

**WARNING**

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.

The engine, turbine, or other type of prime mover should be equipped with an overspeed (overtemperature, or overpressure, where applicable) shutdown device(s), that operates totally independently of the prime mover control device(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

General

The TQ-125™ control is an integrated analog speed control and 0.34 J (¼ ft-lb) actuator. Upon start, the TQ-125 control brings the engine to rated speed and maintains isochronous single-engine speed.

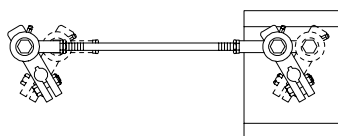
Installation

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

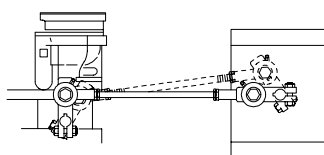
When using a magnetic pickup (MPU), install the MPU through a housing or rigid bracket. Make sure the sensed gear is of a magnetically soft material (a typical non-stainless steel). The gap between the pickup and the outside diameter of the gear should be set between 0.25 and 1.00 mm (0.010 and 0.040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

1. The TQ-125 control should be rigidly mounted to the engine with a bracket. The control is mounted to the bracket with four .250-28 screws which attach to the shaft side of the control.

2. The linkage for diesel engine applications should be linear, and for carbureted engines non-linear. The linkage should not bind or have play in it.



LINEAR LINKAGE



NON-LINEAR LINKAGE

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3. A positive shutdown device, such as a spring, is required to ensure shutdown upon loss of signal to the TQ-125 control. The maximum force of the spring must be less than 0.17 J (1.5 in-lb) at the actuator.

Governor Adjustment

Use either a tachometer or frequency meter to check engine speed for governor adjustment.

1. When sensing speed from the ignition coil, set the appropriate DIP switches for the number of cylinders and the frequency (see chart). (The switch is closed when the switch is depressed with a pen or pencil on the side closest to the control's outer edge.)

No. of Cylinders	Sw1	Sw2	Sw3
4	Open	Open	Closed
6	Open	Closed	Open
8	Closed	Open	Open

Frequency	Sw4
60 Hz	Closed
50 Hz	Open

2. When using a magnetic pickup to sense speed, use the rated engine rpm and the number of teeth on the flywheel to 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 below that includes this MPU frequency.

Set the four position DIP switch on the control to the switch combination that matches the desired speed range.

Speed Range (Hz)		Sw1	Sw2	Sw3	Sw4
Low	High				
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

3. Check the mounting of the control and linkage to assure the 60 degree actuator shaft rotation matches the fuel metering device. The actuator rotates counterclockwise as seen from the shaft side.

Pre-Start Potentiometer Settings

- Speed Trim fully counterclockwise (minimum)
- Start Fuel fully clockwise (maximum) [if equipped]
- Stability at mid-position
- Gain at mid-position

Startup and Adjustment

Starting the Engine

Start the engine using the manufacturer's instructions.



WARNING

TO PROTECT AGAINST POSSIBLE PERSONAL INJURY, LOSS OF LIFE, AND/OR PROPERTY DAMAGE WHEN STARTING THE ENGINE, BE PREPARED TO MAKE AN EMERGENCY SHUTDOWN to protect against runaway or overspeed should the electric control, the actuator, or the fuel control fail.

If the engine does not start, check to assure that the control is receiving the proper battery voltage, 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, 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 bumping the actuator linkage to increase/decrease fuel rack position. Repeat the following tuning procedure until the engine responds as desired.



NOTE

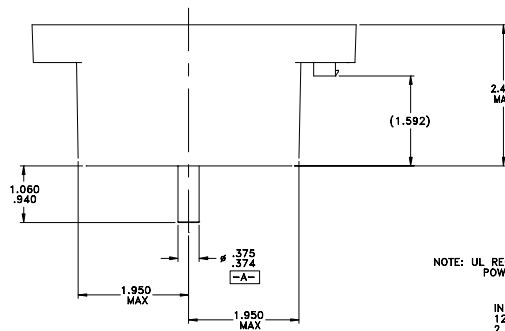
Too high a gain setting may result in stable operation at normal temperatures but could cause oscillation when the engine is cold. Readjustment may be required for satisfactory cold-start operation.

Start Fuel Limiting

(applies only to controls equipped with the Start Fuel Limiting option)

Use this procedure for diesel applications with optional start fuel limiting.

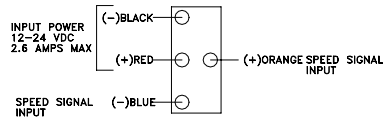
The purpose of Start Fuel Limiting is to limit the fuel that the fuel pump can deliver to the engine on startup. When adjusted properly, the Start Fuel Limiting supplies the engine with just enough fuel to start but not so much as to produce black smoke during startups. After the engine reaches rated 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.



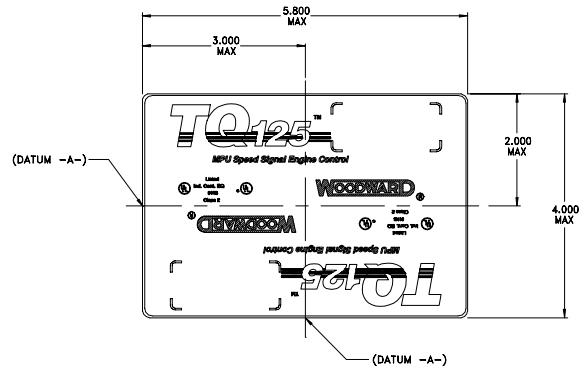
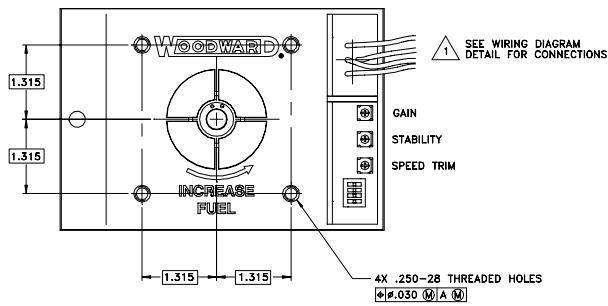
ELECTRICAL CONNECTION OPTIONS:

- 1 SIX PIN CONNECTOR (AS SHOWN). MATES TO AMP PART NUMBER 172339-1 WITH 171639 CONTACT. (WOODWARD GOVERNOR P.N. 1751-949 AND 1751-921 RESPECTIVELY)
- 2 8 INCH LONG 18 AWG WIRE WITH AMP P.N. 2-52010302 QUICK CONNECT TERMINAL (WOODWARD GOVERNOR P.N. 1606-740). MATES WITH ANY .250 QUICK CONNECT LUG.

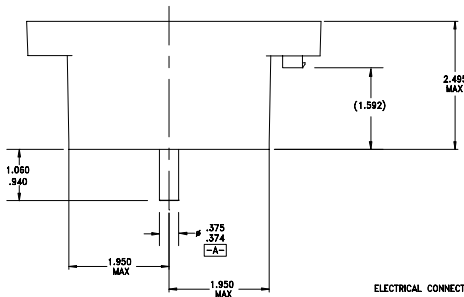
NOTE: UL REQUIRES CLASS 2 POWER SOURCE



NOTE:
NO CONNECTION
ON IGNITION
COIL CONTROLS

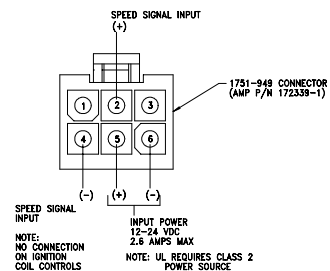


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ELECTRICAL CONNECTION NOTES:

- 1 SIX PIN CONNECTOR (AS SHOWN). MATES TO AMP PART NUMBER 172339-1 WITH 171639 CONTACT. (WOODWARD GOVERNOR P.N. 1751-949 AND 1751-921 RESPECTIVELY)

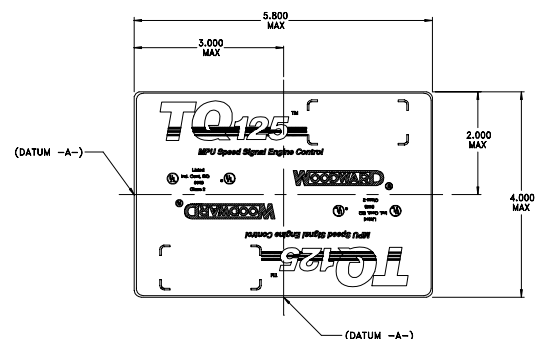
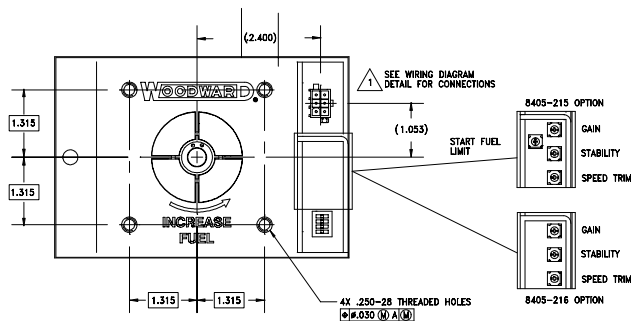


NOTE: NO CONNECTION ON IGNITION COIL CONTROLS

NOTE: UL REQUIRES CLASS 2 POWER SOURCE

MATING CONNECTOR

SCALE: 4/1



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TQ-125™ Control (8405-213, -214, -223 above; 8405-215, -216 below)

TQ-125™ Control Specifications

Woodward Part Numbers:

8405-213	TQ-125, 12/24 Vdc, magnetic pickup speed sensing, 8-inch (203 mm) wires with 1/4" (6 mm) spade connectors
8405-214	TQ-125, 12/24 Vdc, ignition coil speed sensing, 8-inch (203 mm) wires with 1/4" (6 mm) spade connectors
8405-215	TQ-125, 12/24 Vdc, magnetic pickup speed sensing, start fuel limiting for diesel applications, AMP connector integral to governor, compliant with the European Union's EMC directive
8405-216	TQ-125, 12/24 Vdc, magnetic pickup speed sensing, AMP connector integral to governor, compliant with the European Union's EMC directive
8405-223	TQ-125, like 8405-213 except with lever 3952-047

Agency Approval:

UL and cUL Class 2 listed, File #E97763
CE Compliant (8405-215, 8405-216)

Environment:

Ambient Operating Temperature	-40 to +70 °C (-40 to +158 °F)
Storage Temperature	-55 to +105 °C (-67 to +221 °F)
EMI/RFI Specification	EN 50081-2 (emissions) EN 50082-2 (immunity)
Shock	40 G, 11 ms, sawtooth pulse
Vibration	random vibration, 8Grms

Typical Control Characteristics: Steady State Speed Regulation

Rated speed $\pm 0.25\%$ of rated speed for magnetic pickup on diesel or propane applications
Rated speed $\pm 0.35\%$ of rated speed for magnetic pickup on gasoline or natural gas applications
Rated speed $\pm 0.50\%$ of rated speed for ignition coil applications

Inputs:

Speed Signal Input and Range	Magnetic pickup or ignition coil input
Magnetic Pickup Input	2125 to 6525 Hz, 30 Vac max.
Ignition coil Input	Switchable for 4, 6, or 8 cylinders for standby generator sets with rated speeds of 1500 to 1800 rpm @ 50/60 Hz, 18 Vdc continuous, 300 Vdc max. for 100 μ s
Power Supply	8 to 30 Vdc, 2 A max input (12/24 Vdc nominal) UL requires a Class 2 power source
Power Consumption	30 W maximum



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