

ESD-1000 Series - Speed Control Unit

- Simple, isochronous operation
- Lowest cost speed control unit
- Rugged, hard potted design
- Adjustable speed trim



INTRODUCTION

The ESD-1000 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 mode. It is designed for high reliability and it's hard-potted to withstand the engine environment.

Simplicity of installation and adjustment was foremost in the design. A gain performance adjustment allows near optimum response to be easily obtained.

Other features include protection against reverse battery voltage and transient voltages, and fail-safe design in the event of loss of speed 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 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 through the magnetic field of the sensor, a signal is generated which is directly proportional to engine speed.

*Solutions for combustion engines,
that work right from the beginning.*

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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 the GREEN and ORANGE wires of the speed control unit. Between these terminals there is an input impedance of over 5k Ω . The GREEN wire is internally connected to the BLACK wire, battery negative. Termination of the speed sensor shield can also be made at the GREEN wire. Only one end of the cable shield should be connected.

When the controller receives a speed sensor signal, it 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 of the summing circuit is the input to the dynamic control circuit, of which the Gain adjustment is a part, has a control function that will provide isochronous and stable performance for most engine fuel systems.

The speed control unit output circuit is influenced by the integral gain performance adjustment. The governor system sensitivity is increased with clockwise rotation of the **GAIN** adjustment. The **GAIN** adjustment has a nonlinear range of 33:1.

During engine cranking, the actuator is fully energized and will move to the maximum fuel position. The actuator will remain in that 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 set point.

The output circuit provides switching current at a frequency of about 500Hz to drive the actuator. The switching frequency is well beyond the natural frequency of the actuator, thus there is no visible motion of the actuator output shaft. Switching the output transistor reduces its internal power dissipation for efficient power control. The output circuit can provide a current of up to 10A continuous at 25 $^{\circ}$ C at battery voltages up to 32VDC 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 will minimize speed overshoot on engine start-up or when large increments of load are applied to the engine.

The ESD-1000 Series speed control units are compatible with Governors America Corp. proportional actuators (except the ACB-2000 Series) as well as some of those of other manufacturers.

ESD-1000 SERIES SPEED CONTROL UNITS

ESD-1000-12	Standard Unit, 12V
ESD-1000-24	Standard Unit, 24V
ESD-1100-12	Terminal Strip, 12V
ESD-1100-24	Terminal Strip, 24V

SPECIFICATIONS

Performance

Isochronous Operation / Steady State Stability.....	±0.25% or Better
Speed Range Governor	1kHz – 7.5kHz Continuous
Speed Trim Range.....	± 250 Hz. Typical
Speed Drift w/Temperature	± 1% Maximum
YELLOW Wire Sensitivity	130 Hz. ± 15 Hz./Volt @ 5.1K Impedance

Environmental

Ambient Operating Temperature Range.....	-40°F to + 180°F (-40°C to 85°C)
Relative Humidity (Non-condensing)	Up to 100%
All Surface Finishes.....	Fungus Proof and Corrosion Resistant

Input Power

Supply	(Transient and Reverse Voltage Protected)*
.....	12 Volt unit; 8VDC - 20VDC;
.....	24 Volt unit; 16VDC - 32VDC
Polarity.....	Negative Ground (Case Isolated)
Power Consumption	60mA Continuous Plus Actuator Current
Maximum Actuator Current @ 25°C (77°F)	10A Continuous
Speed Sensor Signal.....	0.5-50V RMS

Reliability

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

Physical

Dimensions	See Outline (Diagram 1)
Weight	12oz (347g)
Mounting	Any Position, Vertical Preferred

**Reverse voltage is protected against by a parallel diode on the 12V unit or a series diode on the 24V unit. A 15A fuse must be installed in the positive battery lead. See Diagram 1.*

Diagram 1: SYSTEM WIRING/OUTLINE

