining that the jiggle is in the electric test-stand drive or electric supply.

3. Check the filter capacitor on the output of the printed-circuit board (located below the boards on the inside of the back cover) for an open circuit. The capacitor is rated at 2500 µF at 350 Vdc (working).

4. Tighten and inspect ALL terminal connections, including those on the dc drive motor.

   Cleaning and tightening these terminal connections can improve the operation of the electric test stand.

5. Check the incoming electric supply which must provide 200 to 260 Vac without high noise spikes. The motor alone can pull 24 A for short periods and the entire stand will pull much more than this, especially if the oil heaters and other options are operating at the same time as the motor. The check of the entire power-supply system is important if a new installation is causing jiggle. In the case of established stands which develop jiggle, check particularly for any changes which may have occurred in the supply wiring or the power source.

   Large cyclic electrical-load changes from other machines can cause problems with test-stand operation.

Hampton Drive Boards

The two Hampton Products drive boards cannot be checked with normally available test equipment. Contact Woodward if the boards are suspected as the cause of test-stand problems.

IMPORTANT	**Most jiggle problems which persist after the test loop has been broken by separating the feedback potentiometer from the test governor can be found in the mechanical mounting of the governor to the test stand. Before any extensive testing of electrical drive components be sure that all aspects of the mechanical mounting of the governor on the test-stand table have been carefully inspected.**

Chapter 6.
Parts Included in Kit

Parts Information

When ordering replacement parts, include the following information:

- Actuator serial number and part shown on the nameplate
- Manual number (this is manual 25801)
- Parts reference number and part name from the parts list

Drive Motor Maintenance

The drive motor should have maintenance every 1000 to 1500 hours of operation. (Semi-annually for full-time one-shift operation.)

To service the motor remove the brushes and the cover on the bottom of the motor.

Replace with new brushes if necessary. While the brushes are out, the commutator area should be blown out with compressed air or otherwise serviced according to the shop standards for motor service. Do not remove the motor from the test stand unless absolutely necessary.

The motor is a 3 hp permanent magnet type, 180 Vdc, 1750 or 1800 rpm, TEFC, NEMA C face with 4.5 inch pilot, vertical shaft operation, rated continuous duty with an attached conduit box. The shaft from the motor is 0.875” diameter with a 0.188” square by 1.375” key drive.

Ref. No.	Part Description	Quantity
25801-1	3 hp Electric dc Variable-Speed Motor	1
25801-2	Motor-Support Mount	1
25801-3	Magnetic-Pickup Bracket	1
25801-4	Magnetic Pickup	1
25801-5	Not used	
25801-6	Motor-Mount Bolts	4
25801-7	Adapter Drive	1
25801-8	Motor-Mount Gasket	1
25801-9	Control Box	1
25801-10	Switch Panel	1
25801-11	Feedback Potentiometer Assy.	1
25801-12	Magnetic Pickup (same as 4)	1
25801-13	Tachometer Assembly	1

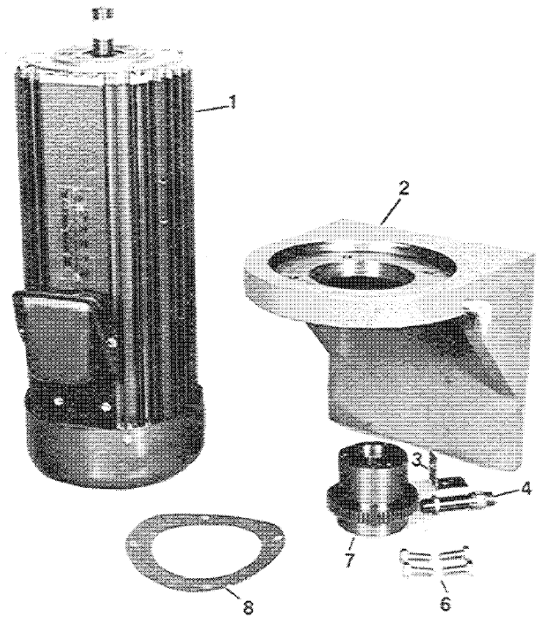

Figure 6-1. Drive Motor Parts
(not pictured—drain hose, wiring elbow, miscellaneous screws, bolts, and nuts)

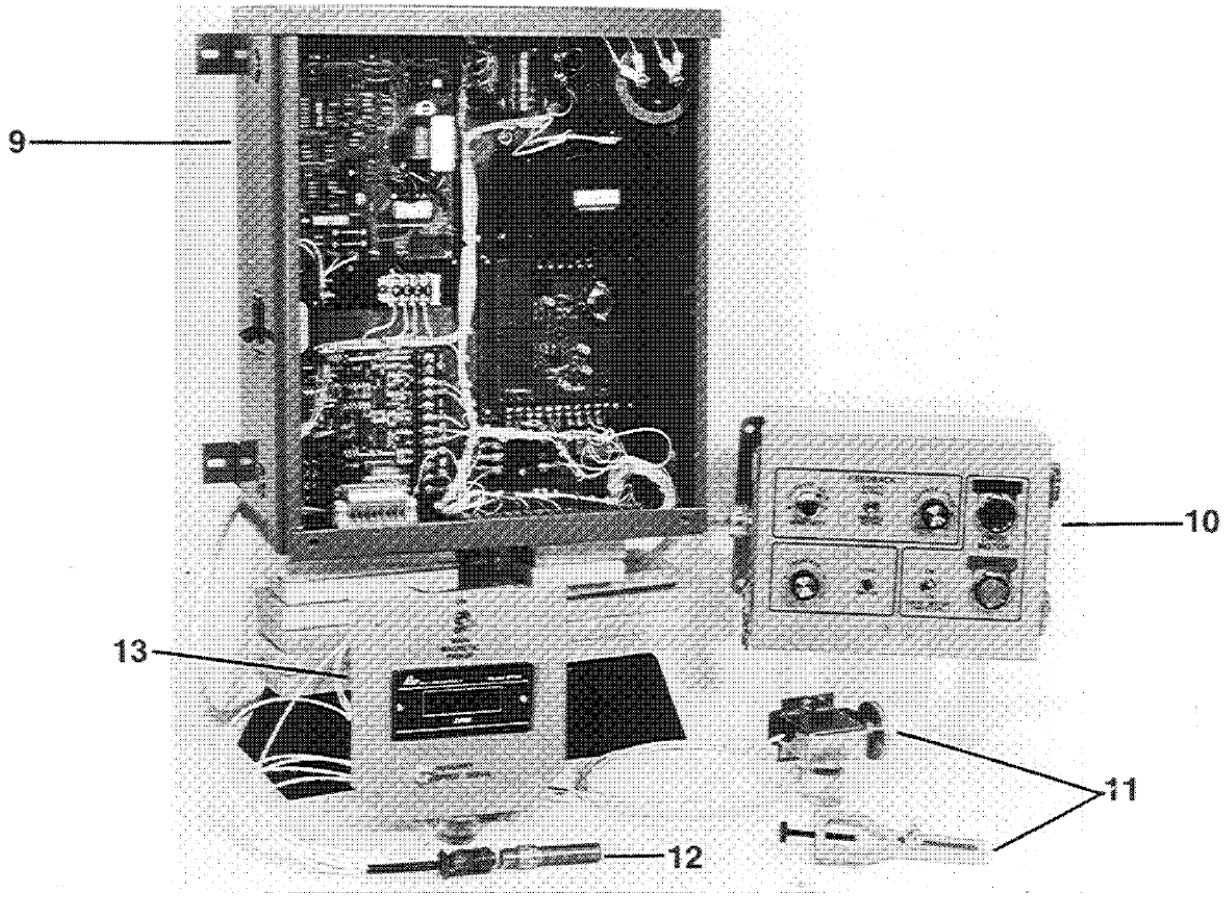

Figure 6-2. Electrical Parts for 8959-061

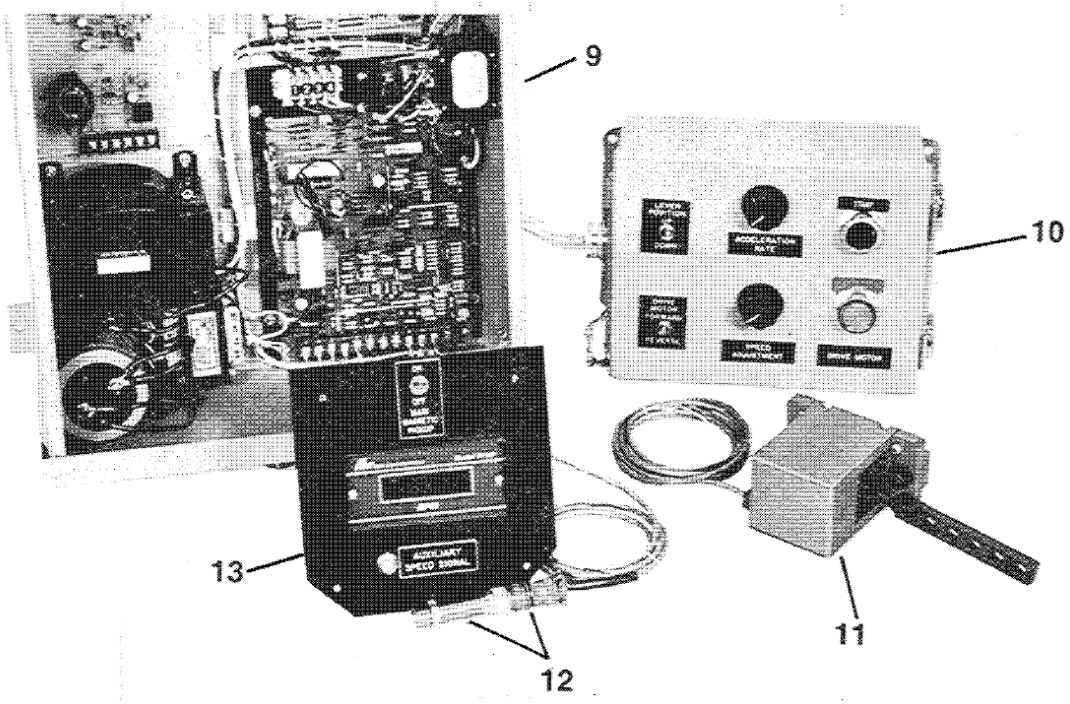

Figure 6-3. Electrical Parts for 8959-045

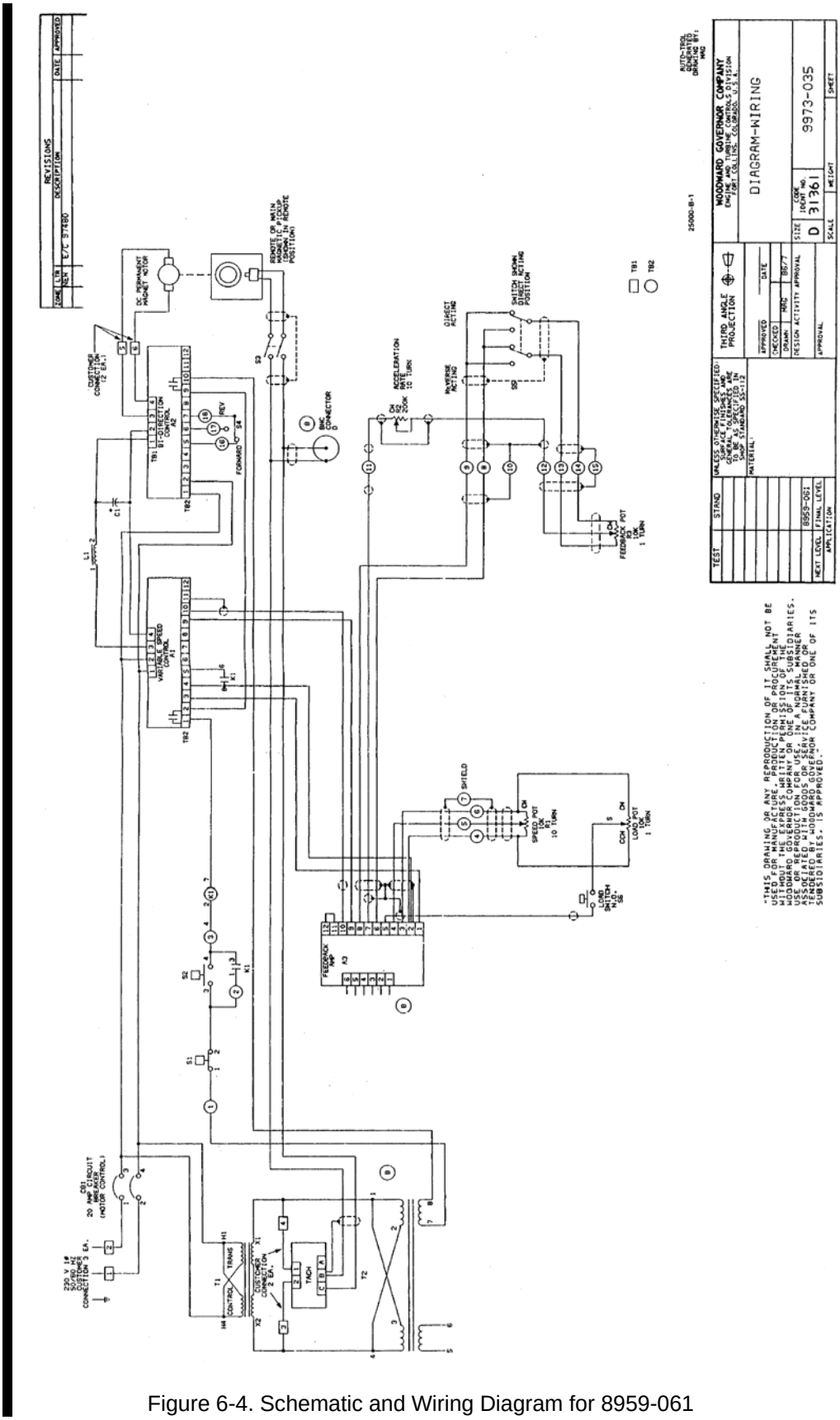

Figure 6-4. Schematic and Wiring Diagram for 8959-061

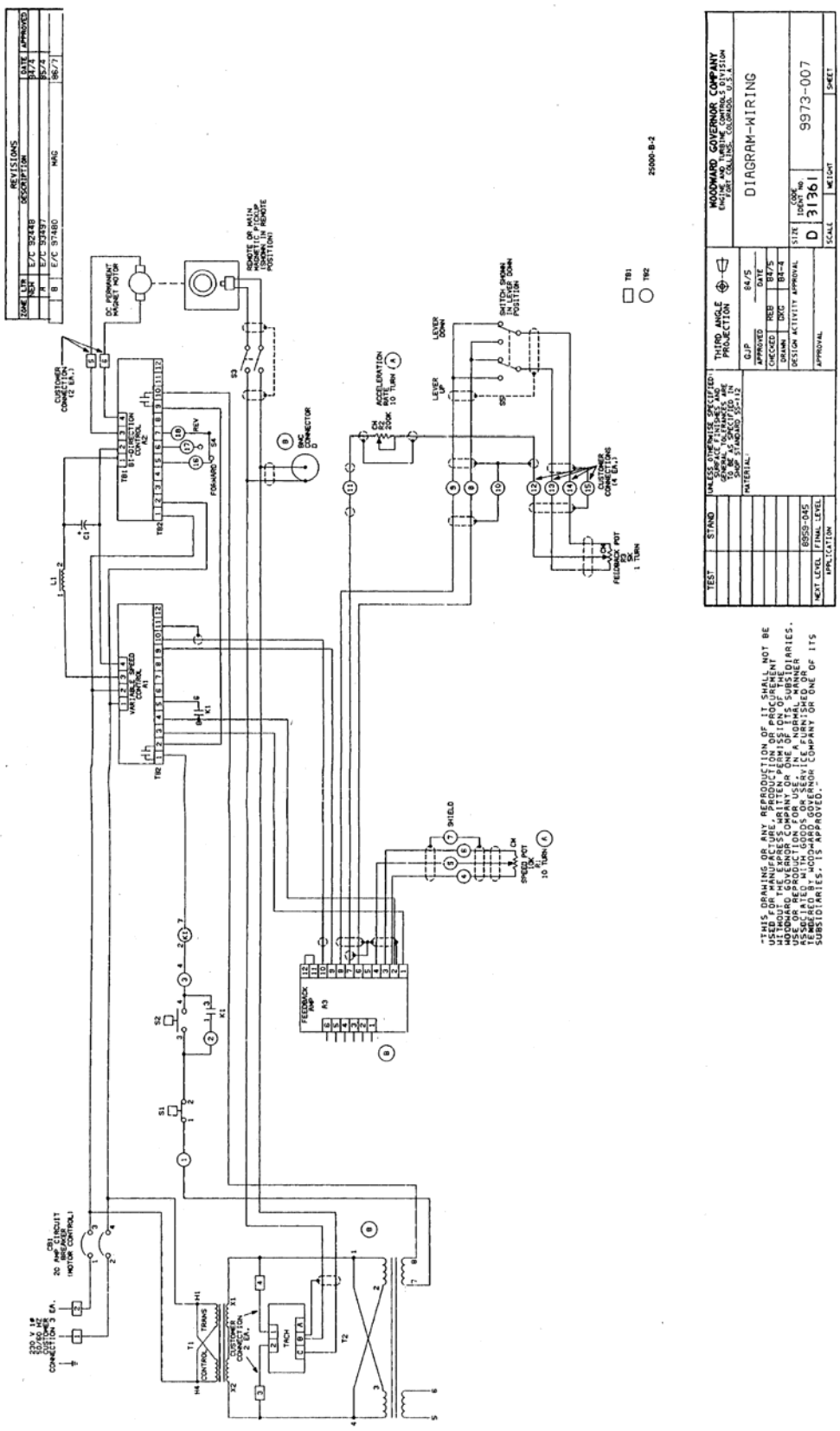

Figure 6-5. Schematic and Wiring Diagram for 8959-045

Chapter 7.
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/directory**.

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/directory**.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory published at **www.woodward.com/directory**.

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

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 6762 6727
India	+91 (129) 4097100
Japan	+81 (43) 213-2191
Korea	+82 (51) 636-7080
The Netherlands	+31 (23) 5661111
Poland	+48 12 295 13 00
United States	+1 (970) 482-5811

For the most current product support and contact information, please visit our website directory at **www.woodward.com/directory**.

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.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 25801B.

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Email and Website—www.woodward.com

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as well as authorized distributors and other authorized service and sales facilities throughout the world.**

Complete address / phone / fax / email information for all locations is available on our website.

2012/9/Colorado