ESD-5500E Series

Features and Benefits

- A Two Element Speed Switch (overspeed sensing and crank termination)
- Speed Ramping from Idle to Operating Speed
- Starting Fuel Control for lower engine exhaust emissions
- A unique actuator power drive circuit

Manufactured by:

Governors America Corp.

Speed Control Unit

The **ESD-5500E Series** speed control unit is an all electronic device designed to control engine speed with last 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. Non-interacting performance controls allow near optimum response to be easily obtained.

The primary features of the ESD-5500E Series speed control unit are the engine STARTING FUEL and SPEED RAMPING adjustments. The use of these features will minimize engine exhaust smoke experienced prior to attaining engine operation speed.

Other features include adjustable droop and idle operation, inputs for accessories used in multi-engine or special applications, protection against reverse battery voltage, transient voltages, accidental short circuit of the actuator and fail safe design in the event et loss of speed sensor signal or battery supply.

The ESD-5500E Series speed control unit is compatible with all GAC proportional actuators except the ACB- 2000 electric actuator. When the ESD-5500E Series speed control unit is used with an ADC-100 Series electric actuator, the DROOP adjustment range will be less due to this actuator's low current demand.

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 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 120 volts RMS is required to allow the unit to function within is design specifications.
The speed signal is applied lo Terminals C and D of the speed control unit.
Between these terminals there is an input impedance of over 33,000 ohms.
Terminal D is internally connected to Terminal E, battery negative.
Only one end of the shielded cable 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 a 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 8:1 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 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 rotation of the gain adjustment.
The gain adjustment has a 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.

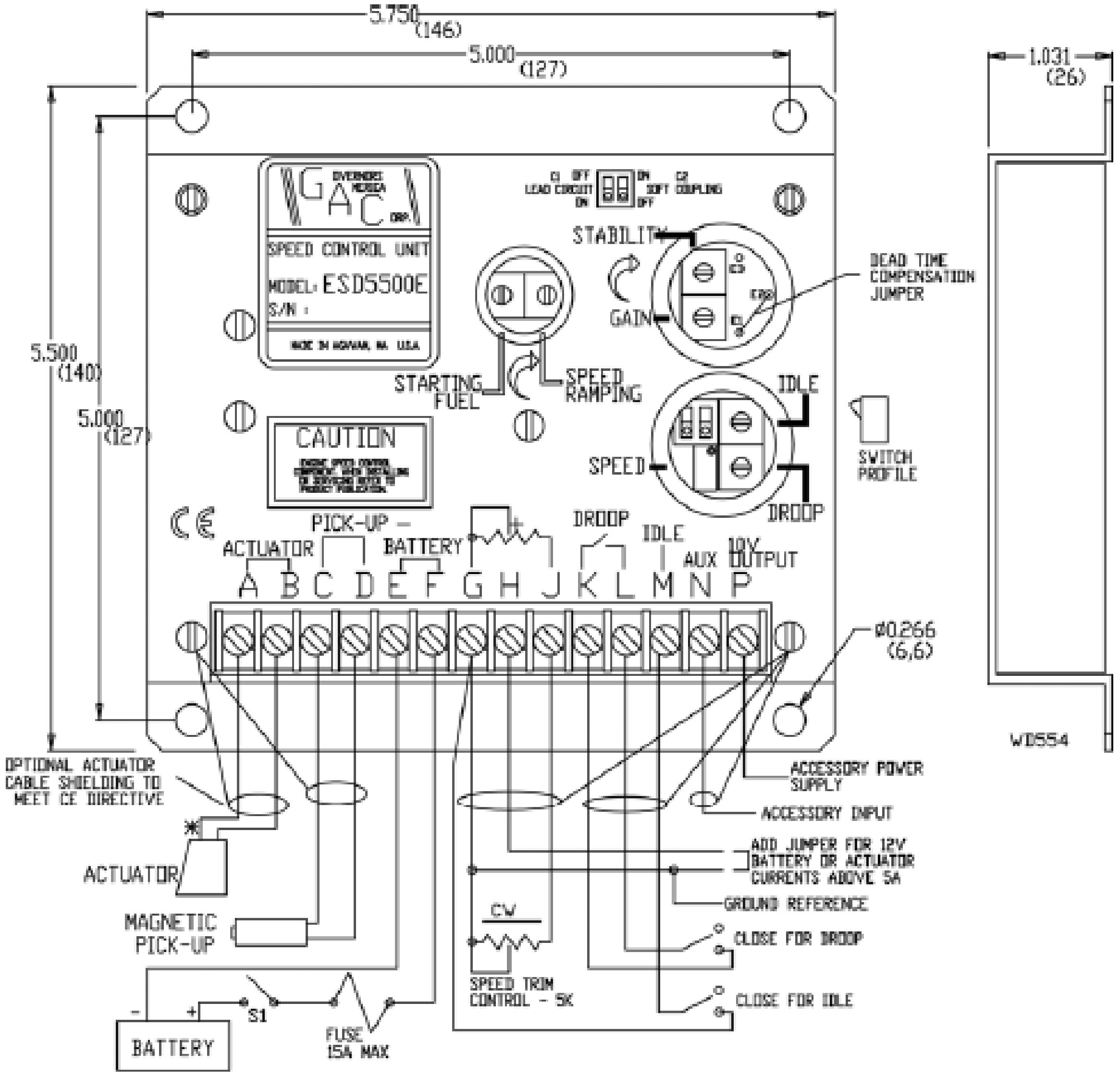
The speed control unit is a P I D device, the "D", derivative portion can be varied when required. (See Instability section)
During the engine cranking cycle, STARTING FUEL can be adjusted from an almost closed, to a nearly full fuel position.
Once the engine has started, the speed control point is determined, first by the IDLE speed set point and the SPEED RAMPING circuit.
After engine speed ramping has been completed, the engine will be at its governed operating speed.
At the desired governed engine speed, the actuator will be energized with sufficient current to maintain the desired engine speed, independent of load (isochronous operation).

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 of up to 10 amps continuous at 25°C for 12 and 24 VDC battery systems.
The actuator responds to the average current to position the engine fuel control lever.

In standard operation, the speed control unit performance is isochronous.
Droop governing can be selected by connecting terminals K and L and the percent of droop governing can be varied with the droop adjustment control.
The droop range can be decreased by connecting Terminals G and H.

The speed control unit has several performance and protection features which enhance the governor system.
A speed anticipation circuit minimizes speed overshoot on engine start-up or when large increments of load are applied to the engine.
Engine idle speed can be remotely selected and is adjustable.
Accessory inputs to achieve variable speed operation and multi-engine control can be accepted by the ESD-5500E Series speed control unit from GAC load sharing modules, automatic synchronizers, ramp generators and other accessory engine control modules.
Protection against reverse battery voltage and transient voltages is provided.
The design is fail-safe In the event of loss of speed sensor signal or battery supply.

Figure 1: Sytem Wiring/Outline



* SEE SPECIFIC ACTUATOR PUBLICATION FOR PROPER WIRING OUF ACTUATOR BASED ON BATTERY VOLTAGE

Analogue Speed Governors

ESD-5500E Series Speed Control Units

EDS-5500E...Standard Unit
ESD-5522................................Suitable for low inertia actuators

Specification

Performance

Isochronous Operation/Steady State Stability.......................... ....± 0.25% or better
Speed Range/Governor..........................1K-7.5K Hz continuous
Speed Drift with Temperature............................± 1% Maximum
Idle Adjust CW..60% of set speed
Idle Adjust CCW...Less than 1200 Hz.
Droop Range...1 - 5% regulation*
Droop Adj. Max. (K-L Jumpered)... ....400 Hz, ± 75 Hz. per 1.0 A change
Droop Adj. Min. (K-L ,Jumpered)... ....15 Hz., ± 6 Hz. per 1.0 A change
Speed Trim Range..± 200 Hz.
Remote Variable Speed Range... ....500 - 7.5 Hz. or any part thereof

<u>Terminal sensitivity</u>

J................................100 Hz., ± 15 Hz / Volt @ 5.0 K Impedance
L.................................735 Hz., ± 50 Hz / Volt @ 65 K Impedance
N............................145 Hz., ± 10 Hz / Volt @ 1 Meg. Impedance
P..10 VDC Supply @ 20 ma Max.

Environmental

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

Input Power

Supply..12 or 24 VDC Battery Systems
................(Transient and Reverse Voltage Protected)**
Polarity...................................Negative Ground (Case Isolated)
Power Consumption... ....50 ma continuous plus actuator current
Actuator Current Range @ 77°F (25°C)-(Inductive Load).......... ....Min. 2.5 Amps
....Max.10Amps continuous***
Speed Sensor Signal......................................0.5-120 Volts RMS

Reliability

Vibration..1G @ 20-100 Hz.
Testing..100% Functionally Tested

Physical

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

* Droop is based on a speed sensor frequency of 4000 Hz. and an actuator current change of 1 amp from no load to full toad. Applications with higher speed sensor signals will experience less percentage of droop. Applications with more actuator current change will experience higher percentages of droop. See droop description for specific details on operation of droop ranges. When used with the ADC100 actuator the droop percentage will be less due to the actuator low current consumption
** Protected against reverse voltage by a series diode. A 15 amp fuse must be installed in the positive battery lead.
*** Protected against short circuit to actuator (shuts off current to actuator), unit automatically turns back on when short is removed.

Local Distributor / Partner:

HUEGLI TECH
SWITZERLAND

HUEGLI TECH AG (LTD)
Murgenthalstrasse 30
4900 Langenthal Switzerland
Phone: +41 62 916 50 30
Fax: +41 62 916 50 35

e-mail: sales@huegli-tech.com
www.huegli-tech.com