ENGINE GOVERNING SYSTEMS

ESD2100 Series

Speed Control Unit

GOVERNORS AMERICA CORP.

- Single engine isochronous speed.
- Precise speed control.
- Easy installation and adjustment.
- Adjustable PID functions.

INTRODUCTION

The **ESD2100** Series speed control unit is an all-electronic device designed to control engine speed with fast and precise response to transient load changes. This closed loop control, when connected to a proportional electric actuator and supplied with a magnetic speed sensor signal, will control a wide variety of engines in an isochronous or droop mode. It is designed for high reliability and built ruggedly to withstand the engine environment.

Simplicity of installation and adjustment was foremost in the design. Two non-interacting performance controls allow near optimum response to be easily obtained.

Other features include; protection against reverse battery voltage, transient voltages, accidental short circuit of the actuator, and fail-safe design in the event of loss of speed sensor signal or battery supply.

DESCRIPTION

Engine speed information for the speed control unit is usually received from a magnetic speed sensor. Any other signal-generating device may be used provided that the generated frequency is proportional to engine speed and meets the voltage input and frequency range specification. The speed sensor is typically mounted in close proximity to an engine driven ferrous gear, usually the engine ring gear. As the teeth of the gear pass the magnetic sensor, a signal is generated which is proportional to engine speed.

Signal strength must be within the range of the input amplifier. An amplitude of 0.5 to 50 volts RMS is required to allow the unit to function within its design specifications. The speed signal is applied to Terminals 3 and 4 of the speed control unit. Between these terminals there is an input impedance of over 33,000 ohms. Terminal 4 is internally connected to Terminal 5, battery negative. Termination of the speed sensor shield should be made at Terminal 4. Only one end of the cable shield should be connected.

When a speed sensor signal is received by the controller, the signal is amplified and shaped by an internal circuit to provide an analog speed signal. If the speed sensor monitor does not detect a speed sensor signal, the output circuit of the speed control unit will turn off all current to the actuator. A summing circuit receives the speed sensor signal along with the speed adjust set point input. The speed range has a ratio of 7:1 and is adjusted with a 25-turn potentiometer. The output from the summing circuit is the input to the dynamic control section of the speed control unit. The dynamic control circuit, of which the gain and stability adjustments are part, has a control function that will provide isochronous and stable performance for most engine types and fuel systems.

The speed control unit circuit is influenced by the gain and stability performance adjustments. The governor system sensitivity is increased with clockwise relation of the gain adjustment. The gain adjustment has a non-linear range of 33:1. The stability adjustment, when advanced clockwise, increases the time rate of response of the governor system to match the various time constants of a wide variety of engines. The speed control unit is a P I D device, the "D", derivative portion can be varied when required (See PIB1020).

During the engine cranking cycle, the actuator becomes fully energized and moves to the maximum fuel position. The actuator will remain in this state during engine cranking and acceleration. While the engine is at steady load, the actuator will be energized with sufficient current to maintain the governor speed setpoint.

The output circuit provides switching current at a frequency of about 500 Hz. to drive the actuator. Since the switching frequency is well beyond the natural frequency of the actuator, there is no visible motion of the actuator output shaft. Switching the output transistors reduces its internal power dissipation for efficient power control. The output circuit can provide current up to 10 amps continuous at 25°C at battery voltages up to 40 VDC to drive the actuator. The actuator responds to the average current to position the engine fuel control lever.

The speed control unit has several performance and protection features, which enhance the governor system. A speed anticipation circuit minimizes speed overshoot on engine startup or when large increments of load are applied to the engine.

The ESD2100 Series speed control unit is compatible with GOVERNORS AMERICA CORP. proportional electric actuators (except the ADB2000) as well as those from other manufacturers.

ESD2100 SERIES SPEED CONTROL UNITS

ESD2110 ..... Standard Unit

SPECIFICATIONS

PERFORMANCE

Isochronous Operation/Steady State Stability	.±0.25% or better
Speed Range/Governor	1K-7.5K Hz continuous
Speed Drift with Temperature	±1% Maximum
Speed Trim Range	± 450 Hz Typical
Remote Variable Speed Range	500 – 6K Hz. or any part thereof
Terminal 9 Sensitivity	120 Hz., ± 15 Hz / Volt @ 250 K Impedance

ENVIRONMENTAL

Ambient Operating Temperature Range	-40 to +180°F (-40° to +85°C)
Relative Humidity	up to 95%
All Surface Finishes	Fungus Proof and Corrosion Resistant

INPUT POWER

Supply	10-40 VDC (Transient and Reverse Voltage Protected)*
Polarity	Negative Ground (Case Isolated)
Power Consumption	60 ma continuous plus actuator current
Actuator Current Range @ 77°F (25°C)	10Amps continuous
Speed Senior Signal	0.5-50 Volts RMS

RELIABILITY

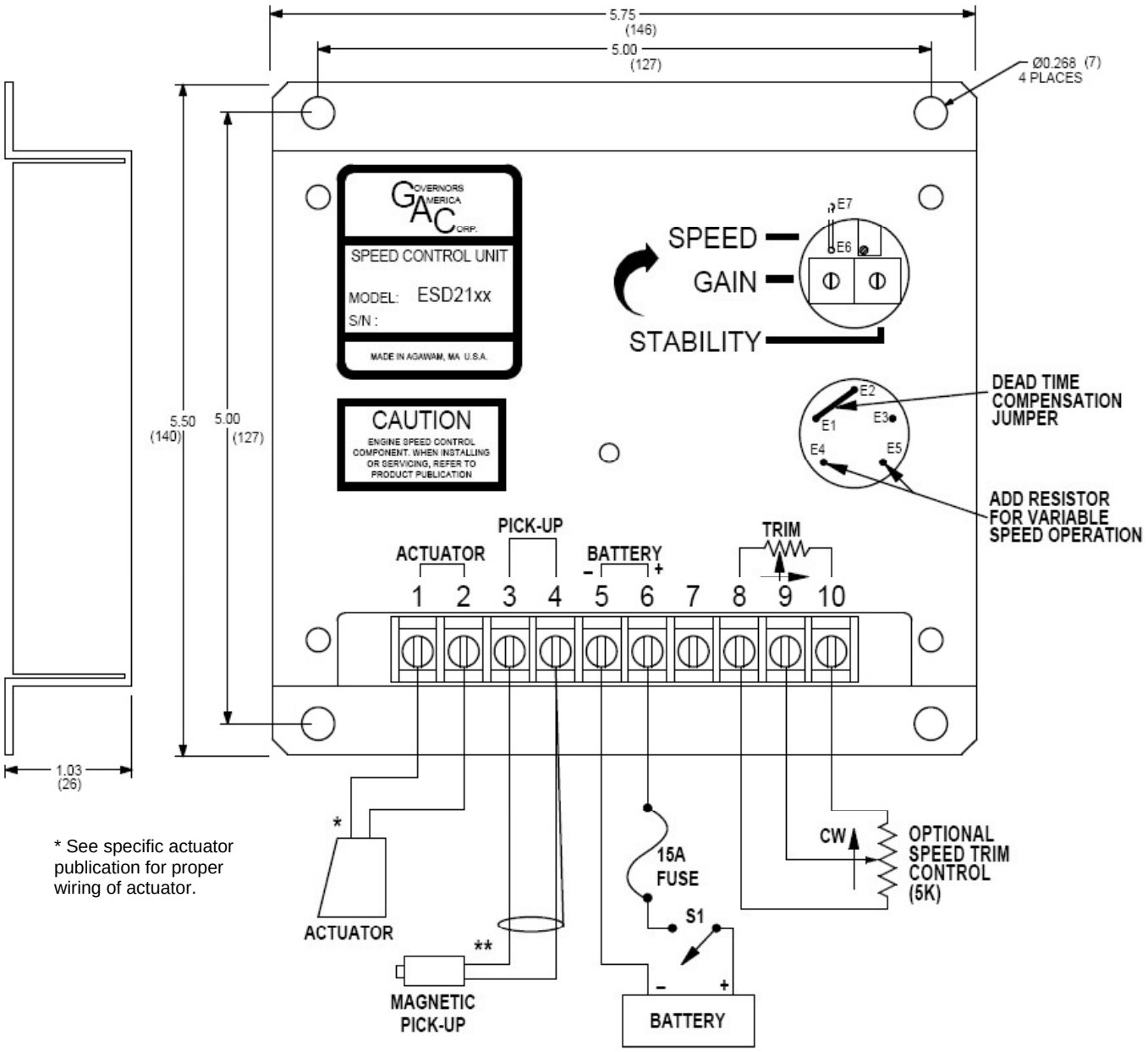
Vibration	5G @ 20-500 Hz.
Testing	100% Functionally Tested

PHYSICAL

Dimensions	See Outline (DIAGRAM 1)
Weight	1.2 lbs. (545 grams)
Mounting	Any Position, Vertical Preferred

*Reverse voltage is protected against by a parallel diode. A 15 Amp fuse must be installed in the positive battery lead. See Diagram 1.

DIAGRAM 1 SYSTEM WIRING/OUTLINE



* See specific actuator publication for proper wiring of actuator.

** If wire leads are longer than 3 meters (10ft) a shielded cable should be used. Ground shield at one end only.