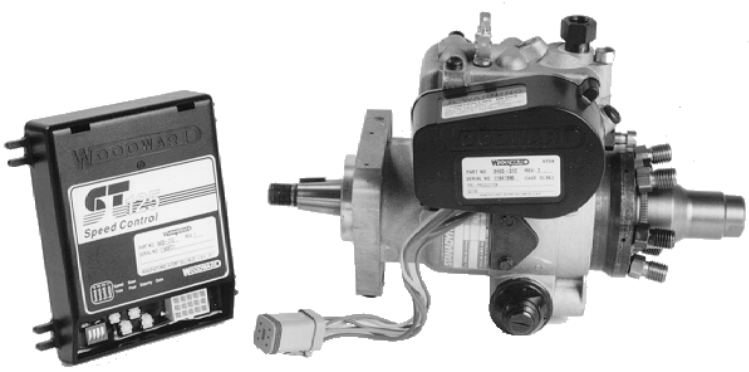
WOODWARD

Product Manual 04185
(Revision NEW)
Original Instructions



ST-125™ Control System for Stanadyne DB-4 Series Pumps

8405-310 Control with Aux Input
8405-312 Actuator
UL/cUL Listed E97763
CE Compliant

Installation and Adjustment 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

The current revision and distribution restriction of all publications are shown in manual *26311*.

The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

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*.

Contents

Illustrations and Tables

Chapter 1.
General Information

This manual covers ST-125™ part numbers:
8405-310 ST-125 Control with Aux Input
8405-312 Actuator

The ST-125 Control System consists of a separate actuator and control. The actuator is a bi-directional actuator designed specifically for the Stanadyne DB-4 Series diesel fuel injection pumps. The control can be mounted in a cabinet or to the skid, but, in either case, the control must be protected from water and excessive dirt. The ST-125 Speed Control is designed for applications where a constant speed must be maintained.

Features of the ST-125 Control System include:
- Capability for both 12 volt and 24 volt operation
- Start Fuel Limiting
- Retention of the Stanadyne shutdown solenoid
- Precise engine control using actuator position feedback
- Capability of covering a wide range of magnetic pickup (MPU) frequencies through the use of a four-position switch
- UL/cUL Listed
- Auxiliary input for load sharing capability

The Start Fuel Limiting allows a setting for the maximum fuel in the Stanadyne pump on initial start-up to reduce “black smoke” starts. This maximum position remains in effect until the engine reaches rated speed. This limit can be disabled if desired.

Since the ST-125 Actuator mounts in the same location as the throttle lever and shaft assembly, the original shutdown solenoid is retained.

The ST-125 Actuator incorporates position feedback that provides accurate and quick response.

There are two methods of engine shutdown provided with the ST-125 system. Along with the above mentioned retention of the shutdown solenoid, a second method is provided by means of the Run/Stop feature. A user-supplied switch connected to the Run/Stop wire is an effective means to drive the Stanadyne pump to minimum fuel and provide an immediate shutdown, but it should not be used as an emergency method for shutdown.

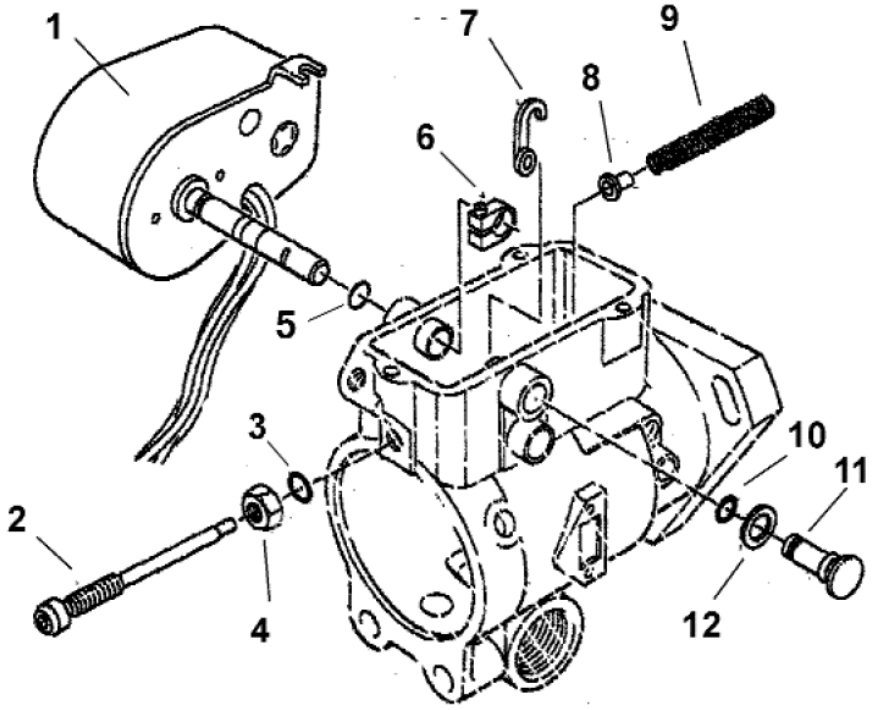
Declaration of Incorporation

In accordance with the EMC Directive 89/336/EEC and its amendments, this controlling device manufactured by the Woodward Governor Company, is applied solely as a component to be incorporated into an engine prime mover system. Woodward declares that this controlling device complies with the requirements of EN50081-2 and EN 50082-2 when put into service per the installation and operating instructions outlines in the product manual.

Notice: In order to be EMC Directive compliant, this controlling device is intended to be put into service only upon incorporation into an engine prime mover system that itself has met the requirements of the above Directive and bears the CE mark.

Chapter 2.
Preparation of Stanadyne Fuel Pump

Parts Diagram



Parts List

1. Actuator
2. Adjustable Guide Stud
3. Seal - Black
4. Locknut
5. Seal - Brown
6. Gear Clamp
7. Roller-Type Shutoff Cam
8. Idle Spring Retainer
9. Governor Spring
10. Seal - Red
11. Retaining Shaft
12. Spacer Washer

Removing Existing Governor Control Cover

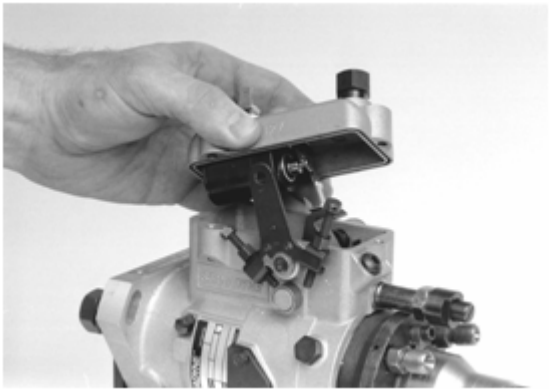
1. Remove the fuel return line from the pump return line connector assembly. Use two wrenches to loosen.

IMPORTANT

Clean the outside of the pump with solvent and dry with compressed air before removing the Stanadyne governor control cover. A suitable container should be placed under the fuel injection pump to catch any fuel that may spill when removing the cover.

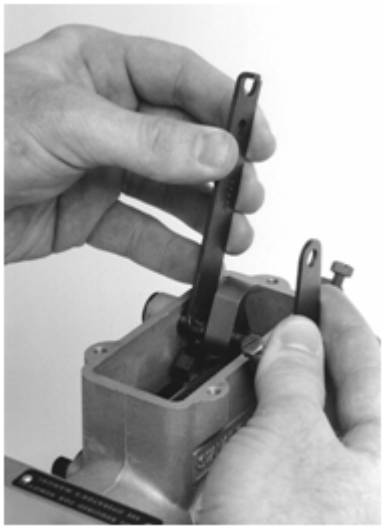
2. Disconnect the electric shutoff (ESO) solenoid wire from the governor control cover.

3. Loosen the three cover screws and remove the governor control assembly from the pump. [On newer pumps (1996 and later) a special torxplus tool will be necessary to loosen the cover screws. The tool can be leased from Stanadyne.] Save all the screws and the cover for later installation.

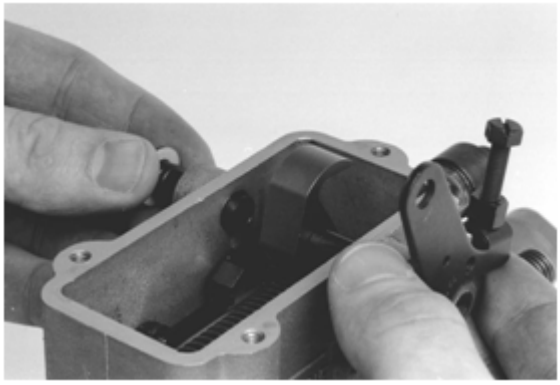


Preparing Stanadyne Fuel Pump

4. Remove and discard the throttle shaft linkage snap clip (or shut-off cam, if external lever). Use Stanadyne tool #20992 or needle nose pliers.

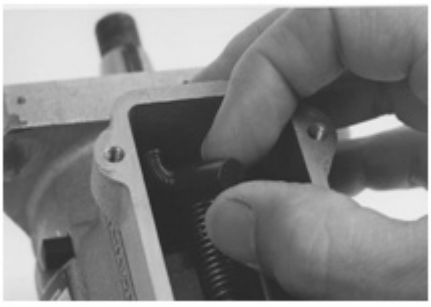


5. Remove the shutoff shaft assembly. Remove the o-ring seal and spacer washer from the shaft and discard.

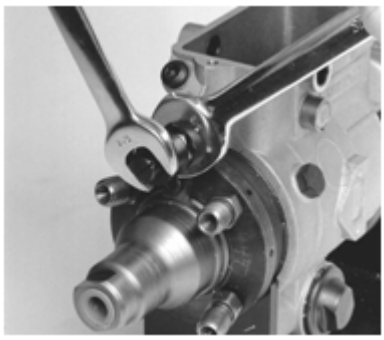


6. Remove the throttle lever and shaft assembly and the throttle lever fork and spacer.

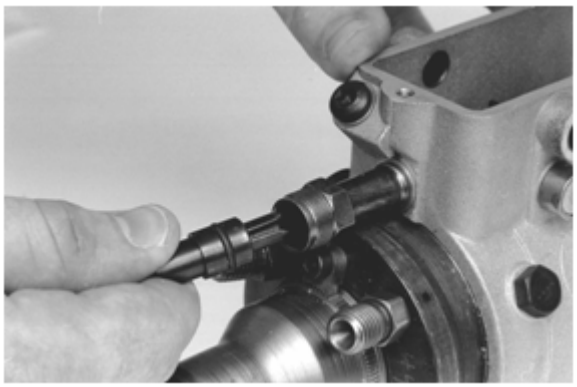
7. If the pump is equipped with a damper assembly, slide the damper barrel off the damper piston.



8. While holding the control rod guide with a 5/8 inch (16 mm) wrench, use a 9/16 inch (15 mm) wrench to loosen and remove the droop control locking cap.



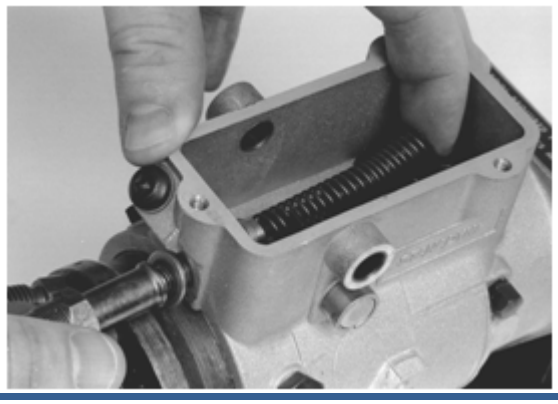
9. Twist and pull to remove the slotted adjusting cap assembly.



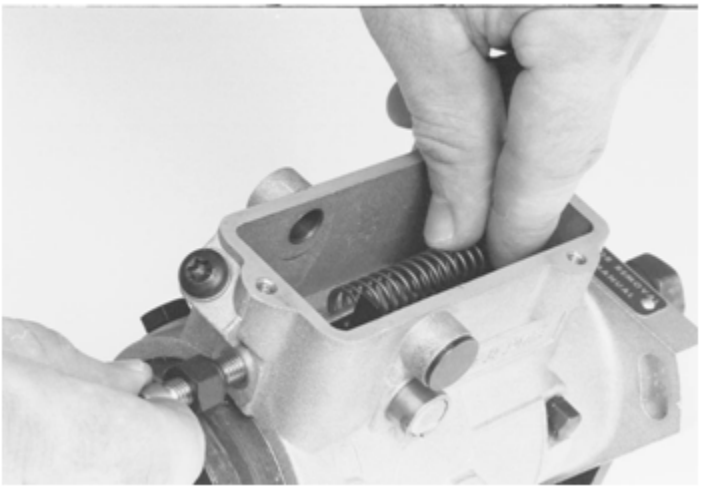
10. Use diagonal cutting pliers to remove the control spring pin from the control rod.

11. Loosen and remove the control rod guide.

12. Disengage the governor spring from the governor arm. Depress the metering valve and remove the control rod and spring assembly.



13. Install the new spring and guide stud assembly (Woodward kit 8934-636).



a. The wire that crosses the center of the spring should be placed between the fingers on the lever. Install the spring seat into the open end of the spring.

b. Thread the locknut and o-ring onto the guide stud slightly so only two or three threads are exposed behind the nut. This is to provide clearance for the nut and stud during installation into the pump.

c. Install the guide stud by turning it into the pump until only one to two threads are exposed between the locknut and the head of the guide stud. Tighten the locknut against the side of the fuel pump to prevent fuel leakage.

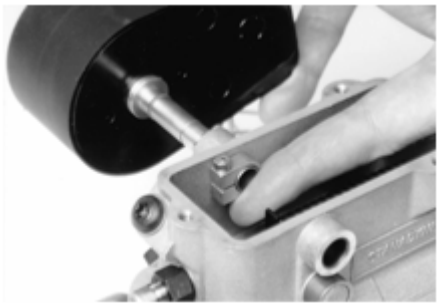
Installation of ST-125™ Actuator

14. Install the ST-125™ Actuator using the following procedure.

a. Lubricate the actuator o-ring (#5/brown) with silicone or petroleum based lubricant prior to assembly.

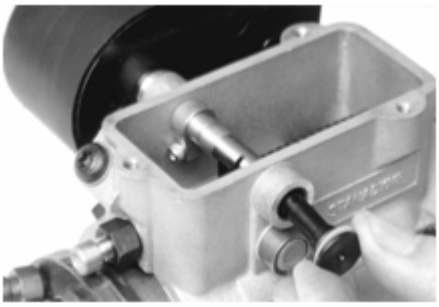
b. Partially insert the ST-125 Actuator into the pump bushing. Place the retaining collar over the shaft with the clamping screw boss on the cam slot side of the shaft. Slide the actuator and collar into place.

c. Hold the actuator solidly against the pump housing bushing by squeezing the actuator and collar together to remove end play. Press directly behind the bushing—not on the free end of the actuator. A maximum of 0.05 mm (0.002 inch) axial end play is allowed, but zero end play is preferred. Torque the 6-32 screw to 1.0 to 1.4 N·m (9 to 13 lb-in). DO NOT OVERTIGHTEN.

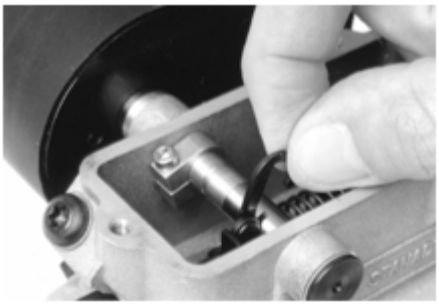


Following assembly, check that the actuator shaft rotates freely.

15. With the actuator fully inserted, insert the grooved o-ring (#10/red o-ring) plug (from kit 8934-636) into the shutdown shaft bushing.



16. Insert the shutoff cam (from kit 8934-636) into the slot on the actuator shaft, making sure it engages the groove on the grooved o-ring plug, and that the roller engages the metering valve linkage. Check for free operation of the metering valve linkage and actuator shaft.



17. Reassemble the pump cover by rotating the actuator so the cover clears the actuator mounting tang, then rotate the actuator back so the tang sits on top of the mounting hole.

IMPORTANT **Press the shutdown lever back during assembly to assure it correctly engages the metering valve linkage.**

Use a new cover gasket, cover screws, and both lock and flat washers.

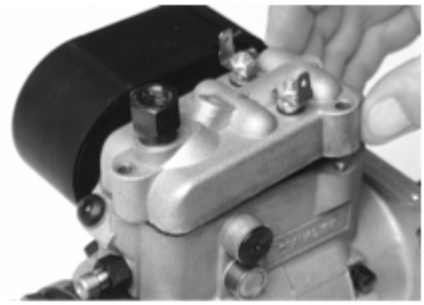
IMPORTANT

Do not load the end of the actuator against the pump when tightening the cover screw. This will cause the actuator shaft to bind.

Tighten the screws to 2.8 to 3.9 N·m (25 to 35 lb-in).

18. Wiring and connectors between the actuator and the speed control are customer supplied. Match the wire colors from the actuator to the speed control.

19. Re-connect the ESO wires removed in step 2.



Chapter 3.
ST-125™ Installation and Calibration

The ST-125™ Actuator is equipped with a Deutsch DT-series connector and accepts mating connector:

6-pin connector	part number DT04-6P-EP04
locking wedge	part number W6P
contact pin	part number 1060-16-0122
(0.5–1.5 mm² [20–16 AWG])	

The ST-125 Control is equipped with an AMP 15-pin PC-mounted connector that accepts mating connector:

AMP 15-socket plug	part number 172171-1
AMP socket contact	part number 171639-1
(0.5–1.5 mm² [20–16 AWG])	

Mount the control on the skid or to a control panel that is enclosed so that the control is protected from the weather. Cable lengths between the ST-125 actuator and control, and the distance between the control and battery, should not exceed 6 m (20 feet). Mount the control in a location allowing space for potentiometer adjustment. Do not expose the control to sources of radiant heat such as exhaust manifolds or turbochargers. The speed control is designed to operate within a temperature range of –40 to +70 °C (–40 to +158 °F). Also, choose a protected location so the control will not be damaged when moving the engine/generator set or when equipment is moving nearby.

All wires from the actuator must be terminated to the control with their respective matching color codes (see the wiring diagram, Figure 3-2).

If the Run/Stop option is not used, tie pin 11 (green wire) to the battery (+). The control is in the Run mode when pin 11 is connected to the battery (+). If the Run/Stop feature is used, the control drives the actuator and respective fuel pump to minimum fuel when pin 11 is disconnected from the battery (+) or connected to the battery (–). After six to ten seconds, the power to the actuator is shut off (allowing pump to go to max fuel) to prevent unnecessary power drain while the engine is off.

Install the magnetic pickup (MPU) through a housing or rigid bracket. Make sure the sensed gear is of a magnetically soft material (a typical non-stainless steel). The gap between the pickup and the outside diameter of the gear should be set between 0.25 and 1.00 mm (0.010 and 0.040 inch) at the closest point (allow for radial runout).

External Speed Trim

Connect pins 1 and 2 on the connector unless an optional remote speed trim potentiometer is used. If a speed trim pot is used, connect it as shown in the plant wiring diagram using either shielded twisted-pair wire or just twisted-pair wire. Should the shielded twisted-pair wire be used, do not connect the shield. A 10 kA pot will provide a ±9% speed adjustment. Potentiometers of the multi-turn type (typically 10-turn) are recommended.

Load Sharing via Auxiliary Input

Using either shielded twisted-pair wire or just twisted-pair wire, connect pins 6(+) and 7(–) of the connector to the output lines 20(+) and 19(–) of a Load Sharing Module. A Generator Loading Control, Automatic Generator Loading Control, Automatic Power Transfer and Load Control, or Import/Export Control may be added to the load sensor load-sharing lines to control load. (All Woodward electrical load-sharing systems are compatible.)

Pre-Start Potentiometer Settings

- Speed Trim fully counterclockwise (minimum)
- External Speed Trim (if used) to mid position (50% or 5 out of 10 turns)
- Start Fuel fully clockwise (maximum)
- Stability at mid-position
- Gain at mid-position

Using the desired rated engine rpm and the number of teeth on the flywheel, calculate the rated MPU frequency in hertz:

$$\text{Rated MPU Frequency (Hz)} = \frac{(\text{rpm})(\#\text{ of Teeth on Gear})}{60}$$

With this calculated MPU frequency, find the speed range in the table that includes this MPU frequency.

Set the four position DIP switch on the control to the switch combination that matches the speed range that includes the calculated MPU frequency. (The switch is closed when the switch is depressed with a pen or pencil on the side closest to the control's outer edge.)

Speed Range (Hz)					
Low	**High**	**Sw1**	**Sw2**	**Sw3**	**Sw4**
2125	2340	Open	Open	Open	Open
2341	2560	Open	Open	Open	Closed
2561	2810	Open	Open	Closed	Open
2811	3030	Open	Open	Closed	Closed
3031	3280	Open	Closed	Open	Open
3281	3500	Open	Closed	Open	Closed
3501	3750	Open	Closed	Closed	Open
3751	4110	Open	Closed	Closed	Closed
4111	4520	Closed	Open	Open	Open
4521	4965	Closed	Open	Open	Closed
4966	5440	Closed	Open	Closed	Closed
5441	5940	Closed	Closed	Open	Closed
5941	6525	Closed	Closed	Closed	Closed

Startup and Adjustment

Starting the Engine

Start the engine using the manufacturer's instructions.

⚠WARNING

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

If the engine does not start, check to assure that the control is receiving the proper battery voltage, that the Run/Stop wire (green wire) has battery voltage applied to it, and that the magnetic pickup is putting out at least 1.0 Vrms. Also, check that the engine is cranking at a minimum of 5% of rated speed, that the engine is receiving proper fuel, and that the shutdown solenoid is in the run condition.

If the engine is unstable after startup, slowly turn the gain pot counterclockwise until it is stable. If the engine is stable, turn the gain slowly clockwise until the engine is unstable and then turn the gain slightly counterclockwise until the engine is stable again.

Speed Trim Adjustment

After the engine is stable (with external Speed Trim pot set to mid position, if installed), adjust the Speed Trim clockwise until the correct rated engine speed is obtained. If the rated engine speed cannot be obtained or if the engine speed is already above rated speed, the four-position DIP switch is not in the correct setting. If it is necessary to readjust the speed setting switch, the engine must be shut down during this procedure.

⚠WARNING

The engine must always be shut down during speed switch adjustments to prevent the possibility of engine overspeed during this process.

Stability and Gain Settings

The Stability and Gain can now be adjusted to obtain the type of engine response desired. The stability and gain adjustments allow you to change the way the engine responds to load steps and speed changes. With a high stability setting, the engine will start up at a controlled rate with little or no speed overshoot. Load steps will produce relatively little speed overshoot when the engine returns to rated speed. This "soft" engine response will occur at the expense of longer recovery times. A low stability setting will produce a "fast" engine response with short times to accelerate to rated speed and quick recovery times from load steps. This will occur at the expense of overshoots or underdamped oscillations (ringing) on speed and load transients. A Stability setting of mid-position is a good compromise between a "fast" engine response and a "soft engine response, and it is usually quite acceptable for most installations and applications.

When either the Gain or Stability is increased, the other adjustment will have to be decreased to maintain a stable engine. It is desirable to have as high a Gain setting as possible at the selected Stability setting in order to reduce the amount of engine speed variations. Check the response of the engine after each adjustment by load stepping the engine. If it is not possible to load step the engine, the engine stability can be checked by quickly disconnecting, then connecting the Run/Stop switch or wire. Repeat the following tuning procedure until the engine responds as desired.

IMPORTANT

Too high a gain setting may result in stable operation at normal temperatures but could cause oscillation when the engine is cold. Readjustment may be required for satisfactory cold-start operation.

Start Fuel Limiting

The purpose of Start Fuel Limiting is to limit the fuel that the fuel pump can deliver to the engine on startup. When adjusted properly, the Start Fuel Limiting supplies the engine with just enough fuel to start but not so much as to produce black smoke during startups. After the engine reaches rated speed, this fuel limiting feature is disabled and the fuel pump is free to go to the maximum fuel condition. If the Start Fuel Limiting feature is not desired, adjust the pot to a full clockwise position. Otherwise, adjust the Start Fuel Limit pot to mid-position and re-attempt to start the engine. If the engine starts but produces black smoke, readjust the Start Fuel Limit pot counterclockwise slightly. If the engine did not start, turn the Start Fuel Limit pot clockwise slightly and repeat start attempt.

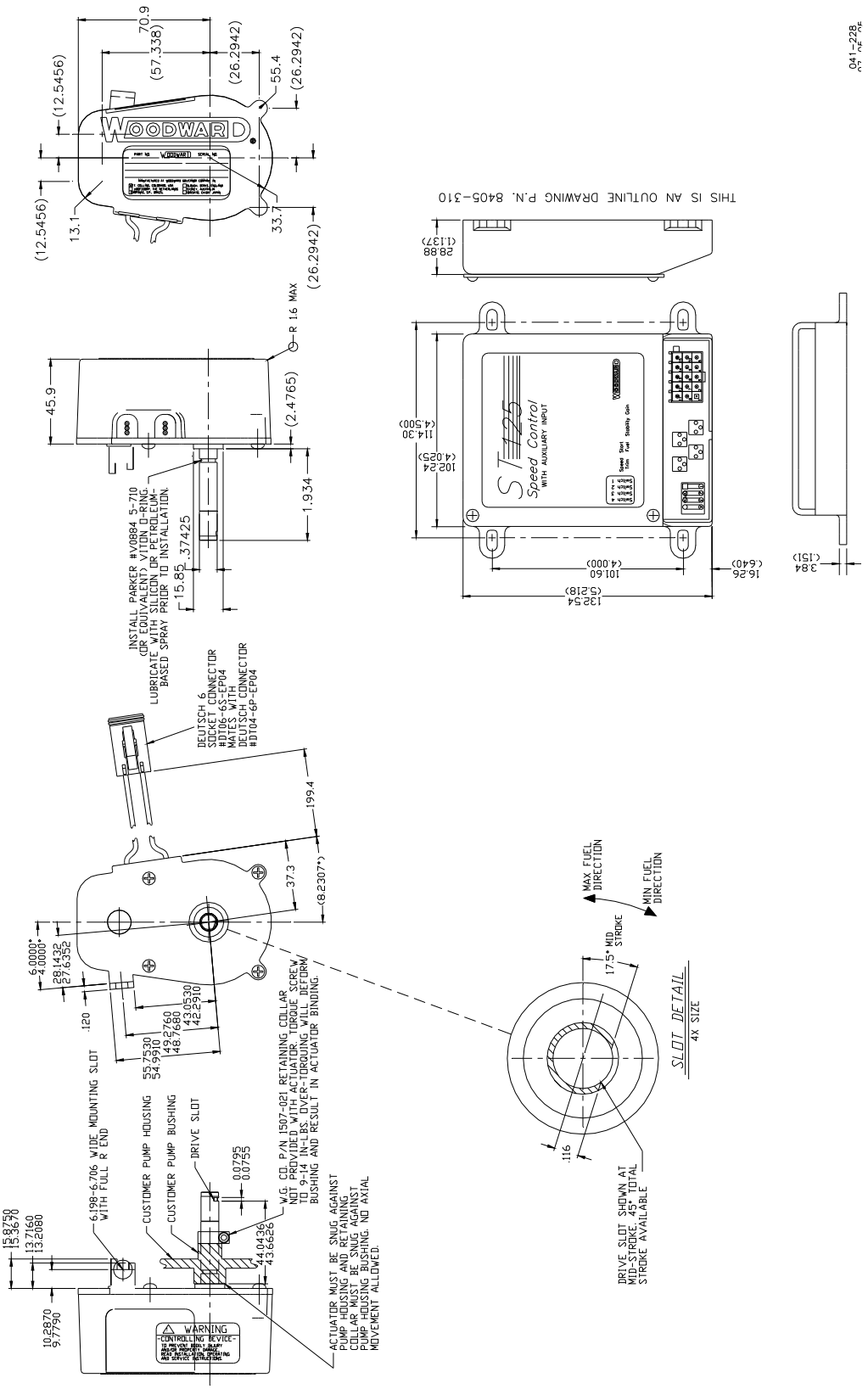


Figure 3-1. Control Outline Diagram

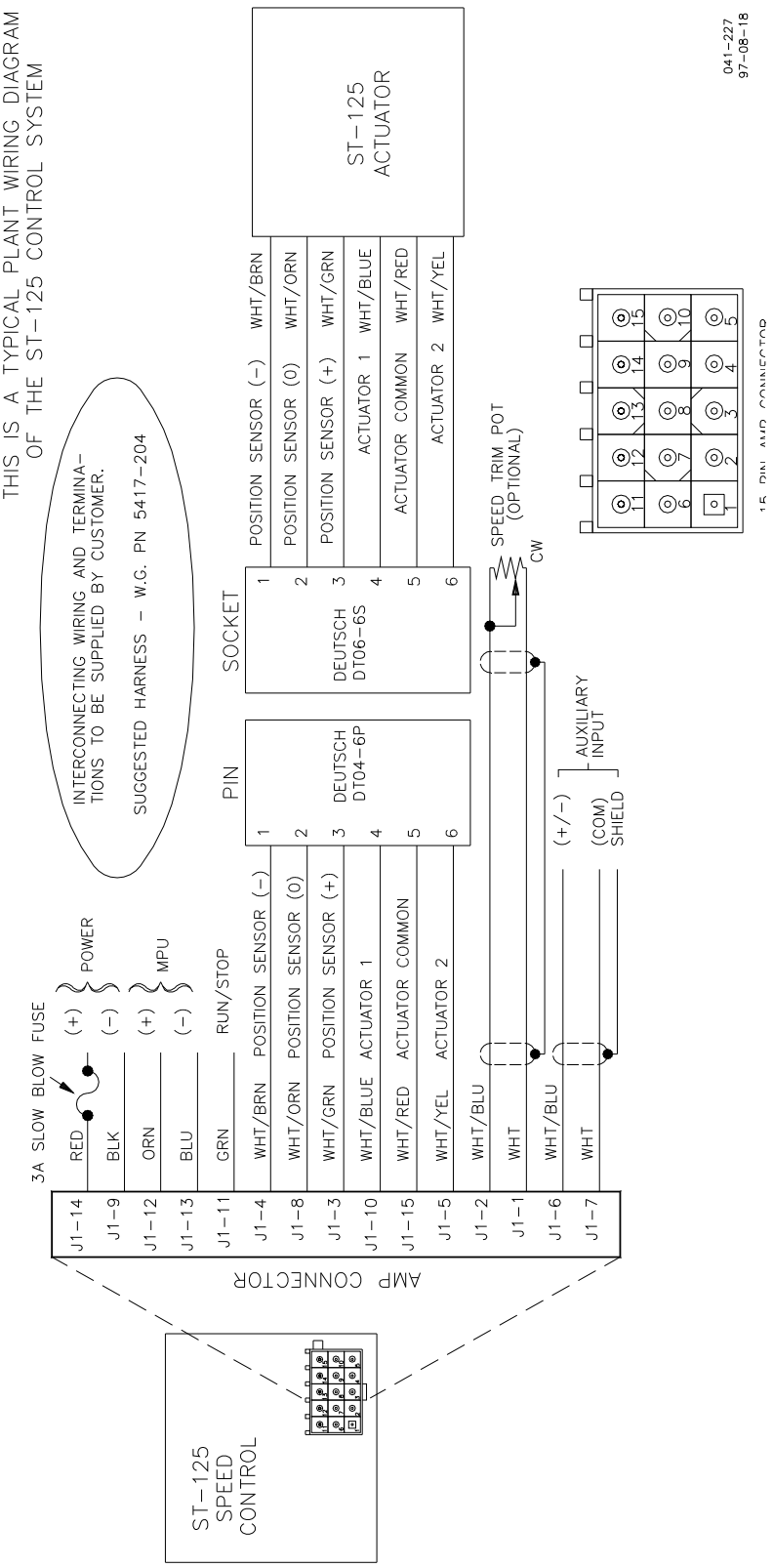


Figure 3-2. Control Wiring

Chapter 4.
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.

ST-125™ Control Specifications

Woodward Part Numbers	
8405-310	Control with Aux Input
8405-312	Actuator
Compliance	
UL/cUL Listed E97763	
CE Compliant	
Environment	
Operating Temperature	
Actuator:	–30 to +85 °C (–22 to +185 °F)
Control:	–40 to +70 °C (–40 to +158 °F)
Storage Temperature	
Actuator and Control:	–40 to +85 °C (–40 to + 185 °F)
EMI/RFI Susceptibility	EN50081-2 and EN50082-2
Shock and Vibration	US MIL-STD-810C, Curve J, 5 G from 5–2000 Hz in 3 axes
Typical Control Characteristics	
Steady-State Speed Regulation	Rated speed ±0.25 percent (±0.50 percent over the operating temperature)
Inputs	
Speed Signal Input and Range	
Magnetic Pickup Input:	2125–6525 Hz 30 Vac (rms) maximum 1 Vac (rms) minimum
Run/Stop Select Inputs:	8–32 Vdc, 4.0 mA maximum
Power Supply	8–32 Vdc (12/24 Vdc nominal), 2.7 A maximum UL requires a Class 2 power source or isolated source (3 A slow blow fuse in line from battery)
Power Consumption	23 W maximum

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 04185.

WOODWARD

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Email and Website—www.woodward.com

**Woodward has company-owned plants, subsidiaries, and branches,
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.

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